"It will flourish, if naturalists, chemists, antiquaries, philologers, and men of science in different parts of Asia, will commit their observations to writing, and send them to the Asiatic Society at Calcutta. It will languish, if such communications shall be long intermitted; and it will die away, if they shall entirely cease." — SIR WM. JONES.

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ON DIFFERENTIAL GALVANOMETERS,—
by LOUIS SCHWENDLER.

(Continued from page 132, Vol. XLI, Part II, 1872.*)

The first part of this investigation concluded with the following question:

What general condition must be fulfilled in the construction of any differential galvanometer in order to make a simultaneous maximum possible with respect to an alteration of external resistance in either of the differential branches?

To answer this question, it will be necessary to remember, that the condition of a simultaneous maximum sensitivity at or near balance was expressed by 3 equations, namely,—

\[
\frac{(w - y)(w + y) + f(w + w' + g - y)}{p(g - w) y'} = \frac{2(g + w + f)}{2 \sqrt{y' - y} - p(g + w)} \quad \text{II}
\]

\[
\frac{(w - y')(w + y') + f'(w + w' + g - y')}{p(g' - w') y'} = \frac{2(g' + w' + f')}{2 \sqrt{y' - y} - g' + w'} \quad \text{II'}
\]

and

\[
g' + w' - p \frac{\sqrt{y'}}{\sqrt{y}} (g + w) = 0 \quad \text{I}
\]

\(y\) and \(y'\) being the resistances of the two differential coils, \(w\) and \(w'\) the two resistances at which balance actually arrives, \(f\) the total resistance in the battery branch, and \(p\) an absolute number expressing what was termed the

* Read before the Asiatic Society of Bengal, 6th March, 1872.
"mechanical arrangement" of the differential galvanometer under consideration.

By these three equations, which are independent of each other, \( g, g' \) and \( p \) can be expressed in terms of \( w, w' \) and \( f \).

By equation I we have at or very near balance:

\[
p = \frac{g' + w'}{g + w} \cdot \sqrt{g'} \quad \text{which value substituted in equations II and II'}
\]

which gives:

\[
\frac{(w - g) (w' + g') + f (w + w' + g' - g)}{(g' + w') (g - w) g'} = \frac{2 (g + w + f)}{(g' - w') (g + w)} \quad \text{... II}
\]

and

\[
\frac{(w' - g') (w + g) + f (w + w' + g - g')}{(g' + w) (g' - w') g} = \frac{2 (g' + w' + f)}{(g' - w) (g' + w')} \quad \text{... II'}
\]

and from these two equations \( g \) and \( g' \) may be developed.

This is best done by subtracting equation II from equation II' when after reduction we get:

\[
(w' - wg') (w'g + wg' + gg' + ww') = -f (g + g' + w + w') (wg - wg') \quad \text{III}
\]

Now it must be remembered, that with respect to our physical problem, \( f, w, w', g \) and \( g' \) represent nothing else, but electrical resistances, and that they have, therefore, to be taken in any formula as quantities of the same sign (say positive).

Consequently the above equation III would contain a mathematical impossibility (a positive quantity equal to a negative quantity), whenever the common factor \( w'g - wg' \) is different from zero.

In other words equation III can only be fulfilled if we always have:

\[
w'g - wg' = 0 \quad \text{................................................................. IV}
\]

This simple relation between the resistances at which balance arrives and the resistances of the two differential coils, expresses not only the necessary and sufficient condition under which a simultaneous maximum sensitiveness can exist, but it also affords an easy means of getting at once those special values of \( g, g' \) and \( p \), which only solve the physical problem.

Substituting the value of either \( g \) or \( g' \), as given by equation IV in equations II and II' and developing \( g \) and \( g' \) we have:

\[
* g = -\frac{1}{2} \left( w + \sqrt{w} \left( w + w' \right) \right) + \frac{1}{3} \sqrt{w^3 + \frac{w}{w'} (w + w') f + \frac{(w + w')^2}{16w'^2}} \quad \text{a.}
\]

\[
* g' = -\frac{1}{2} \left( w' + \sqrt{w} \left( w + w' \right) \right) + \frac{1}{3} \sqrt{w'^3 + \frac{w'}{w} (w + w') f + \frac{(w + w')^2}{16w^2}} \quad \text{b.}
\]

the negative signs of the square roots having been omitted since they would

* See note at end.
obviously make \( g \) and \( g' \) negative, values which cannot solve the physical question.—

Further, if we introduce the ratio

\[
\frac{g'}{g} = \frac{w'}{w},
\]
given by equation IV, into equation I, and develop \( p \) we get:

\[
p^2 = \frac{w'}{w} \quad \text{...........................................................} \quad c.
\]

This latter expression shows the very simple relation which must exist between the mechanical arrangement of any differential galvanometer and the two resistances at which balance is arrived at, in order to make a simultaneous maximum sensitiveness possible.

Thus if the ratio of the two resistances at which balance arrives is fixed, the mechanical arrangement \( p \) cannot be chosen arbitrarily, but must be identical with this ratio. This is in fact the answer to the question put at the beginning of this paper.

However, the meaning of this result will be made even still clearer if we revert to equation I, by which we have

\[
p \sqrt{g'} = \frac{g' + w'}{g + w} = C \quad \text{...........................................................} \quad I.
\]

expressing the ratio between the total resistances in the two differential branches, when balance is established, and which ratio is generally known under the name Constant of the Differential Galvanometer.

Substituting in the above expression I the value of \( \frac{g'}{g} = \frac{w'}{w} \) from equation IV we get at once

\[
\frac{w'}{w} = C \quad \text{...........................................................} \quad d.
\]

and as a second answer to the question put at the beginning of this paper we have therefore:

A simultaneous maximum sensitiveness with respect to an alteration of external resistance in either branch of any differential galvanometer can be obtained only, if the constant of the differential galvanometer is equal to the ratio of the two resistances at which balance arrives, and this clearly necessitates that the resistances of the respective coils to which \( w \) and \( w' \) belong should stand in the same ratio.

The general problem may now be considered as solved by the following four general expressions:

\[
g = -\frac{1}{3} \left( w + \sqrt{\frac{(w + w')^2}{2w'}} \right) + \frac{1}{3} \sqrt{w^2 + \frac{w}{w'} (w + w') f' + \frac{(w + w')^2}{16w^2} f^2} ... a.
\]

\[
g' = \frac{w'}{w} g \quad \text{...........................................................} \quad b.
\]
In the foregoing it has not been shewn that the values \( g \) and \( g' \), expressed by equations \( a \) and \( b \), must necessarily correspond to a maximum sensitiveness of the differential galvanometer, because it was clear \( \textit{a priori} \), that the function by which the deflection is expressed is of such a nature that no minimum with respect to \( g \) and \( g' \) is possible. However, to complete the solution mathematically, the following is a very short proof that the values of \( g \) and \( g' \) really do correspond to a maximum sensitiveness of the differential galvanometer under consideration.

Reverting to one of the expressions for the deflection \( \alpha_0 \) which any differential galvanometer gives before balance is arrived at, we had:

\[
\alpha_0 \propto K \frac{\sqrt{g}}{N} \Delta \quad \text{and as the increase of deflection at or near balance is identical with the deflection itself, and further as the law which binds the resistance of the differential coils to the other resistances in the circuit, in order to have a maximum sensitiveness, is of practical interest only when the needle is at, or very nearly at, balance, we can solve the question at once by making } \alpha_0 \text{ a maximum with respect to } g \text{ and } g', \text{ if we only suppose } \Delta \text{ constant and small enough, and as } K \text{ is known to be independent of } g \text{ and } g', \\
\text{the deflection } \alpha_0 \text{ will be a maximum if } \frac{\sqrt{g}}{N} \text{ is a maximum for any constant } \Delta \text{ (zero included).}
\]

Further we know that \( g' = Cg \) which value for \( g' \) in \( N \) substituted will make the latter a function of \( g \) only and consequently \( \frac{\sqrt{g}}{N} \) also. We have therefore to deal with a single maximum or minimum, and according to well-known rules we have:

\[
\frac{da}{dg} = \frac{N - 2g \frac{dN}{dg}}{2\sqrt{g} N^2} = U
\]

and

\[
\frac{d^2a}{dg^2} = \frac{V \frac{dU}{dg} - U \frac{dV}{dg}}{V^2}
\]
but
\[ \frac{da}{dg} = 0 \] it follows that \[ U = 0 \]
\[ \therefore \frac{d^2a}{dg^2} = \frac{1}{V} \frac{dU}{dg} \]
Now
\[ \frac{dU}{dg} = -\left( \frac{dN}{dg} + 2g \frac{d^2N}{dg^2} \right) \]
but \[ \frac{dN}{dg} \] as well as \[ \frac{d^2N}{dg^2} \] being invariably positive, it follows that \[ \frac{dU}{dg} \] is invariably negative, and as further \( V \) is always positive it follows finally that \( \frac{d^2a}{dg} \) is always negative, or the value of \( g \) obtained by equation \( \frac{da}{dg} = 0 \) corresponds to a maximum sensitiveness of the

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Mechanical arrangement designed by \( p \).—The condition which must be fulfilled in the construction of any differential galvanometer to make a simultaneous maximum sensitiveness possible was expressed by

\[ p^2 = \frac{w'}{w} \]

while \( p = \frac{m' n'}{m n} \) and it will be now instructive to enquire what special physical meaning equation \( c \) has.
By \( m \) was understood the magnetic effect of an average convolution (i.e., one of average size and mean distance from the magnet acted upon, when the latter is parallel with the plane of the convolutions) in the differential coil of resistance \( g \), when a current of unit strength passes through it. Similarly \( m' \) was the magnetic effect of an average convolution in the other differential coil of resistance \( g' \).

Further \( n \) and \( n' \) were quantities expressed by
\[
U = n \sqrt{g} \\
U' = n' \sqrt{g'}
\]

\( U \) and \( U' \) being the number of convolutions in the two coils \( g \) and \( g' \) respectively.

Now we will call \( A \) half the cross section of the coil \( g \) (cut through the coil normal to the direction of the convolutions) and which section, as the wire is to be supposed uniformly coiled, must be uniform throughout.

Thus we have generally
\[
\frac{A}{c(g + \delta)} = U
\]

wherever the normal cut through the coil is taken.

\( c \) is a constant indicating the manner of coiling, either by dividing the cross-section \( A \) into squares, hexagons or in any other way, but always supposing that however the coiling of the wire may have been done, it has been done uniformly throughout the coil. (This supposition is quite sufficiently nearly fulfilled in practice because the coiling should always be executed with the greatest possible care, and further the wire can be supposed practically of equal thickness throughout the coil).

\( g \) is the metallic section of the wire, and \( \delta \) the non-metallic section due to the necessary insulating covering of the wire.

Further we have
\[
g = \frac{U b}{q \lambda} \text{ where } b \text{ is the length of an average convolution and } \lambda \text{ the absolute conductivity of the wire material supposed to be a constant for the coil.}
\]

Now, for brevity’s sake, we will suppose that \( \delta \), the cross-section of the insulating covering, can be neglected against \( g \) the metallic cross-section of the wire.

Consequently we have
\[
\frac{A}{cg} = U \text{ (approximately)}
\]

and
\[
g = \frac{U b}{q \lambda}
\]

\[
\therefore U = \sqrt{\frac{\lambda A}{bc}} \cdot \sqrt{g}
\]
or
\[ n = \sqrt{\frac{Ax}{bc}} \]
similarly
\[ n' = \sqrt{\frac{A'x'}{b'c'}} \]
\[ \frac{n'}{n} = \sqrt{\frac{A'x'bc}{Ax'b'c'c}}. \]

But using wire of the same conductivity in both the differential coils, which should be as high as is possible to procure it, and further supposing the manner of coiling to be identical in both coils, we have
\[ \lambda = \lambda' \]
\[ c = c' \]
\[ \therefore \frac{n'}{n} = \sqrt{\frac{A'}{A} \cdot \frac{b}{b'}}. \]

Further we know that if the shape and dimensions of each coil are given, and in addition also their distance from the magnet acted upon, it will be always possible to calculate \( m \) and \( m' \), though it may often present mathematical difficulties, especially if the forms of the two coils differ from each other and are also not circular. This latter condition is generally necessitated in order to obtain the greatest absolute magnetic action of each coil in as small a space as possible.

However it is clear that we may assume generally that the two coils have each an average convolution of identical shape and of the same length, placed at an equal distance from the magnet acted upon, and that therefore the magnetic action of each coil is dependent on the number of convolutions only.

In this case we have evidently
\[ m = m' \]
\[ b = b' \]
\[ \frac{n'}{n} = \sqrt{\frac{A'}{A}} \]
and as \( p = \frac{n'}{n} \cdot \frac{m'}{m} \)
we have finally
\[ \frac{A'}{A} = \frac{w'}{w} \]

Equation 6 shows at once that under the supposed conditions, i.e., when the average convolutions in each coil are of equal size and shape, the wire used in either coil is of the same absolute conductivity, and that the thickness of the insulating material can be neglected against the diameter of the wire.
The wire used for filling each coil must be invariably of the same diameter, otherwise a maximum sensitiveness is impossible.

How the above simple law expressed by equation \( e \) would be altered, when the given suppositions were not fulfilled, must be found by further calculation, but as the latter is intricate and a more general result is not required in practice, I shall dispense at present with this labour.

**Special Differential Galvanometers.**—Here shall be given the special expressions to which the general equations \( a, b, c \) and \( d \), are reduced when certain conditions are presupposed.

1st case.—When \( w \) and \( w' \), the two resistances at which balance is arrived at are so large that \( f \), the resistance of the testing battery can be neglected against either of them without perceptible error. Substituting therefore \( f = 0 \) in equations \( a, \) and \( b \), we get:

\[
\begin{align*}
g &= \frac{w}{3} & a. \\
g' &= \frac{w'}{3} & b.
\end{align*}
\]

and the other two remain as they are namely:

\[
\begin{align*}
p^2 &= \frac{w'}{w} & c. \\
C &= \frac{w'}{w} & d.
\end{align*}
\]

2nd case.—When the battery resistance \( f \) cannot be neglected against either \( w \) or \( w' \), but when the two resistances at which balance is arrived at are invariably equal.

Thus substituting in the general equation

\[
w = w' = w
\]

we get:

\[
\begin{align*}
g &= g' = g = -\frac{w + f}{3} + \frac{1}{3} \sqrt{4w^3 + 8fw + f^2} & a, b. \\
p^2 &= 1 & c. \\
C &= 1 & d.
\end{align*}
\]

3rd Case.—When the conditions given under 1 and 2 are both fulfilled or

\[
w = w' = w
\]

and

\[
f = 0
\]

then we have:

\[
\begin{align*}
g &= g' = g = \frac{w}{3} & a, b. \\
p^2 &= 1 & c. \\
C &= 1 & d.
\end{align*}
\]

The very same result which was obtained by direct reasoning at the beginning of this paper.
Applications.—Though the problem in its generality has now been entirely solved, it will not perhaps be considered irrelevant to add here some applications.

For our purpose differential galvanometers may be conveniently divided into two classes, viz., those in which the resistances to be measured vary within narrow limits, and those where these limits are extremely wide.

To the first class belong the differential galvanometers which are used for indicating temperature by the variation of the resistance of a metallic wire, exposed to the temperature to be measured. As for instance, C. W. Siemen’s Resistance Thermometer for measuring comparatively low temperatures, or his Electric Pyrometer for measuring the high temperature in furnaces.

It is clear that for such instruments the law of maximum sensitiveness should best be fulfilled for the average resistance to be measured, which average resistance under given circumstances is always known.

To the second class belong those differential galvanometers which are used for testing Telegraph lines, at present the most important application of these instruments. In this case each differential coil should consist of separate coils connected with a commutator in such a manner that it is convenient to alter the resistance of each coil according to circumstances, i.e., connecting all the separate coils in each differential coil parallel, when the resistances to be measured are comparatively low, and all the separate coils consecutively, if the resistances to be measured are high, &c., &c., fulfilling in each case the law of maximum sensitiveness for certain resistances, which are to be determined under different circumstances differently, but always bearing in mind that it is more desirable to fulfil the law of maximum sensitiveness for high resistances, when the testing current in itself is obviously weak, than for the low resistances.

An example will shew this clearer. Say for instance a differential galvanometer has to be constructed for measuring resistances between 1 and 10,000. A Siemen’s comparison box of the usual kind \( \left( \frac{1}{10,000} \right) \) being at disposal, it will be convenient and practical to decide that the two differential coils should be of equal magnetic momentum, from which it follows that C as well as \( p \) must be unity, or in other words that the two coils must be of equal size, shape and distance from the needle, and must also have equal resistances, i.e., must be filled with copper wire of the same diameter. The resistance of each coil is then found by

\[
g = -\frac{w}{3} + \frac{1}{3} \sqrt{\frac{k}{w^2} + 8f} w + f^2
\]

where \( f \) is the resistance of the battery and \( w \) a certain value between 2

1873.] Louis Schwendler—On Differential Galvanometers. 9
1 and 10,000, the two limits of measurement. The question now remains to determine \( w \).

It is clear that the law of maximum sensitiveness has not to be fulfilled for either limit, because they represent only one of the 10,000 different resistances which have to be measured, but it is also clear that to fulfil the law for the average of the two given limits would be equally wrong, inasmuch as the maximum sensitiveness is far more required towards the highest than the lowest limit. We may assume, therefore, that it is desirable to fulfil the law for the average of the average and the highest limit, which gives

\[ w = 7500 \]

against which the resistance of the battery may always be neglected.

Consequently we have

\[ g = \frac{w}{3} = 2500 \]

for each coil.

Now if the coil be small, and consequently the wire to be used for filling it is thin, the value \( g = 2500 \) wants a correction to make allowance for the thickness of the insulating material, by which \( g \) becomes somewhat smaller.*

Before concluding I may remark that the question of the best resistance of the coil, when the resistance to be measured varies between two fixed or variable limits, can be solved mathematically by the application of the Variation Calculus.

* These expressions for \( g \) and \( g' \) must be corrected, if the thickness of the insulating covering of the wire cannot be neglected against its diameter. The formula by which this correction can be made was given by me in the Philosophical Magazine, January, 1866, namely

\[
\text{corrected } g = c \, g \left(1 - 4 \sqrt{g \, m^2}\right)
\]

where \( g \) = the resistance to be corrected and expressed in Siemen's Units,

\[ m = 3^* \sqrt{\frac{c \, \pi \, \lambda}{AB}} \]

\( \delta \) = radial thickness of the insulating covering expressed in millimetres.

\( c \) = a co-efficient expressing the arrangement adopted for filling the available space uniformly with wire. Namely, if we suppose that the cross section of the coil, by filling it up with wire, is divided into squares we have \( c = 4 \), if in hexagons \( c = 3.4 \), &c., &c.

\( \lambda \) = absolute conductivity of the wire material (Hg = 1 at freezing point).

\( A \) = half the section of the coil in question when cut normal to the direction of the convolutions, and always expressed in square millimetres.

\( B \) = length of an average convolution in the coil, and expressed in metres.
Fig. 1-3. Rhysota cymatium.
4-7 Retula biajuga.
8. Stata carinifer.
10. Macrocytis palmicola.
Fig. 11. Eulacarium propolite.
12. Vitrina cancellata.
14-15 Castra.
16. Timorensa.
For further explanation see p. 37.
For further explanation see p 37.
Fig. 18-20. Trachia Penangensis, p. 24
2. Pupa ocellata, p. 33.
3. palmira, p. 32
4-6. 15-17. Clausilia Penangensis, p. 27.
7-8. Clausilia ricolostata, p. 28

For further explanation see p. 38.
On the land-shells of Penang island, with descriptions of the animals and anatomical notes; part second,* Helicacea,—

by Dr. F. Stoliczka.

[Read and received 7th August, 1872.]

(With plates I to III.)

In this group of pulmoniferous land-shells I shall notice twenty three species, belonging to the Zonitidæ, Helicidæ, Bulimidæ, Clausiliidæ, Philomycidæ, Pupidæ, Streptaxidæ, Veronicellidæ and Vaginulidæ. The majority of the species are new, except a few previously described from the neighbouring country, and on one or two of such commonly distributed species, as are Stenogyra gracilis or Ennea bicolor.

Nearly all the species had been collected with the animals living, and I have spared no pains in order to make the detailed anatomical account as complete, as it appears desirable for a correct generic determination.

I scarcely need to mention, that on the whole the fauna is characteristic Malayan, the same fauna which extends from the Philippine islands through Burma and Arakan into the warm valleys of Sikkim. In the plains of Bengal it mixes with the Indian fauna proper.

I cannot help repeating the urgent request to my conchological friends in India, that they may favour me with live specimens of the species of shells occurring in their neighbourhood. In the Helicacea especially, the anatomical characters are indispensable for a correct generic determination, and without this it will not be possible to obtain a natural arrangement of our terrestrial Mollusca.

Fam. Zonitidæ.

Rhysota† cymatium, (Benson). Pl. i, figs. 1-3 and pl. ii, figs. 13-15.


Penang specimens, which slightly differ in the height of the spire, (see figs. 1-3, pl. i,) agree in almost every point of structure with the type shell, described by Pfeiffer from Lancavi, a small island situated a few miles north of Penang. The increase of the volutions is in both exactly the same, the upper side of the whorls is marked with fine oblique rugosities, the lower is spirally striated; in fresh specimens the former is silky brown, the lower olivaceous brown, the inside of the aperture is in full grown specimens cover-
ed with a kind of a nacreous callose layer. The only noticeable difference consists in the narrowness of the umbilicus, its width being in all the Penang specimens, which I obtained, about one twelfth of the diameter of the shell, while in Benson’s type it is only one seventh of the same diameter.

The species is found all over Penang hill from elevations of about 300 to 2500 feet, and both on the ground as well as on trees, but chiefly on the latter; it is, however, not common, and adult shells are indeed extreme rarities.

The closely allied *Rh. densa*, (Adams),* only differs by a slightly smaller number of whorls, the last being much wider. *Rh. Chevalieri*, (Souleyet), differs in the same character, though it has the umbilicus of exactly the same size as the Penang variety of *cyamatium*.

The animal is stout and rather short, its total length being less than twice the diameter of the shell; the posterior part of the body is the shorter one, and above rather sharply ridged; it ends with a large gland and a projecting horn above it. The whole body is uniform more or less dark brown, laterally strongly warty and obliquely grooved; the pedal row is very distinctly margined on both sides with an impressed line, and the margin of the foot below it is broad, smooth, marked with alternately brown and pale oblique stripes, so as to give the appearance of a variegated fringe. The eye peduncles and tentacles are of usual proportionate length, dark brown or even blackish, the latter with pale tips. On the whole, the general colour of the specimens varies a great deal; the young are mostly pale brown with an olivaceous tinge, while in old ones the neck, including the head and pedicles, become almost black.

The mantle is somewhat paler than the body, its edge moderately thickened. There are two small linguiform shell-lobes present, a right one, just below the inner or posterior angle of the aperture of the shell, thus playing on the inner lip, and producing its moderately distinct nacreous and callose structure. The other lobe lies below the outer periphery of the shell on the basal side; it projects from the outer end of a rather elongated very narrow fringe, which is separated from the edge of the mantle itself. The right neck-lobe is entire, thick, rounded, somewhat freely projecting at the lower or umbilical end. The left neck lobe is divided in two portions, the upper elongately rounded, the lower much narrower, with the upper end somewhat pointedly extended. The edge of the mantle which secretes the umbilical margin of the peristome is internally considerably thickened, (comp. pl. ii, fig. 13).

I have not been able to see satisfactorily the exact structure of the genital system, but, as far as it could be examined, it appears almost entirely to agree with that of *Rhysota semiglobosa*, figured by Semper. There certainly are no appendages present—neither on the penis, nor on the seminal duct or uterus.

The jaw is smooth, semilunar, with a round projection in the middle of the concave edge; it is about 2.5 m.m. broad.

The radula is comparatively of very great length. In a middle-sized specimen it measured 7 m.m. in length and 3 m.m. in breadth, although one of the ends was not quite perfect. I counted 106 transverse rows and about 111 teeth in each row. The centre tooth has a comparatively short point without any lateral denticles, and is somewhat smaller than the adjoining laterals. The first of these has a long, laterally bent, rather blunt projection; the following very gradually decrease in size and the middle cusp becomes gradually more pointed and curved, while the basal plate decreases. With about the fiftieth tooth the end begins to become bicusp, and on about the hundredth tooth on either side, the two cusps are sharpest and best developed.

Semper (Reisen im Archipel der Philipp., Vol. III, p. 68) says that Rhysota does not possess any developed shell lobes of the mantle. In the present species their existence is undeniable, and still all the other characters of the animal and shell point towards the greatest relation of R. cymatium to other typical species of the genus, which scarcely would have any meaning, if it were restricted in the sense given to it by Semper. I very much doubt, that all the species with polished lower surface of the shell, referred by Semper to Rhysota, have no shell-lobes. How then do they produce the smoothness of the shell? I generally found shell-lobes essential for that purpose. But supposing some of the species really had no shell-lobes, this would be no sufficient reason for excluding any other species which possess them from Rhysota; for in Xesta we have a similar mixture of forms with and without shell-lobes.

Thus the only anatomical difference, which remains to be considered as distinguishing Rhysota from Xesta, is the simple form of the genital organs in the former. How far this character is really reliable for generic distinctions, is a point by no means easily settled, as I had already occasion to notice when speaking of the anatomy of the two species of Sitala (Conulema, olim) (Journ. A. S. B., Vol. xl, Pt. ii, 1871, p. 236 &c.), S. attegia and S. infula.

When we compare the characters relating to the presence or absence or form of the mantle lobes, we meet with a perfect similarity between Rhysota and Rotula. The distinction between the two merely rests in the presence of an amatorial gland in the latter genus, while the shells only differ in the upper side of Rhysota being irregularly corrugated, and in Rotula reticulately striated, or transversely costulated.

In speaking of the shell of Rhysota, Albers gives the peculiarly rugose upper surface as one of the most important characters of the genus.
Rotula* biluga, n. sp., Pl. i, figs. 4-7 and pl. ii, figs. 16-18.

R. depresse conoidea et suborbiculata, vel late conica, angustissime umbilicata, tenui, cornea, pallide succinea; anfractibus 5'-6' ad 6'-5', suture simplici, supra rare filiforme marginata, junctis, lente accrescidentibus, in superficie superiore convexusculis, costulis transversis obliquis, conflenis, striis spiralibus conflertestimis ac plus minusve distinctis intersectatis, crisspatulis seu subgranulosis, ornatis; ultimo ad peripheriam acute carinato, ad basin modice inflato, nitido, subaeavigato, striis incrementi radiantis atque alteris spiralibus sub-obsoletis notato, medio cancaviusculo; apertura angulatim semilunari, paulum obliqua, labio tenuissimo vix distinguendo, labro ad marginem tenui, neque expanso, neque incassato, ad insertionem umbilicalem brevissime reflexo instructa.

Dimensiones varietatum frequentium:—

<table>
<thead>
<tr>
<th>Diam. major</th>
<th>D. minor</th>
<th>Alt. testae</th>
<th>Alt. aperturae</th>
<th>Lat. apertura</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. 14'-5</td>
<td>13'-5</td>
<td>11'-0</td>
<td>6'-0</td>
<td>7'-6 m.m.</td>
</tr>
<tr>
<td>b. 16'-2</td>
<td>15'-0</td>
<td>10'-9</td>
<td>6'-6</td>
<td>8'-2 &quot;</td>
</tr>
<tr>
<td>c. 17'-4</td>
<td>15'-6</td>
<td>12'-0</td>
<td>7'-2</td>
<td>9'-2 &quot;</td>
</tr>
<tr>
<td>d. 17'-4</td>
<td>16'-0</td>
<td>10'-9</td>
<td>7'-0</td>
<td>9'-0 &quot;</td>
</tr>
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</table>

Diam. maj. specimenis maximi 18.8 m.m.

It will be seen from the above measurements, which are taken from the four figured specimens, that the height of the shell is very variable, but the increase of the whorls is very nearly quite constant. The upper convexity of the whorls also slightly varies; the sides of the spire are generally nearly straight, more rarely conspicuously convex; occasionally the peripheral keel is somewhat projecting above the suture. The ornamentation is characteristic that of Rotula, reticulately sculptured above, nearly smooth below. The transverse ribs on the upper surface are traversed by fine spiral lines, which generally only produce a slight undulation in the direction of the ribs, sometimes, however, a fine granulation is formed. As regards form, the present species very closely resembles the Burmese R. aniceps, (Gould), and also the South Indian R. Shiplayi, the first has, however, the upper costulation very fine and no spiral strike, while the latter has both much stronger developed, producing a granular surface, and the shell is also more solid. The third very closely allied species is R. indica, differing principally by a greater width of the last whorl, and also by a stronger sculpture.

* Comp. Journ. A. S. B., 1871, Vol. xi, pt. ii, p. 231. The name Rotula has also been applied in the Actinozoa, but if our zoological classification should make such rapid progress, as it has done lately, it will, I think, in no long time be almost impossible to find new names for the generic groups, and we shall be forced to modify the existing rules at least so far that the same name may become reapplicable in at least the five or six principal divisions of the animal kingdom. A further relaxation of the rule would scarcely prove beneficial and would hardly be necessary.
The animal of the Penang species, when fully extended, equals in length about twice the longer diameter of the shell ; back roundly flattened above, foot posteriorly obtusely ridged, terminating with a large gland which is superseded by a small horn ; pedal row very distinct and the edge of foot below obliquely striated. The general colour of the body is pale or livid grey, with a general reddish tinge when full grown. A pale yellow (in young), or more or less distinctly cinober red (in adults), stripe extends along the centre of the back and the superior ridge of the foot, the former is bounded on each side by a broad black stripe, originating at the base of each peduncle and continuing to the mantle, and below this stripe there is again a yellowish or red line. The posterior red band is only edged with black. The sides of the foot, both anteriorly and posteriorly, are more or less distinctly variegated with impure black and tinged with red ; front of head between the two pedicles and tentacles with a black spot ; pedicles and tentacles generally greyish, the latter with a reddish tinge, and with pale, rather large, globular tips, the former with a black ring at the base where the longitudinal black bands begin.

The mantle is moderately thickened. The right shell lobe is entirely obsolete, or only indicated by a very slight extension of the edge, a short distance below the upper angle of the aperture of the shell. Sole of foot divided by a longitudinal groove. The right neck lobe is large and extends as a moderately broad fringe to near the retractor muscle where it terminates with a free end. The left neck lobe is smaller with a linguiform free outer end. The left outer edge of the mantle is externally also entire, like the right one, but about the middle of the basal portion it has internally a distinct lobe, about 2 m.m. in length, which in its situation strictly speaking lies between the shell and the neck lobe ; but as it becomes reflected with its edge over the shell, it has to be regarded as the representant of the left shell lobe. The lower portion of the left neck lobe is only a thickened swelling, extending as a narrow inner rim of the edge of the mantle to near the umbilicus. Both the right and left neck lobe have a large black spot, in continuation of the lateral black bands of the back.


The jaw is semilunar, perfectly smooth, with obtusely rounded corners, and a slight rounded projection in the centre of the concave edge ; it is about 1:5 m.m. broad.

The length of the radula is about 4·5, and its breadth above 1·5 m.m. ; it is composed of about 105 transverse, nearly straight rows of teeth, there being about 121 teeth in each row. The form of the teeth again very closely resembles that of \textit{Rot. aniceps}, (loc. cit.). All the points extend beyond the upper edge of the basal plate ; the central is somewhat widened below
the terminal point, contracted in the middle, but it has no distinct denticles at the sides. The laterals gradually become more and more turned, and curved, with a small inner and scarcely a trace of an outer denticle; up to the 20th they very gradually diminish in size, then a very slight break follows, the 21st being somewhat sensibly smaller and first distinctly bicuspid at the tip, while at the same time the size of the basal plate has much diminished, until in the last teeth it almost entirely becomes obsolete; the two terminal cusps on the other hand become gradually more and more equal.

The genital organs have a distinct amatorial gland, possessing near its origin a large globose appendage, internally composed of an elliptical largely cellular mass, in which the cells are concentrically arranged with their longer diameter perpendicular to the walls of the ellipse. The posterior part of the gland is filled with a finely granular substance,—probably calcareous particles. The vas deferens has only one slight enlargement about the middle of its length; it consisted in a simple thickening of the walls, but I could not trace any calcareous particles in it. Towards the end, where the penis is lodged, the tube is widest and somewhat curved, but there are no other appendages, or calcareous saes accompanied with a flagellum, present, such as have been observed in many other species of *Rotula*.

**Sitala** *carinifera*, n. sp. Pl. i, fig. 8.

Testa globose conoidea, cornea, apice obtusula, angustissime perforata; anfractibus quinque, gradatim accrescentibus, convexe angulatis, sutura simplici junctis, transversim minutissime striolatis, superis infra medium carinis filiformibus duobus ornatis, ultimo ad peripheriam tricarinato, basi planate convexiusculo, laevigato; apertura semilunari, verticali, non descendente, labro extus tenuissimo, in regione columnari paululum reflexi. 

Diam. maj. 2·2, minor 2·, alt. testae 2· m. m.

*Hab.—‘Penang hill,’ in folis *Coffeea arabica*, specimen unicum.*

The animal of this species is exactly like that of *S. infula*, figured in pl. xviii, in J. A. S. B., Vol. xi, Pl. ii, for 1871; it has a generally pale brownish grey colour; but having obtained a single specimen, I did not like to sacrifice the shell, in order to notice the internal structure; for when examining these little species one is by no means sure, that he will obtain from a single specimen an insight into the whole anatomy.

The present species is closely allied to the Nilgheri *Helix tricarinata*. Blf., which is also a *Sitala*, and differs by a more depressed and broadly conical shape, and by having a much wider umbilicus.

* H. Adams proposed this name for *Helix infula*, Bens., as type (P. Z. S. for 1865, p. 408). I had unfortunately overlooked this reference, when I proposed for Benson’s *attegia* (and *infula* and a few others) the name *Conulema*, which must now be regarded as identical with *sitala* (J. A. S. B., xi, pt. II, p. 236.)
MACROCHLAMYS* STEPHOIDES, n. sp. Pl. i, fig. 9, and pl. ii, figs. 19-20.

M. orbiculata, spira depresse convexiuscula, basi medio concaviuscula, angustissime perforata, tenui, succineo cornea, unicolore, circa umbilicum albescente; anfractibus sex, lentissime accrescentibus, sutura linearia, infra suturam angustissime adpressis, nitidis, fere politis, striis incrementi transversis minutissimis, nonnuncum fere omnino obsoletis, notatis, supra convexiusculis; ultimo ad peripheriam fere uniforme convexo; apertura subsemilunari, vix obliqua, labio per-tenui, labro simplici, ad basin paulum sinueo producto, ad insertionem umbilicalem anguste atque breviter reflexo. Diam. maj. 11-6, d. min. 10-7, alt. 7; alt. apert. cum perist. 4-8, ejusdem lat. 5-6 m.m.

The nearest ally of this species, as regards general character and size, is the Andamanese Macroch. stephus;† (Benson), differing from the present species by a somewhat more depressed form and by having the sides of the spire nearly straight or slightly concave, but not convex. Macroch. hyalinna;‡ Martens, is also very closely allied, it is a larger shell and with a more rapid increase of the volutions, the difference between the smaller and larger diameters being 2-5 m.m. In Burma and Sikkim several other allied forms occur, such as M. hypoleuca, patane, petasus, &c., but they are all smaller and more depressed shells.

The species is rare; I found a single live specimen and half a dozen of old shells at the base of Penang hill, about 300 feet.

The animal is long and very slender, blackish grey above and on the pedicles, paler at the sides of the foot, which has a long and thin horn above the tail gland. Both shell and neck lobes are well developed, the right ones larger than the respective left ones. The two shell lobes are linguiform, and the right one, when fully expanded, covers almost half of the upper surface of the shell. The lower portion of the left neck-lobe is merely represented by a slightly thickened rim, extending from the place of insertion of the left shell-lobe to near the umbilicus.

The jaw is one mill. broad, with a central rounded tooth in the concave edge and with the corners somewhat bent outwardly; a form which is also met with in several other species of Macrochlamys.

The radula has not been seen perfect, but it does not appear to have been more than four mill. long, and there appear to have been at least 101 teeth in each transverse row; all with very sharp points; the central with

† The figure of this species in Couch, Ind., pl. 62, is taken from a young or imperfect specimen, in which the peculiarly depressed form is not so well discernable as in an adult shell. Fig. 6 on the same plate is incorrect, because it does not show the sinuosely produced median basal portion of the peristome.
‡ Preuss. Exped. nach Ost Asien, II, p. 241, pl. 12, fig. 5.
a distinct denticle on either side, and the last laterals with two small unequal cusps; all have the basal plate obtusely narrowed outwardly.

The genital organs are very similar to those of Microcystis, Benson, but much more slender; the amatorial gland is very thin (in a young specimen), there is a small oesal appendage on the vas deferens, and a flagellum at the base of the penis, just before a swelling filled with calcareous particles.

**Microcystis** palmincola, n. sp. Pl. i. fig. 10.

M. testa late conica, tenui, cornea, angustissime umbilicata; anfractibus quinque, gradatim accrescentibus, convexiusculis, sutura simplicie junctis, supra splendore albide sericino, transversim oblique, minutissime atque con-fertissime, striolatis, ultimo ad peripheriam acute angulato; basi convexiuscula, olivaceo nitita; apertura subsemilunari, extus angulata, obliqua; labro tenui, simplici, ad basin recedente, ad umbilicum reflexo; labio tenuissimo, vix distinguendo. Speciminis maximis diam. maj. 2·8, d. minor 2·6, alt. 2·2, diam. apert. 1·7, ejusd. lat. 0·95 m.m.

*Hab.*—Penang, sub corticem Cocos nuciferae, haud frequens.

The shell is distinguished from allied species by its comparatively sharply angular last whorl, slightly inflated base and by the peculiar silky and very finely striated upper surface.

The animal when fully extended equals in length about four diameters of the shell; it is rather dark brownish grey, darkest on the tentacles and on the rostrum; posterior gland superseded by a small horn.

**Helicarion** † Permolle, n. sp. Pl. i. fig. 11 and pl. ii, figs. 21-23.

H. testa depressae inflatae conoidea, tenuissima, fere membranacea, translucentis, pallide lutescente, vix perforata, spira ultimo anfractu multo breviore; anfractibus 4·5, rapide accrescentibus, ad suturam simplicem ad-pressis, nitidis, convexiusculis, ultimo inflato, ad peripheriam rotundato, transversim lente arcuatoe striatulo, ad basin striis spiralisub-obsoletis notato; apertura lunari, valde obliqua, labio albescente, minutissime puncti-culato, labro tenuissimo, simplici, ad basin valde recedente, ad marginem interiorem umbilici breviter reflexiussulco. Diam. maj. 8·4, d. min. 7·4, alt. 6·3; alt. apert. cum perist. 4, ejusd. lat. 4·3 m.m.

The rather strongly elevated spire, and the membranaceous and transparent structure of the shell, separate this species from the numerous allied forms of the Philippines. The species is rare; I only obtained about half a dozen specimens on low bushes or between old vegetable matter on the ground, about 500 feet above the sea, on Penang hill.


† Semper, Reisen Archip. der Philippinen, vol. iii, p. 20.
The animal is slender and very long; when fresh the extended foot is three times the longer diameter of the shell, which is then entirely covered by the mantle; but in captivity the shell lobes shrink very rapidly, being reduced to narrow linguiform appendages. Middle of back and of the hind foot whitisht or very pale brownish, with a slight pinkish tinge; a broad blackish band runs from each pedicle along the sides of the whole back, and also on the sides of the posterior part of the foot, as far as the terminal gland, which is superseded by a very distinct pointed horn; the dark colour extends down to the pedal row, while a large black spot about the middle of the foot on each side reaches down to the sole; pedicles long, grey; tentacles short and almost white; mantle blackish with small whitish dots. All the four mantle lobes are well developed, the left shell and neck lobes are proportionately somewhat larger than the corresponding right ones, and each of the former has a deep but narrow incision in its lower portion.

The jaw is about one mill. broad, quadrant shaped, smooth, without any projection in the centre of the concave edge, like in most other species of the genus.

The radula is moderately broad and nearly 2.5 m.m. long; there are 95 transverse rows and about 121 teeth in each row, all remarkably small and from the tenth tooth they somewhat rapidly decrease in size towards the edges. The centre tooth has two distinct denticles on either side and a third much smaller one nearer to the base; the principal cusp is pointed. On the subsequent teeth the inner denticles disappear first, and gradually altogether, then the lower outer, while the upper outer remains, until at last it equals the principal cusp, so that the outermost teeth become almost regularly, though shortly, bicuspid.

The general anatomy does not offer any peculiarity requiring special notice. The nervous and digestive apparatus agrees with that of other ZONTIDE, except perhaps that the liver is enormously largely developed. The female portion of the genital system has a long sub-pedunculate receptaculum seminis, branching off at its origin. The vas deferens is very short, passing into a rather widened tube, again somewhat contracted near the base of the penis, which is attached by a special strong muscle. The end of the penis widens very rapidly for a short distance before it joins the hermaphrodite opening. I have not observed, in two specimens examined, any coecal or calciferous appendages.
Genus. Trochomorpha, Albers.


The type of this genus is Helix trochiformis, Fér., which is characterised by a moderately solid, sub-discoid or depressedly conical shell, the whorls being flattened above, the last carinate at the periphery, the aperture rhombiform or narrowly semilunar with simple, sharp edges, but the columellar lips occasionally internally somewhat thickened and slightly reflexed.

I do not know whether the animal of this typical species had been examined, but I have observed those of about a dozen different species, which evidently belong to the same type, and I find that all of them possess a very fine glandular slit at the upper end of the foot, the pedal row being in all also distinct; they have, therefore, to be referred to the Zostitildea, as already noticed in my paper on the Moulmain shells in Jour. A. S. B., vol. xl, pt. II, 1871, p. 225.

Judging from a somewhat more intimate examination of the animals of a few species, the following characters have to be added to those derived from the peculiar shape of the shell.

Animal moderately slender, with the posterior part of the foot shorter than the anterior, the former terminating above with a small glandular slit; pedal row distinct; mantle with elongated narrow neck lobes, but with the shell lobes entirely wanting, left neck lobe sometimes divided or insinuated in the middle; jaw smooth; genital organs without amatorial gland, or any other appendages; seminal receptacle and seminal duct very long.

The Trochomorphae live on the ground generally in decaying vegetable matter, under or on old wood. Three species have been found on Penang.

Albers, while noticing several typical species, such as T. planorbis, Less., under his genus Discus, referred to Trochomorpha a most varied mixture of shells: for instance; anceps, Gould, serrula, Bens. etc. which belong to Rotula; Barrackporeensis, Pfr., is a Kaliella; cacuminifera and infula, Bens. are Sitalo (= Conulema, olim); H. capitium, Bens., does not belong to the present family, but to the next, the true Helicidae, etc.

E. v. Martens (l. cit. pp. 246 and 247) adopted two groups in the genus Trochomorpha; the one, for which he proposes the name Nigritella, includes the obtusely conoid and more solid shells, sometimes with a somewhat obtuse periphery; these are true Trochomorphae, of the type of H. trochiformis, or of Troch. Ternatana, Guillou; the name Nigritella is, therefore, entirely superfluous. The second group is classed by Martens as Videna, Adams; it includes the more planorboid and sharply keeled species of the type of H. planorbis, Less. For this same group, (type H. castra, Benson,) W. T. Blanford proposed the subgeneric name Sivella.
Judging from the similarity of the shells of these two groups and from what we know of the animal of *T. Ternatana*, observed by Martens, I very much doubt that any necessity exists for subdividing the genus *Trochomorpha*.


The shell is subject to a very considerable amount of variation as regards the elevation of the spire. Young specimens are sometimes almost planorbicular, and in some adults the total height of the shell is scarcely more than one-third of the larger diameter, while in others it somewhat exceeds one half of the same dimension. The width of the umbilicus varies from 0:2 to 0:3 of the diameter of the shell. The base is always distinctly spirally striated, but on the upper side the oblique transverse striae of growth prevail. The usual colour is pale hornly, sometimes brown with a pale band below the suture.

The species is very rare on Penang hill, but it is common in Pegu, Arakan, Assam, Sikkim, and within the last few years it became abundant in the botanic garden near Calcutta, having been most likely introduced from Darjeeling. One of the largest Sikkim specimens in my collection measures: larger diam. 13, smaller diam. 12, height of shell 7, same of aperture, 3, width of same 5:4 m.m.

The animal changes from dark leaden to blackish grey, being always paler at the sides of the foot, generally tinged with brownish below the pedal row; tentacles and pedicles mostly somewhat darker than the body; neck distinctly warty; sole dark grey, entire, without any distinct furrows; tail gland represented by a fine slit about one mill. long. The total length of the foot generally equals one and a half diameters of the shell, the caudal portion being always shorter than the anterior one. The mantle is blackish and in its extent above the large pulmonary cavity variegated with pale spots.

The jaw is smooth, very thin, almost semicircular, with broad oblique ends and a small, in younger specimens sometimes almost obsolete, projection in the centre of the concave edge; its width is about one half millimetre.

The radula is narrow, about two mill. long, or slightly longer, composed of about 85 transverse straight rows, there being about 101 teeth in each of them. All have very sharp, long and pointed cusps, the central with a small denticle on either side near the tip; on the outer ones, as they turn laterally and gradually decrease in size, the inner denticile disappears, while the outer increases, until on the last 15 or 20 teeth, preceding the 3 or 4 terminal ones, it equals the principal cusp. The last few teeth are short, broad, and their outer cusp becomes almost entirely obsolete, the teeth presenting merely an oblique sharp edge.

The female portion of the genital organs has a globular swelling near its origin at the hermaphrodite opening, and the receptaculum seminis
branches off above this gland, it is fully one inch long, somewhat thickened in the middle. The penis is attached by a short muscle, about 4 m.m. long and moderately thickened.

**Trochomorpha Cantoriana, (Benson).** Pl. i, fig. 13.


Five specimens which I found on Penang hill (at about 2000 feet elevation) exactly correspond with Benson’s description, which was taken from a solitary specimen obtained by Dr. Cantor on the small island Sung-Sung near Penang. The illustration given on plate i will dispense with a repetition of the description quoted above. The apex is smooth, slightly swollen, and there are scarcely more than five whorls in specimens of 10 m.m.

The animal is blackish grey with a very narrow, pale dorsal stripe, quite similar to that of *T. castra*, but by some accident no specimen was preserved in spirit, so I cannot give any further details of its structure; it is, however, certainly a *Trochomorpha*. The specimens were found under a log of old wood.

**Trochomorpha Timorensis, Martens.** Pl. i, fig. 17, and pl. ii, figs. 10-12.


Penang specimens, of which I obtained sixteen, entirely agree in form and structure with the shell described by E. von Martens, with the single exception that the last whorl is not descending near the aperture, but there is an inclination to it, as its terminal portion in adult specimens is slightly more bent downwards than the preceding part (comp. figs. 17a and 17b). This character is, however, certainly a variable one; it does also occasionally occur in adult specimens of *T. castra* and *T. planorbis*. The differences noticed by E. v. Martens regarding the greater number of whorls, and the larger umbilicus, with less rapidly descending sides, in *Timorensis*, when compared with *planorbis*, are well marked in Penang examples.

The species is found sparingly on or under old wood all over Penang hill; *T. planorbis* was not met with there, but it is a very abundant shell at the Nicobars.

The animal is uniform blackish, mantle more intense black; pedal row distinct and the edge of the foot below it nearly quite smooth; neck and sides covered with small warts; tail gland represented by a very fine slit, scarcely more than half a millimetre long.

The jaw and radula are quite similar to those of *T. castra*. The former is about three quarters mill. broad, with somewhat curved out ends and a broadly rounded central projection in the concave edge. The teeth are very slender, and the lateral denticles are very close to the tip on the centre tooth. The outer denticle descends a little lower down on the laterals, but it
always appears to remain smaller than on the corresponding teeth of *T. castra*; the outermost laterals were not observed, they must be very thin.

The genital organs are distinguished by a very great length of the seminal receptacle and of the seminal duct; the former is one and a half to nearly two inches long; it is somewhat widened near its origin but further on almost throughout equally thin.

**Fam. Vitridae.**

*Vitrina nucleata*, n. sp. Pl. i, fig. 12 and pl. ii, figs. 4-6.

Vit. testa depresse ovata, tumidula, tenui, pallide cornea, translucente; anfractibus 3-75, nucleo 1-5 anf. composito, late conico, inflato, navigato, duobus anf. sequentibus ad suturam adpressis, subcanalicularis, rapide accrescentibus, nitidis, transversim striis incrementi minutissimis notatis; apertura ampla, per-obliqua, labio undique tenuissimo, ad basin valde recedente, margine supero convexiusculo. Diam. maj. 9, diam. minor 7, alt. test. 5-8, alt. apertura 4-8, ejusdem latitudo 61 m.m.

A characteristically distinct species, by having the nucleus composed of one and a half whorls, conically tumid, while the next whorl is at its beginning only very narrowly exposed, or almost entirely covered. The outer lip is very thin, almost membranaceous, and simple throughout.

*V. nucleata* is one of the rarest Penang shells. I found three live specimens on the Penang hill in dense forest on old wood, about 1000 feet above the sea, and two more old shells at the base of the hill.

The animal is entirely black, only slightly paler at the front sides of the foot; it is very long and slender, its total length being about four times that of the longer diameter of the shell; the anterior part is the much shorter one, the posterior tapers into a point, and the whole is warty and grooved. The mantle, however, is nearly smooth. In quite fresh specimens the two shell lobes entirely cover the shell, but generally the left lobe covers a little more than one fourth of the last whorl extending from the margin of the mouth, while the right lobe also covers one-fourth of it beginning at the angle of the mouth, but at the same time also envelopes the whole spire. The neck lobes are also well developed, rounded, with simple edges, the left is much larger and longer than the right one. The sole of foot is pale brown, divided by two grooves in nearly three equal parts, of which the median is smooth and the lateral transversely sulcated. Pedal row well marked by a thin groove above and along the entire base of foot.

The jaw is semilunar, radiately finely striated, with a blunt projection in the centre of the concave edge; the outer or convex portion is smooth; it measures about 0-75 m.m. in breadth.

The radula is about two mill. long and half a mill. broad; there are 110 transverse, almost quite straight rows, but only 61 teeth in each of them.
All have very sharply pointed cusps, the central has two small lateral denticles on either side; on the outer ones these denticles almost entirely disappear.

The genital organs are distinguished by a great length of the uterus, at the end of which lies a large albuminous (ag.) and hermaphrodite gland (hg.). The seminal receptacle (rs.) is a long, pedunculated, spacious bag which includes a peculiarly twisted, horny organ, provided on the concave side with short crispate appendage. It is the same problematic organ which I described in Sesara infrendens, Gld., and Macrolchlamys [Durgella] honesta, Gld., (Comp. J. A. S. B. XL., Pt. II, p. 242 and 250, pl. xvi, fig. 5 and 6, and pl. xvii, fig. 13). Whether this structure represents the amatorial organ and whether that which we call a seminal receptacle really possesses the function which we attribute to it, appears to be as yet an open question. In the present species I found the terminal end of the so-called seminal receptacle filled with a milky substance, which under a high power exhibited a quite irregular flaky appearance.

In other respects the present species does not offer any anatomical peculiarities. The oesophagus is comparatively thin, long, cylindrical. The kidney, situated near the end of the rectum, is very large, of a broadly triangular shape; the liver enormously developed.

Some years passed the Vitrina had been classed as a subfamily of the Helicide; more recently they had been by various authors treated with the Zonitide, in the Oxygathe group of Helicacea. I think the older classification is preferable, as entered by Binney and Bland in their Land and Freshwater shells of N. America. But I would prefer to give them, together with Helicolumax, Hyalina and their allies, a position intermediate between the two families. They combine indeed several of the characters of both. Although they do not possess a terminal mucous gland on the end of the foot (as all Zonitidae do), they have a more or less distinct pedal row, and the sole appears to be often divided by longitudinal grooves. The jaw is entirely or partially finely transversely striated, not quite smooth, as usually in Zonitidae, and not ribbed, as in true Helicide. However, the teeth, particularly the outermost laterals, have more the pointed character of the former than of the next family.

Fam. Helicideae.

Trachia* Penangensis, n. sp. Pl. iii, figs. 1 and 18-20.
T. suborbiculata, alta, spira breviter elevata, obtusa, modice sed profunde umbilicata, tenui, fere cornea, cuticula luteo-fusca dense et breviter pilosa induta, unicolor; anfractibus 4-5, convexis, sutura profunde subcanaliculata junctis, ultimo ad peripheriam uniforme convexo, ad aperturam paulo descen-
dente, ad marginem umbilici obtuse angulato; apertura semilunari, labio tenui, labro expanso atque reflexo, ad insertionem umbilicalem paululum dilatato, ad basin indistincte subangulato, pallide violaceo tincto. Diam. maj. 16, diam. min. 14·5, lat. apertura cum perist. 8·8, ejusd. alt. 8·2 m. m.

As regards the thin, almost horny, fulvous, thickly and finely setose structure of the shell, this species is probably most closely allied to T. erinacea, Pfr., but it differs from it, as well as from two other very similar forms, T. quieta, Reeve, and T. eustoma, Pfr., by its conspicuously more elevated spire. Other species of similar type, like T. breviseta, Pfr., from Siam, T. Helferi, Bens., from the Andamans, and four or five others described by Pfeiffer and E. v. Martens have nearly all a more depressed form and mostly sub-angular last whorl, although their spire is somewhat elevated.

The animal is dark chocolate brown, with a very narrow pale dorsal and caudal stripe, the body is laterally somewhat more blackish in front, and tinged brownish behind; the posterior end of the foot is the shorter one, as in Trochomorpha, although not to the same extent.

The jaw is quadrant shaped, with about six strong ribs,* and one or two less distinct ones on either side; it is 1·3 m.m. broad.

The radula is about 2·5 m.m. long, and 1. m.m. broad; there are 95 transverse rows, and 91 teeth in each of them, decreasing in size the more they approach the edges. The centre tooth is slightly smaller than the first laterals. All have a large basal plate, which is on the centre tooth slightly emarginate in the middle of the upper edge; this emargination increases in depth on the laterals, the inner branch remaining smaller, until on the last ones the upper edge becomes represented by two obtuse branches. The hook is on all teeth comparatively small, broad, with a moderately sharp point. On about the tenth tooth a small denticle appears to shew on the outer edge near the tip, becoming more distinct on the following teeth. After the eighteenth lateral, the teeth become somewhat more rapidly shorter, but increase in width until the last are wider than long, or high, and on these the basal plate has almost entirely become obsolete.

The genital organs are more than an inch long. The female portion has a long seminal receptacle, strongly thickened and muscular for some distance from its origin, then passing into a long thin tube and terminating with a moderately enlarged bubble, attached by very thin muscular fibres to the albuminous gland which is situated at the end of the uterus. The vas deferens takes its origin near the upper end of the uterus; it is attached by numerous thin threads at the hermaphrodite opening, and after a short distance enlarges into a muscular tube. At the beginning of this enlargement is a short pointed flagellum (f), and at the

* Evidently very much like that of Campylcea.
other end, where the penis begins, is a retractor muscle. The penis itself has near its base a coecal appendage; its terminal portion, before it joins the hermaphrodite opening, is very thin.

A comparison of the genital organs with those of Trachia delibrata, represented in J. A. S. B., vol. XL, Pt. II, 1871, pl. xvi, fig. 1, will shew, that the only essential difference consists in the presence of the small coecal appendage on the penis in T. Penangensis. The jaw has fewer and less strong ribs, than that of the former species, but the teeth themselves are extremely similar.

Taking all these anatomical characters together with those of the shell, as noticed in my paper cited above, I think we can consider Trachia as a fairly established genus of the Helicidae.


On Penang this species is mostly found in the coco-palm plantations up to a height of about 200 feet, never in the interior of large forests and at great elevations. The shells are of the usual small size (larger diam. between 12 and 13 m.m.), with or without a brown peripherical band. The striae of growth are generally fine, but in some specimens they accumulate to strong ribs which give the shell a very peculiar costate appearance.

I also obtained the species from Malacca, near Singapore, Hongkong, Chusan, Maccao, Canton, &c., northwards it extends through Tenaserim into Burma, where it is associated with a great number of closely allied species, some of which may prove to be mere varieties of it. I may mention H. bolus, H. sculpturata, H. Zoroaster, &c.

In Bengal itself the species is not known, but in Central India it is represented by H. propinquua, and on the Andamans by H. hemiptea. Judging from the great number of closely allied species in the Indo-Malayan region, there is certainly the greatest probability that the original habitat of H. similis falls within the Indo-Malayan Archipelago, and that it has been introduced into Mauritius, China and South America.

The animal is rather slender, all over strongly varity, brownish fleshy white, or pale brown, the pedal row is very slightly indicated by a fine groove; the pedicles and tentacles are greyish white, mantle dull milky white with a slight vermilion tinge. When the animal is quite fresh the total length of the foot is equal to from two and a half to three longer diameters of the shell.

The jaw is semilunar, about 1 m.m. broad, with three strong central ribs, followed by a somewhat broader one on either side, while the next is only indicated by a faint dark line.
The radula is when compared with the size of the animal large, about 2:3 m.m. long, and somewhat more than one m.m. broad; it is composed of about 90 transverse rows, with 67 teeth in each of them. The central is much smaller than the adjoining laterals, with a long arched cusp. The laterals somewhat rapidly decrease in size after the 14th; on the outermost the basal plate gradually disappears, while the breadth of the teeth exceeds their length.

The genital organs are more complicated than in Trachia. The female portion has at its origin a rather short, thick muscular coecal appendage, which most probably represents the amatorial gland; it is widened near its origin and at its rounded end. The seminal receptacle is a round bag, attached to a long thin peduncle of about the same length as the uterus. The seminal duct is moderately long, but the penis comparatively thick and attached by a strong muscle.

Fam. Bulimidæ.

BULIMUS.—Subg. Amphidromus.

The only two species which I found among the coco-palms were Bulimus atricallosus, Gould, and B. interruptus, var. citrinus; the uniform coloured greenish yellow variety. The former is the more common species.

Besides these two, the ubiquitous Stenogyra gracilis is by no means rare at the roots of palm trees.

Fam. Clausiliidæ.

CLASILIA (PHLEDUSA) PENANGENSIS, n. sp. Pl. ii, figs. 4-6 and 15-17.

C. testa fusiformi, plus minusve atenuata, medio ad anfractum penultimum latissima, non rimata, solidula, castanea, apice submammillata, albescente, anfractibus 9-5 ad 10-5, convexis, sutura simplici junctis, transversim confertissime striolatis, penultimo sensim attenuato; apertura ovata, intus castanea, peristomate modice expansa, undique libero, albescente, plica supera crassa, ad marginem apertura continua, columellari immersa, tenui, valde oblique intrante; plicis palatalibus six, prima longissima, unam mill. a marginie suturali distante, ceteris multo brevioribus, subaequalibus, modice curvatis atque fere equidistantibus.

Var. brevis, exquisite fusiformis, vide fig. 6 et 6α; long. 24, lat. 6:2, apert. cum perist. 6 longa, 4:5 m.m. lata.

Var. elongate fusiformis, vide fig. 5; long. 26:3, lat. 6:2, apert. 6:9 longa, 4:7 m.m. lata; in hoc specimen apertura exceptionaliter longa est, in speciminibus alteris, forma similibus, longitudo apertura 6:2 ad 6:4 observanda.
Var. exilis, attenuate fusiformis, vide fig. 4 et 4a; long. 27, lat. 6, long. apert. 6-3, lat. 4-6 m.m.

Hab.—Penang hill, frequens.

This is an extremely variable species as regards the shorter or longer fusiform shape of the shell, and also as regards the size of the aperture, but both these variations are very commonly observed in other species of the genus, and particularly in the allied Malayan species Cl. Gouldiana, Pfr., insignis, Gould,* and Sumatrana, Martens.† All three have a similarly variable shape, and finely striated, moderately convex, whorls, but in the two former the aperture is much shorter of a squarish shape, and in the last it is conspicuously longer; E. v. Martens gives its length at 8 m.m. in a specimen, the total length of which is from 23-5 to 31-5 m. m. In this last species, which also comes nearest to the Penang shell, the whorls appear to be slightly less convex and there are only five palatal plates present.

The animal is uniform grey covered with small pale brown warts, darker on the back, paler on the pedicles, which have very small, black eyes; tentacles very short.


The genital organs are distinguished by a very great length of both the uterus and the penis, both of which are much twisted. The only appendage is that of the seminal receptable, which is comparatively small and narrow, situated at the end of a long peduncle.

The jaw is very short, about 0-5 m. m. broad, apparently smooth; only very faint radiating and concentric lines are to be observed in certain lights.

The radula is about 2 m.m. long and 0-5 m.m. broad; it consists of about 125 rows, with 61 teeth in each row. All are provided with a strongly curved cusp; after about the fifteenth tooth, they rather rapidly decrease in length. Towards the end of each row they become multi-serrated, while the basal plate almost entirely disappears. The last teeth are very short, but broad, almost linear and entire.


Cl. testa fusiforme turrita, apice sensim attenuata, subrimata, tenui, pallide cornea; anfractibus 10 ad 11, lente convexusculis, sutura simplici junctis, ad suturam filiforme marginatis atque infra marginem paulum contractis, transversis oblique dense costellatis, antepenultimo vix latiore quam penultimo, ultimo versus aperturam paululum contracto; apertura ovate subtrigona, postice, (aut supra), subangulata, peristomate expanso, undique libero, plica

* J. A. S. B., xli, pt. II, pp. 203, 204, 208, pl. ix.
† Ost-Asiat. Exped., 1867, p. 379, pl. 22, fig. 17.
supera tenui, haud usque ad marginem peristomatis interna extensa, intus in fauce rapide evanescentе, columnarii approximata, fortiori, valde obliqua; plicis palatalibus circiter decem, supera longissima, a marginе distante, duas vel tribus sequentibus multo brevieribus, cæteris brevissimis, omnibus inter se irregulariter dispositis. Long. 21-2, lat. 4'-4; long. apert. cum perist. paulo imperfecto 4'-8, lat. 3'-6 m.m.; specim. secundi apert. cum perist. perfecto 5'-3 longa et 4 m.m. lata.

_Hab._—Penang hill, cum precedente, sed rarissima.

This species is very closely allied to _Cl. Javana_, Pfr., but the latter has the whorls, particularly the middle ones, somewhat higher, the transverse costulation is a little finer, and more crowded, the palatal plaits are fewer, two according to Kuster, three to four according to E. v. Martens; it also appears to have the two labial plaits stronger. I do not know any other species with which the Penang shell can be compared. It appears to be extremely rare; out of three specimens found only one has the aperture with the margins perfectly well developed.

**Fam. Philomyctidae.**

Binney and Bland, Land and fresh-water shells N. America, pt. 1, 1869, p. 294.

**Genus Philomyctes.**

1820. Rafinesque. Comp. 'Complete writings,' by Binney and Tryon, 1864, p. 64.


It must be admitted that the original characteristic of the genus by Rafinesque is a very unsatisfactory one, but that is the case with many other old definitions. When Rafinesque wrote that _Philomyctes_ was a very visible mantle, everybody* could, I think, fancy that the mantle must extend over

* Binney writes in 1841 (Boston Journ. IV, p. 174) of his _Philomyctes dorsalis_ corpora... clypeo nullo, and on p. 171 of _Tebenophorus carolinensis_ `clypeo lato et elongato, dorsum integrum vestiente,' and still both species have the mantle covering the entire upper surface of the body, and both are _Philomyctes_ (or _Pallifera_ of Morse).
the whole body, if the animal can at all be closely compared with Linax, or else it could not be a Mollusc at all. This was indeed well understood by Férussac, who in the next year referred to Philomyus, besides the four insufficiently described species of Rafinesque, Linax carolinensis of Bosc, well known from description and figure, (copied in Hist. nat. des Moll., pl., 6, fig. 3). And as Rafinesque’s species had not been rediscovered and his descriptions not more complete, Ph. carolinensis remained to be considered as the type of the genus, though I do not think that there can be much doubt on the point, that Férussac had correctly interpreted Rafinesque’s meaning. In any case there was no sufficient ground for introducing the name Tebenophorus for the same species.

Keferstein (loc. cit.) has shewn by the anatomical examination of the three typical species, Philomyus carolinensis, (seu Tebenophorus), Meghinatium striatum and Incillaria bilineata, that all three genera have to be united into one. The general anatomy and dentition &c., agree in all, the only traceable distinction of Phil. carolinensis consists in the presence of a small amatorial organ, situated at the entrance of the seminal receptacle. The presence or absence of this organ, or even of that of a special amatorial gland (see ante, p. 13), is rightly considered by Keferstein as insufficient for a generic separation of the American from the Indian species. I had repeatedly opportunity of satisfying myself of this by the observation, that the development of that organ does not only appear to depend upon the age of the animal, but often even upon the season or peculiarities of the conditions, under which the animal lives. As far as our materials enable us to judge, we can, I think, look upon Philomyus as a well established genus. For the present it has to be regarded as the sole representative of the family. The finely radiately striated (in Ph. dorsalis coarsely ribbed) jaw in part resembles that of the Vitridideæ, but the dentition has decidedly more the character of true Helicidæ.

I have to notice one new species found on Penang.

Philomyus pictus. n. sp. Pl. III, figs. 9-14.

Ph. corpore tenuiter cylindraceo, plus minusve (35 ad 46 m.m.) extenso, antice rotundate subtruncato, postice acuminato, livido, copiose mucoso, supra pallio laevigato, lateraliter atque in parte postica nonnunquam subgranuloso tecto, fasciis tribus longitudinalibus atratis, reticulationibus ejusdem coloris junctis, picto, faciæ centrali latissimâ, duabus alteris tenuioribus ad latus dorsii sitis et a margine inferiore distantisibus; orificio pulmonari antice ad latus dextrum in incisione pallii sito, circiter 5 ad 7 m.m. a terminazione antica distantâ; pedunculis oculiferis circ. 5 m.m. longis, tentaculis brevissimis, ambobus pallidissimis; pede infrâ transversim plicatello, livido.
During life the length and comparative thickness of the animal changes very rapidly, as may be noticed from a comparison of the two sketches taken from life and one from a specimen preserved in spirit. The animal is covered by a thick layer of mucous secretion, it is very active, and readily burrows in light decomposing vegetable substance. The three black longitudinal bands are connected by a similarly coloured net work which continues, interspersed with, or dissolved into, little dots, to the lower edge of the mantle. The three distinctly marked bands distinguish the present species from the Javaen Ph. reticulatus, according to Férussac’s figures 2* and 3 on pl. 8 E., p. 96*, Moll. terr. et fluv. vol. ii. The peduncles are about 5 m.m. long, provided with distinctly developed globules on which the small black eyes are situated; the tentacles are very short, and when the animal moves about scarcely noticeable; both are very pale coloured.

The anatomy of the species almost perfectly agrees with that given by Keferstein of Ph. striatus and bilineatus. The internal pulmonary cavity extends to about one anterior fourth of the length of the body, and in the fresh animal is always well marked by the mantle above it being somewhat inflated. On this inflated portion, the mantle is smooth, on the other parts generally slightly rugose.

The genital organs (comp. fig. 18) have no special amatorial gland. The seminal receptacle is a globular pedunculated bag, situated a short distance from the hermaphrodite opening. In two specimens which I examined, I noticed the development of a strongly fibrous bundle of muscles at the entrance of the receptacle, where it branches off from the oviduct, but there was no special amatorial organ present.

The jaw is semilunar, strongly curved, thin, radiately striated; when laid flat about one mill. broad.

The radula is 2-8 m.m. long, only about 0.5 broad; there are about 170 rows, and 87 teeth in each row: the central tooth with a symmetrical simple curved cusp, the laterals with a more oblique but simple cusp, both it and the basal plate gradually decrease in height until the last teeth become almost linear and form a confluent row.

None of the other organs require any special notice.

I found three specimens of this species among old decaying vegetable matter on the ground at the northern base of Penang hill, about one hundred feet above the sea.

* E. v. Martens (Preuss. Exp. nach Ost-Asien, Landschneeksn, p. 182) refers to this figure as a synonym of Hassolt's Parmacella reticulata, which he quotes as Parmarion reticulatus. I do not know Hassolt’s original figure, but surely the one given by Férussac does not represent a Parmacella or a Parmarion.
Fam. Pupidae.

This family is represented in India and Burma by Hypselostoma, Boysisia and various subgenera of Pupa, all of small size. Among the Pupae found in Burma and the adjacent countries, inhabited by a large number of Malayan forms, the majority are referable to Albers' subgenus Scopelophila, the type of which is Pupa Kokeili, Rossm. The shells are small, subconic or subcylindrical, composed of 4 to 8 whorls, with a moderately thin, semicorneous or corneous texture, covered by a brown cuticle; the last whorl is rimed at the base, always somewhat rapidly turned to the front, generally slightly ascending at the aperture, which is internally instructed with teeth on the whole peristome; commonly there is a bifid tooth on the inner lip, it is larger than any of the others. Some of the species appear to differ from Pupilla merely by the peculiar turn of the last whorl towards the front, thus shewing a strong affinity to Hypselostoma. The Indian species of Scopelophila, as far as I observed them, have the pedicles well developed and the tentacles short.

A second small group of Pupa, which is found in India, Burma and the country southward, is characterised by a subconic or ovate shape, composed of three to five whorls, of a thin corneous texture, covered with a transversely striated cuticle; the last whorl is not ascending, the aperture generally edentulous; the columellar lip is externally near its attachment somewhat expanded, mostly covering the umbilical region, while internally at the base it is twisted and occasionally provided with a small tooth. I propose for this subgeneric group the name Pupisoma,

and regard as the type of it the Moulmein P. lignicola, described in J. A. S. B., vol. xi, pt. ii, p. 171, pl. vii, fig. 3. The animals have very short pedicles and barely a trace of tentacles. They generally live on wood.

Pupa [Scopelophila] palmira, n. sp. Pl. II. fig. 3.

P. testa ovate cylindracea, rimata, sordida albida, cornea, apice obtusiuscula; anfractibus quinque, convexis, gradatim accrescentibus, sutura simplici junctis, sublevigatis, fere politis, lineis nonnullis incrementi transversis oblignuis, exilissimis notata; apertura fere verticali, subquadrangulari, intus quinque-dentata, albida; labro undique expansiusculo atque paulum incassato, extus infra suturam sinuoso, intus profunde bidentato, (dente supero minori), ad basin dente unico minuto et ad medium collumellae altero fortiori instructo; labio tenui, adnato, extra medium prope angulum posteriorem aperture dente lamelliforme bipartito munito.

Long. testæ 2·15, latit. 1; long. apert. 0·8, lat. 0·6 m.m.
Hab.—Penang et in Provincia Wellesley dicta, sub corticem Cocos nuciferae; testa rarissima.

This is of exactly the same type as the Arrakanese P. filosa, described at p. 333 of the Journal for last year, but it is larger, more cylindrical and has one tooth more in the aperture. From P. Avanica it differs by less closely wound whorls and by the interal dentition of the aperture.

It appears to be a very rare species. I found one specimen under the bark of a cocoa-nut tree on Penang, and two others on the opposite coast in the Wellesley Province.

Pupa [Pupisoma] orcella, n. sp. Pl. II, fig. 2.

P. testa subglobose conoidea, apice obtusa, angustissime perforata, tenui, cornea; anfractibus 3·5, valde convexis, sutura simplici junctis, transverse filose striolatis; apertura subrotundata, paululum obliqua, edentula; margine externo tenuissimo vix repandiusculo, columellari albescente, vix torto, supra reflexo, umbilicum fere omnino obturante.

Alt. testae 1·7, diam. 1·25, alt. aperture 0·6 m.m.

Hab.—Penang, sub corticem Cocos nuciferae, hand frequens.

The animal is grey with dusky pedicles, but no perceptible trace of tentacles. The species differs from P. lignicola (l. cit.) by a shorter and broader form, more convex whorls, and by a very slightly expanded and thin outer lip. In fresh specimens some of the transverse striae of the cuticle are rather stronger than others, but they very soon wear off.

Fam. Streptaxidæ.

This family is represented by the single species Ennea bicolor, occurring with Stenogyra gracilis, though not very commonly. (Comp. J. A. S. B., 1871, vol. xi, pt. ii, p. 169).

Fam. Veronicellidæ and Vaginulidæ.

I have collected two species, which are by authors usually referred to the genus Vaginulus, and with which Blainville’s Veronicella is considered as identical.

The one species is the same as Vaginulus Birmanicus, briefly described by Theobald in Journ. A. S. B., vol. xxxiii, for 1864. It is found about Calcutta, extending throughout Bengal up to the base of the Sikkim hills, through Arrakan, Tenasserim to Penang. A specimen obtained at Singapore does not appear to differ; E. v. Martens’ V. Hasselti, (Preuss. Exp. Ost-Asien, Landschnecken, 1867, p. 176, pl. 5, figs. 2 and 4) from Sumatra, Borneo, &c., also appears to be the same, and it seems to me very probable that it is the true Onchidium molle of Hasselt.
F. Stoliczka—Land-shells of Penang Island. [No. 1,

A second species is very closely allied to Vaginulus Tourannensis, Eydoux and Souleyet, (Voyage de la Bonite, pl. 28, figs. 4 to 7), found by Mr. Gaudichaud at Touranne in Cochin China.

A close examination of various eastern species of what authors usually call Vaginulus or Veronicella appears to me to indicate, that a great confusion has been brought about into the definition of these terms. First of all, we have to return to the typical species of those two generic terms, leaving all subsequent researches regarding other species out of the question.

Blainville's description of his Veronicella levis in 1817 was incorrect as regards the existence of a rudiment of a shell. The mistake was, at least partially, corrected by Blainville in Dict. d. Sc. Nat. vol. 57, p. 348,* and Keferstein, after discussing the opinions about this genus, in Zeitsch. Wiss. Zool., xv, 1864, defined† Veronicella as it ought, I think, to be accepted.

The animals have the sexes distinct in one individuum, the male organ under the right peduncle, the female about the middle of the lower right side of the mantle ; tentacles bilobed ; the anal and respiratory orifices are at the posterior end ; the jaw and teeth of the radula resemble those of the Heliocidae. Thus the general anatomical structure of Veronicella agrees in some respects with Onchidium (comp. Stoliczka in J. A. S. B., xxxviii, pt. ii, 1869, p. 88, pl. xiv), but in this genus the female genital opening lies with the two others at, or close to, the posterior end ; the teeth are peculiarly hook-shaped, and there is no jaw present. As one of the characteristic figures of a Veronicella I may mention Vag. Solea, d'Orb., (Voyage dans l' Am. merid., Moll. pl. 21) from Buenos Ayres, or Vag. Luzonicus, Eydoux and Souleyet, in Voyage de la Bonite, Zoologie, vol. II, p. 495, pl. 28, figs. 1—3. Thus our species will have provisionally to stand as

Veronicella Birmanica, (Theob.).

It is found all over the island, up to the top of Penang hill, but is not common, and the specimens are mostly small, about 1 or 1 1/2 inches. The median dorsal pale stripe generally becomes distinct only in older specimens, and the lower side of the mantle is uniform livid ; in very young specimens the pale stripe is absent, and the mantle marked below with dark dots.

The name Vaginulus was introduced by Férussac in 1821. Judging from the description of the genus, in part at least, from the arrangement of the species and from the anatomical account given by Blainville, it is, I

* In this article, Blainville strangely makes a great mistake in considering Vaginulus, Veronicella and Onchidium as identical.
F. Stoliczka—Land-shells of Penang Island.

1873.]

think, clear, that Férussac considered the first described species, _V. Taunayi_ as the type of the genus, (Comp. Moll. terr. and fluv., II, pp. 96 p, 96q, and explic. des pl. No. 13, pl. 8 c.). Férussac’s characteristic of the genus places the pulmonary opening at a distance of two-fifths of the length of the body from the anterior end, and on the lower right side of the mantle; the female sexual opening is said to be on the same side, about the middle; the position of the anus is not mentioned. Blainville’s account of the anatomy is not clear and partly contradictory to Férussac’s statement. Some of the figures appear to leave no doubt that the position of the female sexual organ is the same as that indicated by Férussac, in others (fig. I and III,) its situation is too much backward. The anus appears to be situated according to figure I near the sexual opening, but again it is said to terminate with the anus at the posterior upper end of the foot. In the figures II and III (l. cit.), which give an insight into the whole anatomy of the animal, the true termination of the intestines is nowhere given. All this is very unsatisfactory.

Eydoux and Souleyet in their figure of _Vaginulus Tourannensis_ also record a small opening at the posterior lower right end of the mantle. I can scarcely believe that this is correct; it is probably only a fault of the artist who thought that an opening must exist there, because it is clearly seen in the other species on the same plate, _Vag. Luzonicus_, which is a _Veronicella_.

