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**VOL. III.**

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**1859.**

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29th October, 1857, Rabba, on the Qworra

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**JOURNAL OF THE PROCEEDINGS**  
OF THE  
**LINNEAN SOCIETY OF LONDON.**

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On the Importance of an Examination of the Structure of the Integument of Crustacea in the determination of doubtful Species.—Application to the genus *Galathea*, with the Description of a New Species of that Genus. By SPENCE BATE, Esq., F.L.S.

[Read January 21, 1858.]

Of the various genera of Decapod Crustacea none are more interesting, or more difficult of description, than those which constitute the family Galatheadæ.

The interest attaching to these forms arises from the intermediate position which they occupy in the natural arrangement of the class, their structure placing them between the Macrura and Brachyura; in accordance with which we find that, whilst Professor M.-Edwards classes them among the Macrura, Professor Bell, in his work on the British Crustacea, places them (more correctly, as we think) in the intermediate group of Anomura.

This opinion is fully borne out both in the development of the animals and in their structure in the adult state.

The early form of the larva bears, anteriorly, a resemblance to the Brachyural type, whilst the caudal appendages assimilate to those of the Macrura. The same conditions obtain in the young of Anomura. At the time of birth, the larva, like that of the Brachyura, has only the two gnathopoda developed, whilst the termination of the tail is like that of a fish, as in the Macrura. In the adult, the internal antennæ possess short flagella and complementary appendages, such as exist in the order Brachyura, whilst the external antennæ have the long and slender flagella proper to the Macrura. The *scale*, however, commonly appended to the external antennæ in the latter order is wanting, a circumstance which exhibits a relation to the Brachyura.

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An examination of the legs shows that the coxæ are fused with the thorax, as in the Brachyura, and not articulated with it as in the Macrura, whilst, on the other hand, the posterior division and caudal termination approach the Macrural type more nearly than that of the Brachyura, the animal thus assuming a character intermediate between the two orders.

But in the description of the several species of the genus *Galathea*, a peculiar difficulty appears to arise, originating in the affinity which they bear to each other. So close, in fact, is the approximation, that the descriptions of the best writers will scarcely avail for the distinction of the individual species without the assistance of figures. This arises from the fact that the general characters, upon which the descriptions are based, vary, in this genus, only in their comparative degrees of development.

In the three species recognized in Professor Bell's work on the British Crustacea, it will be found that each species retains the same characters in greater or less degree.

*Galathea strigosa* is peculiar for the spinous character of the carapace and cheliform legs. Every spine, however, is repeated in both the other species, only less developed. We find the rostrum furnished with four lateral teeth on each side, a character which also exists in each of the other species; and although close observation may detect a slightly different arrangement in the relative position of these teeth, the differences are not of sufficient importance to enable a naturalist thence to derive a specific distinction, unless the peculiarity is seconded by some more unqualified character less liable to be affected by any peculiarity of condition.

In order to arrive at more certain results in the identification of species, we think that the microscopic examination of the surface of the integument will be found peculiarly useful.

This mode of examination of species may also be applied to a considerable extent throughout the Crustacea generally with great advantage; and if found valuable in recent, there can be no doubt that it will prove of far greater importance in extinct forms, where parts on which the identification of species visually rests are lost, and fragments only of the animal obtainable.

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It should be borne in mind that, as the structure in question undergoes modifications more or less considerable in different parts of the animal, it will always be advisable to compare the corresponding parts with each other.

Applying this test to the known species of *Galathea*, we perceive that the structure of the integument upon the arms, independent of the marginal spines, exhibits a squamiform appearance, but that the scales, which characterise the structure, possess features peculiar to each species.

In *Galathea strigosa* the scales are convex, distant from each other, smooth at the edge, and fringed with long hairs. In *G. squamifera* they are convex, closely placed, scalloped at the edge, and without hairs. In *G. nexa* the scales are obsolete, tufts of hair representing the supposed edges. In *G. depressa*, n. sp., the scales are broad, less convex than in *G. strigosa* and *G. squamifera*, smooth, closely set, and fringed with short hairs. In *G. Andrewsii* they are small, distant, very convex, tipped with red, and slightly furnished with hair.

As another instance of the practical application of the microscopical examination of the surface, I would refer to two species of Amphipoda, classed by Leach under the name of *Gammarus Locusta*, from his inability to assign them any separate specific characters. In the structure of their integuments, however, these two forms will be found to exhibit widely different microscopical appearances.

Again, there exists in the same group three or four species, the description of any one of which would apply to either of the others; and it is probable they would never have been ranked as separate species had not their habitats been geographically distant. Thus *Gammarus Olivii*, M.-

Ed., *G. affinis*, M.-E., *G. Kröyii*, Rathke, and *G. gracilis*, R., can only be specifically determined by a microscopic examination of the integument.

The same may be said of other Amphipoda, such as *Urothoe inostratus*, Dana, from South America, which so nearly resembles in form the *U. elegans* of the British shores.

GALATHEA DISPERSA, mihi.

*G. rostro brevi, dentibus 4 utrinque ornato, 2 anterioribus minoribus; pedibus anterioribus elongatis, sparse spiosus; chelarum digitis parallelis.*

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Galathea with short rostrum, armed on each side with 4 teeth, the two posterior being less important than the two anterior. The fingers of the chelæ impinge through their whole length; outer margin of the hand furnished with 3 or 4 small spines.

*Hab.* Trawling-ground, Plymouth, common; Moray Frith, Scotland.

This species unites *G. Andrewsii* with *G. nexa*, and, I think, has often been mistaken for the young of the latter; but *G. nexa*, so far as my experience goes, is a species peculiar to the north of England, whereas *G. dispersa*, I anticipate, will be found to be the most universally dispersed, in deep water, of any of the species known. It can always be detected from *G. nexa* by the form of the hand and the manner in which the fingers impinge: in *G. nexa* the hand is broad towards the extremity, and the fingers meet only at the apex; in *G. dispersa* the hand gradually narrows to the apex, and the fingers meet each other through their whole length, the inner margin of the finger being finely serrated, the thumb not.

It also may be distinguished from *G. Andrewsii* by the breadth of the hands, which are narrow and round in *G. Andrewsii*, and moderately broad and flat in *G. dispersa*.

By an examination of the texture of the integument under a magnifying power of low degree, the surface of *G. dispersa* will be seen distinctly to differ from that of any of the others; it is covered with flat scales, fringed with short cilia. The length of the animal, including the arms, is about 2¼ inches.

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Catalogue of Hymenopterous Insects collected at Celebes by Mr. A. R. WALLACE. By FREDERICK SMITH, Esq., Assistant in the Zoological Department, British Museum. Communicated by W. W. SAUNDERS, Esq., F.R.S., F.L.S.

[Read April 15th, 1858.]

This collection of the Hymenoptera of Celebes is specially interesting, as adding greatly to our knowledge of the geographical range of many well-known species, while the additions made to the Fossorial group contain many of great beauty and rarity. A new species belonging to the tribe of Solitary Wasps, *Odynerus clavicornis*, is perhaps the most interesting insect in the collection; this Wasp has clavate antennæ, the flagellum being broadly dilated towards the apex, convex above and concave beneath. I am not acquainted with any other insect belonging to the Vespidioid group which exhibits such an anomaly.

[Pg 5]

Fam. ANDRENIDÆ, *Leach*.

Gen. SPHECODES, *Latr.*

1. SPHECODES INSULARIS. *S. niger*, abdominis segmentis primo secundo et tertio (basi) rubris; alis hyalinis.

*Male.* Length 3½ lines. Head and thorax black, closely and strongly punctured; the face below the antennæ with silvery-white pubescence; the joints of the flagellum submoniliform; the mandibles ferruginous. Thorax: the tegulæ pale rufo-testaceous, wings hyaline, the nervures ferruginous; the metathorax coarsely rugose; the articulations of the legs and the tarsi ferruginous. Abdomen: the first, second, and base of the third segments red, the apical ones black, very finely and closely punctured, with the apical margins of the segments smooth and shining; a black spot in the middle of the basal segment.

*Hab.* Celebes.

Gen. NOMIA, *Latr.*

1. NOMIA PUNCTATA. *N. nigra nitida punctata*, alis nigro-fuscis.

*Male*. Length 4½ lines. Shining black: head and thorax coarsely punctured, the metathorax ruggedly sculptured, truncate at the apex, the truncation and sides smooth with a few fine punctures; the abdomen closely and rather finely punctured, the apical margins of the segments smooth and shining. The tips of the mandibles, the tarsi and apex of the abdomen rufo-testaceous, the wings fuscous.

*Hab.* Celebes.

2. NOMIA FLAVIPES. *N. nigra pedibus flavis*, abdomine cinereo fasciato, alis hyalinis.

*Female*. Length 3¼ lines. Black; the face and cheeks densely clothed with short cinereous pubescence, the vertex thinly so; the margins of the prothorax, mesothorax and scutellum with a line of pale ochraceous pubescence, the disk of the thorax thinly covered with short pubescence of the same colour, the emargination of the metathorax as well as its sides with longer pubescence of the same colour; the base of the abdomen and basal margin of the second and following segments covered with short cinereous pubescence. The flagellum beneath fulvous; the mandibles ferruginous. The legs reddish-yellow, with the coxæ and base of the femora black; the wings hyaline; the tegulæ yellow, the nervures pale testaceous.

*Hab.* Celebes.

3. NOMIA FORMOSA. *N. capite thoraceque nigris*; abdomine chalybeo; marginibus apicalibus segmentorum cæruleo fasciatis.

*Female*. Length 5½ lines. Head and thorax black and very closely punctured; the face covered with griseous pubescence; the clypeus with a central longitudinal carina. Thorax: the apical margin of the prothorax, the margins of the scutellum, and the sides of the metathorax covered with a dense short ochraceous pubescence; the disk of the thorax thinly sprinkled with short black hairs; the posterior tibiæ obscurely ferruginous; the tarsi ferruginous; the legs covered with bright golden-yellow pubescence; wings subhyaline, the nervures ferruginous; the tegulæ yellow with a fuscous stain in the middle. Abdomen obscurely chalybeous, closely punctured, the two basal segments strongly so; the apical margins of the segments with smooth shining narrow blue fasciæ.

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*Male*. Closely resembling the female, but with the legs black; the posterior femora incrassate, the tibiæ narrow at their base and broadly dilated at their apex, which, as well as the calcaria, are pale testaceous.

This species closely resembles a species from North China, *N. chalybeata*, Westw. MS., from which it is readily distinguished by the form of the fourth ventral segment, which is notched in the middle, rounded, and then emarginate with the lateral angles rounded; in the species from China the margin is arched, and fringed with fulvous pubescence.

4. NOMIA HALIOTOIDES. *N. nigra*, pube cinerea tecta, abdominis segmentis intermediis pube alba fasciatis.

*Female*. Length 4½ lines. Black; head and thorax opaque, and thinly clothed with cinereous pubescence, that on the disk of the thorax and margin of the scutellum slightly ochraceous. The flagellum fulvous beneath, the mandibles ferruginous at their apex; the tarsi ferruginous, wings hyaline, nervures fuscous, stigma testaceous. Abdomen shining, delicately punctured; the basal margins of the second, third, and fourth segments with a band of cinereous pubescence, attenuated in the middle.

*Hab.* Celebes.

## Fam. DASYGASTRÆ.

1. MEGACHILE INCISA. *M. nigra*, rude et dense punctata, facie fulvo pubescente; alis fuscis, segmentis abdominis marginibus multo depressis.

*Male*. Length 5½ lines. Black; closely and strongly punctured, the punctures confluent on the abdomen. The face clothed with fulvous pubescence. The tarsi obscurely rufo-piceous, the claws ferruginous; wings dark fuscous, their base hyaline. Abdomen: the apical margins of the segments smooth, impunctate, their basal margins very deeply depressed; a deep fovea at the tip of the apical segment; the head, thorax, and abdomen clothed beneath with short cinereous pubescence.

*Hab.* Celebes.

2. MEGACHILE FULVIFRONS. *M. nigra*, delicatule punctata; facie dense fulvo pubescente; thoracis lateribus abdomineque subtus fulvo pubescentibus; fasciis marginalibus abdominis fulvis.

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*Female*. Length 7 lines. Black; head and thorax closely punctured, the abdomen delicately so and shining; the mandibles stout, with two acute teeth at their apex, shining and covered with oblong punctures; the face, sides of the thorax, and abdomen beneath, densely clothed with fulvous pubescence; the apical margins of the segments of the abdomen above with narrow fasciæ of short fulvous pubescence; the abdomen in certain lights has a metallic tinge.

The *male* is similarly clothed to the female, the margins of the segments are deeply depressed, and that of

the apical segment slightly notched in the middle.

*Hab.* Celebes.

3. MEGACHILE TERMINALIS. *M. nigra*, capite thoraceque dense punctatis; abdomine pube nigra vestito; segmentis duobus apicalibus pube alba vestitis; alis fuscis.

*Female.* Length 9 lines. Black; the face with tufts of black pubescence above the insertion of the antennæ; mandibles very stout, with an acute tooth at their apex, the inner margin subdentate, and covered with fine cinereous pubescence. Thorax with black pubescence at the sides of the metathorax; the wings dark fuscous. Abdomen clothed with black pubescence; the fifth and sixth segments clothed with ochraceous pubescence above, that on the sixth nearly white.

*Hab.* Celebes.

This species resembles the *M. ornata*; but when viewed beneath, the different colour of the pollen-brush at once separates them.

#### Gen. CERATINA, *Spin.*

1. *Ceratina viridis*, *Guér. Icon. Reg. Ann.* 444. t. 73. f. 6.

*Hab.* India (Bengal, N. India), Ceylon, Celebes, China.

2. *Ceratina hieroglyphica*, *Smith, Cat. Hym. Ins.* ii. 226.

*Hab.* Northern India, Celebes, Philippine Islands, Hong Kong.

#### Fam. DENUDATÆ.

1. STELIS ABDOMINALIS. *S. dense punctata*, capite thoraceque nigris, abdomine ferrugineo; alis nigro-fuscis violaceo iridescentibus.

*Male.* Length 5 lines. Head and thorax black, abdomen ferruginous; head and thorax strongly punctured, the scutellum very strongly so; the sides of the face and the anterior margin of the face fringed with white pubescence. The posterior margin of the scutellum rounded; wings dark brown with a violet iridescence. Abdomen ferruginous and closely punctured.

*Hab.* Celebes.

2. CÆLIOXYS FULVIFRONS. *C. nigra*, rude punctata, facie pube fulva vestita; alis fuscis cupreo iridescentibus.

*Male.* Length 6 lines. Black; the head and thorax with large confluent punctures; the face clothed with fulvous pubescence. Thorax: a stout tooth on each side of the scutellum at its base; wings dark brown with a coppery effulgence, subhyaline at their base; beneath clothed with short cinereous pubescence. Abdomen: elongate, conical; closely punctured, with the apical and basal margins of the segments smooth; the apical segment with a tooth on each side at its base and four at its apex; beneath the margins of the segments fringed with pale pubescence; the apical margin of the fourth segment notched in the middle; the fifth entirely clothed with pale pubescence.

*Hab.* Celebes.

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#### Fam. SCOPULIPEDES.

##### Gen. ANTHOPHORA, *Latr.*

1. *Anthophora zonata*, *Linn. Syst. Nat.* i. 955. 19.

*Hab.* India, Ceylon, Malacca, Sumatra, Borneo, Philippine Islands, Hong Kong, Shanghai, Celebes.

##### Gen. XYLOCOPA, *Latr.*

1. *Xylocopa fenestrata*, *Fabr. Syst. Piez.* p. 339. 6. ♂.

*Hab.* India, Celebes.

2. *Xylocopa æstuans*, *Linn. Syst. Nat.* 961. 53.

*Hab.* India, Java, Singapore, Celebes.

3. *Xylocopa Dejeanii*, *St. Farg. Hym.* ii. 209. 59.

*Hab.* Java, Borneo, Sumatra, Celebes.

4. *Xylocopa collaris*, *St. Farg. Hym.* ii. 189. 26.

*Hab.* India, Sumatra, Malacca, Borneo, Celebes.

5. *XYLOCOPA NOBILIS*. *X. nigra*, pube nigra induta; abdominis basi pube flava, apice lateritio.

*Female*. Length 11 lines. Black; a narrow line of pale fulvous pubescence on the margin of the thorax in front, a patch of the same colour on each side of the metathorax, and the basal segment of the abdomen covered above with similar pubescence; the apical margin of the third and fourth segments, and the fifth and six entirely, covered with bright brick-red pubescence; the wings black, with coppery iridescence.

*Hab.* Celebes.

## Fam. SOCIALES.

1. *APIS ZONATA*. *A. nigra*, thoracis lateribus dense ochraceo pubescentibus; alis fumatis; abdomine nitido, segmentis secundo tertio quartoque basi niveo pubescentibus.

*Worker*. Length 8—8½ lines. Black; the head and thorax opaque, the abdomen shining; the clypeus smooth and shining, the flagellum rufo-piceous beneath; the anterior margin of the labrum narrowly, and the apex of the mandibles, ferruginous; the face with a little fine short cinereous pubescence above the insertion of the antennæ; the vertex with long black pubescence; the eyes covered with short black pubescence. Thorax: the sides with ochraceous pubescence; wings smoky, the superior pair darkest at their anterior margin beyond the stigma. Abdomen: a snow-white band at the basal margin of the second, third, and fourth segments, the bands continued beneath, but narrower.

*Hab.* Celebes, Philippine Islands.

Specimens of this species denuded of their white bands would approach the *A. unicolor* of Latreille; but that insect is described as having the anterior wings black; in the present species both pairs are of the same smoky colour, not approaching black.

## Fam. MUTILLIDÆ.

### Gen. MUTILLA.

1. *Mutilla sexmaculata*, *Swed. Nov. Act. Holm.* viii. 286. 44. ♀. *Mutilla fuscipennis*, *Fabr. Syst. Piez.* 436. 35. ♂.

*Hab.* India (Punjaub, &c.), China, Java, Celebes.

2. *Mutilla unifasciata*, *Smith, Cat. Hym.* pt. iii. p. 38.

*Hab.* India, Celebes.

3. *Mutilla rufogastra*, *St. Farg. Hym.* iii. 629. 51. ♂.

*Hab.* India, Celebes.

4. *MUTILLA VOLATILIS*. *M. nigra*, rude punctata et pubescens; capite abdomineque nitidis, alis fusco-hyalinis.

*Male*. Length 5-6 lines. Black. Head and thorax very coarsely punctured; head and disk of the thorax punctured; the metathorax opaque, with a central abbreviated channel and covered with large shallow punctures; the eyes notched on their inner margin; wings fuscous and iridescent; the tegulæ smooth and shining. Abdomen shining and rather finely punctured; the basal segment narrow and campanulate; the margins of the segments thickly fringed with silvery-white hair; the cheeks, sides of the thorax, and beneath the legs and abdomen with scattered long silvery-white hairs.

*Hab.* Celebes.

## Fam. SCOLIADÆ, *Leach*.

### Gen. SCOLIA, *Fabr.*

1. *Scolia erratica*, *Smith, Cat. Hym. Ins.* pt. iii. p. 88. 10. *Scolia verticalis*, *Burm. Abh. Nat.-Ges. Halle*, i. 37. 61.

*Hab.* India, Sumatra, Celebes.

2. *Scolia aurulenta*, *Smith, Cat. Hym. Ins.* pt. iii. p. 102. 80. (nec *Fabr.*).

*Hab.* Philippine Islands, Celebes.

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3. *Scolia fimbriata*, *Burm. Abh. Nat.-Ges. Halle*, i. p. 32. 24.

*Hab.* Java, Celebes.

4. *Scolia dimidiata*, *Guér. Voy. Coq. Zool.* ii. pt. 2. p. 248.

*Hab.* Senegal, Celebes.

5. *SCOLIA TERMINATA*. *S. nigra*, clypeo mandibulisque flavis, thorace flavo variegato, alis hyalinis, abdomine flavo quinque-fasciato, apicisque marginibus flavis.

*Male.* Length 5 lines. Black; the clypeus, labrum, and mandibles yellow; the former with a triangular black spot in the middle; the latter ferruginous at their apex. The posterior margin of the prothorax, the tegulæ, a transverse curved line on the scutellum, and a spot on the postscutellum yellow; the anterior and intermediate tarsi, tibiæ, and knees, and the posterior tibiæ outside, yellow; a black line on the intermediate tibiæ beneath, and the apical joints of the tarsi fuscous; wings hyaline, the nervures ferruginous. Abdomen brightly prismatic; the margins of all the segments with a narrow yellow fascia, those on the second and third segments terminating at the sides in a large rounded macula; the fascia very narrow or obliterated on the sixth segment; the fasciæ on the second and third segments continued beneath.

*Hab.* Celebes.

6. *SCOLIA AGILIS*. *S. nigra*, mandibulis clypeoque flavis, alis fulvo-hyalinis, abdomine prismatico flavo quadrifasciato.

*Male.* Length 8 lines. Black and punctured, with thin long griseous pubescence; the vertex, disk of the thorax, and the abdomen shining; the mandibles and clypeus yellow, the latter with a black bell-shaped spot in the middle; wings fulvo-hyaline, the nervures ferruginous; the tibiæ with a yellow line outside. Abdomen beautifully prismatic; the first and three following segments with a yellow fascia on their apical margins, the second and two following much attenuated in the middle, or the fourth interrupted.

*Hab.* Celebes.

7. *SCOLIA FULVIPENNIS*. *S. nigra*, antennis capiteque supra basin antennarum rubris, alis fulvo-hyalinis.

*Male.* Length 7 lines. Black; the antennæ and the head above their insertion ferruginous, the scape black, the head coarsely punctured. Thorax: coarsely punctured; the mesothorax with an abbreviated deeply impressed line in the middle of its anterior margin; wings fulvo-hyaline, the nervures ferruginous; the apex of the wings slightly fuscous, the anterior pair with two submarginal cells and one recurrent nervure. Abdomen: shining, punctured, and prismatic.

*Hab.* Celebes.

8. *SCOLIA ALECTO*. *S. nigra*, capite supra basin antennarum rubro; alis nigris violaceo micantibus.

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*Female.* Length 14 lines. Black and shining; head red above the insertion of the antennæ, very smooth and glossy, with a few punctures at the sides of and in front of the ocelli; antennæ black; the mandibles with a fringe of ferruginous hairs on their inferior margin. Thorax: smooth on the disk, which has a few scattered punctures at the sides; the scutellum punctured and shining; the thorax in front and the metathorax with black pubescence, the latter widely emarginate at the verge of the truncation, the lateral angles produced; wings black with a bright violet iridescence. Abdomen punctured, with the middle of the second, third, and fourth segments smooth and shining in the middle; the first segment with a smooth shining carina at its base slightly produced forwards, the abdomen with a slight metallic lustre. The wings with one marginal and three submarginal cells, and one recurrent nervure.

*Male.* Smaller than the female, and differs in having the clypeus red and the red colour running down behind the eyes, the antennæ longer, and the abdomen with a bright metallic iridescence.

*Hab.* Celebes.

9. *SCOLIA MINUTA*. *S. nigra*, abdomine iridescente, segmentorum marginibus apicalibus flavo fasciatis, alis subhyalinis iridescentibus.

*Male.* Length 4 lines. Head and thorax black and shining, with scattered pale pubescence; the mandibles and clypeus yellow, the latter with an anchor-shaped black spot. Thorax: the posterior margin of the prothorax and the anterior and intermediate tibiæ and tarsi yellow; a minute yellow spot on the postscutellum yellow; the wings subhyaline, the nervures fusco-ferruginous. Abdomen: the apical margins of the segments with a narrow yellow border, the second and third uniting with a lateral spot; the sixth segment immaculate; the apex pale testaceous.

*Hab.* Celebes.



1. *Pompilus analis*, *Fabr. Syst. Piez.* p. 209. 42.

*Hab.* India, Java, Ceylon, Celebes.

2. POMPILUS SALTITANS. *P. niger*, pedibus subferrugineis, prothoracis margine postica flava; alis flavo-hyalinis, apice fuscis, abdomine pilis cinereis fasciato.

*Female.* Length 6 lines. Black and thinly covered with ashy pile. The scape, labrum, mandibles and palpi ferruginous; the clypeus widely emarginate anteriorly. The posterior margin of the prothorax angular and with a yellow border; the scutellum prominent, covered on each side with a dense silvery-white pile, the postscutellum with two spots of the same; the wings flavo-hyaline, their apex with a broad dark-fuscous border, the nervures ferruginous, the tegulæ yellow; the posterior wings palest; legs pale ferruginous, the coxæ black with their tips pale; the apical joints of the tarsi blackish, the spines of the legs black. Abdomen: the first, second, and third segments with a fascia of silvery-white pile at their basal margins; the apex of the abdomen ferruginous.

*Hab.* Celebes.

3. POMPILUS CONTORTUS. *P. niger*, cinereo-pilosus, prothorace flavo postice marginato; alis subhyalinis, marginibus apicalibus fuscis, pedibus subferrugineis.

*Female.* Length 5½ lines. Black; the head, thorax, and four basal segments of the abdomen covered with ashy pile; the first and second segments with their apical margins naked. The scape yellow in front; the flagellum beneath, the labrum, mandibles and palpi ferruginous; the joints of the antennæ arcuate, particularly the apical ones; the apex of each joint is oblique, giving the antennæ a twisted appearance. Thorax: the posterior margin of the prothorax angular and with a broad yellow border; the scutellum compressed and prominent; wings subhyaline with a broad fuscous border at their apex, the tegulæ yellow; legs pale ferruginous, with their coxæ and trochanters black; the apical joints of the tarsi fuscous. Abdomen with a yellow macula at the tip.

*Hab.* Celebes.

4. POMPILUS PILIFRONS. *P. niger*, facie argenteis pilis dense tecta; thorace abdomineque flavo maculatis, alis subhyalinis, apice fuscis.

*Female.* Length 4½ lines. Black; the face densely covered with silvery-white pile; a narrow line at the inner orbits of the eyes, the palpi and mandibles yellow; the latter ferruginous at their apex. The posterior margin of the prothorax rounded and yellow; a minute yellow spot on the mesothorax touching the scutellum, the thorax and abdomen covered with a changeable silky pile; the wings subhyaline, their nervures fuscous, a broad dark fuscous border at the apex of the superior pair. A transverse spot on each side of the basal margin of the second and third segments, and an emarginate fascia on that of the fifth, yellow.

5. POMPILUS DECEPTOR. *P. rufescenti-flavus*; vertice nigro, alis anticis apice fuscis.

*Male.* Length 6 lines. Pale reddish-yellow; the antennæ slightly dusky above; a black transverse stripe on the vertex between the eyes, and another issuing from it in the middle and passing beyond the ocelli. Thorax: a black stripe on each side of the mesothorax over the tegulæ; the wings subhyaline, the nervures ferruginous, the superior pair fuscous at their apex. Abdomen immaculate.

#### Subgenus PRIOCNEMIS.

1. PRIOCNEMIS RUFIFRONS. *P. niger*; facie, antennis, tibiis tarsisque ferrugineis, alis fulvo-hyalinis; abdominis segmento apicali flavo unimaculato.

*Female.* Length 9½ lines. Black; the face above the clypeus, as high as the anterior ocellus, reddish-yellow; the extreme edge of the clypeus, the labrum and base of the mandibles ferruginous; the antennæ reddish-yellow. Thorax: fulvo-hyaline, with a dark fuscous border at the apex; the knees, tibiæ and tarsi reddish-yellow; the two latter spinose. Abdomen: gradually tapering to an acute point at the apex, the sixth segment with an elongate red spot.

*Hab.* Celebes.

#### Subgenus AGENIA.

1. *Agenia blanda*, *Guér. Voy. Coq. Zool.* ii. pt. 2. p. 260.

2. AGENIA BIMACULATA. *A. nigra*, cinereo-pilosa, clypeo plagis duabus flavis; antennarum articulis apicalibus, tibiis tarsisque anticis et intermediis femoribusque posticis ferrugineis; alis subhyalinis, nervuris nigris.

*Female.* Length 7 lines. Black, and covered with ashy pile; a large macula on each side of the clypeus, the mandibles and palpi yellow; the base and apex of the mandibles rufo-piceous; the flagellum pale

ferruginous, more or less fuscous above towards the base. Thorax: the posterior margin of the prothorax arched; the anterior and intermediate tibiæ and tarsi and the femora at their apex beneath, also the posterior femora, pale ferruginous; the wings subhyaline, the nervures dark fuscous. Abdomen: the apical margins of the segments obscurely and narrowly rufo-piceous, the apex ferruginous.

*Hab.* Celebes.

#### Gen. MACROMERIS, *St. Farg.*

1. *Macromeris splendida*, *St. Farg. Hym. iii.* 463. 1. ♂.

*Hab.* India, China, Malacca, Borneo, Java, Celebes.

#### Gen. MYGNIMIA, *Smith.*

1. *Mygnumia iridipennis*, *Smith, Journ. Proc. Linn. Soc.* ii. p. 98.

*Hab.* Celebes, Borneo.

This insect, a female, is 5 lines larger than *M. iridipennis*; but I can point out no other distinction beyond a slight difference in the colour of the wings: the specimen from Borneo has a metallic bluish-green iridescence, the Celebes insect has a violet iridescence; notwithstanding which I am inclined to regard them as one species.

2. MYGNIMIA FUMIPENNIS. *M. aurantiaco-rubra*, alis obscure fuscis.

*Female.* Length 9 lines. Orange-red; the anterior margin of the clypeus entire; the labrum produced, its anterior margin widely emarginate; eyes large, black and ovate. Thorax: the posterior margin of the prothorax rounded; the mesothorax with a longitudinal fuscous stripe on each side, widest anteriorly; the metathorax truncate; above, transversely striate; the tibiæ and tarsi spinose; wings dark fuscous, with a pale semitransparent macula at the base of the second discoidal cell and a dark fuscous macula beyond; the insect entirely covered with a fine orange-red downy pile.

*Hab.* Celebes.

#### Fam. SPHEGIDÆ.

1. SPHEX PRÆDATOR. *S. niger*, rude punctatus, facie pube fulva vestita; alis fuscis cupreo iridescentibus.

*Male.* Length 10½ lines. Black; the head and thorax opaque. Abdomen shining blue-black. The face with silvery pile on each side of the clypeus, and sprinkled with erect black hairs. Thorax: the posterior margin of the prothorax with a line of silvery pubescence; the metathorax with a short light-brown pubescence at the apex, and thinly clothed with black hairs; wings dark brown, with a brilliant violet iridescence. Abdomen blue-black, smooth and shining.

*Hab.* Celebes.

2. AMMOPHILA INSOLATA. *A. nigra*, scapo mandibulis, pedibus, abdominisque segmentis primo et secundo ferrugineis; alis subhyalinis.

*Female.* Length 8½ lines. Black; the scape, the base of the flagellum beneath, the anterior margin of the clypeus and the mandibles ferruginous; the latter black at their apex. Thorax: the prothorax smooth and shining; the meso- and metathorax above transversely striated, the scutellum longitudinally so; the legs ferruginous, with their coxæ black; a spot of silvery-white pubescence on each side of the metathorax at its base, and two at its apex close to the insertion of the petiole; the wings fulvo-hyaline with the nervures ferruginous. Abdomen: the petiole and the following segment red, the base of the third also slightly red; the three apical segments obscurely blue, with a thin glittering pile.

The *male* differs in having the legs black, their articulations only being ferruginous; the head entirely black with the face densely covered with silvery-white pile. The thorax is sculptured as in the other sex; the petiole more elongate and slender, the basal joint black, the second and the first segment ferruginous beneath; the rest of the abdomen blue.

*Hab.* Celebes.

#### Gen. PELOPÆUS, *Latr.*

1. *Pelopæus Madraspatanus*, *Fabr. Syst. Piez.* p. 203. 3.

*Hab.* Malabar, Madras, Nepaul, Bengal, Celebes.

2. *Pelopæus Bengalensis*, *Dahlb. Syst. Nat.* i. 941. 2. *Hab.* India, Philippine Islands, China, Isle of France,

3. *PELOPÆUS INTRUDENS*. *P. niger*; clypeo bidentato, tibiis anticis et intermediis, femorumque apice, femoribusque posticis basi, trochanteribus, tibiis dimidio basali, petioloque rufescenti-flavis; alis fulvo-hyalinis.

*Female*. Length 11 lines. Black; the face with silvery pubescence; the clypeus with two large blunt teeth at its apex, formed by a deep notch in its anterior margin; the scape reddish-yellow in front. The meso- and metathorax transversely striated; the wings fulvo-hyaline, the nervures ferruginous; the anterior and intermediate tibiæ and the femora at their apex, the posterior femora at their base, the trochanters, the tibiæ with their basal half and the middle of the basal joint of the posterior tarsi, reddish-yellow; the petiole of the abdomen of a paler yellow; the abdomen smooth and shining. The male only differs in being rather smaller.

*Hab.* Celebes.

Mr. Wallace says of this species, "A common house-wasp in Macassar; builds mud cells on rafters."

*Note*.—In describing the species of this genus collected by Mr. Wallace at Borneo, I incorrectly gave that locality for *P. javanus*. The insect mistaken for that species may be shortly characterized as *P. benignus*, length 12 lines. Opaque-black, with the petiole shining; the metathorax transversely striated; the wings pale fulvo-hyaline, the nervures ferruginous; the scape in front, the anterior and intermediate tibiæ, the apex of the femora, and the basal joint of the tarsi reddish-yellow; the posterior legs, with the trochanters and basal half of the femora, yellow.

4. *PELOPÆUS FLAVO-FASCIATUS*. *P. niger*; capite thoraceque flavo variegato; pedibus abdominisque basi ferrugineis; alis hyalinis, apice fuscis, abdominisque segmento tertio fascia lata flava ornato.

*Female*. Length 9 lines. Black; the clypeus yellow; the mandibles and scape ferruginous, the former black at their base, the latter yellow in front; the sides of the face with a bright golden pile. Thorax: the posterior margin of the prothorax, the tegulæ, scutellum, and a quadrate spot on each side of the metathorax at its base yellow; the legs ferruginous, with the coxæ, trochanters, and claw-joint of the tarsi black; wings fulvo-hyaline, the nervures ferruginous, a fuscous spot at the apex of the anterior pair; the meso- and metathorax transversely striated, the latter with a yellow spot at the insertion of the petiole. Abdomen: the petiole slightly curved upwards, the first segment ferruginous; a broad yellow fascia at the apex of the third segment, the apex of the fourth with a narrow obscure fascia; the abdomen covered with a fine silky pile.

*Hab.* Celebes.

### Fam. BEMBICIDÆ, *Westw.*

1. *Bembex trepanda*, *Dahlb. Hym. Europ.* i. p. 181.

*Hab.* India, Celebes.

### Fam. LARRIDÆ.

Genus *LARRA*, *Fabr.*

1. *Larra prismatica*, *Smith, Journ. Proc. Linn. Soc.* ii. p. 103.

*Hab.* Malacca, Celebes.

### Genus *LARRADA*, *Smith.*

1. *Larrada aurulenta*, *Smith, Cat. Hym. Ins.* pt. iv. 276. 6. *Sphex aurulenta*, *Fabr. Mant.* i. 274. 10.

*Hab.* India, Java, Sumatra, Celebes, Philippine Islands, China, Cape of Good Hope, Gambia.

2. *Larrada exilipes*, *Smith, Cat. Hym. Ins.* pt. iv. p. 278.

3. *LARRADA ÆDILIS*. *L. nigra*; facie argenteo-pilosa, alis subhyalinis, articulis apicalibus tarsorum rufo-testaceis, abdomine lævi et nitido.

*Female*. Length 5½ lines. Black; head and thorax subopaque, the abdomen shining; the face densely covered with silvery pile, the cheeks, sides of the thorax and abdomen thinly so; the tips of the mandibles and apical joints of the tarsi ferruginous, the latter obscurely so. The metathorax transversely and rather finely rugose, the truncation more strongly striated; the scutellum shining; the wings subhyaline, the nervures ferruginous; the tibiæ with scattered spines, the tarsi spinose.

4. *LARRADA AURIFRONS*. *L. nigra*; facie mesothoracis metathoracisque lateribus aurato pubescentibus, abdominis marginibus segmentorum trium basalium argentato piloso fasciatis; alis fuscis.

*Male*. Length 8 lines. Black; the face and outer orbits of the eyes clothed with golden pile; the lateral margins of the mesothorax and the metathorax thinly clothed with golden pile; wings dark fuscous with a violet iridescence; the three basal segments of the abdomen with fasciæ of silvery pile.

*Hab.* Celebes.

5. LARRADA PERSONATA. *L. capite thoraceque nigris, abdomine ferrugineo.*

*Female*. Length 8½ lines. Head, thorax, and legs black; the two former closely punctured and thinly covered with short cinereous pubescence; the metathorax with the punctures running into transverse striæ in the middle; the sides of the thorax and the legs with a fine silky silvery-white pile; the tibiæ and tarsi strongly spinose; wings fusco-hyaline; abdomen entirely red, smooth and shining.

The *male* is smaller, and has the four apical segments of the abdomen black, the face, cheeks, and apical margins of the segments of the abdomen with silvery pile.

*Hab.* Celebes.

This is probably merely a variety of *L. simillima*, wanting the black apex to the abdomen; it very much resembles the *L. anathema* of Europe.

6. LARRADA RUFIPES. *L. nigra, mandibulis pedibusque rufis; alis hyalinis, venis pallide testaceis; abdomine sericeo-piloso.*

*Female*. Length 7 lines. Black; the head smooth and shining; the clypeus, the cheeks, and face anteriorly covered with silvery pile; the scape in front, the mandibles, and palpi ferruginous. Thorax: the sides and beneath with a thin silvery-white pile; the legs ferruginous with the coxæ black, the posterior pair red beneath; the thorax closely punctured, the metathorax transversely striated; wings fulvo-hyaline, the nervures pale-testaceous. Abdomen shining, very closely and delicately punctured; thinly covered with a fine white silky pile, which is very bright on the margins of the segments, which are slightly rufo-piceous.

The *male* closely resembles the female, and is similarly sculptured and coloured.

*Hab.* Celebes.

7. LARRADA FESTINANS. *L. nigra; facie abdominisque marginibus segmentorum argentato-pilosis.*

*Female*. Length 3 lines. Black; the face and cheeks thinly covered with silvery pile. Thorax: the disk very closely punctured, the metathorax rugose; the sides and the legs with a fine glittering sericeous pile, the wings subhyaline, their apical margins fuscous, the nervures fuscous. Abdomen smooth and shining, covered with a thin silky pile, the apical margins with bright silvery fasciæ, only observable in certain lights.

The *male* closely resembles the female, but has the face more silvery.

*Hab.* Celebes.

#### Genus MORPHOTA, *Smith.*

1. MORPHOTA FORMOSA. *M. capite thoraceque nigris; abdomine rufo, apice nigro, pilis argentatis ornato.*

*Female*. Length 5 lines. Black, with the two basal segments of the abdomen red; covered with a brilliant changeable silvery pile, most dense on the face, cheeks, sides of the metathorax, and on the apical margins of the abdominal segments. The mandibles ferruginous, with their apex piceous. The vertex smooth, and having *three distinct ocelli*; the head more produced behind the eyes than in *Larrada*. Thorax: the prothorax subtuberculate at the sides; wings subhyaline and iridescent, the nervures fuscous, the tegulæ pale testaceous behind. The apical margin of the first segment of the abdomen rufo-fuscous.

*Hab.* Celebes.

The insects belonging to the genus *Morphota* differ from those of *Larrada* in having three distinct ocelli, the vertex without any depressions, and the head much less compressed than in *Larrada*; the recurrent nervures are received nearer to the base and apex of the second submarginal cell; the species have, in fact, a distinct habit, and do not assimilate with the species of *Larrada*.

#### Genus TACHYTES, *Panz.*

1. TACHYTES MOROSUS. *T. niger, scutello abdomineque nitidis, facie argenteo-pilosa; marginibus lateralibus abdominis segmentorum argentatis.*

*Female*. Length 4½ lines. Black; the face covered with silvery pile; the thorax finely and very closely punctured; the metathorax opaque and finely rugose, thinly covered with cinereous pubescence; the anterior tarsi ciliated on the exterior, and the intermediate and posterior tibiæ with a few dispersed spines; wings fusco-hyaline and iridescent, the nervures fusco-ferruginous, the costal nervure black. Abdomen smooth and shining; the apical margins of the intermediate segments slightly depressed, with the sides sericeous.

Fam. CRABRONIDÆ.

Genus OXYBELUS, *Latr.*

1. *Oxybelus agilis*, *Smith, Cat. Hym. Ins.* pt. iv. 387. 25.

*Hab.* India, Celebes.

GENUS CRABRO, *Latr.*

1. CRABRO (RHOPALUM) AGILIS. *C. obscuro-nigra*, clypeo argentato, capite, thorace abdomineque flavo variis.

*Female.* Length 4 lines. Black, opaque; head larger than the thorax, quadrate; the ocelli in a curve on the vertex; the clypeus and lower portion of the cheeks with silvery pile; the scape, two basal joints of the flagellum, the palpi, and the mandibles, yellow; the latter rufo-piceous at their apex. The margin of the prothorax, the tubercles, the scutellum, the tibiæ and tarsi, the anterior femora and the intermediate pair at their apex yellow; the anterior femora black above; the wings subhyaline and iridescent, the nervures testaceous. Abdomen: with an elongate clavate petiole; the first segment with an oblique yellow macula on each side, the third with a large lateral macula at its base, and the following segments entirely yellow.

*Hab.* Celebes.

This species closely resembles the *C. Westermanni* of Dahlbome, from the Cape of Good Hope.

GENUS CERCERIS, *Latr.*

1. *Cerceris instabilis*, *Smith, Cat. Hym. Ins.* pt. iv. 452. 74.

*Hab.* India, China, Celebes.

2. *Cerceris unifasciata*, *Smith, Cat. Hym. Ins.* pt. iv. 456. 84.

*Hab.* North China, Celebes.

3. *Cerceris fuliginosa*, *Smith, Cat. Hym. Ins.* pt. iv. 454. 79.

*Hab.* Celebes.

4. CERCERIS VARIPES. *C. nigra*, facie flavo varia; alis fuscis basi hyalinis; pedibus variegatis; abdomine flavo maculato.

*Male.* Length 6 lines. Black; a line down the inner orbits of the eyes, continued along the lower margins of the face, and uniting with the clypeus, which as well as a line above it between the antennæ are yellow; a spot on the scape in front, and the mandibles, yellow; the latter rufo-piceous at their apex. Thorax: a spot on each side of the prothorax, a minute one on the tegulæ; the postscutellum, the intermediate and posterior coxæ and trochanters, the anterior tibiæ behind, the femora beneath, and the intermediate and posterior tibiæ yellow; the femora reddish above and at their articulations; the posterior femora and tibiæ black, with the tarsi rufo-testaceous; the anterior wings and the apex of the posterior pair brown, the base of the anterior pair hyaline. Abdomen: the second and three following segments with a short yellow stripe on each side.

*Hab.* Celebes.

Tribe VESPIDÆ.

Fam. EUMENIDÆ, *Westw.*

Genus ZETHUS, *Fabr.*

1. *Zethus cyanopterus*, *Sauss. Mon. Guêpes Sol.* i. 23. 2.

Genus MONTEZUMIA, *Sauss.*

1. *Montezumia Indica*, *Sauss. Mon. Guêpes Sol.* i. *supp.* 167. 59. t. 9. f. 4.

*Hab.* India, Celebes.

Genus RHYNCHIUM, *Spin.*

1. *Rhynchium hæmorrhoidale*, *Sauss. Mon. Guêpes Sol.* i. 109. 12. *Vespa hæmorrhoidalis*, *Fabr. Syst. Piez.* p. 259. 28.

*Hab.* India, Java, Cape of Good Hope, Celebes.

2. *Rhynchium argentatum*, *Sauss. Mon. Guêpes Sol.* i. 115. 22. *Vespa argentata*, *Fabr. Syst. Piez.* p. 260. 39.

*Hab.* India, Celebes.

3. *Rhynchium atrum*, *Sauss. Mon. Guêpes Sol.* i. 109. 11.

*Hab.* India, Celebes.

4. *Rhynchium parentissimum*, *Sauss. Mon. Guêpes Sol.* p. 111. 14. Var. *R. hæmorrhoidale*?

*Hab.* India, Java, Celebes.

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#### Genus EUMENES.

1. *Eumenes circinalis*, *Fabr. Syst. Piez.* p. 286. 4.

*Hab.* India, Sumatra, Celebes.

2. *Eumenes fulvipennis*, *Smith, Cat. Hym. Ins.* pt. v. 24. 26.

*Hab.* Celebes.

3. EUMENES VINDEX. *E. niger*, flavo variegatus, alis subhyalinis iridescentibus.

*Male.* Length 6 lines. Black; strongly punctured and shining; a minute spot behind the eyes, another in their emargination, the clypeus, with two minute spots above it, a spot at the base of the mandibles, and the scape in front yellow. Thorax: a subinterrupted line on its anterior margin, the tubercles, a spot on the tegulæ behind, and the legs yellow; the coxæ, femora at their base, and the posterior tibiæ outside dusky; wings light brown and iridescent, the anterior margin of the superior pair darkest. Abdomen delicately punctured; the apical margin of the first segment with a narrow yellow border slightly interrupted on each side; the apical segments with a thin cinereous pile.

*Hab.* Celebes.

4. EUMENES ARCHITECTUS. *E. niger*, clypeo, prothoracis margine postscutello abdominisque segmenti primi margine flavis.

*Female.* Length 6 lines. Black and closely punctured; a line behind the eyes near their vertex, a spot between the antennæ and the clypeus, yellow; the latter black at the apex, which is notched; the labrum and mandibles reddish-yellow, the latter black at their base. Thorax: the anterior margin yellow; the tubercles, tegulæ, postscutellum, an interrupted line on each side of the metathorax, the tibiæ, tarsi, and femora at their apex, yellow; the coxæ spotted with yellow and the posterior tibiæ dusky; the wings fusco-hyaline; a black line across the tegulæ. Abdomen: an ovate spot on each side of the petiole, its apical margin, a transverse ovate spot on each side of the first segment, and its posterior margin yellow; the following segments covered with a grey silky pile.

*Male.* Differs from the female in having the clypeus entirely yellow, the metathorax and abdomen entirely black; only the apical margin of the petiole is yellow, it is also longer.

*Hab.* Celebes.

5. EUMENES FLORALIS. *E. niger*; clypeo flavo; thorace pedibusque ferrugineo-flavo variegatis.

*Male.* Length 6½ lines. Black; strongly punctured and shining; the clypeus and a spot above yellow; a narrow abbreviated line behind the eyes, a minute spot in their emargination, and the tips of the mandibles orange-red; the flagellum fulvous beneath. Thorax: the anterior and posterior margin of the prothorax, the tubercles, and a spot on the tegulæ behind, a line on the postscutellum and the legs, orange-red, the coxæ black, and the tarsi dusky; the wings slightly brownish with a violet iridescence. Abdomen immaculate, with a minute spot on the posterior border of the petiole; the third and following segments with a fine cinereous pile.

*Hab.* Celebes.

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#### Genus ODYNERUS, *Latr.*

1. *Odynerus ovalis*, *Sauss. Mon. Guêpes Sol.* 215. 122. t. 19. f. 4.

*Hab.* India, China, Celebes.

2. ODYNERUS (ANCISTROCERUS) CLAVICORNIS. *O. niger*, flavo varius; capite thoraceque fortiter, abdomine delicatule punctatis, antennis clavatis.

*Male.* Length 4½ lines. Black; head and thorax strongly punctured and shining; a spot on the mandibles, the labrum, the clypeus, a spot above, the scape in front, a line in the emargination of the eyes and a spot behind them, yellow; the flagellum broadly clavate, the joints transverse, the apex of the club and the terminal hook reddish-yellow, the thickened part of the club concave beneath, the hook bent into the cavity.

Thorax: two spots on the anterior margin, a spot on the tegulæ in front, and the legs, reddish-yellow, the coxæ dusky; the metathorax coarsely rugose and deeply concave-truncate. Abdomen: the first segment with a transverse carina at its base, in front of which is an irregularly cut deep transverse channel forming a second carina in front of the groove; the segments finely punctured, the first and second segments with a yellow posterior border, the fourth and following segments rufo-piceous.

*Hab.* Celebes.

3. ODYNERUS (LEIONOTUS) INSULARIS. *O. niger*, flavo et aurantio variegatus; abdominis basi ferruginea.

*Male.* Length 6 lines. Black; the head and thorax strongly punctured; the mandibles, clypeus, a line above extending to the anterior ocellus, the emargination of the eyes, a spot at their vertex and a line at their outer orbits, yellow; the antennæ reddish-yellow, with the scape pale yellow in front and a narrow fuscous line above; the yellow marking more or less stained orange. Thorax: the prothorax orange, its anterior border, the tubercles, tegulæ, two spots on the scutellum and postscutellum, the lateral margins of the metathorax and the legs, yellow, the latter with reddish stains; wings subhyaline, the superior pair with a fuscous cloud at their apex. The base of the abdomen and a large macula on each side of the second segment ferruginous; the apical margin of the segments with a yellow border, the first and second with a minute notch in the middle; the first and second segments entirely ferruginous beneath.

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4. ODYNERUS FULVIPENNIS. *O. niger*, flavo varius, pedibus ferrugineis, alis fulvo-hyalinis.