My reason for doubting the correctness of Eydoux and Souleyet’s figure is the very careful examination of the Penang species, which, as already mentioned, is closely allied to _V. Tourannensis_, if not really identical with it.

The Penang species has the following generic characters, as compared with those of _Veronicella_.

The sexes are distinct, the male opening is under the right peduncle, the female sexual opening lies, together with the anus and the pulmonary orifice, at the lower right side of the mantle, about two-fifths of the length of the body distant from the front. The sexual opening is nearest to the edge of the foot, then comes the anal and then the respiratory one; they are only separated by thin lamina from each other. There is no jaw present, the manducatory organ consisting of a simple muscular tube, much as in _Streptaxis_ or _Testacella_; the radula is short, composed of simple pointed teeth which are absolutely identical with those of the two last mentioned genera.

There is no opening whatsoever at the posterior end of the foot or mantle; the pointed end of the intestinal organs is only attached by a bundle of muscles to the terminal inner surface of the mantle.

On p. 96r of Férussac’s Moll. terr. and fluv., Blainville says that the upper
border of the mouth is provided with a dental comb ('peigne dentaire'), and further on, that the buccal cavity is supplied on its inner upper surface with very small sharp points ('très petites pointes acérées'). The latter statement evidently refers to sharp pointed teeth of the radula, but does the former mean to indicate the presence of a jaw, such as exists in Veronica? This is a question of great importance; for if the presence of a jaw can be proved, it would certainly not support the generic identification of our Penang Vaginulus with Vag. Taunaysii.

There are also a few peculiarities in the other anatomical structure, but on the whole this latter well agrees with that given by Blainville of Vag. Taunaysii, with the exception of one or two organs which he evidently misinterpreted.

My doubts against a generic identity of V. Taunaysii with Veronica, as formerly defined, appear to me to be supported also by external differences in the shape of the body. In V. Taunaysii, as well as in the Penang species and in V. Tourannensis, the body is slender and high, so to say nearly cylindrical, the globules on the tentacles are well developed, the appendages of the latter large, the posterior end of the foot is pointed and somewhat projecting beyond the termination of the mantle. In Veronica, on the contrary, the body is more depressed and of a generally more ovate shape, the lower appendage on the tentacles is smaller than the tentacle itself, the end of the foot is more rounded and not, as a rule at least, projecting beyond the termination of the mantle.

E. v. Martens, when speaking of V. Taunaysi (Preuss. Exp. nach Ost-Asien, Landschnecken, p. 6), says that the slight lateral expansion of the mantle and the higher body distinguish it from all other species collected in India, and this opinion is, I think, strongly in favour of my presumed distinction between Veronica and Vaginulus; for it also exactly applies to the Penang species.

Finally, I must draw the attention to the remarkable external similarity in the form of the body of Vaginulus porosus, Fér. (Moll. ter. et fluv. II, p. 96', pl. 8 E, fig. 5) with that a of Testacella. The former species is recorded after a drawing communicated to Ferussac by van Hasselt, and is no doubt from Java or one of the adjoining islands. I think it represents a true Vaginulus, and not a Veronica.

I have placed the above discussion before my malacological friends, because I consider a satisfactory solution of the points in question of considerable importance. The information is not easily obtainable, as the necessary materials are very much scattered about. If my suppositions prove correct, the so called Agnathia group, and especially the Testacellidae or Streptaxidae, will appear before us in a quite different light, when compared with the other
groups. They will show that certain characters remain constant under different physical conditions, while others change, and that the change takes place according to certain principles, affecting similar or the same organs. Extended observations of this kind must give us the key to a correct systematic arrangement.

Our special question cannot be solved, unless Blainville's and Férussac's somewhat contradictory accounts of the structure and anatomy of *Vaginulus Taunaysii* had been satisfactorily settled. I hope to have myself an early opportunity of examining one of these animals, and until such a time I will postpone the detailed description of the Penang species, (and of another new one from Sikkim), together with their anatomy, which requires a careful comparison with that of *Vaginulus* and *Onchidium*, of each of which I will have to describe several interesting new forms.

*Explanation of plates.*

Plate I.

Figs. 1—3. *Rhysota Cymatium*, (Benson), p. 11; a young, an adolescent and an adult shell.


8. *Stylus carinifera*, n. sp., p. 16; 8, natural size; 8a, 8b, 8c, enlarged views.


10. *Microcystis palmicola*, n. sp., p. 18; 10, natural size; 10a, 10b, 10c, three views enlarged.

11. *Helicarion permolle*, n. sp., p. 18; 11, twice the natural size; 11a, 11b, 11c, 11d, views in natural size.

12. *Vitrina nucleata*, n. sp., p. 23; 12, front view in twice the natural size; 12a, 12b, 12c, three views in natural size.


14—16. *Vitrina nucleata*, Stol., p. 23; 4a, represents the side view of the problematic amatorial organ enclosed in the bursa seminalis.


13—15. *Rhysota cymatium*, (Bens.) p. 11.


All the figures are enlarged; the measurements in natural size are given in the text referred to.


4–6. *Clausilia [Phaeusa] Penangensis*, n. sp., p. 27; 4, 4a, attenuated var.; 5, elongately fusiform var.; 6, 6a, fusiform variety; all figures in natural size.


9–14. *Philomicus pictus*, n. sp., p. 30; 9, 9a, 9b, three views taken from a specimen in spirit; 10 and 11, two views of the same specimen in different states of expansion, taken from life; all these figures are in natural size, but the other figures, representing the genital organs, the jaw and teeth, are enlarged.


Explanation of the letters used on pl. II and III.

ho = hermaphrodite opening.

ut = uterus.

al = albuminous gland.

vd = vas deferens.

ag = amatorial gland.

p = penis.

m = retractile muscle.

rs = receptaculum seminis.

po = pulmonary opening.

an = inner, or posterior, angle of mouth.

pm = peripherical angle.

u = umbilicus.

rs = right shell-lobe.

rn = , , neck lobe.

ls = left shell lobe.

le = left neck lobe.

The small letters below the teeth refer to the distance of each tooth from the respective central tooth in each series.
ON NEPHROPSIS STEWARTI, A NEW GENUS AND SPECIES OF MACREROUS CRUSTACEANS, DREDGED IN DEEP WATER OFF THE EASTERN COAST OF THE ANDAMAN ISLANDS,—BY JAS. WOOD-MASON.

(Read 7th August, 1872, received 16th January, 1873).

[With plate IV.]

In April of last year, I was deputed by the Trustees of the Indian Museum, with the sanction of the Government of India, to proceed to the Andaman Islands for the purpose of making a collection illustrative of the marine fauna of that part of the sea of Bengal in which those islands are situated. I reached Port Blair about the 6th of April, and immediately put myself in communication with the Chief Commissioner, who at once placed at my disposal a well-manned boat and a small steam-launch, with which I dredged for nearly two months with much success from low-water line down to near 50 fathoms. Towards the end of my stay, General Stewart knowing my intense desire to try my fortune in deeper water, placed at my disposal for one day the S. S. "Undaunted" which had been recently armed and put into commission for service as a guard ship. The time allowed was short, but sufficiently long to enable me to bring away samples of the life supported by the sea-bed at, and beyond, the 100 fathoms' line, and to ascertain that the sea-bed was uniformly covered with a thick deposit of fine olive-coloured mud derived from the waste of the coral-reefs and of the sandstone and serpentine rocks of the islands. This mud was not very productive, yielding only a few annelids, but was crowded with dead shells of Pteropods and Dentalium and with fragments of a large Brachiopod.

It was in the last cast of the dredge that I had the good fortune to capture the interesting addition to the crustacean fauna of these seas, described in the following pages. It is closely allied to Nephrops Norvegicus of northern European seas, so closely allied, indeed, that were it not for the absence of the squamiform appendage of the antennae, I should be under the necessity of placing it in the same genus as a second species. The absence of this appendage, however, leaves me no choice but to establish a new genus for its reception.

* The following rough analysis by Mr. Tween, the chemist of the Geological Survey of India, will show the proportion of insoluble matter:

<table>
<thead>
<tr>
<th>Soluble in HCl mostly Ca O Co₂</th>
<th>42.8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insoluble clay and sand</td>
<td>57.2</td>
</tr>
</tbody>
</table>

100.0
The discovery in these warm seas of a very near, of the nearest ally in fact, of so characteristic a cold-water species, remarkable though it is, will not appear so surprising when I mention the fact that my crustacean lived and burrowed in the mud of the sea-bed at a depth of nearly 300 fathoms in a temperature not certainly exceeding 50° Fahr.

One of the chief points of interest attaching to this new form lies in the loss of its organs of vision by disuse, as in Calocaris MacAndrewee, Bell, in Cambarus pellucidus—a member of the same family as that to which Nephropsis belongs—and in the other crustaceans and animals inhabiting the caves of Carniola and Kentucky. I not only agree with Mr. Darwin* in attributing the loss of the eyes to disuse, but I also regard the great length and delicacy of the antennæ, and the great development of the auditory organs as modifications effected by natural selection in compensation for blindness.†

Nephropsis, gen. nov.

Diag. Antennal scale absent.

Nephropsis Stewarti, sp. nov. Pl. IV.

Body covered with fine rounded tubercles and with a short but dense pubescence. The carapace is sub-ovoid, armed on each side, just externally to the base of the rostrum, and behind the anterior margin, with an acute forwardly directed spine; a similar spine springs from each side of the anterior margin itself at about the level of the upper surface of the antennal peduncle; the basis of each of these two spines is confluent with a conspicuous convexity to be seen just behind it; immediately in front of each of these convexities lies a smooth, slightly excavated surface bounded in front by a curvilinear row of tubercles. The cervical suture, dividing the carapace into an anterior or cephalostegal, and into a posterior or omostegal portion, is broad and deeply impressed mesially and laterally, until it reaches the level

† Since these remarks appeared in the abstract of my paper (Proc. Asiat. Soc. Ben. viii, 1872, p. 151) Dr. Hagen's Monograph of N. American Astacidae has reached Calcutta, and from it I give the following extract, on account of its obvious applicability to the species here described, merely remarking that the perusal of it led me to note also the stoutness of the rostrum and the great development of the cephalostegal spines in Nephropsis as compared with the slenderness of the one and the minuteness of the others in Nephrops: "But it seems to be a somewhat well recognized law in nature (Rathke, Metamorph. Retrograd., p. 135) that if any part is atrophied, or stopped in development, the nearest parts slow an abnormal increase of development. This is apparently the case in C. pellucidus; the eyes are atrophied, and the rostrum, the fore border of the cephalothorax, the antennal lamina, the basal joint of the inner antennæ, and the epistoma are altered or largely developed." Op. Cit. 34.
of the anterior margin of the epistoma when it bends boldly upwards and backwards upon itself passing into the well-defined semicircular depression that bounds the lateral convexities described above. The cardiac region is broader than long, very convex transversely and bounded on each side by a densely-tuberculated elevation which running backwards, downwards, and forwards along the line of the granulated rim of the branchiostegite, and finally bending upwards almost opposite the origin of the second pair of abdominal appendages, passes again into the swollen anterior boundary of the omostegite; the ovoidal area thus limited off is more sparsely beset with tubercles and presents a marked depression on its anterior half.

The rostrum carries on each side a most acute spine directed upwards and forwards, and curved slightly inwards; and above presents two roughly granulated ridges coalescent towards the tip but divergent at the base; beyond the spines it is canalicate on each side, above and below, and each lateral ridge is fringed with long hairs; below it is carinated and coarsely granulated at the base. A faint linear impression, continuous with the groove between the ridges on the rostrum, passes along the middle line of the carapace almost to its posterior border; situated in this line, and marking the anterior limit of the convex gastric region, lies an almost erect spiniform tubercle.

Antennæ and antennules.—The peduncles of these appendages lie as in Nephrops Norvegicus in the same horizontal line, and their inner margins are ciliate. The basal joint, or coxocerite, of the former is extremely short, and wants the apical spine in Nephrops, but the perforated conical process on its inferior surface is remarkably salient; the second is devoid both of the prominent spine into which, in Nephrops, its distal and external angle is produced, and of the squamiform appendage or scale seen in all the other recognized genera of Astacidae,* and developed to such an extraordinary degree in Carideous Crustacea; one or two small folds or impressions between, or upon, the second and fourth joints being all that remains of the antennal scale, and of the rudimentary joint that in Nephrops corresponds to the moveable spine of Astacus.†

* The antennal scale in Astacidae escaped the notice of Guérin who founded his genus on its supposed absence.
† There appears to be no doubt but that the antennal scale is the representative of the outer of the two appendages borne upon the protopodite at an early stage of embryonic life, and, if the moveable spine in Astacus and its undoubted homologue in the antennæ of Nephrops represent the inner of these appendages, then must the three distal joints of the peduncle with the flabellum be looked upon, as Dr. Fritz Müller looks upon them, as a new formation (Neubildung) and no longer as being in serial homology with the five distal joints of the other appendages, e. g., of an ambulatory leg, which represent the endopodite, the exopodite being completely aborted or represented at most, as Rolleston remarks, by the annular constriction on
The flagella of the antennæ are remarkably long and of excessive fineness at their extremities.

The basal joint of the antennules has its upper surface greatly inflated, owing to the remarkable development of the auditory organ to which, in most Podophthalmatous Crustacea at any rate,* this joint gives lodgment; and the almost globular appearance of the joint as seen from the side contrasts strongly with the flatness of its upper surface in Nephrops or Astacus. Of the two remaining joints of the antennular peduncle, the first is short and cylindrical, being less than half the length of the last which in Nephrops is short and equal to that which precedes it. The peduncle terminates in the usual manner in a double flagellum, the outer branch of which is conspicuously stouter than its filamentous and cylindrical fellow, perceptibly compressed, and thickly fringed below with short hairs along its distal third.

The epistoma is much the same as in Nephrops, save that its posterior edge is straight and presents two small tubercles which give it the appearance of being slightly roundly-emarginate in the middle.

The external maxillipeds and the parts of the mouth in front of them are identical in structure with those of Nephrops.

The eyes are completely rudimentary, neither pigment nor corneal membrane being developed; the peduncles indeed are present, but even these are short, subcylindrical, mere aborted structures, concealed entirely from view by the stout base of the overhanging rostrum; in spirit they have become perfectly blanched like the rest of the appendages, but in life the delicate rose-pink coloration of the animal extended itself to their very tips. The peduncles are far less conspicuous from the side view than represented in the plate.

The first pair of abdominal appendages, those which bear the great chela, are unfortunately absent, the specimen having lost its claws a considerable period previous to its capture, as the presence of uncalcified reproduced rudiments of these appendages indicates; the other legs are smooth and slender; the second and third pairs are didactyle; of these the former has both its upper and lower margins, from the base of the carpodopodite to the extremity of the claws, fringed with long hairs; the latter, much the slenderer as well as the longer of the two, has its propodite greatly elongated, and its claws only are ciliated. The fourth pair, the longest of all and ciliated only on the outer face of the dactylopodite, and the fifth, about as long as the second pair, are monodactyle.

the ischiopodite. For the facts relating to the transformation of the embryonic exopodite into the antennal scale of the Prawn pari passu with the budding out of the flagellum and the abortion of the endopodite, vide Fritz Müller’s admirable essay on the development of the crustacea entitled ‘Für Darwin,” p 41, fig. 31.

* The cephalic ear of Mysis forms an exception to this.
The last abdominal somite is immoveably united to that which precedes it as in *Nephrops* and the common Lobster;* and the sternum is linear as in the *Astacidae* generally.

**Post-abdomen.**—The post-abdomen is gradually attenuated to the extremity of the telson. The appendages of its first somite are as completely rudimentary as they are in the female of *Nephrops Norvegicus*;† those which follow are long and slender, their foliaceous branches being very narrow, produced to a sharp point, and fringed with excessively long cilia. All the terga are covered with minute rounded tubercles, and present at their anterior ends, just behind the tergal facets, a broad smooth transverse groove with its hinder margin convex backwards.

The pleuron of the first somite is precisely similar to that of *Nephrops Norvegicus*, but those of the remaining somites are even more acutely triangular than in that species, and have their margins denticulate and furnished with a fringe of long cilia. In all the somites, with the single exception of the first, the tergal and pleural regions are most sharply defined as such, the former not curving continuously with the latter but terminating abruptly at the level of the ventral chords in a line convex outwards; so that, if a somite were detached, deprived of its ventral chord and flattened out on the table with its dorsal surface uppermost, the imaginary continuation from pleuron to pleuron of the plane in which these pleura laid, would pass below that of the surface of the tergum.

The 'swimmeret' constituted as in all other Macrurous Crustacea by the highly modified and backwardly placed appendages of the last postabdominal somite and by the 'telson,' differs in no particular of more than specific value from that of *Nephrops*; the mesial element, or *telson*, is longer in proportion to its breadth, its greatest breadth, being a transverse line separating its anterior from its middle third, and not at the base as in *Nephrops*, is slightly more truncate posteriorly, and the oblique rounded elevations, that gradually narrow as they pass backwards into the spines at its postero-

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* On characters furnished by the claws alone Dana artificially divides the recognized genera of *Astacidae* into two groups, typified respectively by *Astacus* and *Nephrops*; the first of these is further subdivided according to the number of the branchiae and the mobility or immobility of the last abdominal somite. But no mention is made of the fact that this is firmly fixed in *Nephrops* too. If *Paranephrops*, a genus including only freshwater forms, should turn out to have a mobile last abdominal somite, then we shall have this curious fact presented to us, viz., that all those members of the family *Astacidae* which live in freshwater or are terrestrial (*Egans*) have this somite moveably united by membrane only to that which precedes, while those of them that are marine have it fixedly united to the rest of the sternum.

† The ventral plates of the 2nd, 3rd and 4th postabdominal somites in the males of *Nephrops Norvegicus* have an erect spine in the middle line, but the females exhibit no trace of such.
lateral angles, are stronger than in *Nephrops*. The outer plate of the lateral elements of the swimmeret is moveably articulated at its posterior third as in the rest of the *Astacidae*, but the sutural line is curved and the posterior margin of the proximal and larger division exhibits hardly a trace of the overlapping denticulations seen in other *Astacidae*.

Length from tip of rostrum to the posterior margin of telson, ... 98 mm. Length of carapace in middle line, ........................................... 42 mm.  
" " postabdomen, ........................................... 56 mm.

Therefore the postabdomen : carapace (rostrum incl.) :: 1\(\frac{1}{3}\) : 1 exactly.

and the length of body : that of postabdomen :: 1 \(\frac{1}{4}\) : 1 "

The only specimen (a female) obtained was dredged in from 260 to 300 fathoms about 25 miles off Ross Island on the eastern coast of the Andamans. That the specimen was really brought up from this great depth is certain from the unmistakeable signs of crushing from contact with the lip of the dredge, from its position in the dredge bag and from its firmly adherent greenish coating which appears to indicate that like *Calocaris Mac-Andreweae* it was a burrower.

In conclusion I have to thank Captain Beresford, the commander of the vessel, for his skilful management of the sounding-line and for the zeal displayed by him in carrying out my wishes during our too short cruise.

I have much pleasure in connecting with this extremely interesting species the name of Major General Donald M. Stewart, C. B., Chief-Commissioner of the Andaman and Nicobar Islands, to whose ever ready help the success of my trip was so largely due.

Explanation of Plate IV.

Fig. 1. *Nephrops Stewarti*, ♀, nat. size.
Fig. 2. Upper view of carapace of the same.
Fig. 3. Swimmeret of *N. Stewarti*.
Fig. 4. " " *Nephrops Norvegicus*.
Fig. 5. Inferior view of antennary region of *N. Stewarti*.
Fig. 6. " " " " *N. Norvegicus*.
Fig. 7. Sternal region of *N. Stewarti*.
Fig. 8. " " " " *N. Norvegicus*. 
Fig 1-2 B. Artemis, p 51. Fig 3 R. Westwoodii, p 50.

For further explanation see p 50.
Fig. 1 B. scabriusculus, p. 55. Fig. 2-3 B. hispidulus, p. 47.
For further explanation see p. 56.
ON NEW OR LITTLE KNOWN SPECIES OF PHASMIDAE. PART I.—Genus Bacillus,—by James Wood-Mason of Queen's College, Oxford.

(Read 7th August, 1872; received February 9th, 1873).

[With plates V, VI and VII.]

The difficulties that have hitherto defied all attempts at anything like a philosophical and natural classification of this interesting and truly remarkable family of Orthopterous Insects, although in a great measure due to the extraordinary extent to which protective modification has involved all parts of the body throughout the group, must be in part, at any rate, ascribed to our ignorance in so many cases of the opposite sexes of the species; and the discovery that Acanthoderus lacertinus, Westw. is the female of Lonchodes luteoviridis of the same author, renders it extremely probable that these latter difficulties will be found to be further complicated by other cases of the same nature. As instances of the value of a knowledge of the opposite sexes in the limitation of genera, I need only adduce the fact that the capture of Acanthoderus bicoronatus, West., and Acanthoderus semiarmatus, Westw., in copula with their respective males will necessitate the removal of those species, together with their allies, to the genus Lonchodes. Thus at the very outset of my researches, I am enabled, by the inestimable advantage of a residence in the great distributional area or metropolis of the family, to withdraw from a genus some of the most bizarre of its extremely heterogeneous contents. Since the publication in 1859 of Professor Westwood's classical Monograph of the family, a large number of new or imperfectly known species has been described or remarked upon by various authors,* but chiefly by

  Coquerel, Ann. Soc. Entom. Fr. 1861, p. 495, pl. 9, fig. 1; Bull. Soc. Ent. Fr. 1866, pp. xxiii-xxiv.
  Philippi, Stettin Ent. Zeit. 1865, p. 64.
  Lucas, Ann. Soc. Ent. Fr. 4me Série, t. ix, Bulletin, p. xxv.
  Gerstäcker, Archiv für Naturgesch. xxxv, p. 211.
Bates,* de Saussure† and Kaup‡ whom I mention by name on account of the extent and of the extreme value of their contributions. These numerous additions will be enumerated under the genera to which they belong.

**Genus 1.—Bacillus, Latr.**

Eleven new species have been referred to this genus since the appearance of Professor Westwood's monograph; of these one, viz., *B. patellifer*, Bates, is nearly certainly identical with *B. ? Artemis*, Westw., and two others, viz. *B. gramineus* and *aspericollis*, Bates, are most probably, as indeed the author of those species himself suspects, the opposite sexes of one species. The necessary deductions being made, eight remain, which, added together with those described below to the thirty-eight recognized by Westwood, bring up the total of known species of *Bacillus* to fifty-five.

**Bacillus fuscolineatus**, n. sp. Pl. V. Fig. 7.

♂ Extremely slender, filiform, cylindrical. Antennae of the length of the metathorax, 17-jointed; first joint depressed but not expanded, carinate above, with sub-parallel margins, the inner one of which is raised; second joint nearly twice as long as broad, sub-depressed; the rest filiform. Head scarcely narrowed from the eyes; a brown streak passes from the eye along

† Rev. et Mag. de Zoöl. 1859.
  Ann. de la Soc. Ent. de Fr. iv, Sér.


*Bacillus Seytale*, Bates, ♀ ♀, l. c., p. 328, pl. xlv, fig. 9. Hab. Ceylon.


*Bacillus Geisovii*, ♂, Kaup, loc. cit.
each side of the body as far as the commencement of the fourth abdominal segment where it becomes somewhat interrupted; the interval between this line and the margins of the dorsal arcs of the body is silvery white; below, the insect is of an uniform light yellowish green; above, between the brown lateral lines, darker green; the meso- and meta-notum are indistinctly carinate down the middle, and under a moderately powerful lens appear to be marked with delicate wavy transverse striae; the striation becomes less distinct on the abdominal segments. The abdomen is slightly expanded at the junction of its 4th and 5th segments from which latter it sensibly decreases in width to the apex of the seventh, whence it widens to a trilling extent; seventh segment equal to about 1½ times the 8th, exactly twice as long as the 9th which is obtusely rounded at the extremity and above presents a median and two lateral less distinct ridges; these latter curve inwards at their apical ends, enclosing a shield-shaped area. Posterior margin of the terminal ventral segment slightly emarginate.

Legs simple, of excessive tenuity; anterior very slightly longer than the posterior pair; intermediate shorter by the length of their own tibia than the former. Cerci long, obtuse, porrected beyond the apex of the abdomen, slightly forcipted and grooved at the sides.

Total length 22 lines; head 1½, prothorax 1, mesothorax 4½, metathorax 3½, abdomen 9½ + 2½ = 11½; antennae 3½.

Hab. Murree, Panjab. One specimen collected by Dr. W. Waagen.

_Bacillus hispidulus_, n. sp. Pl. VII. Figs. 2-3.

♂ Filiform, slender, sordid, with a dark-green median dorsal streak, extending from the apex of the mesothorax to the extremity of the abdomen. Head sub-ovate, with the sides slightly convergent posteriorly, antennae 16-jointed, joints very distinct; first joint depressed but not expanded; second twice as long as broad, cylindrical, its proximal end the broader. Mesothorax hardly narrower in front than behind. Meso- and meta-notum with a raised median line and a few minute tubercles on their lateral margins. Abdomen cylindrical and filiform to the apex of the 6th segment, whence it suddenly expands to the junction of the 7th and 8th, whence it narrows to its truncate extremity which appears to be constricted between the 8th and 9th segments; six basal segments slightly expanded at their articular ends; 9th segment strongly carinate; the cerci curved and projecting at its postero-lateral angles.

Legs long, slender, and simple; first joint of anterior tarsi greatly elongated; rather more than twice as long as the remaining joints taken together.

Total length 24½ lines, antennae 4, head 1½, proth. 1, mesoth. 5½, metath. 4½, abd. 10½ + 2½ = 12½ lines.
♀ Much more robust, with a well-defined median raised dorsal line along the whole length of the body, antennae absolutely shorter than those of the male, but with the basal joint strongly carinate and more expanded. The mesothorax is visibly attenuated in front from the commencement of its apical third, meso- and meta-notum with a few minute warts along their lateral margins; meso- and meta-sternum with a few similar warts scattered over their surface.

The abdomen is sub-fusiform, depressed to the apex of the 6th segment, and has a distinct ridge, which can also be detected on the thorax, running internally and parallel to the lateral margins of all its dorsal segments except the last; its five posterior segments have another ridge on each side midway between their sides and the median ridge. The posterior margin of the sixth ventral is produced in the middle into a sharp spine with a broad base. The seventh segment is nearly as long as the two last together; these are subequal. The last is subtruncate at its extremity beyond which projects a small triangular zygous plate carinated above. Cerci, in form of a tall four-sided pyramid with its angles rounded, project at the postero-lateral angles of last segment.

Operculum spatulate in outline and flat below, with a broadly rounded extremity, not extending beyond the middle of the last segment.

First joint of tarsus in anterior legs as in the male. The body is covered with very short setæ in both sexes.

Total length, 3½ lines, ant. 3½, head 2½, proth. 1½, mesoth. 7½, metath. 5½, abd. 15½ + 2½ = 17½ lines.

_Hab._—South Andaman. Three males and three females, of which two were taken in _copulâ._

I have received from Dr. Stoliczka, who obtained it from the Arakan coast, an insect differing from the male insect above described only in its greater length, in the absence of tubercles on the thorax, and in having two more joints to the antennae; the measurements are as follows:

Total length 32 lines: ant. 6, head 1¼, proth. 1¼, mesoth. 7½, metath. 6, abd. 13 + 2½ = 15½ lines.

**Bacillus oxtenes,** n. sp. Pl. V. Fig. 3.

♀ Excessively long and slender. Head unarmed, narrow, almost cylindrical, being but slightly broader in front than posteriorly, notched behind in middle. Antennae 28-jointed, as long as the terminal segment of the abdomen; first joint depressed, carinated above and expanded, second longer than broad, also depressed. Mesothorax much longer than the metathorax, sparsely granulated above and below, slightly expanded at the insertion of the legs, otherwise of perfectly uniform width; meta-thorax with only a few scattered granules above and below; meso- and meta-notum with a dark raised mesial line. Abdomen long, perfectly smooth, very gradually and
regularly attenuated from its base to its almost indescribably acute, deeply-cleft, slightly recurved, and strongly compressed extremity. The seventh segment is hardly twice as long as the 8th, which is about a fifth of the length of the last; this has a perceptible upward curvature and is cleft nearly to the insertion of the minute conical cerci. The operculum is subdepressed, acutely pointed at the extremity, carinated below and reaches the commencement of the middle third of the last segment, where the cerci are inserted.

Legs long, but rather stout as compared with the body, triquetrous; the fore femora are serrated for more than two-thirds of the length of the straight portion, intermediate femora with two or three triangular spines close together above near the base; posterior ones with one or two. Tibiae with a well defined but not very salient foliaceous carina below; four posterior ones with minute spinules on all their crests. The right middle leg is a reproduced limb, having but four joints to the tarsus and a single spine on the femur.

Total length of the body 4 in. 9 lines; antennae 6 1/2: head 2 1/2; proth. 2; mesoth. 11 1/2; metath. 8 1/2; abdomen 23 1/2 + 10 = 33 1/2 lines.


Hab.—Pegu Yomah, collected by Mr. S. Kurz, the botanist at the Calcutta Botanic Garden, during his recent botanical tour through Burma and the Tenasserim Provinces.

In the form of the terminal segments of the body, this species approaches B. Regulus, Westw. ♀ (Cat. p. 8, Pl. XXII).

**Bacillus levigatus**, Pl. V. Fig. 4.

♀ Very slender and cylindrical and smooth. The head is armed with two minute blunt erect spines between the eyes, and is slightly narrowed behind; its posterior margin with 3 or 4 notches. Antennae exactly half the length of the mesothorax; first joint depressed and somewhat expanded, feebly carinate above, its outer margin more convex than the inner; second joint fully as broad as long, depressed.

Abdomen extremely long and slender, tapering very gradually to the apex of the seventh segment; whence it very slightly expands to the basal half of the last which suddenly narrows to its extremity; this is divided by a short cleft into rounded tips. 7th dorsal segment equal to 8th, half as long as the last which is carinate above. Cerci pointed. Operculum narrow depressed, obtusely pointed, reaching the end of basal third of last segment.

Legs simple; anterior pair tolerably long; anterior femora serrated for three-fourths of the length of upper crest. The first joint of anterior tarsi is twice the length of its homologue in the intermediate legs, which is rather shorter than that of the posterior legs.
Total length of body 2 in. 10 lin, ant. 3\(\frac{1}{4}\), head 1\(\frac{3}{4}\), proth. 1\(\frac{1}{4}\), mesoth. 6\(\frac{1}{2}\), metath. 5, abd. 15\(\frac{3}{4}\) + 3\(\frac{3}{4}\) = 19\(\frac{1}{2}\) lines.

Hab.—Samagooting, Naga Hills, Assam. One immature specimen collected by Captain Butler. This species is closely allied to *B. Westwoodii*.

**Bacillus Westwoodii**, n. sp. Pl. VI. Fig. 3.

♀ Elongate, slender, sub-cylindrical, convex. Head narrowed from the eyes to the base, with its sides slightly convex, armed between the eyes with two forwardly and slightly outwardly directed spines; and with its posterior margin faintly notched in the middle and on each side. Antennæ more than half as long as the mesothorax, from 21 to 26-jointed; first joint carinated above and depressed but not expanded; second joint nearly as broad as long; the rest filiform with the exception of the last which is thickened at the tip. Mesothorax slightly narrowed in front and, with the metathorax, somewhat expanded at the insertion of the legs. The abdomen is narrowed from the base to the apex of the first segment, expands again to the apex of the second, maintains pretty much an uniform width for the next two or three segments and finally gradually tapers to a point. The seventh dorsal segment is twice the length of the eighth, but hardly exceeds the last. This is cleft and slightly compressed at the extremity. The operculum is somewhat boat-shaped, below strongly carinate for its posterior half, and comes into such close and complete opposition with the margins of the terminal dorsal segments, with which it is coincident, as to conceal from view the genital parts, permitting only the tips of the *cerci* to emerge. Legs triquetrous, their edges beset with short cilia; straight portion of upper edge of fore femora serrated nearly to the apical end; the intermediate and hind femora have a triangular spine below the apex; all the tibiae have a foliaceous carina arising near the base and gradually subsiding towards the apex; the posterior ones have sometimes a triangular foliaceous spine near the base above; the intermediate ones sometimes one, two or none. Tarsi triquetrous; first joint of the anterior pair as long as the others taken together; in the other legs it is not nearly as long as the united lengths of the remaining joints.

Total length of the body 4 in. 8 lines, antennæ 6\(\frac{1}{4}\), head 2\(\frac{1}{2}\), proth. 2, mesoth. 11, metath. 8, abdomen 27\(\frac{1}{4}\) + 5\(\frac{1}{2}\) = 33.


In the specimen described, the intermediate legs when stretched straight backwards, reach to the commencement of the posterior third of the fourth abdominal segment, the posterior legs to the *cerci anales*; in other specimens the intermediate legs extend rather beyond the fourth segment, and the posterior ones beyond the extremity of the abdomen.

Hab.—Nine adult and three immature females were captured by my
private collector during the months of August, September and October last in the neighbourhood of Port Blair on South Andaman. An immature insect collected by Mr. Homfray at Camorta, Nicobar Islands, differs so slightly from larve, beyond doubt belonging to the present species, that I hesitate to give it another name.

**Bacillus (Baculum) Artemis**, Westwood. Pl. VI. Figs. 1-2.

*Bacillus ? Artemis*, ♀, Westwood, Cat. of Orthopterous Insects in the British Mus., 1859, Pt. I, Phasmide, p. 10, pl. xxvi, fig. 9, 9a.


Numerous specimens of an insect remarkably abundant in the moist, deep valleys of Sikkim, in Cachar, in the Bhutan Doars and at Samagooting in the Naga Hills, agree in every respect both with Bates' description of *B. patellifer* and with *Bacillus? Artemis* described and figured by Prof. Westwood from a dried and mutilated example now in the Hopeian collection at Oxford. The comparison of dried specimens in my possession with Westwood's figures shows that the compression of the three terminal segments is mainly, and that the depression and enlargement posteriorly of the sixth dorsal are entirely effects of drying. Bates omits to mention that the terminal dorsal segment is grooved above in the middle line, and that the emargination in its posterior border is occupied by a small carinated azygos plate with a rounded hinder margin; the state of preservation of Prof. Westwood's specimen may probably account for his omission to mention not only these points but even the emargination itself. The following are the dimensions of a specimen from the Naga Hills figured on plate vi.

Total length 4 in. 5 lines, ant. 7 lines (25-jointed), head 2½, proth. 2, mesoth. 10½, metath. 8, abd. 2 in. 0½ line + 6 = 2 in. 6½.

A variety found in all the districts mentioned above with the exception of the Bhutan Doars is figured side by side with the typical form on the same plate as showing the value of the armature of the legs unsupported by other characters in making a species; almost every gradation from the extremely acanthophyllous and spinose condition of the legs there depicted to their almost completely unarmored condition in fig. 1 being to be met with. Fig. 2 a, 2 b, 2 c may represent the same parts of fig. 1.

**Bacillus (Baculum) insignis**, n. sp. Pl. V. Figs. 1-2.

♀ Extremely robust, greatly elongated, subcylindrical, convex. Head remarkably stout, conspicuously narrowed from the eyes to the base, the sides being almost straight, armed between the eyes with two stout-based, acuminate, forwardly-directed and incurved spines or horns, notched posteriorly in the middle. Antennæ 25-jointed; basal joint depressed, expanded, and carinated above. Mesothorax gradually attenuated from the
base forwards; metathorax of uniform width; both are marked above with a fine raised median line which is continued on to three or four of the basal segments of the abdomen.

The abdomen is attenuated from the base of its third segment to the extremity. The three terminal segments are compressed; the first of these is twice as long as the second; the second \(1\frac{2}{3}\) times as long as the last which is grooved above in the middle line and has its posterior margin divided into two rounded lobes by a narrow fissure filled by the median carina of a small azygos plate; the upper contour of this last segment meets that of the preceding at a very obtuse angle. The operculum extends about one line beyond the abdomen; its posterior half is greatly compressed, so much so that its sub-truncate extremity that its opposite inner faces are in complete contact. _Cerci_ minute, conical, their tips alone projecting slightly between the posterior and middle thirds of the last abdominal segment.

Legs stout, triquetrous; upper and lower crests of fore femora inconspicuously serrate towards the base; the intermediate femora are curved, their upper margin forming the convex curvature, and below at the base present two conspicuous divergent foliaceous expansions with rounded free margins, one springing from each crest and a conical spine at the apex; the posterior femora are but feebly curved and exhibit but a faint indication of these foliaceous lobes, and have also a spine at the apex below; all four posterior femora appear to be regularly tricarinate above, owing to the very close approximation of their two upper crests. The intermediate tibiae have a large foliaceous lobe like a tooth of a saw near the base above, which is much reduced or even absent in the posterior pair; all the tibiae have a sharp, well-developed foliaceous carina, on their basal third below, which in the fore tibia traverses the whole length of the joint. The first tarsal joint in the fore-legs is hardly as long as the other joints taken together; in the other legs it is not nearly as long.

The intermediate legs if stretched backwards would reach only just beyond the apex of the third, the posterior ones to the apex of the sixth abdominal segment.

Total length of body 7 in. 2\(\frac{\frac{1}{2}}{\frac{1}{2}}\) lines; antennae 8\(\frac{\frac{1}{2}}{\frac{1}{2}}\); head 8\(\frac{\frac{1}{2}}{\frac{1}{2}}\); proth. 2\(\frac{\frac{1}{2}}{\frac{1}{2}}\); mesoth. 16\(\frac{\frac{1}{2}}{\frac{1}{2}}\); metath. 14; abd. 40 + 9\(\frac{\frac{1}{2}}{\frac{1}{2}}\) + operc. 1 = 50\(\frac{\frac{1}{2}}{\frac{1}{2}}\).  

_Hab._—Samagooting, Naga hills, Assam, (Captain Butler); Sikkim (Mr. Mandelli); and the valleys around Cherra Punji in the Khasi hills (Lieut. Bourne).

_Bacillus (Baculum) Penthesilea_, n. sp. Pl. V. Fig. 5.

♀ Elongate, stout, cylindrical, smooth, with a faint raised median line extending from the anterior extremity of the mesothorax nearly to tip of
the abdomen. Head not so stout as in the preceding species, armed between
the eyes with two minute conical spinules or tubercles, its posterior margin
presents 3 notches giving it the appearance of being bi-tuberculate,
narrowed from the eyes to the base. Antennæ very slender, as long as the
three terminal abdominal segments taken together, 30-jointed; first joint some-
what expanded; second minute, hardly longer than broad, followed by 28
filiform joints gradually increasing in length to the apical one. Mesothorax
uniform in width except at the insertion of the legs where it is expanded.
Metathorax broader than the mesothorax and expanded at each end.

Abdomen very long, attenuated from the base of the 5th segment; the
three segments anterior to this are uniform in width and broadest of all,
broader even than the basal segment which is just perceptibly concave at
the sides; the 6th ventral has a rounded punctate callosity posteriorly;
the ante-penultimate segment is as long as the two last taken together; the
last is grooved above in the middle line, has its posterior angles pointed and
rather deflexed than projecting outwards and its hinder margin sub-
angularly emarginate, the emargination being filled by an azygos plate
which is carinate, has its free margin straight and projecting beyond the
acutely angular tips of the segment, and its postero-lateral angles rounded.
Cereti tolerably salient, obtuse. Operculum subcompressed and carinate for
nearly its posterior half, rounded but not compressed at the tip which barely
reaches as far as the bottom of the emargination in the last segment.

Legs slender; anterior pair triquetrous; the two other pairs subtrique-
trous, their upper crests being not nearly so closely approximated as in the
preceding species. The intermediate legs, stretched straight backwards so
as to be parallel with the long axis of the body, reach to the middle of the 4th,
the posterior ones to that of the 7th segment. The anterior femora are
denticulate to beyond the middle of their upper and lower crests; the four
posterior pairs are devoid of spines or foliaceous lobes except at their apical
ends below where there is a short denticulate elevation, all the tibiae have a
lamellar carina arising and attaining its greatest development near the prox-
imal end; and the distal halves of the four posterior ones are acutely spinulose
on all edges. The first joint of the tarsus of the fore-legs is fully as long as,
of the intermediate legs shorter than, of the posterior legs almost as long
as, the remaining joints together; but the first tarsal joint of 1st legs is
longer and slenderer than those of the 2nd and 3rd pairs.

Colour green with the prosternum, bases of all the legs, the stigmata,
the spines on the head and the interval between them, and the apex of the
blackish-brown.

Total length, 6 in. 10½ lines; antennæ, 9 lin.; head, 3½; proth. 2½;
mesoth. 15½; metath. 13½; abdomen 3 in. 3 lin. + 9 lin. = 4 in.; ant. legs:
femur 23 lin. + tibia 22 + tarsus 6½ = 4 in. 3½ lin.; inter. legs: f. 17½ + tib.
Bacillus (Baculum) fuscillatus, n. sp. Pl. V. Fig. 6.

♀ Elongate, cylindrical, smooth. Head unarmed, narrowed from the eyes to the base, with three notches on its posterior margin. Antennæ long and fine, as long as the metanotum proper, or as the two basal segments of the abdomen together, 24-jointed; first joint depressed, not greatly expanded, strongly carinate above; second longer than broad, sub-cylindrical; rest filiform. Meso- and meta-notum with a most delicate median line in relief; the former is of uniform width throughout, the latter very slightly expanded posteriorly at the origin of the legs. Abdomen shorter in proportion to the rest of the body than in the two preceding species, cylindrical to the apex of its fifth segment; whence it becomes slightly compressed and attenuated to its furcate extremity. A small azygous plate carinated above and with its posterior margin rounded, fills the bottom of the interval between the arms of the fork, which conceal its sides from view from above. The operculum is boat-shaped; its extremity which is rounded and slightly spread out horizontally, attains the level of the bottom of the fork only.

The legs closely resemble those of B. Penthesilea, but the four posterior femora have some widely-placed spinules on both their inferior crests; the intermediate ones reach to the end of the basal third of the 5th, the posterior extend slight beyond the terminal abdominal segment.

Total length 5 in. 1½ lin.; antennæ 8; head 3; proth. 2½; mesoth. 12½; metath. 10; abd. 27½ + 6½ = 33½; ant. legs, 3 in. 7 lin.; inter. legs 2 in. 6 lin.; post. legs 2 in. 11 lin. Colour uniform green.

The abdomen: rest of body: 1·2162 &c.: 1.

Hab.—Baxa, Bhután Doár, collected by Dr. Cameron.

This species is at once distinguished from the two preceding, as indeed these are from one another, by the difference in the structure of the terminal dorsal segment; by the form of the operculum, by the relative length of the abdomen to that of the body, and by the absence of spines from the head.

In the four preceding species to which M. de Saussure's subgeneric term Baculum may be provisionally applied, the last dorsal segment of the abdomen is mesially grooved above; the line of structural weakness thus produced, may possibly subserve the purpose of giving greater expansibility to the segment during copulation and oviposition. This peculiarity of structure is present also in Bacillus (Baculum) Cuniculus, Westwood, in B. (B.) Hyphereon, Westwood, and in B. (B.)
scytale, Bates, if one may judge from the published figures of those species. With regard to the last mentioned, it should be noted that Mr. Bates, although he states its affinities to be with the first, at the same time refers to it a totally distinct subgeneric group, viz., to Ramulus, de Sauss., in which the abdomen is fusiform and acuminated at the extremity. It is also to be remarked that the species to which B. scytale is said to be so nearly related by Bates has turned out not to be a Bacillus at all, but a Lonchodes very closely allied indeed to L. pseudoporus, Westw., if not identical with that species. Ramulus is, however, still retained by M. de Saussure for a group of the Bacilli, under which B. humilis, Westw., B. carinulatus, Sauss., &c., have been arranged.

Bacillus scabriuscultus, n. sp. Pl. VII. Fig. 1.

Very robust. The integument is wrinkled and studded with granulations and small tubercles. Head thick, coarsely granulated, very little narrowed behind, armed between the eyes with two conical spines, projecting outwards and slightly backwards and with their bases united by a transverse elevation, bi-tuberculate posteriorly. Antennæ as long as the metathorax, 18-jointed, ciliated; the first is depressed and expanded, and strongly carinated; the second joint is about half the length of the first, twice as long as broad and depressed; the rest are slenderer than it and filiform. Prothorax narrower in front, with its anterior margin hollowed for the reception of the head, covered with coarse granules. Meso- and meta-notum irregularly wrinkled longitudinally and covered with small tubercles or coarse granules, marked with a raised median line; the former gradually widens from the apex to the insertion of the intermediate legs; the latter is broader and of uniform width, and a distinct suture divides it into an anterior posterior division (the true 1st abdominal segment = segment mediare). Below, the granulations and wrinkles are finer. The abdomen is cylindrical to the fifth or sixth segment, whence it becomes suddenly contracted and compressed, but expands again slightly at the apex which is furcate; the bottom of the fork is occupied by a small carinated azygos plate. The upper contour of the three terminal dorsal segments is extremely convex and the posterior margin of the first two of them is produced into a small process. The operculum is lanceolate in outline as seen from below, its posterior half is carinate and its apex barely reaches the level of the minute cerci.

Legs long; anterior pair triquetrous, the rest prismatic; anterior femora serrated to the middle of the upper crest; the intermediate ones are armed with three conspicuous dentate foliaceous lobes above and with three small spines on the other crest, one opposite to each of the foliaceous lobes; the posterior femora have some small spines on each of their upper crests. The
intermediate tibiae have each two small foliaceous lobes above at the proximal end and immediately opposite to these, below, a single spine; at their distal ends all their edges are spinulose; the posterior tibiae have two minute spines above at the proximal end and their distal ends are similarly spinulose. All the legs are shortly-ciliate, especially at the extremities.

Total length 4 in. 1½ lines; antennae 7¼; head 3¼; proth. 2⅛, mesoth. 10¾; metath. 7¾; abdomen 18½ + 7 = 25½ lines.

_Hab._—Naga Hills, Assam. A single specimen was collected by Captain Butler.

**Explanation of Plates.**

**Plate V.**

Fig. 1. _Bacillus (Baculum) insignis_, ♀, nat. size. _1a_, the head seen sideways; _1b_, the extremity of the abdomen seen sideways.

Fig. 2. Upper view of terminal abdominal segment of _B. insignis_, ♀, enlarged.

Fig. 3. _B. oxytenes_, ♀, nat. size; _2a_, extremity of the abdomen from the side.

Fig. 4. _Bacillus levigatus_, ♀, nat. size; _4a, b, c_, represent same parts as in the previous figures.

Fig. 5. Upper view of terminal abdominal segment of _B. Penthesilea_ ♀, enlarged; _5a_, side-view of three terminal segments, nat. size.

Fig. 6. _B. furcillatus_, ♀, terminal segment of the abdomen from above, enlarged; _6a_, the three terminal segments nat. size seen sideways.

Fig. 7. _B. fuscolineatus_, ♂, nat. size; _7a_, the three terminal segments of the body seen from above; _7b_, the same seen from the side.

**Plate VI.**

Fig. 1. _Bacillus Artemis_, Westw. ♀, nat. size.

Fig. 2. _Bacillus Artemis_, Westwood ♀, var. nat. size; _2a_, the three terminal segments seen from the side; _2b_, the terminal segment, × 2 from above, _2c_, the extremity of the abdomen from below, _2d_, basal joint of antennæ magnified.

Fig. 3. _B. Westwoodii_; ♀, nat. size; _3a_, side view of three terminal segments of abdomen; _3b_, the same from below.

**Plate VII.**

Fig. 1. _Bacillus scabriusculus_, ♀; nat. size; _1a_, the three terminal segments of the abdomen from the side.

Fig. 2. _Bacillus hispidulus_, ♂, nat. size; _2a_, the terminal segments of the abdomen seen sideways; _2b_, the same seen from above; _2c_, the same from beneath.

Fig. 3. _Bacillus hispidulus_, ♀, nat. size; _3a, 3b, 3c_, represent same parts as in fig. 2.
ON AN UNDESCRIPTED SPECIES OF LOPHOPHANES, by W. E. Brooks, C. E.,
Assensole.

[Received 11th February, 1873; read 5th March, 1873.]

Lophophanes Humei, n. sp.

Description. Head and crest, neck, chin and throat, bluish black; the black of the throat extends about 0.6 of an inch from base of lower mandible; cheeks and ear coverts, and sides of the neck beyond ear coverts, form a patch of pure white; there is also a large patch of pure white on the back of the neck; on the sides of the neck below the white patch the black extends about 1/2 of an inch lower down than it does on the centre of the breast; back and wing coverts dark bluish grey, becoming paler and more ash coloured on the upper tail coverts; lesser and greater wing coverts tipped with bright white; wings and tail dusky, the feathers having paler edges; wing lining, axillaries and breast a clear ochre passing to a dusky yellow grey on the flanks, lower abdomen, and under tail coverts. This fulvous lower surface is characteristic of the species. Bill black; legs and feet dusky.

Total length judging from the skins, will be about 4 inches.

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<th>Tail</th>
<th>Bill at front</th>
<th>Tarsus</th>
<th>Midtoe and claw</th>
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This species strikingly resembles in colouration the plate of Parus Britannicus, Sharpe and Dresser, in their fine work on the Birds of Europe; except that it is almost devoid of the greenish tint of the upper parts shewn in the plate, and our species is not a typical Parus, but a crested Lophophanes. It is also rather like Hodgson's drawing of Parus oemodius; but that species is not shewn to be crested, neither has it any white spots on the wings.

I picked this species out of a collection of Sikkim birds, sent by Mr. Mandelli to Mr. Ball. The discoverer allows me to describe it, and I have, therefore, great pleasure in naming it after my friend Mr. Hume, as I cannot remember any species named after the most laborious of our present Indian Ornithologists.
Hopaline Benthamiana, Schott
NEW BURMESE PLANTS. PART II.—by S. Kurz, Esq.

[Received 15th Feb., read 5th March, 1873.]

[With plates VIII, IX, X.]

106. ANNESLEA MONTICOLA, nov. sp.
   Arbor 80-90 pedalis v. in regionibus altioribus pumila, glaberrima; folia c. 3 (arboris juvenilis usque ad 7) poll. longa, ovato-oblonga, raro lanceolata, basi rotundata v. obtusa et subdecurrentia, breve lateque petiolata, acuminata v. acuta, integra v. obsolete crenata, crassissime coriacea, nervis vix visilibilibus, subtus (in sicco) atropunctata; flores majusculi, basi bibracteolati, pedicellis 2, sub fructu usque 3 poll. longis crassis albis ramulos terminantibus; calyx coriaceus, albus; corolla rosea. Martaban.—A. crassipedi arcte affinis, pedunculis et foliis acutis distinguetur.

107. SAURAUJA ARMATA, nov. sp.
   Arbor 25-30 pedalis, novellis squamis adpressis firmis subosseis acutissimis vestita; folia 9-10 pollicaria, lato-ovata ad obovato-oblonga, acuta, basi obtusa, brevissime petiolata (petiolis crassis squamatis), spinescenti serrata, chartacea, glabra, sed subtus secus costam nervosque squamis subosseis adpressis adpersa; flores 1½ poll. fere in diametro, in pedunculis brevissimis crassis dense squamatis solitarii, vulgo supra foliorum delapsorum cicatricibus fasciculati; sepala tomento squamis rigidis adpressis intermixto obducta; ovarium unacum parte unita stylorum 5 dense villosum.—Martaban.
108. **Sauratja macrotricha**, nov. sp.

Partes omnes (superficie foliorum excepta) pilis longis rigidis ferrugineis v. nigrescentibus vestitae; folia fere pedem longa v. breviora, lanceolata, utrinque attenuata, breviusculae petiolumata (petiolis hirsutis), acuminatissima, setaceo-serrata, chartacea, supra glabra, subtus inprinis secus nervos venuilosque rigidie hirsuta; flores parvi, longe gráciliterque pedicellati, in axillis foliorum v. supra eorum cicatricibus cymas hirsutas formantes; bracteae parvae, linear-lanceolatae, glabrae; sepala et ovarium glabra; styli 5, erecti, basi uniti.—**Avu.** (J. Anderson.)

109. **Pyrenaria diospyricarpa**, nov. sp.

Arbuscula novellis tomentellis; folia 4-5 poll. longa, oblongo-v. elliptico-lanceolata, basi acuta et marginibus utplurimum involutis, breve petiolumata (petiolis crassis dense tomentosis), obtusa v. subobtusa, coriacea, juniora utrinque, denuo subtus tamen dense tomentella v. pubescentia, flavescenti viridia, in sicco more *Symloci* lutescentia; flores mediocres, brevissime et crasse pedicellati, solitarii, axillares; bracteae sepalis longiores, foliaceae, oblongo-lanceolatae, basin versus attenuatae et cum basi latissima sessiles; sepala bracteis conformia, sed minora et gradatim in petala extus dense sericea abuentia; ovarium dense sericeo-villosum; styli 5, apice liberi, crassi et breves; drupae pumiformes, 2 poll. circiter longae, obovato-oblungae, obsolete obturseque 3-4-angulares, carnosae, laevissimae et cerino-luteae, nitenentes, basi *Diospyrorum* more bracteis sepalisque paullulo aceretis sustentae.—**Martaban.**

**DIPTEROCARPEÆ.**

110. **Shorea floribunda** (*Hopea floribunda*, Wall. Cat. 964).

Arbor verosimiliter decidua, glaberrima; folia juniora oblonga ad elliptica, basi rotundata, petiolis mediocribus gracilibus suffulta, acuta, glabra; flores mediocres, subsessiles, racemosi, in paniculas glaberrimas in axillis foliorum novellorum dispositi; calyces latissimi lobi 2 interiores paulo breviores; petala semipollinicum fere longa, lutescentia?, lanceolata, extus parce pubescentia; stamina e. 15, connectivo in aristam reflexam antheræ longitudine terminato.—**Tenasserim.** (Wall.)

111. **Hopea Griffthii**, nov. sp.

Glabra; folia ovato-lanceolata, breviusculæ sed gracilis petiolata, basi acuta, longe et obtussiusculæ caudato-acuminata, coriacea, subtus subnitentia et costa acute prominente percursa, nervis autem lateralis 12-10 utrinque subtillibus; flores minimi, subsessiles, secundi, flexuosos racemosi, paniculam glabram brevem sed gracillimam formantes; calyx glaber, lobis lato-rotundatis et obtusis; petala extus velutina, lineam circiter longa; antheræ breves arista rigida antheræ longitudine v. longiore terminatae.—**Tenasserim** (Helf. 717).
H. jucunda, Thec. arcte affinis a qua autem foliorum nervatione valde diversa jam dudum recognoscenda.

112. Hopea gratissima, Wall. Cat. 960.
Glabra; folia lato-lanceolata, graciliter petiolata, basi acuta, breve et obtusiuscule apiculata, coriacea, supra lucida, nervis 15-16 utrinque subparallelis unacum costa acute prominentibus: flores secundi, breve pedicellati, racemos compositas terminales axillaresque parce puberulos formantes; calyx velutinus, lobis lanceolatis obtusis; petala extus velutina, 2 lin. longa; connectivum arista longa flexuosa terminatum.—Tenasserim. H. diversifolia, Miq., quam maxime affinis, an synonyma?

113. Anisoptera glabra, nov. sp.
Arbor ingens, 100-120 pedalis, glabra; folia circ. 5 poll. longa, elliptica ad oblonga, raro obovato-oblonga, breve acuminata, basi rotundata v. obtusa, coriacea, utrince glabra, nervis subtus valde prominentibus; petiol. 1—1½ poll. longi, glabri; racemorum pedunculi ferrugineo-tomentosi, glabrescentes; flores desunt; calycis tubus fructigerus glaber, nuci tomentose fere ad 2/3 part. adnatus; calycis laciniae inequales, quorum 2 longiores c. 6 pollicares, lineari-lanceolatae, obtuse, basim versus sensim attenuatae, conspicue 3-costata et transverse venose, glabrae (costis minute tomentosis exceptis); interiores 3 strictae, erectae, lineari-lanceolate, pollicem fere longe acuminatae, basin versus latiores; nux velutina stylo longo acuminata.—Murtaban. A marginatae, Korth., cui Shoream Penangianam, Wall. Cat. 963, synonymam adscribere, affinis.

MALVACEÆ.

Species haud cum B. Malabarica conjungenda, sed inter alia stamini-bus bene distinguitur:

B. Malabarica: staminum phalanges et filamentis crassin 15-20; B. insignis, autem e filamentis 50 pluribusve filiformibus compositæ.

STERCULIACEÆ.

115. Heritiera macrophylla, Wall. MS.
Arbor, omnibus partibus argento-lepidotis; folia magna, ovato-oblonga v. oblonga, petiolis parce lepidotis 2-4 poll. longis v. raro brevioribus, basi rotundata et sepius leviter sinuata, 7-12 poll. longa, acuta v. breve acuminata, coriacea, supra glabra, subtus argento-lepidota; flores parvi, dense fulvo-puberuli, 5-raro 7-denticulata, breve pedicellati paniculas axillares amplas ramosas dense fulvo-puberulos formantes; carpella lignosa, suboblique ovalia, canescenti-lepidota et pustulis suberosis rugoso-scabra, facie interna conspicue, extus obsolete carinata, apice in appendicem longiusculum coriaceum
alæformem producta.—Martaban. N. B. H. attenuata, Wall., Cat. 1140; Horsf. et Benn. H. Jav. rar. 237, a me non visa, vix hujus generis sed probabiliter cum Brownlowia lanceolata, Bth., comparanda.


Fruticulus partibus omnibus fulvo-tomentellis; folia oblonga ad oblongo-lanceolata, brevissime petiolata, basi obtusa v. rotundata ibidemque 3-nervia, 2-2 ½ poll. longa, in eademque stirpe obtusa v. acuta et vulgo mucronata, chartacea, integra, supra pilis brevibus stellatis adspersa, subtus fulvescenti stellato-tomentella; flores parvi, breve pedicellati; cyme fulvo-tomentelle, brevissimæ, axillares, pauciflore, graciles; calyx circ. 2 lin. longus, stellato-tomentellus et subfurfuraceus; petala sublongiora; stamina numerosissima et conferta; stylus simplex, glaber; ovarium villosum; capsula unicum alis oblique oblongis nervosis c. 2-2 ½ poll. in diametro, tomentellæ, siccae, brunnea; semina globosa.—Pegu, Martaban.

117. Pterospermum aceroides, Wall. Cat. 1171.

Arbor, novellis dense tomentosis; folia elliptica v. lato-oblonga, utplurimum subobliqua, arboris junioris palmato-5-7-loba, brevissule petiolata, profunde et saepius inaequali-cordata, verosimiliter nunquam peltata, breve acuminata v. apiculata, supra glabra, subtus canescenti v. fulvescenti-tomentellus, basi 5-7-nervia; stipules...; flores magni, albi, breve erasseque pedicellati, 3-v. 2-ni axillares et subcymosi; bracteolæ oblongo-lanceolatae, tomentosæ, integres; calyx 2-3 poll. longus, sepala crassissime coriacea, linearia, ferrugineo-tomentosa, extus striata, intus fulvo-stellato pubescens; stylus glaber; ovarium fulvescenti-tomentosum; capsulae 5-angulares, oblongæ.—Tenasserim, Andamans.

TILIACEÆ.

118. Berrya mollis, Wall. Cat. 1186.

Arbor magna, novellis tomentellis; folia cordato-cordata, lata, circ. 6-7 poll. longa et lata, basi palmato-7-9-nervia, petiolata, petiolis 4-5 poll. longis dense puberulis v. tomentellis, obtusioculata v. acuta, obsolete repanda et in lobos 2-3 breves obtusos producta, chartacea, adulta supra (nervis pubescentibus exceptis) glabra, subtus dense puberula v. subtomentosa; flores c. 4-5 lin. in diametro, albi,paniculas laxas fulvo-tomentosas terminales formantes; pedicelli longi, tomentosi; calyx extus dense tomentosus, profunde 2-3-fidus, in alabastro subglobosus; petala obovato-lanceolata, calyce longiora; stamina numerosissima et conferta; stylus simplex, glaber; ovarium villosum; capsula unacum alis oblique oblongis nervosis c. 2-2 ½ poll. in diametro, tomentellaæ, siccae, brunneaæ; semina globosa.—Pegu, Martaban.
119. Grewia scabrida, Wall. Cat. 1113 (pro parte).
Frutex ? novellis ferrugineo-tomentellis; folia oblonga v. ovato-lanceolata, 5-6 poll. longa, petiolis brevibus ferrugineo-tomentosis, basi obtusa v. rotundata, serrata, acuminata, chartacea, utriuque (presertim subitus) stellato-hirta et scabra, 3-nervia, venis transversis valde conspicuis; flores circ. 8-10 lin. longi, pedicellis sulcatis ferrugineo-tomentosis et subfurfuraceis, 2-3-ni cymas parvas ferrugineo-tomentosas axillares formantes; sepala 7-8 lin. longa, lineari-lanceolata, extus scabriuscula ferrugineo-tomentella; petala circ. 2 lin. longa, lamina oblongo-lanceolata obtusa et a foveolâ lata crassâ dense fulvo-villosâ usque ad basin fere separabilis; gymnophorum et ovarium fulvo-villosa; drupae profunde 4-lobe, sed sape loborum unus alterve abortivus, lobis obtusis et divergentibus parce hispidis glabrescentibus, pollicem fere in diâmetro; mesocarpium fibrosum, coecis monospermis.—Martaban, Tenasserim. Species G. odorata, Bl. (G. umbellata, Roxb.) et G. columna-rî, Sm. valde affinis, sub eodem nomine cum G. pilosa, Lamk., a cl. Wall. chio distributa indeque a Wightio et Arnotto cum eadem confusa. G. retusifolia, Kurz in hocce diario, 1872, p. 294 proposita, foliis profunde retusis in sinu mucronatis insignis, teste el. Mastersio ad G. humilem, Wall., speciem nondum descriptam, pertinet.

Frutex novellis scabro-puberulis; folia oblonga v. ovato-lanceolata, basi inequali-rotundata, brevissime petiolata, 5-7 poll. longa, acuminata, duplicato-serrato-dentata, chartacea, utriuque (presertim subitus) scabro-puberula, 3-nervia, cum nervo adjecto ad latus latius; stipulae petiolis fulvo-tomentosis longiores, subulate, striate, scabro-puberulae; flores parvi; pedicellis tomentosi, breves; cymæ multiflore brevissime pedunculatae 2-3-næ axillæres; sepala circ. 2 lin. longa, fulvo-puberula; petala lineari-lanceolata, 1 lin. longa, longitudinali foveole ovalis villoso-ciliatae incrassate, dorso linea hirsuta notata; stamina in floribus masculis 16; ovarium hirsutum; drupae...—Pegu.

Frutex scabro-stellato-hirtellus; folia rotundata v. lato-ovobato-oblonga, basi vulgo cordata, petiolis longiusculis gracilibus scabris, acuta v. breve acuminata v. obtusa, apicem versus sepius in lobos 2 v. unicum obtusum v. truncatum raro acutum producta, distant dentata, basi vulgo 7-nervia, membranacea, supra stellato-scaberrima, subtus plus minus pilis stellatis puberula et mox scabrescentia; flores parvi, pedicellis gracilibus brevibus
tomentellis, in cymulas pedunculatas dispositi et paniculam terminalem laxam canescenti-puberulam efficentibus; sepala lineam circiter longa, extus canescenti-tomentella; petala obovato-oblonga, obtusa, sepalis subaequilonga, basi foveola minuta incrassata villosa-ciliata acuta; capsule 7-9 lin. in diametro, stellato-puberula, scabra, sicca, mature in carpidea 3-4 indehiscentia monosperma bialata separantes.—Ava, Martaban.

122. Evodia viticina, Wall. Cat. 1219.
Frutex glaber, ramulis lineis 4 acute prominentibus notatis; folia 3-5 uni-foliolata in eodem v. diversis ramulis, opposita, glabra, petiolis ½-¾ poll. leviter alatis; foliola 2-3½ poll. longa, lanceolata v. oblonga, obtusa, subcoriacea.

Fruticulus gracilis, simplex v. parce ramosus, decidualis, inermis, glaberrimus; folia impari-pinnata, rachide anguste alata; foliola 5-7-juga cum impari, alterna, subsessilia, oblongo-lanceolata ad lanceolata, oblique acuminata, crenata, glabra, 1-1½ poll. longa, pellucido-punctata; flores pentameri, parvi, albi, e ramulis novellis axillaribus brevibus orientes et cymam brevem glabram breve pedunculatam v. subsessilem efformantes; calycis lobi trigono-oblongi, acuta, ½ lin. longi; petala 3 lin. longa, acutiuscula; stamina 10, alternatim breviora, filamenta basi intus parce puberula; ovarium obovatum, compressissimum, laxe, toro brevi crasso insidens, 2-loculare, loculis ovulo solitario pendulo; stylum curvus, stigmatate incassato; torus post praeflorationem productus; baccæ.—Pegu.

SIMARUBEÆ.

124. Bucea mollis, Wall. MS.
Fruticulus simplex v. subsimplex, 2-3 pedalis, novellis puberulis v. pubescentibus; folia imparipinnata, petiolas rachisque teres puberula, glabrescentes; foliola 4-6-juga cum impari, ovato-oblonga v. ovato-lanceolata, longiuscula petiolulata, acuminata, integerrima, membranacea, supra sparse, subtus densius, pubescentia v. praeter nervos pubescentes glabra, 2-3 poll. longa; flores minutis, graciliter pedicellati, racemosi puberulos v. pubescentes simplices graciles folio folio breviores axillares formantes; drupæ solitariae v. binæ, rarius ternæ, ovata, pisi majoris magnitudine v. majores.—Marta-

ban. Bucea genus magis ad Tapiriam inter Anacardiaceas spectat.
1873.
S. Kurz.—New Burmese Plants.

MELIACEÆ.

125. Chickrassia velutina, (Swietenia velutina et S. villosa, Wall. Cat.).

Species mihi bona, a Ch. tabulari distinguetur novellis, foliis etc. molliter pubescentibus, foliolis numerosioribus supra velutinis subtus molliter pubescentibus; paniculis ferrugineo-tomentosis; floribus majoribus; petalis obovato-oblongis 5-6 lin. longis; calyce dense fulvo-tomentoso; capsulis atris, sublaevibus.—Pegu, etc.

CELASTRINEÆ.

126. Microtropis longifolia, Wall. Cat. 4339 (pro parte).

Frutex ? glaber; folia oblongo-lanceolata v. oblonga, petiolis crassis 4-5 lin. longis, breve acuminata, basi acuta, 6-7 poll. longa, integra, coriacea, utrinque (praesertim supra) rugulosa, opaca; flores breve cymosi; pedunculus 4-6 lin. longus; ovaria ovata; testa seminis rubra.—Tenasserim. G. latifolia, Gais., in Hb. Kew assimilis, nervatione autem diversa.

AMPELIDEÆ.

127. Leea compactiflora, nov. sp.

Arbustula L. sambucinae valde affinis, sed foliola angustiora, argute serrato-dentata, longe acuminata; inflorescentia petiolo multo brevier, ferruginoe-tomentosa; flores viridiusculi, sessiles, bracteis latis brevibus ovatis acutis subscariosis circumdati et in glomerulos compactos congesti; fructus non adsunt.—Martaban.


Frutex simplex, clatus, glaberrimus; folia largissima, supra-decomposita, petiolus compressiusculus levis; foliola vulgo magna, 6-8 poll. longa, petiolulis \( \frac{1}{2} \) (terminali usque ad 2) poll. longis, oblonga ad oblongo-lanceolata, breve et abrupte acuminata, basi acuta, grosse crenato-serrata, tenuicoricaea, glaberrima, lucida, siccando nigrescentia, nervis subtus prominentibus; flores parviisculi, virescenti-albidi, pedicellis brevissimis robustis v. subssilies, in cymam amplam diffusam 2-3-chotomicam ramosam glaberrimam axillarem v. subterminalem petiolorum longitudine v. longiorum dispositi; bracteae bracteoleaque ante anthesen cadueissimae; calyces lobi breves, rotundati v. subacuti, glabri; petala reflexa, lineam circiter longa; lobi tubi staminis triangulari-lanceolati, acuminati, apice integro reflexi; baceae depresso-globosse, 4-6 spermæ; semina obtuse carinata, lateribus tuberculato-costatis.—Tenasserim.

129. Leea leeta, Wall. Cat. 6831.

Frutex humilis, 2-3 pedalis, glaber; folia bipinnata, petiolis teretibus; foliola petiolum 1-2 lin. longis, oblongo-ad ovato-lanceolata, 5-8 poll. longa,
basi rotundata subinequalia, acuminata, crenato-serrata, membranacea, glabra sicco magis minusve rubescenzia; flores parvi, rubri, pedicellis brevibus tomentosis, cymas compositas breves sessiles v. pedunculatas compacti-eculas v. raro diffusas axillares efficientes; bracteae bracteoleaque ante anthesin caducæ; calyce lobi triangulares, acuti, glabri; petala lineam fere longa; tubi staminei lobi emarginati; baccae desunt.—Burma, Andamans.


Herba perennis, caulibus crassis teretiusculis, glabra; folia inferiora decomposita, superiorem impari-pinnata, summa sepius ternata, petiolis, petiolulis rachique anguste membranaceo-4-alatis; foliola vel volgo 3-juga cum impari, elliptico-oblonga ad oblongo-lanceolata, terminali longius petiolulato sepius ovato-oblongo, brevissime petiolulata v. subsessilia, 6-8 poll. longa, acuta, argute serrata, glabra, nervis parrelaxis venisque transversis subtus valde prominentibus; cymæ vel volgo a basi ramosæ v. pedunculata, trichotomo-ramosæ, pedunculis et ramificationibus purpurascensibus compresso-angulatis glabris; bracteae, bracteoleaque ante anthesin deciduæ; flores parvi, coccinei, pedicelli brevibus crassis glabris suffulte; calyx 5-dentatus, coccineus, lobis acutis; petala coccinea, lineam circiter longa; tubus stamineus cerino-albus, lobis emarginatis; filamenta subpurpurascensia; baccae depresso-globose, pisi magnitudinis, velgo 6-spermacæ, aurantiaceæ.—Ava.

N. B.—*Vitis Wallichii*, Kurz in hocc diario 1872, p. 302 (Leea cordata, Wall. Cat. 6819) ad *V. Linneae* formas probabiliter reducenda, a quibus autem cymis axillaribus (nee oppositifoliis) differre videtur.

**ANACARDIACEÆ.**

131. **Mangifera caloneura**, nov. sp.

Arbor mediocris, glabra; folia oblonga ad oblongo-lanceolata, 3-5 pollincaria, petiolo basi valde incassato 1-2 poll. suffulta, obtuse acuminata, coriacea, glabra, utrinque elegantissime minute et prominenteri reticulata, costâ crassa lata præsériment supra prominentem et subplana percursa, nervis lateralis vix curvis 18-20, tenuibus; flores parvi, sessiles v. subsessiles paniculam terminalam tomentosam amplam formantè; calyx pubescens; petala lanceolata, acuta, reflexa, lineam circiter longa, ciliolata, alba, medio linea cirtina percursa; stamen 1, anthera atropurpurea; discus 5-lobus, lævis; drupae ovi gallinacea magnitudine subreniformi-ovoideae, læves, obtusæ, aurantiaceæ v. luteæ, acido-dulces, subteretes.—*Pegu, Martaban*. M. Indice affinis, reticulatione elegantissima statim recognoscenda.

N. B.—Bouea Brandisiana, Kurz in Journ. As. Soc. 1871, p. 50, ad B. Burmanicam, Griff. in hoc diario, 1854, p. 634, referenda.
1873.]
S. Kurn—New Burmese Plants. 67

LEGUMINOSÆ.

132. MILLETTIA MONTICOLA, nov. sp.

Frutex alte scandens, deciduus, novellis parce ferrugineo-pubescentibus glabrescentibus, ramis verrucosis; folia novella (adulta non visa) impari-pinnata; foliola 4-3-juga cum impari, petiolulata, oblonga, breve acuminata, subtus secus nervos adpressae fulvo-pubescentiae; flores azurei, parviuisci, pedicello 1-2 lin. longo ferrugineo-tomentoso suffulti, fasciculati, in racemos simples solitarios ferrugineo-tomentellos 4-7 pollicares supra foliorum delapsorum cicatricibus orientes dispositi; calyx parce ferrugineo-tomentosus, 2-2½ lin. longus, longior quam latus, obsolete et lato-dentatus, denticulo anteriore paullo producto; corolla glabra, vexillum clercial semipollcarum; ovarium tenuiter ferrugineo-pubescentum; legumina desunt.—Martaban. M. pachycarpæ, Bth., arcte affinis.

133. MILLETTIA LEIOGyna, nov. sp.

Frutex deciduus alte scandens novellis ferrugineo-tomentosis; ramis teretibus minute lentiscellatis; folia novella (adulta desunt) ferrugineo-tomentosa, impari-pinnata; foliola 4-6-juga cum impari; flores majusculi, violacei, vexillo in fundo luteo, pedicellis 2-3 lin. longis nutantibus velutinis suffulti, racemos 4-5 pollicares fulvo-tomentosos e ramulis abbreviatis lateribus ortos formantes et sepius in paniculam amplam lateralem collecti; calyx latior quam longus, 2-2½ lin. longus, fulvo-velutinus, obsolete dentatus, dente anteriore paullo producto; corolla glabra, vexillum ½ poll. longum, emarginatum; ovarium leve; legumina juniora linearia, leves, subulato-acuminata.—Martaban. M. exsensæ, Bth., affinis.

134. MILLETTIA GLAUCESCENS, nov. sp.

Arbor magna, decidua, glabra v. sepius novellis parce pubescentibus; folia impari-pinnata, 3-1 ped. longa, glabra, v. rachi et petiululis parce puberulis; folia elliptica ad obovato-oblonga et oblongo-lanceolata, vulgo 3-4-raro 2-juga cum impari, obtusiuscula et subabrupte acuminata v. apiculata, petiolulis 2-3 lin. longis gracilibus glabrescentibus, integra, 3-4 poll. longa, membranacea, glabra v. subtus secus costam subpubescentia, subtus glaucescens; flores parvisscula, cyanei, pedicellis capitariae puberulis v. subglabris 3-4 lin. longis, in racemos graciles glabros v. puberulos solitarios v. secus ramulos novello affyllos aggregatos dispositi; calyx latior quam longus, parce pubescentes, 1-1½ lin. longus, obsolete lato-dentatus; corolla glabra; vexillum obsolete emarginatum, ½ poll. fere longum; ovarium adpresse sericeum; legumen oblongum, basi attenuatum, lignosum, incurvato-acutum, planum, suturis in alas angustissimis dilatatis undeque quasi subquadrangulari-alatum, glabrum, lenticeillis rimosis sparse obrectum, 3-4 poll. longum, 2-3 lin. crassum, 1-3-spermum.—Pegu, Martaban.
135. **Milletia pubinervis**, nov. sp.

Arbuscula 20-25 pedalis, novellis puberulis; folia impari-pinnata, c. \( \frac{1}{2} \) ped. longa, rachi puberula; foliola elliptico- ad obovato-oblonga, petioliulis gracilibus 1-2 lin. longis puberulis, longiisculae et obtusiisculae acuminata, 2-3 poll. longa, tenuiter chartacea, integra, subtus glauca et secus costam pubescentia; flores parviisculi, luride lutescenti albi, pedicellis capillarisibus pubescentibus, solitarii v. fasciculati, racemos solitarios oppositifolios graciles luteolo-pubescentes \( 2 \frac{1}{2} \)-3 poll. longos formantes; calyx rubicundus, latior quam longus, circ. 1-1\( \frac{1}{2} \) lin. longus, parce pubescens, obsolete sinuato-dentatus; corolla glabra; vexillum plus quam \( \frac{1}{2} \) poll. longus; ovarium adpresse pubescent; legumen deest.—*Martaban.*

136. **Milletia leucantha**, nov. sp.

Arbor mediocris, novellis serico-pubescentibus glabrescentibus; folia impari-pinnata, \( \frac{1}{2} \)-\( \frac{3}{4} \) ped. longa, juniora subtus sparse pubescentia, mox glabrescentia; stipella subulate, rigide, diutius persistentes; folioli ovata ad elliptica, ut plurimum 3-juga cum impari, longius petiolulato, breve et subabrupte acuminata, petioliulis c. 2 lin. longis puberulis glabrescentibus, 3-4 poll. longa, rigide chartacea, adulta glaberrima, integra, subtus saxipallida; flores fasciculati majusculi, candidi, pedicellis 2-3 lin. longis cinereovelutinis; racemi solitarii, cinerascente pubescentes, erectiisculi, 2-4 poll. longi, in ramulis lateralibus terminales v. laterales; calyx canescenti-velutinus, c. 2\( \frac{1}{2} \) lin. longus, dentibus 3 inferioribus distinctis, acutiusculis, 2 superioribus connatis lato-ovatis; corolla glabra; vexillum \( \frac{1}{3} \) poll. fere longum, integrum; ovarium adpresse sericeum; legumen lignosum, oblongum ad obovato-oblongum, acutum, glabrum, lenticillato-scabrum, 1\( \frac{1}{2} \)-3 poll. longum, marginibus uti in *Pongamia obtusis*, 1-3 spermum; semina plana, brunnea.—*Prome, Pegu.*

137. **Milletia ovalifolia**, (Pongamia ovalifolia, WA. Prod. I. 262; Wight Jc. t. 328.)

Arbor mediocris, glabra; folia impari-pinnata, \( \frac{1}{2} \)-\( \frac{3}{4} \) ped. longa, glabra; foliola ovata ad elliptica et elliptico-ovata, petioliulis 1-2 lin. longis gracilibus, 3 (sec. WA. etiam 4-)juga cum impari, breve acuminata, apiculata v. obtusiiscula, \( \frac{1}{2} \)-1 poll. longa, chartacea, integra, subtus subglaucescentia, subtilliter reticulata; flores solitarii v. subfasciculati cyanei, parviisculi, pedicellis capillarisibus 2-3 lin. longis; racemi gracies, glabri, 2-3 poll. longi, solitarii v. plures et ramulis novellis orti; calyx glaber, purpurascens, latior quam longus, c. 1 lin. longus, obsolete dentatus v. subtruncatus; corolla glabra, vexillum c. \( \frac{1}{4} \) poll. longum; ovarium parce adpresse pubescent; legumen linearis-oblongum, basin versus attenuatum, incurvato-acutum, planiusculum suturis obtusis, sublignosum, glabrum, pallidum, sparse verrucoso-lenticillatum, 2-3 poll. longum, ad medium 2-3-spermum.—*Prome.*
138. Millettia Brandisiana, nov. sp.

Arbor mediocris, gemmis cupreo v. fulvo-pubescentibus, ceterum glabra; folia impari-pinnata, ½-1 ped. longa, glabra; stipelle subulate, diuittius persistentes; foliola 7-10-juga cum impari, oblongo-lanceolata, petiolulis lin. longis puberulis, obtuse acuminata, 1½-2½ poll. longa, integra, juniora membranae et subtus parce minuteque puberula, demum rigide sed tenuiter coriacea, glaberrima, subtus glaucescentia; flores cyanei, majusculi, pedicelli crassiulus 2-3 lin. longis glabris suffulti, fasciculati, racemos 4-8 poll. longos glabros secus ramulos novello distributos formantes; calyx purpureus, glaber, e. 2 lin. longus, tomentoso-fimbriatus, dentibus conspicuis, anteriore magis producto, posterioribus brevibus lateque conatus; corolla sericeo-pubescent; vexillum ½ poll. fere longum; ovarium adpresse pubescent; legumen obovato-oblongum ad oblongum et oblongo-lanceolatum, basi plus minusve attenuatum, rigide coriaceum, valde planum, subabrupte incurvato-acuminatum, 2-3 poll. longum, suturis haud incrassatis, brunnescens, leve, 1-3-spermum.—Pegu. M. pulchrae (= Mundulea pulchra, Bth.) affinis.

139. Millettia tetraptera, nov. sp.

Arbor mediocris, novellis molliter pubescentibus; folia impari-pinnata, ½-¾ ped. longa, juniora molliter tomentella; foliola 3-(raro 2-1) juga cum impari, obovata ad elliptico-obovata, petiolulus crasis 1-2 lin. longis tomentosis, apice rotundata, subemarginata v. rarius apiculata, integra, novella membranae et utrinque canescenti-tomentella, demum rigide chartacea et supra glabrescentia; flores fasciculati parviisculi, pallide lilacini, pedicelli 2-3 lin. longis dense pubescentibus; racemi 3-4 poll. longi, fulvo-v. vilvescenti-tomentosi secus ramulos foliatos novello siti v. apicibus oppositifoli; calyx latior quam longus, 1½ lin. longus, tomentosus, obsolete sinuato-dentatus v. subtruncatus; corolla glabra; vexillum c. ½ poll. longum; ovarium adpresse pubescens; legumen subcuneato-oblongum, basi sterilis attenuatum, lignosum, incurvato-acutum, 3-4 poll. longum, pallidum, leve, marginibus in alas irregulara lignosae septi undulatas angustas dilatatum et quasi tetrapterum, 1-2 spermum.—Arav, Promc.

140. Erythrina holosericea, nov. sp.

Arbor aculeato-arnata, novellis furfuraceo-puberulis; folia iis E. lithospermae conformia, 3-foliolata, petiolo 3-4 poll. longo, glabra; foliola plus minusve ovata, petiolulis 2-3 lin. longis, acuminata, 3-5 poll. longa, integra, chartacea v. membranae, glabra; flores magni, coccinei? alis carinaque purpureis, subsessiles, 2-3-ni fasciculati, in racemo fulvo farinaceo-tomentoso collecti; calyx resupinatus, brevi-spathaceus bruneo-villosus, intus fulvescenti-sericeus; vexillum 1½ poll. fere longum, obovato-cuneatum, obtusum, minute-velutinum; alae falcato-oblongae, obtuse, c. ½ poll. longae; carina

141. Dalbergia cana, Grab. in Wall. Cat. 5859.

Arbor magna, novillis pubescentibus glabrescentibus; folia impari-pin- nata; juniora parce pubescentia, max glabrescentia, 1-2 ped. longa; foliola 7-9-juga, alterna, petiolulis 1-1½ lin. longis glabrescentibus, oblonga ad ovato-v. lineari-oblonga, sæpius subinaqualia, breve et subabrupte acuminata, 2-2½ poll. longa, integra, chartacea, adulta glabra v. subtus subpu- berula; flores parvi, luride purpurei, pedicellis capillariibus puberulis 1-2 lin. longis suffulti, paniculam laxam puberulum breve pedunculatum axillarem v. sub-lateralem formantes; calyx atropurpureus, glaber v. subglaber, c. 2 lin. longus, dentibus obtusis; corolla glabra, 3 lin. fere longa, petalis longe un- guiculatis; stamina 10, diadelpha; ovarium pilosum; legumen lineari-oblon- gum, planum, 3-1ispernum, obtusum, basi in stipitem brevem constrictum 3-4 poll. longum, fulvo-velutinum, circa semina indistincte venosum.—Pegu Martaban, Tenasserim.

142. Dalbergia glomeriflora, nov. sp.

Arbor mediocris, decidua, novillis fulvescenti-tomentosis; folia juveni- lia tomentosa glabrescentia, impari-pinnata; folia 3-4-juga, alterna, ovata ad elliptica et obovata, petiolulis parce pubescentibus 1-2 lin. longis, acuta, 2-2½ poll. longa, integra, tenuiter coriacea, supra glabra, subtus parce puberu- la; flores parvi, albi, pedicellis brevissimis, v. subsessiles, in paniculas sub- capitatas ramulos novellos villosos terminantes conglomerati; calyx c. 1½ lin. longus, glaber, dentibus obtusis; corolla glabra, calyx paululo longior, petalis brevissime unguiculatis; stamina 10, diadelpha; ovarium glabrum; legumen desideratur.—Promé.

Arillaria, gen. nov.

Chañolobii species ambæ a el. Miquello confectæ ad Ormosiam coursetam, Jack, reducendæ.

143. A. robusta, (Sophora robusta, Roxb., Hort. Beng. 31; Wight Je. t. 245; Ormosia floribunda, Wall. Cat. 5337.)

 Arbor mediocris sempervirens, novellis fulvo-velutino-tomentosis; folia impari-pinnata, 1-1½ ped. longa, rachi fulvescenti-pubescent; stipella persistentes, c. 2 lin. longæ, lineari-subulate, pubescentes; foliola 4-5-juga, oblonga, petiolulii crassis 2 lin. longis pubescentibus, acuta v. apiculata, 3-4 poll. longa, integra, tenuiter coriacea, adulta supra glabra, subtus fulvescenti-puberula; flores majusculi, luride albi, pedicellis brevibus crassis tomentosis suffulti, racemosi, in paniculam terminalem robustam ferrugineo-v. fulvo-tomentosam collecti; bracteeae persistentes, lineares, tomentosae, 2-3 lin. longæ; calyx amplus, 3 lin. fere longus, dense tomentosus; corolla glabra, c. 3 lin. longa; ovarium villosum; legumen oblongum v. elliptico-oblongum, basi in stipitem brevem pubescentem crassum contractum, acutum, carnoso-coriaceum, luteum v. gilvum, parce pubescens v. subglabrum, mono-spermum sime 2-spermum; semen magnum, oblongum, atterrimum, lucidum, arillo miniato dein sanguineo carnosó complete involutum. — Pegu, Tenasserim.

144. Pterolobium macropterum, nov. sp. (P. lacerans, Miq. Fl. Ind. Bat. I. 106, non R. Br.)

 Frutex magnus scandens, aculeis brevibus armatus, novellis parce pubescentibus; folia ½-¾ ped. longa, abrupte bipinnata, pinnis 7-8 v. pluribus rachibus aculeatis puberulis; foliola 7-9- v. pluri-juga, subsubsessilia, inequali-oblunga v. elliptico-oblunga, ¼-½ poll. longa, apice rotundata v. retusa, membranacea, glabra, subtus palida; flores albi, parvi, breviter pedicellati, racemos axillares solitarii (glabros?) efficientes; legumina samaroidea, basi seminifera plus quam ½ poll. longa, elliptico-oblonga, ala sesquipollicari, pollicem fere lata, semi-oblonga, apice rotundata, sutura interior recta, nec arenata. — Pegu, Martaban, Tenasserim.

 Species Indicæ 3 mihi notæ, nempe, P. microphyllum, Miq. (Hb. Maingay No. 535) racemis in paniculas terminales amplus dispositis, et P. lacerans, R. Br. (Wight Icon. t. 196), cum specie nova supra descripta racemis axillaris solitariis conjunctum, leguminibus autem valde discreps.

145. Cassia renigera, Wall. Cat. 5307; Bth. in Linn. Trans. XXVII. 518.

 Arbor mediocris, novellis molliter pubescentibus; folia abrupte bipinnata, ½-1 ped. longa, molliter pubescentia; stipulae magnæ, lunato-reniformes, deciduæ; foliola 8-20-juga, petiolulii brevissimis, v. subsessilia, elliptico-oblunga ad oblonga, obtusa v. retusa cum mucrone minuto, ¼-1½ poll. longa,
membranacea, molli-pubescentia; flores speciosi, purpurei, pedicellis 1-1½ pollicariibus pubescentibus, in racemos solitarios v. geminatos supra foliorum delapsorum cicatricibus ortos pubescentes brevissimos dense bracteatos collecti; bracteae cordato-ovatae, longe acuminatæ, pubescentes; calyx breve denseque pubescens; petala oblonga, pollicem fere longa, obtusiuscula; ovarium filamentaque glabra; filamenta longiores medio incrassata; legumen cylindricum, 1-2 ped. longum, indehiscens, glabrum.—Ava, Prome.

146. Bauhinia rosea, nov. sp.
Frutex scandens, novellis fulvo-puberulis; folia cordato-rotundata, usque ad ½ partem biloba, lobis rotundatis cum aristâ brevi in eorum sinu auctis, petiolo 1½-2 pollicari puberulo, 3-5 poll. longa et lata, integra, chartacea, juniora supra fugaci-pubera laxis, subus fulvescenti puberula; flores parviusculi, rosei, pedicellis 1½-2 poll. longis gracilibus adpresso puberulis, racemum terminalem bracteatum corymbiformem fulvo-pubescentem formantes; bracteæ lineari-lanceolatæ, acuminatæ, c. 4 lin. longæ; calyx apdresse fulvo-puberulus, tubo brevi, lobis in alabastro tereti-ovoideis, dein libera et reflexis 4 lin. longis lineari-lanceolatis; petala longe unguiculata, obovato-linearia, undulata, utrinque parce adpresse pubescentia, c. ½ poll. longa; ovarium cun stylo crasso brevi (ovario breviore) fulvo-villosum; legumen deest.—Martaban. (Dr. Brandis.) A B. Vahlii inter alia differt stylo et floribus minoribus.

147. Bauhinia ornata, nov. sp.
Frutex alte scandens cirrhiferus, novellis ferrugineo-pubescentibus; folia cordato-ovata ad cordato-rotundata, petiolo 1½-3 poll. longo in juventute ferrugineo-pubescente suffulta, usque ad ½ v. ½ partem biloba, lobis obtusiusculis v. obtusiusculae acuminatis et in sinu arista brevis, 4-7 poll. longa et lata, integra, chartacea, juniora subus parce adpresse ferrugineo-pubescentia, mox glabrescentia, palmatim 11-15-nervia; flores parvi, albi, pedicellis gracilibus 1-1½ pollicariibus, ferrugineo-pubescentibus, apice pedunculi longioris v. brevioris glabrescentis in racemum corymbiformem multiflorum bracteatum fulvo-pubescentem lateralem v. terminalem congregati; bracteæ lineari-lanceolatæ, pubescentes, c. 2 lin. longæ; calyx in alabastro pyriformis, adpresse pubescens, lobis ovatis c. 3 lin. longis reflexis; petala obovato-oblonga, extus parce pubescentia, subundulata, c. 4 lin. longa; ovarium fulvo-villosum, stylo longo gracilique glabro; legumen non repertum.—Pegu.

148. Bauhinia involucellata, nov. sp.
Frutex scandens, novellis parce puberulis; folia cordato-ovata, petiolo glabro 1½-2 poll. longo, usque ad ½-½ partem biloba, lobis obtusiusculae acuminatis in sinu arista brevis, 3-4 poll. longa, integra, tenuiter chartacea, glabra, palmatim 9-11-nervia; flores majusculi, pallide rosei, pedicellis 2-2½ polli-
caribus puberulis glabrescentibus infra apice bibracteolatis suffulti, racemum longiorum v. breviorem laxum terminalem puberulum glabrescentem formantes; bracteae minutae, indistinctae; bracteolae sub calyce elliptico-oblongae, obtusiusculae, ½ poll. longae, intus velutinae, quasi involucrium bifoliatum formantes; calyx velutinus, tubo sulcato-tubulari, c. 3 lin. longus v. longior, lobis in alabastro oblongo-ovato lanceolatis acuminatis ½ poll. longis dein liberis et reflexis; petala 1½ poll. fere longa, lamina ovato-oblonga, obtusa, unguis longitudine; ovarium laxe, stylo longiusculo sed crasso; stamina fertilia 3; legumen desideratur.—Martaban (Dr. Brandis).

149. Bauhinia monandra, nov. sp.

Frutex? novellis puberulis; folia parva, rotundato-ovalia, basi truncata, petiolo ½-1 pollicari breve pubescente, usque ad ½ partem biloba, lobis rotundatis in sinu aristatis, 1-1½ poll. longa, integra, chartacea, supra glabra, subitus presertim secus nervos breve pubescentia, palmatim 11-nervia; flores majusculi, albi? petalo inferiore maculato, pedicellis 1-1½ poll. longis dense puberulis, racemos breves terminales pubescentes formantes; bracteae parvae, subulatae; calyx extus tomentellus, in alabastro fusiformis, spatha ceus; petala obovato-cuneata, c. 1½ poll. longa, glabra, undulata, stamen perfectum unicum tantum, æterea omnia rudimentaria; ovarium stipitatum fulvo-villosum, sutasæ levibus, stylo gracili ovarii ipsius duplo longiore terminatum; legumen deest.—Burma, Martaban? (Dr. Brandis). Ex affinitate B. tomentosæ, cum B. brachycarpa, Wall., ultro comparanda.

150. Afzelia retusa, nov. sp.

Arbuscula glaberrima; folia abrupte pinnata, rachi brevissima glabra; foliola unii- v. bijuga, plus minusve ovalia, sub-obliqua, brevissime peti lotulata, 1½-2 poll. longa, integra, chartacea, emarginata, glabra; flores par viusculi, albidi pedicellis c. 4 lin. longis glabris, racemos breves simplices glabros in ramulis terminales efficiens; bracteola sub calyce 2 parvæ, concavo-cymbiformes, persistentes; calyx laevis, tubo c. 4-lin. longo, lobis obovato-oblongis æqualis-longis; legumen 3-4 poll. longum, 1-1½ poll. latum tenuiter coriaceum, oblongum, secus margines incrassatos subcurvum, glabrum.

—Andamans.

151. Parkia leiophylla, nov. sp.

Arbor vasta, 80-120 pedalis, novellis pubescentibus; folia abrupte bipinnata, 1-2 pedalia, pennis c. 20 v. pluribus suboppositis, rachibus breve fulvo-pubescentibus; foliola c. 30-40, sessilia, opposita, lineari-oblonga, subfalcata, basi oblique auriculata, ½ poll. longa, c. 2 lin. lata, oblique acuta, tenuiter coriacea, glaberrima, unicostata cum nervo solitario basilari laterali, penninervia; flores parvi, flavescentes, in receptaculo irregulari-globoso basi
in stipitem pollicem fere longo contracto sessiles et capitulum densiflorum clavatum longe-pedunculatum formantes; pedunculi 1-1½ pedales, glabri, racemosi, terminales; calyx 4 lin. fere longus, tubo glabro, lobis rotundatis extus dense fulvo-tomentosis; legumen 1-1½ ped. longum, lineare, in stipitem ¼-½ pedalem attenuatum, apice rotundatum, glabrum et subvernicosum, nigrum, inter semina numerosa torosum.—Pegu.

152. Parkia insignis, nov. sp.
Arbor vasta, 80-100-pedalis, novellis fulvo-pubescentibus; folia abrupte bipinnata, 1-2-pedales, pinnis c. 8 suboppositis, rachibus fulvo-v. ferrugineo-tomentosis; foliola 20-25 juga, subopposita, subfalcata, oblonga, cum basi inaequali sub-auriculata sessilia, apice rotundata, 1 poll. longa, ½ poll. lata, integra, coriacea supra nervis exceptis glabra, subtus pubescentia, penninervia, nervis arcuatim anastomozantibus; flores parvi, lutei in receptaculo clavato-orniculo basi in stipitem pollicarem attenuato sessiles et capitulum clavato-pyriformem longe pedunculatum efformantes; pedunculi pedales, plures ex apice ramorum orientes; calyx c. 4 lin. longus, tubo glabro v. subglabro, lobis obovato-cuneatis adpresse fulvo-pubescentibus; leguminas non vidi.—Martaban.

153. Albizzia (Pithecolobium) glomeriflora, nov. sp.
Frutex 2-5-pedalis, novellis puberulis, ramulis subangularibus v. teretibus; folia abrupte bipinnata, pinnis unijugis, petiolus 1-1½ pollicaris, rachibus vix angulares praesertim junioribus puberulis; foliola 3-raro 2-juga, petiolis brevissimis puberulis, oblique oblongo-lanceolata ad subrhomboideo-lanceolata breve mucronato-acuminata, 1-2 poll. longa, tenuerit et rigide coriacea, adulta glabra v. subglabra, v. secus costam puberula, subtus glaucescensia et secus nervos pubescentia; flores parvi, virescenti-albi, sessiles, in capitula pisi magnitudinis pedunculis gracilissimis ½-1 poll. puberulis instructa congregati et in racemos graciles puberulos axillares dein sæpius paniculam terminalem foliatam simulantes dispositi; calyx vix ½ lin. longus, pubescens; corolla usque ad calycis limbum lobata, extus pubescentia, c. 1½ lin. longa; leguminas non adsunt.—Martaban.

Rubiaceæ.

154. Paederia calycinæa, nov. sp.
Herba volubilis, novellis puberulis; folia cordato-ovata ad cordato-lanceolata, petiolo 1-1½ poll. puberulo suffulta, basi sinuato-cordata, acuminata, 2-3 poll. puberula, integra, membranacea, utrinque praesertim subtus parce hispidula; flores ... superiores pedicellati, lateralis sessilibus v. subsessilibus, in cymas dichotomis secundas parvas parce hirsutas disgesti, et paniculas thyrsoides brachiatus hirsutulas axillares et terminales efformantes;
calyx indistincte puberulus, tubo c. 1/2 lin. longo v. longiore, lobis fere duplo longioribus, lanceolatis, subsfoliaceis; corolla ...; capsule ovoidea, c. 4 lin. longæ, compresse, brunnea et lucida, calycis limbo conspicuo coronatae; semina capsulae conformia, alâ nigrescenti c. 1/2 lin. latâ circumdata.—Tenasserim (Wall. Cat. 6247 E).

Rubiacearum genera 44 in regno Burmanico occurrentia mihi cognita sunt, quorum conspectum hic addo:—


§ Ovarium 2-loculare.

* Corolla valvata. Albumen vulgo carnosum (Psychothria).


**Corolla lobi imbricati v. contorti.** Albumen vulgo osseum. (*Ixoreæ*).


8. **Coffea, L.** Corolla infundibuliformis, glabra, limbo 4-7-partito. Baccæ 2- raro 1-spermæ, semina pyrenis chartaceis inclusa. Flores terminales et axillares. Stipula libera. (Hic *Prismatomeris*, Thw.).


§ Ovarium 4-9-loculare. (*Lasiantheæ*).


§ 1. **Euvanguardia.** Corolla valvata. Ovula lateraliter v. sub apice affixa.


13. **Canthium, Lamk.** Ovarium 2-loculare. Drupæ didymæ, v. abortu passim sub-1-loculares. (Hic *Polyozus*, Miq., non Lour.)

§ 2. **Guettardæ.** Corolla imbricata.

* Ovarium 2-loculare, ovulis in loculis singulis 2 placentæ centrali affixa. Drupæ elongatione placentæ spurie 4-loculares, loculis spuris 1-spermis. Pyrenæ in putamen connatae.


**Ovarium 4- ∞-loculare, ovulis in loculis solitariis pendulis.** Pyrenæ in putamen ∞-loculare connatae, loculis monospermis.
15. **Guetarda, L.** Stigma crassum, simplex. Drupae globosae, majusculae.

*** ** Ovaryum pluri-loculare, ovulis in loculis pluribus v. numerosis, secus placentas centrales superposita. Drupae baccatae, 5-10-loculares, loculi pyrenas spurius (seminibus tests crustaceo-indurat?) plurimas continentes.

16. **Polyphragmon, Desf.** Stigmata tot quot ovarii loculi.


§ 1. **Gardenieae.** Ovaryum 1-loculare, placentis 4-5 parietalibus. Corolla imbricata.


* Placentae simplex.


21. **Diplospora, DC.** Stylus 2-fidus. Baccæ majusculæ, epulpose. Semina in loculis biseriata (an semper ?). Arbores v. frutices erecti inermes. (An potius cum sequenti conjungendum ?)


**Post ** Placentae 2-fidæ. Stigma 2-5-lobum.


§ 3. **Urophylleae.** Ovaryum vulgo 5-6- raro 2-3-loculare. Corolla valvata.


*OVula et semina in loculis numerosa, imbricato-pendula.


*OVula et semina in loculis solitaria, erecta.


*Capsulae baccatae, a basi dehiscentes.


*OVula et semina in loculis 2-superpositis sterilibus auctis, in syncarpium connatae.

*Capsulae seicæ, loculicide- v. septicide in cocos 2-∞-v. raro monospermos dehiscentes.

*Capsulae baccatae, a basi dehiscentes.

O. Capsulae in cocos 2-∞-spermos dehiscentes. Corollæ et calycis lobi dentibus interjectis carentes.


OO. Capsulae 2-4-loculares, loculis 1-ovulatis. Calycis et corollæ lobi in sinibus denticulati.

**OOO.** Capsulae 2-loculares, rimis longitudinalibus dehiscentes. Scandentes.


* Capsulae in valvas 2 lignosas septicidae dehiscentes.

34. *Hymenodyction*, Wall. Arbores; inflorescentiae foliis floralibus discoloribus discoloribus gaudentes.

**,** Capsulae apice 4-valvatim dehiscentes.

35. *Hymenopogon*, Wall. Frutices epiphytici; inflorescentiae foliis floralibus discoloribus discoloribus gaudens.


§ 1. *Hedyotidea.* Ovula et semina in loculis pluria v. numerosa, lateraliter affixa.

O Stipulae connatae v. liberae, haud vaginantes v. setaceo-fimbriatae. (Rondeletiae).


**OO** Stipulae petiolis adnatae et basi vaginantes, setaceo-ciliatae. (*Euhedyotidea.*)

41. Hedyotis, L. Flores 4-meri; petala integra. Capsulae loculicida v. septicide dehiscentes, v. in cocciis 2 v. 4 pleiospermos separantes.


Subg. 3. Metabolos. Capsulae septicide dehiscentes v. subdehiscentes, hemisphericæ, apice magis minusve truncatae, æpium obsolete 2-lobæ.


44. Pæderia, L. Corolla valvata. Folia opposita v. 3-4-na verticillata. Volubiles.

COMBRETACEÆ.

155. Terminalia tomentella, nov. sp.

Arbor magna, novellis adpresse cupreo-pubescentibus; folia 5-8 poll. longa, petiolo 8-12 lin. longo apice biglanduloso suffulta, basi inequali decurrentia, ovata ad ovato-oblonga, acuta v. subacuta, coriacea, integra, junio-
ra subitus dense, adulta parce cupreo-pubescentia v. omnino glabrescentia; flores parvi, sessiles, spicati, paniculam parvam ferrugineo- v. fulvo-tomentellam componentes; bracteole subulatae, floribus longiores, decidue; calycis lobi triangulares, acuti, extus glabri, intus unacum glandulis hypogynis albo-lanuginosi; tubus ovatus, teres, glaberrimus; drupa poll. vix longae, ovatae, obsolete 5-gona v. teretes, lutescentes, laves.—Pegu, Martaban, Tenasserim. T. Chebule, Retz., quam maxime affinis, calycis tubo laevissimo, indumento copiosior et fructibus minoribus distat.

**BEGONIACEÆ.**

156. BEGONIA NIVEA, Parish MS.

Herbula succulenta radice tuberosa?, subglabra; folia radicalia 1 v. 2, obovato-oblunga, apice irreguläriter truncato-angulata, basi in petiolum brevissimum crassum glabrum constricta, dentata et parce setulososilíata, palmatim 5-nervia, 2-3 poll. longa, membranacea, supra setulis brevibus adser- sa, subtus glabra; scapus radicalis, glaberrimus, folio duplo longior, apice bibracteato, flores 2 v. 3 majusculos candidos gerens; bractæe 2 ovales v. ovali- oblongae, acute, foliacese, c. 2-3-lin. longæ; flores feminœ pedicellis brevio- ribus, masculi longioribus 1-1 ½ poll. longis glabris, instructi; sepalæ et peta- la obovato-oblonga ad lato-ovalia, c. 5 lin. longa, in feminœs aliiquantum breviora; stamina monadelpha; antheræ obovato-oblonga, obtusæ; styli 2, basi v. ad medium fere connati, uno 3-alatae duobus et glandulis stigmaticis stipitatis dense obducti; capsulae immature glabrae, oblongo-ovatae, inae- qualis-3-alate, alis triangularibus et acute productis, medio majore.—Tenass- serim (Revd. Parish).

157. BEGONIA SUBPERFOLIATA, Parish MS.

Herbula erecta, succulenta, radice tuberosa? scapigera; folia radicalia solitaria, petiolo 1½ usque ad 3½ poll. longo subvelutino suffulta, ovata ad obovato-oblunga, vix inaequalia, basi rotundata leviter peltata, obtusiuscula acuminata, grosse renatodientata, 2-3 poll. longa, membranacea, utrinque pulcherrime concavo-punctata (in vivo probabiliter papilloso-holosericea), subitus utplurimum subpurpurascens; scapus radicalis v. subradicalis, gla- ber, folio brevior, dichotomo-cymesus, pauciflorus; bractææ virides, elliptico- lanceolatae, acute, c. lin. longæ, papillosæ; flores parvi, rosei, pedicellis capillarius glabris; sepalæ ovalia, obtusa, 2-3 lin. longa, extus conspicue venosa; stamina monadelpha; antheræ breves, obovatae; styli 3, alte connati, 2-fidi; capsulae c. 3 lin. longæ, obovatae, glabrae, 3-loculares, 3-alatae, alis capsulâ ipsâ latioribus semi-obcordatis; placentaæ 2-fidæ.—Tenasserim (Revd. Parish).

158. BEGONIA VELUTINA, Parish MS.

Herbula simplex, scapifera, unifoliata, radice parva tuberosa; folium petiolo 1-3 poll. longo nonnunquam parce pubescente suffultum, cordato-ova-
tum ad cordato-rotundatum, palmatum 7-nerve, obtusum, v. breve et obtusiuscule acuminatum, irregulariter et breve lobatum, dentatum et ciliatum, c. 1-2 poll. longum et latum, membranaceum, supra papillosum et pilis minutis brevibus adpersum, subtus secus nervos adpresse pubescent; scapi radicales, folio vulgo sublongiores, glabri, pauciflori; bracteae minutae, lineares; flores majusculi, rosci? sepala 4 lin. fere longa, lato-ovalia, obtusa; petala minuta, linear-lanceolata, acuminata; perianthii feminei lobi dimidio breviores; stamina numerosa, oblongae, breves, truncatae; stigmata 3, libera, apice dilatata in lobos stigmatiferos 2 tortuosos divergentia; capsulae immaturae obovatae, glabrae, 3-loculares, anguste 3-alatae, alis apice truncatis; placentae bifidae.—Tenasserim (Revd. Parish, Dr. Stoliczka).

**Begonia** species Burmanice sequenti modo distinguui possunt:—

Subg. I. *Casparea*. DC. Capsulae carnosae et bacciformes, secus angulos v. alas carrassas latas dehiscentes.

Herba robusta glabrescula ramosa; styli 4; capsulae 4-loculares et 4-angulares, angulis in appendices cornutos productis, ........ B. Roxburghii.

Subg. II. *Begonia*, DC. Capsulae siccae, linear semicirculari secus lateres alarum v. angulorum dehiscentes.

* Styli 2, bifidi v. vario modo dilatati v. ramosi; capsulae 2-loculares; placentae bifidae.

† Stamina libera. Capsulae inaequali-3-alatae, alis 2 anterioribus sepupis ad costam membranaceam reductis.

Herba robusta, ramosa, molliter paleaceo-pilosa; folia longipetiolata, lobata,.......................... B. laciniata.

Ut prior, sed gracilior et glaberrima; capsula glabra, ... B. megoptera.

Herba robusta subsimplex, molliter paleaceo-pilosa; folia longipetiolata, non lobata; capsula paleaceo-pilosa, ............. .................. B. barbata.*

†† Stamina monadelpha. Maris perianthium 5-lobatum, femineum 5-6-lobatum; capsulae inaequali-3-alatae.

|| Folia et inflorescentia radicalis, illa in petiolum 2-3 lin. longum contracta, ciliata, supra hispida; flores poll. fere in diametro, candidi, ... B. nivea.

|| Inflorescentia axillaris v. e basi folii orta, v. prolifica e gemma axillari.

O Non prolifica. Folia alterna v. verticillata, raro numero ad solitarium reducta. Flores parvi, albi.

Glabra; folia alterna, petioli 1-2 lin. longi, ............ B. procrisifolia.

Glabra; folia verticillata, longiis petiolo,.......................... B. verticillata.

Caules petioli pubescentes; inflorescentia glabra; folia alterna, longipetiolata, supra sparse hirtula,.......................... B. Martabanica.

* Planta Burmanica, floribus roseis gaudens, ab Assamica paulo differt capsulis majoribus crassioribus magis pilosis.
OO. Prolifica, folio solitario radicali v. foliis paucis alternatis. Flores parvi, albi.

Magis minusve stellato-velutina; inflorescentia glabra; folia alterna v. raro solitaria, .................................................. B. sinuata.

Glabra; folium solitarium, pedunculis 2 v. pluribus ex ipsius basi ortis, .................................................. B. prolifera.

Caules &c., et inflorescentia conspicue bracteata, paleaceo-pilosa, sappis pilis glandulosis intermixtis, .................................................. B. paleacea.

† † † Stamina monadelpha; perianthium utriusque sexus 2-sepalum, apetalum.

Herba tenerima; folia alterna, supra minute et sparse pilosa; flores parvi, .................................................. B. flaccidissima.

* * Styli 3, liber 3, connati; capsule 3-loculares et 3-alatae.

† Placentae integre.

Glabra; inflorescentia radicalis v. subradicalis; folia radicalia profunde lobata; perianthium 2-sepalum, apetalum, ...................... B. Brandisiana.

† † Placentae bifide.

O Herba caulescentes foliis caulinis alternatis.

Partes omnes et inflorescentia glabra; capsule 3 lin. longae, alis apice truncatis; stamina monadelpha, ........................................ B. parvuliflora.

Folia supra sparse setulosa et nitida, cæteras precedenti assimilis, at capsule ½ poll. longæ; stamina libera, antheræ mucronulatæ; styli liberi, ...................... B. modestiflora.

Uti præcedens, sed folia opaca et pilosiora; stamina monadelpha, antheræ connectivo truncato lato terminatae; styli ad medium connati, B. scutata.

Folia minute et sparse pilosula; inflorescentia glanduloso-puberula; stamina monadelpha, capsule alæ semisagittate basi in lobos obtusos productæ, ...................... B. surculigera.

OO. Herba scapigera, foliis et inflorescentiis radicalibus et vulgo solitariis.

Folia longissime petiolata, basi peltata, papillosa-punctata et glabra, .................................................. B. superfoliata.

Folia longissime petiolata, cordata, nec peltata, supra papillosa et minute pilosula; stamina libera, ...................... B. velutina.

ERICACEÆ.

159. VACCINIUM VERTICILLATUM, Kurz, non Wight. (Agapetes verticillata, D. Don, Gen. Syst. III. 862.; DC. Prod. VII. 554).

Frutex epiphyticus, 2-3 pedalis, glaber; folia obovato-lanceolata ad subcuneato-lanceolata, petiolo brevissimo erassissimo, v. subsessilia, basi attenuata rotundata v. obtusa, 2½-3½ poll. longa, obtusiuscula v. breviter acuminata, coriacea, integra v. apicem versus obsolete et remote serrata, glabra, nervis 11
secus marginem anastomozantibus; flores speciosi, coecinei v. miniati, tubulosi, \( \frac{3}{4} \) ad 1\( \frac{1}{4} \) poll. longi, pedicellis subpollicaribus, glanduloso-hirsutis sulfutti, umbellam v. potius racemum abbreviatum pauciflorum axillarem formantes v. solitarii v. fasciculati; calyx 5-dentatus, glanduloso-hirsutus, dentibus lanceolatis acutis lin. circiter longis; corolla glabra, 5-gona, lobis linear-lanceolatis obtusis; filamenti 2 lin. fere longa; antherae c. 3 lin. longae, granulato-tuberculatae, in tubos rigidos plus quam poll. longos productae; stigma parvum, truncatum v. sub-5-lobo-peltatum; baccae glanduloso-hirsutae, pedunculi apice subcyathiformi-incrassati insidentes, calycis limbo coronatae.

Var. a. genuinum, corolla \( \frac{3}{4} \) poll. tantum longa; flores in racemos umbelliformes brevipedunculatos dispositi. (Thibaudia obliqua, Griff., Icon. Dicot. t. 515).

Var. \( \beta \). elegans, corolla praecedentis sed flores solitarii v. 2-3-ni fasciculati axillares; folia vulgo latiora.—Pegu.

? Var. \( \gamma \). grandiflorum, corolla duplo longior, flores in racemos umbelliformes breve pedunculatos v. sessiles collecti, rarius solitarii.—Martaban, Tenasserim.

N. B.—V. verticillatum, Wight, Ic. t. 1181. ad V. setigerum (Agapetes setigera, Don) pertinet.

160. VACCINUM VARIEGATUM (Agapetes variegata, Don, Gen. Syst. III. 862; Ceratostemma variegatum, Roxb. Fl. Ind. II. 413; Griff. Icon. Dicot. t. 502; Thibaudia variegata, Royle, Ill. Him. Pl. t. 79, f. 1.).

Frutex epiphyticus, 2-3 pedalis, glaber; folia lanceolata ad obovato-lanceolata, acuta v. breviter acuminata, petiolis brevissimis crassis, v. sub-sessilia, basi acuta v. obtusa, 2-3 poll. longa, coriacea, apicem versus obsolete repando-serrata, glabra, nervis secus marginem anastomozantibus; flores coccinei, pedicellis gracilibus glabris sursum cyathiformi-incrassatis suffulti, in racemos umbelliformes axillares v. supra foliorum delapsorum cincinnibus ortos pedunculatos glabros dispositi, v. rarius fasciculati v. solitarii; corolla glabra, poll. fere longa, tubulosa, lobis obtusiisculis; calyx glaber, 5-fidus, lobis oblongis lanceolatis c. 2 lin. longis acutis sapius obsolete costatis et penninervis; antherae granulato-tuberculatae, filamentis brevissimis suffultae, in tubos \( \frac{3}{4} \) poll. longos productae; stigma truncate; baccae glabrae, rubrae, calycis limbo coronatae.

Variat: a. macranthum (Ceratostemma variegatum, Roxb. et Wight; Thibaudia macrantha, Hook., Bot. Mag. t. 4566.) flores c. 2 poll. longi v. longiores, variagati.—Tenasserim.

Var. \( \beta \). parviflora (Thibaudia variegata, Royle) flores dimidio minores, miniati v. coecinei.—Martaban.
161. Vaccinium minutum (Coratostema minutum, Griff. Icon. Dicot. t. 504.)

Frutex epiphyticus glaber; folia oblongo-lanceolata ad oblonga, acuta v. acuminata, petiolis brevissimis crassis, v. subsessilia, basi subinaequali rotundata, 4-5 poll. longa, acuta v. acuminata, repando-serrulata, coriacea, glabra, subtus nervis numerosis et prominentibus, secus marginem evanescentibus, laxe et prominenter reticulata; flores coccinei, racemos breves umbelliformes glabros axillares v. laterales efficientes, raro pauci et fasciculati; calyx glaber; corolla glabra, 5-gona, c. ½ poll. longa, lobis brevibus linearibus acutis; filamenta brevissima, antherae tubo inclusae, granulato-tuberculatae, tubis strictis nudis paullulo breviores; baccae desunt.—Ava? (Griff.)

162. Vaccinium campanulatum, nov. sp.

Frutex epiphyticus, glaber, ramulis subangulatis; folia obovato-oblonga ad lanceolata, obtusa v. obtusiuscula acuminata cum mucrone, petiolis brevissimis et crassis v. subsessilia, 2-3 poll. longa, basi acuta v. obtusa, integra v. subintegra, marginibus recurvis, coriacea, glabra, nervis tenuibus secus marginem liberis, laxe reticulata; flores coccinei, sepius variegati, pedicellis gracilibus glabris suffulti, in racemum gracilem sed brevem glabrum sepius e ramis ortum dispositi; calyx glaber, limbo cyathiformi arguto sinuato-5-dentato; corolla glabra, c. ½ poll. longa, v. paulo longior, 5-angulare, campanulata, lobis longis lanceolatis acuminatis reflexis; filamento brevissima; antherae granulato-tuberculatae, loculis in tubos strictos anthera ipsa sublongiores dorso basi refracto-setosos terminalis.—Martaban.

163. Vaccinium macrostemon, nov. sp.

Frutex epiphyticus, 2-4 pedalis, glaber; folia cum basi crassa rotundata v. obtusa subsessilia, obovato-lanceolata ad lanceolata, acuminata, 3-5 poll. longa, marginibus integris recurva, coriacea, glabra, nervis tenuibus marginem versus liberis, tenuiter et laxe reticulata; flores coccinei, pedicellis gracilibus glabris in racemos magis minusve elongatos glabros subulato-bracteatos solitarii v. geminatim supra foliis delapsorum axillis ortos dispositi; calyx glaber, limbo cyathiformi, lobis longae subulatis; corolla c. 1½ poll. longa, glabra, subeuro-tubulosa, lobis lineari-lanceolatis reflexis; filamenta glabra, gracilia, c. ½ poll. longa v. longiora; antherae brevissculae, connatae, laves, loculis in tubos strictos anthera longiores productis; baccae fusiformi-ovoideae, apice angustatae et calycis limbo cyathiformi coronatae.—Martaban.

164. Vaccinium pumilum, nov. sp.

Frutex ramosissimus, parvus, epiphyticus, novellis pubescentibus; folia oblonga ad lanceolato-oblonga, petiolo brevissimo puberulo, basi acuta, obtusiuscula, crenulata, crasse coriacea, c. poll. longa v. breviora, subtus (in vivo albidi) pallida, nervis obsoletis; flores parvi, pedicellis brevissimis pube-
rulis, in racemos (2 v. 1) terminales pubescentes bracteatos digesti; bracteae decidue, alba, membranacea, foliaceae, ovata, puberula et ciliata; calyx pubescens, dentibus oblongo-lanceolatis, acutis, ciliatis; corolla c. 2 lin. longa, oblongo-urceolata, lobis brevissimis reflexis, 5-gona, extus glabra, intus inprimis ad faucem dense villosa, rosea; filamenta brevia, filiformia, apice pilosa et barbata; antherae glabrae, loculis in tubum brevem lanceolato-subulatum basi bisetosum desinentibus; baccæ parvae, purpureae, glabrae, calycis limbo coronatæ.—Martaban.

165 Vaccinium exaristatum, nov. sp.
Frutex magnus, saepius in arbusculam excrecens, novellis pubescentibus; folia oblongo-lanceolata ad oblongo-ovata, petiolis puberulis brevibus suffulta, basi acuta v. obtusiuscula, 1 1/4-2 1/2 poll. longa, acuta v. breve acuminata, subtilis dum juvenilia parce pubescentia, calycis segmenta lineari-subulata, plus quam lineam longa; pedunculi fructigeri graciles, c. 1 1/2 poll. longi.—Ava (? Griff.). L. pedunculari, Wall., affinis. Lysimaehiae sp. Griff. Not. Dicot. 299. t. 484, speciem mihi distinctam L. Lobelioidi affinem nomine L. Griffithiana saluto.

166. Lysimachia linearifolia, Griff., MS. in Hb. Griff. 3532.
Herba annua, erecta, stricta, glabra, caulibus teretibus v. subteretibus simplicibus ped. circiter altis; folia alterna, linearia ad lineari-lanceolata, utrinque acuminata, 1-1 1/2 poll. longa, petiolis gracillimis sed brevi suffulta, integra, membranacea, glabra; flores parvi, solitarii v. geminati, axillares, longe pedunculati; calycis segmenta lineari-subulata, plus quam lineam longa; pedunculi fructigeri graciles, c. 1 1/2 poll. longi. —Ava ? (Griff.). L. pedunculari, Wall., affinis. Lysimaehiae sp. Griff. Not. Dicot. 299. t. 484, speciem mihi distinctam L. Lobelioidi affinem nomine L. Griffithiana saluto.

167. Ardisia Helpferiana, nov. sp.
Frutex ? ferrugineo-tomentosus; folia obovato-oblonga ad oblonga, petiolis 3-4 lin. longis crassis dense ferrugineo-pubescentibus, breve acuminata, integra v. obsolete repando-dentata, 3-5 poll. longa, membranacea, utrinque ferrugineo-pubescentia, nervis lateralibus tenuibus et curvis; flores parvisculi, pedicellis 3-1 poll. fere longis ferrugineo-pilosis sustentati, racemum subumbelliformem ferrugineo-pubescentem pedunculo nudo 3-4 pollicari gracilis...
axillari suffulto formantes; calyx ferrugineo-pilosus, lobis oblongo-lanceolatis, acutis, lineam circiter longis; corolla glabra, lobis c. 2½ lin. longis, oblongis, acutis; drupa desunt.—Tenasserim (Helf. 3589).

168. Ardisia serrulata, nov. sp.

Frutex? novellis tomento minuto ferrugineo obtectis; folia lanceolata v. elliptico-lanceolata, basi in petiolum 5-8 lin. longum attenuata, breve acuminata v. acuta, repando-serrulata, basin versus integra, 4-6 poll. longa, tenuia et membranacea, glabra, parce punctata, nervis crebris approximatis, subparallele-divergentibus et inconspicuis; flores parvi, pedicellis gracilibus inaequali-longis ferrugineo-puberulis suffulti, densiuscule thyrsoideo racemosi et paniculum terminalen v. ex axillis foliorum superiorum ortam amplam ferrugineo-puberulum bracteatam formantes; bracteæ foliaceæ, linearia-lanceolatae, 3-6 lin. longae, subtus ferrugineo-lepidose; bracteole minores, lineares; calyx ferrugineo-puberulus, lobis linearibus acutis c. 1 lin. longis; corolla subrotata, lobis ovatis acutis c. 2 lin. longis; drupa desunt. —Ava? (Griff. 3562). Inter A. nerifolium et A. floribundam, Wall., intermedia.

169. Ardisia rigida, nov. sp.

Frutex? novellis probabiliter indistincte ferrugineo-lepidotis; folia oblongo-lanceolata, in petiolum 4-6 lin. longum crassum attenuata, breve et obtusiuscule acuminata, pergamaecæ, integra, 6-9 poll. longa, glabra, punctata, nervis subtus prominentibus et subparallelis; flores...parvi, pedicellis ½-¾ lin. longis crassis minute ferrugineo-puberulis nutantibus suffulti, paniculam terminalen compositam rigidam robustam ferrugineo-puberulum efficiens; calyx minute et indistincte puberulus, lobis ovatis acutiusculis, vix ¼ lin. longis, ciliolatis; corolla...; drupa immature globosæ, glabra.—Tenasserim or Andamans. (Helf. 3563).

170. Mesa muscosa, nov. sp.

Frutex ramis teretibus laevibus nitidisque, ramulis...; folia oblonga ad obovato-oblonga, basi acuta v. acuminata, petiolis ½-1 poll. longis validis parce puberulis, breve acuminata, grosse sinuato-dentata, pergamaecæ, 5-7 poll. longa, glabra, costa subtus parce puberula, nervis secus margines in delticula callosa obtusa excurrentibus; flores...parvi, pedicellis brevissimis pubescentibus suffulti, breve racemosi, in paniculum axillarem quasi muscosam petiolis 2-3-pl. longiorem ferrugineo-pubescentem disgesti; bracteæ lin. circiter longæ, pedicellis longiores, ferrugineo-hirsutulae, lineari-acuminatae; bracteæ?; calyx ferrugineo-hirsutus, lin. fere longus, lobis ovato-lanceolatis acutis; corolla tubuloso-campanulata, glabra, calyce duplo longior, lobis brevibus rotundatis; ovarium sub-inferior; stylus calycis lobos longitudine haud attingens.—Burma (Griff. 3556). Ex affinitate M. mollissi-
SAPOTACEÆ.

171. ISONANDRA CALOPHYLLA, Kurz, in Journ. As. Soc. Beng. 1871. 69.
Arbor medioris, novellis dense adpresse ferrugineo-pubescentibus; folia elliptica v. elliptico-oblonga, petiolis 4-5 lin. longis cupreopuberulis glabrescentibus, breve acuminata, integra, marginibus recurvulis, 4-7 poll. longa, chartacea, minute ferrugineo-puberulis glabrescente, superficiem nitida, nervis lateralis prominentibus validis, transverso tenui-venosa; flores nondum reperti; fructus pruni magnitudinis, pedunculo nutante, 1-1½ poll. subglabro axillari sustenti, elliptico-ovati, 1-2-spermi, basi calyce persistente 6-partito lobis ovatis supportati; semina semi-oblonga, 1½ poll. fere longa, lucida, brunnea.—Andamans.

EBENACEÆ.

172. GUNISANTHUS MOLLIS, nov. sp.
Arbuseula ramis novelliisque brunneo-pubescentibus; folia petiolo brevissimo (c. 1 lin.) suffulta, anguste oblonga v. oblongo-lanceolata et sæpium basin obtusum versus subangustata, obthusiusculae acuminata, 3-4 poll. longa, chartacea, supra secus costam et subtus omnino molliter pubescentia; flores ochracei, extus dense pubescentes, pedicellis 4-6 lin. longis suffulti, racemos breviusculi pilosi, racemos breviusculi pilosi, longo-pilosi, racemos breviusculi pilosi, 1-2-spermi, basi calyce persistentem 6-partitis lobis ovatis supportatis; semina semi-oblonga, 1½ poll. fere longa, lucida, brunnea.—Andamans.

173. DIOSPYROS SAPOTOIDES, nov. sp.
Arbor medioris, novelli parce ferrugineo-pubescentibus max glabrescentibus; folia elliptico-oblonga ad elliptica, basi obtusa, petiolo vix semipolicari glabrescente crasso suffulta, 6-8 poll. longa, breve et obthusiusculae acuminata, integra, coriacea, reticulatione laxissima subtili et immera percursa; flores hermaphrodito-feminei 4-meri, flavescenti albi, iis D. sapoto assimiles, subsessiles, glomerati, pedunculo crassissimo axillari brevissimo; calyx extus ferrugineo-pubescentis, lobi ovato-lanceolati marginibus reflexi et basi auriculato-complicati, 3 lin. fere longi, acuminati; corollae tubus urceolatus, calyce sub-duplo longior, extus ferrugineo-pubescentis, lobis obovatis tubi fere longitudinis; stamina c. 12, tubo basi inserta, glabra, inegualia; antherae ovato-lanceolatae, acuminatae; filamenta filiformia, glabra; ovarium ovatum, glaberrimum, stylo moderate longo 4-fido; flores masculi fructusque desunt.—Pegu.—D. undulataé arcte affinis, sed ovario glaberrimo discrepatis.
174. *Styracaceae*.

Arbor mediocris subgracilis, novellis sparse adpressae sericeis; folia elliptico-lanceolata ad lanceolata, in petiolum 4—5 lin. longum gracilem glabrum attenuata, subcaudato-acuminata, obsolete crenato-serrulata, 4-5 poll. longa, tenuiter pergamacea, glabra, opaca, nervis et reticulatione laxa subtilibus; flores ignoti; racemis graciles compositi paniculam depauperatam subssessilem minute adpressae pubescentem axillarem v. supra foliorum delapsorum cicatricibus ortam efficientes; bracteae caseae; bracteolae ½ lin. vix longae, minuta, ovato-acuta, glabrae, decidueae; pedicellis vulgo 2 lin. longi, minute adpressae pubescentes; baccæ immature ovoideae, 3-4 lin. longae, leves, teretes, calycis limbo coronatae, putamen pergamaceum monospermum includentes; calyces lobi sub fructu lato-ovati, obtusi, c. ½ lin. longi, glabri. *Martaban.—S. lucidea*, Wall., affinis, pedicellis distinguitor.

175. *Symplocos leiochaita*, nov. sp.

Arbor v. frutex subglaber; folia elliptico-lanceolata ad lanceolata, petiolis 3-4 lin. longis sparse hirtis suffulta, acuminata, crenato-serrulata, 2-4 poll. longa, subchartacea, supra lucida, subtus secus costam validam nervosque parce adpressae pubescentiae, nervatione tenui et inconspicua percursa; flores parvi, pedicellis gracilibus 1-1½ lin. longis glabris suffulti, racemos numerosos graciles simplices glabros ex apice ramorum orientes efficientes; bracteae pedicelli basi insertae, lin. circiter longe, lanceolatae, acutæ, glaberrimæ; bracteolae sub calyce 2, bracteis subconformes sed minutæ; calyx levis, lobis ovatis obtusis, c. ½ lin. longis; corolla rotata, lobis ovato-oblongis, obtusis, c. 1½ lin. longis; stamina numerosa, inæqualia, basi tubo brevissimo inserta; baccas nondum vidi.—*Tenasserim* (Helf-3656).

176. *Symplocos leucanthia*, nov. sp.

Arbuscula glabra; folia oblongo ad elliptico-lanceolata, basi subinæqualia, petiolo 2-3 lin. longo inserta, breve et obtusiusculæ acuminata, 3-4 poll. longa, crenulato-dentata, chartacea, glabra; flores albi, fragrantes, pedicellis brevissimis vix ½ lin. longis crassi canescenti-tomentosis suffulti; racemi breves, tomentosi, axillares, bracteis nonnullis ovatis extus pubescentibus caducis sustentati; calyx glaberrimus v. ejus lobi ovati obtusi extus pubescentes, ciliolati, c. 2 lin. longi; petala obovato-oblonga, calycis lobis duplo longiora; stamina glabra, inæqualia, 5-adelpha, phalangibus basi loborum insertis; ovarium stylisque longus parce pubescens; drupa non visa.—*Pegu*. Ex affinitate *S. crataegioidis*, Don.

177. *Tabernæmontana ophiocryptoides*, nov. sp.

Frutex 2-4 ped. altus, glaber; folia obovato-oblonga ad lato-lanceolata in petiolum brevissimum (2-3 lin.) attenuata v. foliorum nonnulla subsessi-
lia, breve acuminata, 3-5-poll. longa, integra, membranacea, glabra, subtus pallida; flores pedicellis 1-1½ lin. longis suffulti, cymas 3, v. raro 2, v. plures breve pedunculatæ, v. nonnunquam subsessiles, glabras paucifloras in ramulorum superiorum furcationibus sitas efformantes; calyx glaber, brevissimus, 5-fidus, segmentis lineam vix longis, lanceolatis, acutis; corolla tubus subcrassus, c. 4 lin. longus, apice inflatus, lobis tubo vix dimidio breviribus; folliculi... —Martaban. *T. rostrata*, Wall., affinis videtur, a qua inter alia corolla duplo breviore differt.

178. *Tabernemontana membranifolia*, nov. sp.

Frutex 3-4 pedalis, glaber; folia lanceolata ad lato-lanceolata, in petiolum 3-5 lin. longum attenuata, 3-5 poll. longa, longe et graciliter acuminata, integra, membranacea, glabra, subconcolora; flores albi, pedicellis gracilibus 4-6 lin. longis glabris inserti; cymæ vulgo binae, breve pedunculatæ, dictotomo-ramosæ, glabrae, laxæ, corymbiformes in ramulorum superiorum furcationibus sitae; bracteæ nulla v. minuta et decidua; calyx minutas, lobis linearisubulatis, lineam vix longus; corolla tubus gracilis ¾ poll. longus, infra medio circa antheras leviter inflatus, lobi linearis-lanceolati, acuminati, tubo dimidio circiter breviore; folliculi desunt.—Martaban. *T. subcapitata*, Wall., affinis, sed calyce jam distincta.

*BIGNONIACEÆ.*

179. *Spathodea velutina*, nov. sp.

Arbor, novellis fulvo-puberulis; folia impari-pinnata, 1-1½ ped. longa, petiolo glabro striato basin versus 1-2 folioli diminutis stipuliformibus munita; foliola 4-juga cum impari longe petiolato, basi inæqualia,.sessilia v. subsessilia, oblongo-lanceolata, acuminata, 4-6 poll. longa, serrulata, membranacea, glaberrima; inflorescentia deest; calyx spathaceus, recurvato-acuminatus, extus fulvescenti-velutinus, c. 1½ poll. longus; corolla c. 3 pollicaris, campanulato-infundibuliformis, glabra, tubo pollicari consticto, filamenta glabra, tubo supra constictione inserta; capsula deest.—*Avac, Pegu* (Dr. Brandis).

180. *Heterophragma sulfurea*, nov. sp.

Arbor mediocris decidua, novellis tomento fugaceo canescenti-villoso obductis; folia impari-pinnata, 2-3 ped. longa, rachi petioloque fugaciter floccoso-tomentosæ; foliola 4-5-juga cum impari longe petiolato, elliptica et ovato-elliptica ad ovalia, juniora obtusiuscula apiculata v. obtusiuscula et obsolete serrata, basi rotundata v. obtusa, sessilia v. brevissime petiolulata, 4-6 poll. longa v. longiora, chartacea, parce puberula, supra mox glabrescentia; flores sulfurei, conspicui, pedicellis cinerascenti- v. flavescenti-tomentosis 3-4 lin. longis suffulti, paniculas breves terminales dense tomentosæ efficientes; calyx ½-⅔ poll. longus v. brevior, campanulatus, usque ad medium fissus,
distincte 3- v. 2-lobatus v. dentatus, extus cinerascenti-tomentosus, intus glaber; corolla infundibuliformis, glaberrima, tubo pollicari v. longiori, lobi patentes tubo plus quam duplo longiores, undulato-crispati; capsule usque 2 pedales, iis Spathodea stipulata assimiles, elongato-lineari-oblonge, compressiisulae, dense funoso-tomentosae, septo brevi et valde reducto, medio septi instar dilatato; semina elongato-membranaceo-alata, c. 2 poll. longa.—

Prome, Pegu.

181. Spathodea ignea, Kurz, in Journ. As. Soc. Beng. vol. XL, p. 77 descripta, potius generis novi typum praebet, calyce tantum usque ad medium fisco circumsicisse deciduo spathaceo, filamentis usque ad medium corolla adnatis, antherarum loculis parallelis, nec non foliis decompositis a Spathodea distinguiri potest et sub nomine Mayodendri (in honorem viri nobilissimi M. a y. o, proregis infausti Indie orientalis, dictum) in narratione mea officiali de sylvis Burmanicis fusius descripsi et iconibus illustravi.

182. Stereospermum Neuranthum, nov. sp. Arbor medicaris, novellis molliter pubescentibus; folia impari-pinnata, juniora presertim subitus pubescentia, 1-1 ½ ped. longa; foliola 3 v. 2-juga cum impari longe petiolato, basi subinaquali acuta v. obtusa, petiolulo erasso 1-2 lin. longo suffulta, obtusiuscula v. obtusiusculae apiculata, 2-4, nonnunquam usque ad 5-6, poll. longa, integra, rigide chartacea, juniora subitus canescenti-tomentosa denuo magis minusve scabrescentia, supra scabrescentia glabrescentia et subrugulosa; flores conspicui, pallide lilacinii v.cyanescenti-albi, atropurpureo-venosi, pedicellis 4-7 lin. longis pubescentibus apicem versus bibracteolatis, in paniculam brevisculam subcylindri formem terminalem dispositi; calyx c. 4 lin. longus, pubescens, breviter 4-lobus; corolla campanulato-infundibuliformis, subcurva, puberula, lobis leviter undulato-crispati; capsule elongato-lineares, cylindrico-4-gonae, glabrae, 1-1 ½ ped. longae; semina et septum uti in S. cheloniaide.—Pegu.

ACANTHACEÆ.

183. Rueillia Flaccida, nov. sp. Herba debilis, pilosa, ramosa et suberecta, 1 ½-2 pedalis, caulibus longe et patenter pilosis; folia ovata, basi contracta et in petiolum gracielem pilosum ½-¾ poll. longum attenuata, obtusa, 1½-2 poll. longa, membranacea, obsolete crenato-dentata, presertim supra parce pilosa; flores pariviusculi, pallide coriulei, inter bracteas foliaceas obovato-oblongas obtusas v. emarginatas pilosae firmiavas vulgo solitarii et sessiles; calyx 3 lin. fere longus, lobis linearibus, ciliatis et pilosæ; corolla c. 6 lin. longa, tubuloso-infundibuliformis, glabra, tubo brevisculo, lobis brevisibus rotundatis; stamina 4, filamenta longe pilosa; stylus simplex, 6 lin. fere longus, glaber; ovariunm glabrum.—Pegu.

Herba perennis? subsimplex, 2-3 pollicaris, caulibus hirsutis, novellis pilis albis crispis subplanicrinosis;olia lineari-lanceolata v. linearia, c. 2 poll. longa, acuminata, in petiolum brevissimum attenuata, integra, membranacea, ciliata, utrinque præsertim secus nervos hirsutula; flores magni, solitarii, sessiles, bracteis 2 foliaceis pedunculum brevem axillarem terminantibus insidentes; bracteæ lineari-lanceolata, calyce pluries longiores, structura et indumento foliis similis; calycis segmenta lineari-subulata, c. 2½ poll. longa, minute puberula; corolla tubuloso-infundibuliformis, c. 2 poll. longa, extus parce pilosula, lobis magnis rotundatis, tubo pollicari gracili in corollæ parte efflatam sensim ampliato; stylum longissimum, parce hirsutum; stamina 4, subaequilonga, inclusa; filamenta gracilis, parce hirsuta.—*Prome?* (Col. Eyre). *R. suffruticosa*, Roxb., arcte affinis.

185. *Strobilanthes* (Hemigraphis) *Burmanica*, nov. sp.

Herba decumbens ramosissima pilis albis patentibus eum glanduliferis intermitritis vestita, cauli ramisque 4-gonis; folia ovata ad ovato-lanceolata, basi in petiolum ½-2 poll. longum pilosum angustata, obtusiuscula, 1½-2 poll. longa, membranacea, crenato-dentata, utrinque parce pilosa; flores pallide cyanei, passim solitarii et axillares, frequentius autem in spicas longiores v. breviores foliaceo-bracteatas pilosae pedunculatas axillares et terminales disgesti; bractæ ovato-lanceolata, obtusiuscula, integrae, parce pilosæ et longe ciliatæ, inferiores usque ad 7 lin. longae; bracteola nullæ; calyx pilosus, segmentis linearibus 4 lin. longis; corolla rugata, 6 lin. circiter longa, glabra, ore pubescens, sensim in tubum attenuata, lobis obtusis rotundatis; antheræ 2-loculares, pallide violaceæ; filamenta crassa, piloso-barbata; stylus inaequali-2-fidus; capsule 4 lin. longæ, compresso-4-gone, obovato-lineares, acutæ, glabres, a basi fere 8-spermæ; semina plus quam ½ lin. in diame- tro, anguste marginata.—*Ava, Prome, Pegu*. *S. (Hemigraphidi) Pavulæ*, quacum cl. T. Anderson confudit, affinis.


Herba ramosa, glandulosopuberula; folia lanceolata v. oblongo-lanceolata, obtusiuscula acuminata, in petiolum glandulosum brevem attenuata, 2-2½ poll. longa (superiora minora) repando-dentata, præsertim subitus secus costam glandulosopuberula, supra glabrescentia; flores parviusculi, pulchre lutei, in axillis bractearum foliacearum vulgo solitarii, spicas 1 v. 2 axillares et terminales interruptae longa-pedunculatas foliaceo-bracteatas efformantes; bractæ folii caulis similis sed multo minores, obtuse, superiores sensim minores; bracteolæ calyce breviores, obovato-oblongæ, viscosohirsutæ; calycis segmenta lineari-spatulata, obtusa, glandulos-hirta, c. 2½
lin. longa; corolla c. 3. lin. longa, campanulato-infundibuliformis, tubo brevi extus puberulo intus laxe, lobis rotundatis; stylus et filamenta glabra; cap-
sula clavatae, compressuscula-4-gona, calycis longitudine v. paullo longio-
res, apiculatae, glanduloso-puberule, abortu vulgo 2-3-sperme.—Andamans.
Ex affinitate S. (Hemigraphis) Griffithianae.

187. Strobilanthes Neesii, nov. sp.
Frutex magnus, 10-12 pedalis, ramulis puberulis glabrescentibus; folia
lanceolata ad oblongo-lanceolata, breve acuminata, in petiolum ¼-1½ poll.
longum attenuata, obsolete repando-dentata, 5-7 et sapsius usque ad 10 poll.
longa, membranacea, utrinque pilis minutis adpressis adspersa, subtus secus
costam puberula; flores majusculi, in spicas densas bracteatas sessiles denuo
elongatas laxas interruptas axillares et terminales dispositi; bracteae inferior
iores v. potius folia floralia foliaceae, valde caducae, c. ½ poll. longe v. longi-
iores, setis bruneis ciliatae, apicem versus fissa et serratae; bracteae vere
oblongo-lineares, calye breviores, apicem versus vulgo parce serratae, acumin-
natissimae, glanduloso-pilosae; bracteolae 2, calycis longitudine, lineari-lan-
ceolatae, acuminatae, basi attenuatae, glanduloso-hirsuta; calycis segmenta
c. 6 lin. longa, v. longiora, linearia, canescentia, ciliata, acumen versus sapsi-
us glanduloso-hirsuta; corolla 1¼-1½ poll. longa, purpurea, extus glabra,
intus fauce secus plicam duplicatam pubescent, tubo longo et gracili; sta-
mina 2 (?); filamenta glabra, filiformia, alte adnata; stylus hirsutus; cap-
sula lineari-clavata, calye paulo longiores, glabrae, acumine parce hirtule,
4-sperme; semina sericea.—Martaban. S. fimбриatae, N. E., maxime
affinis, sed indumento glanduloso nigrescente, corolla et filamentis glabris
differt.

188. Strobilanthes fетidissima, nov. sp.
Herba ramosa, caulibus divaricatis subteretibus, plus minusve dense ful-
vo-pilosæ; folia ovata, basi in petiolum longum gracilem fulvescenti-pilosum
attenuata, acuminata, membranacea, 3-5 poll. longa, serrato-dentata, utrin-
que albido v. ochrascenti-hirsuta; flores cyanei, conspicui, spicam laxiuscu-
lum brevem albido-pubescentem pedunculo brevi axillari dense fulvescenti-
hirsuto suffultam v. subsessilem efformantes; bracteae obovato-cuneate, c.
8 lin. longe, obtusae, herbaceae, glanduloso-hirsutæ; bracteolæ bracteis con-
formes sed angustiores et subbreviores; calyx bractearum longitudine, adpresse
glanduloso-puberulus, segmentis profunde lobulatis; corolla1¼ poll. fere longa,
glabra; filamenta glabra; stylus hirsutus; capsule c. 8 lin. longe, glaber-
riming; semina fere 2 lin. in diametro, adpresse villosa.—Martaban. S. раfc-
сentic affinis.

189. Strobilanthes pteroaulis, nov. sp.
Herba annua, robusta, erecta, ramosa, sparse hirsuta, caulis crassius-
culis quadrangulari-alatis, alis herbaceis dense simbriatis; folia 8-12 poll.
190. *Strobilanthes Karensium*, nov. sp.

Herba perennis, ramosa, magis minusve albo-hirsuta; folia caulina inferioria brevissime petiolata, superioria subsessilia, ovata, brevissime acuminata, membranacea, crenata, utrinque hirsuta, 2–3 poll. longa. 

*Strobilanthes Karensium* herb is perennia, ramosa, magis minusve albo-hirsuta; folia caulina inferioria brevissime petiolata, superioria subsessilia, ovata, brevissime acuminata, membranacea, crenata, utrinque hirsuta, 2–3 poll. longa.

191. *S. subfalcida*, nov. sp.

Herba gracilis, glabra, caulibus obsoletae 4-gonis sulcatis; folia lanceolata ad oblongo-lanceolata, acuminata, basi in petiolum ½ poll. longum attenuata, repando-dentata, falcida, membranacea, 5–6 poll. longa, supra glabra subtus pilis minutis adpressis albidis adpersa; spicæ dense et minute adpressae hirsuta; bracteæ lato-ovobato-oblongæ ad oblongæ v. obovato-lanceolatae, obtusissimæ v. emarginate, minute puberulae, enerviæ, (purpureo ?) coloratae, c. 2 lin. longæ; bracteolæ paullo breviore, minus obovatae, 1-nerviæ, minute adpressæ pubescentæ; calyx bilabiatus, labio superiore glabro usque ad ½, partem trilobo; lobis obtusis obsolete ciliatis, labio inferiori fere usque ad basin bifido, lobis linearibus obtusis, 1-nerviis extus minute pubescentibus; capsulo 2-2½ lin. longæ, calycem non superantes, clavato-oblongæ, glabrae.—*Tenaserim.* (Helf. 6114).

192. *Strobilanthes dasysperma*, nov. sp.

Herba erecta, ramosa, subglaabra, 3-4 pedalis; folia inferiora magna, 6-8 poll. longa, oblongo-lanceolata ad lanceolata, basi cuneata in petiolum bre-
viunculum decurrentia, acuminata, serrato-dentata, membranacea, ciliata et supra pilis raris brevibus adpersa, subtus glabra et subglaucescentia; superi•
riora caulina multo minora et basi magis rotundata, v. cordata, ovata, haud
decurrentia, breve petiolata v. summa sessilia; flores cyanei, in capitula va-
pla glanduloso-puberula pedunculata congesti, paniculam spuriam terminalem
glanduloso-puberulum efformantes; bracteae parvae, oblongae, acutae, glandu-
losae; calyx glandulosus, segmentis linearibus 3 lin. fere longis; corolla
glabra, infundibuliformis, poll. fere longa; filamenta et stylus sparse pilosi;
capsule calycis longitudine, obovato-4-gono, glanduloso-pubescentes, 4-sper-
ma, seminibus stupposito-villosulis.—Pegu. Habitu S. Brrxaavio{dis, T. And., assimilis, floribus capitatis &c., autem in vicinitatem S. pentstemono{dis, T. And., referenda.

193. Barleria stenophylla, nov. sp.

Herba perennis, inermis, 1-1½ pedalis, subglabra, ramis erectis gracilibus,

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omnibus partibus plus minusve nitentibus; folia angustae linearia, 3-4 poll.
longa, c. 2 lin. lata, spinescenti-acuta, subsessilia, coriacea, integra, supra
apdresse hirsutula et sublucida; flores magni, sessiles, fasciculati, bracteati
axillares et terminales; bracteae lucide, rigide, ovoato-lanceolatae, pungenti
acuminatse, spinescenti-ciliatse, extus secus costam adpresse hirsutae; sepa-
aperia extus oblonga, apice 2-fida, rigide ciliata, poll. fere longa, glabra; inte-
riora brevissima, linearie-lanceolata, adpresse pubescentia; corolla circ. 2-pol-
licaria, puberula, cyanea?, tubo gracili sesquipollicari, lobis 8 lin. longis,
rhombideo-oblongis apiculatis crenatis; capsule desunt.—Avs (Dr. J. Ander-
son).

194. Neuracanthus grandiflorus, nov. sp.

Herba divaricata v. suberecta, subrigida, ramis retrorsae-hirsutis v. lineis
2 v. 4 retrorsae villosis notatis; folia parva, 1½-2 poll. longa, vulgo obovata
v. oblonga, obtusiuscula v. breve acuminata, basi in petiolum brevissimum
latum attenuata v. superiora subsessilia, obsolete dentata, membranacea, gla-
berrina; flores majusculi, pallide v. intense cyanei, spicas elongatas densas
v. laxas subtetragonas hirsutas rigide-bracteatas ex foliiorum axillis v. e rhizo-
mati protrusas efficiences; bracteae ovoato-lanceolatae, rigide, 5-nerviae,
pubescentes et hirsute, acuminatse, pungentes; calyx bilabiatus, pubescentis,
secus segmenta linearia parce pilosus, prominenter 5-costatus; corolla ½ poll.
longa, rugata, lobis obtusi; capsule tetragono-lanceolatae, acuminatse, gla-
brae, 3 lin. longae, 4-spermae; semina sericeo-splendentia.—Prome.

195. Neuracanthus sublime{vis, nov. sp.

Herba erecta, probabiliter 1-2 ped. alta; folia adulta &c., ignota; flores
albi, parvi, in spicas laxiuseule-bracteatas subtetragonas glandulosas et parce
pilosae et rhizomate protrusae digesti; bracteae lanceolatse, pungenti-acumi-
natse, rigide membranacea, c. 3 lin. longae, concave, medio prominenter
costatae, costis autem 4 lateralibus obsoletis, glanduloso-puberulae, secus nervos piloso; bracteole brevioribus sublatis, 2 inferioribus basi tantum connatis et angustioribus; corolla labium lanceolatum, majora curvata, 3-5 passim nervalibus, capsulae subintegrae, dense puberulae, 4-spermatae, albae, acuminatæ, glanduloso-puberulae et piloso-ciliatæ; calyx profundus, fere usque ad basin, 5-fidus, nervis evanidis, glanduloso-puberulus et piloso-ciliatus, lobo superiore majore c. 4 lin. longo, lineari, acuto, lobis lateralibus paullo brevioribus, subulatis, 2 inferioribus basi tantum connatis et angustioribus; corolla alba, intus præsertim ad labellum brunneo-maculata, exstis puberula, 4 lin. fere longa, tubo 2 lin. longo; labium superius emarginatum, marginibus reflexum, inferius 3-lobum, lobis oblongis rotundatis sub-brevis, antherarum loculi compressi, barbatæ, oblique; filamenta brevissima, fauci inserta; reliqua ignota.—Promes.

196. **LEPIDAGATHIS STROBILINA**, T. And. **MS.**

Herba 1-2-pedalis, glabra caulibus teretibus elevato-4-lineatis; folia lanceolata, basi cuneata in petiolo decurrentia, acuminata, membranacea, integra, 7-8 poll. longa, glabra et nitentia; capitula flororum laxa, terminalia, majora; bracteae c. poll. longæ, oblongo-lanceolatae, acuminatae, tenuiter chartacea purpureo-lilacinæ-tinctæ, 1-nerviæ et reticulatae, glanduloso-puberulae; bracteola bracteis conformes, angustiores; calyx magnus; corolla magna, purpureo-lilacina, poll. fere longa, infundibuliformis, tubo brevi; capsule desunt.—**Martaban**. (Revd. Parish).

197. **JUSTICIA DASTCARPA**, nov. sp.

Herba ramosa, 1½-3 pedalis, subglabra, caulibus saxiis lineis 4 hirtulis notatis; folia ovata, passim subobliqua, in petiolo gracili longo decurrentia, 3-5 poll. longa, breve acuminata, integra, membranacea; pilis minutis adpressis scabra; flores parvi, candidi, spicas breves laxe bracteatas solitarias axillares v. plures terminales efformantes; bracteæ ovatae ad ovato-oblícutæ, brevissime acuminatórum, 3-4 linei longae, membranacea, virides, sparse ciliatæ; bracteola calycis paulli longiores, lineari-lanceolatae, puberulae; calyx 1½ linei longus, puberulus, lobis lineari-lanceolatis acuminatis; corolla 3½-4 linei longa, labio superiore oblongo obtuso, inferiore 3-lobo; antheræ albae; capsule fere 4 linei longae, clavatae, dense puberulae, 4-spermatoæ; semina verruculoso-aspera.—**Martaban**. **J. Atkinsoniana**, T. And., affinis, sed floribus longe distat.

198. **JUSTICIA CALONEURA**, nov. sp.

Herba perennis, erecta, glabra, 2-3 pedalis; folia elliptico-oblonga ad lanceolata, acuta v. acuminata, basi cuneata et secus petiolum totum foliaceo decurrentia, 6-8 poll. longa, integra v. subintegra, membranacea, glabra v. subitus secus nervos laterales numerosos approximatos fugaciter adpressae, puberula; spicae glabrae, terminales, pedunculis brevissimis v. sessilis; bracteæ decussatim oppositae, sub-or bicalares, acutæ v. apiculatae, ciliatae, c. ½ poll. longæ, virides et nervosae; bracteola lineari-lanceolata, acuminata; calycis
199. Justicia flava, nov. sp.

Herba 2-3 pedalis, erecta, ramosa, subglabra, ramis (præsertim superiores) 6-5-gonis, parce hirsutulis; folia ovata ad ovato-lanceolata, basi angustata et in petiolum longiorum v. breviorem indistincte hirsutum decurrentia, acuminata, 4-6 poll. longa, integra, membranacea, siccando nigrescente, utrinque pilis raris brevibus adpersa; flores lutescentes, pedicellis brevissimis, in racemos breves cymæformes paucifloros glabros axillares petioli circiter longum centesima dispositi; bracteæ et bracteolaræ remotæ, lineares, parvae, glabrae; calyx glaber, c. 1½ lin. longus, lobis lineari-lanceolatis, acuminatis; corolla c. 3½-4 lin. longa, extus secus venas pubera, tubo brevi, labio superiore conoavo, inferiori 3-lobo, falcum versus rugato, lobis rotundatis; filamenta glabra; anthera inferior calcarata; capsule clavata, tumida, acuta, glabrae ½ poll. fere longæ, 4-spermae; semina minute rugulosa.—Martaban.

200. Dicliptera speciosa, nov. sp.

Herba annua, erecta, ramosa, 1-3 pedalis, pilosa, caulibus sub-teretibus lineis 4 elevatis notatis plus minusve glabrescentibus; folia ovata ad ovato-oblonga et lanceolata, in petiolum pilosum v. substupposo-ciliatum 1-2 poll. longum decurrentia, breve acuminata, 5-7 poll. longa, integra, membranacea, utrinque pilis crispatis adpersa; flores albi, raro pallide cyanei, in cymas brachiatas longius v. brevius pedunculatas glanduloso-pubescentes v. pilosas congregati et paniculam magis minusve compositam efficiens; bracteæ obovato-lineares, obtuse (v. in var. B. acuta), c. 3-4 lin. longæ; bracteæ dimidio breviores, lineari-subulatae; calyx bracteolis vix brevior, minute puberulus, segmentis subaequalibus, lineari-subulatis et minute ciliolatis; corolla 7-8 lin. longa, resupinata, tubo ½ lin. fere longo, labio inferiori lineari-lanceolato, obtuso, lobo mediano brevi reflexo, labio inferiore 3-lobo, cymbiformi-complicato, lobis 2 lateralibus horizontaliter patentibus rotundatis; antheræ superpositæ, albae; capsule lato obovato-cuneate, glandulosopuberulæ, c. 4 lin. longæ, 4-spermae; semina verruculis minutis flavescenti-bus aspera.—Pegu.