*Male.* Black; head and thorax closely and strongly punctured; the clypeus and two spots above, a line along the lower margin of the sinus of the eyes, a narrow line behind them, the scape in front, and the mandibles yellow; the tips of the latter rufo-piceous; the antennæ and legs ferruginous; an interrupted yellow line on the anterior margin of the thorax; the wings fulvo-hyaline; the veins which enclose the marginal and second and third submarginal cells fuscous, the rest pale testaceous; a fuscous cloud in the marginal cell. Abdomen: the apical margin of the second segment with a yellow fascia, the following segments with red fasciæ.

*Hab.* Celebes.

#### Genus ICARIA, *Sauss.*

1. *Icaria ferruginea*, *Sauss. Mon. Guêpes Soc.* p. 37. 15.

*Hab.* India, Celebes.

2. ICARIA PILOSA. *I. nigra*, rude punctata et densissime pubescens, clypeo flavo, thorace, pedibus abdomineque ferrugineo variegatis; alis subhyalinis, anticis apice fusco maculatis.

*Male.* Length  $7\frac{1}{2}$  lines. Black; closely and strongly punctured; the clypeus, a line on the mandibles, and the scape in front, yellow; tips of the mandibles, the scape above, and the base of the flagellum ferruginous. Thorax: the prothorax, scutellum and postscutellum, ferruginous; the tegulæ and legs pale ferruginous, the coxæ black; wings fusco-hyaline, with a dark cloud in the marginal cell extending to the apex of the wing; a fainter cloud traverses the margin of the wing to its base. Abdomen: the first, second and third segments with a reddish-yellow fascia, that on the second segment continued beneath; a longitudinal broad stripe of the same colour on each side of the second segment; its apical margin serrated.

*Hab.* Celebes.

#### Genus POLISTES, *Latr.*

1. *Polistes sagittarius*, *Sauss. Mon. Guêpes Soc.* p. 56. 12.

Various specimens from Greece and Celebes have the thorax more or less ferruginous.

*Hab.* India, Celebes, China, Greece.

2. *Polistes Picteti*, *Sauss. Mon. Guêpes Soc.* 69. 28. t. 6. f. 8.

*Hab.* Ceram, Australia, Celebes.

3. *Polistes fastidiosus*, *Sauss. Mon. Guêpes Soc.* p. 60. 18.

*Hab.* Africa (Gambia), Celebes.

4. *Polistes stigma*, *Fabr. Syst. Piez.* p. 261. 41.

*Hab.* India, Ceram, Celebes.

5. *Polistes Philippinensis*, *Sauss. Mon. Guêpes Soc.* 58. 14 (var.).

*Hab.* Philippine Islands.

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## Genus VESPA, *Linn.*

1. *Vespa affinis*, *Fabr. Syst. Piez.* p. 254. 6 (var. *V. cincta?*).

*Hab.* India, China, Singapore, Celebes.

2. *VESPA FERVIDA*. *V. nigra*, delicatule punctata; clypei margine antica, macula pone oculos, margineque postica segmenti primi abdominis flavis; alis fulvo-hyalinis.

*Female*. Length 13 lines. Black; closely and finely punctured; the clypeus convex and strongly punctured, emarginate anteriorly, the emargination with a yellow border; the eyes extending to the base of the mandibles, which have three teeth at their apex and a narrow yellow line at their inner margin. Thorax: the postscutellum yellow, and a minute yellow spot on the outer margin of the tegulæ; the wings rufo-hyaline, darkest along the anterior margin of the superior pair; the nervures ferruginous, gradually becoming darker at the base of the wings, the costal nervure black.

*Worker*. Length 9 lines. Very closely resembles the female, but in addition to the yellow markings of that sex has the anterior margin of the clypeus yellow, a narrow transverse line between the antennæ, another along the lower margin of the notch of the eyes, an abbreviated stripe behind them at the base of the mandibles, a spot beneath the postscutellum and a narrow yellow line along the posterior margin of the basal segment of the abdomen.

*Hab.* Celebes.

## Fam. TENTHREDINIDÆ.

### Genus TENTHREDO, *Linn.*

1. *TENTHREDO* (*ALLANTUS*) *PURPURATA*. *T. capite thoraceque cæruleo-viridibus, abdomine purpureo, alis fuscis iridescentibus.*

Size, length 4 lines. Head and thorax blue-green, abdomen purple; wings dark fuscous with a violet iridescence; an oblique white line on each side beneath the scutellum; legs and antennæ black.

*Hab.* Celebes.

## Fam. ICHNEUMONIDÆ.

### Genus MEGISCHUS, *Brullé.*

1. *Megischus indicus*, *Westw. Trans. Ent. Soc. new ser. i.* 1851.

*Hab.* Philippine Islands, Celebes.

### Genus MESOSTENUS, *Brullé.*

1. *MESOSTENUS ALBO-SPINOSUS*. *M. niger*, albo varius, abdominis segmentis albo marginatis, metathorace spinis duabus albis armato.

*Female*. Length 5½ lines. Black; a half-circular spot on the clypeus, a heart-shaped one above it, a spot at the base of the mandibles, the orbits of the eyes, interrupted at their vertex, yellowish white, the palpi of the same colour, and a broad incomplete annulus on the antennæ beyond their middle. Thorax: the mesothorax with two deeply impressed oblique lines inclined inwards and terminating at an ovate spot in the middle of the disk, the scutellum and an oblique line on each side a little before it, a horseshoe-shaped spot in the middle of the metathorax, and a little below it on each side a conical tooth, yellowish white; four spots beneath the wings, one on each side of the metathorax, and the coxæ beneath, white; the legs ferruginous, with the intermediate pair dusky behind, the posterior pair entirely so, the femora being black; the wings hyaline, nervures fuscous. Abdomen: punctured and with a white fascia on the margins of the three basal segments; the two apical segments with very narrow fasciæ.

*Hab.* Celebes.

This species is closely allied to the *M. literatus* of Brullé; but it differs too much, I think, to be identical with it.

2. *PIMPLA TRIMACULATA*. *P. flava*, oculis, macula circa ocellos, vittulis tribus mesothoracis setisque caudalibus nigris.

*Female*. Length 6 lines. Yellow; the antennæ fuscous above, also a fuscous cloud at the apex of the anterior wings, the wings hyaline with the nervures black; a spot on the scape within, and three longitudinal stripes on the mesothorax, black; the latter slightly punctured anteriorly; the metathorax smooth and shining, with



three oblique carinæ on each side, and a small subovate enclosed space in the middle of the disk. Abdomen punctured, all the segments margined at their apex, and each with a deeply impressed line at their extreme lateral margins; the sixth segment with two minute black spots at its basal margin, the two apical segments smooth and shining; the ovipositor black.

*Hab.* Celebes.

This species is closely allied to the *P. trilineata* of Brullé.

## Fam. BRACONIDÆ.

1. BRACON INSINUATOR. *B. capite, thorace pedibusque ferrugineis; antennis, tibiis tarsisque posticis et abdomine nigris; alis nigro-fuscis, macula hyalina sub stigmatæ.*

*Female.* Length  $7\frac{1}{2}$  lines. Head and thorax smooth, shining, and ferruginous, the legs ferruginous, with the posterior tibiæ and tarsi black; the antennæ black, with the scape and following joint ferruginous; wings dark brown, with their extreme base pale testaceous; a hyaline stripe runs from the stigma across the first submarginal cell and passes a little below it. Abdomen black, smooth, and shining, with the lateral margins of the basal segment pale yellow-testaceous; this segment has on each side a longitudinal carina, and between them is a highly polished bell-shaped form; the second segment with deep oblique depressions at the sides, and deeply longitudinally rugose-striate, leaving the apical margin smooth and shining; the second segment is similarly sculptured, and the third has a transverse groove at its base.

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*Hab.* Celebes.

2. BRACON INTRUDENS. *B. rufescenti-flavus, antennis setisque caudalibus nigris; alis nigro-fuscis, basi fasciæ angusta transversa flavis.*

*Female.* Length 9 lines. Pale reddish-yellow; the eyes, flagellum, and ovipositor black; the scape and the following segment yellow; the head and thorax smooth and shining, both pubescent at the sides and beneath, the legs covered with a similar pale pubescence; the face with an upright horn between the antennæ, and a raised flattened plate in front of it. Abdomen: the basal segment with the lateral margins raised, and having on each side an elongate broad depression extending its entire length; the three following with an oblique depression on each side at the base of the segment; the third, fourth, and fifth segments distinctly margined at their apex; the ovipositor the length of the insect.

*Hab.* Celebes.

## Genus AGATHIS, *Latr.*

1. AGATHIS SCULPTURALIS. *A. nigra, prothorace, pedibus anticis mediisque ferrugineis; abdomine lævigato nitido.*

*Male.* Length  $5\frac{1}{2}$  lines. Black; the mouth, prothorax, anterior and intermediate legs, ferruginous; the face with two teeth or horns between or a little before the insertion of the antennæ, and another at the side of each, close to their insertion. Thorax: the mesothorax with two deeply impressed lines in front, running inwards, and uniting about the middle, and with two or three deep transverse channels before their junction; the lateral margins of the mesothorax deeply impressed; the metathorax ruggedly sculptured; the posterior coxæ and femora closely punctured; wings black with a hyaline spot in the first submarginal cell. Abdomen very smooth and shining, with a deeply impressed line on each side of the basal segment.

*Hab.* Celebes.

2. AGATHIS MODESTA. *A. rufescenti-flava; antennis, vertice, tibiis posticis apice, tarsisque nigris; alis fusco maculatis.*

*Female.* Length 4 lines. Reddish-yellow: the antennæ and vertex, black. The mesothorax with two deeply impressed longitudinal oblique lines, and two parallel ones between them; the metathorax reticulated; wings hyaline, with a dark fuscous stain crossing the anterior pair at the base of the first submarginal cell, these hyaline to the middle of the stigma, beyond which they are fuscous; a subhyaline spot at the apex of the marginal cell, and another beneath it at the inferior margin of the wing; the posterior tarsi dusky, and the tips of the tibiæ black.

*Hab.* Celebes.

3. AGATHIS NITIDA. *A. nigra, nitida; facie, pectore, pedibus anticis et intermediis, plaga infra alas, scutelloque pallide ferrugineis.*

Length 4 lines. Black and shining; the face, mandibles, head beneath, legs, pectus, sides of the thorax beneath the wings, the scutellum and the basal half of the abdomen beneath, pale ferruginous; the mesothorax with two longitudinal oblique lines on the disk, which have two parallel ones between them; the metathorax coarsely rugose; the wings dark brown, with the base of the stigma pale, and a hyaline spot beneath it. Abdomen very smooth and shining, with the apical margins of the segments narrowly rufo-piceous; the posterior legs incrassate and dark rufo-piceous.

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Fam. CHRYSIDIDÆ.

Genus HEDYCHRUM, *Latr.*

1. HEDYCHRUM FLAMMULATUM. *H. viridi-purpureo lavatum; capite thoraceque fortiter, abdomine delicatule, punctatis; alis fuscis basi hyalinis.*

Length 3 lines. Bright green; the vertex, two oblique stripes on the prothorax, meeting in the centre of its anterior margin, a broad longitudinal stripe on the disk of the mesothorax, and the sides of the scutellum and postscutellum deep purple. Abdomen: the middle of the basal segment, the second and third segments at their base, broadly purple; the apical margin of the third tinged with purple; wings subfuscous, with their base hyaline. The head and thorax coarsely and closely punctured, the abdomen finely so; the tarsi with the claws unidentate.

*Hab.* Celebes.

Genus CHRYSIS, *Linn.*

1. CHRYSIS PURPUREA. *C. læte purpurea, capite, thorace abdominisque basi rugosis punctatis, segmentis abdominis secundo et tertio delicatule punctatis, apice quadridentato.*

Length 3 lines. Bright purple; the head, thorax, and base of the abdomen strongly and coarsely punctured, the rest of the abdomen finely punctured; the disk of the thorax and apical margins of the segments of the abdomen reflecting bright tints of green; the wings subhyaline, the nervures dark fuscous; the apical margin of the third segment of the abdomen with four teeth, the two central ones approximating, separated by a deep notch, the lateral teeth more distant, separated from the others by a wide emargination.

*Hab.* Celebes.

2. CHRYSIS INSULARIS. *C. nigro-purpurea, violaceo et viridi lavata; capite, thorace abdominisque basi rude punctatis.*

Length 5 lines. Dark purple, with violet and green reflections; the face, legs, and thorax beneath, green; wings slightly fuscous, and iridescent; the head and thorax closely and coarsely punctured; the base of the abdomen roughly punctured, the two following segments much more finely so; the apical segment armed with six teeth, the outer ones subacute.

*Hab.* Celebes.

3. CHRYSIS SUMPTUOSA. *C. fortiter punctata, metallico-viridis auro lavata; thoracis disco, abdominis segmentis secundo et tertio basi purpureis; segmento apicali margine integro.*

Length  $3\frac{1}{4}$  lines. Golden-green; the thorax at the sides and posteriorly with bright coppery effulgence; an oblong purple spot on the disk of the thorax; the metathorax and its lateral teeth vivid green, the vertex and prothorax splashed with gold. Abdomen: the basal segment bright green, with a bright coppery or golden effulgence at the sides; the second segment purple at the base, coppery at the apex, and with a suffusion of green between these tints; the third segment is similarly coloured, with the apical margin entire; the insect closely and strongly punctured throughout.

*Hab.* Celebes.

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Description of a new Genus of Crustacea, of the Family Pinnotheridæ; in which the fifth pair of legs are reduced to an almost imperceptible rudiment. By THOMAS BELL, Esq., Pres. L. S.

[Read June 3rd, 1858.]

Fam. PINNOTHERIDÆ, *Edwards.*

Genus AMORPHOPUS, *Bell.*

CHAR. GEN.:—Corpus subcylindricum. Testa semicircularis, margine posteriore recto.—*Antennæ externæ minimæ*, articulo basali orbitam subtus partim claudente.—*Antennularum fossulæ* transversæ, continuæ, et ab orbitis haud separatæ.—*Pedipalpi externi* articulo quarto ovato, palpo tri-articulato, ad angulum antico-interiorem articuli quarti inserto.—Oris apertura antice arcuata.—*Orbitæ* apertæ, margine inferiore carente, superiore integro.—*Oculi* transversim positi.—*Pedes antici* robusti, inæquales; *pedum paria secundum, tertium et quartum* longa, subcompressa; *par quintum* exiguum, simplicissimum, rudimentarium, in incisura articuli basalis paris quarti insertum.—*Abdomen* MARIS segmentis tertio cum quarto, et quinto cum sexto coalitis; FEMINÆ?

*Description.*—The body is nearly cylindrical, somewhat depressed, the carapace very much curved from the point to the back, quite straight from side to side; the anterior and lateral margins forming nearly a semicircle, the posterior margin straight; the orbits are deeply cut in the anterior margin of the carapace, looking upwards; the inferior margin wanting; the oral aperture much arched anteriorly; the external footjaws with the third articulation somewhat rhomboid, the fourth irregularly oval, and the palpi three-jointed, inserted at its anterior and inner angle. Epistome extremely small, transversely linear; the external antennæ placed directly beneath the orbits, the basal joints partly filling them beneath. The antennules folded transversely in large open fossæ, which are scarcely at all separated from each other, and are open to the orbits, the eyes lying transversely; the peduncles short and thick; the sternum is semicircular, the segments separated by very deep grooves; the abdomen very long and narrow, the first and second joint transversely linear, the third and fourth united and forming a triangle truncated anteriorly at the articulation of the portion formed by the fifth and sixth joints united, and which with the seventh form a very narrow and linear piece extending forwards to the posterior margin of the oral aperture; the first pair of legs robust, unequal (the right being the larger in the only specimen at present observed); the hand in each as broad as it is long; that of the smaller conspicuously tuberculated, that of the larger much less so; the former with the fingers nearly meeting throughout their length, those of the latter only at the tips; the second, third, and fourth pairs of legs are long, somewhat compressed, the third joint tuberculated on the under side, the third pair the longest; the fifth pair is reduced to a mere rudiment, in the form of a minute tubercle inserted in a little notch at the base of the first joint of the fourth pair, and scarcely discernible by the naked eye.

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*Observations.*—The relation of this genus to the Pinnotheridæ is tolerably obvious, in the smallness of the antennæ, the direction and arrangement of the eyes, and particularly in the form of the oral aperture, and of the external footjaws. I shall not, however, enter upon the consideration of these relations, as I am about shortly to offer to the Society a review and monograph of the whole of this family. The most remarkable peculiarity in the genus is the apparent absence of the fifth pair of legs, which can only be discovered to exist at all by examination with the help of a lens. In this respect I doubt not that the Fabrician genus *Hexapus*, adopted and figured by De Haan, will be found to agree with it, although it is very remarkable that the anomalous condition of this part never excited any particular attention on the part of either of these distinguished naturalists; and De Haan describes Fabricius's species, *Hexapus sexpes*, as if there were nothing especial or abnormal in a Decapod having only six pairs of legs besides the claws. Mr. White made a similar mistake on one occasion, when he described an anomalous genus allied to *Lithodes*, in which the fifth pair of legs were not visible; but when, at my suggestion, a more careful examination was made, they were found, as was anticipated, in a rudimentary form, concealed under the edge of the carapace. I believe that I can discover even in De Haan's figure something like a little tubercle at the base of the fourth leg, which is probably the rudimentary representative of the fifth.

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Death of the Common Hive Bee, supposed to be occasioned by a parasitic Fungus. By the Rev. HENRY HIGGINS. Communicated by the President.

[Read June 3rd, 1858.]

On the 18th of March last, Timpron Martin, Esq., of Liverpool, communicated to me some circumstances respecting the death of a hive of bees in his possession, which induced me to request from him a full statement of particulars. Mr. Martin gave me the following account:—

"In October last I had three hives of bees which I received into my house. Each doorway was closed, and the hive placed upon a piece of calico; the corners were brought over the top, leaving a loop by which the hive was suspended from the ceiling. The hives were taken down about the 14th of March; two were healthy, but all the bees in the third were dead. There was a gallon of bees. The two hives containing live bees were much smaller; but in each of them were dead ones. Under whatever circumstances you preserve bees through the winter, dead ones are found at the bottom, in the spring. The room, an attic, was dry; and I had preserved the same hives in the same way during the winter of 1856. In what I may call the dead hive there was an abundance of honey when it was opened; and it is clear that its inmates did not die for want. It is not a frequent occurrence for bees so to die; but I have known another instance. In that case the hive was left out in the ordinary way, and possibly cold was the cause of death. I think it probable that my bees

died about a month before the 14th of March, merely from the circumstance that some one remarked about that time that there was no noise in the hive. They might have died earlier; but there were certainly live bees in the hive in January. I understand there was an appearance of mould on some of the combs. There was ample ventilation, I think; indeed, as the bees were suspended, they had more air than through the summer when placed on a stand."

When the occurrence was first made known to me, I suggested that the bees might probably have died from the growth of a fungus, and requested some of the dead bees might be sent for examination. They were transmitted to me in a very dry state; and a careful inspection with a lens afforded no indications of vegetable growth. I then broke up a specimen, and examined the portions under a compound microscope, using a Nacet No. 4. The head and thorax were clean; but on a portion of the sternum were innumerable very minute, linear, slightly curved bodies, showing the well-known oscillatory or swarming motion. Notwithstanding the agreement of these minute bodies with the characters of the genus *Bacterium* of the Vibrionia, I regarded them as spermatia, having frequently seen others undistinguishable from them under circumstances inconsistent with the presence of *Confervæ*, as in the interior of the immature peridia and sporangia of Fungals.

In the specimen first examined there were no other indications of the growth of any parasite; but from the interior of the abdomen of a second bee I obtained an abundance of well-defined globular bodies resembling the spores of a fungus, varying in size from .00016 to .00012 in. Three out of four specimens subsequently examined contained similar spores within the abdomen. No traces of a mycelium were visible; the plants had come to maturity, fruited, and withered away, leaving only the spores.

The chief question then remaining to be solved was as to the time when the spores were developed; whether before or after the death of the bees. In order, if possible, to determine this, I placed four of the dead bees in circumstances favourable for the germination of the spores, and in about ten days I submitted them again to examination. They were covered with mould, consisting chiefly of a species of *Mucor*, and one also of *Botrytis* or *Botryosporium*. These fungi were clearly extraneous, covering indifferently all parts of the insects, and spreading on the wood on which they were lying. On the abdomen of all the specimens, and on the clypeus of one of them, grew a fungus wholly unlike the surrounding mould. It was white and very short, and apparently consisted entirely of spores arranged in a moniliform manner, like the fertile filaments of a stemless *Penicillium*. These spores resembled those found in the abdomen of the Bees, and proceeded I think, from them. The filaments were most numerous at the junction of the segments. The spores did not resemble the globules in *Sporendonema muscæ* of the English Flora, neither were they apparently enclosed.

The Rev. M. J. Berkeley, to whom I sent some of the bees, procured, by scraping the interior of the abdomen with a lancet, very minute, curved linear bodies from 1/8000 to 1/10000 in. long, which he compares to Vibrios. He also found mixed with them globular bodies, but no visible stratum of mould.

From the peculiar position of the supposed spores within the abdomen of the bees, and from the subsequent growth of a fungus unlike any of our common forms of Mucedines, I think it probable that the death of the bees was occasioned by the presence of a parasitic fungus.

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Notice of the occurrence of recent Worm Tracks in the Upper Part of the London Clay Formation near Highgate. By JOHN W. WETHERELL. Communicated by JAMES YATES, Esq., M.A., F.L.S.

[Read June 3rd, 1858.]

The London clay is very tenacious, and near the surface is generally of a brown colour, probably owing to the decomposition of the iron pyrites which it contains. It abounds in selenite or sulphate of lime, and in nodules which often contain organic remains. Fossil wood with *Teredo antenautæ* is also met with, and pyritous casts of univalve and bivalve shells. Lower down the stratum becomes more compact and is of a bluish or blackish colour, and its fossil contents are in a fine state of preservation. During the last summer, while examining the London Clay in the vicinity of Highgate in search of fossils, my attention was directed to certain appearances in it which I could not account for. This led to a further examination, when I found they were produced by the borings of *Lumbrici* or earth-worms. These appearances consisted of long tubes passing nearly perpendicularly through the clay and terminating in receptacles or *nidi*, each tube

leading to a separate receptacle. As these receptacles occurred in large numbers, I had an opportunity of examining a great many of them with various results. In one instance, I found a dead worm coiled up; in another, a portion of a worm protruding into the lower part of the tube. Again, *nidi* were found partially filled with only the casts of worms, whilst others contained more or less of a species of *Conferva*; and, lastly, I obtained some with the cavities partially or wholly filled up. The receptacles varied in shape, from a sphere to an oval, and were extremely thin and fragile. They also varied in size from a pea to a nut. Externally they presented an appearance so singularly contorted, that I could not help considering they were moulded from the casts of worms. They did not appear to have any attachment to the surrounding clay, except at the point of junction with the tube; and the clay beneath them presented no unusual appearance.

Internally they generally exhibited impressions of the worm; but occasionally I detected some of the round and contorted appearances which I have mentioned as being so conspicuous on the outside. I cannot speak with precision as to the length of the tubes, as the clay when examined had been broken up into large rough masses in digging for the foundations of houses. The largest noticed was about three inches long, and the general width one-eighth of an inch. They often run parallel to each other, but at unequal distances. I now have to notice what I consider a remarkable circumstance, namely, that all the tubes contained a solid cylinder of clay, and in every instance where the worms occurred under the circumstances above recorded, they were found to be dead. Researches of this kind are calculated to throw a light on some of those singular phenomena which geologists occasionally meet with in the older rocks.

[*Mem.*—Several specimens of clay, containing the worm-tubes as above described, were exhibited to the meeting.]

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Natural History—Extracts from the Journal of Captain Denham, H.M. Surveying Vessel 'Herald,' 1857. Communicated by Captain WASHINGTON, through the Secretary.

[Read June 3rd, 1858.]

We found upon the larger islands the small species of the Kangaroo, bearing the native name Wallaby (*Halmaturus Billardieri*), which, when mixed with other meats, affords a fine-flavoured soup.

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On the islets are flocks of the Cape Banca goose, which Mr. Smith informed me were only to be found in these straits in the vicinity of Flinders Island, from Cape Banca to Cape Frankland (west about), and that they are readily domesticated, and hatch from three to seven eggs, and afford an acceptable dish. I obtained a live specimen, which Dr. Rayner of this ship describes thus:—" *Cereopsis Novæ Hollandiæ*. Body about the size of a common goose; bill short, vaulted, obtuse, two-thirds of which is covered by an expanded cere of a pale greenish-yellow colour, the tip of the bill being black, arcuated, and truncated. Nostrils large, round, open, and situated in the middle of the bill. Wings ample, third quill longest. Legs long, light dull-red, and naked to a little above the knee. Feet black, webbed, the membrane being deeply notched, great toe articulated to the metatarsus. Plumage slate-grey, with black spots upon the wings and back. Wing-feathers dusky black, and edged at the tip with pale grey. Irides light hazel."