Var. a. genuina, bracteœ obtuse, glandulosopuberulœ; caules glabrescentes; corolla alba, labio inferiore coccineo-punctato; pedunculi glanduloso puberuli, breviores (forma umbrosa).

Var. B. pilosa, caules, infolrentia &c., cutenex-pilosa; bracteœ lineares acutæ, pedunculi vulgo longiores; corolla præcedentis, raro pallide cyanea, intus atropurpureo-maculata, (forma arida, an species?)
Acanthacearum generis in regno Burmanico adhuc observata secundum systema Neesianum paullisper mutatum sic distinguenda:


* Corolla in labellum magnum expansa, lobis superioribus omnino suppressis v. rudimentaris, tubus brevissimus v. nullus.


2. Blepharis, Juss. Spicae uniflore; flores bracteis pluribus sæpius spnosis sterilibus circumdatai. Antheræ paris inferioris 2-loculares.

** Corolla tubus longus, limbus 5-lobus usque ad tubum fissus.


* Barleriae Calyx 3-partitus, sepalis decussatis, 2 exterioribus sæpius majoribus. Capsule a basi seminiferae.

5. Barleria, L. Corolla infundibuliformis. Stamina 4, raro 5, quorum 2 v. 3 sæpius sterilia et rudimentaria; antherarum loculi paralleli.

** Neuracanthexæ. Calyx 5-fidus, irregularis, v. bilabiatus, v. segmento superiori tantum maximo. Corolla bilabiata

O Calyx bilabiatus. Capsulae dissemina non secedentia. Spicae rigide v. scariosæ, vulgo 4-stichæ.

6. Neuracanthus, N. E. Stamina 4; antherarum loculi obliqui. An potius cum genere sequenti conjungendum ?

7. Lepidagathis, Willd. Stamina 4; antherarum loculi paralleli.

OO Calycis segmentum superius maximum et bracteiforme. Capsulae dissemina in lamellas 2 seminiferæ secedentia.


9. Ruellia, L.

10. Hemigraphis, N. E. Genera inter se valde affinia postea a

11. Strobilanthes, Bl. me accuratius eruenda.

Trib. 3. Eranthemæ. Calyx regularis, 5-dentatus v.-fidus. Stamina 2, raro 4; antheræ 2-loculares, loculis parallelis. Capsula 2-4-spermae, in basin longam sterilem contractæ. Semi-

na compressa, retinaculis uncatis suffulta.

O Spicae v. paniculæ nudæ, i. e. bracteis minutis, persisten-

tibus.

12. Asystasia, Bl. Corolla infundibuliformis, in tubum longiusculum v. rarius longissimum attenuata. Flores omnes fertiles. Capsu-

lae vulgo 4-spermae.

13. Eranthemum, L. Flores 2-5-morphi, fertiles minutis, clausi v. apperti; steriles speciosi, hypocratemorphi, limbo subregulari tuboque longissimo.

OO Spicae foliaceo-bracteatae, bracteis nonnunquam deciduis.

14. Daedalacanthus, T. And. Corolla contorta, hypocratemorphae, limbo regulari explanato v. complicato, capsulae vulgo 4-sper-

mae.

15. Echolium, Kurz. Corolla imbricata, hypocratemorpho-bilabiata limbo irregulari, labio superiori reflexo lineari. Capsulae vul-

go 2- raro abortu 1-spermae, (ovuli in ovarii loculis semper 2).

Trib. 4. Justicieæ. Calyx regularis. Corolla utplurimum ringens v. bilabiata. Stamina 2; antheræ 2-loculares, loculis superposi-

tis. Capsulae compresso 4-gonæ, in basin sterilum contractæ. Semina plana, retinaculis uncatis suffulta.
O Corollae tubus longus, gracilis, limbi lobos longitudine superans.

   O O Corollae ringentis tubus brevis.


   O O O Corolla bilabiata, tubo gracili longitudine loborum v. breviore.


   O O Corolla ringens. Stamina 2. Capsulae planiusculæ, sursum sepius latiores.
   * Antheræ basi sepius barbatæ v. villosæ. Racemi v. paniculæ nudæ.

   ** Antherae nudae.

   O Stamina 2.
   OO Stamina 4.
30. Ethermaiera, N. E. Corolla ringens.

VERBENACEÆ.

201. Vitex canescens, nov. sp.
   Arbuscula 25—35 pedalis, partibus omnibus junioribus canescenti v. gilvescenti-pubescentibus; folia digitatim 3—5—foliolata, petiolo 1—2—pollicari tomentello suffulta; foliola sepius breve (inter medio multo longius) petiolulata, ovata v. ovato-lanceolata, ad elliptica et elliptico-lanceolata, acuminata v. acuta, basi attenuata, integra, v. raro crenato-serrata, membranacea, juniora utrinque dense canescenti-pubescentia, supra denuo scabrescenti-puberula; flores albi, parvi, pedicellis gracilibus 1—2 lin. longis tomentellis suffulti, glomerati, paniculas cinereo- v. gilvescenti-tomentellae compositas v. simplices terminales et supra foliorum delapsorum ortas efficientes; calyx cinereo-pubescentis, lin. circiter longus, 5-dentatus; corolla calyce duplo longior, extus tomentosa; drupae obovoideae, laeves, pisi magnitudinis, calyx magis minusve explanato insidentes.—Promo. V. Negundo, L., affinis, differt in primis floribus graciliter pedicellatis.

LAURINEÆ.

202. Machilus fruticosa, nov. sp.
   Frutex glaber, gemmis velutinis; folia ovato ad ovato-oblonga, 2½—4 poll. longa, basi rotundata subdecurrentia, petiolo crasso lato 2—5 lin. longo, glabra, rigide coriacea, obtusa et passim rotundata, marginibus recurvis, subtus glauca, nervis, simul cum reticulatione copiosa, prominentibus;
203. *Tetranthera* (Cylcodaphne) calophylla, nov. sp.

Arbuscula, novellis fulvescenti-tomentellis; folia ovato-oblonga ad lanceolata, basi acuta v. acuminata, longius v. brevius acuminata, petiolo \(\frac{1}{2}\)–1 poll. longo magis minusve tomentoso suffulta, rigide membranacea, 3\(\frac{1}{2}\)–7 poll. longa, supra lutescenti-viridia et (costa immersa excepta) glabra, sub-tus pallida, tomentella, penninerva, prominenter reticulata; flores in umbellam parvam bracteatm congesti; umbellae pedunculo 2\(\frac{1}{2}\)–3\(\frac{1}{2}\) lin. longo tomentello solitario axillari suffultae v. secus ramulum novellum axillarem fulvo-tomentosum quasi racemiformem disgestae, raro in racemum verum brevem corymbiformem pedunculo fulvescenti-puberulo suffultum efformantes; involuceri foliola concavo-rotunda, puberula; perianthium extus pubescens; filamenta glabra; antherae 4-locellatae; baccae oblongo-ovatae, \(\frac{1}{2}\) poll. fere longe, leves, carnose, cupulâ majusculâ truncata extus minusve pubescentes in pedicellum brevem crassum attenuata suffultae.—*Martaban*, *Tenasserim*. Species quoad folia et inflorescentia variabilis, Cylcod. Wightiana, N. E., arcte affinis ejusve probabiliter varietas insignis?

204. *Tetranthera* (Cylcodaphne) nuculanea, nov. sp.

Frutex ramulis teretibus tomentosis; folia obovato-oblonga ad oblongo-lanceolata, petiolis 4–5 lin. longis pallide-tomentosis suffulta, basi acuta, 5–6 poll. longa, obtusiuscula apiculata, crasse chartacea, supra glabra, sub-tus glauca et plus minusve dense puberula, reticulatione inter nervos laterales crassiusculos tenui sed conspicua; flores ..., apparenter umbellas sub-sessiles axillares formantes; pedunculus in specimbibus fructigeris crasis-simus vix 3 lin. longus; fructus pedilile straminei, oblongi, c. 6–7 lin. longi, leves, cupula integra magna carnosa suffultis.—*Tenasserim*. (Revd. Parish).

205. *Tetranthera* (Cylcodaphne) albicans, nov. sp.

Arbuscula, novellis minute puberulis; folia oblongo-lanceolata ad lanceolata, basi attenuata, petiolo 5–8 lin. longo gracili subglabro suffulta, breve acuminata, chartacea v. tenuiter coriacea, 6–10 poll. longa, glabra, sub-tus albida, reticulatione inter nervos tenues prominentes tenui sed conspicua; umbellae involucratae, velutino-tomentose, pedunculo gracili c. 4 lin. longo canescenti-tomentosum suffultae, in racemum abbreviatum v. subsessilem velutino-tomentosum axillarem v. vulgo supra foliorum delapsorum cicatricibis orientem dispositi; involucri phylla canescenti-velutina; fructus ...; cupula...
magna, carnosa, undulato-lobata, in pedicellum crassum attenuata. — *Pegu*. Ex affinitate *T. Panamojæ*, *N. E.*

206. **Litsea leiophylla**, nov. sp.

Arbor inflorescentiis excepitis glaberrima; folia lanceolata v. oblongo-lanceolata, 5—6½ poll. longa, basi submarginali acuminata, petiolo gracili 1—1½ polllicari glabro suffulta, obtuse acuminata, tenuiter coriacea, glaberrima, supra lucida, subitus vix glaucescens, supra basi trilinervia et pen- ninervia, obsoletissime reticulata; flores fulvo-villosi, pedicellis brevibus tomentosis suffulti, racemos axillares petiolo breviores abbreviates fulvo-villosos simplices formantes; filamina glabra; baccae desunt. *Tenasserim* v. *Andamans*. (Helf. 4330).

207. **Daphnidium argenteum**, nov. sp.

Arbor parva, novellis argenteo-sericeis; folia lanceolata v. lato-lanceolata, utrinque acuminata, petiolo 3—5 lin. longo argenteo-pubescente glabrescente suffulta, 3½—6¼ poll. longa, crasse chartacea, supra glabra, subitus adpressa argenteo-sericea, penninervia, utrinque laxe reticulata; flores virescenti-lutei, pedicellis brevissimi tomentosi, in racemum brevem tomentosum basi bracteis concevis pubescentibus involucratum digesti; perianthium 6-fidum, extus adpressa pubescens; antheræ 2-locellati; filamina subglabra. — *Pegu*, *Martaban.*—Species insignis, foliorum structura et habi- tu *Beilschmiedia* genus in mentem revocat.

**PROTEACEÆ.**

208. **Helicia pyrrhobotrya**, nov. sp.

Arbor ?, novellis ferrugineo-villosis; folia obovato-lanceolata, breve acuminata, versus basin obtusam attenuata, c. pedem longa, petiolis crassis 2—5 lin. longis suffulta, chartacea, grossa serrata, adula glabra v. subitus secus costam sparse ferrugineo-pubescentia; flores 1—1½ poll. longi, gimi- nati, pedicellis crassis 1½ lin. longis ferrugineo-villosis suffulti, racemos c. pedem longos robustos dense ferrugineo-villosos axillares efficientes; squa- mulæ hypogynae ...; ovarium stylusque laeves. *Martaban*, (Dr. Brandis).

**PODOSTEMACEÆ.**

209. **Hydrobryum lichenoïdes**, nov. sp.

Plantule minutæ gregariae; rhizoma latum membranaceum, lobatum, terre v. saxis adpressum, viride, vix ½ lin. latum, 2—3 lin. longum; folia perpauca tantum pedicellorum basi sita, squamæformia; pedicellis filiformes, ½ lin. longi; capsulae globosæ, c. ¼ lin. in diametro, lato-8-costatae. — *Mar- taban*. (Rcvd. Parish).
210. Elatostema membranifolium, nov. sp.

Suffrutex erectus, ramosissimus, E. lineolati habitu, glaberrimus, ramulis 4-quetris, levissimis; folia alterna, subinæqualia, cum basi inæquali sessilia, 1½—2½ poll. longa, acuminatissima (acumine obtuso et integro), tenuiter membranacea, grosse et obtusiuscula crenato-serrata, utrinque levia et striis destituta, basi irregulari-triplinervia, nervis tenuibus sed conspicuis, per nervos laterales strictis rectangularibus cum costa anastomozantibus; stipulæ minutæ, subulato-lineares; flores minuti, sessiles, capitula (nondum evoluta) parva sessilia in foliorum axillis v. iisdem opposita formantæ; perianthium glabrum.—Tenasserim, (Dr. Brandis)—E. lineolato, Wight, arcte affine, absentia striolarum autem tute distinguendum.

211. Elatostema bulbiferum, nov. sp.

Herba monoica v. dioica, erecta, ¼—1 pedalis, succulenta, simplex v. sub-ramosa, glabra, caulibus teretibus ad internodia bulbiferis; folia opposita, dimorpha, quorum evoluta obliqua, ovata v. ovato-lanceolata, petiolis vix lin. longis suffulta, superiora cum basi inæquali subsessilia, 2½—3½ poll. longa, grosse serrata, herbacea, breve acuminata, glabra, supra striis albis adnatis obtecta, basi triplinervia, passim nervis nonnullis adjectis; folia stipuliformia, lanceolata ad ovato-lanceolata, magis variabilia, ¼—½ poll. longa, acuta v. obtusa, integra v. serraturis nonnullis, inferiora vulgo majora; stipulæ minutæ, subulata; flores minuti, pedicellati, cymosi; cymi feminei densiores et pedunculis gracilibus brevioribus suffulti; masculi laxi, pedunculo 1—2 pollicari suffulti e tuberibus globulosis crassis axillaris v. in ramulorum furcationibus sitis subvillosis orti; perianthium glabrum.—Tenasserim, Arracan.

212. Elatostema gibbosum, (Procris gibboa, Wall., Cat. 7273).

Herba procumbens, repens, glabrescens, caulibus ascendibus c. semipedalis, florigeris; folio alterna, obovato-oblonga ad trapezoido-oblonga, subobliqua, cum basi oblique-cordata subsessilia, obtusa v. subobtusa, 2—3 poll. longa, herbacea, grosse rotundato-crenata, supra pilis brevibus albis transverse adnatis adspersa, subtus secus nervos parce pubescentia, basi 3—5—plinervia; stipulæ conspicue, membranacea, brunnææ, usque ad 3 lin. longæ, lanceolata, acuminatae, persistentes, etiam eæ foliorum abortivorum evolutæ; flores masculi majusculi, c. 1 lin. in diametro, subsessiles, in cyamam parvam pedunculo 1½—2 poll. longo pubescente axillari suffultam collecti; perianthium glabrum.—Martaban, Tenasserim.—In vicinitate E. cornuti ponendum; an potius generi Pellioniae adscribendum?

Frutex humidus, ramulis angularibus ochraceo-pubescentibus; folia elongato-obovata ad cuneato-elliptica, petiolo crasso \(\frac{1}{2} - \frac{3}{4}\) pollicari pubescente glabrescente suffulta, basi angustata acuta v. rotundata, 8 poll. - 14 ped. longa, abrupte acuminata, tenuiter coriacea, integra, supra levia, subtilis scabra; stipulae setaceae, pubescentes; flores monoici, in receptaculis capituliformibus involucratis extus velutinis pedunculatis congregati; pedunculi velutini solitarii, axillares; involucrum sub 4 - 6 partitum; syncarpia dimorpha, involucrum bracteis reflexis velutinis. — Tenasserim.

214. Ficus affinis, Wall., Cat. 4524.
Arbor mediocris, glabra; stipulae breves, et parvae, ovato-lanceolatae, glabrae; folia elliptica ad ovato-oblonga, basi obtusa v. rotundata, obtusiusculae et subabrupte acuminata, 3 - 4 poll. longa, chartacea, integra v. subundulata, glabra, basi nonnunquam obscure 3-nervia, nervis lateralibus numerosis et subparallelis secus marginem anastomozantibus, utrinque crebre reticulata; receptacula piperis grani magnitudine v. paullo majora, globosa; flavescens, pastulis obsoletis aurantiacis adpersa, glabra, basi 3-bracteata, pedunculo brevissimo \(\frac{1}{2}\) - 1 lin. suffulta, vulgo geminata in foliorum axillis v. supra foliorum delapsorum cicatricibus; bracteae persistentes, minutae, lato-triangulares. — Pegu, Tenasserim, Andamans. — Prope F. rhododendri-foliam, Miq., inserenda.

215. Ficus geniculata, nov. sp.
Arbor magna epiphytica, ramulis robustis cicatrisatis novellis pubescentibus; stipulae lat-o-vatæ, acutæ, glabrae v. canescentes; folia elliptica, elliptico-ovata v. elliptico-oblonga, petiolo 3 - 4 pollicari apice geniculato inserta, basi obtusa v. acuta, breve et abrupte acuminata v. apiculata, integra, rigide coriacea, utrinque lucida, basi breve 3-nervia, nervis lateralibus subparallelis et magis approximatis sepius subobsoletis, reticulatione elegante magis minuere obsoletae raræ conspicuae percursa; receptacula glabrae, pisi minimi v. piperis grani magnitudine, flavida, albo-pustulata, glabra, 3 - 4 bracteata, sessilia v. subsessilia, in foliorum axillis v. supra eorum cicatribus geniculata; bracteæ persistentes, lato-rotundate, brunneæ, glabrae. — Pegu, Martaban, Tenasserim. — Ex affinitate F. infectoriae, Willd.

216. Ficus insignis, nov. sp.
Arbor mediocris, ramulis erassis cicatrisatis tomentellis; stipulae lat-o-vatæ tomentose; folia iis F. geniculatae subconsimilia, elliptica ad ovato-oblonga, petiolo 2 - 3 poll. longo apice geniculato suffulta, basi rotundata v. obtusa, 5 - 7 poll. longa, obtuse apiculata, integra v. subundulata, glabra, rigide coriacea, supra lucida, nervis lateralibus subparallelis et moderate approximatis, secus marginem arcuato anastomozantibus, subimpressis, reticulatione elegante vix prominentæ; receptacula cerasi minimi magnitudine,
globosa v. subglobosa, cinerascenti albida, roseo-punctata, dense tomentosvillosa, basi bracteata, pedunculo crasso brevissimo tomentoso suffulta, in foliorum axillis v. supra eorum cicatricibus vulgo geminata; bracteae persistentes, lato-ovatae, scariosae, brunneae, glabrae.—Promex. Præcedenti affine.

217. Ficus caloneura, nov. sp.
Arbor glabra; folia iis F. Rumphiì consimilia, cordato-ovata, sensim obtusiuscule-acuminata, basi cordata, petiolo 3—4 poll. longo apice geniculato bi-glanduloso suffulta, 4—5 poll. longa, 2½—3½ poll. lata, grosse et remote repando-dentata, teniiter coriacea, glabra, utrinque opaca, supra hau d punctata, nervis lateralibus vacantibus nervis basilariis omnibus diversitibus et subarcaatis pallidis crassis secus marginem anastomozantibus, nervatione transversali elegante sed tenuiuscula; receptacula desunt.—Burma, sine loco natali, (Dr. Brandis).—Ex affinitate F. Bum'hi, Bl.

218. Ficus pomifera, nov. sp.
Frutex scandens, glaber; folia obovata v. sub-rhomboideo-ovobata, petiolaris 3—4 lin. longis scabridis, basi subcuneata, 1—2½ poll. longa, obtusa v. subemarginata, glabra, coriacea, marginibus subacutis, in areolis reticulationis obscuris acutis, in stipitum brevissimum (c. ½ lin.) crassum constricta, levia, miniatum-aureantia, pedunculus crasso 1—2 lin. longo puberulo suffulta, vulgo solitaria e foliorum axillis v. supra eorum cicatricibus; bracteae ad pedunculi apicem 3, persistentes, triangulares, subglabrae. Variet. a. pomiformis, receptaculam pomiformiam.—Tenasserim, (Falconer); β. oviformis, receptaculam elliptico-oblongam ad ovoideam.—Sumatra.

219. Ficus pyrrhocarpa, nov. sp. (F. tuberculata, Wall., Cat. 4539, non Roxb. et aliorum).
Frutex humilis, 1—3 pedalis, ramulis adpresso-brunneo-setosis; stipulae lineari-lanceolatae, acuminatae, glabriuscule v. dorso pubescentes; folia obverse lanceolata ad subcuneata-lanceolata, basi cuneata v. acuta, petiolo lineis perpaucis usque ad 1½ poll. longo adpresso-glabrae subsuffulta, breve et obtusiuscule acuminata, integra, crassa membranacea, supra glabra v. pilis minutis inconspicuis adpressa, subitus secus nervos sparse adpressa hirsuta et glabrescentia, nervis arcuatis, reticulatione laxa; receptaculam depressio-pyriformiam, cerasi magnitudinis, purpurascenti-viridia, costata, squamis nonnullis vario dispositis adpressa, præsertérum juvenilia pilis rigidissis adpressis v. subpatentibus brunneis v. rufis obtecta, pedunculis ½—1½ poll. pubescentibus glabrescentibus crassis suffulta, solitaria e trunco subterraneo orta v.
secus surculos aphyllos subterraneos errumpentia; bracteae ad apicem pedunculi 3, ovatae, breves. — Pegu, Martaban. — Ex affinitate F. ischnopoda, etc.

219. Ficus anastomozans, Wall., Cat. 4513.
Frutex repens, humilis, magis minusve scabro-pubescentis; stipulae minuta, scabra; folia oblongo-lanceolata ad lanceolata, basi acuta v. obtusa, petiolo 2—6 lin. longo scabro-pubescente suffulta, magis minusve obtusiuscula-acuminata, 2—4 poll. longa, grosse et irregulariter sinuato-dentata, dentibus rotundatis v. obtusis, membranacea, supra scabro-pubescentia,nonnull quam subglabrescentia, nervis numerosis irregulariter-divergentibus et anastomozantibus; receptacula ovidea, piperis grani magnitudinis, umbonata, basi non v. virostricta, scabra, magis minusve obtusiuscula-acuminata, 2—4 poll., longa, crasse membranacea, supra scabra, subpenninervia; receptaculum ovoidum, piperis grami magnitudinis, umbonata, pedunculo ½ lin. longo et pubescente suffulta, solitaria et foliorum axillis v. supra eorum cicatricibus errumpentia; bracteae minuta.—Tenasserim.

220. Ficus Lepidosa, Wall., Cat. 4541.
Arbor mediocris, novissime parce pubescentibus; stipulae lineari-lanceolatae, acuminatissime, glabrae v. subglabrae; folia ovato-oblonga, noninsequalia, basi in petiolum gracilem 5—8 lin. longum glabrum attenuata, breve et obtusiuscula acuminata, 3—4 poll. longa, coriacea, apicem versus leviter obtusiuscula serrata, glabra, concoloria, nervis tenuibus et reticulatione densa suboboletis; pedunculus fructigen usque ad 2 poll. longus, apparenter glaber, 1 v. 2 fructus gerens; glans ovidea, 9—10 lin. fere longa, laevis, exserta; cupula 7—8 lin. in diametro, concava, crasse coriacea, brunnea, glabra, subverniciosa, junior squamis triangularibus acutis adpressis subdistinctis dein in zonas concentricas angustas inaequales et irregularres confluentibus obtecta v. rugato-rugosa. — Martaban.

AMENTACEÆ.

221. Quercus EuMORMHA, NOv. SP.
Arbor 20—30 pedalis, glaberrima; folia ovato-oblonga v. oblonga, noninsequalia, basi in petiolum gracilem 5—8 lin. longum glabrum attenuata, breve et obtusiuscula acuminata, 3—4 poll. longa, coriacea, apicem versus leviter obtusiuscula serrata, glabra, concoloria, nervis tenuibus et reticulatione densa suboboletis; pedunculus fructiger usque ad 2 poll. longus, apparenter glaber, 1 v. 2 fructus gerens; glans ovidea, 9—10 lin. fere longa, laevis, exserta; cupula 7—8 lin. in diametro, concava, crasse coriacea, brunnea, glabra, subverniciosa, junior squamis triangularibus acutis adpressis subdistinctis dein in zonas concentricas angustas inaequales et irregularres confluentibus obtecta v. rugato-rugosa. — Martaban.
222. Quercus Brandisiana, nov. sp.
Arbor parva v. mediocris, ramulis canescenti, v. ochraceo-pubescentibus; folia oblonga ad obovato-oblonga, basi sepius inaequali acuta v. obtusa, 4—5 poll. longa, petiolo 5—8 lin. longo gracili glabro suffulta, breve et obtusiuscule acuminata, obtusiuscule repando-serrata, utrinque subopaca, tenuiter coriacea, supra rugata et glabra, subtus glauca et fugaci-puberula, nervis supra impressis strictis subtus prominentibus sed tenuibus, cum nervatione transversa conspiciuis; pedunculus fructiger c. 1, raro usque 2½ poll., longus, fructus paucos tantum gerens, ocbrascenti-tomentosus; glandes juniores depressae adpressae, magis minusve inclusae, dein exsertae, ovoideas, glabrae; cupula canescenti-velutina, concava, c. 1 pol., in diametro, e zonis circ. 5—6 concentricis lamellatis erosis formata.—Martaban.—In sect. Cyclobalani inserenda.

Chloranthaceæ.

223. Chloranthus insignis, nov. sp.
Suffrutex 1½—2 pedalis, glaber, in sicco sublutescens; folia petiolis 1—2 lin. longis suffulta, linearia, basi acuminata v. acuta, sensim et longissime acuminata, 3½—4½ poll. longa, subcoriacea, integra, glabra, nervis laterribus tenuissimis, vix reticulata; spicis axillares, fructiferis 1—2 poll. longis, simples, glabrae; bracteæ minutæ, crassæ; fructus casi.—Martaban.

Scitamineæ.

Hemiorchis nov. sp.
Flores præcoces, spicati, sessiles. Calyx tubulosus, sursum ampliatus, 3-fidus. Perianthii tubus calyce brevior filiformis; phylla 3 exteriora aequalia, interiora subaqueolonga, basi utrince coriiculata apice 2—3 denticulata; labellum lato-oblongum, concavum, apicatum. Filamentum phyllis fere duplo brevis, apice incurvum, connectivam supra anthera utrince mutica vix productum. Ovarium 1-loculare, placentis 3 parietalibus; stylus filiformis; stigma paulum incrasatum, oblique truncatum. Capsula 1-locularis, subplicato-sulcata, 3-valvis; semina conica, basi albo-arillata.—Herbae perennes Gastrochilo habiti et characteribus essentialibus aequalis; scapis radicis pallidi squamati iis Geodori haud absimiles.

224. H. Burmanica, nov. sp. Tab. VIII.
Rhizoma album, crassum, repens, hypogaeum, nudum; folia post anthesin erumpentia iis Gastrochili simillima, lato-oblonga, brevissime acuminata, basi inaequali-rotundata in petiolum brevem decurrentia, glabra; vagina striata, glabrae; scapi radicis, solitarii, dense tomentelli, a basi usque ad medium bracteis amplis pallidis remotis v. confertis 1—1½ poll. longis oblongis et subacutis vestiti; flores spicati, sessiles, mediocrie; calyx puberulus, albus,
3-fidus, lobis æqualibus acutis; perianthii phylla exterla 3 fere semipolllicaria, virescenti-albida, oblongo-linearia, apiculata v. 2—3 lobulata, marginibus magis minusve recurva, superiori laetri; interiora 2 obovato-oblonga, pallide rubella, apice obsolete 2—3 denticulata, marginibus magis minusve recurva, superior latiore; interiora 2 obovato-oblonga, pallide rubella, apicem obsolete 2—3 denticulata, labellum convexe-latro, aurantiaco-aurantiacum, basin versus pallidius, intus secum carinam sanguine num carinatum, carina in apicem 3-angularem acutum excurrentem; anthe ræ cerino-luteæ, filamenta c. lin. longa, incurva; capsula ovaria, puberula, calyce emarcescent coronatae, c. poll. longæ; semina basi arillo albo suffulta.—Pegu, Martaban, Tenasserim.

**MELANTHACEÆ.**

*Stemon a* Griffithiana, nov. sp. Tab. X.

(Gener. nov., Griff. Journ. of Travels p. 149).

Herba erecta, perennis, glabra, rhizomate crasso hypogea; folia hyst eranthia, ovata, c. 3—5 poll. longa, breve acuminata, petiolo 3—5 poll. longo suffulta, chartacea, glabra, parallelinerva, eleganter transverse venosa, sericeanter-nitentia; flores virescenti v. sordide purpurei, pedicellis strictiusculis poll. circiter longis suffulti, in turionibus erectis aphyllis scapiformibus dein foliatis 3—6 poll. longis eorymboso-racemosi; bracteæ lineari-lanceolate acuminatae, c. 3—4 lin. longæ; perigonium 4-phyllo, phylla poll. longa, v. paullo longiora, lineari-lanceolata, acuta; stamina 4, filamenta lata, purpureæ; antheræ auroæ, cuspidatae; ovarium 1-loculare, ovulis 6, lineari-oblongis ex apice pendulis capsula compresso-ovata, semipollicares, bivalves, 3—4 spermæ; semina sulcato-carinata, lineari-oblonga, subapiculata, basi arillo brevi albo aucta.—Ava, Martaban, Pegu.

**AROIDEÆ.**

*Hapaline*, Schott.


1. *H. Benthamiana*, Schott. Tab. IX.

Herba e. semipedalis, radice tuberosa, basi albo-vaginata; folia 3—4 poll. longa, petiolo æquilongo suffulta, oblonga, basi profunde sinuato cordata, lobis basilaribus complicatis et obtusiusculæ prolongatis, glabra, breve acuminata, nervis anastomozantibus; flores 1—3-ni e rhizomate pro-
trusi, scapo 5—6 poll. longo gracili suffulti; spatha nivea, lineari-lanceolata ad lanceolata, e. 1½ poll. longa, reflexa, reticulata; spadix spathae fere longitudinis, ejus pars mascula exserta strictiuscula lineari-subulata, alba.—Martaban.

Tabularum explanatio.

Tab. VIII.—Hemiorchis Burmanica.—Fig. A, planta florens, magn. nat.; fig. B, folium cum cauli vaginato, magn. nat.; fig. 1, perigonii phyllum exterioris; fig. 2, phyllum exterius superius; fig. 3, perigonii phyllum interius laterale; fig. 4, labellum cum carina, a latere visum; fig. 5, anthera a latere visa; fig. 6, eadem a fronte; fig. 7, capsula, magn. nat.; fig. 8, semen, arillo remoto.

Tab. IX.—Hapaline Benthamiana.—Fig. A, planta, magn nat.; fig. 1, spadix; fig. 2, ovarium; fig. 3, sectio verticalis fructus, semen immaturum exhibens; fig. 4, squama staminalis antheras gerens, a latere interiore visa.

Tab. X.—Stemona Griffithiana.—Fig. A, planta florens; fig. B, caulis foliati pars superior; fig. C, racemus fructiger; fig. 1, perigonii phylla 2 cum stamine; fig. 2, semen cum arillo, latere visum; fig. 3, capsula aperta, semina exhibens; figuræ omnes magn. nat.


Pag. 312. lin. 10. supra pro pomini majoris magnitudine lege pomi minoris magnitudine, brunneo-velutinae.
Figs. 1, 1a, 1b. *Hana plicata* ffl. *Penang, p. 116.*
Figs. 2, 2a, 2b, 2c. *Calamaria Stuhlschie, n. sp., Sumatra, p. 149.*
Figs. 3, 3a, 3b, 3c. *Simoceon calender, n. sp., Malay Peninsula, p. 121.*
Notes on some species of Malayan Amphibia and Reptilia,—
by Dr. F. Stoliczka.
(Received 15th Feb. 1872; read 5th March, 1872.)

[With plate XI.]

It is nearly three years ago that I had the pleasure of submitting to
the Society a few notes on Indo-Malayan Reptiles and Amphibians, chiefly
collected by myself along the Burmese and Tenasserim coasts, about Penang
and on the Nicobar and Andaman islands. When visiting Penang in 1869, I
received information of a tolerably extensive* collection of Reptiles, brought
together by a zealous Jesuit during a residence of about twenty years on the
island. The specimens were collected either on Penang itself or on the op-
posite coast of the Wellesley Province. A very large number had been cap-
tured alive, and coloured drawings, taken from most of the live specimens,
had been prepared. The colouring appeared to me to have been faith-
fully copied, and this it was which particularly excited my interest in the col-
collection, because in many cases the colours of Reptiles fade most rapidly, as
soon as the specimens are placed in spirit; in others the colouring changes
immediately after death, and again some alter even during life their colour,
as soon as they become conscious of their captivity. In any case the coloured
sketches from life seemed to me valuable and I, therefore, resolved to buy
the collection.

As soon as the formal matters were arranged, the collection of the
specimens was transmitted to me, the drawings, however, were afterwards not
considered to form an essential part of it, and were handed over to some one
else, according to a wish of the deceased gentleman under whose supervision
they were executed. After a brief correspondence it did not appear to
me much use treating further about the subject. My interest in the
collection has, on that account naturally enough, partly diminished, and
having had other more pressing work to attend to, the specimens were
for more than two years left unnoticed. More recently my friend Mr.
Stahlknecht of Singapore visited Sumatra, and made for me a very nice
little collection of Reptiles, most of which were in a beautiful state of preser-
vation. This circumstance induced me to look over my old acquaintances,
and to prepare a critical list of all of them. In the old collection I only
found two new species, a Rana and a Simotes, a specimen of the latter had
very recently been also obtained by Mr. J. Wood-Mason’s collector at
Jahore, situated at the extreme south end of the Malayan Peninsula, north
of Singapore island. Mr. Stahlknecht’s collection yielded a new Calamaria.

* This refers to the number of specimens, but not to that of species, as I sub-
sequently discovered.
Thus, although I cannot say, that I came into possession of a great number of new forms, there are among those, which I shall place on record, a few rare and very interesting species, some of which were previously known only from single specimens, and these often were not very perfect. I may mention for instance *Draco quinqu fasciatus*, *Podophis chalcides*, *Ophites subincertus* and *albofuscus*, *Ablabes flaviceps*, *Oxy calamus longiceps*, &c.

I shall first enumerate all the species, and attach an (*) asterisk to those, about which I shall have to say a few words.

The collection was made, as I said, to a large extent on Penang itself or in the Wellesley Province, and judging from the examination of it, I have found no reason to doubt in any way this statement. A great many of the same species had been collected by myself in that part of the country on a former occasion, others were known to occur there from the very elaborate and extensive researches of Dr. Cantor; others again had been recorded from Malacca, Singapore, Sumatra or Java, all countries which belong to the same zoological province, and which have a large number of species common. I have not met with a single instance which would lead me to suspect, that any mixture of other distant localities had taken place. Thus the present list in connection with that of Drs. Cantor, Gray and Günther, and my own published in 1870, may be considered as fairly completing the number of Reptiles and Amphibians, inhabiting Penang and the neighbouring Wellesley Province. Mr. Stahlknecht's specimens are from the neighbourhood of Dilli on Sumatra. In the general list I shall briefly note the localities as *Penang* and *Sumatra*.

**Batrachia.†**

   2.* " fusca*, Blyth.—Penang.
   4.* " *lymnocharis*, var. *pulla*, Stol.—Penang.
   5.* " *plicatella*, n. sp.—Penang.
   7. " *quadri lineatus.—Penang and Sumatra.*
   8. *Hylarana erythrea.—Penang and Sumatra.*
   9. *Bufo melanostictus.—Penang.*

† If no special reference to literature is given, it is understood that the species is described in Dr. Günther's Reptiles of Brit. India, or in my former paper on Malayan Reptiles in Journal A. S. B. vol. xxxix, pt. II.
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   Largest specimen, body 5½ inch. long.


SAURIA.

   All have a rufescent bronzey tinge and dorso-lateral pale bands.

13.* E. olivaceus.*—Penang and Sumatra.

   Exactly the same as in Bengal.


16.* Gymnodaextylus (? Cyrtodaextylus) pulchellus.*—Penang.

17. *Cyrtodaextylus affinis.*—Penang.


   All have less dark coloration than Himalayan or Khasi hill specimens, but are in other respects not distinguishable, Comp. J. A. S. B. xl, pt. II, p. 103.


22. " *stentor.*—Penang.


24. *Bronchocela cristatella,* Kuhl.—Sumatra, very common.
   All have 36 to 42 small equal scales in a lateral row.

25. *Draco volans,* Linn.—Penang and Sumatra, very common.

26.* " quinquefasciatus.*—Penang.

27.* " simbratius.*—Penang.


The light spots and bands are in young and in old males [at least] bright yellow, not white. The species is also very common on all the Nicobar and Andaman islands.

29. *Crocodilus porosus.*†—Penang.

† The similarity of form and colour of the young of this species with equally large specimens of *C. Pondicherianus,* Günther, is very striking. My collector recently brought several young specimens (12-14 inches) of the latter species from Arrakan, and when compared with equally large specimens of *porosus,* the former all have the snout, and also the tail, conspicuously shorter; all have only six rows of shields on the back, but there is an additional one on either external edge broken up into single shields. In *porosus* the outer row of shields on either side is complete, or continuous, and on the whole the dorsal shields appear to be smaller. In every other respect the young of both species are identical. I have not seen an adult of *Pondicherianus,* but it ought to be looked for in Arrakan. Both have a small shield on either anterior side of the
neck, it being a rudiment, or rather probably the beginning, of the anterior nuchal plates.

Besides C. Pondicherianus, my collector brought among others the following species which I do not think had been previously recorded from Arrakan.

Callula pulchra.
Diplopelma carnaticum and D. Berdmorei.
Polypedates maculatus and P. quadrilineatus.
Hylarana erythrea and H. Tyleri. Both quite distinct species.
Biopa lineolata.
Tachydromus sextlineatus.
Homidactylus (Doryura) Berdmorei.
Hinulia maculata. Also common on all the Andaman and Nicobar islands.
Lycodon aulicus, (black variety).
56. Psammodynastes pulverulentus.—Penang.
57. ”, pictus.—Sumatra.
(Colub. Snakes, p. 251). Exactly agreeing with Günther’s description.
58. Lycodon aulicus.—Penang.
59.* Ophites subcinctus.—Sumatra.
60.* ”, albofuscus.—Sumatra.
61. Bungarus fasciatus.—Penang.
62. Adeniophilis* (Calophis) intestinalis.—Penang.
63. ”, liviratus.—Penang and Sumatra.
64. Xenopeltis unicolor.—Sumatra.
65. Python reticulatus.—Penang.
67.* ”, [Perania] alternans.—Sumatra.
68. Fordonia unicolor.—Sumatra.
(The young are brownish olive with numerous dark dots).
69. Cerberus rhynchops.—Penang.
70. Homalopsis bucata.—Penang.
71. Hipastes hydrinus.—Penang.
72. Hydrophis robustus.—Sumatra.
73.* Trimeresurus Wagleri.—Penang and Sumatra.
74. ”, erythrus.—Penang.

**Rana fusca.**


 Rufus brown above, with a pale longitudinal dorsal streak, broad in front, narrow towards the posterior end; limbs above somewhat indistinctly variegated and banded with darker brown, posterior side of femora with closer and darker variegations. Lower side uniform whitish, except a few dark spots on the lower lip, but the front-end of the lower lip has a conspicuous white spot, as stated by Blyth.

The nostrils are much nearer the snout than the eye; the tympanum is smaller than the eye, but quite distinct in a nearly full grown specimen; skin above and at the sides of the belly with few scattered slightly enlarged tubercles; lower side perfectly smooth. The first and second fingers are slightly shorter than the third and fourth respectively; the second is shortest. The metatarsus has a single, inner, marginal, elongated tubercle. The first and fifth toes are fringed externally, but the tarsus has no fold. The toes are entirely webbed and their tips very distinctly swollen.

The length of the body equals the distance from the vent to half the length of the tarsus.

* See Peters in Monatsb. Berlin Akad., 1871, p. 579.
Rana lymnocharis, var. pulla.


Since the publication of my notes on this variety I have received two other specimens from Penang. The form of the body, the teeth, the structure and general coloration exactly agree with typical lymnocharis, except that in one of the specimens the four dark bands on the upper side of the femora are well marked and somewhat narrower than in the other, in which the coloration is typical. In both, the lower lip is spotted and the chin variegated with dusky. Neither of the specimens has a dorsal pale streak.

One of them measures, body 1·35 inch., which is only one tooth less than the distance between the vent and the metatarsal tubercle, the total of the hind-limb being 2 inch., while in a specimen of typical (half-webbed) lymnocharis of which the body is also only 1·35 inch., the distance between vent and metatarsal tubercle is 1·15 inch, but the total hind-limb is 2·2 inch. Thus in lymnocharis var. pulla the metatarsal bones are longer and the fourth toe on the contrary much shorter than in typical lymnocharis. In the former also, as previously noticed, the toes are nearly fully webbed, the web reaching to very near the tip of the third and fifth toes, but only to the base of the penultimate joint of the fourth toe.

The other specimen has the length of the body 1·3 inches, which is equal to the distance between the vent and the heel, and the total hind-limb is 2·17; thus very nearly equal to that of lymnocharis, only differing from it by the fuller webbing, the web reaching fully to the middle of the penultimate joint of the fourth toe. In this specimen also the tips of the toes are all remarkably swollen. All other characters are exactly as in typical lymnocharis.

These variations appear to me to indicate that they are progressive or undergoing certain changes according to the requirements of the animal, and that we are, therefore, not entitled to give them a specific value, unless they become permanent. I look upon this longer-limbed, shorter-toed and fuller-webbed hill form of lymnocharis as a small (pulla) local variety, possessing certain peculiarities, in exactly the same manner as the Andaman and Nicobar variety of the same species. (Comp. l. c. p. 142 et seq., and Proc. A. S. B. for June 1872, p. 102).

Rana plicatella, n. sp. Pl. XI. Fig. 1.

Body moderately stout with longish hind-limbs and swollen tips to the toes.

Head large, snout obtuse, with the canthi rostales rounded; nostrils lateral, oval, somewhat directed upwards, nearer to the tip of the snout than to the eye; eye large, prominent, its longer diameter is slightly more than
the distance between it and the nostril, but it is equal to the width of the upper side between the eyes. Tympanum naked, as large as the eye.

Head smooth above, hinder half of the eyelids tuberculated; body above with about eight longitudinal somewhat interrupted folds, with numerous small tubercles between them; limbs also smooth above, with the exception of the posterior halves of the tibiae, which are tubercular; chin in front with a few scattered, minute tubercles, a few others exist on the side of the belly, and the hinder part of the sacral region is densely studded with small plicated tubercles; the remainder of the under side is smooth.

The length of the body is very nearly equal to the distance between the vent and the middle of the tarsus; the fore limb is equal to the distance from the tympanum to the groin. The first finger is scarcely shorter than the third, the second and fourth are subequal. There is a slight fold on the inner lower edge of the tarsus, and one along the outer edge of the fifth toe. The tarsus has a single, inner, elongated, marginal tubercle. The toes are about three-quarter webbed, the web reaching on the fourth toe to scarcely beyond the base of the third-ultimate joint; on all the other toes it extends to the last joint, but it is deeply emarginate between all of them. The tips of all the toes are much swollen; the length of the fourth measured from the base of the tarsus is slightly less than half the length of the body.

Lower jaw with two fang-like projections directed inward. Tongue elongate, much broader towards the tip than at the base, terminating with two moderately sized projections. Vomerine teeth in two short oblique converging series. Sacral diapophyses not dilated.

Above, greenish brown, with a dark band from the nostril through the eye, continuing behind it; limbs with numerous transverse dark bands; they are somewhat ill-defined on the upper arm, on the lower arm there are three or four very short ones, six on the femur, five somewhat more distant ones on each tibia, three on the tarsus, one on metatarsus and a few more on the outer-side of the toes. The hinder sides of the femora are densely and rather minutely variegated with dark brown; a horse-shoe shaped yellow mark, open below, round the anus; folds on the tarsus and outer toe also yellowish; lips indistinctly variegated with pale and dusky; lower side uniform white, except on the tibia, and on the feet, which are speckled with dark.

The only species which in some respects resembles the present form is Rana porosissima, Steindachner, from Angola (Novara Amphibicius, p. 18, pl. I, figs. 9-13), but it differs in the coloration of the limbs, in the smaller size of the tympanum, smaller vomerine ridges of teeth, in having the apophyses on the lower jaw scarcely enlarged, the tips of the toes not swollen &c.
Euprepedes olivaceus.

The young (body 1 to 1·5 and tail 1·5 to 2 inches) are very differently coloured from the old. The snout and headshields are olivaceous, the posterior edges of all the shields being blackish; the whole body and limbs are blackish brown, with numerous rather close, transverse, greenish white or yellow stripes; tail and the entire lower side yellowish white, or quite yellow. In the adolescent and some old ones the pale transverse bands exist as remnants in the shape of transverse series of spots, but most adults become entirely olivaceous, with only the edges of the eyelids bright yellow.

Gymnodactylus pulchellus.

In the descriptions of this species it is usually stated that there are six dark, white edged bands across the body, but properly speaking the sixth band is situated on the base of the tail. Further, it is stated that a fold of the skin exists along the side of the body. This is in reality not the case, at least not in live specimens, but the shield-like scales of the lower side are separated from the granular upper surface by a row of conspicuously enlarged granular scales; this row becomes strongly prominent in spirit specimens, and gives the appearance of a fold.

As regards the position of the femoral pores the species is intermediate between Cyrtodactylus and Gymnodactylus, the pores lying first in a longitudinal fold and then extending flatly on the femora. This instance shews that Cyrtodactylus, (as likewise the present species), should be looked upon merely as a section of Gymnodactylus.

Draco quinquefasciatus.

A single male specimen measures: head and body 3·5 inch, tail imperfect, apparently about 5 inches. The hind limb is contained 1·33 times in the distance between it and the fore limb, the latter being somewhat shorter than the former. There are no enlarged tubercles on the head, but only a number of interspersed, slightly larger white scales at the sides of the neck, and a broad band of closer set ones across the occiput. The scales on the anterior part of the back are obsolesly keeled, on the posterior part they are perfectly smooth. On the wings scales are present along all the ribs, and in numerous longitudinal series on the basal half of the alar skin, while further on their number greatly diminishes, except again at the outer margin.

The specimen has only a very slight indication of a crest on the neck; the gular sack is very long and lanceolate, a dark band running at its posterior base across the lower neck. Chin dark spotted, like the body; tail also spotted at its base, but further on with brown bands. In all other respects the specimen agrees with Gray's characteristic description.
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**Draco fimbriatus.**


A specimen from Penang exactly agrees with the one figured by Gray and Hardwicke in Illust. of Indian Zoology as *D. abbreviatus* from Singapore. The scales of the back are very small and almost quite smooth, with a series of larger ones on either side at the base of each wing. Günther (Rept. Brit. India, p. 123) says that no orbital or rather post-orbital, spine exists. This is a mistake, at least as far as male specimens are concerned. In these there are two very distinct post-orbital spines; they are well shewn in Gray and Hardwicke's figure. Dumeril and Bibron's minute description of the headshields from Javanese specimens also appears exactly to correspond with the structure of Singapore and Penang specimens.

General colour bronze brown; head, not including the nape, a zigzag undulating slightly variegated band across the neck, another across the shoulders, a third between the hind limbs, and a fourth, though less distinct one, across the middle of the body, pale bluish, a bluish black spot between the eyes; on the body are four irregular marks, each composed of a few blackish lines, and each enclosing along the middle of the back a somewhat elongated diamond-shaped figure.

Limbs with cross dark stripes, and bluish edges to all the front and hind sides. Wings above blackish with radiating bluish lines, below pale with a few scattered black spots. Tail banded with bronze and pale bluish. Chin variegated with dark; gular pouch tinged with blue and red, dusky at the base. Body below uniform yellowish white, with scattered bluish dusky spots, mostly conspicuous along the sides.

**Calamaria Stahlknechtii, n. sp. Pl. XI. Fig. 2.**

Body long, cylindrical, snout somewhat narrowly obtuse; total length 13.5 inches, of which the tail is 1.2 inch; rostral reaching to the upper surface of the head; frontals anteriorly narrower than posteriorly, laterally bent down, and in contact with first and second labials, the nasal being very small; occipital six-sided, with the anterior angle shorter and more obtuse than the posterior one, it is smaller than one occipital; each of the latter has an obtuse angle in front and behind, and both form an inwardly directed angle along the suture on either end; one pre- and one post-ocular; five upper labials, the third and fourth touch the orbit, the fifth is largest, in contact with the post-ocular and occipital; it is followed by a moderately sized shield which has quite the appearance of a sixth labial, and indeed the gape partially extends below this quasi-sixth labial; above this last extends a long temporal. Mental shield small; five lower labials; the first pair is the smallest, separated from each other, the fifth the largest. The first pair of chin-shields is largest, each being in contact with three labials and having a very
obtuse angle behind; the shields of the second pair are only about half the size of the first, entirely separated from each other by two scale-like shields following each other, and by two other somewhat larger shields from the first very large ventral. Scales smooth, in thirteen rows; ventrals 163, anal entire, subcaudals 22, the last single occupying the shortly pointed end of the tail.

Uniform iridescent brownish black above, the two outer series of scales on either side mostly white; upper labials spotted with yellow, the fifth labial being almost entirely yellow. Lower side, beginning a short distance from the throat, with two or sometimes three ventral shields alternately yellowish white and black, the black colour encroaching laterally upwards upon the yellowish white lateral bands, and being longitudinally connected along the edges of the ventrals and subcaudals; the latter have besides an interrupted blackish line along the middle, and the pale colour is tinged with vermilion. Possibly the red colour extended over the whole of the light coloration during the life of the snake.

The only specimen examined was sent to me with several other species by my friend Mr. Stahlknecht of Singapore; he collected the same near Dili on Sumatra.

In general aspect the species resembles C. Linnei, but differs essentially in several points of its structure. It also does not agree with any of the species more recently described by Bleeker and Edeling, or figured by Ján.

**Oxxcalamus longiceps.**

A single specimen of this rare snake was in the Penang collection; it measures seven inches of which the tail is one.

The following may be added to Cantor’s and Günther’s descriptions:

The rostral shield is of moderate size, reaching with its angle to the upper surface of the head; anterior frontals small, each about one-third the size of a posterior; the suture separating the two anterior frontals is only two-fifths of the length of the suture between the posterior frontals; vertical six sided, the sides touching the supraciliaries being parallel to each other; one supraciliary not quite as wide as half the width of the vertical; occipitals nearly double the length of the vertical, reaching down on either side to the postocular; nasal in a single shield.

Vent. 137, anal entire, subcaudals 29.

Uniform iridescent black above and below, many of the ventrals and subcaudals with paler posterior edges; a pale yellowish spot on the fifth upper labial and a second one on each side of the throat.

**Simotes bicatenatus.**

In several specimens, the dark dorsal band is divided by a pale reddish
line. A young specimen has only one preocular, and only the upper smaller temporal is in contact with the postoculars.

**Simotes cruentatus.**


This species agrees in general aspect and coloration with *S. bicanatus*, but it has only seventeen rows of scales. One specimen in the collection has a small portion of a labial detached, forming a second (lower) preocular; it has very few dark blotches on the anterior ventrals; only two black spots on the tail, one at the root, the other near the tip.

**Simotes catenifer, n. sp.** Pl. XI. Fig. 3.

The body is short, stout, moderately compressed, the head large, conspicuously truncate in front.

Rostral shield well reaching to the upper surface of the head; anterior frontals considerably smaller than the posterior ones, both bent down at the sides; superciliaries narrower anteriorly than posteriorly; vertical large, six-sided, with a very obtuse angle in front, somewhat converging sides, and with nearly a right angle behind; one occipital is about the same size as the vertical, each reaches down to the superior postocular and is rather broadly truncate behind. Nostril between an anterior large and a posterior somewhat smaller shield; loreal squarish; two pre-oculars, the upper is long, while the lower has the appearance of being only a small detached portion of the fourth labial; two postoculars; temporals $1 + 2 + pl.$, the last is somewhat irregular and scale-like, the first obliquely in contact with both postoculars. Eight, rarely nine, upper labials, the fourth and fifth under the orbit, sometimes a small portion of the fourth is detached, touching the orbit as a separate shield. Mental shield small; nine lower labials, those of the first pair form a suture; anterior pair of chin-shields largest, each in contact with four labials; second pair much smaller, and separated by other two somewhat smaller pairs following each other from the first ventral. Scales smooth, in nineteen rows; ventrals 178 to 205, distinctly angular at the sides; anal entire, moderately enlarged; subcaudals bifid, in 57 pairs.

The general coloration of the upper side is sandy brownish; head with the usual dark brown markings; the first band crosses the eyes and reaches forward to the rostral; the second ascends across the angles of the mouth to the outer median edge of the occipitals; the third is thick, arrow-shaped, anteriorly prolonged to between the eyes. Body with twelve or thirteen dark cross bands, each composed of four confluent spots, the two dorsal ones being larger and darker; tail with four or five cross bands. Between each two of these bands the scales, following alternately each other, are partially blackish, forming three undulating cross lines in each interspace. The sides
along the ventrals are checkered with blackish brown; lower labials with their hinder edges blackish. Lower side dusky yellowish, tinged with red which passes into vermilion on the posterior half; every second or third ventral has a quadrangular black spot at each of the outer edges, the interposed edges being white, and the spots are somewhat more distant on the ventrals than on the caudals.

The total length (in two specimens) is 9.5 inch., the tail being 1.75. I have received one specimen from Penang and Mr. Wood-Mason lately obtained a second one from Jahore, North of Singapore.

This is the fourth species of a small group of Simotes, all of which are closely allied to each other and all belong to the Malay or Chinese fauna: they agree in their small size, short and stout body, in the form of the head-shields and in coloration. S. Cochinchinesis, Günther, has twenty-one rows of scales round the body. S. brevicauda, Steindachner, (Novara Rept. p. 61, pl. iii, figs. 13—14) has, like catenifer, nineteen rows of scales, but the occipitals and oculars are in the former somewhat differently shaped, the markings on the head are also somewhat different, and there are no lateral spots on the ventrals; in every other respect both species almost perfectly agree, as far as I can judge from the figure and description, and if I had not obtained two perfectly like specimens of catenifer from different localities, I would have hardly ventured to separate them as distinct. The fourth species is Ján’s S. ancoralis, which has the black spots on the edges of the ventrals, but only seventeen rows of scales round the body and only one pré-ocular.

**Cyclophis tricolor.**

Schlegel, Phys. Serp. II, p. 187, pl. vii, figs. 16—18; idem, Dum. and Bibr.; Günther; Ján, Oph. Livr. 31, pl. vi, fig. 2.

One specimen measures 18.5 inches, of which the tail is 7 inch. Scales smooth, in fifteen rows, vent. 144, anal bifid, subcaudals 129. Greyish, or rather olivaceous, brown above, yellowish white below, a black streak from the nasal through the eye to the side of the neck, rapidly disappearing on the anterior part of the body. Each six-sided scale, above, has the anterior lateral margins pale, producing longitudinal zigzag pale lines; upper labials yellow; along the edges of the ventrals and sub-caudals runs an indistinct dusky line, and another interrupted one along the middle of the ventrals, these lines begin to appear a short distance from the neck, which is below and at the sides uniform yellowish.

The fine zigzag pale lines of the upper side are indicated in Ján’s figure. Both in structure and coloration the Sumatra specimen agrees with Schlegel’s figure and description, except that the head is a little more slender. This specimen had a large spider in the stomach. Schlegel’s snake was
from Java and the species has, I think, not yet been recorded from anywhere else.

*Abalabes Flaviceps*, (var.), Günther.

Ann. and Mag. Nat. Hist. vol. XVIII, 1866, p. 26, pl. vi, fig. B.

One specimen agrees well with Günther’s description and figure of this snake, but it has nine upper labials, the second being replaced by two, so that the 4th, 5th and 6th labials enter the orbit. The hinder chin-shields are almost in immediate contact with the first well marked ventral. Total length 16'7 inch., of which the tail is 5'5 inch., being somewhat obtuse at the end; scales in 17 rows, one pre- and one or two post-oculars, 150 ventrals, anal bifid, 70 subcaudals.

Head yellow, somewhat tinged with brown in front, a straight black streak through the eye and a white one along the upper labials. The general colour of the upper side is brown, powdered with grey; a light blue band begins on each side of the neck, continuing on each side of the back, the colour gradually turning to grey, but both bands remain tolerably distinct to the tip of the tail. On the front part of the body each is marked with squarish black spots along the inner edge, further on the spots become smaller, alternate in position on the two sides, but are somewhat removed from the internal margins towards the middle line. Below, yellowish, all the ventrals, (except those on the neck), with narrow blackish hind edges about the middle of the body, almost meeting in the centre, but further on the black becomes more confined to the outer margins, and on the subcaudals it forms a serrated black band on either side, as in *Abalabes melanocephalus*, to which the present species bears a very strong resemblance. Dr. Günther mentions in his specimen only the presence of a black spot on either side of the ventrals.

*Gonyosoma Oxycephalum.*

A very large specimen, measuring about five feet, has the scales round the body in 27 series; it is sea-green, the tail strongly tinged with rubescent brown, the sutures of the scales being blackish; the dark streak on the side of the head is very indistinct; upper labials whitish green.

*Dendrophis Caudolineatus.*

Dr. Günther when noticing my paper on Penang Reptiles in the Zool. Record for 1870, says that I described his *D. caudolineolatus* (from Ceylon), as *D. caudolineatus* of Gray. I should have hardly expected such a brief dismissal of the consideration of all other points connected with the identification of this species. Dr. Günther appears to have noticed merely my statement regarding the thirteen rows of scales round the body, and to this one charac-
ter he seems to have sacrificed everything else. Now the Penang species, of which I lately also received four beautifully preserved specimens from Sumatra, has only thirteen rows of scales. Cantor’s description of the snake is admirable, and he gives also thirteen rows of scales. Dumeril and Bibron, when describing their *D. octolineatus*, also speak of only thirteen rows, and Ján (Ophid. Livr. 31, pl. II,) gives the same number of scales when figuring the species under Dum. and Bibron’s name.

Thus the question to be determined is, whether Gray’s type has thirteen or fifteen rows of scales round the body? If fifteen rows are present, we have to see whether we are entitled to regard this number as a normal or abnormal one in that particular specimen, that is, whether other specimens from the same locality have 13 or 15 rows of scales; for as far as other points of structure and coloration go, the Penang and Sumatra species is absolutely identical with Gray’s *caudolineatus*. I have no Bornean specimens for comparison, so I can add nothing more towards the solution of the question.

The Ceylonese *D. caudolineolatus*, as far I can judge from the description and figure of it, differs in the structure of the pre-ocular, in the upper labials, and so very essentially in coloration, that I could not have thought of identifying the Penang *caudolineatus* with it.

**Ophites subcinctus.**

One specimen measures eighteen inches, of which the tail is 3·25 inch. The general colour of the upper surface is black, slightly duller at the sides, dull olivaceous blackish below; front head above blackish brown; seventeen broad white rings round the body, the first on the neck, and four on the tail; the white of the rings is considerably more distinct on the anterior than on the posterior part of the body. The eight median rows of scales on the back are keeled; eight upper labials, regular on both sides.

**Ophites albofuscus.**

A remarkably slender snake, measuring 18·75 inches, of which the tail is 5·75 inch. It has seventeen rows of scales, all strongly keeled, the keels on the back being finely crenulated. The general structure exactly agrees with Günther’s account of the species. The specimen has 241 ventrals, anal bifid, and 178 subcaudals, the last shield is single, very long and cylindrical. The general colour is dark brown above, olivaceous white below; hind head and collar on neck very slightly olivaceous white tinged with yellow; body with twenty-six transverse white cross bands, some are imperfect, the intermediate brown bands of ground colour being first thrice, afterwards only twice as broad as the white ones. Tail with about twenty-six transverse white bands, several of them succeeding each other being often
confluent along the middle line, and all are about equally broad as the brown bands separating them; towards the tip of the tail the light coloration prevails and almost entirely suppresses the dark one.

Mr. Stahlknecht obtained only a single specimen near Dilli on Sumatra-Dumeril and Bibron also described a specimen from Sumatra; another one is reported by Dr. Günther as having been brought from Malabar, but as it was bought from a dealer, the locality is not considered reliable.

**Hipsirhina** [Ferania] alternans, Reuss.


*Homalopsis decussata*, Schlegel.—*Hipsirhina alternans* apud Ján, Ophid., Livr. 30 pl. vi, figs. 1 and 2.

One specimen measures: total length 8·25 inches, the tail being one inch. It has two anterior frontals, the first scarcely half as large as the posterior, vertical six-sided, much smaller than one occipital; one loreal, one pre-ocular, two post-oculars; seven upper labials, the fourth under the orbit; the two first lower labials are in contact; two pairs of chin-shields, the first forms a suture, the shields of the second pair are much smaller, diverging and with their upper pointed ends lying between the first chin-shields and the labials. There are twenty-six rows of scales immediately behind the head, twenty-two round the neck, below interrupted by the second ventral, and nineteen round the middle of the body, ventrals 157, anal bifid, subcaudals thirty-four, the first five entire, the last conical.

General colour brown; head, above, anteriorly with a few pale spots; back with narrow pale (yellowish) cross bands: the first passes over the hind-edges of the occipitals and is laterally bipartite, the next four are simple and complete, the following after these mostly interrupted along the centre, and after the middle of the body the bands become reduced to indistinct lateral spots. The sides of the body are marked with a series of pale yellow cross-bars, more than one scale broad, and are separated by equally broad bands of the general brown coloration; the lateral pale bands more or less encroach upon the ventrals, but the general colour of these latter is pale brown. Chin and upper labials spotted with yellow.

This coloration slightly differs in minor details from that given by Ján, but it agrees with it in all essential points.

The larger size of the occipitals as compared with the vertical, the smaller number of upper labials and of the scales round the middle of the body, and the coloration readily distinguish the present species from *F. Sieboldi.*

* Günther, in Ann. and Mag. N. H., 1866, xviii, p. 28 and in Zool. Rec. for 1868 says, that Ján figured *F. Sieboldi* as *Hipsirhina Bocouri* (Iconograph. Livr. 28, pl. v, fig. 2). Ján's *H. Bocouri* has apparently only 23 or 25 rows of scales round the body,
Trimeresurus Wagleri.

Fresh specimens are black above, with numerous spots on top of head, the superciliary edges, both lips, numerous narrow cross bands and the whole of the lower side bright golden yellow with a greenish reflection during life; the stripe from the nostril to below the eye, continuing above the angle of the mouth, one stripe on each side along the margins of the labials, and all the other light spots on the back, but particularly at the sides, are sea-green, more or less tinged with yellow.

Notes on the Indian Species of Thelyphonus,
by Dr. F. Stoliczka.

(Received 23rd February, 1873, read 5th March, 1873.)

[With plate XII.]

Towards the end of last year, a monograph of the genus Thelyphonus appeared in the September number of the Annals and Magazine of Natural History. The author of the paper, Mr. A. G. Butler, seems to have sifted well the materials of the national collection in the British Museum, but whether he has succeeded in his determinations of known, described and figured, species, is a question on which I may be permitted to say a few words. I will not unnecessarily transgress the field of my observations, and will chiefly confine my remarks to the Indian representatives of the genus.

I had for some little time devoted attention to these Arachnoids, and it has been my intention to publish a detailed monograph of the Indian Thelyphoni, together with an account of their anatomy,* notes on their habits, propagation, development, etc., all points about which our present knowledge is as yet very imperfect. Unfortunately, I have just at the present neither the time nor the materials which would justify me to treat satisfactorily with this subject, and I must leave it, therefore, for a subsequent communication. One of the chief objects of the accompanying notes is to draw the attention to certain discrepancies, or perhaps insufficiencies, in Mr. Butler’s determinations of a few of the Indian Thelyphoni.

the coloration is somewhat similar to that of *F. alternans*, the occipitals are much longer than the vertical, and there is only one anterior frontal, this, however, is also said to exist in an old specimen of Sieboldi from Siam. Still I am not certain that Günther’s suggested identity of the two snakes will be confirmed.

Ján does not acknowledge the distinctness of *Ferania* from *Hipsterhinia*, and if *F. Sieboldii* has occasionally only one anterior frontal, the principal reason for keeping the two genera as distinct no doubt looses its validity.

* As compared with that of the Scorpions.
1. *Th. scabrinus*, p. 130
2. *Th. Assamensis*, p. 133
4. *Th. formosus*, p. 137
5. *Th. indicus*, p. 138

See explanation on p. 169.
Lucas’ account of the external anatomy of *Thelyphonus* is the only reliable one which we as yet possess. Short as it is, it clearly points out the great relation of the genus to *Phrynus*, and its essential difference from the scorpions.

As regards general distribution, I may say, that on the whole, particularly when compared with scorpions, the *Thelyphoni* are rare. I have only observed two life species, *T. scabricus* and *T. (conf.) angustus*. Both were found at the foot of the Sikkim hills in damp places under the bark of old trees. They are crepuscular or nocturnal animals. When disturbed during the day, they try rapidly to escape, slightly raising themselves on their feet, holding up the cheliceres ready for defence, and erecting their caudal seta. Thus they progress very fast and soon disappear in any crevice or hole to which they find easiest access. In the evening they progress very quietly, moving their antennular first pair of feet in advance. When disturbed they stretch out these feet in a curve, and close their cheliceres over the mouth as a kind of protection, lying at the same time quite flat and motionless. I saw *T. scabricus* issuing a peculiar fluid from two internal piloric appendages on each side of the anus, but the fluid did not have any offensive odour.

Mr. Peal of Sibsagur (Assam), who is an able observer and is always ready to give assistance on any subject connected with natural history, writes to me also that the *Thelyphoni* are generally found underneath the bark of decayed wood in groups, rarely singly. When first uncovered they (generally) lie *perdu* and try to pass as some smudge or fungus; lying close and flat, the legs gathered well together and the cheliceres folded in and closed in front of the mouth. On being disturbed they generally start up, throw out and up their cheliceres, gaping wide, erect the tail and invert it so as to feel if possible any object above them; sometimes they throw it quite over between the cheliceres. The first pair of feet, he says, seems to act more as feelers them as organs of progression. These animals seem to move either very slowly or very fast. In raising any fragment offered, they hold it aloft and stand well upon their legs, at least for a time.

Mr. Butler proposed to group the *Thelyphoni* in three sections, according to the number of denticles on the upper antero-interior edge of the second joint of the cheliceres. This is apparently a character of great importance, but like all others it is not without variation. I found that the relative proportions of the joints, particularly of the second, third and fourth, are almost more constant than the denticles alluded to. The form of the large spine on the fourth joint, and in fact the total length and ornamentation of the surface of the cheliceres, and the proportionate length of the feet are at least equally important in distinguishing the species.
The next useful character lies in the form of the anterior part of the thorax, whether it is depressed or rounded, and whether the anterior and lateral eyes are connected by a ridge or not. Next in importance is the form of the first abdominal shield. The length of the tarsi on the first pair of feet is also tolerably constant, and so is the form of the mandibles, but these, as a rule, are difficult to examine.

All other characters relating to the form of the body have a comparatively limited value; the single parts are very uniformly constructed in the different species, and are at the same time very much liable to variation. Thus the width of the abdomen is very variable, (most likely according to the different sexes), and so is the length of the abdominal seta, as regards number and size of the separate joints, etc.

Turning now to the sections, distinguished by Mr. Butler, there are some discrepancies to be noticed in the species referred to them by the author. In the first section, with five denticles on the second joint of the cheliceres, we find among others:

*T. Brasilianus.* I count in Koch's original figure of the species at least seven, almost equal, denticles on the antero-interior edge. Their number, it is true, is not mentioned in the description, but if Koch's figure has been found to be incorrect, the correction should have been noticed. I am not aware that anybody has pointed out an inaccuracy in Koch's figure.

Guerin's *T. caudatus* (in his edition of the Régne animale) is identified with *T. Antillanus* of Koch. This is, I think, hardly admissible. Guerin's figure represents a species with comparatively shorter limbs and with the third joint of the cheliceres smooth on the upper surface and much longer, than a comparison of Koch's figure of *T. Antillanus* can bear out. The only reason for the identification of the two figures is, I think, Guerin's note that *T. caudatus* is from the Antilles, but whether that particular specimen was from the Antilles is an other question.

The identification of *T. Assamensis* with *T. rustimanus* of Lucas is entirely inadmissible, as I shall point out in detail further on (see p. 134).

*T. proscorpio* of Lattreille is an altogether doubtful species, and even should Koch's definition of the presumed same species be adopted, there is no sufficient reason for considering it as identical with *T. caudatus* of Lucas. I shall refer to this question again in the description of *T. scabrinus* (see p. 133).

*T. Linganus.* Koch's original figure gives six denticles on the second joint of the cheliceres, but does not refer to that number in the text. Is the figure incorrect in that respect?

Koch's *T. rufipes* is clearly not the same species as the one originally described by Lucas under the same name. The cheliceres and the limbs are in proportion to the body much longer in the former than in the latter; and, besides that, Koch's species has a slight central keel on the upper side of the
abdominal segments, and on the lower side the first segment is centrally grooved; neither of these characters are mentioned by Lucas, though when describing the respective parts he could hardly have overlooked these prominent characters. I consider Koch's *rufipes* as the same which he describes under the name of *proscorpio*; for the differences which he notices as distinguishing the two are decidedly of no specific value.

In the second group with two denticles on the second joint of the cheliceræ, Butler describes *T. formosus*. My specimen of evidently the same species has six denticles of which, however, only two are well marked.

In the third division, including species with six well developed denticles, one is referred to under the old name of *T. caudatus*. I shall attempt to trace the history of this name when speaking of *T. indicus* (n. sp.), which is possibly the same species as the one referred to by Butler from Madras and Bengal under the name of *T. caudatus*.

In addition to the three sections, I have one species, *T. Beddomei*, from the Anamallies, with seven denticles on the upper edge of the second joint. Among the very large number of specimens of *T. scabrinus*, (n. sp.), I found instances in which the second left joint has occasionally six denticles, while the right one had constantly only five. This clearly shows that the sections solely based upon the character, selected by Mr. Butler, can have only a very limited use.

Thus far I have commented upon Mr. Butler's determinations, but it must be understood that in the above instances my observations are mainly based upon descriptions and figures; for I have no other but Indian specimens for comparison. If those descriptions and figures were found to be incorrect, or not reliable, the mistakes had first to be pointed out and corrected, before a determination, based upon them, was admitted or rejected.

Finally, before entering upon the specific details, I must briefly allude to the geographical distribution of the genus. This distribution extends from South America and the West Indies northwards to Mexico, in a westerly direction through the ocean of little islands to the Philippines, touching North Australia, and stretching North as far as Corea, China and through the Malay Peninsula to Burma and India, where we meet with most of the species in the provinces of Assam and Sikkim, more rarely in Bengal and in South India, including Ceylon, all countries which have a marked admixture of Malayan types. No species is known to occur westward of the country alluded to, not even in Eastern Africa, as far as we know at present. This distribution resembles in so many respects that of the *Passalidæ*, that I shall again return to its discussion at an early opportunity.
The species which I have to notice from India, are:

1. *T. scabrinus*, n. sp.—Cachar, Khasi hills, Assam, Sikkim.
3. *T. (conf.) angustus*, Lucas.—Sikkim, Martaban (Moulmein), and Penang.
5. *T. indicus*, n. sp.—South India, W. Bengal, and Jahore, North of Singapore.

I will make my descriptions as complete* as possible, and will not only give figures of single parts of the body, but also of the perfect specimens, in order to facilitate the determination by identification and not by guess. Figures of single parts are undoubtedly very useful, but they are not sufficient; they do not convey an exact idea of the relative proportions of all the parts of the body, and without paying due regard to these, a really reliable determination of *Thelyphonius* is in my opinion impossible.

1. **Telyphonius scabrinus**, n. sp. Pl. XII. Fig. 1.

The whole upper surface granular; length† of the five terminal joints of the cheliceræ equalling the length of the first eight abdominal segments; the length of last pair of feet equals exactly, or very nearly, the total length of the cephalothorax and abdomen; second joint of the cheliceræ with five spines, third with a spine on the upper and lower inner edge, and equal in length to the fourth joint; a sharp upper ridge connecting the central and lateral eyes; first lower segment of abdomen of moderate size, depressed, with a broadly convex posterior edge.

_Hab._—Sikkim, Assam, Garo-, Khasi- and Cachar- hills.

The cephalothorax is slightly convex, with the anterior ocular portion somewhat higher, but on the whole depressed and flattened, roundly obtuse in front. The two anterior blackish eyes are separated by a moderately elevated smooth tubercle; from its anterior edge proceeds a sharp ridge curving outward, and running along the upper edge to the three lateral eyes, which are pale yellow. The ocular portion is more densely and somewhat more coarsely granular than the thoracic one; the former has a longitudinal central groove,‡ and parallel to it an indistinct elevation on either side, placed nearer

* I know that few would take the trouble of reading them on account of their length, but everybody, who has attempted to determine Arachnoids, will know that a description, unless fully detailed, is worthless for an accurate determination.

† This length is of course measured as far as the joints can be opened without disconnecting the articulation; it is not the aggregate length of the separate joints.

‡ I shall speak of this as the cephalic groove, and of the one on the posterior half of the cephalothorax as the thoracic groove and the lateral thoracic depressions.
to the margins; the latter has also a longitudinal groove which is most depressed in the centre; anteriorly from the central depression proceed two lateral grooves to the postocular depressions, and from the centre itself two on either side towards the margin. The sternum is triangular, obtuse in front.

The abdomen is moderately depressed, very elongately ovate, across the middle about one-twelfth of an inch broader than the thorax; granular above, with the posterior segmental edges crenulated; the muscular points* are round and well marked on the second to eighth segment, the three last segments are mostly smooth, the last joint being roundly compressed towards the upper end, with a small vertical and elliptical gland on either side. Below, the first nine segments are finely scrobiculately punctated at the sides, and smooth along the centre; the first joint is largest, equaling in length the three last ones, with the central portion of the posterior edge somewhat convexly produced; the second joint is barely curved at the edge and the third, like the succeeding, quite straight. The muscular impressions are elongate and well marked on the fourth to seventh joints, but a little less distinct and more approximate on the first and second joints. The caudal seta very nearly equals in length the whole of the body, it is always peculiarly attenuated towards the end, and all the joints are more or less hairy. The length of the joints and their number is very variable; the first is as usually the longest, the succeeding either gradually decrease in length, or some of them situated near the middle are longer than the rest.

The cheliceres may be regarded as of proportionate size to the body. The two first joints have each a strong spine in front, provided with a sharp joint and a small denticle on the inner side. The second joint has the upper side depressed, anteriorly moderately produced, with three small denticles on the inner edge, and two larger ones on the anterior one; the outermost large denticle is somewhat more distant from its preceding one, than any of the others from among each other, but all are directed forward and inward; the inner concave side of this joint is coarsely granular, and the lower anterior corner has two denticles, of which the terminal one is the larger. The third joint on the upper side is equal in length to the second, and laterally along the middle to the fourth; it always has a small denticle on the inner anterior corner, and a larger one in front of the middle of the lower edge. The anterior process of the fourth joint equals in length the fifth joint, it is depressed, smoothish, with a rapidly contracted sharp point and serrated edges, the posterior serration being slightly coarser.

* These points or depressions are very often called stigmatic points, but they have nothing in common with the stigmata, which lie under the edge of the first lower abdominal segment, and are not externally visible; the depressions are merely places of the inner attachment of the muscular bundles which connect the upper chitinous integument with the lower one.
and beginning with two somewhat larger denticles at the base of the process; this fourth joint also has a minute denticle on the lower anterior corner. The fifth joint is invariably conspicuously shorter and thinner than the fourth, anteriorly with a strong depressed, sharply pointed process which is somewhat more coarsely serrated posteriorly than anteriorly; the lower anterior corner of this joint has two denticles, the anterior of which is somewhat stronger than the corresponding denticle of the preceding joint. The sixth joint, or movable claw, is somewhat longer than the process of the fifth, slightly inwardly curved, sharply pointed, above and below with a finely serrated edge, internally on the concave side with a smooth ridge, and two equally smooth ones are externally on the convex side.

The first pair of feet are thin; the terminal eight tarsal joints are shorter than the preceding metatarsal one. The coxal and femoral joints of the three other pair of feet are thick, depressed, very densely and finely granular.

**Colours.** Full grown specimens are above brown, slightly darker on the cephalic portion of the thorax and on the cheliceres, except near their ends; all the feet from their tibial joints to the end are red, and each joint of the three posterior pairs has near its terminal upper edge a black dot; the last joint of the maxilla, the ocular tubercle and the claws are black. On the lower side the cheliceres, the prosternum, the abdomen are more or less dark brown, the coxae of the feet and the sternum are yellowish brown and the feet reddish brown.

The following are the dimensions of a specimen of very nearly the same size as the one figured by Koch as *T. prosectorio*.

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total length of cephalothorax and abdomen</td>
<td>37 mm</td>
</tr>
<tr>
<td>Length of cephalothorax</td>
<td>13.6 &quot;</td>
</tr>
<tr>
<td>&quot; abdomen, including the three terminal joints</td>
<td>23. &quot;</td>
</tr>
<tr>
<td>&quot; cheliceres, measured above, without basal joint</td>
<td>17.5 &quot;</td>
</tr>
<tr>
<td>&quot; first pair of feet, excluding the basal or coxal joint</td>
<td>44. &quot;</td>
</tr>
<tr>
<td>&quot; second ditto</td>
<td>25. &quot;</td>
</tr>
<tr>
<td>&quot; third ditto</td>
<td>26.5 &quot;</td>
</tr>
<tr>
<td>&quot; fourth ditto</td>
<td>36. &quot;</td>
</tr>
<tr>
<td>&quot; abdominal seta, ditto</td>
<td>36. &quot;</td>
</tr>
</tbody>
</table>

In young specimens (with a total length of about 20 mm.) the abdomen is often slightly longer in proportion to the length of the cheliceres, but there is not the least difference in structure. The body and cheliceres are olivaceous brown, the process of the fourth joint, the whole of the fifth and sixth joints of the cheliceres red; coxal and femoral joints of all feet olivaceous, the remaining joints and the seta yellowish red. On the lower side, the basal joint of cheliceres is pale brown with the spinal processes red, the three following olivaceous brown, the two terminal red; prosternum
olive brown, coxae and sternum yellowish brown, abdomen pale brown, feet of the same colour as on the upper side.

The species grows to a large size: the largest specimen from Sikkim has the total length of cephalothorax and abdomen 50 mm.

In Sikkim the species is found from 1000 to about 4000 feet in damp places under wood, more rarely under stones. It is the most common of all the Indian Thelyphonii. I have examined about forty specimens of all sizes from 20 to 50 mm., and all exactly agree in structure.

It seems very improbable (judging from the localities recorded by Mr. Butler) that there should be no specimens of this species in the British Museum, but I am not certain whether Mr. Butler refers to it under T. rufimanus or proscorpio. He must have thought it not worth while reading my description and comparing my figure of T. Assamensis, or else he could not have referred it to the present species.

The original name T. proscorpio of Latreille (Gen. Crust. et Insect., 1806, p. 130) was, strictly speaking, proposed for Linné's Phalangium caudatum. In spite of the numerous references to figures in various old books, it is entirely impossible to trace the species which Latreille had in view. The name would have had to be entirely ignored, but for its timely rescue by Koch who figures a Javanese species under Latreille's name, giving the same synonymy, (Arachniden, Vol X, p. 26, pl. 333, fig 771). Judging from mere figures, we are, I think, justified to regard the species, delineated by Koch, as different from Lucas' Th. caudatus (to which I shall refer further on). Koch's proscorpio would appear to have the joints of the cheliceres shorter and thicker, the fifth much stronger than the fourth, (while the reverse is observed in Lucas' figure), the centre of the anterior upper abdominal joints keeled, the first, lower abdominal joint very large and with a longitudinal groove. I hardly think that Lucas could have overlooked the last character, when describing the first lower abdominal joint; and besides that in his species he particularly refers to a separate small spine preceding the great spinal process on the fourth joint of the cheliceres; it is indicated in his figure, but not a trace of it is to be seen in Koch's figure. For these reasons, it seems to me clear that we have to consider Latreille's re-established Th. proscorpio as distinct from Linné's re-established T. caudatus.

Butler also doubtfully refers Lucas' T. augustus to his compound mixture of Th. proscorpio, but with still less reason, as I shall presently shew.

2. Thelyphonius Assamensis, Stol. Pl. XII. Fig. 2.


The whole upper surface granular; the length of the five terminal joints of the cheliceres fully equals the first nine abdominal segments; the last foot is
longer than the cephalothorax and abdomen together; second joint of cheliceres with five subequal spines, four being on the inner, one somewhat more distant on the upper anterior edge; third joint with a single strong spine on the lower median edge, it is longer and slenderer than the fourth joint, whose anterior process is long, subcylindrical, smooth posteriorly, denticulate on the antero-interior edge; a sharp denticulate ridge connects the central with each group of lateral eyes; first lower abdominal segment depressed, particularly in the middle, with the posterior edge convexly produced.

Hab.—Assam and Sikkim. The species is much rarer than the previous.

It will be seen from this abbreviated characteristic that the species is very closely allied to the previous, but after having examined several specimens of each, exactly agreeing with each other, I think they must be looked upon as two distinct species. I have already given a detailed description of the present one.

In size and coloration it almost exactly agrees with *T. scabrinus*, but is slightly more depressed, the cheliceres are somewhat more slender and longer. The spines on the second joint are subequal, four on the inner edge, and one distant one on the upper edge; the form of the third joint and the process on the fourth differ essentially, as may be readily seen by a comparison of the enlarged figures of the respective cheliceres. The feet are also proportionately longer than in *T. scabrinus*; the eight tarsal joints on the first pair equal in length their preceding metatarsus. Internally along each group of lateral eyes are two imperfect ridges of granules somewhat parallel to the central cephalic groove.

As regards general form and proportional size of the joints of the cheliceres *T. Assamensis* is also closely allied to *T. caudatus*, as emended by Lucas, but the denticles on the second joint are very different.

Butler (loc. cit. p. 202) considers *T. Assamensis* as the adult of *T. rufimanus* of Lucas. If such identifications were admitted, we might better give up the idea of distinguishing at all species of Thelyphoni; a superficial comparison of the respective figures will show that the cheliceres and limbs of *T. Assamensis* are proportionately very much longer, than could possibly be attributed to a change in age. Lucas particularly refers to the shortness of the cheliceres* in his description of *T. rufimanus*, their third joint is said to have no spines whatever; the first lower abdominal segment is stated to be very large. Besides that it appears to me, judging from the figure, that there is in Lucas’ species no sharp ridge between the central eyes.

3. THELYPHONUS (conf.) ANGUSTUS, Lucas. Pl. XII. Fig. 3.

* T. augustus, Lucas, Guerin’s Mag. de Zool. for 1835, pl. 10, fig. 3.

Cephalothorax and abdomen long and slender, finely granular above; cheliceres in young almost entirely smooth, in old specimens with the exception of

* They are much shorter than the abdomen.
the second joint mostly smooth, the length of the five terminal joints is about equal to that of the first six abdominal segments, which is slightly more than the length of the cephalothorax; the length of one of the last feet, or that of the caudal seta, is considerably less than that of the cephalothorax and abdomen together; cephalic portion of thorax at the sides between the central and lateral eyes rounded; second joint of cheliceres with five denticles, of which the two uppermost are subequal and larger than the three others; third joint not longer than the fourth, with a denticle on both the upper and lower inner edges; first lower abdominal segment depressed, with the posterior central edge somewhat narrowly produced.

Hab.—Penang, Moulmein, and Pankabari (Sikkim).

I have six specimens for examination, two from each locality; they all agree in the above characters, and appear to me to be referable to Lucas's species.

The slenderness of the body and the shortness of the cheliceres are very striking distinctions as compared with the two preceding species. The cephalothorax is only about half the total length of the abdomen, with the anterior end somewhat narrowly rounded, convex above, the cephalic portion being more distinctly, though still very finely, granular than the thoracic one; the median ocular tubercle is low, rounded, smooth; the central eyes small, black; the sides between them and the lateral amber-coloured eyes rounded, with a slight longitudinal elevation above the latter. The cephalic groove is distinct, beginning a short distance behind the ocular tubercle. The central thoracic impression is rather large, with a very fine groove passing through it; lateral impressions rather indistinct. Prosternum on the face obtusely keeled with a short anterior broad point; sternum ovately subtriangular, smooth, anteriorly subtruncate.

The first nine abdominal shields are on the upper side very finely granulated, with slightly raised lateral and posterior edges. The muscular rounded pits are well marked from the second to the eight segment. The lateral kin is densely and very finely punctated and scrobiculate. The first segment has the middle of the posterior edge narrowly produced, and its length laterally is equal to that of the two succeeding ones; all three are broadly laterally punctated, smooth in the middle, while the other segments are mostly smooth, with only a few fine scattered dots.

The caudal seta is always shorter than the total body; it is distinctly hairy in young specimens, but the hairs easily wear off in adults.

The cheliceres are almost quite smooth in young specimens, while in adults the second joint is on the upper side densely punctated, the other joints are very sparingly covered with hair, these becoming, however, more numerous towards the tips. The first joint is flattened, with two anterior diverging processes, each terminated by a short spine, which has the appearance as if it had
been set into the abbreviated end of the process. The remaining five joints are in form, relative size and denticulations, exactly like those of Th. scabrinus on a small scale, with the single exception that, as already observed, they are mostly smooth. The eight tarsi of the first attenuated pair of feet are considerably shorter than the preceding metatarsus. The remaining feet have the femoral joints depressed and finely granular above.

Colour of adult, above, blackish brown, somewhat less pure on the abdomen and with the three terminal joints of the cheliceres reddish brown, coxal and femoral joints of all feet olivaceous brown, remaining joints bright red; lower side entirely reddish brown, only the second and third joints of the cheliceres, the points or denticles of all the other joints, the prosternum, the femora, the external margins of the abdominal segments, including nearly the whole of the four terminal ones, are blackish; the shades of brown, however, slightly differ: the last joint of the cheliceres being rather bright red, the first pair of feet reddish brown, the coxae and sternum yellowish brown and the abdomen chestnut brown; the seta is reddish brown.

Younger specimens have all the upper dark brown as well as the lower reddish coloration paler, but the ends of the cheliceres are bright red and the feet and caudal seta yellowish red. In the four specimens from Sikkim and Penang the femoral joints of the first pair of feet are dark, in the two specimens from Moulmein the whole of these feet are reddish brown.

The largest specimen from Sikkim measures:—

<table>
<thead>
<tr>
<th>Total length (excluding the seta),</th>
<th>31 m.m.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length of five terminal joints of cheliceres,</td>
<td>11 &quot; &quot;</td>
</tr>
<tr>
<td>&quot; cephalothorax,</td>
<td>10 &quot; &quot;</td>
</tr>
<tr>
<td>&quot; abdomen,</td>
<td>20 &quot; &quot;</td>
</tr>
<tr>
<td>&quot; first pair of feet (excluding the coxa),</td>
<td>26 &quot; &quot;</td>
</tr>
<tr>
<td>&quot; second,</td>
<td>16.5 &quot; &quot;</td>
</tr>
<tr>
<td>&quot; third,</td>
<td>17.5 &quot; &quot;</td>
</tr>
<tr>
<td>&quot; fourth,</td>
<td>25.5 &quot; &quot;</td>
</tr>
<tr>
<td>&quot; caudal seta,</td>
<td>26.5 &quot; &quot;</td>
</tr>
</tbody>
</table>

A comparison of my figures and description of the present species with those of Lucas (loc. cit.) will show, that the form of the body, the proportions of the different joints and the coloration agree as closely as could be expected, so much so that I can scarcely doubt the identity of the two. There is only one point in Lucas' description which, although in itself apparently of no very great importance, is contradictory to what can be observed in my specimens. Lucas says that the third joint of the cheliceres is smooth on the upper inner edge, and provided with a spine only on the lower edge, while in all my specimens there is a distinct though very small spine on the upper edge and a somewhat larger one on the lower. As Lucas’ type is in the Paris Museum, it will be comparatively easy to settle this point by a re-examination of the specimen.
4. Thelyphonus formosus, Butler. Pl. XII. Fig. 4.
Ann. and Mag. nat. hist. 1872, vol. x, p. 203, pl. xiii, fig. 4.

Upper side of body finely granular, of cheliceres nearly smooth, length of the five terminal joints of cheliceres very nearly equalling that of the first nine abdominal segments; second joint of cheliceres on the upper anterior edge with six very small denticles, of which only the two middle ones are pointed, fourth and fifth joints more swollen than the two preceding ones; edge between the central and lateral eyes swollen, rounded, not carinated; length of one of the last feet almost exactly equals the cephalothorax and the abdomen; first lower abdominal segment very large, with the median posterior edge produced, but still truncated, and depressed.

Hab.—Moulmein, (in the Martaban province).

The cephalothorax is comparatively small, its length being only slightly more than half that of the abdomen; it is convex, anteriorly somewhat narrowly rounded, with the cephalic portion behind the ocular tubercle transversely rugose, further on rugosely granular, the granulation being considerably stronger than on the thoracic portion. Ocular tubercle and central eyes small, black. Cephalic groove with slightly raised margins. Edges beginning a short distance behind the central eyes and extending to the laterals broadly rounded and swollen. Median and lateral thoracic grooves and impressions narrow, but distinct and shining smooth. Prosternum narrow, subcarinate; the sternum rather elongately trigonal, anteriorly obtusely rounded, with the sides posteriorly sloping.

The first nine upper abdominal segments very finely granular, with crenulated posterior margins; the muscular rounded pits are distinct on the first eight segments, the three last narrow segments are smooth. Sides punctured, and with small scattered elongated tubercles, of which a median row slightly exceeds the others in size. On the lower side the two first segments are strongly rugose at the sides, the others only punctated, the median portions being smooth, except on the narrow second and third segments on which the punctuation extend almost to the centre. The first segment is largest, with the posterior part centrally produced, but with the edge truncate. The first pair of feet is entirely smooth, the second and third have the femoral joints, and the last all the joints, scrobiculately punctated, the punctuation extending even to the hinder sides of the coxae.

The cheliceres are sparingly hairy, except on the inner sides and near the tip. Each first joint has anteriorly a strong sharply pointed process. The second joint has on the upper margin six denticles, four being on the inner edge,—the two lower obtuse, the two upper pointed and longer,—the fifth and sixth are on the anterior edge, both very small and indistinct, the last is distant from the rest; the anterior half of the joint is transversely rugose; the lower anterior edge has two subequal very small denticles. The third
joint is slender, slightly longer than the second, with numerous sharp granules on the upper rounded inner edge, and one strong spine in the middle of the lower edge. The fourth joint is not longer but considerably thicker than the third, with a long, inner, rather equally slender, smooth, anterior process, with its termination shortly bifid and internally provided with a compressed tubercle. The fifth joint is equal in length to the preceding, but again more inflated, with a short and broad anterior process, sharply serrated on both edges. The sixth joint is moderately curved, externally grooved and with the upper and lower edges finely serrated, and internally pilose.

The length of the eight tarsi of the first pair of feet is less than that of the metatarsus. The femora of the other feet are moderately thickened and depressed.

Colours. Above,—cheliceres and cephalic thorax brilliantly shining blackish brown, remainder of cephalothorax and abdomen dull blackish; maxillae with the exception of their tips and all feet bright reddish chesnut; caudal seta somewhat deeper red; sides of abdomen fulvous brown. Below,—cheliceres on the first joint dark brown, remaining joint blackish brown, sternum, coxae and feet reddish chesnut, abdomen darker chesnut.

I have some years ago collected this species near Moulmein, wherefrom Butler’s type was received. If the second joint of the cheliceres of the type specimen has no indication of any other but two denticles, the occurrence must be looked upon as, an accidental variation. The form of the body and of the cheliceres is so characteristic, that the species cannot be easily mistaken with any other. The following are the dimensions of an apparently full grown specimen:—

<table>
<thead>
<tr>
<th>Measurements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total length of cephalothorax and abdomen</td>
</tr>
<tr>
<td>Length of the first terminal five joints of cheliceres</td>
</tr>
<tr>
<td>&quot; &quot; cephalothorax</td>
</tr>
<tr>
<td>&quot; &quot; abdomen</td>
</tr>
<tr>
<td>&quot; first pair of legs (without coxae)</td>
</tr>
<tr>
<td>&quot; second</td>
</tr>
<tr>
<td>&quot; third</td>
</tr>
<tr>
<td>&quot; fourth</td>
</tr>
<tr>
<td>&quot; caudal seta</td>
</tr>
</tbody>
</table>

5. Thelyphonus indicus, n. sp. Pl. XII. Fig. 5.

An Thel. caudatus auctorum!

Upper side very finely granular; the first nine abdominal segments, centrally, with a partial, very fine carina; cheliceres mostly smooth, except on the second and third joints which are densely punctated; the length of the five terminal joints of the cheliceres equals that of the first seven or seven and a half abdominal segments; the length of one of the last pair of feet is very nearly equal to that of the cephalothorax and abdomen taken together;
a short sharp edge in front of the lateral eyes, not continuing to the central eyes; second joint of cheliceres with six small, subequal denticles, third not longer than the fourth, with a little spine above and below; first lower abdominal segment very large, convex, centrally grooved.

Hab.—South India, Western Bengal, and the Malay Peninsula.

The cephalothorax is rather obtusely rounded, with the perpendicular front side perfectly smooth; the ocular tubercle is also smooth and very high, the circumference round each black central eye being depressed. From the ocular tubercle passes in a curve a rounded edge below the central eye, and after a short distance from this one joins a thin, but sharp and finely serrated, ridge which continues to the lateral eyes; the latter are pale amber yellow. The upper side of the cephalic thorax is flattened, indistinctly granularly rugose, with a rather small central groove. The thoracic portion is very finely granular and most minutely punctated, with the central depressions distinct, but the lateral ones ill-defined. The abdomen is one sixth broader than the thorax, very finely granular, with a fine central carina, scarcely traceable on the fourth and fifth segments; all have a posterior submarginal row of very minute granules; the last three narrow segments are smooth. The first segment on the lower side is very large, smooth, centrally grooved, with the posterior edge somewhat produced and broadly truncate. All the other segments are finely rugose; the second and third being very narrow.

All the joints of the cheliceres are internally distinctly pilose. The first joint is sparingly punctated; on the median anterior part it is transversely rugose, terminating with a sigmoid, pointed process. The second joint has an anterior rounded shovel-like edge provided with six subequal denticles, of which the two outermost are more distant from the other four than these among themselves; on the lower edge there are two unequal denticles. The third joint is short, with a small denticle at the inner upper end and a larger one on the middle of the lower inner edge. Both the second and third joints are densely punctated above and outwardly, and granular below; the following are mostly smooth. The fourth joint is slightly thicker than the third, with a long, pointed, anteriorly and posteriorly serrated process; it has no spine on the lower side. The fifth joint is again somewhat more inflated with a short, broad, depressed process, sharply serrated on both sides; on the front margin of the lower side there a minute denticle. The sixth joint is slender, considerably longer than the process opposite to it; the upper and lower inner edges are, as usually, finely serrated, and near the tip there is on the upper edge a conspicuously enlarged tubercle.

The tarsi on one of the first pair of feet are shorter than the preceding metatarsus. The femoral joints of the other feet are compressed, granular
above, smooth below; the last foot is very little shorter than the whole body, and the caudal seta fully equals in length the latter, it is multi-articulate and densely pilose.

Upper side of cephalothorax and abdomen dull brownish black; cheliceres shining deep chesnut, feet and seta bright chesnut. Lower side,—cheliceres same as above, feet, sternum and first abdominal shield bright chesnut, rest of abdomen deeper chesnut.

<table>
<thead>
<tr>
<th>Description</th>
<th>Measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total length of cephalothorax and abdomen</td>
<td>35.5 m. m.</td>
</tr>
<tr>
<td>Length of five last joints of cheliceres</td>
<td>17.3 &quot; &quot; &quot;</td>
</tr>
<tr>
<td>cephalothorax</td>
<td>12.1 &quot; &quot; &quot;</td>
</tr>
<tr>
<td>abdomen</td>
<td>22. &quot; &quot; &quot;</td>
</tr>
<tr>
<td>first pair of feet (with coxae)</td>
<td>38 &quot; &quot;</td>
</tr>
<tr>
<td>second</td>
<td>22. &quot; &quot;</td>
</tr>
<tr>
<td>third</td>
<td>24. &quot; &quot;</td>
</tr>
<tr>
<td>fourth</td>
<td>33. &quot; &quot;</td>
</tr>
<tr>
<td>caudal seta</td>
<td>36. &quot; &quot;</td>
</tr>
</tbody>
</table>

The preceding description and the figures refer to a South Indian specimen which I had received from Major Beddome.

Another specimen was collected by Mr. Ball near Sirgúja in Western Bengal. It agrees with the former in every particular, except that the denticles on the second joint of cheliceres are somewhat stronger, and that the fourth and fifth joints are not so much inflated, both being only slightly thicker than the third.

Several other specimens were obtained by Mr. Wood-Mason’s collector at Jahore, at the extreme south end of the Malay Peninsula. These also agree in every point of structure, the proportions of the body, &c., with the type form, but the first, second, third and fourth joints of the cheliceres are more densely punctated, while the humidity of the fifth is intermediate between the South Indian and the Bengal specimen. The six denticles on the second joint of the cheliceres are well developed, and the process on the fourth is a shade broader than in either of the two Indian specimens.

Judging from the references to the two localities Madras and Bengal, it would seem probable that the present species had been alluded to by Mr. Butler under the name *Th. caudatus*, though the remark referring to the broad body and depressed abdomen would rather apply to the next species.

But here the question arises what is *Thelyphonus caudatus* = *Phalangium caudatum* of Linneus? Mr. Butler (loc. cit.) gives among others as the reference of *T. caudatus* Linne’s Syst., and Fabricius’ Ent. Syst. If anybody will look through these references, he will, I think, find very little satisfaction in the definition of *T. caudatus*.

As habitat of the species, Mr. Butler gives Ceylon, Madras, Bengal and Tenasserim, and says that it is a broad, well marked form, having
six teeth on the second joint of cheliceres and a very depressed* abdomen, and that it has been confounded with two, if not three, other species! Now I confess after having carefully looked over the references alluded to and Mr. Butler's notice, I have not succeeded in tracing Linné's *T. caudatus*, nor will, I think, anybody else do so; and if the species has been confounded by older writers, as no doubt it was, Mr. Butler has only added his share to that confusion.

Let us see whether and how far we might be justified to adopt the name *T. caudatus*.

Linné named a species in 'Syst. nature 619, n. 2' Phalangium caudatum, which he characterises as 'chelis ramosis, anu setisero.' In Museum Lud. Reg., 1764, p. 426, the celebrated author describes the same species in detail and gives 'habitat in Java,' quoting at the same time Seba's figures 7 and 8 on pl. 70 of his Thesaurus. To determine anything according to Seba's figures is an altogether hopeless case, but we know that Linné's description of Ph. caudatum was drawn up after a Javanese specimen, and we must, therefore, look to Java for Linné's Ph. caudatum. When we see through our literature we find, I think, only two descriptions and figures, which can bear out any comparison with Linné's type, and these are Lucas' *Th. caudatus* ex Java, and Koch's *Th. proscorpio* ex India orientali et Java.

In reading carefully over Linné's description, I think, the passages corpus.......ferrugineum,.........chelae......articulis 5 constructae......β (i. e. articulus tertius) subrotundus, inermis,... γ (i. e. art. quartus) subrotundus...... are decidedly more in favour of Lucas's than of Koch's figure. If we, therefore, wish to retain Linné's name we can reasonably, I believe, only adopt it in the form in which it had been introduced into science by Lucas in his Monograph of the genus in Guerin's Mag. de Zoologie for 1835. Any other meaning, which we force upon Linné's name, is more arbitrary than this, still I do not wish to leave altogether the references of previous authors to this name without notice.

I have already (p. 133) stated the reasons, which appear to me to indicate that Koch's reinstated *Th. proscorpio* of Lattreile is distinct from Lucas' *Th. caudatus* of Linné.

Fabricius copied Linné. In Syst. entomologici, 1775, p. 411, he only added 'habitat in India orientali,' and I do not think it improbable, that several specimens of *Thelyphoni* had been sent by the French and German Missionaries from South India to European Museums.

Pallas' two figures most probably refer to *Th. scabrinus*. He also had Indian specimens.

Lattreille, both in his Hist. nat. des Crust., p. 130, pl. lx, fig. 4, and in his Gen. Crust., p. 130, evidently confounded various species from differ-

* Linné says: abdomen ovato-oblongum, supra et subtus gibbum.
ent parts of the world under one name. He does not give any descriptions.

The figure in Guerin's Régne animale would, if correct, represent a
species distinct from Th. Antillanus, Koch, as already (p. 128) observed.

Douges and M. Edwards' figure in their edition of the Régne animale
most likely represents Koch's T. proscorpio.

I do not think it would be profitable to go further with this review,
even if I had all the old books at hand. I have looked over many of these
historical figures and descriptions, and if anybody wishes to study the history
of the genus, he might do the same, but if he wishes to determine his species,
he will find it much more profitable, to ignore every reference written
prior to 1835, the date of Lucas' Monograph of the genus.

6. Telyphonous Beddomei, n. sp. Pl. XII. Fig. 6.

Upper side of body granular, of cheliceres sparingly punctated; length
of the five terminal joints of cheliceres equal to the first eight abdominal
segments, these have on the upper side a median thin ridge; second joint of
cheliceres with seven denticles on the upper edge; third joint on upper side
shorter than the fourth, above and below with a spine; the length of one of
the last joints very nearly equals the total length of the body; a very fine short
ridge in front of the lateral eyes; first lower abdominal segment enlarged,
along the middle indistinctly grooved, with the posterior edge centrally much
produced and rounded.

Hab.—Annamally mountains, South India.

The cephalothorax is much higher anteriorly than posteriorly, rounded
in front, with the ocular tubercle prominent, smooth, its posterior portion
being separated by a fine incomplete transverse groove from the intra-ocular
one; central eyes of moderate size, dull yellowish; lateral eyes amber coloured,
with a short, very thin and finely serrate ridge in front of them, dis-
appearing already at the middle of the distance between the lateral and
central eyes. Cephalic thorax granularly rugose, shining; thoracic portion
conspicuously broader, more finely granular, dull. Cephalic groove deep,
median thoracic and postocular pits and lateral groove well developed,
smoothish, shining. Sternum elongately semi-elliptical. Abdomen rather
broadly ovate and depressed, above granular, with very slightly raised pos-
terior and lateral margins, the first eight segments with a central longitudi-
nal fine ridge. Sides granularly scaly. Lower surface almost smooth, with
spare fine pits; first segment much larger than any of the others, depressed-
ly convex, longitudinally indistinctly grooved, and with the central poste-
rior edge considerably and rather narrowly and roundly produced.

First joint of cheliceres with the usual anterior process, provided
with a rapidly attenuated sharp point. Second joint on the upper edge with
seven denticles, of which the outermost is the smallest and the median on
the inner anterior corner the largest; below with two subequal denticles. Third joint with a distinct denticle on the upper and a slightly larger one on the lower side, the latter is accompanied by a minute sharp granule. These two joints are above and below rather densely punctated. The fourth joint is more swollen and larger than the third, with a depressed, anteriorly and posteriorly sharply serrated process, and a little spine on the median anterior lower edge. Fifth joint somewhat thinner than the previous, with a quite similar process than on the preceding joint, but slightly shorter, and also with a denticle on the lower side. Sixth joint, or movable claw, long, with the upper and lower inner edges serrated.

Tarsi of first pair of feet slightly shorter than the preceding metatarsus. All other feet with compressed, and on the upper side finely granular, femoral joints. Caudal seta slender, with rather elongated, hairy joints; its length equals that of the whole body.

Body including the seta, above, dark brown, on the cheliceres and on the cephalic portion of the thorax shining blackish brown; feet chestnut; lower side, deepest brown on the cheliceres and on the posterior end of the abdomen, dark brown on the first joint of cheliceres and on the anterior part of the abdomen, and lighter brown on the coxae of the feet and on the sternum.

Total length, ................................. ................................. 40.5 m. m.
Length of the five terminal joints of cheliceres, ................................. 19 " "
" cephalothorax, ................................. 14.5 " "
" abdomen, ................................. 25. " "
" first pair of feet, ................................. 42.5 " "
" second, ................................. 23.2 " "
" third, ................................. 23.5 " "
" fourth, ................................. 28. " "
" caudal seta, ................................. 39.5 " "

The number and distribution of the denticles on the second joint of the cheliceres, the broad abdomen, the form of the first lower abdominal segment, and the slightly longer limbs distinguish the present species from the previous.

Explanation of plate XII.

Fig. 1. Thelyph. scabrinus, n. sp., p. 130; 1a, right chelicer, enlarged twice the nat. size; 1b, four anterior lower abdominal segments.

Fig. 2. Thelyph. Assamensis, Stol., p. 133, right chelicer, enlarged twice the nat. size; 2a, four anterior lower abdominal segments.

Fig. 3. Thelyph. (conf.) angustus, Lucas, p. 134; 3a, left chelicer enlarged three times the nat. size; 3b, four anterior lower abdominal segments, enlarged twice the nat. size.

Fig. 4. Thelyph. formosus, Butler, p. 137; 4a, right chelicer, and 4b, first four lower abdominal segments, both enlarged twice the nat. size.

Fig. 5. Thelyph. indicus, n. sp., p. 138; 5a, right chelicer, in twice the nat. size; 5b, four first lower abdominal segments.

Fig. 6. Thelyph. Beddomei, n. sp., p. 142; 6a, left chelicer, in twice the natural size; 6b, four first lower abdominal segments.
Note on the genus Gymnops, W. Blanf., (Lacertidae),—
by W. T. Blanford, F. G. S., C. M. Z. S.

[Received 12th April, 1873.]

In the Journal of the Asiatic Society of Bengal for 1870, Vol. xxxix, Pt. II, p. 357, I proposed to distinguish a new and peculiar form of Ophiops from Chhatisgarh by the subgeneric title of Gymnops. The species, to which I applied the name of Ophiops (Gymnops) microlepis, differs from the typical forms of Ophiops found in India and Western Asia in its more elongate proportions, longer tail, single postnasal and minute dorsal scales.

Dr. Stoliczka has since obtained the same species in other parts of India and especially in Kachh (J. A. S. B. 1872, Vol. xli, Pt. II, p. 90 and Proc. A. S. B. 1872, p. 74), and he has adopted the name Gymnops as a generic term, founding the distinction from Ophiops mainly on the difference in the character of the dorsal scales, which are much smaller and more granular than in true Ophiops, although they are distinctly keeled and imbricate. Quite recently Proc. A. S. B., July 1872, p. 126, Dr. Stoliczka has described a second species Gymnops meizolepis from Kalabagh on the Indus. This has somewhat larger scales than G. microlepis, but it possesses the same elongate form, the tail from the anus being more than twice the length of the body, and it again presents the peculiarity of a single postnasal instead of two or three as in Ophiops.

But the name Gymnops, whether considered as generic or subgeneric, cannot be retained for this type of naked-eyed lizards, as it has been twice employed in ornithology, having first been applied by Spix to a South American genus of Raptoreae, for which, however, an earlier generic title viz., Daptriæ existed, secondly by Cuvier to a Malayan genus of Sturnidae, allied to Eulabes.

Under these circumstances I propose to change the name of the Indian lacertian genus, above specified, to Chondrophiops in reference to its somewhat granular scales.
ON AQUILA BIFASCIATA AND AQUILA ORIENTALIS,—
by W. E. Brooks, C. E., Assensole.

[Received 8th April, 1873.]

I have long had in my possession two specimens of Aquila orientalis, Cab., one sent me by Dr. Bree and labelled by Mr. Gurney, and the other from Mr. Dresser. The latter is a Sarepta specimen from the Volga region, and the former, from the Dobrudscha.

On returning the Dobrudscha example, which Dr. Bree had submitted to Mr. Gurney, the latter sent the following memorandum.

"The eagle which I have ticketed 'Aquila orientalis, Cab.', is identical with that so often sent in collections from Sarepta near the mouth of the Volga, and is in fact the only species of Eagle which I have seen from that locality. I have hitherto been in the habit of calling this eagle 'Aquila clanga of Pallas,' but as Pallas does not appear, by the description of his Aquila clanga in the Zoog. Ross. As., Vol. I, p. 351, to distinguish between this eagle and the smaller spotted eagle A. nevia, and as his measurements, which are given in old French feet, inches, and lines, (for a scale of which see Finsch and Hartlaub's Vögel Ostafr.) agree better with A. nevia than with the present species, it will perhaps be best to adopt for the present species the name of Ag. orientalis, proposed by Cabanis in the Journal für Orn. 1854, p. 369, (note), which though not very well chosen is the next in order of priority and the earliest that can with certainty be applied to this eagle exclusively. The specimen now sent appears by its measurements to be a female, and is in adult plumage; the immature birds of this species being spotted in precisely the same manner as those of Aquila nevia which is well shewn in Yarrell's figure of the 'Spotted Eagle.'"

I quote this memorandum by Mr. Gurney to shew upon what good authority one of my specimens is named Aquila orientalis, and the other, sent me by Mr. Dresser labelled A. clanga, Sarepta, closely resembles it.

Mr. Gurney's statement, that the immature is spotted like Aquila nevia, is, as far as I can see at present, a mistake; for we have the bird in India (A. bifasciata) and it never in any way resembles A. nevia.

I have, from the first, been struck by the great similarity of these two specimens to our Indian Aquila bifasciata, Gray and Hardwick; but had not till the other day obtained Indian specimens according in every respect, to a feather, with the European examples of A. orientalis, above referred to. Now I have, and the accordance is so beautifully perfect, that there is no
alternative, but to come to the conclusion that *A. orientalis* is identical in every respect with *A. bifasciata.*

I have now, therefore, three European killed examples of *A. bifasciata*; the third being that sent me by Capt. Elwes, and referred to in “Stray Feathers,” Vol. I, p. 291. The two first are in nearly mature plumage, and the third is quite mature; and is the finest specimen of the bird I have seen.

The two sent as "*A. orientalis*" have only slight indications of the nuchal patch; otherwise I should have recognized them at the first glance as *A. bifasciata*, as was the case with Capt. Elwes's Bosphorus bird. This term has, I believe, priority over *A. orientalis*, Cabanis, and if so will be retained for this eagle.

The application of Pallas's term "*A. clanga*" to the same species by some European writers is, I believe, an error, if I read the original description correctly. It appears to refer to our Indian spotted eagle which we accept as *Aq. navia*, and which I believe to be the true *navia*. Klein, whose work is dated 1750, is the author of the term *Aquila clanga*, and Pallas quotes and adopts this *synonym* in preference to the older term *Aquila clanga*, Schwenckfeld. This term Pallas also quotes under the head of *Aquila clanga*, but as a synonym. Schwenckfeld's work is dated 1603.

In a letter received the other day from my friend Mr. Anderson, he records the occurrence of a lineated *A. Mogilnik* at Aden, which was stunned by flying against the telegraph wires there.

I may as well mention here that the Indian Imperial Eagle, to which I applied Hodgson's term of *A. crassipes*, is identical with the East European bird, *A. Mogilnik*, better known as *A. imperialis*, but the former is the prior term.

I compared our bird with an adult Turkish specimen sent me by Dr. Bree. Mr. Gurney also came to the same conclusion, after comparing the adult Indian birds, I had sent home, with European examples.

The West European Imperial Eagle is, however, quite distinct and is now known as *A. Adalberti*, Brehm. This is the species said to have no lineated stage, and having, when adult, an excess of white on the scapulars and ridge of wing.

* [Mr. V. Ball and I had the pleasure of comparing the two specimens of *A. orientalis*, referred to by Mr. Brooks, with a series of Indian *A. bifasciata*. They undoubtedly appear to be perfectly identical, both in structure and coloration. If the determination of those two specimens as *A. orientalis* is correct, (and upon such good authority, as Mr. Gurney, it ought to be), there can be no doubt that the two species must be considered as identical. F. Stoliczka.]
I sent a fine series of our Indian *Aquila hastata* to the Norwich Museum. Mr. Anderson also sent one example in mature plumage.

Besides these we sent others to ornithological friends. I hear from Messrs. Gurney and Dresser, that the adult plumage of this species is not to be distinguished from that of the small Pomeranian spotted Eagle which they term the true *Aquila navia*.

They assert, however, that though the adults are alike, the immature birds differ.

This is a point for further investigation, but the perfect accordance of the adults leads me to expect the same in the immature birds. The connection between the immature and the adult is the first point to be established, and this can only be done by the field naturalist.

One of my ornithological friends informs me that the immature of *A. orientalis* (which we have shewn is *A. bifasciata*), has spotted plumage like that of *A. navia*; another friend informs me he has received the immature bird, and it "is strangely like *A. bifasciata*!" Now the latter eagle is *not* spotted, and the "doctors," who are both men of repute, "differ."

These points will all be cleared up it is to be hoped before long; and we shall perhaps have the natural history of the Eagles as clear and as correct as that of the common Rook, with little or nothing else to be learned. At present the Eagles appear to be in a state of dire confusion, which the English naturalists are daily making worse.*

* Since the foregoing was written, Capt. G. F. L. Marshall, who is much interested in this subject, came and examined the series used. He fully concurred in the identification of *A. orientalis* with *A. bifasciata*, and was even more positive than I was that the Danzig killed *Aquila hastata* was indeed that species. It will be remembered, it was sent to me labelled "*A. navia*." My English Ornithological friends with whom I communicated are incredulous regarding my identifications, and I, therefore, refer to my friend's corroboration. If all fails to convince them I shall have the series exhibited at a meeting of the Zool. Society.
A Contribution towards a Monograph of the Indian Passalidæ,—
by Dr. F. Stoliczka.

[Received 27th April, read 7th May, 1873.]

Some years ago, when I visited my veteran friend Dr. J. J. Kaup in Darmstadt, I found him, quite unexpectedly, busily engaged with Passalidæ. He urged me most strongly to collect Indian specimens, which I did; but the collection progressed so very slowly,—in spite of the very numerous applications which I made for assistance,—that Kaup's Monograph of the family appeared early in 1871* without my little contribution in the way of Indian materials.

When I saw that the geographical distribution of the Passalidæ is so very peculiar and interesting for the study of our Indian fauna, I resolved to continue my researches, and to publish as far as possible a revised Monograph of all the Indian species, with such little additions to the anatomy and development, as might be obtainable. Of these points I shall, however, not speak on this occasion; they will be fully treated in my Monograph, which will be accompanied with all the necessary illustrations. I will merely mention that in India we meet with Passalidæ in those districts only which have a Malayan fauna. No species is as yet known from the Himalayas west of Nipal, or from any part of Central India or the Panjáb.

The object of the few following lines is chiefly to give a list of the Indian species with authenticated localities, together with diagnoses of the new species which had lately come under my observation. I am sorry that I cannot complete more fully the task which I undertook, but in the middle of pre-

parations for an expedition to Central Asia I am not allowed to do more, than to
shew those who assisted me that their materials had been duly appreciated.
My old friend Dr. C. Felder, the Lord-Mayor of Vienna, has sent me the whole
of his collection of Passalidæ for examination, and Dr. L. Redtenbacher, the
Director of the Vienna Museum, sent me a great number of eastern species.
These are rare instances of liberality and true interest in the work. My
thanks are further due to Messrs. W. S. Atkinson and J. Wood-Mason, Messrs.
Péal (Assam) and Mandelli (Darjeeling), Major H. H. Godwin-Austen, Major Beddome, Mr. Stahlknecht of Singapore, Mr. Theobald, Rev.
Baker, Dr. Cameron, the late Dr. Walter Abbey and the late Capt. Mitchell of
Madras. The original collection in our Museum contained only five of the
commonest species.

In recording the species I will follow Kaup’s last Monograph on the
subject. Whatever opinion various naturalists may have regarding the mode
of classification which that distinguished author has adopted, I do not
think that they will find much fault with the limitation and characteristics
of the genera* and species. Undoubtedly that Monograph is the most
complete and the most remarkable paper which the philosophical school of
naturalists has in late years produced. I am now not prepared to say any-
thing for or against it, but I will do so in my Monograph, when I hope to
have examined a larger number of Passalidæ, than I had been able to do
up to the present. Such mental productions† must not be disposed of with
prejudice, they are entitled to receive a fair trial and a full share of all opi-
nions pro and con, before we side one way or the other. Nobody will, after
careful perusal, deny the fact, that Kaup’s classificatory arrangement has in
many respects very considerable advantages; it is easy and practical, but
time and research must shew whether it can be adopted or not. Whenever I
shall have any scruples against generic definitions, or against the quinquennial
divisions, I shall state my reasons without any reference to the validity of
the whole system.

Before proceeding to the details I have only to mention that I shall
include in the present list all the species known to occur in the East Indies,
viz., India proper (Vorder-Indien), with Eastern Bengal, Burma, and the
Malayan Peninsula as far south as Singapore (Hinter-Indien).

Sub-fam. AULACOCYCLINÆ.

1. Aulacocyclus Parryi, Kaup.
I received numerous specimens from Malacca.

* Even in the very limited sense in which the author defines them.
† For a short exposition of the principles of the system, and a brief discussion
thereon, see Proc. of the Society for May, 1873.
2. Ceracupes Austeni, n. sp.
This species possesses all the characteristics of the genus, as given by Kaup. Total length 22 m.m., width of head 4:8, of prothorax 6:6, of wings at the shoulders 6:8, length of elytra 12:3 m.m.

In general structure it is very like C. fronticornis, but the clypeus-horn is obtusely rounded at the end, not emarginated, the upper concave edge is punctated, longer and narrower than in that species. The processes on the jaws are posteriorly flattened and rugosely striated, anteriorly convex and smooth. The lateral scar of the prothorax forms a punctated S. Scutellum smooth, waist at the sides densely punctuated.

The furrows of the wings are coarsely punctated, without any perceptible hair. The metasternum is convex, generally smooth, only along lateral margins finely punctated. The median tibiae have externally two spines, the posterior ones only an indication of a small point.

Hab.—Naga hills, North Eastern districts of Bengal. Major H. H. Godwin-Austen found a couple of specimens at an elevation of 6000 feet.

I have never received C. fronticornis from any of these districts. It must come from the Chinese portion of eastern Tibet, for western Tibet has no forests.

3. Comacupes cylindraceus, Perty.

Hab. Johore, at the southern end of the Malay Peninsula. One specimen measures: total length 26:4 m.m., width of clypeus 5:5, (Kaup gives 7 m.m.) width of prothorax 8, (Kaup gives 9), length of elytra 14:9 m.m., (Kaup gives 25:4, which is clearly a mistake for 15:5 m.m.).

Kaup's specimens from Malacca appear to have had a much broader clypeus and prothorax, but the two Johore specimens which I examined agree with the description of the species in every other detail.

4. Comacupes Masoni, n. sp.
Total length 30:5 m.m., width of clypeus 6:4, of prothorax, or shoulders, 9:1, length of elytra 16:75 m.m.

Resembles C. basalis, but is much more slender; upper lip with the front surface sloping, but scarcely indented at the edge; densely hairy. Clypeus densely punctated and shortly hairy, except in front of the horn, which is large, compressed, strongly projecting in front and very slightly elevated, with an obtuse end sharpened from below, its posterior end is almost vertical without a free point, the upper ridge is obtusely rounded, except for a short distance along the middle which is concave and rugose. Prothorax with the lateral scar small, smooth, with a little dot in front of it, as in C. cylindraceus, but in the present species the marginal furrow is in front near the corner almost angularly bent in. The furrows on the wings are slightly more coarsely punctated, than in the last species.
Scutellum and the waist at the sides and the whole of the lower side densely punctated and shortly hairy. Lower lip densely and coarsely punctated and hairy, with barely an indication of a central carina. The last four abdominal segments almost quite smooth. Middle and hind tibiae each with a strong spine.

_Hab._—Johore, obtained by Mr. J. Wood-Mason.

Kaup quotes _C. cavicornis_ from Malacca and Penang. I have not seen it, but there is a specimen of a _Comacupes_ in Dr. Felder's collection, evidently belonging to a new species.* Its locality is given as Bras., which clearly means Brasilia, there is, however, no such form described from America, the specimen came much more likely somewhere from the Philippines.

5. _Tæniocerus pygmæus_, Kp.
Malacca. I have as yet obtained only a single specimen.

6. _Tæniocerus bicanthatus_, Guér.
Johore, north of Singapore.


* _Comacupes Felderi_, n. sp. Total length 22·5, width of clypeus 5·8, width of prothorax 6·6, of shoulders 6·8, length of elytra 13·2 m.m. Upper lip in front and laterally deeply concave, as in _Autac. teres_. Jaws with the upper of the three front teeth very small. Clypeus smooth, with a fine groove along the anterior straight margin. Horn situated far behind, as in _basalis_, rising almost vertically, slightly inclined forward, behind with a convex, smooth, simple and rounded edge; anteriorly below the point it is first vertically truncated, then concave, falling with a broad surface to the large forehead. Ocular ridge sharply angular in the middle, terminating with a small sharp point in the anterior corner of the clypeus.

Prothorax with a median groove, deepest about the centre, and a punctated, complete marginal furrow, only slightly bent in anteriorly; lateral scars small, sub-semilunar, deep, finely punctated. Wings in the furrows indistinctly punctated, not hairy. Scutellum smooth, waist at the sides finely punctated, below entirely smooth as is also the case with the metasternum and the abdominal segments. Tongue with a central carina and with the lower halves of the sides somewhat concave and roundly dilated. Lower lip smoothish in the middle, with a central impressed projection in the front edge; its lateral branches densely punctated. Tibiae of the front feet very broad, each with six denticles; middle and hinder tibiae stout, each with a sharp spine.
Jaws bidentate at the end; upper lip truncated in front, covered with red stiff hairs. Antennæ long, with only three short terminal lobes. Clypeus uneven, but not punctated; the central horn is flatly convex, smooth, transversely very elongately subtriangular, anteriorly with a small projection, ending in a small free point, from which diverge in a slight curve the, frontal ridges, terminating with distinct tubercles near the front edge. This frontal edge has a sharp process above each of the two lateral margins of the upper lip, the left appears to be occasionally a little larger than the right one, recalling a similar structure in *Basilianus*. The two frontal tubercles are connected by a low ridge and the margin between them is deeply concave. Supraocular ridges with a sharp point above each eye, flattened in front, and externally at each corner terminating with a small spine.

Prothorax moderately convex, with a distinct central groove, but not extending anteriorly to the margin; marginal furrow narrow, finely punctated; lateral scar forming a shortly elongated and smooth impression.

Scutellum at base finely punctated and hairy, along each side of the centre finely strigated. Waist laterally densely punctated, below smooth, somewhat transversely rugose, but without any special scar.

Elytra with the shoulders somewhat swollen and projecting, smooth; all the furrows distinctly punctated.

Tongue long, with a median and two marginal ridges, strongly contracted in the lower half. Lower lip with its branches entirely punctated and hairy, slightly depressed in the middle.

Metasternum laterally densely punctated, but the posterior sloping corners are smooth, which is also the case with all the abdominal segments.

Prothorax at the lateral lower sides, and the median femora, covered with dense, long, rufous-brown hair; anterior femora, sides of metasternum and hinder tibie a little less hairy.

*Hab.*—Nilgheries and Malabar. I received originally two specimens of this species from the Madras Museum, but since then several others have been sent to me by Major Beddome and Rev. Baker.

Kaup describes a single species, *P. pilipes*, from Sumatra. The generic characteristics have to be slightly altered, but in all essential points the South Indian species agrees with *Pleurarius*.

9. **Semicyclus Redtenbacheri**, n. sp.

Total length 25.4, width of clypeus 5.2, of prothorax 7.3, of shoulders 7.1, length of elytra 14.3 m.m.

Jaws rather short, each with three denticles; antennæ moderately elongated, the three terminal lappets well developed and equal; upper lip squarish hairy, very slightly concave at the front edge.

Clypeus rugose, punctated on the forehead, front edge very slightly emarginate in the centre, and with a small projection above the edges of the
upper lip. The horn originates in a slightly convex smooth tubercle, and extends freely and almost horizontally to near the front edge, its base is posteriorly and at the sides surrounded by a slight furrow, and from the point where the horn becomes free originates on either side a low, indistinct ridge, which makes a curve anteriorly and terminates in a small tubercle some distance short of the marginal projections. Supraoculcar ridges undulating, each with a sharp point above the eye and another at the anterior corner of the clypeus.

Prothorax convex, with a central groove; marginal furrow incomplete, punctated, terminating anteriorly, some distance from the central line, with an elongately ovate scar. Lateral scar large, slightly impressed, composed of a number of irregularly arranged, coarse pits; a few dots exist near the anterior corner.

Scutellum very finely punctated at the base; waist laterally densely punctated, below nearly smooth.

Elytra rather depressed above, but comparatively high; all the furrows coarsely pitted; each shoulder with a tuft of brown hair, which also extends a little posteriorly along the margin.

Tongue with three ridges, minutely punctated, tridentate at the front edge which is slightly narrower than the base. Lower lip transversely rather elongated, smooth, convex, with a rounded scar at each end; the lateral branches densely punctated. Metasternum on the posterior sloping corners coarsely punctated. Abdominal segments with an oblique furrow on either side, but in other respects nearly smooth.

Hab.—Ceylon. The only specimen examined is in the Vienna Museum; it was obtained by the late Mr. Zelebor during the Novara expedition.

The species almost perfectly agrees with the characteristic of the genus as given by Kaup.

Second group. Leptaulaceæ.

Out of the five genera distinguished by Kaup only one is represented in India, namely Leptaulax. It seems to be a little too closely allied to Ciceronius, and still more so to Didimus. From the last it is stated to differ by the single denticle in the centre of the front edge of the clypeus, while Didimus has two; but I have in a few instances also observed two denticles in both Lept. bicolor and dentatus. Of course we may say, what is in Didimus the rule, is an exception in Leptaulax, still it looks rather a little arbitrary to define genera in such cases. However, as I have not a single one of the species of Didimus, described by Kaup, for comparison, I do not wish to propose any changes in the genera, as characterized by him. Looking at Leptaulax in Kaup’s sense, it seems to me somewhat doubtful that the number five will suffice to include all the different forms which must belong to the genus. The following details, taken with those of Kaup, may speak for themselves.

The typical small form was obtained from Sikkim, Bútán, Assám, Té-nasserim (at Mergui) and from Johore. In the Vienna collections it is represented from nearly all the Philippine islands.

The larger form, or *L. Timorensis*, is also very abundant in Sikkim (between 500 and 1000 feet), Bútán, Assám, Naga hills, Pegu (near Tŏng-hú), and on the Andaman islands. It grows up to 37 m.m. I had very large numbers of both forms for comparison, and came to the conclusion that no definite characters exist by which the two species could be separated. I have all intermediate sizes from 21 to 37 m.m.

11. **Leptaulax bicolor**, Fabr.

Very common in Sikkim and through the whole of the Malayan Peninsula, as well as on the Andaman and Nicobar islands, in Malabar and in Ceylon. Form the last locality—two specimens exist in the Vienna Museum collection under the name of *Nietneri*, M. C.

A peculiar small variety, possessing cross bars in the lateral furrows of the elytra, instead of simple dots, occurs at Johore.

12. **Leptaulax planus**, Illig.

This is, I think, a good species, the smallest of all our eastern Passalidæ. It is very much more depressed, than either of the previous species, and in proportions and relative size of the prothorax and of the elytra it more closely resembles *dentatus* than *bicolor*, of which it is stated to be a synonym. Specimens from Java, Johore, and Malacca, whence I have lately obtained large numbers, measure between 13 and 14 m.m., but a somewhat larger variety occurs in Burma and on the Andaman islands. Specimens from these last localities measure 18 m.m., they are in almost every other respect identical with typical *planus*.

Of the third group, the Eriocneminæ, no species as yet occurred within our limits. I received *Vellejus Moluccanus* from Amboina, *Eriocnemis monticulosus* from Sumatra, and gigantic specimens of *Erioc. tridens* from Java, but none from Siam or Malacca, which localities are also given by Kaup. The last species will have, therefore, to be included in our list.

**Fourth group. Macrolinæ.**


Malacca; apparently rare.


Johore; a single specimen from Mr. J. Wood Mason.

* In Dr. Felder’s collection I find a Malacca specimen named *pasilus*?
Dr. Redtenbacher (Coleopteren, Reise Oest. Fregatte Novara, 1867, p. 49) gives *Mastachilus politus* from Madras. There is a specimen of that species in the Vienna Museum collection, marked *Ind. or.*, and is most likely the one referred to by Redtenbacher. I very much doubt, however, that it is Indian. It was probably received from the Madras Museum, or from a collector, during the stay of the Novara at Madras. My reason for doubting the correctness of the Indian locality is based upon an observation which I made. I asked the Curator, the late Capt. Mitchell, for the loan of any specimens of *Passali*, he might have in the Madras Museum. I was promptly responded to, and shortly after received four specimens of *Passali*. Two proved to belong to a new species *Pleurarius brachyphyllus*, and the two others were *Solenocyclus exaratus* (known from Madagascar) and *Mastachilus polyphyllus* (from Australia).† After detailed inquiry Capt. Mitchell informed me, that the two first specimens (distinguished by numbers attached to them) were truly Indian, from the Nilgherries, but that the localities of the two others were unknown. They had been received from some old European collection. It seems to me very probable that something similar happened with the specimen of *M. politus*, obtained by the Novara at Madras.

Kaup describes *Macrolinus Waterhousei* and *Episphenus Moorei* from Ceylon. I have not seen either of these.

**Fifth group. Acerale.**

Of the five genera, Laches, Gonates, Aceraius, Cetejus, and Basilianus, only the third and fifth have as yet been found in India; they are common and numerous, and the specific number of five will, I am sure, run short for what is in this case really required for specific determination, unless the genera are somewhat differently defined and grouped.

Of the other genera I have examined a few interesting species. Among these is one which Kaup would probably call the first, *moderately convex*, species of Laches, and the largest species of Cetejus; both answer exactly the characters of the respective genera. I add descriptions of the two new species‡ in a foot note.

* Originally described by Burmeister from Van Diemen's Land.
† The Vienna Museum possesses two specimens of *polyphyllus* from China.
‡ *Laches gracilis*, n. sp. Total length 26, width of head 5·5, of prothorax 7·5, of shoulders 7·6, length of elytra 15 m.m. Whole body moderately convex. Upper lip almost quite straight in front; left jaw barely longer than the right one. The three first lobes of the antennae short, the fourth slightly shorter than the fifth. Clypeus on its posterior half rugosely punctated; the short horn rises from the anterior central edge of a transversely elongated, smooth protuberance; from it proceed under a narrow angle the frontal carine, each terminating in an elongated smooth tubercle, or rather short ridge, connected by a very fine carina. The marginal tubercles of the clypeus are pointed, depressed, placed nearer to each other than the width of the
A specimen of *Gonates navicular* from the Moluccas, in Dr. Felder's collection, has the middle frontal carina very distinct, while two others of upper lip, they are unequal, the left being slightly larger than the right one; they are not in any way connected with the frontal tubercles, but a smooth concavo field proceeds from each of these to the respective ocular ridge. The latter is angular or subtubercular above each eye, and anteriorly formed by a thin carina, terminating on the angle of the clypeus with a little spine.

Prothorax somewhat broader posteriorly than anteriorly, with a very distinct central groove; marginal furrow very narrow, with a minute punctuation; lateral scars vertical, subovate, punctated; a group of distinct dots also exists above each anterior corner.

Scutellum smooth; waist laterally punctated. All the furrows of the elytra coarsely punctated, without a trace of any kind of hair.

Tongue tricarinate, the middle carina the strongest; laterally slightly concave. Lower lip convex, smooth, with a transversely elongated, small, marginal, smooth scutellum between it and the tongue; branches coarsely punctated. Waist, below, with a small oblique, ovate scar on either side. Meta sternum on the posterior part sparsely, on the sloping corners densely punctated. Abdominal rings each with a linear, punctated scar on either side. Prothorax, below, as well as the middle and hind tibiae, sparsely covered with yellowish rufescent hair.

*Hab.*—Batchian island; a single specimen in the Vienna Museum.

*Cetejus australiensis*, n. sp.

Total length 33, width of head 7, of prothorax 9 9, of shoulders 9 6, length of elytra 19 2 m.m. Whole body rather depressed.

Left jaw slightly longer than the right one. Upper lip deeply emarginate, the right half being slightly shorter and a little more rounded than the left one, as in *G. navicular*. Antennae with six lappets, the two first being very short, the third a little shorter than the three terminal ones, which are subequal and rather slender. Clypeus entirely rugose; the horn is elongated, with a triangular tubercle on each of its basal halves. The frontal ridges issue from the horn under a moderately obtuse angle, (as in *Lept. dentatus*), and terminate with distinct points, connected by a very fine carina, from which the margin of the clypeus descends almost vertically. Both marginal tubercles are pointed, similarly formed, but the left one is conspicuously larger than the right. Each frontal tubercle is connected by a short carina with its corresponding marginal one, and besides also with its corresponding small tubercle in the middle of the supra-ocular ridge, each of which is truncated in front.

Prothorax slightly broader posteriorly than anteriorly, with a fine but almost complete central groove; sides entirely punctated, lateral scar small and rounded; marginal furrow very narrow.

Scutellum smooth, with a central basal groove; waist laterally punctated. The four central furrows of the elytra on the upper side indistinctly, the remainder distinctly, punctated, those at the sides at least twice as broad as the ridges separating them and with distinct transverse bacilli. This structure very strongly reminds one of *Basillanous cancros*, which is also the largest species of its genus.

Tongue tricarinate, laterally concave. Lower lip convex and smooth, with a small elongately semi-elliptical scutellum between it and the tongue; a small but distinct scar on each side of the lower lip, its branches rather larger, rounded at the ends and somewhat inwardly curved, entirely but not very densely punctated. Prosternal
the same species in the Vienna Museum collection from Amboina (marked Dotleschali, M. C.) have merely a trace of the middle frontal carina, and the prothorax is comparatively smaller.

Gonates Germarii was received by Mr. W. S. Atkinson from Java.
Kaup describes Laches Comptonii from Ceylon. I have not seen it.

15. Aceraius grandis, Burm.
This is a very common species in Sikkim, Assam, the Naga and Cachar hills. Indian specimens exactly agree in structure with the large Javanese type form, but their usual size is only 40 m.m., and I never saw one exceeding 45 m.m. In Javanese specimens generally only the ninth and tenth rib of each wing are punctated and hairy near the shoulder, while Indian specimens have, as a rule, the whole of the seventh and ninth rib punctated; it is very rarely that the pits entirely disappear on the seventh.

An extremely variable species, both in general size, as well as in the shape of the two marginal processes of the clypeus; the left one being sometimes sharply pointed at the end, or scarcely bipartite, as in Percheron's pilifer. The seventh and ninth ribs of the elytra are as a rule entirely punctated, very rarely is the seventh smooth. The smaller forms, between 30 and 38 m.m., are, I think, mostly males, they have the furrows of the wings perceptibly punctated; the larger specimens, about and above 40 m.m., appear to be mostly females, the furrows of their elytra are almost devoid of punctations.

The species occurs in Sikkim, Assam, Cachar, but is much rarer than A. grandis. I also obtained it on Penang hill, and from Johore; in the Vienna collections are specimens from China, Luzon, and Manilla.

Redtenbacher's Passalus Nicobaricus from Sambelong (Great Nicobar) is also undoubtedly this species, and neither a Macrolinus nor a Basilianus.

The next genus, Basilianus, is the most numerous in species. I possess specimens of the four species described by Kaup, and three others which I must regard as new. This is as yet almost the only instance in which I have been obliged to transgress Kaup's limit of five species. I took considerable pains to ascertain whether these species could possibly belong to any of the other genera of Eriocneminae, but they do not answer to the characteristic of any process between the anterior coxae grooved. Waist, below, smooth, with an elongated scar on either side. Metasternum smooth; on the sloping corners rugously punctated. Sides of abdominal segments and the posterior part of the last segment mostly finely punctated. No hairs are seen on the elytra; the middle tibrze are moderately hairy, the hind ones somewhat less so.

Habitat—Australia; a single specimen in Dr. C. Felder's collection.
other genus than Basilianus. They differ from Aceraius by the absence of hair at the sides of the elytra, and from the other genera of the Aceraiae in the shape of the lower lip and the want of a scutellum between it and the tongue; the same character holds good in a comparison with Mastachilus, and the unequal lappets on each of the antennæ readily separate them from the other Macrolinae. The seven species may, however, be divided into two sections, as follows:

a. With the marginal processes of the clypeus very asymmetrical,— Nilgheriensis, inaequalis, Cantoris, Indicus.

b. With the marginal processes of the clypeus very slightly or scarcely asymmetrical,—cancrus, Andamanensis, Sikkimensis.

17. Basilianus Nilgheriensis, Guér.

The usual size of Malabar specimens is only 28 m.m.; it does not appear to be a common species.

18. Basilianus inaequalis, Burm.

Common at Malacca. Kaup gives it from Singapore and Penang. The largest specimen which I have examined is nearly 30 m.m., and the smallest 24-7 m.m., the length of the elytra being 13-7, width of head 5-5, of prothorax 6-9, the proportionate size of this last being often remarkably small.


The usual size of Sikkim and Assam specimens is 33 to 35 m.m. Kaup gives it also from Malacca and Cambodja.

20. Basilianus indicus, n. sp.

Total length from 33 to 40 m.m., one specimen is 37-6, width of its head 9, of prothorax posteriorly 12, of shoulders 11-5, length of elytra 21-5 m.m.

Left jaw slightly straighter and longer than the right one. Upper lip widely and rather deeply emarginate in front. Antennæ, with the three terminal lappets longest and subequal, the second and third about half the length of the fourth, and the first is very short, sometimes scarcely traceable. Clypeus rather large, mostly smooth, or sparsely punctated, with the supraocular ridges anteriorly truncated with an inward slope, the inner edge of the slope being sometimes very indistinct, while the outer one is sharp, and projects at the corners, somewhat as in Aceraius grandis. The horn rises out of a transverse long tubercle, it is subpyramidal, the posterior slope being gradual, the anterior vertical; the frontal carinae are very fine, forming together a wide semicircle, each terminating in a blunt tubercle, and from each proceeds a very fine carina to the respective marginal process of the clypeus; the left process is the longer, depressed, inwardly bent, obtuse at the end; the right one is thick, short, obtusely pointed.
The prothorax is moderately convex, as in Cantoris; it is conspicuously wider posteriorly than anteriorly, with a central groove which is almost as complete, as it is usually to be found in American forms and in these only; marginal furrow anteriorly somewhat widened, bent in and punctated; lateral scar small, rounded, generally with a few pits; the sides of the prothorax are either quite smooth (in the larger specimens), or punctated in front of the scar and at the anterior corner (in the smaller specimens). Whether this is a distinction of sex I cannot say.

Scutellum centrally very minutely strigatet; waist laterally densely punctated. Shoulders slightly thickened, only anteriorly with few very short and thin hairs. Furrows of the elytra, above, slightly, laterally distinctly punctated; without hair.

Tongue tricarinate. Lower lip in the middle somewhat convex, mostly smooth or punctated, anteriorly sometimes slightly indented; its branches densely punctated, no scars exist on it. Waist, below, smooth, with elongated diverging, dull scars. Metasternum smooth, its posterior sloping corners rugoslently punctated, its sides entirely hairy. Abdominal segments laterally with linear scars.

Prothorax posteriorly, below, covered with brown hair; middle tibiae very densely, posterior ones less hairy.

Hab.—Nilgheries and Malabar. I received several specimens from Major Beddome, Rev. Baker, and Surgeon Major F. Day.

The largest specimen in my collection is 45 m.m. It has as yet only been obtained in Nipál, Sikkim, Bútán, and Assám.

22. Basilianus Andamanensis, n. sp.
Total length 32 to 38 m.m.; one measures 35·6, width of its head 8, of prothorax 10, of shoulders 10·2, length of elytra 21 m.m.
Jaws almost equal. Upper lip straight in front or obliquely truncated, the left rounded corner being often a little more projecting. Lappets of the antennæ generally graduated, the first very short, the succeeding to the fifth gradually longer. Clypeus entirely punctated and covered with short hair; supra-ocular ridges low, distinctly truncated in front and with the carina round the concave space well developed. The horn consists of an elongated ridge, with a small tubercle on either side; it is slightly elevated at the anterior end and with an almost vertical slope. The frontal carinae are rather short, terminating with elongated distinct points, connected by another carina, from which the margin of the clypeus is almost vertical. The marginal processes of the clypeus are far distant, situated above the edges of the upper lip; they are short, pointed, in some specimens apparently almost equal, in others the left one is distinctly larger. They exactly resemble those
of cancrus, and each also has on its lower side a small tubercle. From both the marginal processes and the frontal tubercles generally proceed a few irregular low ridges to the middle of each supra-ocular ridge.

Prothorax moderately convex, smooth, generally with a very faint indication of a central groove; lateral scar rounded and, like the entire lateral margins, very finely punctated; sometimes there are one or two dots at the anterior corner.

Scutellum smooth, convex, sometimes with a minute punctuation along the lateral edges. Shoulders well prominent, and each with a group of short brown hair, considerably more developed than in Cantoris. Furrows of the elytra finely punctated; all the ridges smooth.

Tongue tricarinate. Lower lip large, mostly smooth, without any scars; its branches densely punctated. Prosternal carina sharp, long. Waist with elongated diverging scars, sometimes with a short, central, basal groove. Metasternum smooth, its hinder corners sparsely and very finely punctated; sides densely punctated and hairy. Abdominal segments smooth, with linear oblique scars. Middle and hind tibiae rather thinly hairy; lower sides of prothorax more distinctly so; last abdominal segment at the end provided with conspicuously elongated brown hair.

Hab.—Andamans near Port Blair; Camorta and Katchal islands of the Nicobar group; common. I found one specimen in the Vienna collection, together with Mastachilus politus, labelled 'Madras,' 'Novara.' It was most likely obtained from some officer who had been at the Andamans, or from the Museum.

23. Basilianus Sikkimensis, n. sp.

Total length 33, width of head 7·1, of prothorax or of shoulders 10, length of elytra 19 m.m.

This species resembles B. Cantoris in size and general character of form and convexity of the body. The jaws are subequal; the upper lip obliquely truncated, almost quite straight, with obtuse corners. The three first lappets of the antenna: much shorter than the three terminal ones, the two sets being among themselves almost equal. Clypeus entirely punctated and very similar to that of B. Andamanensis, but the horn is a little shorter, the frontal carinae include a slightly smaller semilunar space, and the frontal processes of the clypeus are almost shorter, both pointed, nearly quite equal in size, and each is on the outer side accompanied by a short longitudinal carina, which, however, does not extend to the supra-ocular ridge.

Prothorax moderately convex, with a very faint trace of a median groove; lateral scar rather large, pitted all round, the dots or pits being almost continuous to the anterior corner and here again rather dense; along the lateral margins densely and very finely punctated.
F. Stoliczka—*Andamanese and Nicobarese Reptiles.* [No. 3,

Scutellum smooth. Shoulders moderately developed, on the anterior slope finely punctured and shortly hairy. Furrows of the elytra above distinctly punctured, laterally broader and with transverse bacilli, the seventh and eighth furrow are broadest.

Tongue rather narrow, punctated, thinly tricarinate, laterally concave. Lower lip convex, with sparse punctuation, its branches densely punctated. Waist, below, with diverging elongated, dull scars. Metasternum smooth, its hinder corners coarsely punctated, and the narrow sloping sides along the elytra very finely punctated and hairy.

Abdominal segments with elongated, finely punctated lateral scars, broadest on the first few segments, linear on the penultimate and obsolete on the last. Lower side of prothorax the middle and hind tibiae with short and rather thinly distributed hairs.

*Hab.*—Sikkim. I obtained a single specimen at about 1500 feet, some two miles east of Pankabari.

The species is intermediate between *cancerus* and *Andamanensis*; with the latter it agrees in the shape and structure of the head, with the former in the transverse costulation of the lateral furrows of the elytra, but in *cancerus* this costulation is still stronger.

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**Note on some Andamanese and Nicobarese Reptiles, with the description of three new species of lizards,—by Dr. F. Stoliczka.**

[Received and read 7th May, 1873.]

I have given a list of the Reptiles and Amphibians, known from these islands, in a former paper,—*Journal A. S. B.,* Vol. xxxix, pt. II, 1870, pp. 136-138 etc.; having, however, lately had an opportunity of visiting all the Nicobar islands (excluding Little Nicobar and Pulo Mili), and the Andamans, including the Cocos and Preparis, I am in a position to add a little information about, some of the species. Our visit* was chiefly from an ornithological point of view, and as it fell already in the hot season (March), the time was very unfavorable for collecting reptiles, at least on the northern group of islands, which at this season are much drier than the southern Nicobars.

We found the following species generally distributed over nearly all the islands which we visited:—*Tropidonotus quincunciatius,* *Lycodon ausicus,* *Dendrophis pictus,*† *Cerberus rhynchos,* and *Trimeresurus Cantoris.* Spe-

* In company with Mr. A. O. Hume, C. B., Messrs. Ball and Wood-Mason.
† In the July number of the Berlin Monatsbericht (for 1872, p. 583), just received, I observe that Dr. Peters describes a *Dendrophis terrificus,* with 13 rows of scales; it is very closely allied to *Dendrophis caudolineatus,* (compare ante p. 123), but differs in coloration.
cimens of *D. pictus* from the Nicobars generally are as soberly coloured as the continental form, while those from the Andamans are very much bright-er, but the typical form again occurs on the Cocos.* The rare *Trimeresurus porphyraceus* was found to be common on the Preparis island; it grows to nearly four feet. Of lizards the most common were *Euprepeis carinatus*, *Hinultia maculata*, *Cyrtochelus rubidus*, *Tiaris suberistata* and *Hydrosaurus salvator*. Of Batrachians *Bufo melanostictus* is very common.

*Euprepeis macrotis*, described by Steindachner, was observed in Galthea Bay on Great Nicobar (Sambelong).

The large Andaman form of *Euprepeis carinatus†* is not specifically distin-
tinct from the common type. I met with similarly large specimens (up to 20 inches) on the Cocos islands. Most of those which I obtained there have thirty rows of scales round the body, and each scale has seven keels, the three median ones being strong and distant from each other, the two laterals on either side short, thin and sometimes scarcely traceable. Some speci-
mens have the anterior frontal in contact with the rostral as well as with the vertical, a short process of the anterior frontal separating the two pos-
terior. The specimens were apparently in breeding dress. The whole sides of the head, neck and belly were vermilion or bright cinnabar red, the anterior extremities and the back were also strongly tinged with red. The entire sides of the body and of the tail and the extremities had numerous large, irregu-
lar white and black spots intermixed, giving the lizard quite a different appearance from the ordinary type. The white spots were most numerous along the edges of the back, but there is no marked white band present.

**Phelsuma Andamanense, Blyth.**


The following is a complete description of this remarkable lizard.

Body rather stout, moderately depressed, tail tapering, narrow at the base, with transverse contractions at distances. Snout almost conically elongated, rostral broader than high, just reaching the upper surface of the head; nostrils lateral, in the hinder edge of an enlarged, somewhat swollen shield, followed by a slightly smaller one; on the upper side the two nasals are separated by two (rarely by three) shields. Head, body and limbs, above and at the sides, covered with equal granular scales, or rather shields,

* It is perhaps due to their more isolated situation that the Cocos and neighbour-
ing islands, (Preparis, Narkondam, Barren island), have several Nicobar forms which on the Andamans are apparently wanting. We found *Carpophaga bicolor* common, *Calanias Nicolarius* is said to have occurred on the Cocos, and *Megapodus* is found on Table island. Among shells I got numerous *Helicina*, exactly like *H. Dunkeri*, *Balinus Nicolarius*, var., *Cyclophorus*, like *C. nicobaricus*, &c.

becoming on the tail more depressed, scale-like, and intermixed with a few larger ones. Eye of moderate size, with an almost round pupil; it is surrounded with small granules. Ear-opening ovately rounded, equal to about one third of the longer diameter of the eye. Eight to ten low upper labials. Lower rostral large, somewhat perceived and contracted behind. Nine to ten lower labials, the first two are largest, not in contact, the succeeding gradually decrease in size. None of the chinshields are particularly enlarged, and they vary in arrangement in different specimens. The scales of the belly are roundly hexagonal, across the middle in twenty-one to twenty-three longitudinal, alternating series.

The adult male has thirty-one femoral pores, in an uninterrupted series, angularly ascending in the centre. The female has a similar row of enlarged but not perforated shields. Præanal shields not enlarged. A small slit exists on either side in the postanal margin. On the tail the subcaudals become a short distance from the anus enlarged, single, only occasionally broken up into smaller shields. The inner toes on both the fore- and hind-limbs are very short, almost rudimentary; the fourth toe is longest, and all have their front edges rounded.

The general colour in males is grass- or bluish-green, subject to very great changes during the life of the lizard; head and neck with yellowish orange spots and stripes, among which one from behind the eye, one or two across the occiput, and one along the middle of the neck are most conspicuous. The anterior part of the body is on the upper side marked with small, oval, orange spots, on the posterior part these spots are somewhat larger, encircled with yellow, and sometimes partly confluent. All these orange spots often assume during life a strong reddish tint. Tail generally uniform bluish green. The lower side is uniform yellow or yellowish white.

The females are more soberly coloured, particularly when not full grown, in which case the orange spots are much less distinct, and sometimes almost obsolete.

The lower sides of the toes, especially towards their terminations, are silvery grey.

The usual size of full grown males is five inches, head and body being two; specimens of six inches are great rarities. The females are generally somewhat smaller than the males.

The species is not uncommon about Port Blair. I found a few on old trunks of trees (between epiphytes) on Mt. Harriet. They generally hide themselves under the bark of trees, but also often feed on the ground. Mr. Wood-Mason about a year ago brought a large number of specimens from the vicinity of Port Blair. I have not seen specimens from any of the other islands.
GYMNODACTYLUS WICKI, n. sp.

A small species, resembling in general character some of those described by Jerdon and Beddome from South India. The body is moderately slender and depressed, covered with very small, keeled tubercles which have the appearance of pointed granules; on the back there are numerous larger, but similarly formed, tubercles interspersed, and on the side of the belly these larger tubercles become distinctly spinulose; tail verticillate, with similar spinules, exactly as in Hemidactylus frenatus. On the snout the sharp granules are, as usually, somewhat larger than on the top of the head, but none are enlarged above the labials. The rostral reaches to the upper side of the snout, and is followed by two small shields, separated by a still smaller pentagonal azygos, the upper angle of which fits into a posterior emargination of the rostral. The nostril is lateral and directed somewhat backwards, it lies immediately behind the rostral, and is followed by two slightly enlarged and diverging shields, the anterior angles of which nearly touch the rostral, thus almost entirely isolating the nasal opening from the first labial and the shield behind the rostral. No particularly enlarged scales round the eye. Seven upper and lower labials, the first are in each case the longest, the succeeding gradually decrease in size, the last are very small; all are very low. Ear opening forms an oval, oblique slit, its distance from the eye is slightly less than that from the eye to the end of snout. Lower rostral large, obtusely pointed behind, followed on each side by a slightly enlarged shield, separated by smaller ones; there are no particularly enlarged chin-shields. The scales on the throat and anterior breast are finely keeled; those on the belly hexagonal and across the middle in about nineteen longitudinal series. Prae-or post-anals not enlarged. Sub-caudals along the middle line very little larger than the other shields covering the lower side. Reproduced portions of the tail are uniformly scaly, without enlarged tubercles.

The male has four pra-anal pores, situated between the femora in a shallow transverse depression, and quite separate from these are four or five femoral pores placed at the hinder lower edge of the femur, somewhat nearer to the hip than to the knee. Toes long and slender; basal portion with three or four transverse, squarish plates, the last the largest; terminal phalanges very much narrower.

Colour. Above, powdered brownish grey and white, a series of whitish, almost continuous spots along the middle of the back, extending on to the tail. There are six or seven of these spots from the nape to the base of the tail, and each of them is edged anteriorly and laterally with black, sometimes the lateral black edges develope into elongated spots and are most distinct. On the tail the white spots are less distinctly developed, but the transverse black margins well marked. The sides of the body, of the tail
and the upper side of the limbs is thinly checkered with black; the enlarged spinules and tubercles are all pure white. There is a dark streak between the snout and the eye, posteriorly there are three dark lines, one going to the occiput, the second to the ear, the third to the angle of the mouth; and generally there are one or two more below the eye, giving the side of the head quite an ornamental appearance. Labials spotted with white. Chin and throat powdered with brownish dusky, remainder of lower side uniform pale, more or less distinctly tinged with fleshy; in males more markedly so than in females. In the very young lizard (about one inch long) the lateral black spots along the back, and the median black line behind the eye are most distinctly marked, in other respects it does not differ from the adult.

Hab.—Preparis Island. I obtained five specimens, two apparently adult males and two females, and one young; all were found on the ground between old decaying vegetable matter. One of the largest specimens with perfect tail, measures: head and body 1.13, tail 1.37 = 2.5 inches. The length of the hind limb equals the distance from the shoulder to the groin.

I have great pleasure in connecting with this very interesting new species the name of the able Commander of the "Scotia," Capt. G. W. Wicks, who piloted us most skilfully through the labyrinth of small and large islands.

*Mocoa macrotympanum*, n. sp.