We likewise obtained specimens of the following wildfowl:—

#### AVES.

A Bronze-wing Pigeon,	Phaps elegans.
Quail,	Coturnix pectoralis ( <i>Gould</i> ).
Oyster-catcher,	Hæmatophus fuliginosus.
Ring Plover,	Hiaticula bicincta.
Wild Duck,	Anas punctata ( <i>Cuvier</i> ).
Great Gull,	Larus pacificus.
Lesser Gull,	Xema Jamesonii.
Mutton Bird,	Puffinus brevicaudus ( <i>Brandt</i> ).
Southern Gannet,	Sulu australis ( <i>Gould</i> ).
Small Penguin,	Spheniscus minor ( <i>Temminck</i> ).

The Mutton Bird we observed streaming from island to island; and I learnt from Mr. Benvenuto Smith the following particulars of its habits from his own observations.

The male birds come in from sea in the month of September, and prepare the burrows for the reception of the hens. The hen bird does not make her appearance till about the 25th November, when she lays and sits at once.

The Mutton Bird lays but one egg; they are employed rearing the young bird until the month of May, at which time the old birds leave the young ones to shift for themselves; the young birds remain in the burrows till they are starved down, and then set off to sea, and are not seen again amongst the islands till September. The cock and hen sit alternately night and day; and all the labour of providing for the young is equally shared.

There are at this date about ninety people living on the small islands in "Franklin Inlet" who make a livelihood by gathering the oil, feathers, and eggs of the Mutton Bird.

Upwards of 2000 gallons of the oil are extracted from the birds annually; and although 300,000 birds are known to be destroyed each year, they appear undiminished in numbers. The oil burns well, and is of a bright-red colour.

I was presented by Mr. Smith with two Paper Nautilus shells (*Argonauta tuberculosa*) found on the shore of Flinders Island this season, a circumstance which he has remarked occurs but every seventh year, when many hundreds are thrown up: the shells are rarely obtained perfect, as they are extremely fragile, and the sea fowl pick the fish out of them.

Our Botanic Collector, Mr. Milne, ascertained, from what he obtained himself and from what we could contribute from our individual visits to the islets, the existence of plants, which he believes to be indigenous, belonging to the following families and genera, viz.

- Amentaceæ. Umbelliferæ.
- Asteraceæ. Graminaceæ.
- Rosaceæ. Junceæ.
- Geraniaceæ. Solanum.
- Euphorbiaceæ. Geranium.
- Myrtaceæ.

Testing the chances of fish refreshment at this anchorage, we found little encouragement for hook and line; but the two favouring opportunities which the weather allowed for hawling the seine produced as tabulated on opposite page.

We found the Reef Islands in this sound so abundant in rabbits since Captain Stokes's forethought had set some loose upon them, that, in two visits of four hours with but four guns, 100 brace were brought on board.

I took care to follow my esteemed brother officers' example and the system of introducing such productions, and obtained a dozen couple alive for letting loose in Shark Bay.

[A coloured drawing of *Cereopsis Novæ Hollandiæ* accompanied Captain Denham's observations.]

Locality.	How many hauls and phase of	Trawl-seine, or hook and line.		Natural History Names.	Common Names.	No. of Pounds sorts. weight.	
		Depth of water.	Nature of bottom.				
West side Flinders Isl.	6 hauls	with seine.		Mugil	Mullet	23	28
Settlement Bay	...	1/2	...	Hemiramphus	Gar-fish	10	5
H.W.F. & C. X. 30.	14 days	1 fathom on a flat	Sand and weed	{Raia	Flat-head, small	3	1
Range 10 ft.	L.W.	...	...	{Iulis	Sting Ray	2	29
East side of Hummock Island	7 hauls	with seine (mar.).			Small fish of the Basse family	Several	...
		...	...	Labrax	Basse	1	1
		...	...	{Myliobatis	Ray	11	375
		1 to 3	Sandy	{Mugil	Mullet	20	30

centre	26 days	fams.	beach	Platycephalus	Flat-head	3	2
				{Siphyracus	Barracouta	1	1
Bay	at 3/4 flood	... ..	... ..	{Scomberesox	Saury	27	17
				{Sepioteuthis	Cuttlefish	Several	...
					Total	...	489

On some points in the Anatomy of *Nautilus pompilius*. By T. H. HUXLEY, F.R.S., Professor of Natural History, Government School of Mines.

[Read June 3rd, 1858.]

Some time ago my friend Dr. Sinclair, of New Zealand, had the kindness to offer me two specimens of the Pearly Nautilus which had been brought to him from New Caledonia, preserved in Goadby's solution. I gladly accepted the present, and looked forward to the dissection of the rare animal with no little pleasure; but on proceeding to examine one of the specimens, I found its anatomical value greatly diminished by the manner in which a deposit from the solution had glued together some of the internal viscera. Other parts of the Nautilus, however, were in a very good state of preservation; and I have noted down such novel and interesting peculiarities as they presented, in the hope that an account of them will be acceptable to the Linnean Society.

Of the six apertures which, besides the genital and anal outlets, open into the branchial cavity of *Nautilus pompilius*, one on each side lies immediately above and in front of that fold of the inner wall of the mantle which forms the lower root of the smaller and inner gill, and encloses the branchial vein of that gill. The aperture is elongated and narrow, with rather prominent lips. It measures about 1/8th of an inch.

The other two apertures are larger, and lie at a distance of 7/16ths of an inch below and behind the other. They are in close juxta-position, being separated only by a thin triangular fold of membrane, which constitutes the inner lip of the one and the outer lip of the other.

The inner aperture is the larger, measuring 3/16ths of an inch in long diameter, and having the form of a triangle with its base directed posteriorly. The outer aperture is not more than 1/8th of an inch long. The two apertures lie just above the edge of the fold of membrane which runs from the inner root of the larger or outer branchia, across the branchial cavity and beneath the rectum, to the other side.

These apertures lead into five sacs, which collectively constitute what has been described as the pericardium. The sacs into which the superior apertures open, by a short wide canal with folded walls, are situated on each side of and above the rectum. Their inner boundaries are separated by a space of not less than 5/8ths of an inch in width, in which lie the vena cava and the oviduct. Each cavity has a rounded circumference, and a transverse diameter of about half an inch. In a direction at right angles to this diameter the dimensions vary with its state of distension; but a quarter of an inch would be a fair average.

The anterior or outer wall of the cavity is formed by the mantle; the posterior, inner, or visceral wall by a delicate membrane. The former separates it from the branchial cavity; the latter from the fifth sac, to be described by-and-by. I could find no natural aperture in the thin inner wall, so that I conceive no communication can take place between either of these sacs and the fifth sac.

Two irregular, flattened, brownish, soft plates depend from the posterior wall of the sac into its cavity; their attached edges are fixed along a line which is directed from behind obliquely forwards and upwards.

The outer and smaller of the inferior apertures on each side leads into a sac of similar dimensions and constitution to the preceding, but having a less rounded outline in consequence of its being flattened in one direction against its fellow of the opposite side, from which it is separated only by a delicate membranous wall, whilst on another side it is applied against the inferior wall of the superior sac, and is in like manner separated from it only by a thin and membranous partition.

Like the upper sacs, each of these has two dark-brown, lamellar, glandular masses depending from its membranous visceral wall.

A delicate, but broad, triangular membranous process, about 1/4th of an inch long, hangs down

freely from the visceral wall of the cavity just behind the opening of the short canal which connects the sac with its aperture.

The third and largest aperture on each side opens directly into a very large fifth cavity, whose boundary is formed anteriorly by the visceral walls of the sacs already described, and behind this by the mantle itself as far as the horny band which marks and connects the insertion of the shell-muscles.

In fact this cavity may be said to be co-extensive with the attached part of the mantle,—the viscera, enclosed within their delicate "peritoneal" membranous coat, projecting into and nearly filling it, but nevertheless leaving a clear space between themselves and the delicate posterior wall of the mantle.

A layer of the "peritoneal" membrane extends from the posterior edge of the muscular expansion which lies between the shell-muscles and from the upper wall of the dilatation of the vena cava, and passes upwards and backwards like a diaphragm to the under surfaces of the gizzard and liver. It is traversed by the aorta, to whose coats it closely adheres.

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Along a line nearly corresponding with the horny band which proceeds from the insertions of the shell-muscles and encircles the mantle below, the pallial wall is produced inwards and forwards into a membranous fold or ligament, which I will call the pallio-visceral ligament; and this pallio-visceral ligament becoming attached to various viscera, divides the great fifth chamber into an anterior inferior, and a posterior superior portion, which communicate freely with one another.

Commencing with its extreme right-hand end, the ligament is inserted into the line of reflection of the mantle, and then into the wall of the oviduct, which becomes enclosed as it were within the ligament. The latter then ends in a free edge on the inner side of the oviduct, and is continued along it until it reaches the inferior surface of the apex of the ovary, into which it is inserted.

The free edge is arcuated; and the rectum passes over it, but is in no way connected with it.

Here, therefore, is one great passage of communication between the anterior and posterior divisions of the fifth chamber.

On the left side, this aperture is limited by the heart, whose posterior edge is, on the left side, connected by means of a ligamentous band with the surface of the apex of the ovary; but on the right, for the greater part of its extent, receives a process of the pallio-visceral ligament. Between the ovario-cardiac ligament and this process lies the small oval aperture already described by Professor Owen, which gives passage to the siphonal artery. It constitutes the middle aperture of communication between the two divisions of the fifth chamber.

The left-hand end of the ligament is inserted into the upper wall of the dilated end of the vena cava; but between this point and the heart it has a free arcuated edge, as on the right side.

Thus there are in reality three apertures of communication between the two divisions of the fifth chamber, the middle, by far the smallest, being alone hitherto known.

A delicate membranous band passes from the whole length of the middle line of the rectum to the heart and to the ovary.

The singular "pyriform appendage" of the heart lies in the left process of the ligament, its anterior edge nearly following the arcuated contour of that process.

The siphuncular process of the mantle was broken in my specimen; but its aperture appeared to communicate quite freely with the posterior division of the fifth chamber.

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Four sets of brownish, glandular-looking bodies depend into the anterior division of the fifth chamber, from parts of the delicate septa dividing this from the four small sacs, corresponding with the insertions of the glandular bodies above described.

In fact, on distending the vena cava with air, it is found that the four branchial arteries traverse these septa, and that the appendages in question are diverticula of their walls. Consequently the anterior wall of each branchial vein is produced into two glandular appendages, which hang into one of the four smaller sacs, while the posterior wall is produced into a single mass of appendages, which hangs into the anterior division of the fifth chamber.

Although, as I believe, the five chambers do not communicate directly, all the appendages must nevertheless be equally bathed with sea-water, which enters by the apertures of the chambers.



An impacted yellowish-white concretary matter filled the anterior chamber; and a small quantity of it lay as a fine powder at the bottom of the posterior one. In the latter, however, its presence might, by possibility, have been accidental. My colleague, Dr. Percy, who kindly undertook to examine this substance, informs me that he has been unable to detect uric acid in it. The follicular appendages of the branchial arteries present remarkable differences in their external appearance. The eight which hang into the four anterior chambers are similar, slightly festooned, but otherwise simple lamellæ; while the four which depend into the posterior chambers are produced into a number of papillary processes. This external difference is obvious enough: whether it be accompanied by a corresponding discrepancy in minute structure I am unable to say; for I have not as yet been able to arrive at any satisfactory results from the microscopic examination of the altered tissues, and, as will be seen below, the only observer who has had the opportunity of examining the Nautilus in the fresh state has not noted any difference of structure in the two sets of follicles.

One is naturally led to seek among other mollusks for a structure analogous to the vast posterior aquiferous chamber of the Nautilus; and it appears to me that something quite similar is offered by the *Ascidioidea* and the *Brachiopoda*. In both cases, the viscera, inclosed within a delicate tissue, project into a large cavity communicating freely with the exterior by the cloacal aperture in the one case, and by the funnel-shaped channels which have been miscalled "hearts" in the other.

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The rudimentary renal organs of the Ascidian are developed in the walls of the cavity in question; and an aquiferous chamber of smaller dimensions has the same relation to the kidney in Lamellibranchiata—in Gasteropoda, Heteropoda, Pteropoda, and dibranchiate Cephalopoda. But although such is likely enough to be the case, we do not know at present that the aquiferous chambers in any of the last named mollusks attain an extension similar to that which obtains in Nautilus.

On comparing the observations detailed above with the statements of previous writers, I find that, in his well-known "Memoir on the Pearly Nautilus" (1832), Professor Owen describes "on each side, at the roots of the branchiæ," "a small mamillary eminence with a transverse slit which conducts from the branchial cavity into the pericardium. There is, moreover, a foramen at the lower part of the cavity (*o*, pl. 5) permitting the escape of a small vessel; and by the side of this vessel a free passage is continued between the gizzard and ovary into the membranous tube or siphon that traverses the divisions of the shell, thus establishing a communication between the interior of that tube and the exterior of the animal."

The foramen here described is easily seen; but, as I have stated, there are other modes of communication between the so-called pericardium and the cavity with which the siphuncle communicates, of a far more extensive nature.

With respect to the pericardium itself, Professor Owen states, "The peritoneum, after lining the cavity which contains the crop and liver, and enveloping those viscera, forms two distinct pouches at the bottom of the pallial sac, in one of which, the left, is contained the gizzard, and in the other the ovary; anterior to these, and on the ventral aspect of the liver, is another distinct cavity, of a square shape, which contains the heart and principal vessels, with the glandular appendages connected therewith." This is what the author terms the pericardium.

As Van der Hoeven has pointed out, however, the gizzard lies to the right and the ovary to the left. Moreover, the gizzard is superior to the ovary, so as only to overlap it a little above; and I can find no evidence of the existence of such distinct pouches as those described.

Professor Owen states that the branchiæ "arise by a common peduncle from the inner surface of the mantle." My own observations, however, and Van der Hoeven's figures, of both male and female, lead me to believe that the peduncles of the branchiæ are perfectly distinct from one another.

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The follicles of the branchial arteries are thus described in the "Memoir on the Pearly Nautilus:"—"They are short and pyriform and closely set together. To each of the branchial arteries are appended three clusters of these glands, of which one is larger than the united volume of both the others; and the larger cluster is situated on one side of the vessel and the two smaller on the opposite side. Each of these clusters is contained in a membranous receptacle proper to itself, partitioned off, as it were, from the pericardium, but communicating with it.... The two canals which form the communication between the pericardium and the branchial cavity commence at the receptacle of the lesser cluster attached to the superior branchial arteries, and terminate at the papillæ before mentioned, which are situated at the roots of the branchiæ. The pericardium and these receptacles of the glands, when first laid open, were found filled with a

coagulated substance so closely compacted as to require a careful removal, bit by bit, before the contained follicles and vessels could be brought into view."

Like Valenciennes and Van der Hoeven, I have been unable to find any communication between the four sacs in which the small double clusters of follicles are contained, and the "pericardium;" and I hold it to be certain that the other four sets of follicles are not contained in sacs at all, but lie free in the "pericardium" or posterior chamber.

No notice is here taken of the widely different characters of the anterior and posterior follicles; and the figure gives both a similar structure.

Valenciennes ("Nouvelles Recherches sur le Nautilé Flambé," 'Archives du Muséum,' ii., 1841) pointed out the existence of three pairs of apertures opening into the branchial sac, besides the genital and anal openings; and he affirms that they open into as many closed sacs, which communicate neither with one another nor with the cavity that contains the heart. M. Valenciennes indicates the difference in the structure of the anterior and posterior venous appendages. He seems to me to have seen something of the part which I have described as the pallio-visceral ligament; but I cannot clearly comprehend either his figure or his description.

Van der Hoeven, in his 'Contributions to the Knowledge of the Animal of *Nautilus pompilius*,' 1850, confirmed the statement of Valenciennes with regard to the existence of three pairs of apertures; but he showed, in opposition to him, that one of these pairs of apertures communicated with the pericardium. The sacs into which the other two pairs open are, according to this anatomist, blind. In the aperture of the anterior blind sac he found a concretory matter which he supposed to contain uric acid, but chemical analysis did not confirm the supposition. Van der Hoeven refers to some observations by Vrolik; but as these are in Dutch, and have not, so far as I can find, been translated into either French, German, or English, I know not what they may contain.

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In his more recent essay, translated in 'Wiegmann's Archiv' for 1857, under the title of "Beitrag zur Anatomie von *Nautilus pompilius*," Van der Hoeven states that he has again found hard concretions in the chamber enclosing the appendage of the anterior branchial artery, and that these on chemical analysis yielded phosphate of lime and traces of fat and albumen, but no uric acid.

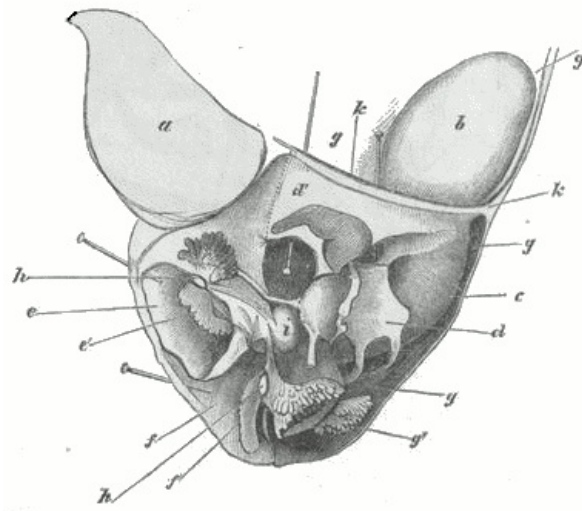
Mr. Macdonald, in a valuable paper on the anatomy of *Nautilus umbilicatus*, published in the Philosophical Transactions for 1855, thus describes the follicular appendages of the branchial arteries:—

"These follicles are subcylindrical in form, somewhat dilated at the free extremity, to which is appended a folded and funnel-shaped process of membrane, which expands rather suddenly, presenting a jagged and irregular border. They open by a smooth and oval or slit-like, orifice into the afferent pulmonary vessels, on each of which, as Professor Owen has observed, they are disposed in three clusters. The outer membrane is smooth and glassy, homogeneous in structure and sprinkled over with minute rounded and transparent bodies, probably the nuclei of cells. Beneath this layer, flat bundles of fibres, apparently muscular, are traceable here and there, principally disposed in a longitudinal direction, and sometimes branched. The lining membrane consists of a loose epithelial pavement in many respects similar to that of the uriniferous tubules of the higher animals, the cells containing, besides the nuclei, numerous minute oil-globules, or a substance much resembling concrete fatty matter. This membrane is thrown up into an infinite number of papillæ and corrugations, so as to augment the extent of surface considerably. The papillæ are more numerous at the inner part or towards the attached end; and a circlet of longitudinally disposed folds radiate from the bottom of the follicles, in which a number of small pits or fenestrations are sometimes visible. The sides of these folds are wrinkled transversely so as to present a median zigzag elevation. The funnel-shaped membranous process above noticed is continuous with the lining membrane, consisting of an extension of the same epithelial pavement; but the cells are somewhat larger and more regular in form. The cavity of each follicle, therefore, communicates with the exterior through the centre of this process; and the aperture is thus guarded by a kind of circular valve, permitting the escape of secreted matter, but effectually preventing the entrance of fluid from without."

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In his fig. 9, pl. xv., Mr. Macdonald depicts certain "crystalline bodies often occurring within the follicles."

From what Mr. Macdonald states, one would be led to conclude that all the follicles have the same structure; but I suspect this to be an oversight.



Nautilus pompilius. Fig. 1.

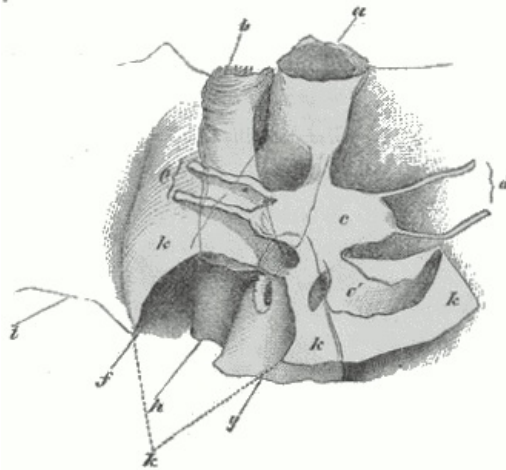
Viewed from the left side and a little behind.

Two of the anterior chambers, and the fifth or posterior chamber, laid open. Natural size.

a. Shell muscle. b. Ovary. c. Intestine. d. Heart; d'. its pyriform appendage. e. Superior anterior chamber; e'. its follicles. f. Inferior anterior chamber; f'. its follicles. g. Posterior chamber; g'. Follicles. h. Cut ends of branchial arteries. i. Termination of vena cava. k. Pallio-visceral ligament.

In the second edition of Professor Owen's Lectures on the Invertebrata (1855), I find no mention of Valenciennes' discovery of the additional four apertures; but the author states that "on each side, at the roots of the anterior branchiæ, there is a small mamillary eminence with a transverse slit, which conducts from the branchial cavity to one of the compartments of the pericardium containing two clusters of venous glands. There are also two similar, but smaller, slits, contiguous to one another, near the root of the posterior branchia on each side, which lead to and may admit sea-water into the compartments containing the posterior cluster of the venous follicles." In this work the ovary is not only described, but *figured*, on the right side of the gizzard. The figure, however, rightly places the greater part of the ovary below that organ.

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Nautilus pompilius. Fig. 2.

Natural Size.

The pallio-visceral ligament seen from below: torn on the right side to show the rectum and oviduct; cut through on the left side along the dotted line close to d' in the preceding figure.

a. Anus. b. Oviducal aperture. c. Heart. d. Left branchial veins. e. Right branchial veins. f. Oviduct cut through. g. Ovary. h. Rectum. i.

Mantle. k k k. Pallio-visceral ligament; k'. its torn portion. The oval "aperture for the siphonal artery" is seen to the left of c', and the right-hand style in Fig. 1 passes through it.

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On the Tendency of Species to form Varieties; and on the Perpetuation of Varieties and Species by Natural Means of Selection. By CHARLES DARWIN, Esq., F.R.S., F.L.S., & F.G.S., and ALFRED WALLACE, Esq. Communicated by Sir CHARLES LYELL, F.R.S., F.L.S., and J. D. HOOKER, Esq., M.D., V.P.R.S., F.L.S., &c.

[Read July 1st, 1858.]

London, June 30th, 1858.

MY DEAR SIR,—The accompanying papers, which we have the honour of communicating to the Linnean Society, and which all relate to the same subject, viz. the Laws which affect the Production of Varieties, Races, and Species, contain the results of the investigations of two indefatigable naturalists, Mr. Charles Darwin and Mr. Alfred Wallace.

These gentlemen having, independently and unknown to one another, conceived the same very ingenious theory to account for the appearance and perpetuation of varieties and of specific forms on our planet, may both fairly claim the merit of being original thinkers in this important line of inquiry; but neither of them having published his views, though Mr. Darwin has for many years past been repeatedly urged by us to do so, and both authors having now unreservedly placed their papers in our hands, we think it would best promote the interests of science that a selection from them should be laid before the Linnean Society.

Taken in the order of their dates, they consist of:—

1. Extracts from a MS. work on Species[A], by Mr. Darwin, which was sketched in 1839, and copied in 1844, when the copy was read by Dr. Hooker, and its contents afterwards communicated to Sir Charles Lyell. The first Part is devoted to "The Variation of Organic Beings under Domestication and in their Natural State;" and the second chapter of that Part, from which we propose to read to the Society the extracts referred to, is headed, "On the Variation of Organic Beings in a state of Nature; on the Natural Means of Selection; on the Comparison of Domestic Races and true Species."

2. An abstract of a private letter addressed to Professor Asa Gray, of Boston, U.S., in October 1857, by Mr. Darwin, in which he repeats his views, and which shows that these remained unaltered from 1839 to 1857.

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3. An Essay by Mr. Wallace, entitled "On the Tendency of Varieties to depart indefinitely from the Original Type." This was written at Ternate in February 1858, for the perusal of his friend and correspondent Mr. Darwin, and sent to him with the expressed wish that it should be forwarded to Sir Charles Lyell, if Mr. Darwin thought it sufficiently novel and interesting. So highly did Mr. Darwin appreciate the value of the views therein set forth, that he proposed, in a letter to Sir Charles Lyell, to obtain Mr. Wallace's consent to allow the Essay to be published as soon as possible. Of this step we highly approved, provided Mr. Darwin did not withhold from the public, as he was strongly inclined to do (in favour of Mr. Wallace), the memoir which he had himself written on the same subject, and which, as before stated, one of us had perused in 1844, and the contents of which we had both of us been privy to for many years. On representing this to Mr. Darwin, he gave us permission to make what use we thought proper of his memoir, &c.; and in adopting our present course, of presenting it to the Linnean Society, we have explained to him that we are not solely considering the relative claims to priority of himself and his friend, but the interests of science generally; for we feel it to be desirable that views founded on a wide deduction from facts, and matured by years of reflection, should constitute at once a goal from which others may start, and that, while the scientific world is waiting for the appearance of Mr. Darwin's complete work, some of the leading results of his labours, as well as those of his able correspondent, should together be laid before the public.