Body moderately slender, head flattened above, muzzle rather attenuated and prolonged. Anterior frontal in contact with the rostral, separating the two elongated nasals, and posteriorly just touching the vertical, which is rather shortly, obtusely angular in front, and gradually attenuated behind. Four enlarged supraciliaries, preceded and followed by a smaller shield. The two anterior occipitals (? accidentally) united, the median one roundly angular in front, attenuated and contracted behind, the two laterals narrow, in contact with each other behind the median shield. Four pairs of scales behind the occipitals enlarged, occupying the whole width of the neck. Seven upper labials, the fifth under the orbit, six narrow lower labials. First chin-shield single, the second is a pair in contact, third separated by a small shield, fourth pair somewhat smaller. Lower eyelid with a transparent disk. Ear opening very large, rounded, with a perfectly smooth edge all round, the tympanum being distinctly visible. Body in the middle surrounded by twenty-two longitudinal series of smooth scales, six series being on the back; they are slightly larger than those at the sides. About fifty-two scales along the edge of the lower side, counted between the fore and hind limbs. A pair of moderately enlarged pre-anal shields. Median row of sub-caudals slightly enlarged. Limbs proportionately developed, with the toes very slender.
Head above brown, paler on the muzzle; three longitudinal white bands along the body,—one along the middle, originating between the eyes, and two along the sides, beginning on the supraciliary edges;—they are separated, above, by two somewhat broader brown bands, each being lighter coloured along the centre, and bounded at the sides by a similar brown band which is, however, darkest along the centre. The median dorsal white band becomes obsolete at the root of the tail, the two lateral ones continue on it, and unite when approaching the tip. Labials and sides of head brownish, spotted with white. Lower portion of the sides and the entire lower surface livid carneous, most distinctly so, and tinged with bright orange, on the lower belly and on the tail, which is also on the upper side carneous, with a few white dots at the side of the base, and irregularly marked with pale brown on the lower surface. Limbs, above, with very close longitudinal brown lines, toes all distinctly powdered with pure white.

Total length four inches, the head and body being 1·8, the length of the fore limb is equal to the distance between the shoulder and the angle of the mouth, or one-third of the distance between the axil and the groin; the length of the hind limb is one-half of the same distance.

Hab.—South Andaman. The single specimen was obtained on a sandy beach in Macpherson’s Straits.

_Tiaris Humei_, n. sp.

A larger species than _T. suberistata_, and like this one with the crest interrupted above the shoulders, but the crest itself is very much more developed. The nuchal part is considerably higher than the dorsal one, on its convex edge it is composed of 13-15 lobes; the dorsal portion continues on to the tail, disappearing after about one-fourth of its length. None of the scales are at the lateral bases of the crest particularly enlarged. All scales on the body are distinctly and sharply keeled.

Head shelving and concave above; snout with a few enlarged scales along the centre; supraciliary edge sharp, its posterior end is separated by a short groove from a small tubercle following it. Two groups of enlarged conical scales on the upper side of the occiput; several (3-4) enlarged scales on the side of the head above the tympanum which is hardened near the centre, and about as large as the eye. Below the tympanum no scales are enlarged. Eight or nine upper labials and seven or eight lower labials; the scales adjoining the former are enlarged, and there is also a conspicuous row of slightly enlarged scales below the eye. A row of enlarged scales is separated from the lower labials by one of small scales. Scales on the side of the neck and body very small, arranged in somewhat irregular transverse series, with scattered larger ones intermixed; on the tail they gradually increase in size, but within a short distance of its base still have some
larger ones intermixed. On the limbs the scales are much larger, two or three on the upper side of the femora particularly so. Gular pouch and fold covered with small scales, which become larger on the lower belly than on its sides. The two rows of sub-caudals are slightly larger and more pointed than the shields on the upper side of the tail.

General coloration greenish olive, on the top of the head brownish; sides of the entire body more or less distinctly and rather densely reticulated and spotted with black and yellow; sides of head and neck and the gular sac tinged with purplish blue, labials spotted with blue. Chin mostly yellow; belly whitish, without spots. Tail brownish above, paler below, irregularly and indistinctly spotted with dusky.

Total length of one specimen 16 inches, of which head and body are 4.4 and the tail 11.6 inch. The fore limb when laid backwards extends beyond the groin, or almost to the preanal edge, and the hind limb when laid forwards fully reaches the anterior edge of the eye.

The above noticed characters readily separate the Nicobar species from *T. dilophus*, or *T. tuberculatus*, lately (P. Z. S. 1872, p. 583, pl. xxxviii) described by Dr. Günther from the East Indian Archipelago.

I obtained only two specimens (male and female) on the Nicobar island Tillingchhang, but the species did not seem to be rare.

**Dibamus nicobaricus**, (Fitz.).

*Rhinophilidion nicobaricum*, Fitz, Steindachner, Novara Rept. p. 52 and *Typhloscinus nicobaricus*, ibidem, p. 94.

I have two specimens for examination, one a male* and the other a female (known from dissection).

The male is six inches of which the tail is 0.9 inch; there are 24 longitudinal rows of scales round the body, and 48 transverse rows along the tail. The two extremities are on either side somewhat in front of the anus, towards which they converge; they are depressed, each lying in an oblique cavity, the intermediate space of the sacral region being flat, triangular and pointed above the anus. Each extremity is fully as long as the whole head,† it is covered on the upper side by three longitudinal rows of scales, narrowing towards the end which is occupied by a large, flat, nail-like scale.

The body of the female is somewhat stouter; it measures 5.5 inches, of which the tail is only 0.5 inch. The body is again surrounded by 24 longitudinal and the tail by 34 transverse rows of scales. On each side in front of the anus is an enlarged scale, separated by three small scales from the anal edge, and just in the place where the extremity in the male originates;

* This is in the Indian Museum and I am indebted to Dr. Anderson for the opportunity of examining it.

† In *D. Nova- Guinea* the extremity is only as long as the head is broad.
this large scale covers a small opening, in which internally a rather strong muscle terminates; the muscle is most probably emissible and retractile at the will of the animal.

All other characters are common to both sexes. The upper labial is separated from the rostral by a distinct groove. The shields are dark brown, almost blackish, with paler edges; paler below. The shields on the head are yellowish, and there are occasionally yellowish spots on the chin and throat, or on the lower side of the tail.

As compared with *Typhloscinus Martensii*, Peters, the snout of the Nicobar species is narrower, the head posteriorly broader, the eyes, although covered by skin, distinctly traceable, all points to which Steindachner drew attention when comparing the two, but the shields of the head, the number of scales round the body and on the tail are in both species quite the same. There is in *T. Martensii* also an enlarged scale above the anal edge, but it is nearer to it than in the Nicobar species. Still, if it were not for Peters’ distinct statement, that out of three specimens of *T. Martensii* two are males, and one a female, both without any trace of extremities, I should have considered the specific distinction of the *D. Nicobaricus* from *T. Martensii* somewhat doubtful. The coincidence is certainly remarkable.

*Dihamus* was characterized by Dumeril and Bibron (Erpet. gen. v. p. 833) from two New-Guinean specimens, sent to them by Prof. Schlegel. Both specimens were apparently males, but Schlegel* says that these only possess a pair of posterior extremities, the females having none. And this is strictly in accordance with the observation made on the two Nicobar specimens.

**Descriptions of two new species of Indian Landshells,**

*by Dr. F. Stoliczka.*

[Received 7th May, 1873.]

The following descriptions have been drawn up with the view of supplementing the figures of them which are to be given by Mr. Theobald in the 'Conchologia Indica.' The first species is from the Shan-states, and was collected, several years ago, by Mr. Fedden; and the second was given to me by Mr. Foote who obtained it in the cotton soil district near Bolgaom, when on his geological tour.

**Plectopylis Shanensis**, n. sp.

*Pl. testa planorbulari, pallide fusca, apice minutissime exserto, pallido; anfractibus $6^{1/2}$, angustis, sutura indistincte marginata junctis, primis $2^{1/2}$ ad tribus minutus rugulosis, ceteris transversim oblique striatis atque concentrice obsolete striolatis, ultimo ad peripheriam subrotundato, infra paululum angustiore, ad aperturam modice deflexo; umbilico spatioso, anfractus omnes suture distincte marginatâ separatos exhibent; apertura angulum circiter $55^\circ$ attinentem cum axi formante, peristomate undique expansiusculo atque incrassato, margaritaceo lutescente, circumdata, ad utranque terminations labii subangulati profunde incisa; labio plicis tribus distinctis instructo, plica mediana crassissima, ca atque infera multo tenuiore usque ad peristoma extensis, tertia interposita a margine remoto evanescente, sed usque ad laminam internam verticalem, circiter tertiam partem unius circuitus a margine aperturali distantem, extensa; ultimo anfractu intus supra laminam verticalem antice plicis sex crassiusculis, postice plicis decem brevioribus atque tenuioribus instructo.*

*Diam. maj. 21.5, min. 17, alt. 6.5; diam. aut. alt. aperturae 7.5 m.m.

*Dimensiones speciminis secundi minoris sunt: 18.5, 15, 5.8, 6.6 m.m.*

*Hab.—Provinciam Burmanam 'Shan-states' dictam.*

This *Plectopylis* is readily distinguished from its allies by the presence of three labial plicae, the strongest being in the middle and extending, like the lower thin one, to the edge of the lip, while the intermediate one disappears before it reaches the aperture, but it is the only one which extends to the internal almost vertical lamina. This last is superseded anteriorly by six stronger and posteriorly by ten thinner and shorter folds, but there is no corresponding lamina present on the inner side of the last whorl.

In external shape and character of volution the species is almost identical with *P. repercussa*, except that in this latter all the whorls are transversely striated on the upper side, and the last at the aperture a little more deflected, the umbilicus also appears to be a little wider, and not only the plicae at the mouth but also the internal laminae are totally different in *repercussa*; in this one there are two internal laminae on the inner lip one behind the other, and one on the outer lip projecting in the space bounded by the two others.

**Trachia Foevel**, n. sp.

*Trach. testa albida, orbiculata, supra deplanata, infra inflata, versus medium angustata, perspective modice umbilicata, undique dense granulifera; anfractibus 4 ad 4.5, gradatim accrescentibus, primis duobus aut tribus convexiusculis, transversim striatis, ceteris magis deplanatis, transversim costulis inaequalibus et obliquis ornatis, ultimo ad peripheriam valde carinato, costulis in carina evanescentibus, ad aperturam valde descendentem atque fere...*
omino deflexo; basi circa umbilicum rotundate subangulata, similariter costulata, costulis usque ad peripherian extensis; apertura fere horizontaliter deflexa, transversim rotundate elliptica, margine dilatato fere undique libero, ad angulum umbilici angustissime adnato, circumdata. Diam. maj. 13·3, d. min. 11·2, altitudo totius testae 6 ; altitudo apert. cum peristomate 5·5, ejusdem latitudo 6·8 m.m.

Hab.—Belgaom, India occidentali.

The present species has to be placed in close proximity to T. crassicostata, and is as closely allied to it as this is to T. fallaciosa. It differs very markedly from crassicostata by its more distinctly orbicular and depressedly planorbid shape, by a well marked, smoother and thinner, peripherial keel on the last whorl, by a more inflated and towards the middle more contracted base, it being angular the umbilicus, and by a considerably more deflected aperture.

In a former paper* I expressed a doubt about H. fallaciosa, ruginosa, and nilghivica belonging to the genus Trachia, as originally proposed by Albers. I observe, however, in well preserved specimens, that all of them possess the peculiar granular structure which is so characteristic of Trachia. T. crassicostata and Footei must now be added to the list of these closely allied Western Indian species.

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On Rhopalorhynchus Kröyeri, A New Genus and Species of Pycnogonida,—by JAMES WOOD-MASON, of Queen's College, Oxford.

[Received and read May 7th, 1873.]

(With plate XIII.)

Much difference of opinion has prevailed with regard to the systematic position of the Pycnogonida, as to whether they should be classed with the Crustacea or with the Arachnida. By one set of naturalists, including Johnston, Milne-Edwards, Quatrefages, Kröyer, and Dana, they have been placed with the Crustacea; by another—including Latreille, Erichson, Gerstaecker and Huxley who separates them, as well as the Tardigrada and Pentastomida, from the typical Arachnida (Spiders, Mites and Ticks) as an aberrant order,—with the Arachnida. Dr. Anton Dohrn† who has recently studied the embryology of these animals finds that they are in no way related to the Arachnida, that they resemble the Crustacea in having a naupliiform first developmental stage, but that from this point the course of development ceases to exhibit anything in common with that of the Crustacea; under these circumstances I have thought it better to call the cheli-

† Jenaische Zeitschrift, 1869.
cere, palps, and accessory legs (= mandibles, and 1st and 2nd pairs of maxillae of Kröyer) of those who range the Pycnogonida with the Arachnida, the first, second and third pairs of cephalic appendages respectively, thus avoiding the use of terms implying affinities and homologies that may not in reality exist.

**Rhopalorhynchus,** gen. nov. Wood-Mason.


**Rhopalorhynchus Kröyeri,** n. sp.

Body linear, smooth. The rostrum is almost as long as the rest of the body, moveably articulated to the middle of the anterior end of the oculigerous somite, slender and filiform nearly to its middle whence it expands and finally narrows to its obtuse extremity; when examined in profile, the convex upper contour of the expanded portion is seen to carry two minute forwardly-directed spines, the one behind the other in the middle line. The mouth is situated at the extremity of the rostrum and has the form of a triradiate slit, the three slits being so disposed that a circle described from the point in which they meet so as to pass through their free extremities would be by them divided into three equal sectors. The ocular tubercle is erect, occupies the posterior half of the segment on which it is placed, and has the form of a short cylinder surmounted by a minute cone, the eyes being situated partly on the cylinder and partly on the cone at points corresponding, as usual, to the extremities of the arms of a St. Andrew's cross. A very distinct crescentic suture, bounding the base of the ocular tubercle posteriorly and curving forwards and outwards so that, if produced far enough, it would pass

* φόναλον, clava; φόντος, rostrum.
out just in front of the first pair of legs, divides the oculigerous from the first thoracic somite.

The cephalic appendages of the first pair are absent. Those of the second pair are about \(1\frac{1}{2}\) times as long as the rostrum with which they lie in the same horizontal line, being articulated one on each side of it to the anterior end of the oculigerous somite, are filiform, excessively slender, and composed of nine joints. The first joint is subglobular, being nearly as broad as long, much broader than any of the succeeding joints; the second greatly elongated and slightly expanded at the apex; the third is very short and slightly curved; the fourth is greatly elongated, but not so much so as the second; the fifth is shorter than either of the four equal terminal joints which, together with the fifth and the distal half of the fourth, are fringed with short and very delicate cilia. Those of the third pair are also extremely slender, are articulated, a little posteriorly and internally to the second pair, to minute processes springing from the ventral arc of the oculigerous somite and meeting in the middle line. They are composed of ten joints, of which the first is minute, the two next equal and cylindrical, the third greatly elongated and just perceptibly expanded at the apical end; the fourth short, scarcely longer than the second of the two basal joints, and curved; the fifth is likewise greatly elongated, but more expanded at the apex and longer than the third; the four terminal joints are short, slightly decrease in length from the first to the last which comes suddenly to a subacute incurved point forming a sort of claw, are curved, fringed on their inner and concave margins with cilia and minute spinules, and capable of being coiled tightly together so as to form a prehensile organ.

Both pairs of appendages are elbowed at a short joint, intercalated between two long ones, viz., the second pair between the 2nd and 4th, the third between the 3rd and 5th joints.

In many other species the terminal joints of the third pair of cephalic appendages (\textit{pedes accessorii}) will probably be found to be similarly modified as a prehensile organ; an examination of O. F. Müller’s faithful figures of \textit{Nymphon grossipes}, Fabr. in the \textit{Zoologica Danica}\* would, in fact, alone suffice to show the existence of such a modification in that species, even if Kröyer\† had not described it in his diagnoses of the genera \textit{Nymphon} and \textit{Zetes}, without, however, offering any interpretation of the structure.

The oculigerous somite has its anterior margin straight, and is but faintly constricted in front of the eye-tubercle.

The first thoracic somite, if its distinctness from the oculigerous somite be admitted, is very short. Of the remaining somites, the second and third are subequal, the former being if anything the longer; are as perfectly cylindrical,

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and nearly as long as, but slightly stouter than, the filiform proximal moiety of the rostrum; and are suddenly expanded at their articular ends, each somite presenting the appearance of a cylinder with a greatly truncated cone affixed by its truncated surface to each end. The fourth and last somite is scarce half the length of those that precede it, and is similarly expanded at its anterior end only. From the sides of the expansions at the posterior extremity of the 2nd and 3rd spring two somewhat inflated outwardly-directed, obconic processes which might, at first sight, be mistaken for the first of the basal joints of the legs from their close similarity to these, but which are in reality one with the somite from which they arise: precisely similar processes carry the legs both of the first and of the last somite in which, however, they diverge like the arms of the letter Y. Wedged in between the roots of these processes of the last somite and the posterior boundary of its ventral arc, lies a minute, obtusely-conical tubercle with a large circular (anal) aperture at its extremity. This is the abdomen, a very evident, though rudimentary, structure in most *Pycnogonida* and even biarticulate in one species (in *Zetes hispidus*, Kröyer), but here so reduced in size as to be quite invisible from above, and only demonstrable with difficulty from below whence it appears, in ordinary positions, under the microscope as a convex, ovoidal or heart-shaped plate. It, moreover, looks downwards and slightly backwards, instead of upwards and backwards or directly backwards as it usually does.

The legs are long, slender, simple, equal in length, rather more than twice as long as the body including the rostrum, and are composed of eight joints, terminated by a weak, slightly curved claw. Their three basal joints are as broad as long, equal, and almost globular; the fourth is club-shaped at the distal end; the fifth is all but as long as the fourth and, with the remaining joints, perfectly filiform; the sixth is shorter and about twice the length of the two last together; these are subequal.

Length of the body including the rostrum, .................... 13 mm.
" " legs, .................................. 26 mm.
" " 2nd pair of cephalic appendages, .................. 10 mm.
" " 3rd " " " " " 12 mm.

From the linear from of the body and the slenderness of the legs, I conclude that my specimen is a male, a conclusion by no means invalidated by the presence of the third pair of cephalic appendages, which, being apparently invariably developed in both sexes throughout several genera, (*Nymphon*, etc.) consequently possesses no value in the determination of questions of sex.

*Hab.*—Dredged by the writer at Port Blair, Andaman Islands, in 25 fathoms of water, at which depth the bottom was clothed with a dense
tangle of delicate, filamentous algae so closely resembling the animal in point of colour and form, that the latter was with difficulty distinguishable.

In conclusion, I dedicate the first species of *Pycnogonida* hitherto discovered in these seas to the memory of the illustrious Danish naturalist whose name is so indissolubly connected with the history both of the *Pycnogonida* and of the lower Crustacea.

*Explanation of Plate XIII.*

Fig. 1. *Rhopalarhynchus Kröyeri*, nat. size.

Fig. 2. The same greatly enlarged.

Fig. 3. A cephalic appendage of the second pair, greatly enlarged.

Fig. 4. " " " third " " "

Fig. 5. Rostrum seen from the side ........... " "

\[ a = \text{mouth.} \]

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**ALGAE** collected by Mr. S. Kurz in Arracan and British Burma, determined and systematically arranged by Dr. G. Zeller, High Councillor of Finance in Stuttgart.

(Communicated by Mr. Kurz.)

[Received 3rd May; read 4th June, 1873.]

**DIATOMACEÆ.†**

*1. Podosira Kurzii, Z., n. sp.*

Stipiti brevi cylindrico adnata; cellulis sphaericis, v. oblongis et diametro paulo longioribus; 1/175 ad 1/150 lin. crassis; 2 et pluribus isthmo brevi concatenatis, levibus, valvulis ad commissurae margines nodulis binis minutis instructis. Arracan, Akyab, in rupibus marinis submersis (3280, 3283.)

**CHROOCOCCACEÆ.**

*2. Chroococcus minor, Ng. (Protococcus minor, Kg.).

Pegu, Elephant-point, in rhizophoretis ad corticem Sonneratiae apetale. (3277).

* The arrangement is according to Rabenhorst's *Flora Europaea Algarum*, that of the sea weeds according to Kützing's *Species Algarum*. The numbers within brackets refer to Mr. Kurz's collections. Those species marked by an asterisk are new additions to Burmese phycology (see a paper on Burmese Algae by the late Dr. G. von Martens, Journ. A. S. B., Vol. XL, 1872, p. 461 sq.)

† The diatoms from Burmah (about 60 or more species) are not yet distributed; Dr. L. Rabenhorst of Dresden has, however, been kind enough to undertake the determination of them. (S. Kurz.)
*3. Chroococcus Indicus, Z., n. sp.
Stratogelatinoso, tenui, pallide fusco; cellulis singulis solitariis, oblongis v. globosis, 1/700—1/300 lin. crassis, virescentibus; tegumento hyalino, vix conspicuo, cytiodermate achromatico, cytioplasmate granuloso. In stagno silvatico ditionis Prome (3151).

*4. Chroococcus granulosus, Z., n. sp.
Stratogelatinoso, granuloso, aurantiaco; cellulis 4-12 et pluribus in familias circiter 1/100 lin. crassas associatis, 1/500—1/300 lin. crassis, v. singulis ad 1/100 lin. crassis, globosis v. angulosus; tegumentum tenerim, hyalino; cytiodermate hyalino, in cellulis junioribus vix conspicuo, in adultioribus crassiusculo; cytioplasmate auro-fusco, rarius viridi. Pegu, in valli alluviali fluminis Irrawaddi versus Thabyeigon, in rivulo exsiccatum (3223).

*5. Aphanocapsa albida, Z., n. sp.
Thallo tenui, membranaceo, amorpho, sordide albido; cellulis globosis, 1/700—1/600 lin. crassis, nunc solitariis, nunc seriatis aut acervatis; tegumentis diffusentibus; cytioplasmate homogeneo, pallide aerugineo. Arracan, Akyab, in stagnis salcis putrescentibus fluitans (3234).

*6. Synechococcus fuscus, Z., n. sp.
Cellulis singulis, interdum duabus v. tribus longitudinaliter seriatis ellipticis, utraque fine rotundatis, 1/100 lin. longis, 1/250 lin. crassis; cytioplasmate fusco v. lutescente, homogeneo. Pegu, in montibus Yomah dictis secus rivulum Thit-Kouk (Pazwoondoung) in limo arenoso (3258).

LEPTOTHRIXCHÆ.

*7. Leptothrix ochracea, Kg.
Pegu, in variis locis præsertim in montibus Yoma frequentissime e fissuris ruptum humidurum protrudens et massas 1—1½ poll. crassas ochraceas formans. In collectione hæce prostant stationes: Kadeng-choung ad Natmadhee (3232/a); Thayet-choung inter Kya-Eng (Eng = laculus) et Phounggyee, (3277); Wha-choung (choung = rivulus, fluvis, etc.) in stagno sylvatico (3237/a); Mui-how in montibus (Yomae meridionalis) in fonte (3240).

*8. Hypheothrix eruginea, Rabenh. (Leptothrix, Kg.)
Pegu, Phounggyee, ad ripas laculi in limo (3186/a) var. subtorulosa, Z. articulis ad genicula interdum parum contractis. Pegu, Kenbatee-choung in fonte ad vicum (3131).

*9. Hypheothrix calcicola, Ag. b. muralis (Leptothrix muralis, Kg.)
Pegu, Henzadah, ad muros ædis cujusdam vetustæ lateritiae. (3167).


**OSCILLARIEÆ.**


*17. Oscillaria sancta*, Kg. Pegu, Tharawa, non procul ab Henzada, in muris humidis cisternae (3214/a, 3223).


*22. Chthonioblastus Lyngbyei, Kg.
Arracan, Akyab, in rupibus marinis inundatis (3285).

*23. Chthonioblastus Burmanicus, Z., n. sp.
Filis 1/1500 lin. crassis, õrugineis v. lutescentibus, indistincte articulatis, parum flexuosis, apice attenuatis, in fasciculós pallide fuses, 1/300 lin. crassos, flexuosos, contortis; vaginis ad 1/100 lin. crassis, pellucidis, fibrillosis, margine undulatis. Pegu, Tharawa prope Henzadah, in muris cisternae (3214b).

*24. Chthonioblastus Kurzii, Z., n. sp.
Litoreus, strato nunc obscure chalybeo, nunc luteo-viridi, filamentoso; filis 1/400—1/300 lin. crassis, violascentibus, v. pallide õrugineis, numerosis, in fasciculos laxe contortis, apicibus attenuatis, obtusis; articulis diametro ad tripulum brevioribus, rarius granulatis; vaginis 1/90—1/50 lin. crassis, sordidis, hyalinis, interdum transversim striatis. Pegu, Elephant-point, in rhizophoretis in limosis ad arborum radices et ad algas majores maritimas (3273,3274).

*25. Lyngbya pallida, Z., n. sp.
Pallide viridis, adnata, filis 2-4 pollicaribus, cespitosis, flexuosis, luteis v. virescentibus, cum vagina laxi, achronomatica, 1/60 lin., sine vagina 1/70 lin. crassis; articulis diametro 3-5plo brevioribus, subtilissime granulatis. Pegu in montibus Yomah, Wathabwot-choung in saxis arenosis submersis (3175).

*26. Hydrocoleum Meneghianum, Kg.
Pegu, Elephant-point, in rhizophoretis, ad radices et arborum truncos submersos (3263).

*27. Hydrocoleum striatum, Z., n. sp.
Rivulare, semipollicare, õrugineo-nigrum; vaginis 1/90 lin. crassis, transversim striatis, striis in 1/100 lin. 9; filis inclusis plerumque ternis, leviter contortis, 1/180 lin. crassis, dense granulatis, continuos, vel obsolete articulatis; diametro molto brevioribus. Pegu, in rivulo vadoso prope San-ya-wa ditionis Rangoon (3200).

*28. Sirocoleum Indicum, Z., n. sp.
Cespite parvulo, vix semiunciali, viridi; vaginis a basi 1/60 lin. crassa ad 1/250 lin. attenuatis, achronomaticis; filis initio pulchre õrugineis, apice obtusis, obsolete articulatis, articulis diametro æqualibus, 1/750 lin. crassis, deinde pallidioribus et divisione longitudinali et transversali in gonidia 1/1500 lin. crassa, seriata, diametro 2-4plo longiora, collapsis. (Sirocoleo
G. Zeller—On Burmese Algae, &c. 179


*29. Symplaca Kurziana, Z., n. sp.
Lignicola, pollicaris et ultra, griseo-æruginea, fasciculis strictis, densis, basi coalitis: filis rectis, pallide ærugineis, subtiliter granulatis, continuis vix hinc inde obsolete articulatis, cum vagina 1/375 lin. crassis; vaginis aëromaticis, arctis, superne sape vacuis. Pegu, in fundo naviculae fluminis Myitnae ad Thabyægon (3222).

*30. Symplaca Lutescens, Z., n. sp.

NOSTOCHIÆ.

*31. Nostoc Ellipsosporum, Rabenh. (Hormosiphon, Desmaz.) var. vaginis aëromaticis.
Prome, in montibus Yomæ, inter muscos secus declivia rivuli Whaydho (3178).

*32. Nostoc Granulare, Rabenh. (Hormosiphon, Kg.).
Pegu, Elephant-point, in aquis dulcis stagnantibus (3291).


*34. Nostoc Rivulare, Kg.
Pegu in montibus Yomæ, Koon-choung ad saxa arenosa humida (3176).

*35. Nostoc Heterothrix, Z., n. sp.
Strato irregulariter expanso, olivaceo-viridi; filis leviter flexuosis, inaequalibus; alteris ærugineis, articulis globosis, 1/600—1/450 lin. crassis, cytiidemate vix conspicuo hyalino; alteris fuscis, cytiidemate evidentii, colorato, articulis globosis v. ellipticis, ad 1/175 lin. crassis; cellulis perdurantibus ellipticis, ceteris paulo majoribus. (Forsan Hormosiphon heterothrix, Kg.?) Pegu, in valli Pazwoondoung, in rivulo Bala-choung (3196); secus declivia limosa fluminis Irrawaddi ad Khyoung-geyee (3163).

*36. Nostoc Kurzianum, Z., n. sp.
Terrestre, thallo fusco-atro, irregulariter expanso, membranaceo; filis densis, parum curvatis, fulvis; articulis 1/600—1/500 lin. crassis, sphæricis,
arctis, virescentibus; peridermate tenui, hyalino; cellulis perdurantibus globosis, ad 1/400 lin. crassis. Pegu, in montibus Yomae centralis, Whathabwot-choung ad declivia limos (4138).

*38. Nostoc limosum, Z., n. sp.
Terrestre, thallo olivaceo-fusco, tenui, indefinite expanso; filis brevibus rectis, dense implicatis, filis leptothrichioideis tenerrimis, articulatis, hyalinis intermixtis; articulis 1/500—1/300 lin. crassis, auctis, globosis v. ellipticis, artce connexis, granulis viridibus fatis; peridermate hyalino, achromatico; cellulis perdurantibus sphericis, duplo majoribus. Pegu, in planitie fluminis Irrawaddi, in limo ripario fluvii Lein inter Theo-choung et Beendau Hseat (3157).

*39. Nostoc saxatile, Z., n. sp.
Subglobosum, vetustate intus cavum, magnitudine cerasi, olivaceo-fuscum, aggregatum; peridermate fuscescente, filis non vaginatis, flexuosis; articulis ellipticis, pallide ærigineis, subtiliter granulatis, 1/600—1/500 lin. crassis; cellulis perdurantibus globosis, ad 1/375 lin. crassis. Pegu, in montibus Yomae centralis, Kayeng-mathay-choung in saxis arenosis humidis (3180).

SPERMOSIREÆ.

*40. Anabena bullosa, Kg.
Pegu, in valli fluminis Sittang, in laculo prope Otweng, Tounghoo (3150); Pegu, in planitie fluvii Pazwoondoung, Bala-choung in limo (3241/6).

*41. Anabena flos-aquae, Kg.
Pegu, in fluvio Lhein inter Beendau-Hseat et Theong-choung (3159).

*42. Anabena stagnalis, Kg.
Pegu, in fluvio Lhein prope Beendau-Eng (3161/6); Khyoung-gyee ad ripas fluminis Irrawaddi (3164).

*43. Anabena subtilissima, Kg.
Rangoon, in limo canalium estuarium (3205).

*44. Anabena indica, Z., n. sp.
Strato tenui, expanso, obscure viridi, deinde fusco; filis rectiusculis, densis, subvaginatis, ærigineis, denique fuscis, apicem versus attenuatis; articulis tenuioribus 1/650 ad 1/600 lin. crassi, sphericis, sepe geminatis; crassioribus (sporangis) ad 1/350 lin. crassi, sphericis, v. ellipticis; ciytoplasmate dilute ærigineo, granuloso. Arracan, Akyab, in lino aquæ subsalsae (3213, 3218); Pegu, in montibus Yomae, Yaitho-choung, in arena humida rivuli frequens (3234).
*45. **Cylindrospermum humicola**, Kg.
Pegu, in limo ripario fluminis Irrawaddi ad Khyoung-gyee (3165).

*46. **Cylindrospermum macrosporum**, Kg.
Pegu, Kadeng-choung ad Natmadhee, natans (3230).

**RIVULARIEÆ.**

*47. **Gloiotrichia Kurziana**, Z., n. sp.
Thallo globoso, lineam crasso, obscure olivaceo; filis ærugineis, brevibus, subulatis; articulis suepe confluentibus, inferioribus ad 1/300 lin. crassis, diametro duplo brevioribus, superioribus eam æquantibus; vaginis ad 1/150 lin. crassis, achromaticis, sporis ærugineis v. lutescentibus, ovatis, basi ventricosis, ad 1/180 lin. crassis, diametro 2-4plo longioribus, dense granulatis; cellulis perdurantibus sphæricis, 1/250 lin. crassis.—Arracan, Akyab in plantis aque dulcis (3212).

Thallo gelatinoso, indefinite expanso, olivaceo, molli, hyalino; filis inclusis ærugineis, basi 1/300 superne 1/500 lin. crassis, apice plus minusve acuminatis, laxe intricatis, flexuosis, nune distincete articulatis, articulis v. moniliformibus, diametro æqualibus v. duplo longioribus; nune—præsertim in parte superiore,—continuis; cellulis basilaribus globosis, 1/300—1/175 lin. crassis, denique in sporangia fusca permutatis.—Pegu, Kadeng-choung ad Natmadhee in truncis vetustis submersis (3228).

**MASTIGOTHRICHEÆ.**

*49. **Mastigothrix æruginea**, Kg.
Pegu, Yenay Eng, in planicie alluviali fluminis Irrawaddi, ramis emortuis insidens (3132).

*50. **Schizosiphon parietinus**, Næg.
Arracan, Akyab in parietibus Phari vetusti (3215).

**SCYTONEMACÆÆ.**

*51. **Scytonema aureum**, Menegh.
Pegu, in variis locis frequens, ad rupes et corticola.—Elephant-point (3276); inter Rangoon et San-ya-wa (3352); in montibus Yomæ centralis, Kayeng-mathay-choung, ad saxa arenosa (3173).

*52. **Scytonema cinereum**, Menegh.
Pegu, in templis pagoda dictis vetustis fere undique; Kya Eng in templo vetusto (3199).
*53. Scytonema gracile, Kg.
Pegu, in planitie fl. Irrawaddi, Palay Kweng in cisternæ muris (3224).

*54. Scytonema tomentosum, Kg.
Supra Rangoon, corticola (3466).

*55. Scytonema Peguanum, Martens.
Pegu, in valle Sittang (3139) ; Phoung-gyee (3118), in truncis arborum frequens.

*56. Scytonema varium, Kg.
Pegu, in montibus Yomæ, in valle Choung-menah (Khaboung) (3152) ; Wachoung (Pazwoondoung) (3241/0).

*57. Scytonema Vieillardi, Mart.
Arracan. Akyab, in stagnis exsiccati subsalsis (3287).

*58. Scytonema fulvum, Z., n. sp.
Strato obscure olivaceo ; filis curvatis, 1/180—1/120 lin. cum vagina crassissime, fulvis ; pseudoramulis sparsis, divaricatis, conformibus ; apicibus attenuatis, clausus, extremis hyalinis ; filis internis vix conspicuis, pallide virescentibus ; articulis obsoletis ; vaginis levibus, arctis, aureo-fulvis.—Pegu, Rangoon in foliis calami (3467) ; Yoma in cortice arborum (3146).

*59. Scytonema fuscum, Z., n. sp.
Strato pannoso, fusco-rubescente ; filis 2-3 lin. altissimis, subsimplicibus, gracilibus, elongatis, basi 1/180—1/120 lin. cum vagina, superne 1/200 lin. cum vagina, 1/300—1/250 lin. sine vagina crassis ; vaginis levibus, saturate fuscis, apicem versus pallidioribus ; filis inclusis pallide virescentibus, obsoletis articulis, graulatis, articulis diametro æqualibus.—Pegu, in terra nuda et ad declivia argillosa, Sanye-wa prope Rangoon in oryzetis (3201) ; in montibus Yomæ in valle fluvii Choung-menah (3153) ; Wachoung, in via cava (3187).

*60. Scytonema Kurzianum, Z., n. sp.
Strato olivaceo ; cæspitulis vix lineam altissimis, compactis ; filis 1/300 lin. cum vagina 1/450 lin. sine vagina crassissimis, subsimplicibus, basi coalescentibus curvatis, internis articulatis, viridi-lutescentibus ; articulis sæpe obsoletis, diametro æqualibus ; vaginis achromaticis v. lutescentibus ; cellulis perdurantibus globosis.—Pegu, Yoma, in cortice arborum (3141/a).

*61. Scytonema murale, Z., n. sp.
Strato compacto, spongioso, lineam crassum, sordide olivaceis, v. nigrescente ; filis intricatis, flexuosis, parce ramosis ; pseudoramulis conformibus, brevibus, cum vagina 1/300—1/200 lin. crassissimis, luteis, apice cinereis, inter-
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*62. SCYTONEMA OLIVACEUM, Z., n. sp.

*63. SCYTONEMA PARRYUM, Z., n. sp.
Strato tenui, tomentoso, fuscescente; filis brevibus, subsimplicibus, attenuatis, basi 1/375 lin. superne 1/500 lin. cum vagina vix 1/700 lin. sine vagina crassis, a basi distincte articulatis; articulis diametro æqualibus, vel longioribus, superne confluentibus; vaginis fuscis, filis internis viridibus. Pegu, in montibus Yomæ centralis, Zamayee-choung, in fissuris humidis rupium arenosarum (3235).

*64. SCYTONEMA (SYMPHYOSIPHON) RHIZOPHORE, Z., n. sp.
Cespitulis obscure olivaceis (in siccatis cinereo-nigrescentibus), spongioso-hirtis, semilinearum crassis; filis fasciculatis, flexuosis, fuscis, parce pseudoramosis, cum vagina 1/300—1/225 lin. crassis, apicem versus attenuatis, internis pallide ærugineis; articulis diametro æqualibus, vel ad triplum brevioribus, superne confluentibus; vaginis fuscis, filis internis viridibus. Pegu, in saxis arenosis montium Yomæ australis (3156).

*65. SCYTONEMA SUBCLAVATUM, Z., n. sp.
Calcicola; strato obscure olivaceo, filis fuscis, æpe basi connatis, partim (junioribus ?) sursum incrassatis, 1/30—1/20 lin. longis, simplicibus, curvatibus, ad 1/180 lin. crassis; partim elongatis, ramello uno alterove instructis, 1/300 lin. cum vagina crassis; filis internis virescentibus, nunc obsolete, nunc distincte articulatis; articulis diametro æqualibus; vaginis arctis. Pegu, in domo vetusta lateritia oppidi Henzadah (3167, 3168, 3169).

*66. SCYTONEMA VIOLESCENS, Z., n. sp.
Cespite erecto, 3-4 lin. alto, pallide violaceo; filis basi 1/150—1/100 lin. cum vagina 1/130—1/110 lin. sine vagina crassis, fasciculatis, parce ramosis; pseudoramulis interdum binis, adpressis, vel intricatis, elongatis, gracilibus, flagelliformibus, variegatis, violaceis, ærugineis et fuscio-luteis, ad 1/250 lin.
attenuatis, apice pallidoribus vel hyalinis; articulis diametro ad duplo brevioribus, saepe confluentibus; vaginis arctis, hirtis, hyalinis v. lutescentibus. Pegu, Yoma in valle Choungmenah (Khaboung) ad declivia argillosa (3154).

*67. Polyphthrix binata, Z., n. sp.

**SIROSPHONIACEÆ.**

*68. Sirospinon parasiticus, Z., n. sp.
Strato cespitoso, fusco; filis virescentibus, 1/200 lin. cum vagina 1/300 sine vagina crassis, curvatis, parce ramosis; ramis ascendentibus, homogeneis; articulis saepe obsoletis, vel confluentibus, duplici serie ordinatis, granulosus, diametro brevioribus; vaginis arctis, luteis v. hyalinis. Pegu, Yoma, Choungmenah, in sylvis sempervirentibus ad folia arborum et fruticum (3292).

**PALMELLACEÆ.**

*69. Pleurococcus vulgaris, Menegh. (Protococcus, Kg.).
Rangoon, ad parietes hospitii circuit house dicti (3210).

**DESMIDIEÆ.*

*70. Closterium striolatum, Ehrenb.
Pegu, Kya Eng, inter plantas submersas aquaticas.

*71. Pleurotenium baculum, De Bary (Docidium, Bréb.).
Pegu, in palude prope Wanet, natans (3238/a).

*72. Pleurotenium trabecula, Neg. (Docidium Ehrenberghii, Bréb.).
Pegu, Eng-ga-na prope Phounggyee (3242).

*73. Euastrum ansatum, Ralfs.
Pegu, Eng-ga-na (3242).

*74. Euastrum ampullaceum, Ralfs.
Pegu, Kya Eng.

* These are only stray Desmids found by DD. Zeller and Rabenhorst amongst the Algae. My collection of Burmese Desmids is in the hands of Mr. W. Archer of Dublin. (S. Kurz.)
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ZYGNEMACEÆ.

*74. Rhynchonema Kurzii, Z., n. sp.
Articulis sterilibus fine replicatis, diametro (1/120—1/100 lin.) 6-8×longioribus, sporiferis tumidis; sporis fuscis, ellipticis, diametro (1/40 lin.) 2-2½×longioribus; fascis spiralibus 2 laxis, torulosis, anfractibus 2. Pegu, Eng-ga-na (3242).

*75. Spirogyra adnata, Kg.
Pegu, Pazwoondoung, Balachoung (3247).

*76. Spirogyra crassa, Kg.
In lacu prope Rangoon (3251).

*77. Spirogyra decimina, Kg.
Prome, Toung-naweng-choung (3155); Myoma, in ripibus fluminis Irrawaddi (3170); Pegu, Kenbatee in fonte scaturiente (3165/a); Pazwoondoung-choung ad Kyauzoo (3184). Alga vulgatissima Burmæ, præsertim in planitiebus alluvialibus.


*78. Spirogyra irregularis, Næg.
Pegu, Yomah centralis, Wopyoo-choung (Khayengmathay-chg.) versus Ghalee Tay natans (3177); Rangoon in canalibus aestuariis subsalsis (3204).

*79. Spirogyra jugalis, Kg.
Pegu, Kya Eng (3198).

*80. Spirogyra longata, Kg.
Prome, Khyee Thay in flumine Irrawaddi (3137); Arracan, Akyab (3211).

*81. Spirogyra majuscula, Kg.
Pegu, in palude quadam prope Thounggyee (3244).

*82. Spirogyra nitida, Kg.
Pegu, in palude inter Theanchoung et Oakkan (3161/a); Promé, Khyee-thay in flumine Irrawaddi (3137); Arracan, Akyab, in aqua dulci (3219).

*83. Spirogyra quinina, Kg.
Arracan, Akyab in aqua subsalsa (3289).

var. β. inæqualis, Næg. Pegu, Beeling Kadeng-choung ad Kway makaing (3232).

*84. Spirogyra tropica, Kg.
Arracan, Akyab, in aqua subsalsa (3289).
*85. Zygnema stellinum, Ag. Pegu, Tonkyan in vicinitate rivuli Bala-choung (3289).

*86. Zygnema Vaucherii, Ag. Pegu, Kya Eng (3194).


*89. Mesocarpus scalaris, Hass. Pegu, Eng-ga-na (3242); Yoma australis, infra pagum Karensium Mui-hau dictum in rivulo (3256).

*90. Stauropspermum fragile, Z., n. sp. Filis luteolis, intricatis, fragilibus; cellulis diametro (1/140—1/100 lin.) 5-10plo longioribus, ad genicula contractis; zygosporis quadrangularibus, 1/100—1/80 lin. crassis; sporodermate laevi. Pegu, Rangoon in lacu (3252); Kadeng-choung ad Natmadhee (3223). In provincia Pegu, præcipue secus fl. Irrawaddy, vulgaris.

VAUCHERIACEÆ.

*91. Vaucheria sessilis, DC., a. cespitosa, Ag. Pegu, Yoma centralis, Khayeng-mathay-choung (3172); var. b. repens, Hass. (forma terrestris); ibidem, in limo siccescente (3181).

ULVACEÆ.

92. Enteromorpha compressa, L., var. c. complanata (E. complana-ta, Kg.). Pegu, Elephant-point in rhizophoretis (3278); Arracan, Akyab, in mari (3281, 3284).

DIPLOSTROMIEÆ.

*94. Diplostromium tenuissimum, Kg.
Pegu, Elephant-point, in rhizophoretis ad radices (3272).

CONFERVACEÆ.

*95. Conferva Funkii, Kg.
Pegu, in palude prope Phounggyee (3244).

*96. Conferva rhypophila, Kg.
Pegu, in planitie fluminis Irrawaddi, Eng-suay in truncis submersis. (3165/c.).

*97. Conferva subseetaea, Kg.
Arracan, Akyab in aqua subsalsa (3288).

*98. Conferva Burtonica, Z., n. sp.
Albo-viresceens, rigidia, intricata; articulis diametro (1/130—1/100 lin.) 24-5 plio longioribus. Pegu, Yenay-eng in planitie fl. Irrawaddi, in plantis aquaticis (3165/6).

*99. Conferva utriculosa, Kg.
Pegu, Yoma centralis, Khayeng-mathay-choung, in stagnis natans (3171); Tay Tay-choung (Zamayee) in limo siccescente (3179).

*100. Conferva inœqualis, Rabenh. (Psychohormium, Kg.); forma, filis ad 1/120 lin. crassis. Rangoon in aqua vadosa lacus natans (3243).

*101. Rhizoclonium Hookeri, Kg.
Pegu, Elephaint-point in limo marino (3260).

*102. Rhizoclonium arbo reum, Z., n. sp.
Obscure viride, siccatum cinerascens; filis a basi apicem versus paulo attenuatis, hinc inde ad genicula intumescentibus, brevissime radicantibus et genuflexis; articulis diametro (1/35—1/25 lin.) æqualibus, vel duplo longioribus; cytiodermate crasso. Pegu, Elephant-point, in rhizophoretis ad corticem arborum (Sonneratia apetala) frequentissime truncorum latus ad septentri onem vergens dense investiens (3261).

103. Cladophoea callicoma, Kg. (Cl. glomerata, forma III. Rabenh.) Pegu, Kadeng-choung ad Natmadhee. (3225).

*104. Cladophoea Javanica, Kg.
Ibidem (3226).

*105. Cladophoea strepens, Kg. (Cl. fracta c. strepens, Kg.). Pegu, Yoma centralis, Wopyoo, choung (Khayeng-mathay-chg.) versus Ghalee Tay (3177).
106. **Cladophora Tranquebariensis**, Kg.
    Pegu, Yoma centralis, Tay Tay-choung, natans (3183).

*107. **Cladophora codiola**, Z., n. sp.
    Cespitosa, viridis, sicca pallida, pygmea, vix 2 lin. longa, subsimplex; filis 1/100—1/75 crassis, apice incrassatis, obtusis; ramellis raris, uniar ticulatis; articulis diametro 8-20 plo et ultra longioribus, infimo perlongo; cytiodermate crasso, hyalinone, levae; cytioplasmate granulare. Pegu, Irrawaddi, Eng-suay in truncis submersis (3166).

108. **Cladophora exigua**, Z., n. sp.

*109. **Cladophora (Ægagropila) contorta**, Z., n. sp.
    Cespitosa, pallide viridis, filis e radice pulposa provenientibus, simplicibus, perraro ramellum uniar ticulatum emittentibus, 2-4 poll. longis, inuniculos contortis, basi 1/80 lin., sursum ad 1/35 lin. apice 1/100 lin. crassis; articulis cylindricis, valde inæqualibus, diametro 2-12 plo longioribus. Pegu Tonghoo, in fundo naviculi in fluvio Sittang (3143).

110. **Cladophora minutissima**, Z. (ad interim).
    Pallide viridis, filis in cortice truncorum radicantibus, dense aggregatis, semilineam vix superantibus, 1/250—1/150 lin. crassis, simplicibus, v. raro ramello unicellulari instructis, a basi apicem versus incrassatis; articulis diametro 1½-3 plo longioribus; cytiodermate flaccido, hyalino, cytioplasmate lamelloso. (Forsan Cladophore cujusdam status juvenilis). Marina Elephant-point in truncis submersis (3264).

**ŒDOGONIACEÆ.**

*111. **Œdogonium apophysatum**, A. Br.
    Pegu, Kya Eng (3195).

*112. **Œdogonium Braunii**, Kg.
    Pegu, Eng-suay non procul a flumine Irrawaddi infra Henzadah (3166/a); Kadeng-choung ad Natmadhee (3229).

*113. **Œdogonium gracile**, Kg.
    Pegu, Eng-suay in truncis submersis (3165/d).

*114. **Œdogonium Landsboroughii**, Kg.
    Pegu, prope Tonkyan supra Rangoon (3248).

*115. **Œdogonium Rothii**, Bréb.
    In lacu Rangoonensi fluitans (3253).
Pegu, Kya Eng in radicibus (3195).

*117. *Edogonium tenellum*, Kg.
Pegu, in stagnis et fossis prope Tonkyan, vicum supra Rangoon (3248).

*118. *Edogonium vesicatum*, Link.
Pegu, Eng-ga-na (3242); Yoma centralis, Zamayee-choung in saxis arenosis (3233).

var. g. fuscescens, Kg.
Pegu, Kya-eng in radicibus (3193).

Monecum; cellula basilari biloba, articulo terminali obtuso, articulis diametro (1/45—1/32 lin.) 2-5 plo longioribus, sese medio dilatatis, v. cunei-formibus, passim uno fine transversim plicatis; oogoniis sparsis, raro seriatis, ellipticis, diametro (1/30 lin.) 1½-2 plo longioribus; oosporis fuscis, sphericis, v. diametro paulum longioribus; antheridiis unicellularibus, lanceolatis, medio constrictis. Pegu, in palude prope Wanet (3255).

*120. Bulbочетe intermedia*, De Bary.
Pegu, Kya Eng (3195, 3203).

*121. Bulbochete Peguana*, Z., n. sp.
Dense intricata, repetite ramosissima, ramis alternis vel oppositis, sensim attenuatis et setis longis, vix 1/1500 lin. crassis, terminatis; articulis fili primarii ad 1/200 lin. crassi 2-3 plo, ramorum 1/300—1/500 lin. crassorum 5 plo et ultra longioribus; oosporis ignotis. Pegu, Yoma centralis, ad rupes calcareo-siliceas inter muscos in cacumine montis Kambala-toung, alt. 3200 ped. s. m. (3459).

**ULOTHRICACEÆ.**

*122. Ulothrix subtilis*, Kg.
Pegu, Eng-ga-na (3212).

*123. Schizogonium tenuissimum*, Z., n. sp.

**CHROOLEPIDEÆ.**

*124. Chroolepus flavum*, Kg.
Yoma centralis, ad bambusarum culmos (3144).

var. filis tenuioribus, articulis longioribus, *Chr. flavi et elongati* intermedium. - Yoma, ad arborum corticem frequens (3145).
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*125. Chroolepus lageniferum, Hildebrand.  
In lacu Rangoonensi, inter Conferm inaqualem in aqua vadosa natans (3243).

*126. Chroolepus umbrinum, Kg. (Protococcus crustaceus, Kg.). Pegu, Yoma, Yaitho-choung, corticola, frequens (3148).

*127. Chroolepus botryoides, Z., n. sp.  
Cespite siccitate pallide luteo, villosa, 2-3 lin. alto; filis flaccidis, ad 1/100 lin. crassis, laevibus; ramis subsecundis, divaricatis, attenuatis, apice 1/250 lin. crassis; articulis diametro 1½-2 plo longioribus; spermatii globosis, minutis, plerumque ad latera ramorum in cumulos botryomorphos aggregatis. Pegu, Yoma, in cortice arborum (3147).

128. Chroolepus calamicola, Z., n. sp.  
Cespite intricato, viridi, (in sico pallide lutescente); filis ramosis, ramis attenuatis, subsecundis, divaricatis; articulis infinis 1/120 lin. crassis, diametro sesquilongioribus; superioribus diametro (1/300 ad 1/180 lin.) 2-4plo longioribus; spermatii plerumque lateralibus, sessili- bus, globosis v. ellipticis, 1/180 lin. crassis, solitariis, v. seriatis. Supra Rangoon, in silvis sempervirentibus in foliis Calami (3467).

*129. Chroolepus elongatum, Z., n. sp.  
Cespitosum, siccitate flavo-cinereum, filis rectis, rigidis, 1/150 lin. crasis, ramosis; ramis secundis, valde elongatis, acuminatis, 1/300—1/225 lin. crassis; articulis primariis diametro duplo, ramorum 4-6 plo longioribus; spermatii ignotis. Pegu, Yoma, Yaitho-choung, in cortice arborum in sylvis sempervirentibus (3148).

*130. Chroolepus fusco-atrum, Z., n. sp.  
Strato tenui, crustaceo, fusco-atro (in sicco); filis brevibus, rectis, v. parum curvatis, torulosus; ramis divaricatis; articulis fuscis, 1/400—1/300 lin. crassis, globosis, v. late ellipticis. Pegu, in valle Choungmenah (Kha- bourg) non procul a Tonghoo, in sylvis sempervirentibus (3469).

*131. Chroolepus Kurzii, Z., n. sp.  
Semipollicare, viride, cespitosum, in fasciculos conicos dense implicatum, filis primariis ad 1/125 lin., ramorum ad 1/300 lin. crassis; articulis diametro 2-4plo (rarius pluries) longioribus; ramis divaricatis, subsecundis; sper- matii lateralibus, ereberrimis, seriatis, sessilibus v. breviter petiolatis, initio globosis, deinde crateriformibus, 1/250—1/60 lin. crassis. Pegu, Tonghoo, Choungmenah-choung in sylvis sempervirentibus ad folia fruticum (præcipue Alsodeiw) (3149).
*132. Chroolepus tenue, Z., n. sp.

Cespitulis exiguis, gregariis, aurantiacis, siccatis cineireis; filis primariis 1/375—1/300 lin. crassiis, varie flexuosis; ramis divaricatis, interdum recurvis, 1/500—1/400 lin. crassiis; articulis diametro aequalibus, vel ad duplum longioribus, torulosis; spermatis globosis, terminalibus et lateralis. Chr. abietino proximum, sed articulis omnibus plus minus inflatis, brevioribus et tenuioribus distinguendum. Pegu, Elephant-point, in rhizophoretis ad corticem Sonneratiae apetale frequens (3268).

**CHÆTOPHORACEÆ.**

*133. Stigeclonium tenue, H., γ. gracile, Kg.

Pegu, Beendau Eng in caulibus Polygoni (3141).

*134. Stigeclonium Rangoonicum Z., n. sp.

Cespite vix 1½ lin. alto, dilute viridi, vel lutescente, dense implicato; filis primariis 1/375—1/250 lin. crassiis; ramis subdichotome secundis, ad 1/900 lin. crassiim attenuatis, flaccidis; articulis valde inaequalibus, diametrum aequalibus torulosis, ad genicula leviter constrictis, vel cylindricis et ea 2-3plo longioribus. In cisterna quadam oppidi Rangoon (3249).

*135. Chetophora pisiformis, Ag.

Pegu, Phounggyee in laculo ad radices submersas (3190); Prome, Myitmakha-choung ad Gho-tau, in plantis aquaticis (3140).

*136. Chetophora radians, Kg.

Pegu, Kya Eng in radicibus (3193).

*137. Chetophora tuberculosa, Kg.

Pegu, in laculo inter Phounggyee et Kyauzoo (3245).

*138. Chetophora stricta, Z., n. sp.

Viridis, expansa, mollis, 1-2 lin. crassa; filis internis repetite et dichotome ramosis, strictis; ramis attenuatis, gracilibus, non piliferis; articulis oblongis, ad 1/350 lin. crassiis, diametro 1½-3plo longioribus. Pegu, Kadeng-choung at Natmadhee in ramis emortuis submersis (3231); Prome, Khyee-thay, ad silices rivuli tenui aquafluentis in flumine Irrawaddi (3136).

*139. Gongrosira pygmea, Kg.

Forma tenuis, non ultra 1/180 lin. crassa. Rangoon, ad rudera lateritia submersa (3250).

140. Gongrosira onusta, Z., n. sp.

Flavo-viridis, cespitibus confluentibus, lineam crassis; filis e basi fibrosa continua articulatis; articulis diametro (1/150—1/100 lin.) 2—3plo longioribus; ramis numerosis, undique egredientibus, moniliformibus; articulis

**192.** 192

ramorum omnibus oogonia globosa, ad 1/125 lin. crassa, formantibus; oosporis fuscis, 1/250 lin. crassis. Pegu, Elephant-point secus littora in truncis vetustis inundatis (3262).

**CHANTRANSIEÆ.**

*141. Chantrania roseola, Z., n. sp.*

Cespitulis minutiis, roseo-chalybeis; filis 1/400—1/300 lin. crassis, fastigiatim ramosis; ramis distantibus, erectis; articulis diametro 4plo longioribus. Pegu, Beendaung Eng, in caulibus Polygoni (3141).

**BATRACHOSPERMACEÆ.**

142. *Batrachospermum moniliforme*, Roth.

Pegu, in gurgite profundo paludis prope Phoungyee, ad radices arborum (3188).

**HILDENBRANDTIACEÆ.**

*143. Hildenbrandia Arracana, Z., n. sp.*


**CERAMIEÆ.**

*144. Gongroceras radicans, Z., n. sp.*

Capillare, repens, pollicare, apicibus rectis, vel parum curvatis, non forcipatis; filis intricatis, subpectinatis, vel reptite dichotomis, radicantibus; radiculis numerosis e parti inferiori egredientibus, continuis, vel articulatis; articulis cylindricis, diametro nunc 1½-2plo longioribus, nunc ei equalibus, supremsi brevioribus; zonis superioribus confluentibus; tetrachocarpiis plerumque infra apices ramorum verticillati dispositionis. Pegu, Elephant-point in rhizophoretis ad radices truncosque arborum inundatos, (3274).

**HALYMENIÆ.**


Pegu, Elephant-point, frequens in rhizophoretis et secus littora in truncis vetustis inundatis, (3265).

**GELIDIEÆ.**

146. *Acrocarpus intricatus*, Kg. (*Gelidium*, Kg., *Sphaerococcus*, Ag.).

Arracan, Akyab in rupibus marinis, (3279).
POLYSIPHONIEÆ.

*147. Polysiphonia subadunca, Kg., major, ramis crebrioribus, minus strictis.
   Pegu, Elephant-point, in rhizophoretis frequens, (3274).

*148. Bostrychia intricata, Mont.
   Pegu, Elephant-point, in rhizophoretis frequens, (3263).

*149. Bostrychia rivularis, Harv.
   Pegu, Elephant-point, in rhizophoretis ad arborum radices, (3271).

DELESSERIEÆ.

*150. Hypoglossum Bengalense, Mart.
   Pegu, Elephant-point, in truncis vetustis inundatis ad littora satis frequens, (3266).

*151. Hypoglossum Leprieuri, Kg.
   Pegu, Elephant-point, in rhizophoretis frequens, (3270).

APPENDIX.

Characeæ Burmanice,* determined by Dr. A. Braun, Professor of Botany in Berlin.

1. Nitella Roxburghii, A. Br.
   Pegū, Kya Eng, (3295).

2. Nitella microglochin, A. Br. sp. v. subsp. nov. N. oligospirae proxima.
   Arracan, in valle Koladyne in stagno quodam silvatico.

3. N. oligospira, A. Br.
   Pegu, Kya Eng, (3294).

4. Chara gymnophyta, A. Br.

* It may not, I think, be uninteresting to insert at this opportunity the few Characeæ, which have as yet been found in Burma. I am indebted to Prof. A. Braun who obligingly sent me the list a long time ago, for the names of the species. (S. Kurz.)
ON THE PTEROPIDÆ OF INDIA AND ITS ISLANDS, WITH DESCRIPTIONS
OF NEW OR LITTLE KNOWN SPECIES,—by G. E. Dobson, B. A., M. B.,
Staff Surgeon, H. M.'s British Forces.

(With Plate XIV.)

[Read July 5th, received July 18th, 1873.]

Although Dr. W. Peters has done so much towards clearing up the
synonymy of the Pteropidae as well as of other families of Chiroptera, much
yet remains to be done before a correct list of the species can be obtained.
The state of confusion into which the species of this family have fallen,
in common with most species of Chiroptera, is mainly due to the great
imperfection of the original descriptions, from many of which it is impossi-
ble to recognise the family to which the species belongs.* This imperfection
in description has arisen chiefly from the general ignorance respecting the
Order which has prevailed amongst Zoologists, who seem to have shared the
vulgar antipathy to these animals, if we may judge from the small amount of
attention they have received, and also from the want of proper material in
the Museums. Most of the Pteropidae being large bats, and therefore unlikely
to be preserved by collectors in spirit, have been described from dried speci-
mens, and this also has added much to the imperfection of the description.

Much work, therefore, remains to be done both in obtaining well-pre-
served duplicates, in comparing them with the type specimens, and in
producing from them descriptions from which it may be possible for natura-
lists in general to determine the species.

If the species of the genus Pteropus, as given by Drs. Peters and
Gray,† be enumerated, there will be found to be not less than fifty.
The distribution of these fifty species is as follows:—

<table>
<thead>
<tr>
<th>Continent/Island</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Continent of India and Burma</td>
<td>1</td>
</tr>
<tr>
<td>Malay Archipelago</td>
<td>25</td>
</tr>
<tr>
<td>China, Japan, and Loo-choo Islands</td>
<td>4</td>
</tr>
<tr>
<td>Solomon Islands; New Caledonia; New Hebrides; Fiji Islands; Marianne and Viti Islands</td>
<td>9</td>
</tr>
<tr>
<td>Australia</td>
<td>5</td>
</tr>
<tr>
<td>Africa and its Islands</td>
<td>6</td>
</tr>
</tbody>
</table>

* Thus Dr. J. E. Gray remarks (P. Z. S. Lond., 1866, p. 148)—“The generic charac-
ters of Aello, as given by Dr. Leach, occupy nearly a page of a quarto book, and yet no
one has been able to discover the genus. One could not have a more convincing
proof that it is not mere length of character that is required to define a genus.”

† See Peters in Monatsb. Berlin Akad., 1867, p. 323, and Gray's Catalogue of
Monkeys, Lemurs and Fruit-eating Bats, 1870.
1. Pteropus medius. 2. Pteropus nicobarius. 3. Pteropus edulis.
4. Cynopterus marginatus. 5. C. marginatus var. andamanensis.
It is very remarkable that, supposing the localities to be correct or approximately so, one half of the whole number of species is distributed among the small islands of the Malay Archipelago, while a single species—Pteropus medius—is the sole representative, hitherto discovered, of the genus in the Continent of India and Burma.

That a large proportion of the species should be found in the Malay Archipelago and adjoining Islands might be expected, as these animals like monkeys can live only where a constant supply of fruit is attainable throughout the whole year, but the same conditions obtain in the greater part of the Peninsula of India, and especially in Equatorial Africa, yet scarcely one-seventh of the whole number has been found in these regions.

The Malay Archipelago is, therefore, either the original and special home of the genus from which a few species have wandered into India and Africa, or many species remain undiscovered in the latter countries, and probably many of the so-called species which go to make up the large number from Malayana have been founded on insufficient grounds.

I have not the least doubt that the real number of species is much less than that recorded, and that many described as new by Temminck and others will, with the accession of additional and more perfectly preserved specimens to the collections hitherto available in our Museums, be found referable to a few really distinct species. This may be especially expected in the case of those species that have been founded on differences in the colour of the fur, which appears to have been regarded by some zoologists as of equal importance with the colour of the feathers in birds.

I have elsewhere* dwelt at some length on the variability of the colour of the fur in many species of bats, and have shown that, in the Pteropini especially, individuals belonging to the same species present very different shades of colour according to sex, age and season, and probably also, but in a less degree, according to locality.

Differences in the form of the skull and in the teeth have been also used to distinguish the species, but these, though of the greatest importance, are not satisfactory, if alone available as a means of diagnosis, for it should, surely, be possible to distinguish the species of a given vertebrate animal without first finding it necessary to kill and make a skeleton of it.

It is, therefore, desirable that, in the description of species, certain external characters may be given from which the living animal can be known, and these, I believe, may be found in the shape and relative size of the ears, and in the quality and distribution of the fur.

In all the Chiroptera, we find one or more of the organs of special sense greatly developed to supplement or, in some genera, almost wholly replace the visual organs (which in most cases are very rudimentary or, where

G. E. Dobson—On the Pteropidae of India. [No. 3, 

moderately developed, can be of little use owing to the nocturnal habits of the animals), and this development varies remarkably according to family, genus, and species.

Thus the peculiar form of the nose-leaf taken with the shape of the ears at once characterises the Rhinalophidae, and each species of the family may be distinguished by secondary modifications of these organs alone.

And in those families of bats where the nostrils are not furnished with appendages, the form and relative size of the ear will generally be found to be the most important characters for readily and accurately determining the species, and, next to and with these, the quality and distribution of the fur.

I shall employ this principle of diagnosis in the following descriptions of the species of Frugivorous Bats known to inhabit Continental India and Burma, and the Islands of the Bay of Bengal.

Genus I.—Pteropus, Brisson.

Nostrils projecting; upper lip with a vertical groove in front bounded laterally by naked prominences; index finger with a distinct claw, metacarpal bone of second finger shorter than the index finger; wings from the sides of the hairy back; wing-membrane attached to the back of the first phalanges of the second toe; tail none.

Dentition:—in. \( \frac{4}{4} \); c. \( \frac{1-1}{1-1} \); pm. \( \frac{2-2}{3-3} \); m. \( \frac{3-3}{3-3} \)

A.—Ears acutely pointed.

Pteropus medius. Pl. XIV, Fig. 1.


Ears long, with acutely pointed tips, the upper third of the outer margin concave beneath the tip; in fully grown individuals the longest diameter of the opening of the external ear, from the point of junction of the outer and inner margins below to the tip, measures one inch and a half.*

Nostrils projecting, with a deep intervening emargination; upper lip with a narrow vertical groove in front bounded laterally by naked rounded prominences continuous with the integument of the nostrils.

* The length of the ear (anteriorly) as given in the tables of measurements accompanying this paper (and also wherever mentioned in previous papers) has been determined by measuring the distance between the termination of the outer margin below and the tip. The breadth has been ascertained by means of a string passed round the ear posteriorly from the inner to the outer margin.
The ears are naked except at the bases posteriorly, and a narrow triangular portion covered with short hairs terminating towards the middle of the outer margin; anteriorly, the anterior flattened edge of the inner side of the conch is covered from the base upwards for about one-third of the length of the ear.

The face is naked in front of a line joining the inner angles of the eyes, and on either side of the naked space (which corresponds to the position of the nasal bones) a few long fine hairs arise from separate papillæ. The fur is rather dense and moderately long on the back of the head, neck, and shoulders, but short and appressed on the back, narrowing to about two inches in width across the loins. A narrow line of short fur passes outwards on to the wing membrane posterior to the humerus for rather more than half its length; the elbow is quite naked, but a few short hairs cover a narrow portion of the wing-membrane, about one inch and a half long, posterior to the forearm. The femur, and the interfemoral membrane as far as a line corresponding to the position of the semi-circular band on the under surface of the membrane are covered; the tibiae are naked, or have only a few very short hairs; the feet are quite devoid of hair.

On the under surface, the whole body is well covered; the antebrachial membrane is similarly covered as far as a line drawn from the knee to a point about one inch posterior to the elbow joint, thence the hair passes outwards on the wing-membrane posterior to the forearm, terminating at about the beginning of the distal third of the radius. The thighs are covered, the legs and inter-femoral membrane are quite naked.

The nape of the neck and the shoulders are usually reddish yellow or golden yellow or pale straw colour, but every shade of these colours has been observed, the different colours and intermediate shades appearing to depend on sex, age, season, or locality. The darker shades are usually found in females.

The chest and upper part of the abdomen are either of the same colour as the nape of the neck or of a darker hue. The remainder of the fur black or dark brown mixed with grayish hairs.

The fur of the neck is coarser and longer than that covering other parts of the body. In most male specimens a circular tuft of rigid unctuous hairs, of a deep reddish yellow colour, is found on each side of the neck, situated midway between the base of the ear and the origin of the ante-humeral portion of the wing-membrane from the shoulder. In a large male obtained near Calcutta, these tufts occupy a space one inch in diameter, and the hairs composing them measure about one-third of an inch in length.

Hab.—India generally, from Kachh to Burma, and from the Himalaya to Ceylon.

To this section of the genus belongs Pt. edulis, Péron et Lesueur, from
Java and Sumatra, which has been reported from Tenasserim,* and may probably be found in the Nicobar Islands. This species, the largest of known bats, may be readily distinguished from *P. medius* by its ears, and by the distribution and quality of the fur. The ears are proportionately shorter and narrower than in the Indian species, and the concavity of the upper third of the outer margin is much less distinct. In a specimen from Java, in the Indian Museum, the ears are about the same length as in the most adult specimen of *P. medius*, while its forearm exceeds that of the latter species by more than two inches, and the tibia by an inch and a half. Compared with *P. medius* the light coloured portion of the fur extends further down upon the shoulders, and the breadth across the loins occupied by hair is proportionately much greater: this is well seen when specimens of equal size are compared, the breadth of the fur in this position in the not fully grown *P. edulis* being nearly, if not quite, double that in the adult *P. medius*. Elsewhere the distribution of the fur is similar in both species, but the hair on the wing-membranes and legs is conspicuously much longer in *P. edulis*.

B.—Ears rounded at the tip.

*Pteropus nicobaricus.* Pl. XIV, Fig. 2.


" *nicobaricus*, Zelebor, Reise der Oester. Freg. 'Novara,' Sängethiere, 1863, p. 11.

Ears rounded off at the tip, their breadth nearly equal to their length; the upper third of the outer margin slightly flattened, not concave, the lower two-thirds convex; in fully grown individuals the longest diameter of the opening of the external ear, from the point of junction of the outer and inner margins below to the tip, scarcely exceeds one inch.

The distribution of the fur of the body is similar to that of *P. medius*, but the hair on the wing-membrane is very much shorter.

In some male specimens the colour of the fur also corresponds very closely with that of *P. medius*; generally, however, the lighter coloured portions of fur on the nape of the neck, and on the shoulders and chest, are of a deeper hue than in the latter species, usually dark ferruginous red or chestnut; females and young males are commonly *intensely black throughout*; in some female specimens the position of the light-coloured tippet in the male is indicated by a reddish tinge.

* A very badly preserved dried skin of an immature specimen of some species of *Pteropus*, in the Indian Museum, has been identified by Mr. Blyth with *P. edulis*, and the locality 'Tenasserim' recorded in his Catalogue. The specimen is in such a very bad condition I am able neither to confirm nor to correct Mr. Blyth's identification.
The skull differs from that of *Pt. medius* in being shorter, wider across the maxillary and nasal bones, and in having nearly all its processes and ridges much more strongly defined. The distance between the small anterior upper premolars exceeds that in *Pt. medius* by one-tenth of an inch. The *foramen ovale* is divided in the centre by a process of bone, in *Pt. medius* it is undivided. A post-orbital process of the zygomatic arch is present, though not so well developed as in *Pt. medius*.

The mandible is shorter and its rami deeper than in *Pt. medius*; the coronoid process is more developed vertically, its posterior margin is nearly straight, not deeply concave, and its superior angle is narrowly, not broadly rounded off as in the latter species.

The teeth are stouter in *Pt. nicobaricus* but their general characters are the same in both species.*

Hab.—Andaman and Nicobar Islands, probably Java also. An old dried specimen in the Indian Museum is labelled Java, but not numbered in Blyth's Catalogue.

Neither Fitzinger nor Blyth described this species, though they invented names for it. Zelebor's description occupies nearly two pages of a quarto book, and very careful measurements of the original specimen are given, yet, as his description is taken from a young individual and contains few really diagnostic characters, I was unable to feel certain that specimens obtained by me last year from the Andamans and Nicobars should be referred to this species. But Dr. Peters has lately, at my request, very kindly compared some specimens sent to him from the Indian Museum with the type specimens of *Pt. nicobaricus* in the Vienna Museum. He informs me that they agree in the form of the ear and feet. With this additional information I feel no hesitation in referring the specimen from which the above description is taken, to that species.

<table>
<thead>
<tr>
<th>Pteropus medius</th>
<th>Pteropus nicobaricus</th>
<th>Pt. edulis</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Calcutta</td>
<td>Mammalium</td>
</tr>
<tr>
<td>Length, head and body</td>
<td>9.0</td>
<td>7.5</td>
</tr>
<tr>
<td>head</td>
<td>3.1</td>
<td>3.15</td>
</tr>
<tr>
<td>ear (anteriorly)</td>
<td>1.5</td>
<td>1.40</td>
</tr>
<tr>
<td>Breadth, ear</td>
<td>0.85</td>
<td>0.8</td>
</tr>
<tr>
<td>Length, from ear to tip of nostril</td>
<td>2.7</td>
<td>2.4</td>
</tr>
<tr>
<td>from eye to tip of nostril</td>
<td>1.3</td>
<td>1.1</td>
</tr>
<tr>
<td>forearms</td>
<td>6.6</td>
<td>6.7</td>
</tr>
<tr>
<td>thumb</td>
<td>2.7</td>
<td>2.7</td>
</tr>
<tr>
<td>second finger</td>
<td>2.5</td>
<td>13.5</td>
</tr>
<tr>
<td>fourth finger</td>
<td>8.5</td>
<td>8.5</td>
</tr>
<tr>
<td>tibia</td>
<td>3.0</td>
<td>3.2</td>
</tr>
<tr>
<td>foot and claws</td>
<td>2.3</td>
<td>2.3</td>
</tr>
<tr>
<td>calcaneum</td>
<td>1.0</td>
<td>0.9</td>
</tr>
</tbody>
</table>

* For the dentition of the genus *Pteropus* see De Blainville, Ostéographie.
Genus II.—Cynopterus,* F. Cuvier.

Nostrils projecting; upper lip with a vertical groove in front, bounded laterally by naked prominences; index finger with a distinct claw; metacarpal bone of second finger exceeding slightly in length the index finger; wings from the sides of the hairy back, wing-membrane attached to the base of the first toe; tail short, distinct.

Dentition:—inc. \( \frac{4}{4} \); c. \( \frac{1-1}{1-1} \); pm. \( 2-2 \); m. \( 2-2 \).

Cynopterus marginatus. Pl. XIV, Fig. 4.


Cynopterus affinis, Gray, Cat. Mammal., 1850, xix, p. 38.

Eleutherura marginata, Gray, Catalogue of Monkeys, Lemurs and Fruit-eating Bats, 1870, p. 118.†

Ears large, rounded at the tip, with a slight but distinct concavity of the outer margin immediately beneath the tip; both the outer and inner margins are bordered with white; the white border along the inner margin is about one-twelfth of an inch wide, and contrasts strongly with the dark brown colour of the ear; the outer margin terminates below without forming a lobe at the base.

Nostrils projecting, with a deep intervening emargination. The upper lip marked in the centre, as in Pteropus, with a narrow vertical groove bounded laterally by naked rounded prominences continuous with the integument of the nostrils.

The ears are naked posteriorly except at their bases; anteriorly, a few hairs appear on the conch along the outer side of the white border of the inner margin of the ear, and, similarly, along the inner side of the white border of the outer margin. On the upper surface, the fur of the back extends upon the wing-membrane nearly as far as a line joining the elbow and knee joints, also, thinly, upon the humerus, the femur, and proximal end of the tibia. Beneath, the antebrachial membrane is covered with moder-

* I have placed the genus Cynopterus next Pteropus as I believe it presents more affinities with that genus than any of the other genera of Pteropidae. The species of these genera agree very closely in the form of the nostrils and of the narrow emargination on the upper lip bounded by naked prominences. In Cynonycteris this emargination is wide and deep with slanting sides, altogether very different from the same part in Pteropus. In habit also the species of Cynopterus and Pteropus perfectly agree; they are all strictly frugivorous bats and live in trees, while the species of Cynonycteris are commonly found in caves, and I have been informed that a colony of C. amplexicaudata living near the sea were seen to feed on Mollusca left exposed by the tide.

† For a complete list of synonyms of this species see Peters in Monatsb, Berlin Akad., 1867, p. 866, and 1869, p. 395.
ately long thinly spread hairs, and the wing-membrane is clothed to about the same extent as on the upper surface, the hairs also passing outwards in a narrow band posterior to the forearm. The colour of the fur is extremely variable, dark brown, reddish-brown, snuff-brown or olive-brown, sometimes with a bluish tinge throughout.

The first upper premolar is minute, and in the centre of the space between the canine and second premolar; the second premolar is about equal to the lower canine in vertical extent.

Cynopterus marginatus, var. Andamanensis. Pl. XIV, Fig. 5.

This is, I believe, a permanent variety of C. marginatus. It is readily distinguished by the small size of the ears which are similarly margined with white. The relative size is very well shown in the accompanying illustration.

Specimens of young individuals of C. marginatus from Bengal with forearm bones nearly half an inch shorter than specimens of adult animals of this variety from the Andamans have considerably larger ears.

Cynopterus sherzeri. Pl. XIV, Fig. 6.


This species, like Pteropus nicobaricus, was named but not described by Fitzinger, and Zelebor regards it as a variety only of C. marginatus. It is at once distinguished from that species by its small and narrow ears which are also not margined with white. When adult specimens of C. marginatus and of this species are compared together, the difference in the size and shape of the ears is very striking.

The muzzle is thicker, and the colour of the fur much darker than in any specimen of C. marginatus.

Zelebor mentions that the ears of the specimens obtained at Car-Nicobar are margined with white, but I have been unable to detect even the slightest trace of a white border in the ears of several specimens examined by me. Therefore, either Zelebor has been mistaken, or the white bordering of the ears is not a constant character in this species, or I have wrongly identified the species here described with C. sherzeri. But although it is quite impossible to identify the species here described with that obtained during the Novara Expedition at Car-Nicobar Island from Zelebor’s description (which consists merely of some unimportant remarks on the colours of the fur, wing-membrane, and eyes), yet as the animals which furnished the above description were taken not only at the same island—Car-Nicobar—but also from the same place on that island, namely, from the leaves of the cocoa-nut palms, I think it highly probable that they
belong to the same species, and, accordingly, to avoid the possibility of introducing a fresh synonym, I have retained Fitzinger's name.

Cynopterus brachysoma. Pl. XIV, Fig. 7.


I have little to add to my original description of this species.

The ears are much rounded off above, and the upper third of the outer margin is straight or slightly convex; the presence of a rounded lobe at the base of the outer margin at once distinguishes this species.

The difference in the measurements of the breadth of the ear given with the original description and in the table below is due to the measurement having been taken in the former case across the concavity of the ear, anteriorly; in the latter, by means of a string round the convexity, posteriorly.

Genus III.—Cynonycteris, Peters.

Nostrils projecting; upper lip with a wide groove in front with smooth not elevated margins; index finger with a distinct claw; metacarpal bone of second finger exceeding, or equalling, the index finger in length; wings from the sides of the hairy back; wing-membrane from the base of the second toe; tail short, distinct.

Dentition: — in. \( \frac{4}{4} \); c. \( \frac{1-1}{1-1} \); pm. \( \frac{2-2}{3-3} \); m. \( \frac{3-3}{3-3} \).

Cynonycteris amplexicaudata. Pl. XIV, Fig. 8.


" Leschenaultii, Desmarest, Mammal., p. 110.

" amplexicaudatus, Temm., I, p. 200.


Head long, triangular; upper lip with a wide groove directly continuous with the emargination between the nostrils, the edges of the groove smooth, not thickened as in Pteropus or Cynopterus; ears moderate, triangular, rounded at the tip, the upper half of the outer margin straight, the lower half convex.

Posteriorly the ears are naked except at their bases, anteriorly the conch is covered with a few very short fine hairs. The fur of the body extends upon the humerus and upon the fleshy part of the forearm, the remaining part to the carpus has only a few very fine hairs. The portion of the back and wing-membrane covered with fur across the loins is not more than an inch in breadth. The interfemoral membrane is densely covered with hair at the root of the tail, and on either side as far as lines drawn from the knee joints to the base of the free portion of the tail; the remaining portion, the legs and a considerable part of the wing-membrane beyond, are clothed with short, thinly-spread fur which extends along the wing membrane and legs.
to the back of the feet. Beneath, the ante-humeral membrane is clothed with rather long thinly-spread fur, and the wing-membrane is similarly covered as far as a line drawn from the knee to a point about half an inch posterior to the elbow, whence the fur extends outwards to the carpus. The interfemoral membrane, the legs, and the feet are covered with a few very short hairs.

First upper premolar minute, equally distant from the canine and second premolar; second premolar exceeding lower canine in vertical extent; first lower premolar small, less than half the size of the second premolar; second premolar nearly equal to lower canine in vertical extent.

Hab.—From the Persian Gulf to the Philippine Islands. Bengal; Southern India; Ceylon; Burma; Celebes; Amboyna; Timor; Aru Islands.

**Cynonycteris minor**, n. sp. Pl. XIV, Fig. 9.

Ears smaller and much narrower than in *C. amplexicaudata*; muzzle also proportionately shorter.

The minute first upper premolar is closely wedged in between the canine and second premolar; in *C. amplexicaudata* it is separated by a narrow interval from both these teeth.

The distribution of the fur is somewhat similar to that of *C. amplexicaudatus*, but it is much shorter on the wing-membrane and almost absent from the backs of the tibia, from the adjoining portions of wing-membrane, and from the feet.

Hab.—Java.

### Table

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<th>C. sherzeri</th>
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### Table

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Genus IV.—Eonycteris, (nov.)

Nostrils not projecting; upper lip with a shallow vertical groove in front; index finger without a claw; thumb short, part of terminal phalanx included in the wing-membrane; metacarpal bone of second finger equal to the index finger in length; wings from the sides of the hairy back; wing-membrane from the base of the first toe; tail short, distinct.

\[ \text{Dentition: } -in. \quad \frac{4}{4}; \quad c. \quad \frac{1-1}{1-1}; \quad pm. \quad \frac{2-2}{3-3}; \quad m. \quad \frac{3-3}{3-3}. \]

First upper premolar minute.

Eonycteris spelea. Pl. XIV, Fig. 10.

Macroglossus speleus, Dobson, Journ. A. S. B., 1871, p. 261, pl. x, fig. 3, 4.

When first describing this species, I placed it in the genus Macroglossus on account of its very close resemblance to M. minimus, the type of that genus, in the form, number and arrangement of the teeth. Subsequently, however, in the MS. of a 'Catalogue of Chiroptera in the Indian Museum' I placed it in a separate subgenus 'Eonycteris' on account of the very different attachment of the wing-membrane to the foot and sides. Lately, Dr. Peters writes to me that he is convinced, after a very careful examination of specimens sent to him from the Indian Museum, that the differences existing between this species and M. minimus are of generic importance, and require the formation of a new genus for its reception.

Since I described this species in 1871 I have come to regard the dentition of the Chiroptera as of less importance in their classification than many other characters. I believe that, although the teeth of Macroglossus minimus and Eonycteris spelea correspond very closely, these species yet present many structural differences of more than subgeneric importance, and I agree with Dr. Peters that the latter species should be placed in a separate genus. I have, accordingly, raised my subgenus 'Eonycteris' to the rank of a distinct genus of Pteropidae.

Genus V.—Macroglossus, F. Cuvier.

Nostrils not projecting, upper lip not grooved in front; index finger with a distinct claw; thumb moderate; metacarpal bone of second finger equal to, or longer than, index finger; wings from the sides, their points of attachment separated by a considerable interval from the spine; wing-membrane from the base of the fourth toe; tail very short.

\[ \text{Dentition: } -in. \quad \frac{4}{4}; \quad c. \quad \frac{1-1}{1-1}; \quad pm. \quad \frac{2-2}{3-3}; \quad m. \quad \frac{3-3}{3-3}. \]
First upper premolar nearly equal in size to the second.

Macroglossus minimus. Pl. XIV, Fig. 11.

*Macroglossus minimus*, Temminck, Monogr. de Mammal., I, p. 191.


This species is so well-known, and has been redescribed so carefully by Temminck, that no further description of it is here necessary.

It is found in abundance in the deep warm valleys about Darjiling. It extends from India through Burma to the Malay Archipelago.

Description of a new species of *Vespertilio* from the north-western Himalaya,—by G. E. Dobson, B. A., M. B.

*Vespertilio murinoides*, n. sp., Pl. XIV, Fig. 12.

This species is closely allied to *V. murinus* of Europe, from which, however, it is readily distinguished by the following characters:—

The general form of the ear is triangular, with narrow rounded tips: the inner margin is very faintly convex, almost straight, in its upper third, and the outer margin is concave beneath the tip, the remaining portion convex with a faint concavity opposite the base of the tragus.

In *V. murinus* the inner margin of the ear is strongly convex from the base to the tip, the concavity of the outer margin beneath the tip is very feeble, and there is a distinct emargination, almost angular, opposite the base of the tragus, succeeded by a well-developed terminal lobe; the general form of the ear is, moreover, oval, not triangular.

The tragus is slender and acutely pointed, with a quadrangular lobe at the base of its outer margin. In *V. murinus* the tragus is subacutely pointed, and the lobe at the base of the tragus is remarkably small.*

The fur is dark brown above, with light brown tips; beneath, dark brown, almost black, with grayish tips.

The first upper premolar is very small, scarcely visible from without, and not much larger than the second. In *V. murinus* this tooth is distinctly visible from without and much larger than the second premolar.

The specimen (an adult female preserved in spirit) from which the above description is taken, was obtained at Chamba, at an elevation of about 3000 feet, by H. McLeod Hutchison, Esq., H. M.’s 14th Regiment.

* The relative shape and size of the ears and tragi of *V. murinus* and *V. murinoi(d*es are well shown in Pl. XIV, figs. 12, 13.
A dried specimen in the Indian Museum, labelled *V. murinus*, belongs also to this species. It is said in Blyth's Catalogue to have been sent from Masuri by Captain Hutton. The measurements of both specimens compared with those of *V. murinus*, L. from Europe are as follows:

<table>
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<th>V. murinoides</th>
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<td>&quot; head,</td>
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<td>Breadth, ditto,</td>
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<tr>
<td>Length, forearm,</td>
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<tr>
<td>&quot; thumb,</td>
<td>...</td>
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<tr>
<td>&quot; second finger,</td>
<td>3.75</td>
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<tr>
<td>&quot; fourth ditto,</td>
<td>2.8</td>
</tr>
<tr>
<td>&quot; tibia,</td>
<td>0.9</td>
</tr>
<tr>
<td>&quot; calcaneum,</td>
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<tr>
<td>&quot; foot and claws,</td>
<td>0.5</td>
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</table>

The measurements given in the third column are those of a not fully grown specimen of *V. murinus*.

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**Explanation of Plate XIV.**

1. Ear of Pteropus medius.
2. " " nicobaricus.
3. " " edulis.
5. " " var. andamanensis.
6. " " sherzeri.
7. " " brachysoma.
8. " Cynonycteris amplexicaudata.
12. " Vespertilio murinoides.
13. " " murinus.
Fig. 1. Unio Bhamoensis.
2. Unio Manduaensis.
3. Unio Pellelianus.
4. a. U. crispulatus, Bens.
4. b. Monocheiocyrtis Aev.
5. Sphyrum Amnum.
JOURNAL
OF THE
ASIATIC SOCIETY.

Part II.—PHYSICAL SCIENCE.

No. IV.—1873.

Descriptions of New Species of Unionidae.—By W. Theobald, Esq

[Received July 29th, 1873; read August 6th, 1873.]

(With plate XVII.)

Unio bhamoensis, n. s., Pl. XVII, Fig. 1.


Hab. prope Bhamo, regno Birmanico; necnon in Prome occidentali Provinciâ Pegu.

Lat. 52, alt. 40, crass. 26 mm.

A rare species in Western Prome where alone I have met with it in Pegu, and remarkable for its smooth thin epidermis. The posterior slope alone is conspicuously ornamented with sculpture, but in my largest specimen from Bhamo and in some others also, the peculiar sculpturing of Unio burmanus, W. Blîd. is faintly but distinctly perceptible over part of the valves towards the umbones especially. A small specimen of 36 mm. from Western Prome exhibits distinctly also the two rows of spines which characterise the next species, so that it seems that Unio burmanus, U. bhamoensis
and *U. mandelayensis* constitute a natural little sub-group of osculant species at once distinct, but connected and sufficiently distinguishable from any of the ordinary Indian types. I have not, however, felt justified in separating them from the great Indian "*corrugatus*" group in my forthcoming catalogue of Indian shells.

**Unio mandelayensis**, n. s., Pl. XVII, Fig. 2.


_Hab. prope Mandelay, regno Birmanico._

_Lat. 53, alt. 40, crass. 31 mm._

In only one specimen have I seen the muricate spines descend below the centre of the valves, but the pale linear bands whereon they stand usually descend to the margin.

The peculiar sculpturing of *U. burmanus* is also seen in this species though less strongly marked and though sometimes carried over a good portion of the valves, yet is usually most pronounced on the posterior slope.

**Unio Feddeni**, n. s., Pl. XV., Fig. 3.


_Hab. in Peenungufluvio, Indiae centralis. Teste F. Fedden._

_Lat. 40, alt. 29'5, crass. 19 mm._

This very peculiar and marked form which somewhat recalls by its outline the American *U. securis*, seems a rare species and was collected sparingly among numbers of fine specimens of *U. wyngungensis*, Lea, in Central India by my colleague Mr. Fedden after whom I have named it. It falls naturally within the great "*corrugatus*" group, though there are few better marked varieties than it.

**Unio gowhattensis**, n. s., Pl. XVII, Fig. 4.

*Testa* quadrato-ovali, antice rotundata, postice declive truncata, margine ventrali recto. *Umbonibus* decorticatis. *Epidermide* flavescente, postice

_Hab. prope Gowhatti in Assam._

*Lat. 39, alt. 25°5, crass. 18 mm.*

The only other *Unio* that I am acquainted with possessing the peculiar fulgurate and granulose sculpture of this species is _U. crispisulcatus_, B., and to that group it must be referred, for greatly as the two species at first sight would seem to differ I have little doubt that intermediate forms connecting them will eventually be discovered. _Fig. 4a_ represents the sculpture enlarged and _fig. 4b_ that of _U. crispisulcatus_, B. for comparison.

**Monocondylena Ave, n. s., Pl. XVII, Fig. 5.**


_Hab. prope Mandelay regno Birmanico._

*Lat. 96, alt. 52, crass. 28 mm.*

This species differs considerably from the ordinary forms of _M. salweniana_ by its great smoothness and its elongated form. It resembles in the former respect the Philippine _M. Cumingi_, Lea, and young specimens sometimes exhibit a trace of faint sculpturing along the posterior slope much as in _M. inoscularis_, Gould, but all the adults I have seen have been quite devoid of sculpture.

**Sphierium Avanum, n. s., Pl. XVII, Fig. 6.**

Testa quadrata rotundata, tumida, antice rotundata, postice truncata, dilatatæ, equilaterali. Epidermide, leviter et concentricæ corrugatæ, postice levissime radiatæ. Umbonibus prominentibus, tumidis, osculantium; colore pallide stramineo, tribus fasciis purpureis umbonaliis radiatim picto. Ligamento umbones versus inflato.

_Hab. prope Ava._

*Lat. 7°5, alt. 6°6, crass. 5·2 mm.*

A single specimen of this rotund or pisiform species occurred among a number of specimens of _Corbicula_ and other fresh-water shells received from Ava.

* Obtained by one of the collectors of the Indian Museum.—[Ed.]
ON THE MUDDY WATER OF THE HUGLI DURING THE RAINY SEASON WITH REFERENCE TO ITS PURIFICATION AND TO THE CALCUTTA WATER SUPPLY.—BY D. WALDIE, ESQ.

(Received Oct. 29th; read Nov. 5th, 1873.)

CONTENTS.

I.—Introduction,—construction of the Filters at Palta, difficulties in their working—question as to the cause of this,—true cause, according to the author, is the peculiar nature of the water.

II.—Desirableness of explaining the reason of this peculiarity,—considerations which led to its discovery,—its nature,—experimental evidence in proof.

III.—Corroborative evidence from other sources, direct and indirect.

IV.—Details of experiments connected with it and results.

V.—Further corroborative evidence and additional explanatory remarks.

I.—The works for the supply of Calcutta with water have been in operation since the early part of 1870. The nature and arrangement of the filtering materials in the filtering tanks at Palta were decided upon chiefly from the results and conclusions to which I came after a series of experiments made during the rainy seasons of 1868 and 1869, for the purpose of ascertaining what was likely to be most suitable and efficacious for filtering the muddy water of the Hugli during the floods that extend from June to September or October annually. These experiments also included an examination of the value of a particular contrivance called Spencer's Regulating Cup, to which great importance was attached by the Engineer who designed the works. The general conclusions to which I came were, that this Regulating Cup possessed no special value, for that the retardation of the flow of water which was stated to be its particular function could be attained equally well or better by other means; and that the better sand of the two kinds submitted to me for comparison was the fine sand from the sand-bank in the river, which, as it could be obtained on the spot, was called Palta sand. The other sand, called Magra sand from the locality at which it was found, was considerably coarser in grain, and was stated to be more like that used for filters in England. Though well enough aware of this, I decidedly preferred the Palta sand for filtering the muddy water of the rains, which was the period of special difficulty. For the remainder of the year, I considered it of little importance which kind of sand should be used.

In accordance with my recommendation, the filters were fitted up with Palta sand and without the regulating cups. They worked well during the first rainy season; but afterwards, particularly during last season (1872), there was so much difficulty in getting water filtered through them sufficiently
clear, and in the required quantity, owing to the largely increased demand, that they were pronounced a failure by the Superintending-Engineer, who advocated a trial of the coarser sand combined with the Regulating Cup, with, as he said, assurance of success, and in the view of adapting this arrangement to the whole eight filters if found satisfactory.

No more complete condemnation of the arrangements I had recommended could well have been made. Reasons were given for it, of which I need only state the principal. The Palta sand was too fine, and consequentlily rapidly became choked up; such sand was not used in England. It was a principle laid down by Engineers that the muddy particles should not penetrate more than an inch or two below the surface of the sand; this was not the case here, as they penetrated deep into the sand, and made it foul throughout. The fine sand retarded the flow of water too much, and speedily became choked up by the deposition of mud; the proper retardation and regulation of the flow should be effected from below, either by a greater depth of coarser materials, or by the use of the Regulating Cup.

My replies to these reasons were that the fine sand was not too fine for the water which was to be filtered, and that if not used in England, neither was such water filtered in England. This mud of the Hugli water during the rainy season could not be prevented from penetrating deep into the sand, at least if the water were to pass at such rate as would be practically of use; that the choking up of the sand to a certain extent, instead of being an objection, was essential to its proper action as a filter for this water, and the object should be not to prevent but to regulate it,—and that it could be prevented neither by a greater thickness of coarse material nor by regulating cups. And, further, that the difficulty and consequent great amount of labour and trouble in filtering the water during the rainy season was caused, not by the particular arrangement or nature of the filtering materials but by the nature of the water itself; and, consequently, that the proposed remedy was entirely delusive, and would certainly fail.

Though no formal opposition, so far as I am aware, has ever been made to my statements or opinion respecting the quality of the water, neither has the conclusion been formally admitted as correct, and it has been overlooked or neglected in all reasoning on the subject, at least as a sufficient explanation of the difficulty. The principles of sand-filtration were appealed to, and these were explained to depend chiefly on the attractive power of the coarser particles of sand for the finer particles of the mud suspended in the water; and this was represented as the most important part of the process,—"such is, in fact, filtration,"—apparently almost to the exclusion of what was called mere straining. This explanation I hold to be totally erroneous. The most important part of the process is straining, the prevention of the passage of particles through narrow crevices between the grains of sand; next is depo-
sition by gravity, on the upper surface of these granules, of still finer particles;* and last, and least important of all, is the mutual attraction of particles of mud and sand independent of gravity. The influence of all of these processes will be affected by the greater or smaller size of the particles of mud in suspension, and the difficulty in getting the water to pass clear will be the greater the smaller the particles are. Hence the great difficulty with the water in question, the particles being so very fine.

II.—The peculiarity of the Hugli water from June to October I had always connected with the tropical rains and melting of the snows at the sources of the Ganges, occurring together so as to form one great flood of four or five months duration, instead of occasional floods to which rivers of European countries are subject, exceeding these greatly both in amount and in duration. I had not, however, been able to offer any other than conjectural explanations of its slowness in clearing by settling and of the difficulty in filtering it, of which I had found abundant evidence as a matter of fact. Attention having been again directed toward the subject by the circumstances previously referred to, I was led again to think of the advantage it would give me to be able to state some reason for my belief that the cause of difficulty lay in the nature of the water; some explanation of this peculiarity,—a reason why it should be so,—some generalisation shewing that it was not an isolated fact, but one of other similar facts admitted and acknowledged. Indeed, ever since it had been so forcibly brought under my own notice by my filtration experiments, and fixed in my own mind at least as a certainty, I had been alive to everything, old and new, that appeared to have a bearing on the subject, whether it were practicable means of purifying the water or a way of explaining the difficulty.

With respect to purifying muddy water generally there were certain methods which were well known and others less generally. The use of alum and other salts of alumina for such a purpose had long been known: salts of peroxide of iron, a substance chemically having much analogy with alumina, had more recently been introduced, and in my opinion they were even superior to salts of alumina. These substances act by the alumina or peroxide of iron being separated from its combination with the acid by alkaline matter which might be added along with them, or by the action of the carbonate of lime present in many waters, or even simply by large dilution, as in this case the base tends to separate from the acid. The alumina or oxide of iron separates in loose soft flakes which envelop or attract the fine particles of the mud, and carry them down with them, leaving the liquid quite clear. Indeed many other substances that produce flocculent precipitates by the addition of another substance have the same effect; thus by adding a solution of sulphate

* Well illustrated by Wanklyn and Chapman in the 2nd edition of their treatise on Water Analysis.
of copper, and then a little soda, oxide of copper is thrown down carrying the mud with it. I have, indeed, made use of this method for precipitating the fine, suspended mud for chemical examination; the oxide of copper being removed from the precipitate, after collection, by ammonia and acetic acid, and the mud washed. This process, when the precipitants are employed in proper quantity, is speedy and convenient.

There is another class of substances which operate in a similar way, namely, alkalies and alkaline earths, such as Soda and Lime. These combine with the carbonic acid that keeps carbonate of lime in solution, which becoming insoluble is consequently precipitated. When Lime is used an additional quantity of carbonate of lime is produced. This, in fact, is Dr. Clark's well-known process for softening such waters as owe their hardness to carbonate of lime in solution. The precipitate formed carries down other matters with it leaving the water clear. The objection to the use of this process is the large quantity of additional sediment produced, and the risk of some prejudicial effect on the quality of the water, at least if not carefully managed.

Another class of substances the mode of action of which is not so evident, is acids. I do not know when this was first noticed. Graham, Miller, and Hofmann in their Report on the London waters, June 1851, speaking of the impurities, refer to "this clay tinge which resists the action of acids." Whether from this hint or not, I do not recollect, but I myself employed acids in 1866 for the purpose of clarifying the muddy waters of the Hugli during the rains.* A small quantity of Nitric or Hydrochloric acid added to a large bottle of muddy water so altered and precipitated the mud that next day, or even in a few hours, it could be filtered clear with ease. I used alkalies, also, and perchloride of iron; but did not prosecute the subject further, my object having been simply to get the water clear with as little addition of foreign matter as possible; and nothing was better than a little of these acids,—even of acetic acid.

There is yet another class of substances the action of which is equally if not more difficult to explain, namely, those substances usually called neutral salts, both alkaline and earthy. The first direct notice I found of this was in some remarks in the 'Chemical News' of 3rd April, 1868, by Mr. W. Skey, Chemist to the Geological Survey of New Zealand, on the property of this class of substances to clarify muddy water. In this he specifies that 1 grain of common salt clarifies 6 ounces of muddy water and 1 grain of chloride of calcium or barium 10 ounces, 1 grain of lime 15 ounces and 1 grain of sulphuric acid 50 ounces. He thinks that these substances must act solely from their affinities for water, as it is not at all likely that they undergo any decomposition themselves. In the 'Chemical News' of 8th

July, 1870, is a short abstract from the 'Comptes Rendus' of the Academy of Sciences, of 20th June 1870, of a paper by Dr. C. Schloesing on the same subject, in which, it is stated, he refers to river waters contaminated with clay being readily clarified by 1000th part of chloride of calcium or other salts of lime, and being then readily filtered, while previously they rapidly choked the filter. He refers to several rivers, such as the Rhine in its lower course and the Durance which supplies Marseilles, as being notorious for this peculiarity. Then in the same Journal of 12th May, 1871, Mr. Skey notices this as a re-discovery on the part of Schloesing, and says that 1 grain of chloride of calcium is sufficient for 10 ounces of muddy water or 50,000 grains, an evident misprint for 5000 grains. He also notices a paper on the so-called molecular movements of microscopic particles by Professor Jevons, who has some theory about this coagulation of clay being due to the water becoming by such addition a conductor of electricity, and the clay particles charged with electricity.

Besides all these direct observations, there is a phenomenon which had long (long before these observations were made) come under the observation of chemists in filtering and washing certain precipitates and sediments, namely, that for a time, while there is saline matter present in solution, the filtered liquid comes clear, but when, by continuing to wash such substances by distilled water, these saline matters become much reduced in quantity, then the filtered liquid flows muddy, the solid substance passing in a state of very fine division through the pores of the filtering paper. The chemist to avoid this adds a proportion of some saline substance (such as chloride of ammonium or muriate of ammonia) which will not interfere with his subsequent proceedings, and so is enabled to wash the sediment or precipitate free from everything except the substance which he has added. He can get rid of this afterwards by other means if it be necessary. This peculiarity especially occurs with clays and substances more or less analogous to them, such as Zirconia and Titanic acid. Another illustration is given when we attempt to extract the saline matters soluble in water from clayey soils. When the soil is first mixed with distilled water and allowed to settle, the supernatant liquor may be clear: if this be poured off and more distilled water be mixed with the residue, it will not settle and clear so readily, and if the process be repeated, it may take a very long time to do so. Just in proportion as the saline matter is removed, the fine clay separates with greater difficulty from the pure water.

It is to be observed that the substances here referred to, namely, neutral salts, are just the same sort of matter that exists in natural waters in small quantity. Reflecting on the difficulty, with the impression of the above-mentioned facts on my mind, on or about the 1st August last, the question occurred to me: How small a quantity of such substances is sufficient
so to change the character of the mud in the river water of the rains as to enable it to settle with sufficient readiness, and in such a state as to render the water capable of being filtered without difficulty? Will the difference of quantity between that of the saline matter which exists in the water of the rainy season and that, say, of December be sufficient? Will the addition of such small quantity of the same kind of saline matter that exists in the river water to the water of the rainy season, so change its character that these difficulties in settling and filtering will be removed? Without delay a few experiments were instituted and their results observed, and these results shewed that the question was solved in the affirmative and the whole difficulty cleared up. The Hugli water during the rains contains too much pure water in proportion to its saline constituents, or these natural precipitants are present in too small quantity to precipitate the mud, as they do in other localities which have no tropical rainfall to produce so great dilution. And now my previous conviction as to the cause of the peculiarity was at once confirmed and explained.*

The first experiment was made by means which came at once to hand. One quarter of a litre of muddy water from the river was mixed in a bottle with an equal volume of water from a tank which, in the dry season, I had found to contain a considerable quantity of saline constituents. Now, from the rains, I knew that it must be considerably more diluted, nevertheless not so diluted as the river water. In another bottle, for comparison, was mixed an equal quantity of the river water with the same volume of distilled water. It seemed natural to think that this mixture with distilled water would settle most speedily, more particularly as the tank water contained much glutinous vegetable matter; nevertheless, notwithstanding this disadvantage, the mixture with the tank water settled best. It was not a very good experiment, yet the result was quite distinct.

Then solutions of sodium and of calcium chloride (common salt and muriate of lime) were prepared of known strengths. The amount of saline constituents in the river water during the rainy season was pretty well known from former analyses, and these solutions were added in such quantity as approximately to double the quantity of saline constituents in the water, and thus bring it near the composition of the river water of December as regards alkaline and earthy salts. This produced an improvement in the settling, very slight in the case of common salt, very decided in that of chloride of calcium (muriate of lime). This at once shewed, what was afterwards abundantly confirmed, that lime salts were much more efficacious than alkaline salts. I shall return to this part of the subject further on.

* At the meeting of the Society on 4th August last I intimated that I had discovered what I believed to be the true explanation of the difficulty with the water. Vide Proceedings for August, 1873.

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Another obvious-looking plan was to dry a measured portion of the water and add its solid constituents to an equal quantity of water, so as to double the total amount. But there were practical difficulties in this process, in the changes the constituents would undergo by evaporation; it was, however, done thus: a portion of filtered water from the Calcutta hydrants was concentrated by evaporation over the water-bath to one-fifth of its volume; after this carbonic acid gas was passed through the concentrated liquor in order to redissolve the carbonates of lime and magnesia which had separated. One volume of this concentrated water was now mixed with four volumes of muddy river water, so as to make up the original quantity. This mixture, on being allowed to stand, settled well and the water could be filtered easily. In all cases a similar bottle of the muddy water, unmixed with anything, was placed beside these mixed waters for comparison.

In all the above experiments the waters were allowed to stand 24 or 48 hours to settle. This was a point I had calculated on, as the object was not to clarify the waters as rapidly as possible, but to imitate the settling and clearing of other natural waters or of the Hugli water itself during the dry season, by assimilating its composition so far as regards soluble salts to that of those.

III.—I have examined the tables given in Bischoff's Chemical Geology* of the composition of various river waters for anything to be found bearing on this subject, and the author's remarks connected with rivers. The varieties of composition are obvious, and a few rivers are to be found containing but a small quantity of saline constituents and particularly of earthy salts in their waters. In a few cases the composition is given at different localities or at different periods of the year, but generally there is not enough of information to connect these facts with the subject under consideration. Two analyses of the Rhine water at Basle and at Strasbourg shew fully 14 parts of Carbonate of Lime and Magnesia in 100,000: again at Bonn in March, 1852, there are fully 10 parts; in March, 1857, only 4½ parts; but in the former case the river was very low and of the usual clearness, in the latter it was much swollen and very turbid. Bischoff has a chapter on mechanical deposits from water, in which he notices various particulars respecting rivers. Of torrents which issue from glaciers, he says, all of them roll along in a turbid grey milky or dark stream according to the nature of the pulverized rock. Generally speaking, in rivers, the quantity of suspended matter increases with the height of the water, and the substances dissolved diminish. The suspended matter consists generally of clay, but in limestone districts it may consist partly or chiefly of carbonate of lime itself. Of course even water containing a considerable quantity of soluble salts of lime may be muddy, but if the mud consist of clay, the mud

* Cavendish Society's Trans., 1854.
in such the waters consist partly or chiefly in carbonate of lime, how it will be affected by the soluble salts present. I am not prepared to say, as I have had no opportunity of examining such waters. A French author, whom I shall quote presently, speaks of waters which are never clarified entirely by repose; such are, as he calls them, "les eaux blanches de Versailles," which owe their milky tint to their contact with layers of calcareous marl. Whether these waters contain soluble salts of lime or not, I do not know.

In a note to the chapter referred to, Bischoff mentions that Th. Scheerer* had found that "the deposition of suspended matter is hastened when certain salts—alum, sulphates of copper and iron—are dissolved in the water. But since a solution of chloride of sodium behaves like pure water, it cannot be expected that the suspended matter is deposited more quickly in the sea than in rivers." Now here is a mistake, for solution of chloride of sodium does not behave like pure water. Mr. Skey, more correctly, thinks that the transparency of the sea may depend on the precipitation of mud by the saline matter. Scheerer's observations must I think have been too hastily or imperfectly made.

The French works just referred to,† very valuable no doubt for what they were intended, principally engineering, did not, however, contain much of the sort of information I was in search of. That by Darcy gave me some worth noticing. It contains accounts of the filtering operations at Chelsea, Southwark, Thames Ditton, York, Hull, Paisley, Glasgow and Marseilles, also of the natural filters of Nottingham, Perth, Toulouse and Lyons. The natural filters are out of the range of the present enquiry, the first four appear to be on a similar plan to those at Palta, the latter three are different in their arrangements for cleaning the sand. Those of Gorbals, Glasgow, are not sufficiently well described, those of Paisley are; in both the clearing is effected by passing the water from below upwards, but, as the nature of the water is not at all likely to have any analogy with the water under consideration, I need not notice them. The filters at Marseilles, however, are worthy of a little attention. The water which supplies Marseilles is derived from the Durance. This water, as well as that of the Rhone, judging from the description, must have a considerable similarity to that of the Hugli during the rains, at least during certain periods, requiring a long time to settle and become clear. From some things stated in the account of the filtering operations, however, I do not think that the particles of the sus-

* In Poggendorff's Annalen, Vol. 82, p. 419, date unknown but previous to 1854.
† Traité de la conduite et la distribution des eaux, par J Dupuit, Paris, 1854 and Les Fontaines publiques de la ville de Dijon par Henry Darcy, Paris, 1856, both beautifully illustrated by plates. For inspection of these I have to thank Dr. Tonnerre, Health Officer to the Municipality.
pended mud can be so very fine as those of the water of the Hugli during the rainy season. There are unfortunately no analyses, but as they come from Alpine regions they must be often diluted with much pure water from melted snow.

The whole thickness of the bed of filtering materials is only .8 metre or about 2 feet 8 inches, of which the upper layer is .3 metre or about 12 inches, consisting of very fine sand (Sable très fin de Montredon), below which are layers of middling and coarse sand, gravel and broken stones. It is stated that the filters might work more than eight or ten days, but if kept going longer they would be more difficult to clean. This cleaning is effected by passing the water backwards and upwards through the sand, the impure water being carried off from the surface by channels for the purpose. I have to observe that here we have filter beds much thinner than those at Palta, very fine sand and upward charging, all points that have been considered objectionable for the Palta filters. The cleaning by upward charging requires considerable velocity of current and a continuance of it for four or five hours of time. I have calculated from the data given that it would require about 14 or 15 feet of perpendicular height of water, that is, about as much water as one of the filter tanks, emptied of its filtering materials, would hold two and a half times. No account is given as to how it is done, but I concluded that the level of the canal from which the water is supplied to the filters must be sufficiently high for the purpose.*

I can also bring confirmatory evidence of another kind from English waters, evidence to shew why these waters are not attended with such difficulties in their filtration. There are no circumstances to produce such muddy waters as are to be found even on the European continent, no Alps and glaciers to produce this muddy water even at its source, no mountain snows to melt, and no large falls of rain concentrated in one period. I refer to a paper by Dr. Frankland† on the water supply of the Metropolis during the year 1865-66. In this paper there are several tables of the principal constituents of the water of nine Water Companies for every month of the year. These tables shew that the amount of saline constituents varies during the year, but never to near such an extent as that of the Hugli: they also shew that the earthy salts vary in their amount as indicated by the hardness, but never become reduced to nearly the same degree as those of the Hugli, being at their lowest indeed nearly as much in amount as those of the Hugli in December or January. The variation of course depends upon the rainfall, but this does not vary as respects either quantity or time in the same

* I have since been informed by Dr. Tonnerre that the level of the canal is high above the town.
† Journ. Chemical Society, 1866, Vol. XIX, p. 239.
way as it does in the valley and the source of the Ganges; in England the rainfall and hardness both rise and fall repeatedly during the year. The case is entirely different from the state of matters here in which we have a very soft water from the commencement of the regular rains gradually becoming harder in November and December and continuing so till the rains set in again in the following year. There is no reason, therefore, to expect any noticeable disturbance in the conditions of filtration in England from change in the condition or nature of the water, but every reason to expect it here, if we can only suppose or admit that such a change in the water may affect the filtration. And I would ask, why should we not admit that it should do so? My experience convinced me that it did so affect the filtration, and though I could not satisfactorily account for it or explain how it did so, I continued firmly to maintain that it did so, that this was the true cause of the difficulties, and that consequently other explanations were fallacious and baseless.

I should have been glad to have found other corroborative evidence of the correctness of my opinions, but had no means of obtaining it. Fortunately the discovery of the nature of the peculiarity rendered this of comparatively small importance. I return now to the consideration of this subject a little more in detail.

IV.—After ascertaining that such a very small quantity of lime salts or rather of chloride of calcium, for that was the salt experimented with at first, was sufficient for the purpose required, I proceeded to compare the efficiency of different neutral salts. For this purpose I had to choose a standard of comparison, and as the enquiry related at present to the Hugli water, I chose it with reference to the composition of this. Chloride of Sodium or common salt might have been taken, but I found its effect comparatively so small that I gave that up. The really influential constituents in the river water were the salts of lime and magnesia, particularly the carbonates, and as I found that these were of nearly equal power, I decided to take that which existed in largest quantity, namely carbonate of lime, as the standard of comparison. But as a solution of carbonate of lime in excess of carbonic acid is troublesome to prepare, its strength somewhat troublesome to ascertain, the solution itself weak, consequently involving the addition of a notable quantity of water, besides being liable to change, I chose for my working standard a solution of chloride of calcium equivalent in strength to 1 grain carbonate of lime in 50 cubic centimetres of solution, equal to 1·11 gm. chloride of calcium in 50 c. c. This formed a convenient strength for measuring by a pipette. For the composition of the water, I assumed that during the rainy season it contained salts of Lime and Magnesia equivalent altogether to 7 grains of carbonate of lime in 100,000 flgn. or .07 grammes in 1 litre. This is equal to 4·9 grains in 1 gallon. Perhaps it is rather too
low an estimate, 8 grains or even 9 grains to 100,000 being possibly more correct.

A question soon arose as to what was the general nature of the action, for on that I must regulate the plan on which I was to compare different substances. I have quoted Professor Jevons's electrical theory about the coagulation of clay, which is too speculative for practical application,—also Mr. Skey's, that these precipitating substances must act solely from their affinity for water, because the powerful affinities of the component parts of most of these substances precluded the idea of their decomposition. The general tendency of the experiments I made at first, however, led me to reject this explanation, and to conclude that the action was most probably a chemical one, though it might be difficult, or at present impossible, to explain exactly how it operated. In consequence of this I decided to compare, not absolute weights of the different substances, but their chemical equivalents. Reasons for this conclusion will be given presently.

I generally operated on half a litre of water. This was mixed with the substance to be tried and allowed to stand from 24 to 48 hours. A row of such bottles with different substances was placed on the table with one bottle containing unmixed water, and comparison was made of their respective appearances at the end of a certain time, sometimes of two or three times, and the result noted. Different proportions of the same substance were compared in the same way. The conclusions were drawn only from the experiments made on the same water at the same time, not between different samples of water or between observations made at different times.

The substances compared were chiefly, but not exclusively, those found in natural waters. They may be divided into the following classes:—

Alkalies and alkaline earths.
Acids, or Hydrogen salts.
Neutral salts of the alkalies.
Salts of Lime and Magnesia,—or of alkaline earths generally.
Salts of protoxides of heavy metals, namely of Iron, Manganese and Copper.

Salts of the sesquioxides,—namely of Aluminum and of Iron.

The range might have been considerably extended, and the series have been more complete, but I could not spare the time necessary for a more numerous series; besides, the river water began to improve about the end of August and continued to do so, as the rains ceased early. The experiments, however, were sufficiently numerous to enable me to draw conclusions of interest.

I shall arrange the substances tried in a tabular form, attaching to them numbers indicating the number of chemical equivalents necessary to produce the same effect as Carbonate of Lime in solution in carbonic acid water. The
equivalents will be in relation to the atomic weight of chlorine 35.5; thus,—
combined with Sodium 23, Calcium 20, Iron (Ferrosum) 28, (Ferric) 18.66, forming Sodium Chloride 58.5, Calcium Chloride 55.5, Ferrous Chloride 63.5, Ferric Chloride 54.16, so that equivalents can easily be converted into absolute weights by multiplying by these numbers, and to facilitate this the equivalent numbers are given. The absolute weights are also given in the last column which, it will be observed, are the products of the two first multiplied by 2 to bring them to the standard of Carbonate of Lime taken as 100, the double of its equivalent. The equivalents and absolute weights, also, are all for the substances free from water of combination, crystallization or solution.

Table of approximate quantities required to produce an equal effect in clarifying the muddy water:—

<table>
<thead>
<tr>
<th>Substance</th>
<th>Chemical equivalent</th>
<th>Number of equivalents</th>
<th>Absolute weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chloride of Sodium or Common Salt, ...</td>
<td>58.5</td>
<td>40.0</td>
<td>4680</td>
</tr>
<tr>
<td>Potassa Hydrate,</td>
<td>56.0</td>
<td>5.0</td>
<td>560</td>
</tr>
<tr>
<td>Soda Bicarbonate,</td>
<td>84.0</td>
<td>4.0</td>
<td>672</td>
</tr>
<tr>
<td>Acetic Acid,</td>
<td>60.0</td>
<td>3.0</td>
<td>360</td>
</tr>
<tr>
<td>Sulphuric Acid,</td>
<td>49.0</td>
<td>2.0</td>
<td>196</td>
</tr>
<tr>
<td>Calcium Chloride, or Muriate of Lime, ...</td>
<td>55.5</td>
<td>2.0</td>
<td>222</td>
</tr>
<tr>
<td>Magnesium Chloride, or Muriate of Magnesia, ...</td>
<td>45.5</td>
<td>2.0</td>
<td>182</td>
</tr>
<tr>
<td>Nitric Acid,</td>
<td>63.0</td>
<td>1.5</td>
<td>180</td>
</tr>
<tr>
<td>Barium Chloride,</td>
<td>104.0</td>
<td>1.0</td>
<td>208</td>
</tr>
<tr>
<td>Carbonate of Lime, dissolved by Carbonic Acid,</td>
<td>50.0</td>
<td>1.0</td>
<td>100</td>
</tr>
<tr>
<td>Carbonate of Magnesia, dissolved by Carbonic Acid,</td>
<td>42.0</td>
<td>1.0</td>
<td>84</td>
</tr>
<tr>
<td>Sulphate of Lime,</td>
<td>68.0</td>
<td>1.0</td>
<td>136</td>
</tr>
<tr>
<td>Sulphate of Manganese,</td>
<td>75.5</td>
<td>5</td>
<td>75.5</td>
</tr>
<tr>
<td>Sulphate of Copper,</td>
<td>79.5</td>
<td>2</td>
<td>31.8</td>
</tr>
<tr>
<td>Protosulphate of Iron,</td>
<td>76.0</td>
<td>1.5</td>
<td>22.8</td>
</tr>
<tr>
<td>Protocarbonate of Iron, dissolved by Carbonic Acid,</td>
<td>58.0</td>
<td>1.5</td>
<td>17.4</td>
</tr>
<tr>
<td>Alum,</td>
<td>79.2</td>
<td>0.5</td>
<td>7.92</td>
</tr>
<tr>
<td>Aluminum Chloride,</td>
<td>44.8</td>
<td>0.5</td>
<td>4.48</td>
</tr>
<tr>
<td>Perchloride of Iron,</td>
<td>54.7</td>
<td>0.25</td>
<td>2.74</td>
</tr>
</tbody>
</table>

Chloride of Potassium or Muriate of Potassa, Sulphate of Potassa, Acetate of Potassa and Phosphate of Soda were about equally efficacious with common salt.
This table shews the very great difference in efficiency between different substances, common salt having only one-fortieth part of the power of the standard Carbonate of Lime when chemical equivalents are compared, or about one-forty-seventh part when actual weights are compared. On the other hand, Perchloride of Iron is forty times as powerful as Carbonate of Lime, chemical equivalents being compared, or about thirty-six times when actual weights are taken.

A glance at the table will shew that the precipitating power is just in proportion to the facility with which the acid and basic constituent of the salt can separate. The alkalies and alkaline earths ought to be excluded as they exert a chemical change in the soluble constituents of the waters, but it appears to me pretty evident that both the acid and basic constituents of the remainder of these substances take part in the effect produced on the clay. Acids themselves do so, as shewn by the table, even so very weak a one as Carbonic acid gas does so when passed for sometime through the muddy water, as I found from direct experiment. And I also found that when using these small quantities of alumina, the addition of a proportion of potash, more or less, to neutralize the acid constituent of the salt was no improvement but the reverse. Pieces of sheet iron, immersed in a bottle of muddy water and shaken occasionally, in a few hours caused the mud to precipitate very well; the iron evidently had been acted on by the Carbonic acid in the water and the atmospheric oxygen to form a small quantity of a salt of iron which produced the effect.

The numbers in the table are by no means to be taken as accurately ascertained. The shortness of the period during which muddy water of nearly similar quality was available rendered this impossible. After the end of August, I employed water from the river mixed in a vessel with the mud deposited from previous water and stirred up, which can scarcely be taken as a very good representative of the water during the worst period of the rains, though probably good enough for the purpose, as the comparisons between different substances were always made with the same water. But as the month of August was chiefly occupied with experiments on the natural constituents of the water, namely alkaline and earthy salts, and those on the effects of the salts of the heavy metals and of the sesquioxides were not made till September when the water had undergone some change, the numbers given for these latter are not quite so certain, possibly may be stated as smaller than they would have been had the August water been used. The decision on this point must be reserved for next rainy season.

It may be well also to state the absolute quantities of these or at least of some of these substances that would be necessary to clarify a given quantity of the muddy water, calculated from the data given. For this purpose the standard will be Carbonate of Lime, dissolved by Carbonic acid, in the
proportion of 0.07 gramme to 1 litre or 1000 cub. centimetres or 7 pounds to 100,000 pounds of water, which is equal to 700 pounds to 10 million pounds of water or to 1 million gallons. From this the quantity of any other of the substances given in the table may be calculated from the last column by simple proportion. Thus as 100 Carbonate of Lime is to 700 pounds required, so is 136 Sulphate of Lime to 952 pounds required, or 2.74 Perchloride of Iron to 19.18 pounds required for 1 million gallons of the muddy water of the Hugli.

It is necessary to remember, however, that the table given refers to the dry substances, which is the natural condition in which they are usually found in only a few of the substances enumerated in the table, such as Common Salt and Carbonate of Lime. Most of the other substances contain water of crystallization or water of solution, which last may be a very variable quantity. In the latter case the quantity of dry matter in solution must be known. The following table includes a few of the preceding substances most likely to be of practical application:

**Table of absolute quantities of substances necessary for the clarification of 1 million gallons of muddy water of the Hugli during the rainy season, calculated from the data given above.**

<table>
<thead>
<tr>
<th>Substance</th>
<th>Pounds</th>
</tr>
</thead>
<tbody>
<tr>
<td>Common Salt, dry, equiv. 58.5</td>
<td>32760</td>
</tr>
<tr>
<td>Chloride of Calcium or Muriate of Lime, fused or dry, eq. 55.5</td>
<td>1554</td>
</tr>
<tr>
<td>Carbonate of Lime, dry, eq. 50</td>
<td>700</td>
</tr>
<tr>
<td>Gypsum or native cryst. Sulphate of Lime, eq. 86</td>
<td>1204</td>
</tr>
<tr>
<td>Sulphate of Iron cryst., eq. 139</td>
<td>159.6</td>
</tr>
<tr>
<td>Alum cryst., eq. 151.2</td>
<td>55.4</td>
</tr>
<tr>
<td>Perchloride of Iron, dry, 54.7</td>
<td>19.15</td>
</tr>
</tbody>
</table>

It may be also worth noting the proportion of a few of these substances to the water on the above data.

<table>
<thead>
<tr>
<th>Substance</th>
<th>Proportion to Water</th>
</tr>
</thead>
<tbody>
<tr>
<td>Common Salt</td>
<td>1 to 305</td>
</tr>
<tr>
<td>Gypsum</td>
<td>1 to 8306</td>
</tr>
<tr>
<td>Carbonate of Lime</td>
<td>1 to 14286</td>
</tr>
<tr>
<td>Perchloride of Iron</td>
<td>1 to 522000</td>
</tr>
</tbody>
</table>

These numbers show that chloride of calcium is nearly twenty-three times as effective as common salt. Skey estimated it as only twice as effective. Schloesing, as will be stated immediately, estimated chloride of potassium as of only one-fifth of the efficacy of lime salts and chloride of sodium

* On referring to my Note Book I find that in July 1866, I had come to the conclusion that about 1 of Perchloride of Iron is sufficient to precipitate the mud from 125,000 of water by standing over night, an approximation at least to the small quantity I have recently found to be sufficient. This was when I was not thinking of its application on the large scale nor searching for a minimum.
weaker still. It will be observed that my numbers differ widely from theirs. The differences are to be accounted for, partly from the circumstance that my examinations have been pushed further than theirs, thus shewing that one lime salt is twice as efficacious as another, that some other salts are far more powerful than lime salts, and that the salts of the heavy metals and particularly of the sesquioxides seem to act on the same principle, which does not appear to have been suspected by either Skey or Schloesing, at least is not alluded to. It is also probably partly due to the differences of the mud operated on, both as respects the composition of the insoluble matter it chiefly consists of, as well as of the soluble matter that it may contain.

V.—I had written thus far when I had an opportunity of seeing Schloesing's paper in the original, in the Comptes Rendus, and found it much more complete and interesting than I could have concluded from the brief abstract in the Chemical News. He was first led to notice the peculiarity from a circumstance I have mentioned before, namely the treatment of argillaceous soils with distilled water. He not only mentions that distilled water rendered muddy by a mixture of purified fat clay is precipitated by 1-1,000th part of lime salts immediately, but that this is the case also by 1-5,000th part in some minutes and by 1-50,000th part in two or three days. He refers to the muddy water of the Seine becoming limpid in an hour or two by a very small addition of a lime salt, but at the same time states that the Seine water contains 80 milligrammes of lime per litre, equal to 8-9 parts in 100,000 or 15-9 of Carbonate of Lime, a much larger quantity than that which exists in the Hugli water during the rainy season, indeed nearly as much as is found in December and January. Schloesing further directs attention to the influence of this peculiarity on clay soils and on what is called the mechanical analysis of soils; and he further notices the precipitation of mud so carried in rivers by the water of the sea, and also the practical applications suggested by it for clearing muddy water. Indeed he concludes by a reference to the waters of the Durance employed for supplying Marseilles, tracing the muddiness of such waters to their sudden dilution with large quantities of pure water and suggesting a remedy in the restoration of the water to its normal condition by the addition of lime salts or an admixture of some other water containing abundance of these; in complete accordance with all I have been contending for. Schloesing states that Magnesia salts are about equally efficacious with Lime salts, and that salts of Potash are required in about five times the quantity that lime salts are, and that soda salts are still less active. He refers to no other classes of salts, but speaks of Carbonic acid as producing the same effect, attributing its efficacy to the solution of Carbonate of Lime present in the insoluble state.

This idea had occurred to myself, and that also it might explain the
action of the other stronger acids. I am not prepared at present either to admit or deny this. To settle the point would require experiments to be made in which the sources or causes of doubt should be removed. Though it might be supposed that these acids dissolve a small quantity of the otherwise insoluble carbonate of lime, this does not account satisfactorily for the circumstance that the salts of the sesquioxides of aluminum and iron and even of the protoxides of the heavy metals are so much more efficient than lime salts themselves.

I found in another number of the Chemical News, that of 14th May, 1869, an abstract of a "Report of the Netherlands Committee." This committee, evidently, (though particulars are not stated), consisted of a body of scientific men examining the waters of certain rivers with a view to their economical use, the Rhine and Maas being particularly mentioned. So far as I can judge from some particulars mentioned, these waters do not appear to be exactly similar to the muddy water of the Hugli. The committee especially recommend Perchloride of Iron for the purification of such turbid waters, along with Carbonate of Soda, and recommend 0.32 grains Perchloride of Iron for 1 litre which is equal to 1 part for 31,250. I have given it as 1 to 522,000 and without soda. It is obvious that the question of quantity is very important in the application of this artificial method of clarifying muddy water with a view to economy. The great expense, evident in the application of all proportions known before, was one cause that prevented me from giving the subject much attention, as I had adverted to the use of precipitants as far back as 1867, in my paper in this Journal.*

One way and the best of all ways of restoring the proper quantity of Lime salts to such water would be to bring it thoroughly in contact with Carbonate of Lime, provided it contained enough of free Carbonic acid to dissolve a sufficient quantity. But this is very doubtful and not very likely in ordinary waters. Experiment shewed only a small improvement.

Both Skey and Schloesing state that the chief point seems to be that there should be a certain quantity of the precipitating substance in proportion to the water, and that the quantity of clay present does not make much difference, Schloesing remarking even that the limpidity is more perfect when the mud attains a certain proportion, just as I have myself found that the muddy Hugli water settled and cleared better by adding some dry soil to it, this of course from the soluble matters contained in that soil. The general point, however, I had not time to examine, my attention having been given to the Hugli water as it presented itself in nature.

Both Skey and Schloesing also describe the effect produced by the term coagulation, and it seems quite appropriate. The very fine particles coalesce as it were into larger and comparatively flocculent ones.

I was not content with these small experiments but tried the process by clarifying the water first by such small proportions of these precipitants, settling one or two days and then passing through a sand filter, and found it to answer perfectly, the filtration going on easily and rapidly. The apparatus was small, the precipitating vessel holding about 45 gallons, the filter being a Zinc tube of about six inches diameter. There were two filters, one with Palta and one with Magra sand: the Palta sand filtered best as I used as small a quantity as possible of the precipitating substances. I could not try it on a larger scale, as my premises are now no longer on the bank of the river. But there cannot in my opinion be the smallest doubt but that the process would answer admirably on the large scale.

My former experiments, at least in my own judgment, proved that the Hugli water during the rainy season could not be filtered without unusual difficulty, and that arising from a peculiarity in the water which I connected with the peculiar distribution of the rainfall in this country, though I could not then explain the cause:—it was a matter of fact whether it could be explained or not. Plans proposed to overcome this difficulty, supported by experience of water filtration in England, I declared would be useless, because the water was different and English experience therefore not applicable.

One special contrivance, which it was alleged would be effective for the purpose, I had tried, and had given my opinion that it was worthless for the purpose. The best plan for filtering the water of the rainy season as it presents itself in nature, I concluded, would be by the use of the Palta sand, properly managed, which includes a proper relation between the amount of filtering surface and the quantity of water to be filtered. All of these statements and opinions I still adhere to, as they were conclusions drawn from the observation of facts, the highest and only true authority from which scientific conclusions can be drawn.

A new idea has supplied me with the means of explaining the nature of the peculiarity, and that not by superseding but by confirming the correctness of my previous conclusions that it was connected with the tropical rainfall, and that was by producing extreme dilution of the water. It also indicated a way to remedy the difficulty of settling and filtering the water. The evidence has been given in the preceding pages, and is founded also on the authority of experimental facts open to scrutiny and criticism. The conclusions, it appears to me, may be of value not only with reference to the Calcutta water supply, but to the purification of water in cases where the circumstances are similar, occurring more generally in tropical countries, but even occasionally in other localities.
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[With Plates XVIII & XIX.]

CAPPARIDÆ.

227. Capparis crassifolia, nov. sp.

Frutex scandens, spinis brevibus recurvatis armatus, novellis et foliis junioribus subitus tomento minuto canescente obtectis; folia obovalia ad obovata, petiolo \(\frac{1}{2}\)-\(\frac{3}{4}\) poll. dum juvenili canescenti-puberulo suffulta, basi magis minusve acuta, apice rotundata et brevissime recurvato-acuta, coriacea c. 2 poll., glabra, nervis crassi subitus conspicuis et præsertim basin versus egredientibus; flores solitarii, iis \(C. horridæ\) subconformes, pedicello \(\frac{1}{4}\) ad \(\frac{3}{4}\) poll. canescenti-tomentoso suffulti; sepala et petala ferrugineo-lanata; filamenta numerosa, glabra; gynophorum longum et ovarium globosum glabra.—Prome.—\(C. horridæ\) arcte affinis.

228. Capparis polymorpha, nov. sp.

Frutex scandens, glauco-viridis, ramis ramulisque tenuiter albescenti-farinoso-tomentosis, spinis brevibus curvis puberulis armatibus; folia (juniora valde elongato-rhomboidea) rhomboideo-ovata ad obovato-rhomboidea, petiolo \(\frac{3}{4}\) poll. albescenti-puberulo suffulta, basi obtusa, subcoriacea, obtusa, glauca, subtus et dum juvenilia utrinque, fugaci-albo-puberula, nervis crassis et præsertim basin versus egredientibus; flores solitarii, axillares, iis \(C. horridæ\) simillimi, pedicello \(\frac{3}{4}\) poll. canescenti- et pro parte ferrugineo-tomentoso crasso suffulti; sepala et petala ferrugineo-lanata; filamenta numerosa, glabra; gynophorum gracile, glabrum; ovarium glabrum; baccae (immature) cerasi magnitudine, oblongae, polyspermæ.—Prome.—Ex affinitate \(C. horridæ\). \(C. horridæ\), \(crassifolia\) et \(polymorpha\), species inter se valde affines, habitu longe distant et saepius in eodem solo sociatim crescent.

MALVACEÆ.

229. Decaschistia crassiuscula, nov. sp.

Frutex humilis, ramosus, dense albo-tomentosus; folia ovata, in petiolo crasso 2—3 lin. tantum longo decurrentia, 2—3 poll. longa, integra v. sublobata, grosse v. obsolete dentata, utrinque dense, subitus albo-tomentosa; flores sessiles v. subsessiles, 2 poll. fere longi; involucr phylla dense tomentosa, basi bractea longa subulata sustenta; calycis lobi paulum longiores et latiores, tomentosi, crasso-costati; petala stellato-pubescentia, venosa; capsulae dense tomentosae.—Prome.—\(D. crotonifolia\) valde affinis, sed differt floribus sessilibus v. subsessilibus, foliis latioribus decurrentibus et petiolo brevissimo.
STERCULLIACEÆ.


Arbor decidua, novellis pilis coccineis (in sicco brunneis) særius glutinosus tomentosis; liber et lignum album (nee rubrum uti in St. villosa); folia lata, 5—7-loba, lobis acuminitatis, subus dense stellato-pubescentia, supra pilis brevibus fasciulatis minutis aspersae; flores majusculi, pedicello ½—1 poll. longo suffultì, plerumque ochracei in fundo rubicundi, in paniculas terminales coccino-tomentosas dispositi; calyx puberulus, semilineum longum, lobis lanceolatis patentibus; gynopborum stellato-tomentosum; ovaria fl. fem. dense hispido-tomentosa; carpella 5—6, setis fragilibus lineam fere longis urentibus dense vestita et glabrescentia, c. 2½—3 poll. longa, subcylindrico-lanceolata, incurvato-acuminata, intus dense fulvo-setosa; semina pluria, oblonga, atræ, Isevia.—Pegu, Martaban, Tenasserim.—St. villosæ affinis, inter alia indumento carpellorum et floribus jam distincta.

MALPIGHIACEÆ.

231. HIPTAGE ARBOREA, n. sp.

Arbor parva, decidua, 15—20-pedalis, novellis dense albido v. flavido-tomentosis; folia valde variabilia, oblonga et ovato-oblonga ad elliptica et elliptico-lanceolata, 2—3½ poll. longa, petiolo brevissimo crasso, basi obtusa v. rotundata, subcoriacea, dum juniora dense albido-tomentosa et acuta v. breviter acuminate, dein subilexosa et acuta v. rotundata, nervis subus valde prominentibus; flores lilacini v. albi, in fundo aurei, pedicello medio 1—2-bracteolato longo albido-pubescento basi bracteato suffulti, racemos breviores v. longiores albido-pubescentes axillares formantes; sepala v. acuta, lanato-pubescentia, 2—3 lin. longa; petala unguiculata, fimbriata, reflexa; carpella magis minusve fulvo-tomentella, glabrescentia, alis plerumque securiformi-emarginatis valde inaequalibus (terminali erecta 1½—2 poll. longa, lateralibus patentibus plus quam 2/3 brevioribus), costa centrali obsoleta.—Prome, Martaban.—Inter species Hiptagis generis extricatu difficillimas haec statura erecta (non scandente) et cortice crassa suberoso-fissa praestat.

RUTACEÆ.

GONOCITRUS, nov. g., Pl. XVIII.


232. G. ANGULATUS (Citrus angulatus, Willd. sp. pl. III. 1426; Rumph. Herb. Amb. 110, t. 32; De. Prod. I. 540; Atalantia longispina
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1873.

Kurz in Journ. As. Soc. Bengal, 1872 295. Bacae epulposae, sed intus succo viseido parco (oleo condensato?) vestitae. Flores albidi (ex Rumph.).

LEGUMINOSAE.

233. Crotalaria Kurzii, Baker MS.

Herba annua, erecta, ramosa, 1—3-pedalis, ramis teretibus parce appresse pubescentibus; folia obovato-ad lato-lanceolata, basi subcuneata, brevissime (1—2 lin.) petiolata, mucronato-acuta v. subecuspidata, 1½—3 poll. longa, raro longiora, subtus parce puberula et pallida; flores mediocres, lutei, vexillo extus atropurpuro-striato, pedicello ¼—½ poll. pubescente suffultu, vulgo solitarii v. raro bini, hinc inde fasciculatim ex foliorum axillis crumpyentes simulque in racemos axillares et terminalis parce pubescentes dispositi; bracteae minutae, subulatae; calyx semilineum circiter longus, parce appresse puberulus, lobis falcato-lanceolatis acuminatis; corolla calyce longior; legumen ½ ad 1½ poll. longum, sessile, basi attenuatum, glabrum; semina pallida v. pallide brunnea, nitentia, lin lata. Var. a. genuina, folia minora, 4 poll. non excedentia; legumen ⅔—1 poll. tantum longum et calyce duplo longior; semina pallida, lineae la. —Pegu, Martaban.—Var. β. luxurians, folia 6 poll. longa; legumen 1⅔—2 poll. longum et calyce 3—4 poll. longior; semina brunnea, 2½ lin. circiter lata. Pegu. Var β, cujus flores non vidi, cum forma typica, characteribus supra indicatis exceptis, omnino quadrat.

234. Indigofera Caloneura, nov sp.

Frutex erectus, ramosus, fulvo-puberulus; stipulae c. 2 lin. longae, lineari-subulatae, dense pubescentes; folia 1-foliolata, petiolo 3—4 lin. longo crasso dense fulvo-pubescente suffulta; foliolium ellipticum, utrinque rotundatum v. sæpius apice retusum, mucronulatum, 3—4 lin. longum, chartaceum, supra glabrum, subtus mollis-pubescentes et glaucescentes, costa nervis venisque valde prominentibus et fulvo-pubescentibus; flores rosei?, parvissculi, pedicello 2 lin. longo filiformi puberulo suffulti et racemum robustum pubescentem axillarem foliis vulgo breviorem formantres; bracteae longiusculae, subulatae; calyx brevis sed amplus; lineam vix altus, dentibus 3-angularibus acutis; corolla c. ⅓ poll. longa; ovarium dense sericeopubescent; legumen deest.—Pegu.—Ex affinitate J. Brunonianæ, Grah.


Herba perennis, volubilis, 3—4-pedalis, puberulus; stipule lanceolatae, acuminatae, pubescentes, c. 3 lin. longae; folia pinnatim 3-foliolata, petiolo ¼—1 pollicari puberulo; foliola lateralia minora, deltoidae, retusa et mucronato-apiculata, foliolum terminale transverse obcordato-lunatum, ½—2 poll. latum, in sinu mucronatum, chartaceum, supra tenuissime subtus parce pilosum et pallidum, venis transversis prominentibus; flores parvi, cyanoe-
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purpurei, pedicello gracili 2—3 lin. longo pubescente, in racemum gracilem pubescentem axillarem sepius in paniculam terminalem abuentem dispositoi; bracteae lineares, subulato-acuminatæ, 2—3 lin. longæ, pubescentes, caducissimæ; calyx pubescens, lineam circiter longus, lobis lanceolatis acuminatis; corolla 2½ lin. longa; legumen in stipitem 1 lin. longum attenuatum, recurvatum, planum, chartaceum, puberulum, moniliformi-2—3, v. sepius 1-articulatum; articuli hastato-rotundati, c. ½ poll. longi et lati; semina reniformi-oblonga, compressa, brunnea, nitentia.—Tenasserim.—Ex affinitate D. strangulati, &c.

236. Desmodium Oblatum, Baker MS. (Desmodium reniforme, Wall. Cat. vix De. certissime non Burm).

Fruticulus erectus, graciilis, 2—3-pedalis, glaber; stipulae et stipellæ minutæ; folia 1-foliolata, petiolo capillari ¼—½ pollicari suffulta; folium transverse ellipticum, apice subapiculatum v. rotundatum, 1—1½ poll. latum, integrum, glabrum, lœte virens; flores parviusculi, cyanei, pedicello capillari c. ½ pollicari puberulo, fasciulati et racemum gracillimum puberulum axillarem in paniculam terminalem abuentem formantes; bracteæ persistentes, ovatae; calyx c. 1½ lin. longus, subglaber, lobis linearis-lanceolatis acuminatis; corolla sub—3 lin. longa; legumina in stipitem brevissimum contracta, compressa, minute puberula et glabrescentia, linearis-oblonga, moniliformia, 2—4 passim 1-articulata, articuli semioblongi, suturâ exteriore vix curvâ, reticulati, c. 2 lin. longi v. longiores; semina compressa reniformia pallide brunnea nitentia.—Ava, Pegu, Martaban.—Ex affinitate D. reniformis, &c.

237. Desmodium Auricomum, Grah. in Wall. Cat. 5704.

Herba annua a basi ramosa patenter fulvo-pilosa; stipulae lanceolatae, aristato-acuminatæ, striate, 2—2½ lin. longæ; folia pinnatim 3-foliolata, petiolo parce piloso 3—4 lineari suffulta; foliola elliptica ad obovalia, rotundata v. subretusa, ¼—½ poll. longa, supra subglabra, subtus parce appresse pilosa; flores parvi purpurei, pedicello capillari piloso ½—¾ pollicari, racemum gracilem patenti-fulvo-pilosum terminalem v. ramulos axillares terminantem formantes; bracteæ vulgo sub anthesi persistentes, ovatae, subulato-acuminatæ, 3—4 lin. longæ, fulvo-pilose; calyx 1½ lin. longus, fulvo-pilosus, lobis linearibus subulatis; corolla æquilonga v. paulo longior; legumina plana, sessilia, linearis-oblonga, ciliata et intra marginem villose-pilosa, laxe reticulata, 3—5-articulata, articuli lin. circiter longi et lati, suturâ interiori rotundati exteriori subrecti, dehiscentes; semina reniformia, brunnea, nitentia.—Arracan, Tenasserim.—Ex affinitate D. triflori, &c.

238. Lespedeza Pinetorum, nov. sp.

Frutex subsimplex v. ramosus robustus erectus 2—4-pedalis dense fulvescenti-pubescent; folia 3-foliolata, petiolo ¼—¾ pollicari villose suffulta; foliola elliptica ad elliptico-ovata, brevissime crassæque petiolata, 1—2
poll. longa, obtusa v. acuta cum mucrone, integra, coriacea, supra subrugosa et parce subtus dense fulvescenti- v. subcanescenti-villosa et prominenter nervosa; flores parvisculi, cyanei v. rosei, pedicello lin. longo gracili pubescente suffulti in racemos villosos-pubescentes robustos sed breviusculos axillares v. terminales dispositi et sæpius paniculam densam terminalem efformantes; calyx c. 2½ lin. longus, fulvescenti-villosus, lobis subulatis; corolla 3½ lin. longa, glabra; legumen dimidiatio-ovatum, 3 lin. longum, sericeo-pubescente.—Martaban.—L. hirtæ, Miq. quodammodo affinis.

239. Lespedeza decoræ, nov. sp.

Frutex erectus, 3—5-pedalis, caulibus angularibus appresse fulvo-pubescentibus dein canescentibus; stipulæ c. 3 lin. longæ, rigideæ, lineari-subulate; folia pinnatim 3-foliolata, petiolo gracili 1—1½ pollicari canescente suffulta; foliola breviter petiolulata, obovalia ad elliptica, apice rotundata mucronata, chartacea, 1—1½ poll. longa, supra atroviridia, glabra, subtus glaucescentia et sub lanceo pannes pubessentia; flores cerulei, pedicello gracili c. ½ pollicari glandulosos-pubescentes instructi, racemos breves at gracies fulvo-glandulosos-pubescentes persistenter bracteatos sæpius in paniculam brevem collectos efficientes; bractee ovato-lanceolata, subulato-acuminata, c. lin. longæ, glandulosos-puberulae; calyx c. 3 lin. longus, fulvo-pubescente, lobis ovatis acuminatis; corolla ¼ poll. longa; legumina (immatura) oblique ovato-lanceolata, acuminate, compressa, breviter sericea.—Martaban.—Hie Desmodium angulatum, Wall. Cat. 5729, I. quoad specimina sterilia probabiliter e Taong-dong sumpta.

240. Lespedeza partiflora, nov. sp.

Frutex, ramulis angularibus sericeo-puberulis; stipulæ rigideæ, lineari-subulate, c. 2—2½ lin. longæ; folia pinnatim 3-foliolata, petiolo gracili canescente ½ poll. longo suffulta; foliola breviter petiolulata, elliptica ad elliptico-ovata, ½—1 poll. longa, chartacea, supra glabra et atroviridia, subtus glaucescentia et appresse puberula; flores cyanei ?, parvi, pedicello ½—1 lin. longo fulvo-pubescenti instructi et in racemos axillares strictos fulvo-pubescentes folio circiter duplo longiores apice ramorum sæpius congregatos dispositi; bractee deciduae; calyx dense fulvo-pubescentis, c. 2 lin. longus lobis subulatis; corolla 3½ lin. circiter longa; legumina (immatura) oblique ovata, acuminate, sericea.—Martaban (Rev. F. Mason).—L. ellipticae, Bth affinis, a qua differt: floribus multo minoribus, calycis lobis subulatis, bracteis deciduis et indumento.


Herba perennis, volubilis, novellis parce appresse pubescentibus; stipulae...; folia pinnatim 3-foliolata, petiolo glabro v. subglabro 2—4 pollicari suffulta; foliola ovata v. subovata (lateralibus valde obliquis, terminali magis trapezoideo), petiolulo brevi pubescenti suffulta, obtusiusculæ apiculata v.
cuspidata, mucronata, chartacea, supra glabra, subtus puberula v. sub lente appresse pubera; flores magni, atropurpurei, pedicello canescenti-puberulo e. 2 lin. longo suffulti, 2—3-ni v. solitarii pedunculum secundarium 2—3 lin. longum terminantes et in racemum bracteato-pedunculatum axillarem nutantes canescenti-v. fulvescenti-pubescentem dispositi; bracteae ovatæ ad lanceolatae, subulato-acuminatae, velutinae, florales valde deciduæ, inferiores vacuæ pedunculum vestientes persistentes, majores, ½—⅔ poll. longæ; bracteole paulo minores, rotundatae, deciduæ; calyx amplus, e. 4—5 lin. in diametro, dense canescenti-puberulus et setis fragilibus fulvescentibus aspersus; corolla e. 1½ poll. longa, alæ subduplo, carina vexillo subtriplo longiores; leguminæ oblonga v. suboblonga, compressa, 1—2½ poll. longa, carinis longitudinalibus secus suturam superiorem destituta densissime urente-setosa, 2—5 sperma; semina transverse oblonga, vulgo brunneo et atroraximula.—Pegu, Martaban, Ava.——Species distinctissima, M. prurienti affinis.

243. PuEARIAR IN BRACHYCARPA, nov. sp.


ROSACEÆ.


MYRTACEÆ.

244. Eugenia pachyphylla, nov. sp.

Arbor glabra, ramulis albis; folia obovata ad obovato-oblonga, basi magis minusve cuneato-acuminata, petiolo crasso 3—4 lin. longo suffulta, obtusiuscula v. obtusiusculæ apiculata, 3—4 poll. longa, crasse coriacea, glabra, in sicco fuscescencia, nervis lateralisibus tenuibus et prominentibus
satis distantibus et subirregulari-parallelis; flores mediocres, vulgo solitarii
v. terni, sessiles paniculam brevissimam crassam trichotomam terminalem
efformantes, pedunculo et ramis brevissimis (¼—½ poll.) crassissimis 4-gonis
articuliformibus; calyx c. 4 lin. longus, obconicus, basi attenuatus, laevis,
limbo 4-lobo, lobis rotundatis c. 2 lin. longis persistentibus; petala, etc.
desunt.—Tenasserim (Dr Brandis).—Ex affinitate E. grandis.

245. Eugenia cerasiformis, nov. sp.

Arbor magna, 90-100 pedalis, glabra, ramulis albidis compressiusculis;
folia magis minusve lato-lanceolata, basi acuta v. acuminata, petiolo ¼—½
poll. longo, obtusiuscule acuminata v. passim obtuse apiculata, 4—7 poll.
longa, pergamae, glabra, opaca, subbus pallida, nervis lateribus sat irre-
gulari-parallelis et sepius curvis tenuibus sed prominentibus; flores
parviusculi, albi, pedicello gracili 2—4 lin. longo suffulti, in racemum
brevem graciilem glabrum axillarem v. supra foliorum delapsorum cicatri-
bus orientem collecti; calyx 3½—5 lin. longus, ejus pars superior ampliatus
c. 3 lin. longa, clavato-turbinatus, laevis. limbo persistente 4-lobo, lobis
semiorbicularibus 2 lin. fere longis, pars inferior pedicelliformi-contracta
gracilis ¼—2 lin. longa, petala c. ½ poll. longa, concavo-ornicularia, libera;
filamenta longa, gracilia; baceæ globosæ v. didymo-globosæ, pisii magnitu-
dinis, in stipitem longum gracilem protractæ, 1—2 sperme, laves, calycis
limbo disciformi patente coronatae.—Martaban (Etiam in montibus Sikkim
Himalaya, Khasya, etc. Species juxta E. lanceæfolium inserenda.

246. Eugenia tristis, nov. sp.

Arbor glabra. ramulis teretibus crassis pallide brunneis; folia elliptica
ad elliptico-ovata, basi acuta, petiolo ¼—½ poll. longo crasso, obtuse-
apiculata, coriacea, 4—5 poll. longa, glabra, opaca, nervis lateribus sub-
distantibus et sat irregularibus crassiusculis et prominentibus; flores....;
panicula fructicans corymbiformis, sessilis, terminalis, glabra, ramificationibus
brevisibus et robustis; baceæ pedunculo crasso 1—2 lin. longo suffulta,
depresso-globosæ, erasi magnitudinis, glabreæ, calysis limbo discoideo
patenter 4-lobo coronatae, 2 v. 1 sperme, endocarpio tenui carnoso; calycis
lobi sub fructu c. 1½ lin. longi, rotundata.—Tenasserim. Ex affinitate E.
grandis, sed foliorum indole longe distat.

247. Barringtonia augusta (Strovadium augustum, Wall. Cat. 2637
pp.)

Arbor mediocris glabra; folia cuneato-oblonga ad obovato-cuneata,
basi attenuata obtusa v. acuta, petiolo crasso 3—4 lin. longo, acuta v.
subacuneata, ¼—1¼ ped. longa, sursum crenulato-serrata, chartacea, glabra;
flores conspicui, sessiles, in spicam longissimam fulvo-pulverulentam termi-
nalem dispositi; rachis crassa basi folisi numerosis redactis lanceolatis
cineta; calyx velutinus, tubo c. lin. longo v. longiore alatim 4-gono, lobis
rotundatis c. 2 lin. longis; petala....; baceæ (immature) fibroso-carnoso,
oblongæ, fulvo-pulverulentæ, calyces limbo coronatæ, 4-alatae, alis carnosis et crassis angustis undulatulis.—Tenasserim.

248. Barringtonia pterocarpa, nov. sp.

Arbor mediocris, 30—50-pedalis, glabra; folia elongato-obovato-lanceolata, basi cuneato-acuminata in petiolum breviorum v. longiorum (usque $\frac{1}{2}$ poll. longum) decurrentia, breviter acuminata. 1—1$\frac{1}{2}$ ped. longa, apicem versus crenulato-serrata, pergamacea, glabra; flores conspicui, albi v. rosei (filamentis albis), sessiles, spicum longissimam robustam pulverulentam terminalem efficientes, rachis crassa basi foliis floralibus reducis numerosis lanceolatis cineta; calyx velutinus, tubo lineam circiter longum alatim 4-angulato, limbo 4-fido, lobis triangulari-ovatis acutis v. obtusiusculis plus quam 3 lin. longis; petala $\frac{3}{2}$ poll. longa, ovato-oblonga, acuta; baccæ oblongæ, fibroso-carnose, c. 2 poll. longae, 4-gone, angulis anguste et crasse alatis.—Pegu, Martaban.—B. augustæ valde affinis sed differt foliis longe decurrentibus et calycis lobis.

**LYTHRARIEÆ.**


Arbor parva v. mediocris 30—40-pedalis decidua, glabra; folia oblonga ad ovato-oblonga, breviter petiolata, vulgo larga præsertim juniora usque 1$\frac{1}{2}$ ped. longa, adulta 5—6—9 poll. longa, basi obtusa v. rotundata, chartacea, obtusa, obthusiuseule apiculata v. passim acuminata, integra, glabra; flores magni, 3—4 poll. in diametro, speciosi, violacei v. violaceo-purpurei, pedicello crassiusculo canescenti-pulverulento suffultii, solitarii v. 2-ni—3-ni cymosi et in paniculum depauperatum terminalem brevisium collecti; calycis alabastrum oblongo-turbinatum, canescenti-velutinum, tenui-sulcatum nec costatum, lobis lanceolatis acutis secus margines haud incrassatis; petala 1—1$\frac{1}{2}$ poll. longa, lato-elliptica v. suborbicularia, unguiculata, crispato-undulata; stamina aquilonga; capsulæ lignose, 1—1$\frac{1}{2}$ poll. longæ, oblongae mucronatae; semina L. Flos reginae, sed majora.—Birmania tota.—L. Flos reginae valde affinis.

250. Lagerstræmia villosa, Wall. MS. in H. B. C.

Arbor magna, 80—90-pedalis, in locis siccioribus 40—50-pedalis, ramulis, &c. dense puberulis; folia ovata ad ovato-oblonga, petiolo brevisimo pubescente suffulta, basi rotundata, chartacea, magis minusve acuminata 2—4 poll. longa, supra minute velutina, subtus subcanescenti-pubescentia v. puberula; flores parvi, albidi, pedicello gracili pubescente, in cymas pedunculatas dispositi et paniculum terminalem contractam molliter puberulum efformantes; calyx in alabastro turbinatus, dense canescenti-puberulus, 4—5—6-lobus, lobis triangularibus acutis tubum 4—6-costatum longitudine fere æquantibus, costis subaliformibus; petala minuta, calycis
dentes haud superantia, cuneato-lanceolata, acuta, alba; antheræ purpureæ; capsule oblongæ, semipellucidae circiter longæ, mucronulatae, valvatim 4—6-loculares.—Pegu, Martaban.