We have the honour to be yours very obediently,

CHARLES LYELL.

JOS. D. HOOKER.

I. *Extract from an unpublished Work on Species, by C. DARWIN, Esq., consisting of a portion of a Chapter entitled, "On the Variation of Organic Beings in a state of Nature; on the Natural Means of Selection; on the Comparison of Domestic Races and true Species."*

De Candolle, in an eloquent passage, has declared that all nature is at war, one organism with another, or with external nature. Seeing the contented face of nature, this may at first well be doubted; but reflection will inevitably prove it to be true. The war, however, is not constant, but recurrent in a slight degree at short periods, and more severely at occasional more distant periods; and hence its effects are easily overlooked. It is the doctrine of Malthus applied in most cases with tenfold force. As in every climate there are seasons, for each of its inhabitants, of greater and less abundance, so all annually breed; and the moral restraint which in some small degree checks the increase of mankind is entirely lost. Even slow-breeding mankind has doubled in twenty-five years; and if he could increase his food with greater ease, he would double in less time. But for animals without artificial means, the amount of food for each species must, *on an average*, be constant, whereas the increase of all organisms tends to be geometrical, and in a vast majority of cases at an enormous ratio. Suppose in a certain spot there are eight pairs of birds, and that *only* four pairs of them annually (including double hatches) rear only four young, and that these go on rearing their young at the same rate, then at the end of seven years (a short life, excluding violent deaths, for any bird) there will be 2048 birds, instead of the original sixteen. As this increase is quite impossible, we must conclude either that birds do not rear nearly half their young, or that the average life of a bird is, from accident, not nearly seven years. Both checks probably concur. The same kind of calculation applied to all plants and animals affords results more or less striking, but in very few instances more striking than in man.

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Many practical illustrations of this rapid tendency to increase are on record, among which, during peculiar seasons, are the extraordinary numbers of certain animals; for instance, during the years 1826 to 1828, in La Plata, when from drought some millions of cattle perished, the whole country actually *swarmed* with mice. Now I think it cannot be doubted that during the breeding-season all the mice (with the exception of a few males or females in excess) ordinarily pair, and therefore that this astounding increase during three years must be attributed to a greater number than usual surviving the first year, and then breeding, and so on till the third year, when their numbers were brought down to their usual limits on the return of wet weather. Where man has introduced plants and animals into a new and favourable country, there are many accounts in how surprisingly few years the whole country has become stocked with them. This increase would necessarily stop as soon as the country was fully stocked; and yet we have every reason to believe, from what is known of wild animals, that *all* would pair in the spring. In the majority of cases it is most difficult to imagine where the checks fall—though generally, no doubt, on the seeds, eggs, and young; but when we remember how impossible, even in mankind (so much better known than any other animal), it is to infer from repeated casual observations what the average duration of life is, or to discover the different percentage of deaths to births in different countries, we ought to feel no surprise at our being unable to discover where the check falls in any animal or plant. It should always be remembered, that in most cases the checks are recurrent yearly in a small, regular degree, and in an extreme degree during unusually cold, hot, dry, or wet years, according to the constitution of the being in question. Lighten any check in the least degree, and the geometrical powers of increase in every organism will almost instantly increase the average number of the favoured species. Nature may be compared to a surface on which rest ten thousand sharp wedges touching each other and driven inwards by incessant blows. Fully to realize these views much reflection is requisite. Malthus on man should be studied; and all such cases as those of the mice in La Plata, of the cattle and horses when first turned out in South America, of the birds by our calculation, &c., should be well considered. Reflect on the enormous multiplying power *inherent and annually in action* in all animals; reflect on the countless seeds scattered by a hundred ingenious contrivances, year after year, over the whole face of the land; and yet we have every reason to suppose that the average percentage of each of the inhabitants of a country usually remains constant. Finally, let it be borne in mind that this average number of individuals (the external conditions remaining the same) in each country is kept up by recurrent struggles against other species or against external nature (as on the borders of the Arctic regions, where the cold checks life), and that ordinarily each individual of every species holds its place, either by its own struggle and capacity of acquiring nourishment in some period of its life, from the egg upwards; or by the struggle of its parents (in short-lived organisms, when the main check occurs at longer intervals) with other individuals of the *same* or *different* species.

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But let the external conditions of a country alter. If in a small degree, the relative proportions of the inhabitants will in most cases simply be slightly changed; but let the number of inhabitants be small, as on an island, and free access to it from other countries be circumscribed, and let the change of conditions continue progressing (forming new stations), in such a case the original inhabitants must cease to be as perfectly adapted to the changed conditions as they were originally. It has been shown in a former part of this work, that such changes of external conditions would, from their acting on the reproductive system, probably cause the organization of those beings which were most affected to become, as under domestication, plastic. Now, can it be doubted, from the struggle each individual has to obtain subsistence, that any minute variation in structure, habits, or instincts, adapting that individual better to the new conditions, would tell upon its vigour and health? In the struggle it would have a better *chance* of surviving; and those of its offspring which inherited the variation, be it ever so slight, would also have a better *chance*. Yearly more are bred than can survive; the smallest grain in the balance, in the long run, must tell on which death shall fall, and which shall survive. Let this work of selection on the one hand, and death on the other, go on for a thousand generations, who will pretend to affirm that it would produce no effect, when we remember what, in a few years, Bakewell effected in cattle, and Western in sheep, by this identical principle of selection?

To give an imaginary example from changes in progress on an island:—let the organization of a canine animal which preyed chiefly on rabbits, but sometimes on hares, become slightly plastic; let these same changes cause the number of rabbits very slowly to decrease, and the number of hares to increase; the effect of this would be that the fox or dog would be driven to try to catch more hares: his organization, however, being slightly plastic, those individuals with the lightest forms, longest limbs, and best eyesight, let the difference be ever so small, would be slightly favoured, and would tend to live longer, and to survive during that time of the year when food was scarcest; they would also rear more young, which would tend to inherit these slight peculiarities. The less fleet ones would be rigidly destroyed. I can see no more reason to doubt that these causes in a thousand generations would produce a marked effect, and adapt the form of the fox or dog to the catching of hares instead of rabbits, than that greyhounds can be improved by selection and careful breeding. So would it be with plants under similar circumstances. If the number of individuals of a species with plumed seeds could be increased by greater powers of dissemination within its own area (that is, if the check to increase fell chiefly on the seeds), those seeds which were provided with ever so little more down, would in the long run be most disseminated; hence a greater number of seeds thus formed would germinate, and would tend to produce plants inheriting the slightly better-adapted down<sup>[B]</sup>.

Besides this natural means of selection, by which those individuals are preserved, whether in their egg, or larval, or mature state, which are best adapted to the place they fill in nature, there is a second agency at work in most unisexual animals, tending to produce the same effect, namely, the struggle of the males for the females. These struggles are generally decided by the law of battle, but in the case of birds, apparently, by the charms of their song, by their beauty or their power of courtship, as in the dancing rock-thrush of Guiana. The most vigorous and healthy males, implying perfect adaptation, must generally gain the victory in their contests. This kind of selection, however, is less rigorous than the other; it does not require the death of the less successful, but gives to them fewer descendants. The struggle falls, moreover, at a time of year when food is generally abundant, and perhaps the effect chiefly produced would be the modification of the secondary sexual characters, which are not related to the power of obtaining food, or to defence from enemies, but to fighting with or rivalling other males. The result of this struggle amongst the males may be compared in some respects to that produced by those agriculturists who pay less attention to the careful selection of all their young animals, and more to the occasional use of a choice mate.

II. *Abstract of a Letter from C. DARWIN, Esq., to Prof. ASA GRAY, Boston, U.S., dated Down, September 5th, 1857.*

1. It is wonderful what the principle of selection by man, that is the picking out of individuals with any desired quality, and breeding from them, and again picking out, can do. Even breeders have been astounded at their own results. They can act on differences inappreciable to an uneducated eye. Selection has been *methodically* followed in *Europe* for only the last half century; but it was occasionally, and even in some degree methodically, followed in the most ancient times. There must have been also a kind of unconscious selection from a remote period, namely in the preservation of the individual animals (without any thought of their offspring) most useful to each race of man in his particular circumstances. The "roguing," as nurserymen call the destroying of varieties which depart from their type, is a kind of selection. I am convinced that intentional and occasional selection has been the main agent in the production of our domestic

aces; but however this may be, its great power of modification has been indisputably shown in later times. Selection acts only by the accumulation of slight or greater variations, caused by external conditions, or by the mere fact that in generation the child is not absolutely similar to its parent. Man, by this power of accumulating variations, adapts living beings to his wants—may be said to make the wool of one sheep good for carpets, of another for cloth, &c.

2. Now suppose there were a being who did not judge by mere external appearances, but who could study the whole internal organization, who was never capricious, and should go on selecting for one object during millions of generations; who will say what he might not effect? In nature we have some *slight* variation occasionally in all parts; and I think it can be shown that changed conditions of existence is the main cause of the child not exactly resembling its parents; and in nature geology shows us what changes have taken place, and are taking place. We have almost unlimited time; no one but a practical geologist can fully appreciate this. Think of the Glacial period, during the whole of which the same species at least of shells have existed; there must have been during this period millions on millions of generations.

3. I think it can be shown that there is such an unerring power at work in *Natural Selection* (the title of my book), which selects exclusively for the good of each organic being. The elder De Candolle, W. Herbert, and Lyell have written excellently on the struggle for life; but even they have not written strongly enough. Reflect that every being (even the elephant) breeds at such a rate, that in a few years, or at most a few centuries, the surface of the earth would not hold the progeny of one pair. I have found it hard constantly to bear in mind that the increase of every single species is checked during some part of its life, or during some shortly recurrent generation. Only a few of those annually born can live to propagate their kind. What a trifling difference must often determine which shall survive, and which perish!

4. Now take the case of a country undergoing some change. This will tend to cause some of its inhabitants to vary slightly—not but that I believe most beings vary at all times enough for selection to act on them. Some of its inhabitants will be exterminated; and the remainder will be exposed to the mutual action of a different set of inhabitants, which I believe to be far more important to the life of each being than mere climate. Considering the infinitely various methods which living beings follow to obtain food by struggling with other organisms, to escape danger at various times of life, to have their eggs or seeds disseminated, &c. &c., I cannot doubt that during millions of generations individuals of a species will be occasionally born with some slight variation, profitable to some part of their economy. Such individuals will have a better chance of surviving, and of propagating their new and slightly different structure; and the modification may be slowly increased by the accumulative action of natural selection to any profitable extent. The variety thus formed will either coexist with, or, more commonly, will exterminate its parent form. An organic being, like the woodpecker or misseltoe, may thus come to be adapted to a score of contingences—natural selection accumulating those slight variations in all parts of its structure, which are in any way useful to it during any part of its life.

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5. Multiform difficulties will occur to every one, with respect to this theory. Many can, I think, be satisfactorily answered. *Natura non facit saltum* answers some of the most obvious. The slowness of the change, and only a very few individuals undergoing change at any one time, answers others. The extreme imperfection of our geological records answers others.

6. Another principle, which may be called the principle of divergence, plays, I believe, an important part in the origin of species. The same spot will support more life if occupied by very diverse forms. We see this in the many generic forms in a square yard of turf, and in the plants or insects on any little uniform islet, belonging almost invariably to as many genera and families as species. We can understand the meaning of this fact amongst the higher animals, whose habits we understand. We know that it has been experimentally shown that a plot of land will yield a greater weight if sown with several species and genera of grasses, than if sown with only two or three species. Now, every organic being, by propagating so rapidly, may be said to be striving its utmost to increase in numbers. So it will be with the offspring of any species after it has become diversified into varieties, or subspecies, or true species. And it follows, I think, from the foregoing facts, that the varying offspring of each species will try (only few will succeed) to seize on as many and as diverse places in the economy of nature as possible. Each new variety or species, when formed, will generally take the place of, and thus exterminate its less well-fitted parent. This I believe to be the origin of the classification and affinities of organic beings at all times; for organic beings always *seem* to branch and sub-branch like the limbs of a tree from a common trunk, the flourishing and diverging twigs destroying the less vigorous—the dead and lost branches rudely representing extinct genera and families.

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This sketch is *most* imperfect; but in so short a space I cannot make it better. Your imagination

must fill up very wide blanks.

C. DARWIN.

III. *On the Tendency of Varieties to depart indefinitely from the Original Type.* By ALFRED RUSSELL WALLACE.

One of the strongest arguments which have been adduced to prove the original and permanent distinctness of species is, that *varieties* produced in a state of domesticity are more or less unstable, and often have a tendency, if left to themselves, to return to the normal form of the parent species; and this instability is considered to be a distinctive peculiarity of all varieties, even of those occurring among wild animals in a state of nature, and to constitute a provision for preserving unchanged the originally created distinct species.

In the absence or scarcity of facts and observations as to *varieties* occurring among wild animals, this argument has had great weight with naturalists, and has led to a very general and somewhat prejudiced belief in the stability of species. Equally general, however, is the belief in what are called "permanent or true varieties,"—races of animals which continually propagate their like, but which differ so slightly (although constantly) from some other race, that the one is considered to be a *variety* of the other. Which is the *variety* and which the original *species*, there is generally no means of determining, except in those rare cases in which the one race has been known to produce an offspring unlike itself and resembling the other. This, however, would seem quite incompatible with the "permanent invariability of species," but the difficulty is overcome by assuming that such varieties have strict limits, and can never again vary further from the original type, although they may return to it, which, from the analogy of the domesticated animals, is considered to be highly probable, if not certainly proved.

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It will be observed that this argument rests entirely on the assumption, that *varieties* occurring in a state of nature are in all respects analogous to or even identical with those of domestic animals, and are governed by the same laws as regards their permanence or further variation. But it is the object of the present paper to show that this assumption is altogether false, that there is a general principle in nature which will cause many *varieties* to survive the parent species, and to give rise to successive variations departing further and further from the original type, and which also produces, in domesticated animals, the tendency of varieties to return to the parent form.

The life of wild animals is a struggle for existence. The full exertion of all their faculties and all their energies is required to preserve their own existence and provide for that of their infant offspring. The possibility of procuring food during the least favourable seasons, and of escaping the attacks of their most dangerous enemies, are the primary conditions which determine the existence both of individuals and of entire species. These conditions will also determine the population of a species; and by a careful consideration of all the circumstances we may be enabled to comprehend, and in some degree to explain, what at first sight appears so inexplicable—the excessive abundance of some species, while others closely allied to them are very rare.

The general proportion that must obtain between certain groups of animals is readily seen. Large animals cannot be so abundant as small ones; the carnivora must be less numerous than the herbivora; eagles and lions can never be so plentiful as pigeons and antelopes; the wild asses of the Tartarian deserts cannot equal in numbers the horses of the more luxuriant prairies and pampas of America. The greater or less fecundity of an animal is often considered to be one of the chief causes of its abundance or scarcity; but a consideration of the facts will show us that it really has little or nothing to do with the matter. Even the least prolific of animals would increase rapidly if unchecked, whereas it is evident that the animal population of the globe must be stationary, or perhaps, through the influence of man, decreasing. Fluctuations there may be; but permanent increase, except in restricted localities, is almost impossible. For example, our own observation must convince us that birds do not go on increasing every year in a geometrical ratio, as they would do, were there not some powerful check to their natural increase. Very few birds produce less than two young ones each year, while many have six, eight, or ten; four will certainly be below the average; and if we suppose that each pair produce young only four times in their life, that will also be below the average, supposing them not to die either by violence or want of food. Yet at this rate how tremendous would be the increase in a few years from a single pair! A simple calculation will show that in fifteen years each pair of birds would have increased to nearly ten millions! whereas we have no reason to believe that the number of the birds of any country increases at all in fifteen or in one hundred and fifty years. With such powers of increase the population must have reached its limits, and have become stationary, in a very low years after the origin of each species. It is evident, therefore, that each year an immense number of birds

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must perish—as many in fact as are born; and as on the lowest calculation the progeny are each year twice as numerous as their parents, it follows that, whatever be the average number of individuals existing in any given country, *twice that number must perish annually*,—a striking result, but one which seems at least highly probable, and is perhaps under rather than over the truth. It would therefore appear that, as far as the continuance of the species and the keeping up the average number of individuals are concerned, large broods are superfluous. On the average all above *one* become food for hawks and kites, wild cats and weasels, or perish of cold and hunger as winter comes on. This is strikingly proved by the case of particular species; for we find that their abundance in individuals bears no relation whatever to their fertility in producing offspring. Perhaps the most remarkable instance of an immense bird population is that of the passenger pigeon of the United States, which lays only one, or at most two eggs, and is said to rear generally but one young one. Why is this bird so extraordinarily abundant, while others producing two or three times as many young are much less plentiful? The explanation is not difficult. The food most congenial to this species, and on which it thrives best, is abundantly distributed over a very extensive region, offering such differences of soil and climate, that in one part or another of the area the supply never fails. The bird is capable of a very rapid and long-continued flight, so that it can pass without fatigue over the whole of the district it inhabits, and as soon as the supply of food begins to fail in one place is able to discover a fresh feeding-ground. This example strikingly shows us that the procuring a constant supply of wholesome food is almost the sole condition requisite for ensuring the rapid increase of a given species, since neither the limited fecundity, nor the unrestrained attacks of birds of prey and of man are here sufficient to check it. In no other birds are these peculiar circumstances so strikingly combined. Either their food is more liable to failure, or they have not sufficient power of wing to search for it over an extensive area, or during some season of the year it becomes very scarce, and less wholesome substitutes have to be found; and thus, though more fertile in offspring, they can never increase beyond the supply of food in the least favourable seasons. Many birds can only exist by migrating, when their food becomes scarce, to regions possessing a milder, or at least a different climate, though, as these migrating birds are seldom excessively abundant, it is evident that the countries they visit are still deficient in a constant and abundant supply of wholesome food. Those whose organization does not permit them to migrate when their food becomes periodically scarce, can never attain a large population. This is probably the reason why woodpeckers are scarce with us, while in the tropics they are among the most abundant of solitary birds. Thus the house sparrow is more abundant than the redbreast, because its food is more constant and plentiful,—seeds of grasses being preserved during the winter, and our farm-yards and stubble-fields furnishing an almost inexhaustible supply. Why, as a general rule, are aquatic, and especially sea birds, very numerous in individuals? Not because they are more prolific than others, generally the contrary; but because their food never fails, the sea-shores and river-banks daily swarming with a fresh supply of small mollusca and crustacea. Exactly the same laws will apply to mammals. Wild cats are prolific and have few enemies; why then are they never as abundant as rabbits? The only intelligible answer is, that their supply of food is more precarious. It appears evident, therefore, that so long as a country remains physically unchanged, the numbers of its animal population cannot materially increase. If one species does so, some others requiring the same kind of food must diminish in proportion. The numbers that die annually must be immense; and as the individual existence of each animal depends upon itself, those that die must be the weakest—the very young, the aged, and the diseased,—while those that prolong their existence can only be the most perfect in health and vigour—those who are best able to obtain food regularly, and avoid their numerous enemies. It is, as we commenced by remarking, "a struggle for existence," in which the weakest and least perfectly organized must always succumb.

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Now it is clear that what takes place among the individuals of a species must also occur among the several allied species of a group,—viz. that those which are best adapted to obtain a regular supply of food, and to defend themselves against the attacks of their enemies and the vicissitudes of the seasons, must necessarily obtain and preserve a superiority in population; while those species which from some defect of power or organization are the least capable of counteracting the vicissitudes of food, supply, &c., must diminish in numbers, and, in extreme cases, become altogether extinct. Between these extremes the species will present various degrees of capacity for ensuring the means of preserving life; and it is thus we account for the abundance or rarity of species. Our ignorance will generally prevent us from accurately tracing the effects to their causes; but could we become perfectly acquainted with the organization and habits of the various species of animals, and could we measure the capacity of each for performing the different acts necessary to its safety and existence under all the varying circumstances by which it is surrounded, we might be able even to calculate the proportionate abundance of individuals which is the necessary result.

If now we have succeeded in establishing these two points—1st, *that the animal population of a country is generally stationary, being kept down by a periodical deficiency of food, and other checks*; and, 2nd, *that the comparative abundance or scarcity of the individuals of the several species is entirely due to their organization and resulting habits, which, rendering it more difficult to procure a regular supply of food and to provide for their personal safety in some cases than in others, can only be balanced by a difference in the population which have to exist in a given area*—we shall be in a condition to proceed to the consideration of *varieties*, to which the preceding remarks have a direct and very important application.

Most or perhaps all the variations from the typical form of a species must have some definite effect, however slight, on the habits or capacities of the individuals. Even a change of colour might, by rendering them more or less distinguishable, affect their safety; a greater or less development of hair might modify their habits. More important changes, such as an increase in the power or dimensions of the limbs or any of the external organs, would more or less affect their mode of procuring food or the range of country which they inhabit. It is also evident that most changes would affect, either favourably or adversely, the powers of prolonging existence. An antelope with shorter or weaker legs must necessarily suffer more from the attacks of the feline carnivora; the passenger pigeon with less powerful wings would sooner or later be affected in its powers of procuring a regular supply of food; and in both cases the result must necessarily be a diminution of the population of the modified species. If, on the other hand, any species should produce a variety having slightly increased powers of preserving existence, that variety must inevitably in time acquire a superiority in numbers. These results must follow as surely as old age, intemperance, or scarcity of food produce an increased mortality. In both cases there may be many individual exceptions; but on the average the rule will invariably be found to hold good. All varieties will therefore fall into two classes—those which under the same conditions would never reach the population of the parent species, and those which would in time obtain and keep a numerical superiority. Now, let some alteration of physical conditions occur in the district—a long period of drought, a destruction of vegetation by locusts, the irruption of some new carnivorous animal seeking "pastures new"—any change in fact tending to render existence more difficult to the species in question, and tasking its utmost powers to avoid complete extermination; it is evident that, of all the individuals composing the species, those forming the least numerous and most feebly organized variety would suffer first, and, were the pressure severe, must soon become extinct. The same causes continuing in action, the parent species would next suffer, would gradually diminish in numbers, and with a recurrence of similar unfavourable conditions might also become extinct. The superior variety would then alone remain, and on a return to favourable circumstances would rapidly increase in numbers and occupy the place of the extinct species and variety.

The *variety* would now have replaced the *species*, of which it would be a more perfectly developed and more highly organized form. It would be in all respects better adapted to secure its safety, and to prolong its individual existence and that of the race. Such a variety *could not* return to the original form; for that form is an inferior one, and could never compete with it for existence. Granted, therefore, a "tendency" to reproduce the original type of the species, still the variety must ever remain preponderant in numbers, and under adverse physical conditions *again alone survive*. But this new, improved, and populous race might itself, in course of time, give rise to new varieties, exhibiting several diverging modifications of form, any of which, tending to increase the facilities for preserving existence, must, by the same general law, in their turn become predominant. Here, then, we have *progression and continued divergence* deduced from the general laws which regulate the existence of animals in a state of nature, and from the undisputed fact that varieties do frequently occur. It is not, however, contended that this result would be invariable; a change of physical conditions in the district might at times materially modify it, rendering the race which had been the most capable of supporting existence under the former conditions now the least so, and even causing the extinction of the newer and, for a time, superior race, while the old or parent species and its first inferior varieties continued to flourish. Variations in unimportant parts might also occur, having no perceptible effect on the life-preserving powers; and the varieties so furnished might run a course parallel with the parent species, either giving rise to further variations or returning to the former type. All we argue for is, that certain varieties have a tendency to maintain their existence longer than the original species, and this tendency must make itself felt; for though the doctrine of chances or averages can never be trusted to on a limited scale, yet, if applied to high numbers, the results come nearer to what theory demands, and, as we approach to an infinity of examples, become strictly accurate. Now the scale on which nature works is so vast—the numbers of individuals and periods of time with which she deals approach so near to infinity, that any cause, however slight, and however liable to be veiled and counteracted by accidental circumstances, must in the end produce its full legitimate results.

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Let us now turn to domesticated animals, and inquire how varieties produced among them are affected by the principles here enunciated. The essential difference in the condition of wild and domestic animals is this,—that among the former, their well-being and very existence depend upon the full exercise and healthy condition of all their senses and physical powers, whereas, among the latter, these are only partially exercised, and in some cases are absolutely unused. A wild animal has to search, and often to labour, for every mouthful of food—to exercise sight, hearing, and smell in seeking it, and in avoiding dangers, in procuring shelter from the inclemency of the seasons, and in providing for the subsistence and safety of its offspring. There is no muscle of its body that is not called into daily and hourly activity; there is no sense or faculty that is not strengthened by continual exercise. The domestic animal, on the other hand, has food provided for it, is sheltered, and often confined, to guard it against the vicissitudes of the seasons, is carefully secured from the attacks of its natural enemies, and seldom even rears its young without human assistance. Half of its senses and faculties are quite useless; and the other half are but occasionally called into feeble exercise, while even its muscular system is only irregularly called into action.

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Now when a variety of such an animal occurs, having increased power or capacity in any organ or sense, such increase is totally useless, is never called into action, and may even exist without the animal ever becoming aware of it. In the wild animal, on the contrary, all its faculties and powers being brought into full action for the necessities of existence, any increase becomes immediately available, is strengthened by exercise, and must even slightly modify the food, the habits, and the whole economy of the race. It creates as it were a new animal, one of superior powers, and which will necessarily increase in numbers and outlive those inferior to it.

Again, in the domesticated animal all variations have an equal chance of continuance; and those which would decidedly render a wild animal unable to compete with its fellows and continue its existence are no disadvantage whatever in a state of domesticity. Our quickly fattening pigs, short-legged sheep, pouter pigeons, and poodle dogs could never have come into existence in a state of nature, because the very first step towards such inferior forms would have led to the rapid extinction of the race; still less could they now exist in competition with their wild allies. The great speed but slight endurance of the race horse, the unwieldy strength of the ploughman's team, would both be useless in a state of nature. If turned wild on the pampas, such animals would probably soon become extinct, or under favourable circumstances might each lose those extreme qualities which would never be called into action, and in a few generations would revert to a common type, which must be that in which the various powers and faculties are so proportioned to each other as to be best adapted to procure food and secure safety,—that in which by the full exercise of every part of his organization the animal can alone continue to live. Domestic varieties, when turned wild, *must* return to something near the type of the original wild stock, *or become altogether extinct*.

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We see, then, that no inferences as to varieties in a state of nature can be deduced from the observation of those occurring among domestic animals. The two are so much opposed to each other in every circumstance of their existence, that what applies to the one is almost sure not to apply to the other. Domestic animals are abnormal, irregular, artificial; they are subject to varieties which never occur and never can occur in a state of nature: their very existence depends altogether on human care; so far are many of them removed from that just proportion of faculties, that true balance of organization, by means of which alone an animal left to its own resources can preserve its existence and continue its race.

The hypothesis of Lamarck—that progressive changes in species have been produced by the attempts of animals to increase the development of their own organs, and thus modify their structure and habits—has been repeatedly and easily refuted by all writers on the subject of varieties and species, and it seems to have been considered that when this was done the whole question has been finally settled; but the view here developed renders such an hypothesis quite unnecessary, by showing that similar results must be produced by the action of principles constantly at work in nature. The powerful retractile talons of the falcon- and the cat-tribes have not been produced or increased by the volition of those animals; but among the different varieties which occurred in the earlier and less highly organized forms of these groups, *those always survived longest which had the greatest facilities for seizing their prey*. Neither did the giraffe acquire its long neck by desiring to reach the foliage of the more lofty shrubs, and constantly stretching its neck for the purpose, but because any varieties which occurred among its antitypes with a longer neck than usual *at once secured a fresh range of pasture over the same ground as their shorter-necked companions, and on the first scarcity of food were thereby enabled to outlive them*. Even the peculiar colours of many animals, especially insects, so closely resembling the soil or the leaves or the trunks on which they habitually reside, are explained on the same

principle; for though in the course of ages varieties of many tints may have occurred, *yet those races having colours best adapted to concealment from their enemies would inevitably survive the longest*. We have also here an acting cause to account for that balance so often observed in nature,—a deficiency in one set of organs always being compensated by an increased development of some others—powerful wings accompanying weak feet, or great velocity making up for the absence of defensive weapons; for it has been shown that all varieties in which an unbalanced deficiency occurred could not long continue their existence. The action of this principle is exactly like that of the centrifugal governor of the steam engine, which checks and corrects any irregularities almost before they become evident; and in like manner no unbalanced deficiency in the animal kingdom can ever reach any conspicuous magnitude, because it would make itself felt at the very first step, by rendering existence difficult and extinction almost sure soon to follow. An origin such as is here advocated will also agree with the peculiar character of the modifications of form and structure which obtain in organized beings—the many lines of divergence from a central type, the increasing efficiency and power of a particular organ through a succession of allied species, and the remarkable persistence of unimportant parts such as colour, texture of plumage and hair, form of horns or crests, through a series of species differing considerably in more essential characters. It also furnishes us with a reason for that "more specialized structure" which Professor Owen states to be a characteristic of recent compared with extinct forms, and which would evidently be the result of the progressive modification of any organ applied to a special purpose in the animal economy.

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We believe we have now shown that there is a tendency in nature to the continued progression of certain classes of *varieties* further and further from the original type—a progression to which there appears no reason to assign any definite limits—and that the same principle which produces this result in a state of nature will also explain why domestic varieties have a tendency to revert to the original type. This progression, by minute steps, in various directions, but always checked and balanced by the necessary conditions, subject to which alone existence can be preserved, may, it is believed, be followed out so as to agree with all the phenomena presented by organized beings, their extinction and succession in past ages, and all the extraordinary modifications of form, instinct, and habits which they exhibit.

Ternate, February, 1858.

FOOTNOTES:

[A] This MS. work was never intended for publication, and therefore was not written with care.—C. D. 1858.

[B] I can see no more difficulty in this, than in the planter improving his varieties of the cotton plant.—C. D. 1858.

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Contributions to the Anatomy and Natural History of the Cetacea. By R. KNOX, Esq., M.D., F.R.S.E. Communicated by the Secretary.

[Received Oct. 6, 1857.]

Part I. THE DOLPHINS.

The dissection of the Cetacea, and more especially of the larger kinds, is attended with great difficulty, and not unfrequently entails heavy expenses on those who attempt it. For these reasons I have thought that zoologists might be pleased to have, even now, submitted to them the results of numerous dissections made many years ago, when, not stinted in means, and having the aid of excellent assistants, I attempted the dissection even of the gigantic Arctic Rorqual, the largest, perhaps, of all living beings. Certain of the details have been from time to time laid before the public, but in an extremely scattered and incomplete form, and without the illustrations (artistic), which explain so much better than any verbal description. The greater part is still before me in manuscript. It is my intention in the following contributions to endeavour to connect them together, adding to those already published many facts I find in MSS. The original drawings, made by my brother and by Messrs. Edward Forbes and Henry Goodsir (who were at that time my students and assistants), are still in my possession.

*Determination of Species.*—The determination of species as regards the *Cetacea* is one of much

difficulty; Cuvier met this difficulty by an appeal to anatomy. The number of vertebræ composing the vertebral column (exclusive of the cephalic) seemed to me a tolerably secure guide in the determination of species,—being aware, however, that some doubted the method, believing that the number of the vertebræ might vary, first, with the individual, secondly with the age of the specimen. I still continue to be of my original opinion, that the number of vertebræ comprising the vertebral column, properly so called, may safely be trusted in determining the species of the Cetacea; and with this view I drew up the following Table, excepting from it the genus *Dugong*, which I have never considered to be a Cetacean:—

*Tabular View of the Number of the Vertebræ in certain Cetacea.*

(Cephalic vertebræ excluded.)

SPECIES.	Authorities.			
	CUVIER.	RUDOLPHI.	KNOX.	J. HUNTER HUNTER. (Glasgow.)
1. MYSTICETUS.				
Skeleton of the foetus (the cervical reckoned as 7) of the <i>Mysticetus borealis</i> , Greenland			48	
Adult <i>Mysticetus</i> , Whale of Commerce.	unknown			
<i>B. Mysticetus australis</i> , True Whale of the Cape Seas	59			
2. BALÆNOPTERA.				
Gigantic Northern Rorqual			65	
Specimen of Rorqual described by Rudolphi		54		
<i>B. rostrata</i> of Fabricius; on the authority of Van Beneden: A. Rorqual				48
Great Whale at Antwerp. Van Beneden. Species not stated				61 or 62.
The lesser Rorqual of the North			48	46
Great Rorqual of the Cape	52			46
3. PHYSETER.				
Sperm Whale or Cachalot	60			
4. DELPHINUS.				
<i>D. Delphis</i>	67			
<i>D. Delphis</i> . In my museum			81	
<i>D. Delphis</i> . In the Museum of Dr. R. Hunter, Glasgow				90
<i>D. Delphis</i> . Dissected by John Hunter			60	
<i>D. Phocæna</i>	66		65	51
<i>D. Ebsenii</i> . Van Beneden				90

In a late number of the 'Bulletins of the Royal Academy of Brussels' I find some valuable remarks in respect of these points by M. Van Beneden. He praises, and deservedly, no doubt, the exertions of M. Eschricht to collect a proper Museum of the Cetacea. It appears, according to M. Eschricht, that at no age whatever do we find in true whales (meaning, I presume, the *Mysticetus borealis* and *australis*) any distinct vertebræ in the cervical region as in other mammals. A fusion of all into one bone or cartilage seems to take place even in the youngest foetus. In the foetus examined by me of this species (a specimen removed from the uterus of a true *Mysticetus* killed in the Greenland seas), I do not recollect the precise appearance of the cervical vertebræ; but the skeleton is in existence, and shall be referred to. To the skeleton of the Rorqual now in the Museum at Antwerp, and which seems to me of the same species as the one I dissected in Scotland (and of which the skeleton, prepared with infinite care by my brother and myself, was presented by me to the Town Council of Edinburgh, and is now preserved in the Zoological Gardens of the same city), he gives the following vertebræ:—

Skeleton of the Rorqual at Antwerp—Cervical 7  
Dorsal 14-15  
Lumbar 15  
Caudal 25[C]  
Total 61 or 62

In the skeleton of the Great Rorqual now in the Zoological Gardens at Edinburgh, and originally dissected and prepared by my brother and myself, these vertebræ are—

Cervical	7
Dorsal	15
Lumbar and Caudal	43
Total	65

In that of the Lesser Rorqual I dissected in 1830, the skeleton of which I think is still preserved in the Museum of the University of Edinburgh, we found—

Vertebræ.	
Cervical	7
Dorsal	11
Lumbar	13
Caudal	17
Total	48

The specimen was that of a young animal, and of the same species, I believe, as the one described by Mr. Hunter and Fabricius; it is a distinct species, and not merely the young of the Great Rorqual.

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I shall return to the Dugong, as not being a Cetacean, in a future Section: its skeleton has been examined in a masterly way by De Blainville, an anatomist and observer of the highest order, since the time I wrote and published my Memoir on the Dugong.

The first great step in the anatomy of the Cetacea is unquestionably due to Cuvier; but his dissections were almost confined to the genus *Delphinus*, or the common Porpoise of our coasts. I repeated all his dissections, and found them, as they almost always were, scrupulously exact; but when I came to examine Cetacea with whalebone instead of teeth, I was surprised to find how different, in fact, the anatomy of the two great families was. Scarcely in any great natural family do we find Cuvier's favourite theory of anatomical and physiological co-relations so entirely at fault as in the Cetacea. The teeth or whalebone, as natural-history characters, lead to no results; the whole structure of the interior defies all *à-priori* reasoning. The brain in whalebone-whales does not fill the interior of the cranium; so that the capacity of the one is no measure of the solid bulk of the other. Their food is various, having no relation to the teeth or buccal appendages; vascular structures surround the spinal marrow, and extend in the *Balænopteræ* into the cavity of the cranium, which seem to be without any analogy in other mammals, or, at the least, a very obscure one, and whose functions are wholly unknown.

Cetacea might with some propriety be divided into whales with whalebone, and whales with teeth. Those with whalebone have rudimentary teeth in both jaws in the foetal state. Fossil Cetacea exist, and they seem to have been of both kinds, but, no doubt, were generically and specifically distinct from the recent. Judging from the remains of those I have seen, I am inclined to think that those with teeth were of a stronger and firmer build in the skeleton than those called recent; that the neck was longer, and the caudal portion of the column shorter than in the recent kinds, and that they approached the Saurians in form. There is a remarkable want of symmetry in the crania of some of the Cetacea; but most remarkable is the cranium of the Narwhal. Of this fact I have already spoken, in the article published in the Transactions of the Royal Society of Edinburgh.

*Delphinus Phocæna*. Dissection of a small Cetacean sent to me from Orkney in the month of May 1835.—This species is said to abound on the coasts, and to furnish a kind of fishery to the inhabitants. On dissection we found 81 vertebræ, exclusive of the cephalic. The species must be quite distinct from those previously and subsequently examined by myself and many others, in which the number of vertebræ ranged from 61 to 66. It is also, I think, distinct from the specimen I saw in Dr. R. Hunter's Museum in Glasgow, in which the number of vertebræ was 90, exclusive of the cephalic in all the cases. Thus it stands with regard to the Cetacea called Porpoises and Dolphins.

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In certain species of *Delphinus* the vertical column is composed of 61 vertebræ, in others of 65, in others of 66, in others of 81, in others of 90.

The specimen I now describe was, no doubt, that of a young animal; and the skeleton was prepared, consequently, as a natural one. This method has the advantage of security against the loss of any important osseous structures, which too frequently happens when the bones require to be macerated. The bones contained little oil, and weighed, head included, only 7¼ lbs.; the whole animal, when entire, weighed 14 stone, or 196 lbs.; the skeleton therefore was about a twenty-fourth part of the whole weight. It was a female. The external nostrils terminated in a

single orifice of a semilunar shape, with the concavity turned towards the snout. Measurements of young animals have not the importance of those of the adult; but I give them here because I think that the specimen, although young, had nearly attained its full growth:—

	ft.	in.
Total length over the dorsum	6	5-2/8
Total length lateral surface	6	11-2/8
Total length abdominal surface	6	11-2/8
From the snout to the nostrils	0	11-4/8
From the nostrils to the dorsal fin	1	6-4/8
Base of the dorsal fin	0	11
From dorsal fin to foot of tail	3	0-2/8
Breadth of pectoral limb	0	4-4/8
From the snout to the organs of generation	3	9-4/8
Circumference anterior to the arm	2	9
Circumference anterior to dorsal fin	3	2-4/8
Circumference posterior to dorsal fin	2	10
Circumference at setting on of the tail	0	8-4/8
Length of pectoral limb	0	10
Breadth of tail	1	2
Greatest height of the dorsal fin	0	9

From the notes taken at the time, I find that my brother remarks that the Dolphin of Orkney differed a good deal in shape from those found in the Forth and seas in the South of Scotland. There were, moreover, 16 more vertebræ than in the skeleton of the Common Porpoise of authors. The teeth generally weighed 2½ grains each.

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Further, the muscles of the tongue, intrinsic as well as extrinsic, were extremely well developed. The isthmus faucium was 3 inches long. All this part was extremely glandular. A well-marked muscular gullet followed, composed of two layers of muscular fibres,—one circular internally, and one longitudinal externally. These latter sent a slip to the base of the arytænoid cartilages. The mucous membrane of the gullet had no true epidermic covering, and in this respect differed remarkably from the first gastric compartment, from which a cuticular lining could be peeled off, as strong as that from the sole of the foot in man. The larynx presented that organization so well described by the illustrious Cuvier, and which I believe to be peculiar to the whales with teeth. It differs very much, as I explained long ago, in its arrangement from that of Whalebone Whales,—a fact of which I think Cuvier was not aware. The cricoid cartilage was imperfect in form; the hyo-epiglottic muscles very strong. The proper arytænoid were present, and strong, but did not extend so high as in man; the thyro-arytænoid muscles were very fully developed. In the interior of the larynx there were no projections nor ventricles, no cuneiform cartilages, nor cornicula laryngis. The rings of the trachea formed complete circles.

*Stomach.*—The cuticular lining is limited to the first cavity or compartment. It is in the second compartment that is found the curious glandular arrangement first, I believe, described by me in the 'Transactions of the Royal Society of Edinburgh.' This structure is most probably not limited to the second compartment. There are four distinct compartments in the stomach of this animal. A dilated duodenum follows, 6 inches in length. It is possible that this may have been in some instances mistaken for a stomach. The valvulæ conniventes commence with the jejunum; these are longitudinal, and extend to within about 6 inches of the anus, terminating at a point where the intestine seems enlarged. The length of the intestines, large and small, was 90 feet; circumference generally about 2 inches. Thousands and tens of thousands of parasitical worms were found in the stomach, but none in the intestine. In the stomach also we found four mandibles of the cuttlefish, but no remains of anything in the intestines, and no parasites.

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*Heart and Vessels.*—The heart weighed exactly one pound. The Eustachian valve was small, that of Thebesius imperfect. The aorta proceeded for about 3 inches of its course before giving off any branches. At a point corresponding to the 15th or 16th lumbar vertebra the vessel divided into the common iliacs. The *art. sacri media*, its continuation, continued its course protected by the V-bones, and giving off branches corresponding to the intervertebral spaces.

*Brain and Nervous System.*—The erectile tissue surrounding the spinal cord and origin of the spinal nerves in the Cetacea did not extend into the interior of the cranium. The entire encephalic mass weighed 2½ lbs.: cerebrum, 2 lbs.; cerebellum, ¼; pons and medulla, ¼ = 2½. Compared with a drawing of Camper of the *Delphinus Phocæna*, the brain was found to differ remarkably, in being much broader in the line of the middle and posterior lobes. In no animal did I ever find the fibrous structure of the brain so well marked; and this extended to the cerebellum[D]. I give here

some measurements of the brain, which may be of use to future observers. The brain is short from before backwards, but broad transversely:—

Antero-posterior diameter	5-2/8 inches.
Breadth	8 inches.
Greatest breadth of the cerebellum	4 inches.
Length of the cerebellar hemisphere	4-6/8 inches.
Depth of ditto	3-2/8 inches.
Weight of the encephalic mass	2½ lbs.
Depth of the interhemispherical fissure	1-2/8 inches.
Length of the corpus callosum	1-7/8 inches.
Weight of cerebrum	2}
Weight of cerebellum	0¼} = 2½ lbs.
Weight of the pons and med. oblongata	0¼}

*Nerves.*—The 7th pair was found to be unexpectedly large and firm, including both portions. The anterior roots of the spinal nerves were far more numerous than the posterior or dorsal.

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*Muscles.*—The panniculus carnosus, strong and fleshy, extended nearly over the whole trunk. The recti abdominis were powerful, and attached inferiorly in this way:—A portion runs to the pelvic bones; a much stronger to a strong aponeurosis, situated between the anus and the root of the tail.

The erector muscles of the spine (sacrolumbalis, longissimus dorsi and multifidus spinæ) weighed fully 16 lbs. They had but slender costal attachments; but their spinal (small delicate tendons) were innumerable. The scaleni were very large; and the vessels held the same relation to them as in man. The serratus magnus was comparatively small. The larger rhomboid had no spinal attachment; the minor rhomboid seemed to be the larger of the two. The pectorals were comparatively small. The adipose tissue appeared to be wholly confined to the subcutaneous region. The muscles were of a deep brown colour, full of blood, with a short, dark, and well-flavoured fibre: when cooked, they had a strong resemblance in flavour and taste to the flesh of the hare.

## Part II. THE BALÆNA WHALES, OR WHALES WITH WHALEBONE.

In February 1834 a young whale of the family of Balæna Whales was caught near the Queensferry, in the Firth of Forth. One much larger had been seen some time before, but escaped. I purchased it for dissection, although I was aware that it was impossible for me, during the hurry of the winter session, to devote much time to it. But I had able assistants (Mr. Henry Goodsir, Mr. Edward Forbes, and my brother), from whom I expected a good deal of aid. Some very beautiful drawings of this whale, made for me by Mr. Edward Forbes and by my brother, are still in my possession.

It was easy to see, by the dorsal fin and by the numerous plaits or folds on the abdominal surface of the throat and chest, before any dissection, that the specimen was a young Balænopterus whale, differing in a great many points from the true whale or *Mysticetus*: for, 1st, the form of the head was entirely different; 2nd, it had a dorsal fin; and, 3rd, occupying the lower surface of the throat and thorax were numerous folds of the integuments. To this class of whales I have been in the habit of giving the name of Rorqual, to distinguish them from the other class of Whalebone Whales, the *Mysticetus* both *borealis* and *australis*.

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It appears from my notes, that at that time M. G. Cuvier considered the species I now describe as identical with the Great Rorqual I had described about two years previously; but I felt convinced then, as now, that they form distinct species, and in this opinion some continental anatomists seem to coincide.

Being persuaded that there was some inaccuracy in former drawings of the species, I had the specimen suspended and drawn with great care by Mr. Edward Forbes. This position explained the mechanism of the mouth, showing its great size, even in the short Balæna Whales; its great capacity in the *Mysticetus* had never been doubted.

As to the species, the conclusion I arrived at was, that the specimen belonged to that termed by Fabricius *rostrata*, and that individuals of the species had been seen by John Hunter, Sir James Watson, and Fabricius.



Total length of the specimen	9	11
Circumference immediately behind the pectoral extremities	5	2
Circumference where the folds or rugæ terminated	4	8¼
Ditto of the tail at its origin	1	5½
Length from the back fin to the setting on of the tail	2	10
Length from the snout to the ear	3	0
Length from snout to nostrils	1	4
Length of lower jaw	2	3
Length of arm; inner side	1	3
Length from the angle of the mouth to the arm	1	3
Length from snout to arm	2	9
Length of tail in depth	0	11
Length of back fin at the base	0	8
Height of back fin	0	8½
From top to tip of tail	2	8½
Stomach:—1st compartment, in length	1	2
2nd compartment, in length	1	4
3rd compartment, in length	0	8
4th compartment, in length	0	7
5th compartment, in length	0	3
Spleen weighed 4 ounces; its length was	0	5
Liver, 9 lbs.		
Small intestines, length	20	0
Large intestines, length	2	4
Kidney, weight 2¼ lbs.		
Brain (including 2 inches of spinal marrow), 3½ lbs.		
Cerebellum, pons, and 2 inches of spinal marrow, ¾ lb.		
Great hemisphere of the brain measured 3 inches in length, in breadth, 6½; at the base, 8 inches.		
Tuber annulare	0	1-2/8
Olfactory nerves, in length	0	1½
Ditto, breadth	0	2½
Skeleton:—Length of cranium	2	11
Greatest breadth between the orbits	1	3
Length of vertebral column	7	8

When we compare the skeleton of this Rorqual with the Gigantic Rorqual I also dissected, we find as follows:—

	<i>R. giganteus.</i>	<i>R. minor.</i>
Cervical           vertebræ	7vertebræ	7
Dorsal	15	11
Lumbar, sacral, caudal	43	30
	—	—
	65	48

These differences must be specific.

At the extremity of the snout in either jaw there were 8 strong bristles, being the only vestiges of hair found on the external surface. The mouth was of great size; the tongue large and tolerably free, and of a pale rose or vermilion colour. The baleen, where deepest, measured about 4 inches; there were 370 plates on each side; but anteriorly and posteriorly these plates were reduced to mere bristles.

The isthmus faucium allowed the closed hand to pass through it; through this isthmus I do not believe that any water ever passes into the pharynx, unless it be accidentally, as in man. The "spout" of the Whalebone Whale is composed, no doubt, of the pulmonary vapour, and not of any water received into the pharynx from the mouth.

The stomach seemed composed of five compartments externally, but presented only four when laid open, the fifth being manifestly the duodenum. In the intestines no remains of food were found, but abundance of intestinal worms, and a substance strongly resembling the human meconium. There was an ilio-cæcal valve as distinct as in man. In the rectum the folds of the mucous membrane were transverse.

*Organs of Respiration.*—The external nostrils were double; and the cavities of the nostrils provided with the remarkable cartilages and muscular apparatus I discovered and described in the anatomy of the Great Rorqual. In this specimen they were about 4 inches in length, but of as many feet in the large Rorqual. The mode of breathing in the Rorquals does not differ much from that in man, with the exception of the apparatus of the protruding cartilages, which in man are rudimentary.

The *Olfactory Nerves* were quite as large as in other mammals; and in this respect the *Balæna* Whales are quite unlike the Dolphins<sup>[E]</sup>.

The trachea communicated, near its upper part, with a sac or pouch; the lungs were each composed of a single lobe. The rings of the trachea were mostly deficient anteriorly. In the heart the foetal arrangements had wholly disappeared. The dura mater seemed divisible into three layers, the external being vascular. A remarkable vascular substance connected with this layer covers the back part of the brain and cerebellum, extending into the spinal canal, and even into the chest. At the base of the brain the vascular plexus was about 2 inches in thickness. It is, as is well known, a sort of erectile tissue, of whose functions we are wholly ignorant. It is not confined to this course, but extends to the neck, and, passing through the foramina intervertebralia, fills the intercostal spaces exterior to the pleura.

There was evidently a canal in the centre of the spinal marrow. Wherever the nerves of the lungs and stomach were traced, they terminated in loops. We did not observe in the Great Rorqual any tracheal pouch like that in the smaller; but it may have escaped notice: if absent in the Great Rorqual, it would be another proof of the distinctness of the species.