**GENTIANÆ.**

251. *Gentiana nudicaulis*, nov. sp.

Herba erecta annua glabra cauli tereti nudo 1—2 pollicari; folia apice rosalata, lineari-lanceolata ad linearia, basi subbattenuata sessilia acuta v. acuminata, usque ad 1½ poll. longa, coriacea, 3-nervia (nervis supra impressis); flores cyanei, raro pallide coerulei, depauperato-cymosi et foliosis-pedunculati v. (in spp. Burmanicis) in glomeris densis axillaris et terminales congregati; calyx ½ poll. longus, infundibiliformis, plicato-5-angulatus, usque ad medium 5-lobus, lobis linearisubulatatis albo-marginalis; corolla semipellucida v. paulum longior, plicato-5-loba, lobis acutis v. acuminatis; stamina corollam longitudine subajquantes; filamenti stricta, sub medio corollae tubi inserta; ovarium linearis, in stipitem brevem attenuatum; capsula clavata, crassa et breviter stipitata, a medio ala sursum latissima cincta stylos 2 revolvente corollae, semina minuta, exalata, oblonga. Var. a. genuina, ramuli evoluti et florentes paniculam spuriam efformantes.—var. b. compacta, ramuli compressi indeque flores compacto-glomerati.—var. a. montes Assamiee (Griff. No. 5819); var. b. Martaban.

252. *Gentiana crassa*, nov. sp.

Suffrutex ramosus deorsum defoliatus; folia lanceolata ad obovato-lanceolata, basi attenuata et cum folio opposito in vaginam brevem connata, inferiora 1½—2 pollicaria, coriacea, obtusiuscula acuminata, 3-nervia, secus margines subrevolutos subcrenulata: flores majusculi, sessiles et glomerati et cymam terminalem majorem v. minorum foliatam compactam formantes; calyx fere ⅓ poll. longus, tubulosocampanulatus, teres, profunde 5-lobus, lobis valde inaequalibus, quorum 3 minimis lineari-lanceolatis et basi truncatis abrupte emissis, caeteris 2 subfoliaceis tubi fere longitudinis oblongis acuminatis basi attenuatis 1-nervis; corolla pollicarum, infundibiliformis-campanulatus, plicato-5-lobus, lobis lato-ovatis, abrupte acuminatis; stamina corolla breviora, filamentis basi versus sensim latioribus tubo basin versus insertis; ovarium linearis-campanulatum, in stipitem crassum attenuatum; capsula compresso-lanceolata, acuminata et corollâ marcescente semi-exserta, stipite plusquam ⅔ poll. longo suffulta, valvis stylo brevi revoluto terminatis.—Martaban.

**PHYLLOCYCLUS**, nov. g.

Calyx campanulatus, inllatus teres. Corolla subregularis, lobis imbri-catis, basi sepias bimaculatis. Stamina 4, 2 inferiora longiora fertilia exserta polline miniato secatentia, 2 superiora subinclusa filamentis brevibus suffulta effloret. Ovarium 1-loculare, ovulis numerosis placentae bifide pariei-
tali insertis; stylus deciduus; stigma bilobum. Capsula 1-locularis, septicide bivalvis. Semina plurima, placenta spongiosa immersa, minuta. Herbaria annuae facie Cyclophylli generis Canscora, sed foliis omnibus perfoliatis caulibus teretibus et floribus vulgo solitariis axillaribus. Genus Canscora inter alia differt: corolla lobi 2 inferiores approximati a medio tali modo replicati ut plicis arcte approximatis quasi lorum singulum mentient indeque corollam prima facie 3-loram immitent; stamina 4, quorum unum unum tantum fertile et multo longius in plica lorum inferiorum receptum, cetera multo minora effeta sunt.

253. Ph. Helferiana, (Canscora Helferiana, Wall. MS.)
Herba annua dichotomo-ramosa glabra 1—2-pedalis; folia perfoliata, orbicularia, ¼—1 poll. lata, radiato-venosa, membranaecea; flores parvi, albidi, pedicello brevissimo gracilis, solitarii, axillares; calyx lavis, teres, campanulatus, e. 3 lin. longus, lato-4-dentatus; corolla tubus calycis longitudine, inflatus, limbo parvo 4-lobo, lobis oblongis obtusiusculis; capsula ...

—Tenasserim (Helf. 5816).
Alter species hujus generis, O. Parishii, Hook. Bot. Mag. t. 5129, facile distinguitor floribus duplo majoribus, lobis multo latorium, etc.

PEDALINEÆ.

254. Brandisia discolor, Hf. et Th.
Capsula ovalis, compressiuscula, semipollicem fere longa, calyce subduplo longior, fulvo-tomentosa, mucronata, semina linearia, 2 lin. longa.—Wightiae, Wall., arcte affinis. Etiam Buddleia generi affinis, sed differ corolla irregulari, etc. et certissime inter Sesameas recipienda est. Gardneria, a cl. Benthamio Loganiaceis adnumerata, Solanaca esse videtur.

EUPHORBLIACEÆ.

255. Acteplila puberula, nov. sp.
Frutex 4—8-pedalis, novellis minute puberulis; stipulae ovatae, breves valde deciduæ; folia elliptico- v. obovato-oblonga, basi rotundata v. subcordata, petiolo ½—1½ pollicari puberulo glabrescente suffulta, 4—7 poll. longa, obtusiuscula acuminata, integra, crasse membranaecea v. chartacea, supra glabra, subitus secur nervos puberula et glabrescentia, in sicco flavescen-civiridia; flores aurantiaci, monoci v. dioici, solitarii, axillares; calyx coriaceus; capsula cerasi magnitudine, granulato-rugulosa, pedunculo sursum incrassato ¾—2 pollicari glabro suffulta.—Andamanus (etiam in insulis Nicobaricis).—Actepihila habitu et characteribus generi Trigonostemoni valde accedit sed ovulorum numero distinguitur. Tylolepalm aurantiacum, Kurz, quod cl. Muell. Arg. ad Codiceum duxit, ad genus Trigonostemon repellendum est ubi in sect. VI. Eutrigonostemoni inserendum (cf. Teysm. et Binnend. Cat. pl. hort. Bogor 1868, p. 223).—
256. Antidesma fruticosum, nov. sp.

Fruticus 2—4-pedalis ramosus pubescentis; stipulæ lineares, acuminatae, fulvo-pubescentes, petiolo longiores, 2—3 lin. longæ; folia parva, elliptico- ad obovato-lanceolata, petiolo crasso c. lin. longo fulvo-pubescente, basi attenuatâ rotundata v. obtusa, 1—2½ poll. longa, breviter et obtusiuscula acuminata cum mucrono, passim obtusa v. retusa, membranacea, supra sparse hirsuta subius imprinus secus nervos adpresse pubescentia; flores minutì, sessiles, in spicae breves sat robustas fulvo-tomentosas simplices v. raro compositas vulgo e ramulis reductis ortas collecti; bracteæ ovato-lanceolatæ, pilosæ, minute, calyx extus tomentosus, 4-partitus, lobis rotundatis subacutis; discus subglaber; stamina 2 v. 3, antheris didymis; stylus terminalis, simplex; drupa pubræ dein atropurpureæ, suboblique ovoidere, leveæ, 2—2½ lin. longæ, putamina compresso subrugoso.—Pegu.—A. Roxburghii, Wall. valde affinis, sed minus partibus puberulis minor.—V. B. A. molle, Mull. Arg. synonymon est A. velutinosi, Bl.; bracteæ dum juveniles obovatae, dein sub anthesi lineari-lanceolatæ.

Glochidion, Forst.


257. Glochidion dasystylum, nov. sp.

Arbuscula v. frutex 15—20-pedalis, pubescens, ramulis subteretibus fulvo- v. ferrugineo-hirsutis; folia ovata, subobliqua, petiolo 1 lin. longo tomentosa, acuminate, basi rotundata v. obtusa, 2—3 poll. longa, chartacea, molliter pubescentia, adulta supra minute puberula; flores desunt, feminæ fasciculati v. subumbellati; capsulæ pedicello gracillimo usque ad ¼ poll. longo piloso suffultæ, depress-globosæ, c. ¼ poll. in diametro, 3-loculares et 6-llobulatæ, patenter albo-pilosæ; columna stylaris brevis, 3-lida, lobis linea- ribus simplicibus patentibus pubescentibus.—Martaban.—Gynoön hisrutum, Wight Ic. t. 1909 habitum plantæ supra descripæ optime representat sed certissime specifice distinctum est.

258. Glochidion leioxystylum, nov. sp.

Frutex magnus v. arbuscula, ramulis subangulatis novellissque pubescentibus; folia oblique ovata ad oblongo-ovata, petiolo lin. longo pubescente, basi inaequali acuta v. obtusa, longius v. brevius sepius obtusiuscula acuminata et mucronata, chartacea, supra costæ exceptæ glabra, subius præser-
tim secus nervos puberula; flores minutis, masculi pedicello longo gracili pubescente, feminci sessiles v. subsessiles, glomerati; maris calyx vulgo 5-fidus, lobis lanceolatis acutis; stamina 3; fem. calyx 5-partitus, parce pubescentis, segmentis lineari-lanceolatis acuminatis; ovarium villosum; columna stylaris conica, sursum attenuata et 3-fida, lævissima; capsule omnino iis G. dasystylis conformes, depresso-globosæ, c. ½ poll. in diametro, 3-loculares et 6-lobulatae, sessiles v. brevissime pedunculatae stylis glabris.—Pegu, Martaban, Tenasserim.—Priori arcte affinis.

259. GLOCHIDION ANDAMANICUM, nov. sp. (Phyllanthus Andamanicus, Kurz in And. Rep. ed. 1. p. XVI.)

Arbuseula 25-pedalis glaberrima, ramulis compresso-angulatis; folia elliptica v. elliptico-oblonga, basi sepium minora et suborbiculares; petiolo 1½—2½ lin. longo suffulti, obtusa v. obtusiuscule acuminata, 2—3 poll. longa, tenui-coriacea, levia, subtus glaucescentia, flores fem. parvi, sessiles, glomerati, masculi pedicello gracili puberulo suffulti, axillares, fasciculati: calyx maris puberulus, lobis oblongis obtusis; stamina 3; calyx fem. 5-lobus, parce puberulus; ovarium villosotoomentosum, columna stylaris crassa conica, ovarii crassitudine, truncata, stigma tuberculiforme 5—6 tuberculiformibus terminata; capsule 6—4-coccae, depresso-globosae, utrinque concave, canescenti-puberules et 12—8-sulcate, plus quam ½ poll. in diametro.—Andamans.—Ex affinitate G. Bancani, Miq. speciei haud eum G. Zeylanico conjungendae.

CICCA, L.

Sub nomine hocce Phyllanthi species epicaprio carnoso a me conjunguntur; structura florum et masculorum et femineorum autem valde diversa est, viz.


260. Cicca (Emblica) albizzioïdes, nov. sp.

Arbor elegans, 25—30-pedalis, novellis puberulis; folia oblonga, inferiora elliptica v. suborbicularia, subsessilia, basi rotundata, usque ad poll. longa et $\frac{1}{2}$ poll. lata, retusa v. obtusa, chartacea, glabra, subitus glaucescentia; flores minuti, flavescentes, glabri, pedicello glabro gracili suffulti, feminei subsessiles, secus ramulos novellos pubescentes glomerati et racemum interruptum subaphyllum efformantes; calyceis lobi obovato-lineares, columna staminalis longiuscula et gracilis; styli 3, basi connati, 2-fidi, lobulis latiusculis integrisque; capsulae drupaceae iis C. Emblicae conformes sed duplo majores, sessiles, in vivo plus quam poll. in diametro, globosae, aqueo-albi et nervose, pericarpio carnoso acidissimo.—Pegu.

261. Cicca (Emblica) macrocarpa, nov. sp.

Arbuscula 20—25-pedalis, habitu C. Emblica, sed cortice aspero fisso rugoso insignis, ramulis puberulis; folia anguste linearia, subsessilia, acuta v. obtusiuscula, basi rotundata, coriacea, marginibus subreflexis, $\frac{1}{2}$—$\frac{3}{4}$ poll. longa, glauco-viridia, glabra; flores lutescentes, pedicellis filiformibus suffultis, secus ramulos novellos brevibus apylllos fasciculati et racemum compactiusculum usque poll. longum canescenti-pubescentem efformantes; calyx glaber, 6-partitus, lobis obovato-oblongis; columna staminalis gracilis, styli 3, basi breviter connati, robusti, 2-lobi, lobulis latissimis et brevibus 3-crenulatis; capsulae drupaceae cum iis C. albizzioïdis exacte congruentes.—Pegu, Pegu.—C. Emblicae arcte affinis, sed differt cortice, stylorum lobis et capsulis duplo majoribus.

262. Aporosa villosula, nov. sp.

Arbor sempervirens, 25—30-pedalis, novellis parce pubescentibus mox glabrescentibus; folia oblonga ad elliptico- et obovato-oblonga, basi obtusa v. acuta, petiolo apice incrassato $\frac{1}{2}$—$\frac{3}{4}$ glabro suffulta, breviter et obtusiussule acuminata v. apiculata, integra v. subintegra, 3—5 poll. longa, rigide chartacea v. subcoriacea, glabra, in sicco fuscescentia et nitentia; flores minuti (masculi desunt), feminei sessiles, bracteis latis obtusiussulis glabris ciliolatis dense imbricatis protecti et epicas amantacae breves usque semipollincem longas binas v. per plures glomeratas axillares v. supra foliorum delapsorum cicatricibus orientes efformantes; ovarium dense fulvo-villosum, stigmatibus levibus brevibus recurvus breviter bilobis terminatum; baccae aurantiaceae, ovoidae, pisi majoris magnitudine, apiculatae, parce hirsutulae v. passim subglabrae, 2—1-loculares.—Pegu, Martaban, Tenasserim, Andamans.—A. Roxburghiana nimirum affinis.—N. B. Antidesma lunatum, Miq. = Aporosa lunatum, mihi; hic planta cl. Maingay No. 1416 et Wall. Cat. 5975, sub nomine "Cynometra fide Bentham."

263. Hymenocardia plicata, nov. sp. (Cococceras plicatum, Muell. Arg.)
Arbor decidua, novellis ferrugineo-puberulis; folia oblonga et elliptico-ad obovato-oblonga, petiolo poll. longo v. paulum longiore puberulo suffulta, basi 3-nervia rotundata v. subcordata et steiplus subabrupte obtusiuseule acuminata, crenato-repanda, 3—5 poll. longa, chartacea, subtus secus nervos puberula et dense lutescenti- v. rubescenti-glandulosa; flores dioici, masc. pedicello brevissimo puberulo, glomerati, feminei sessiles, in racemos elongatos axillares v. supra foliorum delapsorum cicatriciibus egredientes dum juvenilia amentaceos collecti; calyx in alabastro globosus, subglaber; stamina numerosa, libera; ovarium dimerum, compressum, dense glanduloso-punctatum, transverse rugoso-plicatum, stylis 2 brevibus magnis dense papilloso-villosis terminatum; capsulae desiderantur.—Pegu, Martaban, Tenasserim (Hefl. 4963).—Inter plantam mean et eam cl. Muell. Arg. ex descriptione diserim nullum adest nisi ovarium dimerum, nec alato 3-gonum. *Mallo'tus W'alkerichianus*, Muell. Arg. ex Ava, a me non visa, nulla nota differe videtur. *Hymenocardia*, ovulis solitariis nec binis gaudens, a *Coccocereate* imprinis seminibus compressis et testae textura differt. Numerus coccorum in *Coccocereate* variat 2—4 (et probabiliter usque 5).

264. *Cyclo'stomon eglandulosum* (Hopea eglandulosus, Roxb. Fl. Ind. II. 611). Arbor mediocris, 40—50-pedalis, glabra; folia subobliqua, ovato-oblonga v. ovato-lanceolata, basi acuta v. obtusa, petiolo 2—3 lin. longo gracili suffulta, integra, obtusiuseule acuminata, 1½—2 poll. longa, tenui-coriacea, eleganter reticulata, glabra; flores masculi glabri, feminei puberuli, c. 3 lin. in diametro, pedicello puberulo c. ½ poll. suffulti, solitarii v. raro binii et axillares; ovarium fulvo-vclutino-pubescentis, 2-loculare; stigmata sessilia glabra, dilatato-3-angularia, crenata; drupae desunt.—Arracan (etiam in montibus Bengalie orientalis).

265. *Cyclo'stomon sub'sessile*, nov. sp. Arbor sculea 25—30-pedalis, glabra; folia oblonga ad elliptico-oblonga, basi subinequalia, obtusiuseule et sapuius subabrupte acuminata, 4—6 poll. longa, chartacea, integra v. undulata v. obsolete crenata, glabra, laxe reticulata; flores parvi, pedicello vix ½ lin. longo canescenti-pubescenti suffulti, glomerati, axillares, calyceis lobi concavo-oriculares, extus canescenti-pubescentes, lineum circiter longi; drupae ovoideo-oblongae, obsolete 4-lobe, c. 3—4 poll. longae, pedunculo usque ad 1 lin. longo suffulte, aurantiae, dense fulvo-puberula, 2-loculares et 2-spermae, stigmatibus 2 v. raro 3 obtusiuseule mitinis sessilibus coronatis.—Martaban (etiam in montibus Khasyanis).

3—3½ poll. longa, eleganter reticulata, glabra; flores majusculi, pedicello minute appresse-hirsuto 1—1½ lin. longo suffulti, solitarii v. bini, axillares: calyx appresse puberulus, lobis concavo-rotundatis, 2 interioribus tenuioribus c. 2 lin. longis; stamina numerosa; drupae pedunculo vulgo deflexo crasso 2—3 lin. longo, obverse ovoideae, plus quam semipollinenc longae, teretes, leves, putamine semiterete, tenui-coriaceo.—Andamans. (Heller 4962, mas).


Arbuscula 15—25-pedalis, glabra; folia elliptica ad obovato-elliptica, petiolo levi 2 lin. longo, basi obtusa, 2½—4 poll. longa, obtusa v. rotundata tenui-chartacea, glabra, subtus subglaucescentia, nervis lateraliibus et reticulatione exiguis; flores glabri, masculi flavescentes, multo minores, feminae brevi-pedicellati, dense glomerati, rubri, axillares; calyx fem. glaber, lobis lanceolatis subulato-acuminatis, lin. fere longis: petala minuta, obovato-oblonga, rosea; discus orbicularis, sublobatus; drupae globosis, pisi magnitudine, succulentae, atropurpureae, leves.—Burma. Genus Briedelia a Lebidieropside differt coccis inter se non connatis et seminum testa membranae sicea. Drupa in Lebidieropside epicarpio carnoso gaudent, coccis lignosi connati et semina tegumento exteriori succeso-carnoso circumdata sunt.

268. Briedelia pubescens, nov. sp.

Arbuscula 20—30-pedalis, novellis pubescentibus; folia elliptico-ad obovato-oblonga, basi rotundata v. obtusa, petiolo c. 2 lin longo pubescente, breviter et abrupte acuminata v. apiculata, tenui-chartacea, integra, supra glabra v. subglabra, subtus fulvescentia-pubescentia; flores parvi, albi, pedicello brevi pubescente suffulti, glomerati, axillares; calyx dense puberulus, lobis lanceolatis c. 1 lin. longis, petala obovata, truncata et 3-denticulata, discus magnus, orbicularis, aureus; drupa desunt.—Pegu.—Habitus omnino B. Moonii, Thw.

269. Briedelia dasycaIyx, nov. sp.

Frutex magnus scandens, novellis fulvo-pubescentibus; folia obovata ad obovato-oblonga, basi obtusa, petiolo crassiusculo c. 2 lin. longo suffulta, breviter acuminata apiculata v. obtusiuscula, 2—6 poll. longa, obsolete repanda, chartacea, supra glabrescentia, subtus subglaucescentia et parce pubescentia, nervis venisque valde prominentibus; flores parvi, fulvo-tomentella, sessiles, numerosi, in glomeris densos tomentosos axillares collecti et sepius in racemum terminalem reducto-foliatum transformati; calyx extus dense fulvo-pubescentis, c. 2 lin. in diametro, lobis sub fructu lin. longis lanceolatis acutis; discus orbicularis, levis, in centro annullo setoso drupae basi cingente auctus; petala obovato-linearia; drupa ovoidea-ellipticae, pisi magnitudine, leves, atropurpureae, succulentae, calyce non acerescente suffulte. Var. a. genuina, frutex scandens, folia multo majora et texture tenuioris, acuminata. Var. b. aridicola, frutex minor et erectus, folia minora, usque
ad 3 poll. longa et subcoriacea, obtusiiscula v. obtusa—Var. a. Ava, Prome, Pegu; var. b. Prome.—Ex affinitate B. stipularis, Bl.

270. Cleistanthus stenophyllus, nov. sp.

Arbor v. frutex f glaber; folia lineari-lanceolata, basi acuta, petiolo 2 lin. longo, longe subulato-acuminata, 3—4 poll. longa, chartacea, integra, glabra subitus subpallida; flores minutì sessiles, pauci glomerati, axillares; bracteae ciliatae; calyx extus parce appresse pubescens; ovarium glabrum, sessile; capsule desunt.—Tenasserim v. Andamans (Helf. 4875).—N. B. Nanopetalum, Hassk. ad Cleistanthum certissime reducendum est.

271. Croton robustus, nov. sp.

Arbuseula robusta, 15—25-pedalis, novellis dense ferrugineo-lepidotis; folia elliptica v. elliptico-oblonga, petiolo crasso ferrugineo-lepidoto usque pollicem longo suffulta, basi biglandulosa obtusa v. acuta, 1 ½—2 poll. longa, obtusa v. obtusiiscula cum v. absque mucrone, rare subretusa, coriacea, obsolete repanda v. integra, subitus parce ferrugineo v. lutescenti-lepidoto et glabrescentia, nervis lateralis tenuibus vix conspicuis; flores parvi, masculi brevi-pedicellati canescenti-villoso-lepidoti, feminei subessiles, majores ferrugineo-lepidoti racemos breviores spiciformes formantes, rachi canescenti-v. ferrugineo-tomentoso-lepidoto et sulcata; calyx tomentoso-lepidotus; styli 2-fidi; ovarium dense cupreol-lepidotum; capsule globose-ovoideae, 3-coccæ, 6-sulcatae, pisi majoris magnitudine, fulvo-argenteae, obsolete lepidoto-tuberculatae; semina 3 lin. fere longa, 3-angulari-oblonga, levia, brunnea.—Pegu, Tenasserim.—Ex affinitate C. argyrati, Bl. (syn. C. bicolor, Roxb.).

272. Croton calococcus, nov. sp.

Fruticulus stellato-hirsutulus; folia elliptico-ovata v. ovata, basi biglandulosa rotundata, petiolo gracili 3—4-lin. longo stellato-aspero suffulta, breviter acuminata, repando-serrulata, rare subintegra, 1—2 poll. longa, membranacea, flavescenti viridia, subitus stellato-pubescentia, supra stellato-aspera; bracteæ minute, subulate, hirsuta; flores graciliter pedicellati, racemos graciles pubescentes terminales formantes; calyx hispidus, lobis sub fructu c. 1 ½ lin. longis lanceolatis; capsule pisi magnitudine, profunde et subdivicato 3-lobæ et 3-coccæ, tuberculis pilis hispidis radiantis terminatis obtectæ; semina levia, brunnea.—Pegu, Rangoon.—Species elegans, C. Tiglii habitu, nulli arcte affinis.

273. Croton flocculosus nov. sp.

Arbuseula, novellis dense sed fugaciter albo-v. flavescenti-stellato-tomentosis; folia cordato-ovata, basi biglandulosa 5-nerviis cordata v. rotundata, 1 ½—3 poll. longa et fere æquilata, obtusiiscula et subabrumpente acuminata v. apiculata, crenata v. crenato-serrata (in serraturis glandulosa v. eglandulosa), membranacea, juniora subitus dense stellato floccosa, dein utrinque v. supra tantum glabrescentia; flores......pedicellati, in racemos terminales dispositi; capsule nutantes, pisi magni magnitudine, subglobosæ et obsolete 3-angula-
res, crustaceae, dense et molliter canescenti-stellato-tomentosa; semina c. 2 lin. longa, elliptico-oblonga, dorso convexo levia.—Pegu, Promé.—C. caudato affinis.

274. Croton sublyratus, nov. sp.
Frutex deciduus, 5—8-pedalis, novellis ferrugineo-furfuraceis; folia obovata-ad sublyrato-oblonga, basi stipitato-biglandulosà attenuatâ rotundata v. subcordata, petiolo \( \frac{1}{4} \frac{1}{2} \) pollicari stellato-furfuraceo sullivanâ, obtusa v. obtusiuscula acuminata, 3—5-poll. longa, argute repando-serrulata, membranacea, adelta glabra v. subtus secus nervos stellato-aspera; flores parvi, pedicellati, stellato-tomentosa, racemum ferrugineo- v. fulvo-stellato-tomentosum ramulos novellos terminantem formantes; sepala lati-lanceolata, acuta, extus fulvo-pubescentia; petala marginibus ciliato-pubescentia; torus pilosus; stamina c. 15—20, glabra; petala in fl. fem. nulla; ovarium dense fulvo-stellato-tomentosum, stigmatibus brevibus; capsulae parvae, pisi minoris magnitudine, 3-coccce, subglobose, crustaceae, leves, parce appresse-stellato-hirtae; semina 2 lin. fere longa, albido- et brunneo-variegata, levia.—Andamians.—C. Tiglii quodammodo affinis.

275. Croton crozophoroïdes, nov. sp.
Suffrutex erectus, 1—1\( \frac{1}{2} \)-pedalis, dense stellato-tomentosus; folia ovali-oblonga v. ovalis, basi stipitato-biglandulosà rotundata v. obtusa, petiolo \( \frac{1}{2} \frac{1}{2} \) pollicari stellato-tomentosub glabrescentesuffultâ, obtusa v. acuta, \( \frac{1}{2} \frac{1}{2} \) 2 poll longa, indistincte dentata-crenata (denticulis pilis stellatis terminatis), crasse membranacea, juniora dense canescenti-stellato-tomentosa, supra granulato-aspera et subtus tomentella, nervis et reticulatione crassis et prominentibus; flores lutescentes, parvi, masculi pedicello 1—2 lin. longo (feminei brevi crasso) stellato-tomentosus suffulti, racemos longos stellato-pubescentes ramulos novellos axillares terminantes formantes; bracteae con-spicue, 2—3 lin. longae, lineares, stellato-pubescentes et muriculcis coecineo-glandulosis ciliatae, calyx extus dense fulvo-stellato-tomentosus, femineus major, lobis lanceolatis acutis; petala maris oblongo-lanceolata, marginibus albo-villosis; stamina numerosa, glabra, toro piloso inserta; ovarium dense fulvo-stellato-tomentosum, stylis coccineis, bis dichotomice-divisis; capsula ovoideo-globosa, leviter 3-loba, 3-coccæ, cerasi putaminis magnitudine, apice depressæ, fulvo-stellato-tomentosæ, crustaceæ.—Species pulchermissima distinctissima, habitu omnino Julocrotonis.—Promé.

276. Celodiscus hirsutulus, nov. sp.
Suffrutex 1—2-pedalis, simplex, ramulis junioribus compressis hirsutis; folia opposita, suborbicularia, 5—6 poll. longa et subæquilata, basi 7-nerviâ subobsolete maculata cordata, petiolo \( \frac{1}{4} \frac{1}{2} \) 1 ped. fere longo pubescente suffulta, brevissime et obtusiuscula acuminata, subintegra v. obsolete repando-dentata, chartacea, utrinque sparse sed longe hispida, subtus prominenter et crasse nervosa, glabrescentia et parce aureo-glandulosâ; spicæ masculæ dense
et breves, usque ½ pollicares, sessiles, fulvo-tomentellae, axillares; bracteae sublineares, calyce paulo longiores; calyx maris plusquam lin. in diametro, fulvo-tomentellus, in alabastro globosus; sepala 3, lato concavo-ovata; stamina numerosissima, glabra; flores feminei et capsulae ignotae.—Pegu, Prome.—Cœlodiscus melius species omnes Malloti includit quæ alabastro apiculato et seminibus carunculatis gaudent. Genus tali modo reformatum, characteribus stabilibus ornatum, magis naturalis evadit, et inter alia Mallotum eriocarpoidem, eriocarpum, lappaceum, longipedem et disparem recipit.

277. Claoxylon longifoliolatum, nov. sp.
Frutex subsimplex v. arbusculæ, 8—15-pedalis, caulibus fistulosis et novellis appresse pubescentibus, folia elliptica ad ovato-oblonga, basi acuta v. obtusa, v. raro subcordata, petiolo 5—3 poll. longo suffulta, breviter et tenuiter acuminata, 4—5 poll. longa, crasse membranacea, undulato-crenata v. crenato-dentata, penninervia, utrinque scabra, subtus secus nervos parce appresse pubescentia; flores parvi, masculi racemos nutantes canescentes appresse hispidos formantes; capsula (unica tantum adest in montibus Khasya a cl. Hookero et Thomsonio collecta et a speciminius ipsis separata) is Mallotus eriocarpoidi nimirum affine, profunde 3-loba, pubescentia Barnes, nervos prominens transversis crassis et prominentibus perscurra; flores desunt, feminei breviter-pedicellati, racemos breves stellato-tomentosos axillares efformantes; calyx stellato-tomentosus, inaequalis 2-sepalus; ovariorum dense muricatum, stellato-hispidum; capsula pedunculo puberulo 2—3 lin. longo crasso suffulta, cerasi minoris magnitudine, 3—v. rare 4—v. 2-cocceae et -lobe, stylis crassis papillosa-fimbriatis coronatae, dense muricati (muricibus stellato-hispidus), albo, carnoso- coriaceæ; semina subgloboso-ovoidea, levia, pisis minoris magnitudine, arillo niveo succulentum omnino inclusa.—Pegu, Martaban.—O. longifolio affine.

278. Claoxylon leucocarpum, nov. sp.
Fruticulus 3—4-pedalis, caulibus fistulosos, novellis stellato-pubescentibus; folia ampla, lato-ovata, basi rotundata v. subcordata, petiolo puberulo glabrescente 3—8 pollicari suffulta, pedem circiter longo et fere æquilib- ta, basi crasse-3 v. sub-5-nervia, breviter et obtusiuscula acuminata, repandodentata, membranacea, supra stellato-aspera, subtus stellato-puberula, nervis venisque transversis crassis et prominentibus perscurra; flores desunt, feminei breviter-pedicellati, racemos breves stellato-tomentosos axillares efformantes; calyx stellato-tomentosus, inaequalis 2-sepalus; ovariorum dense muricatum, stellato-hispidum; capsula pedunculo puberulo 2—3 lin. longo crasso suffulta, cerasi minoris magnitudine, 3—v. rare 4 v. 2-cocceae et -lobe, stylis crassis papillosa-fimbriatis coronatae, dense muricati (muricibus stellato-hispidus), albo, carnoso-coriaceæ; semina subgloboso-ovoidea, levia, pisis minoris magnitudine, arillo niveo succulentum omnino inclusa.—Pegu.

279. Tragia Burmanica, nov. sp.
Frutex volubilis, novellis appresse puberulis; folia larga, cordato-ovata, petiolo 1—3 pollicari canescenti-appresse-puberulo suffulta, basi 5-nervia sinuato- cordata, breviter et abrupte acuminata, tenui-chartacea, remote denticularia v. subintegra, 2—5 poll. longa, supra sparse albo-setulosa, flores desunt; pedunculi solitarii, gracies, 2—3 poll. longi, puberuli, e ramulis novellis axillaribus egreditientes; calycis lobi sub fructu lato-ovati, foliacei, acuti, pollicem fere longi, extus sparsius, intus dense appresse setosi; capsula 3-
Blumeodendron nov. g.


Genus a cl. Muell. Arg. cum Malloto incaute conjunctum.


Altera species, sub nomine Paracronicis penduli in Horto Bogoriensi culta et sub eodem nomine a cl. Muell. Arg. in Prodromo annotata, nomine Bl. Muelleri saluto. Folia sunt minora, texture tenuioris et subtus laevia.—Paracronoct pendulus, Miq., mihi ignota est, sed jam racemis 3—4 pedalibus capsulisque et spicam effridentes toto coelo differt.


281. Cleidion nitidum, Thw. MS.

Arbuscula glaberrima; folia lato- ad elliptico-lanceolata, petiolo 2—3 lin. longo (in speciminibus Ceylonicis longiore) crasso suffulta, utrinque acuminata, a medio repando-dentata, 2—3 ped. poll. longa, tenui-coriacea, glabra, in sico fuscescensia; flores masculi parvi, glabri, sessiles, pauci, glomerati, spicam glabram v. indistincte puberulam elongatam oppositifoliam terminalem effridentes; calyx glaber, in alabastro globosus; flores aperti etc. ignoti.—Andamans.

282. Macaranga molliuscula, nov. sp.

Arbor mediocris, novellis mollis-pubescentibus; stipulae magnae, lineari-oblongae, acuminatis; folia magis minusve orbiculari-ovata, petiolo 3—4 pedicari glabrescente glaucescente suffulta, basi multinerviá lato-cordata, 1 1/2—1 1/2 ped. in diametro, sinuato-denticulata, breviter acuminata, membranaea v. submembranacea, supra mollis-puberula v. subglabra, subtus dense puberula et luteo-glandulosa, raro glabrescentia; flores parvi, masculi et feminei sessiles, illi glomerati bracteâ foliaceâ 2—4 lin. longâ lato-ovali v. ovatâ acuminata dentata v. pectinata protecti et paniculam axillarem pedunculatum subgracilem puberulam eficientes; feminei solitarii bracteâ cuneato-oblongâ
sepium 3-lobā serrato-dentatā v. finbriatā foliaceā tomentellā c. $\frac{1}{4}$—$\frac{3}{4}$ pollari cari subtenti, spicas simplices interruptas puberulas formantes; antherae 5—6; ovarium appresse hispidulum, 2-loculare; stylī 2, subulati; capsulae desunt. Andamanīs (Helf. 4722).—


283. **Macaranga membranacea**, nov. sp.
Frutex sursum ramosus, 2—4-pedalis, novellis puberulis, ramulis glabrescentibus et glaucescenti-fuscis; folia ovata v. suboblongo-ovata, non peltata, basi 3-nerviā subtruncata v. subsinuato-rotundata, petiolo gracili 1—3 poll. longo puberulo suffulta, 2—4 poll. longa, simplicia v. passim in lobos 2 v. 1 laterales longe acuminatos producta, remote calloso-dentata, longissime et tenuiter acuminata, juniora utrinque rubescenti-glandulosa et subvelutina, v. supra glabrescentia; flores masculi, ignoti, feminei sessiles, solitarii bini v. terni, bracteā foliaceā $\frac{1}{4}$—$\frac{3}{4}$ pollari ovata acuminatā lacerato-dentatā puberula et glandulosō subtenti et in capitulum involucratum pedunculo 1—3 poll. longo pubescente axillari suffultum collecti; calyx urceolatus, limbo tubulāri styli basin amplectente, ovarium rubicundo-glandulosum et hirsutum, styli 2, $\frac{1}{2}$ poll. longi, filiformes, glabri; capsule 2-cocceae et 2-lobæ, coecis pisi minoris magnitudine, rubicundo-glanduloso-pulverulentæ et muricibus filiformibus glabris sparsis obtectæ; semina globosa, brunnea, levia.—*Ava*, Martaban.—*M. involucrata* affinis.

284. **Codleum Andamanicum**, nov. sp.
Frutex magnus, glaber; folia obovato-oblonga ad elliptica, basi acuta v. obtusa, petiolo 3—10 lin. longo, breviter et obtusiusculæ acuminata, 3—6 poll. longa, pergamaecia, integra, glabra; flores parvi, masculi pedicello capillari 3—4 lin. longo suffulti et racemum umbellī- v. corymbi-formem formantes, feminei paulo majores, pedicello brevissimo crasso supportati et corymbulum subsessilem ramulos novellos sepium axillares terminantem efficientes; calyceis lobi rotundati, glabri, ii fl. fem. ovati, acuti; petala in mare parva; glandulae hypogyniae magne, trigono-truncatae, carnose; staminā in seriebus pluribus; ovarium appresse hirsutum, styliis 3 longissimis profunde bifidis, capsule pedunculo nutante brevi sursum incrassato suffultae, globoso-3-cocceae, cerasi minoris magnitudine, indistincte scabriusculae, lignoso-coriaceæ; semina ovoideo-elliptica, holosericeo-canescencia, variegata.—Andamanīs.—*C. umbellato*, Muell. Arg. affinis.

285. **Codleum? lutescens**, nov. sp.
Frutex dioicus?, 8—12-pedalis, novellis sparse puberulis; folia lanceolata, passim subfalcata, basi acuminata, petiolo 2—3 lin. longo puberulo glabrescente suffulta, obtusiusculæ acuminata, pergamaecia, glabra, penninervia, in sieco flavescentia; flores masculi minute, pedicello capillari 2—3 lin. longo suffulti, umbellati, umbellis pedunculo puberulo $\frac{1}{4}$—$\frac{3}{4}$ pollari apice capitato-bracteato solitario axillari suffultis; calyx 3-partitus, leviter imbrī-
catus, lobis ovato-lanceolatis, c. 1/2 lin. longis, acutis, extus appresse hispidulis; stamina c. 8—12 circa centrum love luteum disci latiusculi continuin inserta petala nulla; flores feminei etc. ignoti.—Andamans.

286. Exccecaria holophylla, nov. sp.

Arbor sempervirens, glaberrima; folia alterna, oblonga ad lato-lanceolata, basi acuta v. obtusa, petiolo 3—4 lin. longo suffulta, obtusiuscula acuminata, pergamaeae, integerrima, 3—6 poll. longa, nervis lateribus curvis tenuibus; flores parvi, sessiles, masculi 3-ni v. plures, feminei basilares solitarii, bracteis brevibus latis (magiae glandulae utrinque insertis) protecti et racemum spiciformem oppositifolium terminalem glabrum formantes; flores masculi 2—3-andri; baccce ignotae.—Martaban, Tenasserim—E. oppositifolia affinis, sed foliis integerrimis alternis statim distinguenda.

287. Euphorbia scabripolia, nov. sp.

Herba annua, subsimplex, gracilis, 1—2-pedalis, ramis glabris in stculo; stipulae breves et angustae, parce et rigide fimbriatae; folia linearia v. elongato-lineari-oblonga, brevissime petioluta v. subsessilia, basi inaequali rotundata v. obtusa, 1—2 poll. longa, mucronato-acuta, cartilagineo-serrulata, crasse membranacea, supra glabra, subtus sparse crispati-pilosula, 1-nervia, nervis lateribus nullis; glaucoides, caputia subsessilia, in cyanis glomeriformes subsessiles axillares v. spuri terminales collecti, v. scpe bina v. solitaria; involucrum campanulatum, breve, extus puberulum, fauce villosum, fimbriatum, glandulis in appendicem obovato-cuneatum lacерatum album plus quam lin. longum expansis; ovarium canescenti-pilosulum; stylis gracilis, 2-lobulati; capsule 3-coccei, parce crispato-pilosulae, c. 2-lin. in diametro, coccis compresso-acutis dorso nudis; semina obsolete 3-gono-oblonga, sordide aurantiacea, opaca, lœvia.—Prome, Pegu.—Ex affine E. notoptere, Boiss.


Arbuscula 15—12-pedalis, carnosa, glabra, inermis, ramis complanatis erasse alatis, crenato-sinuatis, ad articulationes attenuatis et teretibus; stipulae obsoletae; folia obovalia, brevissime petioluta, basi obtusa, glabra, carnosa, nitentia, rotundata v. subretusa, nervis lateribus obsolitis; capitula in cymulas dichotomas brevipedunculatas glabras e sinibus crenaturum ramorum egredientes disposita; capsule profunde trilobae, glabrae, iis E. ligulariae consimilia.—Andamans.

URTICACEÆ.
289. **Balanostreblus ilicifolius**, nov. sp.

Arbor ramulis scabriuscule puberulis; folia elliptica ad lato-ovalia, petiolo terete 1—2 lin. longo glabro suffulta, basi sæpicus subimpressus acuta v. obtusa, rigide coriacea, spinoso-acuta, grosse spinoso-dentata, 1—3 poll. longa, glabra, supra nita costa supra immensa nervis lateribus arcuato anastomosantibus valde prominentes; flores parvi, viridiiscule, pedicello brevi crasso suffulti, in racemum axillarem brevem collecti; periantthium obturbinatum, rugulose-tuberculatum, c. 2 lin. longum; drupœ pisi minoris magnitudinis, rubra, rugulose, carnosa, glabra. — *Chittagong* (Hf. et Th. sub Sapii sp. No. 4); *Ava* (J. Anderson).

**MUSACEÆ.**


Humilis, caespitosa, caudicibus pollicem vix crassis viridibus; folia oblonga basi subrotundata glabra, petiolis brevibus foliaceo-marginitatis; spathe saltem apice imbricata decidue ovales obtusa rubra pruinosa 5—6-flore; flores aurantiaci, labio pumilo; fructus erose truncato-rostrati lutei glabri; semina depresso-turbinata laevia.—*Pegu, Martaban.*

**LILIACEÆ.**


Suffrutex parvus, decumbens, simplex v. vix ramosus, glaber, 1—2-pedalis, caudice basi radicante 3—4 lin. crasso; folia approximata, obverse lanceolato-oblonga, sessilia et basi dilatata, v. in petiolum lato-foliaceum longiorem v. breviorum vaginantem subtenua, acuta v. breviter acuminata, 1—1½ ped. longa et 1½—2 poll. lata, subundulata, tenui-coriacea, costa apicem versus subevanescente, venis in sico tenuibus sed prominentibus; flores albi v. in colore purpurascentem vergentes, tubo viridisculo, poll. longi, pedicello gracili basis versus articulato suffulti 2—3-ni fasciculati, secund et paniculam parce disfaciato-ramosam terminalem amplam glabram efficientes; bractœe lineari-lanceolate, eae ramificationum inferiorum usque ad pollicem longæ, deciduae; bractœe ovato-lanceolate, minuta; periantthium basi inflatum et fere usque ad basis 6-partitum, lobis linearibus obtusiis tubuloso-convergentibus apice tantum patentibus; filamenti alba; baccœ 1—3 lobœ, lobis subsphaericis pisi magnitudinis aurantiacis nitidis 1-spermis.—*Pegu, Martaban, Tenasserim.—D. ternifolia affinis.*
292. Dracena pachyphylla, nov. sp.
Fruticulus erectus v. ascendens, simplex v. vix ramosus, glaber, 1—2-pedalis, caulibus digitii minoris crassitudine v. tenuioribus; folia elliptica ad elliptico-lanceolata, acuta v. subulato-acuminata, coriacea, supius maculata, 4—6 poll. longa et 1½—2¼ poll. lata, costa apicem versus evanescente, venis tenuibus et prominentibus, superiora basi sensim complicato-attenuata semi-amplexicaulia, inferiora in petiolum usque ad poll. longum foliaceum basi vaginanter ampliatum abruptius contracta; flores albi, pedicello brevissimo robustiusculo articulato suffulti, racemum terminali 1—2 pollicarem spiciformem pedunculatum glabrum efficiens; perianthium c. ¾ poll. longum rectum, basi parum inflatum, fere usque ad basin 6-fidum, lobis erectis et tubiformi-conniventibus apice tantum erecto-patentibus; baccæ 3—1-lobæ, lobis globosis pisii magnitudine rubris nitentibus monospermis.—Andamans.

293. Dracena brachyphylla, nov. sp.
Fruticulus gracilis, parce ramosus, glaber caulibus 2—4 lin. crassis, folia linearia, sessilia basi breve petioliformi-attenuata et lato-amplexicaulia; ½—1-pedalia, acuminata, tenui-chartacea, costi apicem versus evanescente venisque tenuissimis et prominentibus; flores ½—¾ poll. longi, albi, pedicello supra medio articulato 2—3 lin. longo suffulti, bini v. solitarii, in racemos breves strictiusculos dispositi et paniculum terminalæ sessilem brevem erectam glabrum formantes; bracteæ lineari-lanceolatae, subulato-acuminatae, inferiores usque ad ½ poll. longæ; bracteolæ ovatae, acuta, membranaeae, scarioso-marginatae, c. lin. longæ; perianthium fere ad basin 6-fide, lobis tubuloso-conniventibus et apice erecto-patentibus; filamenta alba; baccæ.—Andamans.—D. angustifolius affinis.

GRAMINEÆ.

294. Arundinaria elegans, nov. sp.
Fruticosa, 6—15-pedalis, culmis digit-crassiss; folia linearia, longe acuminata, brevissime petiolata, rigide chartacea, 4—5 poll. longa, ½—⅓ poll. lata, subitas conspiciue tesselata et, præsertim apicem versus, secus margines cartilagineæ subspunuloso-seabra; foliorum vaginae glabrae, ore truncato parce hirsuto; turionum vaginae parce fulvo-hispidulae, ore nudo attenuato minute auriculatæ; spicula pedicello gracili ½—1 poll. longo suffrütæ, 1½—2 poll. longæ, 14—4-florum, racemum terminalæ paniculiformem angustum glabrum efficiens; glumae 2, 3—3½ lin. longæ, superior paulo brevior; racillæ c. 2 lin. longæ, sericeo-puberulae, nodo barbatæ; valvula exterior c. 4 lin. longa, compresso-concava, lanceolata, cuspidato-acuminata, laevis; valvula interior paulum brevior compresso-navicularies, secus carinas apicem versus
2-fidum sulcatum parce pilosa; lodiculae 2, ciliatae; stigmata alba; antherae purpureae; caryopsis deest.—Avicennia, Martaban.—Avicennia racemosa nimis affinis.

295. Bambusa (Dendrocalamus) longissimata, nov. sp.

Cœspitosa, arborea, 40—60-pedalis, culmis brachium crassissimum, turionum vaginae longissimae, sursum culmum haud amplexentes, 1¼—1½ ped. longae appresse brunneo-setose, altero latere oris angustati auriculo brevi rotundato nudo membranaceo auctae; lamina imperfecta membranacea, reflexa; lingula conspicua sed angusta, longe et grosse brunneo-setoso-fimbriata; folia lanceolata ad lineari-lanceolata, 6—8 poll. longa et ⅗—⅓ poll. lata, longe acuminata, brevissime petiolata v. subsessilia, supra præsertim seccus marginis scabriuscula glabrescentia; subtus glaucescentia; vaginae glabrae, ore nudo paulum productæ, ligula conspiciua, fimbriata; spiculae minutæ, truncatae, 2½—3 lin. longæ, basi attenuatae, compactiussculæ et divaricato-5-flores, dense glomeratae, in spicas interruptas deins in paniculam amplam transformatas collectæ; valvulae 2 inferiores vacuae v. gemmiparæ, superiores 3 fertiles; valvula exterior fl. herm. obovato-ornicularis, acuta, 3 lin. fere longa, nitida, valvula interior subæquulonga, angustae navicularis, seccus carinas dorsi concavo-depressi parce pilosa; antheræ luteæ, mucronatae; stylus longus, persistens, breviter 2-fidus, stigmata purpurea; ovariolum et stylus hirsuti.—Arracan, Pegu, Martaban.—Caryopsis Dendrocalami non est baccata nec perigynio circumpedita, sed epicarpium plane coriaceum v. subcrustaceum nec membranaceum uti in Bambusa sensu stricto.

296. Bambusa (Dendrocalamus) calostachya, nov. sp.

Arborea, cœspitosa; vaginae ramorum novellorum appresse fusco-setosæ, ore truncatae, marginibus albo-ciliatis; ligula integra v. subintegra, angusta; folia larga, lato-lanceolata, ⅞—1 ped. longa, 2—1 poll. lata, basi rotundata, breviter (vix lin. long.) petiolata, acuminatissima, marginibus et supra apicem versus scabra, subtus mollis tuberula; vaginae glabrae? conspiciuae albo-ciliatae, ore non productæ; lingula conspicua, integra erosa v. fimbriata; spicula lato-oblongæ, compressiussculæ, ¼ poll. longæ v. paulo longiores, 7—8-flores, glomeratae, spicas interruptas deins in paniculam amplam transformatas efficientes ramulis plus minus puberulis; valvulae 2 infimæ abbreviatiæ, vacuae, sequentes omnes fertiles; valvula exterior fl. herm. lato-ovata, e. 4—5 lin. longa, acuta, levæ; valvula interior naviculari-oblonga, acuta (ea florum inferiorum etiam obtusa), basi subattenuata, exteriore brevior, dorso puberula v. raro subglabra, seccus marginis et carinas albo-ciliata; antheræ luteæ, longiussculæ et levis-mucronatae; filamenta libera; ovariolum cum stylo longo hirsutum; stigma simplex, purpureum? lodiculae 1 v. 2, lanato-fimbriatae, minutæ.—Avicennia.—B. latifloræ (Dendrocalamus—Munro) valde affinis.

297. Bambusa (Dendrocalamus) critica, nov. sp.

Arborea, cœspitosa, 15—30-pedalis, culmis 1—3 poll. crassissim, junioribus
appresse-albidus puberulis; turionum vaginæ magna, appresse argentæ-ositulosæ, ore subtruncate; lamina imperfecta extus appresse sericeo-setulosa, basi in auriculas falcato-oblongas setoso-fimbriatas decurrents; folia lineari-lanceolata, basi truncata sæpius subobliqua, breviter (1 lin.) petiolata (superiora u bsessila), 4—8 poll. longa, ⅓—1 poll. lata, acuminata, subtus sebbride birtula, marginibus scabra, nervis utrinque 5—7; vaginæ glabrae? (verosimiliter juniores hirsutes); ore hau ductuæ et auricula incrassata longe (pilis 2—4 lin. longis) fimbriata terminatæ; spiculae, etc. ignota.—Pegu.—ex affinitate B. strictæ.

298. Gigantochloa (Oxytenanthera) macrostachya, nov. sp.

Arborea, 30—50-pedalis, cespitosa, culmis brachis, crassis; turionum vaginæ brevissimæ, 5—8 poll. longæ, dense appresse nigrescenti-setosæ; lamina imperfecta in auriculas magnas undulatas rotundato-terminatas fusco-fimbriatas decurrents; lingula angustissima, integra v. obsolete dentata; folia lanceolata, basi obtusa v. subrotundata, breviter (1 lin.) petiolata, 5—7 poll. longa, ⅓—⅔ poll. lata v. latiora, acuminatissima, marginibus retrorse scabra, subtus albida et molliter puberula; vaginæ patenti-hirsutæ, glabrescentes, uno latere oris paulum productæ minute auriculatæ et parce sed longe (2—3 lin.) fimbriatæ; lingula inconspicua; spiculae sesillæ (raro una alte-rave pedunculata), 1⅓—2 poll. longæ, lineares, compressiussculæ, 6—7-flore, strictæ v. raro curvulæ, subulato-acuminatæ, laxe glomeratæ, interrumpit spicatae et sensim paniculam amplam radicalem efficientes; valvulæ exterior- es omnès rigide nigrescenti-fimbriatæ, inferiores 3 v. 4 abbreviatae et vacuae, superiores 3 hermaphroditæ; valvula exterior fl. herm. lineari-lanceolata, convoluta, subulato-acuminata; valvula interior anguste navicularis, preser-tim sursum secus angulos dorsi deplanati atropurpureo-ciliata, apice vix bifida; anthera purpurea, aristato-acuminata; ovarium cum stylo simplici longo hirsutum; stigma album.—Martaban, Tenasserim.—Genus Oxytenan-thera, Munro (excepta O. Thwaitesii) nulla nota differt a Gigantochloa nisi Caryopsis elongata; valvula interior in omnibus speciebus a me examinatis deplanata et bicastrata evadit. Gigantochloa genus valde artificiale et filamentis connatis vix ac ne vix a Bambusa differt. Habitus et spicularum structura in generibus Bambusa et Gigantochloa simili modo variat et species ex habitu arctissime affines, e. g. B. polymorpha et Gigantochloa aspera spiculis omnino inter se different.

299. Melocanna humilis, nov. sp.

Fruticosa, cespitosa, 8—15-20 pedalis, culmis ⅓—1 poll. crassis; turionum vaginæ glabrae? brevissimæ, ore sinuato valde producto rotundato et ampliatæ; lamina imperfecta linearis, erecta, basi in marginem polito-viride angustum decurrents; lingula angustissima, integra; folia lanceolata ad lineari-lanceolata, basi obtusa, petiolo 2—3 lin. longo suffulta, subulato-acuminata, 4—6 poll. longa ⅔—1 poll. lata, secus marginem alterum seberrima
subtus glaucescentia et scabrido-puberula; vaginae glabræ, ore minute auriculo longe fimbriatae; spiculae, etc. ignota.—*Pegu, Arracan. Melocanna* a *Schizostachyo* differt caryopsisidis epicarpio crasse carnoso et perigynii absentiā.

300. *Cephalostachyum flavescens*, nov. sp.

Fruticosa, cæspitosa, 10—15-pedalis, culmis poll. circiter crassis; turionum vaginae fragiles, appresse albo-setulose, lamina imperfecta erecta v. suberecta, inflato-cordata, convoluto-acuminata, basi in appendicis latas undulatæ fimbriatæ falcatae decurrents, quorum una deflexa altera sursum vergens; lingula e. 2 lin. lata, erosodentata; folia parva, linearia, 3—5 poll. longa, $\frac{1}{2}$—$\frac{3}{4}$ poll. lata, acuminata, basi rotundata, brevissime petiolata marginibus presertrim apicem versus scabra, cæterum glabra; vaginae glabræ, ore vix producto minute et incrassato-auriculate et pauci-fimbriatae; spiculae cylindrico-lineares, acuminatae, e. $\frac{1}{2}$ poll. longæ, albo-pilosæ, 3-floræ, dense glomeratae et interrupte spicatae, dein sensim in paniculam radicalem amplam collectæ; valvula infauna vacua, sequentes hermaphroditæ cum terminali hebetata; valvula interior et exterior fl. herm. subconformis, albo-pilosæ, subulato-acuminata, illa dorso subdeplanato apicem pilosum versus bicarinata; lodiculæ 3, lanceolatae, acuminatae, ciliolatae; antheræ primum viridiusculæ et purpurascenti-punctatae, dein pallide flave, acuta v. obtusa; perigynium elongato-lageniforme, cum rostro triquetro parce pilosum; stigmatæ 3, brevia, albo-pilosa; pericarpium......—*Pegu*, in H. B. C. culta.—

*C. pergracili* affine.—Genus *Teinostachyum* a *Cephalostachyo* more *Arthrostylidii* rachillis elongatis tantum differt et, in opinione mea, rejiciendum est. *Schizostachyrum Blumei* Munro, non N. E. species est nova Hindostanica, Sch. Hindostanticum nominanda.

301. *Pseudostachyum compactiflorum*, nov. sp.

Arborea, cæspitosa, semiscandens, culmis 1—1$\frac{1}{2}$ poll. crassis; turionum vaginae lavissimæ, lamina imperfecta in auriculam angustam reflexam lunato-productam patenter fimbriatam decurrent, lingula integra, angustissima; folia larga, oblongo-lanceolata ad lanceolata, basi oblique truncatae v. obtusa, breviter (1—2 lin.) petiolata, 6—10 poll. longa, 1—2 poll. lata, subulato-acuminata, glabra, uno latere apicem versus scabra; vaginae appresse sericeo-setosæ, mox glabreceans, ore truncato in auriculam lunatam reflexam longe (3 lin.) fimbriatam productæ, ligula integra, angusta; spiculae minimae, 2—2$\frac{1}{2}$ lin. tantum longæ, iis *Bambuse longispatæ* consimiles, latæ et sub anthesi quasi truncato-2-fidæ, 5-floræ, dense glomeratæ et interrupte-spicatae, dein sensim in paniculam amplam radicalem collectæ; valvulae inferiores 2 vacuae, sequentes 2 hermaphroditæ, cum floseulo terminali longe pedicellato obtovato; valvula exterior fl. herm. lato-ovalis, ventricosa, brevissime mucronata, nitens, e. 2 lin. longa; valvula interior æquilonga, laticlavicularis, apice 2-denticulata, secus angulos dorsi depressi albo-ciliata;
lodiculae 3, maximae, ovales, obtusae, longe fimbriatae; antherae virescenti-luteae, perigynium cum rostro brevi truncato glabrum; stigmata brevia, albo-plumosa; pericarpium maturum pomi feri magnitudinis, irregulari-globosum, nitens, rigide coriaceum; semen maximum, carnosum, mox germinans.—Martaban.

302. Pseudostachyum Helferi, nov. sp. (Bambusa Helferi, Munro,?)

Subscandens, caespitosa, arborescens, culmis poll. circiter crassis; turionum vaginae fugacissime albido-setulose, lamina imperfecta patens, basi attenuata in auriculam parvam longe fimbriatam producta, lingula angustissima setis albis 2—1 lin. longis fimbriata; folia larga, oblongo-lanceolata, basi vulgo inaequalia, breviter (1—2 lin.) petiolata, acuminata, ½—1 ped. longa 2—2½—3 poll. lata, juniora seecus margins scabra, mox glabra, subtus glaucecentia; vaginae apparenter glabrae, ore parum producto et uno latere minute fimbriato-auriculatae; lingula fimbriata, fragilitate pilorum mox integra v. indistincte denticulata; spicule, etc. ignota.—Pegu, Martaban.

303. Dinochloa Andamanica, nov. sp.

Alte scandens, culmis poll. circiter crassis; turionum vaginae sparse albido-setulose, ore nudo rotundata et vulgo undulata; lamina imperfecta erecto-patens, supra hispidula, lingula minute denticulata, simum oris marginis; foliis larga, oblongo-lanceolato ad lanceolata, basi rotundata, brevisimae petiolata, setaceo-acuminata, 6—12 poll. longa, 1—2 ped. lata, utrinque laevia; vaginae glabrae, ore parum producto subrotundatae, lingula angusta, albida, os totum marginans et integra; spicule minute, ⅓—1 lin. longa, ovata, nitidae, stramineae, glabrae, sessiles, glomerate, interrupte spicatae et in paniculum racemiformem angustam terminalem collectae; valvula inferior saepe-cymbiformis, abbreviata, retuso-muranota, vacua; valvula exterior fl. herm. lato-convoluto-ovata, acuta, laevis, lin. fere longa; valvula interior conformis; antherae spurie-4-loculares, acuminatæ; ovarium etc., ignota....Andamans (etiam in insulis Nicobariocis).—D. Tjangkorreh affinis, sed spiculis multo minoribus pallidis (ne brunnes) foliis multo majoribus et ligula vaginarum differt. Specimina ex insulis Phillipinis, valvula interiore ciliata gaudentia et a cl. Munro cum D. Tjangkorreh conjuncta mihi est species nova et etsi eam non vidi D. ciliatum nomino.

304. Dinochloa Maclellandii, (Bambusa Maclellandii, Munro in Linn. Trans. XXVI. 114).

Alte scandens, culmis poll. circiter crassis; turionum vaginae fugaciter appresse argenteo-setulose ore incrassato polito-marginatae; ligula brevis, integra; folia magna, oblongo- ad ovato-lanceolata, basi rotundata, breviter (1—2 lin.) petiolata, subulato-acuminata, ⅓—1½ ped. longa, 1⅓—3½ poll. lata, laevia, uno latere apicem versus retorse scabra; vaginae juniores appresse argenteo-setulose, mox glabrescentes, ore parum productae et auricu-
la appressa rotundata nitente nuda terminatæ, lingula os totum occupans, integra; spiculæ, etc. ignota.—Pegu, Martaban.

Corrigenda et Addenda.

Pueraria brachycarpa, supra p. 232, dele observationem “Spatholobus crassifolius Bth. Diocèle est species,” et adde:

2436. Pueraria stricta, nov. sp.

Herba perennis erecta 2—4-pedalis, ramis subteretibus novellis canescenti-tomentosis; folia pinnatim 3-foliolata, petiolo 1 1/2—2 pollicari pubescende suffulta; foliola ovata, lateralia inaequalia, 2—3 poll. longa, acuta v. breviter acuminata chartacea utrinque sparse appresse hirsuta; flores desunt; racemi canescenti-tomentosi simplices axillares et in paniculas terminales collecti; bracteæ parvae, subulatæ, persistentes; pedicelli sub fructu c. 2 lin. longi, calyx c. lin. longus puberulus; legumina lineari-oblonga, 1—1 1/2 poll. longa, 2 1/2 lin. lata, plana, glabra, pallida, 7—9-sperma; semina compresso-orbicularia, nigra, c. 2 lin. lata.—Pegu, Martaban.

243c. Pueraria hirsuta, nov. sp.

Herba perennis volubilis v. prostrata ramis obtuse angulatis et retrorse appresse hirsutis; folia pinnatim 3-foliolata, petiolo patente hirsuto 2—2 1/2 pollicari suffulta; foliola ovata ad ovato-lanceolata, lateralia obliqua, acuminata, chartacea, 2 1/2—3 1/2 poll. longa, utrinque (præsertim subto) sparse appresse hirsuta; flores desunt; racemi vulgo bini v. terni dense fulvo-hirsutuli, axillares; bracteæ deciduæ; pedicelli sub fructu c. lin. longi; calyx parvus; legumina oblongo-v. lineari-lanceolata, 1—1 1/2 poll. longa, 3—3 1/2 lin. lata, plana et subtorosa, sparse sed longe et patenter hirsuta, 2—4-sperma; semina transvere ovoidea, compressa, pallida v. pallide brunnea, nitida, 'c. 2 1/2 lin. lata.—Pegu.

Explanatio tabularum.

T. XVIII. Gonocitrus angulatus, Kz. Fig. 1. ramus fructiferus; f. 2. fructus; f. 3. id. longitudinaliter sectus; f. 4. id. horizontaliter sectus; f. 5. semen, magnitudine paullo auctum; f. 6. semen longitudinaliter sectum.

T. XIX. Balanostreblus ilicifolius, Kz. Fig. 1. ramus florens plantae femineae; f. 2. ramus fructicans; f. 3. racemus florum femineorum; f. 4. flos femineus perianthio remoto ovarium exhibens; f. 5. flos femineus longitudinaliter dissectus; f. 6. fructus maturi sectio verticalis. Fig. 3—6 omnes magnitudine auctæ.
Notes on the Certhiinæ of India,—by W. E. Brooks, Esq., C. E.,
Dinapore.

(Received September 8th, read November 5th, 1873.)

With a good series of about thirty to work with, it appears to me that we have decidedly five species in India.

I.—Certhia himalayana, Vigors.

A well-known species which need not be described here, and which is distinguished from the others by its well-barred tail, the other species having the tail only occasionally obscurely rayed.

II.—Certhia Hodgsoni, Brooks.

The differences between this bird and the European C. familiaris have been already pointed out.*

I regard the four outer plain or unspotted primaries of C. Hodgsoni versus the three plain ones of the English bird, as conclusive evidence of the distinctness of the two species. The much longer and straighter bill, with the white lower mandible; and the greyer and less rufous tone of plumage, with much whiter spotting on the back and head, should also be taken into account. The legs and feet of the English bird are also, as a rule, darker. The voices of the two birds differ; that of the English one being much louder and somewhat different in tone. The Indian species is much more silent. I have before noted the conspicuous difference in the eggs.

This species is the C. familiaris of some Indian ornithologists.

III.—Certhia nipalensis, Hodgson.

Certhia discolor, Blyth.

Any one who has examined Mr. Hodgson's drawing of C. Nipalensis, must have seen at a glance that it represents the earthy brown breasted bird; and I have therefore no hesitation in uniting both species under Hodgson's term.

The supposition that the brown-breasted bird could be identical with either of the two species next to be described, is a great mistake, as a good series at once shews. As far as my own observation goes, the sexes of the Certhiinae are alike in plumage. Even the young and old are very similar. The earth-brown tint of C. Nipalensis commences from the base of the lower mandible; and the chin and throat, which are generally protected from getting soiled in most birds, are in this species as dark as any part of the breast. The idea that the brown lower surface is merely produced by the feathers being soiled, is against the rule with regard to Creepers, which preserve the purity of their plumage in a remarkable manner, even near large manufacturing towns. The colour on the breast of C. Nipalensis is, as Mr. Blyth observed, a fast colour.

The tail of this species is more rufous than that of any of the others. In other respects the colouration of the upper parts is similar to that of the two species next to be described. *C. Nipalensis* has a large and rather strong bill compared with those of the others.

Hab. Nepal and Sikkim.

IV.—*Certhia Stoliczka*, n. sp.*

This species, as far as the upper surface is concerned, resembles "C. Nipalensis," but the bill is much shorter and weaker. The chin and throat are fulvous, and breast warm buff, increasing in rufous tone to the flanks and lower tail coverts, which are bright rusty brown. The rump and upper tail coverts, as in *C. Nipalensis*, are bright rusty brown, even brighter perhaps than in that species; but the colour of the tail feathers is less rufous, particularly so as regards the shafts of the feathers. The long claws, especially those of the anterior toes, and the large foot, are noticeable in this new species; in fact, it could almost be separated by the foot alone. Sometimes its throat alone is nearly white, but from this point the fulvous tone covers the lower surface.

I have much pleasure in naming it after my friend Dr. Stoliczka, to whom Indian naturalists are so much indebted.

Hab. Sikkim.

V.—*Certhia Mandelli*, n. sp.*

A bird of similar dimensions to the last, but with a longer and more curved bill, and smaller feet and claws.

The throat and breast are bright silky white; abdomen and sides tinged with brown, and flanks slightly washed with rusty; lower tail coverts pale rusty brown; upper tail coverts, as in the last, bright rusty brown; tail plain brown with the shafts rather rufous. In the colour of the tail being less rufous, this bird differs much from the last. Its principal characteristics are, however, the pure white breast, instead of the buff one of the last species, while the upper surface of the bird is very similar.

One of the eight specimens differs notably from all the others, by having a warm rosy tinge suffusing the white of the breast and throat. I do not, however, think this sufficient ground upon which to make a new species, and will not, therefore, name it provisionally; but will leave this to any one who will take the trouble to investigate the creepers further than I have done. The present species is named after Mr. Mandelli who sent me the two new species I have just described, and who placed all the creepers in his collection at my service.

Hab. Sikkim.

In examining examples of this genus, care is necessary to keep the long loose feathers in their proper places. The rufous feathers of the rump often

* This species is probably the "Certhia Nipalensis" of Jerdon's Birds of India; as the "lower parts" of the last are not "pure white."
get twisted out of place, so as to shew more or less on the under surface of the bird. So also with regard to the correct colour of the flanks. I conclude with a table of dimensions.

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<th>Wing.</th>
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<td><em>C. Mandellii</em></td>
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<td>The rosy-breasted example.</td>
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<td><em>C. Mandellii</em></td>
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Mr. Mandelli says "to my recollection the dirty and brown-throated and breasted creepers (*C. Nipalensis*) are always found at low elevations. The white-breasted ones (*C. Mandellii*), always at high elevations. I know nothing about the yellow-breasted ones." (*C. Stoliczka*).

The latter were procured by Mr. Mandelli's shikaree but at what elevation I have not ascertained.
ON A NEW GENUS AND SPECIES (Hylaeocarcinus Humei) OF LANDCRABS FROM THE NICOBAR ISLANDS,—by JAS. WOOD-MASON, of Queen's College, Oxford.

(With Plates XV & XVI.)

(Received and read August 6th, 1873.)

Milne-Edwards, in his classical work on the entire class of crustacea published in 1837, divides* the four then recognized genera of the small but remarkable group of Gecarcinidae, or Landcrabs properly so-called, into two divisions accordingly as they have the terminal joints of the external maxillipeds completely exposed, or inserted on the internal face of the third joint near its summit and completely hidden beneath it; and Dana† in his great work not only adopts these divisions but gives them subfamiliar names:—"The Gecarcinidae," he says, "pertain naturally to two groups or subfamilies, one having the termination of the outer maxillipeds exposed as usual, the other having this part concealed beneath the second and third segments. The subfamilies and genera are as follows:—

SUBFAM. 1. UCAINÆ. Articulus maxillipeds externi 4tus apertus.
   1. Maxillipedes externi non hiantes.
   2. Maxillipedes externi late hiantes.

SUBFAM. 2. GECARCININÆ. Articulus maxillipedis externi 4tus et sequentes 3tios celati.


This division is unnatural as separating the genus Gecarcoidea (hodie Pelocarcinus) from Gecarcinus to which it is most closely related, and ranging it with others with which its relations are more general; and the classificatory value of the character upon which it is based is, moreover, much diminished, if not altogether destroyed, by the discovery of a new form presenting an interesting transition from the former to the latter genus in this very character. A more natural result can, however, be attained, and

HYLOCARCINUS HUMEI.
Dana’s family names still retained, by the substitution of another maxillipedary character for the one originally selected and now proposed to be rejected: Gecarcinus, Pelocarcinus, and Hylæocarcinus, in fact, agree with one another and differ from all other genera of the family in that the exopodites of their outer foot-jaws are short, without flagella, and completely concealed from view beneath the second joints. The several genera of Gecarcinidae divided into two groups or subfamilies accordingly as they have the exopodites of their outer foot-jaws provided with a flagellum and applied to the external margin of the second and third joints so as to be externally visible; or have them short and rudimentary without flagella, and concealed beneath the second joint; will then be distributed as follows:

Subfam. I. Ucainæ.

Genus 1. Uca, Leach.
" 2. Gecarcińucus, M.-Edw.
" 3. Cardisoma, Latr.

Subfam. II. Gecarcininae.

" 2. Pelocarcinus, M.-Edw.
" 3. Hylæocarcinus, Wood-Mas.

A careful study of all the numerous figures and descriptions of species of Gecarcinidae and, in the cases of the genera Cardisoma and Gecarcinucus, of actual specimens has convinced me that the Gecarcininae further agree with one another in the structure of the epistoma which in them is of great length from before backwards and nearly horizontal, thus differing remarkably from the Ucainæ in which it is short and nearly vertical; this part has in Pelocarcinus been described by Milne-Edwards* as “grand, complètement à découvert et confondu en arrière avec le palais,” and it appeared to me to pass insensibly into the endostoma or ‘palate’ in Hylæocarcinus also until I had removed the thick clothing of coarse hairs that obscured the parts when I found no difficulty in distinguishing them. It is also a notable fact that the three most closely-allied species of the former, viz., Gecarcinus ruricola, Pelocarcinus Lalandei, and Hylæocarcinus Humei, have six rows of strong spines to the terminal joints of the walking legs, and I would also draw attention to the shallow yellow scars situated in all three on each side of the eye and on other parts of the carapace—tell-tale marks of their descent from a common ancestor!

Hylæocarcinus,† n. gen., Wood-Mason.


* Arch. du Mus., 1855, Vol. vii, Pl. xv, fig. 2a.
† ὑλαῖος, sylvester, et καρκίνος, cancer.
Front not united to the internal suborbital lobes as it is in the genera *Gecarcinus* and *Pelocarcinus*, but separated from them by spaces at least as wide as the deep bold fissures that divide to their bases the internal from the external suborbital lobes; into these interspaces project the flagella of the antennæ, the basal joints of which appendages lie tightly wedged between the internal margins of the internal suborbital lobes and the epistoma. The third joint of the external maxillipeds with an obtuse-angled emargination in its anterior border; the external margins only of the first of the three terminal joints is barely visible externally when the appendages are properly closed, its external surface being flattened for movement upon the inner face of the preceding joint: in *Gecarcinus* these terminal joints are completely hidden from view, the angular process that projects like a pillar in demi-relief from the inner face of the third joint and supports them, ending abruptly so very far short of the anterior margin of the joint: in *Hyleocarcinus* the similar but stouter pillar-like projection that carries these joints at its summit extending much farther towards the extremity of the joint than it does in *Gecarcinus* but certainly failing to reach it, these joints can consequently be only partially visible: in *Pelocarcinus* they are completely visible, being articulated to the apex of the third joint.

**Hyleocarcinus Humei**, n. sp.

The carapace is at once distinguished from that of *Pelocarcinus Lalandei*, M.-Edw. by its more arched outline in front, and by the two rounded tubercles on the mesogastric lobe which, as in *Gecarcinus ruricola*, is limited off antero-laterally from the rest of the gastric region by very shallow depressions passing off from the hinder end of the profoundly-deep median groove and joining the branchio-gastric groove on each side; the straight line representing its greatest breadth crosses it just in front of these tubercles; in front of this imaginary line its upper surface is very convex and much swollen everywhere, but behind it flat; it is just perceptibly angulated on each side for a short distance beyond the external margin of the orbits, these angulations corresponding to the lines of spiniform tubercles seen in the same position in *Gecarcinus ruricola*. The outer slopes of the branchial regions, both anteriorly and posteriorly, and the floors of the branchial chambers, all the inflected portions of the carapace in fact, covered with squamiform tuberculated lines which, fine and delicate above, become shorter and coarser as they approach the bases of the legs and the buccal frame. The anterior is divided by a shallow transverse impression slightly interrupted in the middle line from the posterior cardiac lobe, which, just as in the rest of the *Gecarcinidae*, is much expanded posteriorly between the bases of the posterior pair of legs.

The interantennnlarly septem is formed mainly by the subfrontal lobe,
but partly by a short triangular process of the epistoma. The flagella of the antennae are rudimentary. Both divisions of the suborbital lobes have their margins roughened with small tubercles, but the external one not nearly so distinctly so as it is represented to be in fig. 1 of pl. XVI.

The sternal region is much broader than long, its greatest breadth being between the bases of the second pair of legs.

The male appendages are very stout and long, reaching beyond the fifth postabdominal somite, and are connected at their bases with a remarkably stout and highly indurated semicircular plate which arches over the intestinal canal; a similar plate has been observed in the genus Cardisoma by S. I. Smith,* and is, doubtless, present in all Gecarcinidae.

Postabdomen of the female broadly oval, about as broad as long, covering all but the margins of the sternal region, broadest across the posterior third of its fifth somite; last segment, trefoil-shaped, its sides being slightly emarginate, with its antero-lateral angles slightly covered by the produced posterolateral angles of the preceding somite.

The chelipeds are equal and very powerful in the male; subequal and slenderer in the female; their meropodites, which in the male, as in Pelocarcinus Lalandei, extend much beyond the lateral borders of the carapace, but which in the female hardly reach the level of the branchial regions, have a few obtuse tubercles on their anterior, and some coarse tuberculated squamiform ridges on their posterior angles. The chelae are granulated and ornamented, especially on the fingers, with minute dark-coloured smooth tubercles; their toothed prehensile edges meet, in the male, only at the extremities which are feebly excavated spoonlike; the margin of the spoonlike excavation in the propodite is notched for the reception of the external cutting edge of the dactylopodite, so as to form scissor-like organs.

The ambulatory legs are also remarkably powerful; their meropodites have their edges and sides much roughened by squamiform tuberculation; the upper crest of their carpopodites is armed with a row of minute spinules; their propodites have a row of stronger spines on each of their four angles, and the dactylopodites are provided with six rows of spinelike teeth.

* Colours: upper surface of the carapace and the legs red violet, the claws whitey-brown faintly tinged with reddish violet; the scars at the extra-orbital angles, in the middle of the branchio-gastric suture on each side of the mesogastric region, etc., and the margins of the orbits, yellow; the flat posterior portion of the carapace is also much variegated with impure yellow.

Breadth of carapace of the male, ......................... 108 m m.
Length " " " ................................. 80 m m.

B : L : : 1.35 : 1;

Breadth of carapace of the female, .......................... 96 m m. 
Length " " " " ........................................... 73 m m. 

: B: L : : 1.315, etc. : 1.

Length of left claw of male, ..................................... 88 m m. 
Ditto right ditto, ................................................ 87 m m. 
Height left ditto, .................................................. 38 m m. 
Ditto right ditto, .................................................. 38 m m. 
Length of left claw of female, ................................... 55 m m. 
Ditto right ditto, .................................................. 57 m m. 
Height of left ditto, ............................................... 21½ m m. 
Ditto right ditto, .................................................. 25 m m. 
Length of post-abdomen of female, ............................. 55 m m. 
Breadth ditto ditto, .............................................. 51 m m.

Hab. The dark dense damp forests of the Nicobar Islands. I captured a male and a female on Treis Island. Another specimen with a much distorted carapace was subsequently taken on Narkondam Island by Mr. Allan O. Hume, C. B., after whom I have named it.

Explanation of the plates.

Pl. XV. Hylexcarinus Humei, Wood-Mason, male, nat. size.
Pl. XVI. Fig. 1. Facial region of the same. Fig. 2. Front view. Fig. 3. Post-abdomen of the male. Fig. 4. External maxilliped of the left side viewed from the outside. Fig. 5. Internal view of the same. All the figures of the natural size.
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Names of new genera and species have an asterisk (*) prefixed.

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