The doubts raised by M. St. Hilaire, as to the Whale being a mammal in the true sense of the term, were set aside long ago by an appeal to facts. The young of the Whale tribe suckle like the young of all mammals; nevertheless I showed, in 1834, that the lactiferous glands in the *Balænopteræ* differ in structure from the same organs in most mammals.

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I do not find in my notes anything to add to the description of the Great Rorqual already published in the 'Transactions of the Royal Society of Edinburgh' for 1827, to which I beg leave to refer the reader.

A single remark must be added regarding the nature of the vascular plexus which, in the Cetacea, surrounds the spinal marrow, and extends into the chest. On selecting the artery which seemed to form the plexus, which was, if I rightly recollect, in this instance an intercostal artery, and dissecting it under water, I found, to my surprise, that the artery, so long as I followed it, never gave off any branches, but continued of the same calibre throughout, making innumerable flexuosities or turnings. Thus, on a plexiform mass of this kind being cut across, the first impression is, that a great number of arterial branches or arteries have been divided, whilst in fact the entire plexus seems to be formed of one artery.

As was to be expected of animals so much withdrawn from human observation, there is but little to say on the natural history of the Cetacea properly so called. Their food, no doubt, is various, and seems to have little or no relation to the character of their dentition. The enormous Cachalot, with its vast teeth implanted only in one jaw, is generally understood to prey chiefly on the Cuttlefish. The food of the true Whale, or *Mysticetus*, is well known to be the Clio and other smaller Mollusca, with which certain regions of the ocean abound; the same, or similar, is probably the food of the more active and restless Rorquals, found in both hemispheres. The Dolphins, or Toothed Whales, generally prey, no doubt, on fishes of various kinds; yet, even as regards these, it has been proved by my esteemed friend, the late Mr. Henry Goodsir, that some of the largest, following in the wake of the herring shoals, prey not on these, but on the various microscopic food (the Entomostraca and other marine animals) which I was the first to prove to be the natural food of many excellent gregarious freshwater fish, as the Vendace, Early Loch Leven Trout, the Brown Trout of the Highland and Scottish lakes generally, and of the Herring itself<sup>[F]</sup>. It is scarcely necessary to add, that the complex apparatus connected with the exterior nostrils of the Dolphins is wholly wanting in the *Balæna* Whales,—a fact of which M. Cuvier was not aware when he wrote his celebrated Treatise on Comparative Anatomy.

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*Appendix.*—Since writing the above, I have received an answer to a letter I addressed to my friend, John Goodsir, Esq., Professor of Anatomy in the University of Edinburgh. The request contained in my letter to Mr. Goodsir was, to examine for me the skeleton of a foetal *Mysticetus* now in the University Museum. The foetus from which this skeleton was prepared was removed from the uterus of the mother, killed in the North Seas by the seamen of a whaling ship, by one of my former students, Mr. R. Auld, who presented the specimen to me. The point at issue was the

composition of the cervical vertebræ in the true or Greenland Whale, the *Balæna Mysticetus*. M. Van Beneden, to whose memoir I have referred in the commencement of this, says, on the authority of Eschricht, that at no age whatever do we find in true Whales (meaning, I presume, the *Mysticetus borealis* and *australis*) any distinct vertebræ in the cervical region, as in other mammals. A fusion of all into one bone or cartilage seems to take place even in the youngest fœtus. Now, I had enjoyed the rare opportunity of dissecting the fœtus of the *Mysticetus*, and I knew that the skeleton, prepared with the greatest care, was still preserved in the Museum of the University of Edinburgh. I wrote to Mr. Goodsir to re-examine this point for me, for I did not find in my notes any confirmation of the observations of Eschricht. Mr. Goodsir's reply to my note is as follows:—

"University, Edinburgh,  
Sept. 30, 1857.

"MY DEAR SIR,

"In the skeleton of the fœtal *Mysticetus* now in the University Museum, the bodies of the axis and atlas have shrivelled up together, having evidently consisted of cartilage only; but the bodies of the five posterior cervical vertebræ are beautifully distinct, having well-formed osseous centres, which give them more of the configuration of the succeeding vertebral bodies than they present in their compressed form in the adult.

"The neural arches in the cervical region of this skeleton are five in number; the two anterior, which are distinctly those of the atlas and axis, have an osseous nodule on each side, where the transverse processes pass off. The third arch belongs to the third vertebra, the fourth and fifth to the sixth and seventh. These three arches are cartilaginous, and present no osseous centres. It is impossible to determine from the preparation whether the arches of the fourth and fifth vertebræ had been cut away in dissecting the parts, or whether they have shrivelled up in drying; but as the skeleton was very carefully prepared, and as these two arches are deficient (at least laterally) in the adult *Mysticetus*, I presume that the cartilaginous matrices were at least extremely delicate in the fœtus.

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"I believe I have stated all the facts, afforded by this skeleton, which bear upon your questions. They appear to me to afford no support to the views to which they refer.

"Yours very sincerely,  
(Signed) "JOHN GOODSIR."

The conclusion I arrived at is this,—that the actual number of cervical vertebræ in the *Mysticetus* is, as in most other mammals, seven, and that, notwithstanding their earlier fusion, they are originally quite distinct.

FOOTNOTES:

[C] It is stated that some of the last of these are of wood. The skeleton in Edinburgh is perfect.

[D] "The substance of the brain is more visibly fibrous than I ever saw it in any other animal, the fibres passing from the ventricles as from a centre to the circumference, which fibrous texture is also continued through the cortical substance."—HUNTER, "On Whales," 'Animal Economy,' Palmer's edit. p. 373.

[E] In his paper "On the Structure of Whales" (Phil. Trans. 1787), Hunter remarks that the organ of smell "is peculiar to the large and small Whalebone Whales." He further remarks, that, "in those that have olfactory nerves, the lateral ventricles are not continued into them as in many quadrupeds;" and he notices "the want of the olfactory nerves in the genus of the Porpoise."—'Anim. Economy,' Palmer's edit. pp. 372, 373, 376.

[F] See Memoirs in the 'Transactions of the Royal Society of Edinburgh' for 1832.

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Extract of a Letter from Dr. BAIKIE to Sir JOHN RICHARDSON, M.D., C.B., F.R. & L.S., dated 29th October, 1857, Rabba, on the Qworra.

[Read January 21st, 1858.]

"In natural history my collection is advancing, especially in skins and skeletons of birds. I am collecting skulls of all the domesticated animals, and skeletons of the sheep and goats. I have got

a few fish, including a prettily-marked *Diodon* or *Tetraodon*, probably new, and a *Myletes* which I did not meet with formerly. The *Siluridæ* are the most abundant fishes; and one species closely resembles the *Hypophthalmus*, figured by Rüppell in his 'Fishes of the Nile and Red Sea.' I have not met with another Polypterus. I shall get a *Lepidosiren* in the river, and have heard of an electrical fish, I believe a *Malopteruris*, such as I formerly found. I enclose two scales of a fish which is said to grow to the length of 5 feet, but of which I have specimens half that size only,—also a sketch of a curious fish 2½ feet, which I put into spirits; it has neither ventral nor anal fins, a very peculiar caudal, and a slender head, while the dorsal extends along the whole back; eyes very small; teeth numerous and hard, but not sharp." He adds, in a postscript, that he had got the *Lepidosiren*. He had collected 700 species of plants, and numerous fine fruits, which he says "will rejoice Sir William Hooker's heart."

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Dr. Baikie's postscript, however, mentions that his vessel had been wrecked about twelve miles above Lagos, and that she sunk in a few minutes after she struck. He does not say what was the fate of his collections, but states that all the party had fever from fatigue and sleeping in swamps after the wreck.—J. R.

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Catalogue of the Dipterous Insects collected in the Aru Islands by Mr. A. R. WALLACE, with Descriptions of New Species. By FRANCIS WALKER.

ARU ISLAND.

Fam. MYCETOPHILIDÆ, *Haliday*.

Gen. SCIARA, *Meigen*.

Div. A. a., *Meig.* vi. 305.

1. SCIARA SELECTA, n. s. *Mas.* Nigra, cinereo-tomentosa, antennis sat validis, pedibus piceis, alis cinereis, venis costalibus crassis.

*Male.* Black, with cinereous tomentum; antennæ rather stout; legs piceous; wings greyish; veins black; radial and cubital veins thick; radial vein extending to the fork of the subapical. Length of the body 1¾ line; of the wings 4 lines.

Fam. BIBIONIDÆ, *Haliday*.

Gen. PLECIA, *Hoffmansegg*.

2. *Plecia dorsalis*, *Walk.* See Vol. I. p. 5.

Fam. CULICIDÆ, *Haliday*.

3. CULEX SCUTELLARIS, n. s. *Mas.* Nigro-fuscus, capite thoraceque argenteo trivittatis, scutello rufescente; abdominis segmentis argenteo fasciatis, genubus et tarsorum posticorum fasciis niveis; alis subcinereis, venis nigris ciliatis.

*Male.* Blackish brown. Head and thorax with three silvery stripes, the middle one very distinct; scutellum reddish; pectus with silvery gloss; abdomen with silvery bands, which are narrow above, broad beneath; femora pale towards the base; knees snow-white; hind tarsi with 5 broad snow-white bands; middle tarsi with the first and second joints white at the base; wings slightly greyish; veins black, fringed. Length of the body 3 lines; of the wings 5 lines.

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Fam. TIPULIDÆ.

Gen. MEGISTOCERA, *Wied.*

4. *Megistocera tuscana*, *Wied. Auss. Zweist.* 1. 55. 1. Inhabits also Java.

Gen. GYNOPLISTIA, *Westw.*

5. GYNOPLISTIA JURGIOSA, n. s. *Mas. et Fœm.* Nigra, capite rufescente, alis cinereis, plagis costalibus nigro-fuscis.—*Mas.* Abdomine ochraceo, apice nigro, femoribus basi testaceis.—*Fœm.* Abdomine atro fasciis albidis apice luteo.

*Male and Female.* Black. Head reddish; antennæ testaceous at the base; thorax testaceous in front; wings greyish, blackish-brown along the costa, and with three subcostal blackish-brown patches, the third continued along the veins towards the hind border. *Male.* Abdomen ochraceous, black at the tip; femora testaceous at the base; halteres testaceous. *Female.* Abdomen deep black, with whitish bands on the sutures; tip luteous. Length of the body 5-6 lines; of the wings 9-10 lines.

## Fam. STRATIOMIDÆ, Haliday.

### Gen. PTILOCERA, Wied.

6. *Ptilocera quadridentata.* See Vol. 1. p. 7.

7. MASSICYTA INFLATA, n. s. *Fœm.* Nigra, capite viridi maculis nigris, antennis basi ferrugineis, pectoris callis duobus scutelloque testaceis, abdomine basi sordide albido lineis tribus nigris, fasciis duabus canotomentosis, segmentis tertio quartoque apice ferrugineis, tibiis basi tarsisque albidis, alis subcinereis fusco marginatis, stigmatate nigricante, halteribus testaceis.

*Female.* Black. Head dull green, with several black spots; mouth testaceous; antennæ dark ferruginous towards the base; two pectoral calli and the scutellum testaceous; abdomen at the base dingy-whitish and semihyaline, and with three black lines; third and fourth segments with hoary bands, their hind borders ferruginous; tibiæ towards the base, and tarsi, whitish; hind tibiæ with the two colours most distinctly marked; wings grey, with broad brownish borders; stigma blackish; veins black; halteres testaceous. Length of the body 6 lines; of the wings 11 lines.

8. MASSICYTA CERIOIDES, n. s. *Fœm.* Nigra, capite testaceo maculis nigris, antennis basi ferrugineis, pectoris callis duobus, thoracis vittis duabus interruptis, scutello abdominisque fasciis tribus viridibus, segmento abdominali secundo maculis duabus testaceis, tarsis albis, alis nigricanti-fuscis, halteribus viridibus.

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*Female.* Black. Head testaceous, with some black spots on the vertex. Antennæ dark ferruginous towards the base. An interrupted stripe on each side of the thorax, two pectoral calli, the scutellum, and the hind borders of the second, third, and fourth abdominal segments green. Abdomen testaceous at the base beneath; first band interrupted, having before it two testaceous spots. Knees lurid; tarsi white. Wings blackish brown; stigma and veins black; halteres apple-green. Length of the body 5-6 lines; of the wings 10-12 lines.

### Gen. SALDUBA, n. g.

*Male.* *Corpus* angustum, sublineare. *Caput* transversum; vertex angustus. *Oculi* magni. *Antennæ* capite transverso valde longiores; articuli primo ad septimum breves; flagellum longum, lanceolatum, subarcuatum. *Thorax* longus, subcompressus; scutellum inerme. *Abdomen* planum, thorace paulo longius. *Pedes* graciles; postici longi. *Alæ* angustæ.

*Male.* Body narrow, nearly linear. Head slightly transverse, nearly as broad as the thorax; vertex narrow. Eyes large. Antennæ shorter than the thorax; joints from the first to the seventh short; flagellum long, lanceolate, slightly curved. Thorax long, slightly increasing in breadth from the head to the base of the wings. Abdomen nearly flat and linear, a little longer than the thorax. Legs slender; hind pair long. Wings narrow; veins complete, distinctly marked; first cubital areolet rather short, divided from the second by the oblique first cubital rim; discal areolet large, hexagonal; subanal and anal veins united at some distance from the border.

9. SALDUBA DIPHYSOIDES, n. s., *Mas.* Nigra, ore flavo, thorace vittis quatuor subauratis, abdominis apice cinereo, pedibus albidis, femoribus posticis apices versus tibiisque posticis nigris, alis cinereis, venis stigmatateque nigris, halteribus testaceis.

*Male.* Black. Mouth yellow; thorax with four stripes of slightly gilded tomentum; tip of the abdomen with cinereous tomentum; legs whitish, hind femora towards the tips and hind tibiæ black; wings greyish, veins and stigma black; halteres testaceous. Length of the body 4½ lines; of the wings 8 lines.

### Gen. STRATIOMYS.

10. STRATIOMYS CONFERTISSIMA, n. s. *Fœm.* Nigra, subtus ferruginea, capite fulvo, antennis basi fulvis, thorace vittis quatuor subauratis, scutelli margine fulvo, ventre piceo basi testaceo, pedibus fulvis nigro fasciatis; alis subcinereis, venis stigmatateque nigris, halteribus testaceis.

*Female.* Black, ferruginous beneath. Head, antennæ at the base, border of the scutellum, and legs tawny; antennæ a little shorter than the breadth of the head; thorax with four slightly gilded stripes; abdomen beneath piceous, testaceous at the base; femora and tibiæ with broad black bands; wings greyish, stigma

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and veins black; halteres testaceous. Length of the body 4 lines; of the wings 7½ lines.

11. STRATIOMYS NEXURA, n. s. *Mas et Fœm.* Nigra, antennis basi fulvis, capite transverso brevioribus, abdominis lateribus, ventre, tibiis, tarsis halteribusque fulvis, alis limpidis, venis testaceis. *Mas.* Thorace atro piloso. *Fœm.* Thorace nigro-æneo angustiore.

*Male and female.* Black. Head rather prominent; antennæ tawny towards the base, shorter than the breadth of the head; spines of the scutellum, abdomen beneath, tibiæ, tarsi, and halteres tawny; wings limpid, veins testaceous. *Male.* Thorax deep black, pilose; abdomen tawny along each side. *Female.* Head shining; thorax æneous black, narrower than that of the male; abdomen with the tawny stripes much narrower than those of the male. Length of the body 3½ lines; of the wings 6½ lines.

#### Gen. CLITELLARIA, Meigen.

12. Clitellaria bivittata, *Fabr.* See Vol. I. p. 7.

Gen. GABAZA, n. g.

*Fœm. Corpus* breve, latum. *Caput* transversum, thorace paullo angustius; facies valde obliqua. *Antennæ* capite transverso breviores; articuli breves, transversi; arista longa, gracilis, filiformis. *Scutellum* prominens, spinis duabus minutis. *Abdomen* transversum, thorace multo latius. *Pedes* graciles, breviusculi. *Alæ* sat angustæ; venæ tenues.

*Female.* Body short, broad. Head transverse, a little narrower than the thorax; face very oblique. Antennæ shorter than the breadth of the head; joints short, transverse; arista slender, filiform, longer than the preceding part, which is lanceolate. Scutellum prominent, armed with two minute spines. Abdomen transverse, much broader than the thorax. Legs slender, somewhat short. Wings rather narrow; veins feeble, in structure like those of *Stratiomys*.

13. GABAZA ARGENTEA, n. s. *Fœm.* Nigra, antennis fulvis, arista alba, thorace abdomineque argenteo-tomentosis, tarsis albido-testaceis, alis limpidis, venis pallidis.

*Female.* Coal-black. Antennæ tawny, arista white; thorax and abdomen with bright silvery tomentum; tarsi whitish testaceous; wings limpid, veins pale. Length of the body 2 lines; of the wings 3½ lines.

#### Gen. SARGUS, Fabr.

14. Sargus metallinus, *Fabr.* See Vol. I. p. 110.

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15. SARGUS COMPLENS, n. s. *Fœm.* Rufescente-fulvus, capitis vertice nigro, antennis testaceis, abdomine fasciis latis abbreviatis piceis, tarsis posticis basi tibiisque posticis nigris, alis cinereis, basi subluridis, apud costam anteriorem nigro-fuscis.

*Female.* Reddish tawny. Head black above, testaceous beneath; antennæ testaceous; abdomen with four broad abbreviated piceous bands; legs tawny, hind tibiæ black with a tawny apical mark, hind tarsi black towards the base; wings greyish, slightly lurid towards the base, blackish-brown about the exterior part of the costa, veins black, tawny towards the base; halteres testaceous, tawny towards the tips. Length of the body 6 lines; of the wings 14 lines.

16. SARGUS ROGANS, n. s. *Mas et Fœm.* Capitis vertice nigro, antennis pedibusque testaceis, tibiis tarsisque posticis nigris, alis subcinereis apice obscurioribus. *Mas.* Luteo-testaceus. *Fœm.* Ferrugineus.

*Male and Female.* Head black above; antennæ and legs testaceous; hind tibiæ and hind tarsi black; wings greyish, darker towards their tips; veins black, tawny towards the base. *Male.* Lutescent testaceous. *Female.* Ferruginous; wings darker than those of the male. Length of the body 5 lines; of the wings 10 lines.

#### Gen. NERUA, n. g.

*Fœm. Corpus* longiusculum, sublineare. *Caput* transversum, thorace non latius. *Antennæ* breves; articulus tertius rotundus; arista apicalis, longa, tenuis, setiformis. *Thorax* productus. *Scutellum* spinis quatuor longiusculis. *Abdomen* depressum, sublineare, thorace vix latius, non longius. *Pedes* graciles, non longi. *Alæ* angustæ; venæ bene determinatæ.

*Female.* Body rather long, nearly linear. Head transverse, not broader than the thorax. Antennæ short; third joint round; arista apical, long, slender, setiform. Thorax long. Abdomen flat, thin, nearly linear, hardly broader and not longer than the thorax. Legs slender, not long. Wings narrow; veins distinctly marked, in structure like those of *Clitellaria*.

This genus may be distinguished from *Culcua* by the shape of the abdomen.

17. NERUA SCENOPINOIDES, n. s. *Fœm.* Atra, nitens, antennis fulvis, scutelli spinis pedibusque albis, alis nigro-cinereis, postice pallidioribus, venis nigris, halteribus testaceis.

*Female.* Coal-black, shining; antennæ tawny; thorax slightly tomentose; spines of the scutellum and legs white; wings blackish grey, paler towards the hind border, veins black; halteres testaceous. Length of the body 3 lines; of the wings 5 lines.

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Gen. ADRAGA, n. g.

*Mas. Corpus* sublineare. *Caput* thorace non latius. *Oculi* connexi. *Antennæ* brevissimæ; articulus tertius rotundus; arista apicalis, gracilis, setiformis. *Thorax* sutura transversa bene determinata. *Scutellum* prominens, trigonum, marginatum. *Abdomen* thorace paullo brevius, non latius. *Pedes* breviusculi, validi, non dilatati. *Alæ* mediocres.

*Male.* Body nearly linear, rather thick. Head not broader than the thorax. Eyes connected. Antennæ very short; third joint round; arista apical, long, slender, setiform. Thorax with the transverse suture very distinct. Scutellum prominent, triangular, with a border. Abdomen a little shorter and not broader than the thorax. Legs stout, rather short, not dilated. Wings moderately broad; veins in structure like those of *Clitellaria*.

18. ADRAGA UNIVITTA, n. s. *Mas.* Nigra, subtilissime punctata, antennis piceis, thorace vitta cinerea, tarsis posterioribus albis, alis nigricantibus.

*Male.* Coal-black, hardly shining; antennæ piceous; thorax and abdomen very minutely punctured; thorax with a stripe of cinereous tomentum; posterior tarsi white; wings blackish, veins black. Length of the body 3 lines; of the wings 5 lines.

Gen. OBRAPA, n. g.

*Fœm. Corpus* breve, latum, crassum, convexum. *Caput* transversum, thorace angustius. *Antennæ* breves; articulus tertius rotundus; arista apicalis, gracilis, setiformis. *Thorax* sutura transversa bene determinata. *Abdomen* transversum, thorace paullo latius, valde brevius. *Pedes* breviusculi, validi; antici subdilatati. *Alæ* mediocres.

*Female.* Body short, broad, thick, convex. Head transverse, narrower than the thorax. Antennæ short; third joint round; arista apical, slender, setiform. Thorax with the transverse suture very distinct. Scutellum large, prominent, with a marginal suture. Abdomen transverse, a little broader than the thorax, and not more than half its length. Legs stout, rather short, the fore pair slightly dilated. Wings moderately broad, veins rather irregular; discal areolet large, quadrilateral; externo-medial veins, subanal vein, and anal vein very slight; subanal vein and anal vein united at some distance from the border.

19. OBRAPA PERILAMPOIDES, n. s. *Fœm.* Atra, nitens, subtilissime punctata, capite glabro, antennis piceis, tarsis posterioribus albidis, alis limpidis, venis albidis basi nigris, halteribus niveis.

*Female.* Deep black, shining, very minutely punctured; head smooth; antennæ piceous; posterior tarsi whitish, with black tips; wings limpid, veins whitish, black towards the base; halteres snow-white. Length of the body 2½ lines; of the wings 5 lines.

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20. OBRAPA CELYPHOIDES, n. s. *Fœm.* Atra, nitens, subtilissime punctata, capite glabro, antennis piceis, tarsis albidis, alis nigro-cinereis, venis nigris, halteribus niveis.

*Female.* Deep black, very minutely punctured. Head smooth; antennæ piceous; tarsi whitish; wings blackish cinereous, veins black; halteres snow-white. Length of the body 2 lines; of the wings 4 lines.

Fam. TABANIDÆ, *Leach.*

Gen. TABANUS, *Linn.*

21. TABANUS RECUSANS, n. s. *Fœm.* Piceus, cinereo-subtomentosus, callo nigro angusto, antennis rufis apice nigris, humeris rufescentibus, abdomine basi glaucescente, tibiis obscure ferrugineis, alis nigro-fuscis, apice margineque postico cinereis.

*Female.* Piceous, slightly covered with cinereous tomentum. Callus of the head black, long, slender, entire; antennæ red, black towards the tips, angle of the third joint very small; thorax reddish on each side in front of the forewings; abdomen with glaucous tomentum towards the base; tibiæ mostly dark ferruginous; wings blackish-brown, cinereous towards the tips and along the hind border; veins black; forebranch of the cubital vein simple, very slightly undulating, its tip, like that of the radial vein, clouded with blackish-brown. Length of the body 6½ lines; of the wings 12 lines.

Fam. ASILIDÆ, *Leach.*

Subfam. DASYPOGONITES, *Walk.*

22. DASYPOGON INOPINUS, n. s. *Fœm.* Piceus, facie aurata, mystace parvo albo, antennis ferrugineis, apices versus nigris, capite transverso longioribus, articulo tertio lineari, pectore fasciis tribus canis, abdominis segmentis ferrugineo fasciatis, alis luridis, apud costam nigro-fuscis, halteribus testaceis.

*Female.* Piceous. Face flat, brightly gilded; epistoma not prominent; mystax with a few white bristles; mouth black; antennæ ferruginous, black towards the tips, longer than the breadth of the head; third joint linear, longer than the first and the second together; pectus with three hoary bands; abdomen subclavate, nearly twice the length of the thorax; a ferruginous band on the hind border of each segment; legs mostly ferruginous; wings lurid, blackish-brown towards the costa, veins black; halteres testaceous. Length of the body 8 lines; of the wings 14 lines.

23. DASYPOGON HONESTUS, n. s. Lutescente-fulvus, capite, antennis, pedibus alisque nigris, thorace vitta schistacea nigro marginata vittisque duabus lateralibus cinereis, pectore postico nigro, abdomine —?-, tibiis tarsisque posticis fulvis.

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Luteous-tawny. Head, antennæ, hind part of the pectus, and legs black, shining; mystax with very few bristles; antennæ almost as long as the breadth of the head, third joint long, slender, linear; thorax with a slate-coloured blackish-bordered stripe, a short slate-coloured stripe on each side; abdomen wanting; hind tibiæ and tarsi tawny; wings blackish, veins black. Length of the body 4? lines; of the wings 7 lines.

### Subfam. LAPHRITES, *Walk.*

#### Gen. LAPHRIA, *Fabr.*

24. *Laphria scapularis*, *Wied. Auss. Zweifl.* 1. 516. 29. Inhabits also Java.

25. *Laphria aurifacies*, *Macq.* See Vol. I. p. 10.

26. LAPHRIA GLORIOSA, n. s. *Mas et Fœm.* Aurata, capite pectoreque albis, abdomine purpureo, guttis lateralibus albis, basi viridi, lateribus pedibusque cyaneis, alis fuscis basi cinereis, halteribus testaceis.

*Male and Female.* Head and pectus with white tomentum and hairs; mystax with a few black bristles; mouth and antennæ black; third joint of the latter linear, conical at the tip, longer than the first and the second together; thorax with cupreous-gilded tomentum; abdomen purple, green at the base, blue and with a row of white dots along each side; legs blue; wings brown, cinereous towards the base, veins black; halteres testaceous. *Male.* Legs very thick and pilose. Length of the body 9 lines; of the wings 16 lines.

27. LAPHRIA SOCIA, n. s. *Fœm.* Cyaneo-viridis, capite aurato, antennarum articulo tertio longissimo subfusiformi, thoracis tomento subaurato, vitta media nuda, pectore argenteo, abdomine purpureo-cyaneo basi viridi maculis lateralibus argenteis, alis nigro-cinereis basi cinereis.

*Female.* Bluish-green. Head brightly gilded, hind part silvery; mystax with six long black bristles; third joint of the antennæ very elongate subfusiform; thorax with slightly gilded tomentum, excepting a broad bare middle stripe; pectus with silvery tomentum; abdomen purplish-blue, green towards the base, with spots of silvery tomentum along each side; hind borders of the ventral segments white; wings grey, blackish-grey for almost half the length from the tips and along three-fourths of the length of the hind border, veins black; halteres ferruginous. Length of the body 8½ lines; of the wings 16 lines.

28. LAPHRIA CONSOBRINA, n. s. *Fœm.* Purpurea, capite aurato, pectore argenteo, abdomine viridi-cyaneo, maculis lateralibus argenteis, alis nigricantibus basi cinereis.

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*Female.* Purple. Head brightly gilded, hind part silvery, underside with white hairs; mystax with six long black bristles; pectus with silvery tomentum; abdomen greenish blue, with spots of silvery tomentum along each side; hind borders of the ventral segments white; wings slightly grey, blackish for full half the length from the tips and along full three-fourths of the length of the hind border, veins black; halteres ferruginous, with black tips. Length of the body 7½ lines; of the wings 14 lines.

This species much resembles *L. socia*, but may be distinguished by the difference of colour, and more especially by the more undulating first branch vein, by the much less oblique third externo-medial vein, and by the subanal vein, which is united to the anal vein much nearer the border.

29. LAPHRIA SODALIS, n. s. *Mas.* Cyanea, capite aurato, antennarum articulo tertio fusiformi, thoracis lateribus purpureo-viridibus, pectore ventrequae argenteis, abdomine maculis lateralibus argenteis, alis cinereis, apice posticeque nigricantibus.

*Male.* Blue. Head brightly gilded, vertex and hind part silvery, underside with white hairs; mystax with four long black bristles, and with several gilded bristles; third joint of the antennæ elongate-fusiform; sides of the thorax varied with green and purple; abdomen with spots of silvery tomentum along each side, underside and pectus silvery; wings grey, black towards the tips and along half the length of the hind border; halteres white. Length of the body 7 lines; of the wings 13 lines.



The veins of this species are hardly different from those of *L. consobrina* in structure, excepting the third externo-medial, which is united to the fourth nearer the border.

30. LAPHRIA COMES, n. s. *Mas et Fœm.* Viridi-cyanea, capite aurato, antennarum articulo tertio fusiformi, pectore ventrisque lateribus argenteis, abdomine viridi (mas) aut purpureo-cyaneo (fœm.) maculis lateralibus argenteis, alis nigricantibus basi cinereis.

*Male and Female.* Greenish blue. Head brightly gilded, hind part silvery; mystax with six long black bristles; third joint of the antennæ elongate-fusiform; pectus with silvery tomentum; abdomen green in the male, purplish-blue in the female, with silvery spots along each side, underside with two silvery stripes; wings blackish, grey at the base and along the costa for more than one-third of the length, veins and halteres black. Length of the body 6—6½ lines; of the wings 11-12 lines.

This may be only a small variety of *L. consobrina*; but the wings are not darker towards the costa as in that species, and the first branch-vein is much more straight.

31. LAPHRIA CONSORS, n. s. *Mas et Fœm.* Viridis (mas) aut cyanea (fœm.), capite aurato, antennarum articulo tertio brevifusiformi, pectore argenteo, abdomine æneo-viridi (mas) aut cyaneo-purpureo (fœm.) maculis lateralibus argenteis, alis nigricantibus, basi cinereis.

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*Male and Female.* Green (male) or blue (female). Head gilded, hind part silvery; mystax with a few black bristles; third joint of the antennæ short-fusiform; pectus silvery; abdomen æneous-green in the male, bluish-purple in the female, with silvery spots along each side; wings blackish, grey at the base and along the costa for more than one-third of the length; veins and halteres black. Length of the body 4½—5 lines; of the wings 8-9 lines.

The straight and not oblique third externo-medial vein distinguishes this species from all the preceding *Laphriæ*.

32. LAPHRIA GERMANA, n. s. *Fœm.* Cyanea, facie aurata, antennarum articulo tertio longissime subfusiformi, abdominis maculis lateralibus pectoreque argenteis, alis cinereis, basi subcinereis, halteribus albis.

*Female.* Blue. Head gilded in front, vertex and hind part silvery; mystax with six black bristles; third joint of the antennæ very long, subfusiform; pectus silvery; abdomen purplish blue, shorter than in the preceding species, with silvery spots along each side; wings grey, slightly grey towards the base; halteres white. Length of the body 3½ lines; of the wings 7 lines.

33. LAPHRIA FLAGRANTISSIMA, n. s. *Mas.* Rufescente-cervina, capite aurato, antennis pedibusque rufescentibus, thorace vittis tribus latissimis (lateralibus abbreviatis) pectoreque nigricantibus, alis lutescentibus, plaga postica interiore fasciaque latissima exteriore nigricantibus.

*Male.* Reddish fawn colour. Head gilded; mystax with numerous gilded bristles; mouth lanceolate, very stout; antennæ reddish, third joint long, lanceolate, abruptly acuminate at the tip; thorax with three very broad blackish stripes; disk of the pectus black; abdomen with the segments darker towards the base, underside black towards the tip; legs reddish, stout; tarsi with black bands beneath; wings somewhat luteous, with a large blackish patch on the hind border near the base, and with a very broad blackish band near the tip; halteres testaceous. Length of the body 11 lines; of the wings 22 lines.

34. LAPHRIA JUSTA, n. s. *Mas.* Lutea, capite aurato, ore, antennis apice, thoracis maculis duabus posticis, pectore, abdominis fasciis latis femoribusque nigris, alis cinereis, apud costam luridis.

*Male.* Luteous. Head gilded; mystax with numerous gilded bristles; mouth short, black; antennæ reddish tawny, third joint lanceolate, black except at the base; thorax with the disk somewhat darker, two large black spots hindward; pectus black; abdomen linear, with a broad black band on the fore border of each segment; femora black above except at the tips, hind femora black also beneath; wings greyish, slightly clouded with dark grey, lurid along the costa for three-fourths of the length; halteres testaceous. Length of the body 8 lines; of the wings 14 lines.

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35. LAPHRIA MANIFESTA, n. s. *Mas et Fœm.* Fulva, capite argenteo (mas) aut pallide aurato (fœm.), antennis apice nigris, thoracis disco et abdominis maculis subtrigonis subæneo-ferrugineis, scutello quadrisetosus, alis subcinereis.

*Male and Female.* Tawny. Head silvery in the male, pale-gilded in the female; mystax with several slender bristles; mouth lanceolate; third joint of the antennæ very elongate-subfusiform, black towards the tip; disk of the thorax and nearly triangular dorsal spots of the abdomen ferruginous with a slight æneous tinge; pectus testaceous, slightly silvery; wings slightly greyish; veins black, testaceous at the base, where the wings also have a testaceous tinge; halteres testaceous. Length of the body 4½—5 lines; of the wings 8-9 lines.

36. LAPHRIA APERTA, n. s. *Fœm.* Testacea, capite subargenteo, antennis abdominisque apice nigris, alis nigricantibus basi limpidis, halteribus albidis.

*Female.* Testaceous. Head with whitish slightly silvery tomentum; mystax with very few bristles; antennæ black, third joint long, linear, conical at the tip; thorax with a very indistinct darker stripe; abdomen black towards the tip; wings blackish, limpid towards the base; veins black, testaceous at the base; halteres

whitish. Length of the body 4 lines; of the wings 7 lines.

37. LAPHRIA DECLARATA, n. s. *Mas.* Fulva, capite albo, facie argentea micante, antennis tibiisque posticis nigris, thorace atro, alis cinereis, venis nigris, halteribus testaceis.

*Male.* Tawny, slender. Head white, face brilliant silvery; mystax with four bristles; mouth black, short, slender; eyes flat in front; antennæ black, almost as long as the breadth of the head; third joint long, slender, lanceolate; thorax deep black; scutellum reddish tawny; hind tibiæ black, with tawny tips; wings greyish, veins black; discal veinlet and third externo-medial vein forming one straight line, as in the genus *Atomosia*; halteres testaceous. Length of the body 3½ lines; of the wings 6 lines.

### Subfam. ASILITES, *Walk.*

#### Gen. TRUPANEA, *Macq.*

38. TRUPANEA CONTRADICENS, n. s. *Mas et Fæm.* Nigricans, cinereo-subtomentosa, thoracis vittis pectoreque cano-tomentosis, pedibus nigris, tibiis rufis apice nigris, alis fusco-cinereis, areola radiali schistaceo vittata. *Mas.* Capite subaurato, barba testaceo-albida, abdominis segmentis lutescente marginatis. *Fæm.* Capite barbaque albidis, abdomine stylato, segmentis cano marginatis.

*Male and Female.* Blackish. Antennæ and legs black; thorax slightly covered with cinereous tomentum; stripes, pectus, and underside of the abdomen hoary; tibiæ red, with black tips; wings brownish grey; radial areolet with a slate-coloured stripe. *Male.* Head slightly gilded; mystax with a few black bristles and many gilded bristles; beard testaceous-whitish; sides of the abdomen and hind borders of the segments lutescent. *Female.* Head and beard whitish; mystax with many black bristles and a few white bristles; abdomen with an apical style, more than one-third of the length of the preceding part, sides and hind borders of the segments hoary. Length of the body 12-14 lines; of the wings 14-18 lines.

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#### Gen. ASILUS, *Linn.*

39. *Asilus longistylus*, *Wied. Auss. Zweifl.* 1. 433. 13. Inhabits also Java.

#### Gen. OMMATIUS, *Illiger.*

40. OMMATIUS NOCTIFER, n. s. *Mas.* Niger, capite aurato, thoracis incisuris, scutello, pectore, segmentorum abdominalium marginibus ventreque canis, tibiis fulvis apice nigris, alis cinereis costa apiceque nigricantibus, halteribus ferrugineis.

*Male.* Black. Head gilded; mystax with a few black and several gilded bristles; sutures of the thorax, scutellum, sides, pectus, hind borders of the abdominal segments, and underside hoary; tibiæ tawny, with black tips; wings cinereous, blackish along the costa and towards the tips, veins black; halteres ferruginous. Length of the body 6—6½ lines; of the wings 11-12 lines.

41. OMMATIUS LUCIFER, n. s. *Mas.* Æneo-niger, capite argenteo, pectore albido, abdominis segmentis ferrugineo marginatis, pedibus testaceis, femoribus nigro-vittatis, tarsis nigris, alis limpidis apice nigricantibus costa atra apud medium incrassata, halteribus testaceis.

*Male.* Bronze-black. Head silvery in front; mystax with a few black and a few whitish bristles; pectus whitish; hind borders of the abdominal segments ferruginous; legs testaceous; femora striped with black; tarsi black, ferruginous at the base; wings limpid, blackish at the tips; costa deep black, incrassated in the middle; halteres testaceous. Length of the body 6 lines; of the wings 11 lines.

42. OMMATIUS RETRAHENS, n. s. *Fæm.* Cinereo-niger, facie argentea, pectore albido, pedibus testaceis, tarsis, femoribus tibiisque apice femoribusque posticis nigris, alis limpidis apice subcinereis, halteribus testaceis.

*Female.* Cinereous-black. Head silvery white in front; mystax with very few white and black bristles; pectus whitish; legs testaceous; tips of the anterior femora and of the middle tibiæ black; hind femora and hind tarsi black; anterior tarsi and hind tibiæ black, testaceous towards the base; wings limpid, slightly cinereous towards the tips; veins black; halteres testaceous. Length of the body 4 lines; of the wings 7 lines.

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#### Gen. LEPTOGASTER, *Meigen.*

43. LEPTOGASTER FERRUGINEUS, n. s. *Mas.* Ferrugineus, pectore albo, abdomine nigro, segmentorum marginibus ventreque testaceis, pedibus fulvis, femoribus apice nigris, tibiis piceo vittatis, tibiis posticis tarsisque nigris basi testaceis, alis sublimpidis, halteribus testaceis apice piceis.

*Male.* Ferruginous. Head pale, gilded in front, hind side and pectus white; mouth and antennæ tawny, the latter blackish towards the tips; abdomen black; hind borders of the segments and under side testaceous; legs tawny; anterior femora with a testaceous band before the tips, which are black; hind femora and anterior tibiæ striped with piceous, the latter black towards the tips; tarsi and hind tibiæ black, testaceous

at the base; wings very slightly greyish, veins black; halteres testaceous, piceous towards the tips. Length of the body 7 lines; of the wings 10 lines.

44. LEPTOGASTER LONGIPES, n. s. *Mas.* Ferrugineus, pectore albido, abdomine piceo, segmentis apice fulvescentibus, pedibus anterioribus fulvescentibus, posticis piceis longissimis, femoribus posticis basi testaceis, alis subcinereis basi obscurioribus costa venisque nigris, halteribus testaceis apice nigris.

*Male.* Ferruginous. Head testaceous in front; mouth and antennæ black; pectus whitish; abdomen piceous, hind borders of the segments somewhat tawny; legs somewhat tawny; hind legs piceous, very long, their femora testaceous at the base; wings slightly greyish, darker towards the base, costa and veins black; halteres testaceous, with black knobs. Length of the body 4 lines; of the wings 8 lines.

45. LEPTOGASTER ALBIMANUS, n. s. *Mas.* Niger, capite antico pectoreque albis, antennis basi ferrugineis, abdominis segmentis cano fasciatis, femoribus, tibiis tarsisque basi albis, femoribus posticis luteo fasciatis, alis limpidis, halteribus albidis apice piceis.

*Male.* Black. Head in front and the pectus white; antennæ ferruginous at the base; abdomen long, a hoary band on the hind border of each segment; femora, tibiæ, and tarsi white at the base; hind legs long, rather stout; hind femora with a luteous band; wings limpid, veins black; halteres whitish, with piceous knobs. Length of the body 5 lines; of the wings 7 lines.

### Fam. LEPTIDÆ, *Westw.*

#### Gen. LEPTIS, *Fabr.*

46. *Leptis ferruginosa*, *Wied.* See Vol. I. p. 118.

#### Gen. CHRYSOPILA, *Macq.*

47. CHRYSOPILA VACILLANS, n. s. *Mas et Fœm.* Lutescens, capite nigro, thorace subvittato, abdominis segmentis nigro fasciatis, alis sublimpidis apud costam flavescentibus, venis fusco latissime marginatis, stigmatibus nigro-fusco. [Pg 90]

*Male and Female.* Lutescent. Head of the female black, shining; thorax with two brown bands which are paler and indistinct hindward; abdomen with a broad black band on each segment; tarsi blackish towards the tips; wings nearly limpid, yellowish along the costa, veins exteriorly with very broad brownish borders, stigma blackish brown. Length of the body 3½ lines; of the wings 6 lines.

### Fam. BOMBYLIDÆ, *Leach.*

#### Subfam. THEREVITES, *Walk.*

48. THEREVA CONGRUA, n. s. *Mas.* Nigra, glaucescente albo tomentosa, albo pilosa, capite argenteo, thorace trivittato et bilineato, pedibus nigris, femoribus albis, alis cinereis stigmatibus elongato venisque nigris.

*Male.* Black, with glaucous-white tomentum and with white hairs. Head silvery in front; thorax with three blackish brown stripes, the middle one with a dark stripe on each side, broader and more distinct than the lateral pair; abdomen beneath and legs black, femora white; wings grey, with an elongated black stigma and black veins; halteres black. Length of the body 5 lines; of the wings 8 lines.

#### Subfam. BOMBYLITES, *Walk.*

#### Gen. ANTHRAX, *Fabr.*

49. ANTHRAX PELOPS, n. s. *Mas.* Ferruginea, thoracis margine rufo piloso, pectore abdomineque nigris, abdomine fasciis duabus, maculis duabus apicalibus, plagaque ventrali subtrigona argenteis, alis cinereis, basi costaque nigris.

*Male.* Closely allied to *A. Tantalus*. Dark ferruginous. Head above, antennæ, pectus, abdomen, and legs black; thorax bordered with red hairs; pectus with a silvery dot on each side; abdomen with red hairs on each side at the base, with two silvery bands, with two silvery apical spots, and with a ventral, nearly triangular, silvery patch; wings cinereous, black at the base and along five-sixths of the length of the costa, veins and halteres black. Length of the body 8 lines; of the wings 18 lines.

50. *Anthrax semiscita*, *Walk.* See Vol. I. p. 118.

51. *Anthrax degenera*, *Walk.* See Vol. I. p. 15.

52. GERON SIMPLEX, n. s. *Mas*. Ater, antennis pedibusque nigris, alis subcinereis, halteribus fulvis.

*Male*. Deep black. Eyes bright red; proboscis a little longer than the thorax; antennæ and legs black; wings slightly greyish, veins black; halteres tawny. Length of the body 2½ lines; of the wings 5 lines.

Fam. EMPIDOÆ, *Leach*.

Gen. HYBOS, *Fabr*.

53. HYBOS BICOLOR, n. s. *Mas*. Fulvus, ore antennisque testaceis, abdomine, femoribus posticis apice tibiisque anticis piceis, tarsis anterioribus ferrugineis, alis obscure cinereis.

*Male*. Tawny. Mouth and antennæ testaceous; abdomen, hind femora at the tips, and fore tibiæ piceous, anterior tarsi ferruginous; wings dark grey, veins black. Length of the body 3½ lines; of the wings 7 lines.

Fam. DOLICHOPIDÆ, *Leach*.

Gen. Psilopus, *Meigen*.

54. Psilopus æneus, *Fabr. Syst. Antl.* 268. 9.

Inhabits also Java.

55. PSILOPUS BENEDICTUS, n. s. *Mas et Fœm*. Aureo-viridis, facie pectoreque argenteis, antennis testaceis apice nigris, thorace vittis tribus cupreis, abdomine fasciis cupreo-purpureis, maculis lateralibus albidis, pedibus testaceis tibiis posticis tarsisque nigris, alis subcinereis, costam versus et apud venas transversas nigro-fuscis, halteribus testaceis. *Fœm*. Vertice cyaneo-purpureo, abdomine fasciis cyaneis.

*Male and Female*. Golden green. Face silvery; antennæ testaceous, black towards the tips, arista full as long as the thorax; thorax with three cupreous stripes; pectus silvery; abdomen with cupreous purple bands and with whitish spots along each side; legs testaceous, tarsi and hind tibiæ black; wings slightly greyish, blackish brown along the costa and about the transverse veins, veins black, fore branch of the præbrachial vein curved inward, discal transverse vein undulating; halteres testaceous. *Female*. Vertex bluish purple; abdomen with blue bands. Length of the body 4—4½ lines; of the wings 7-8 lines.

56. PSILOPUS LUCIGENA, n. s. *Mas*. Aureo-viridis, facie pectoreque argenteis, antennis tarsisque nigris, thorace vittis tribus rufo-cupreis, abdomine fasciis cupreo-purpureis, femoribus lutescentibus, tibiis piceis, femoribus anticis apice nigricantibus, alis nigris apice albis, halteribus fulvis apice nigris.

*Male*. Golden green. Face and pectus silvery; antennæ black, arista longer than the thorax; thorax with three broad reddish cupreous stripes; abdomen with broad cupreous purple bands; femora lutescent, tibiæ piceous, fore femora blackish towards the tips, tarsi black; wings black, tips snow-white, fore branch of the præbrachial vein slightly curved inward, discal transverse vein much curved outward; halteres tawny, with black tips. Length of the body 4½ lines; of the wings 9 lines.

57. Psilopus flavicornis, *Wied. Auss. Zweifl.* 11. 227. 31.

Inhabits also Sumatra.

58. PSILOPUS TERMINIFER, n. s. *Mas*. Aureo-viridis, vertice cyaneo-purpureo, facie pectoreque argenteis, antennis, pedibus halteribusque testaceis, abdomine apicem versus atro fasciis duabus cupreis, alis subcinereis apice nigris.

*Male*. Golden-green, slender. Vertex bluish-purple; face and pectus silvery; antennæ testaceous, arista about half the length of the body; fourth and fifth segments of the abdomen deep black with a cupreous band on the hind border of each segment, tip blue; legs and halteres testaceous; wings greyish, paler along the hind border, tips black, fore branch of the præbrachial vein slightly curved inward, discal transverse vein slightly undulating. Length of the body 3 lines; of the wings 5 lines.

59. PSILOPUS ORCIFER, n. s. *Fœm*. Purpureus, facie pectoreque subcinereis, antennis, pedibus halteribusque nigris, abdomine cyaneo-viridi segmentorum marginibus posticis purpureis, alis nigricantibus margine postico cinereo. *Var*. Viridis, vertice cyaneo, abdominis segmentis basi nigris.

*Female*. Purple, rather stout. Face and pectus slightly cinereous; antennæ, legs, and halteres black; abdomen bluish-green, hind borders of the segments purple; wings blackish, cinereous along the hind border, fore branch of the præbrachial vein forming an obtuse angle, discal transverse vein very undulating. *Var*. Green. Vertex blue; abdominal segments black at the base. Length of the body 2½ lines; of the wings 5 lines.

60. PSILOPUS EGENS, n. s. *Mas et Fœm*. Purpureus, facie pectoreque cyaneo-viridi cinereo subtomentosis,

antennis, pedibus halteribusque nigris, metathorace viridi, abdomine cyaneo, suturis nigris, alis cinereis.

*Male and Female.* Purple. Face and pectus slightly covered with cinereous tomentum, the latter bluish-green; antennæ black, arista much more than half the length of the body; metathorax green; abdomen blue, sutures black; legs and halteres black; wings grey, fore branch of the præbrachial vein much curved inward, discal transverse vein straight; length of the body  $2\frac{1}{2}$ — $2\frac{3}{4}$  lines; of the wings 5 lines.

#### Gen. DOLICHOPUS, *Latr.*

61. DOLICHOPUS TRIGONIFER, n. s. *Fœm.* Cupreo-viridis, facie argentea, antennis, pedibus halteribusque testaceis, pectore, ventre abdominisque maculis lateralibus trigonis albidis, abdomine purpureo marginibus posticis nigris, tarsis posterioribus nigricantibus, alis cinereis.

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*Female.* Cupreous green. Face silvery; antennæ, legs, and halteres testaceous; pectus, abdomen beneath, and triangular spots on each side whitish; abdomen purple, hind borders of the segments black; posterior tarsi blackish; wings grey, veins black, præbrachial vein forming a right angle at its flexure, between which and the border it is much curved inward, discal transverse vein very slightly curved outwards. Length of the body 3 lines; of the wings 5 lines.

This species resembles the *Psilopi* in the structure of the præbrachial vein.

#### Gen. DIAPHORUS, *Meigen.*

62. DIAPHORUS RESUMENS, n. s. *Mas et Fœm.* Obscure viridis (mas) aut niger (fœm.), facie pectoreque albidis, antennis piceis, abdomine nigro-cupreo basi obscure testaceo, pedibus anterioribus tibiisque posticis basi obscure testaceis, pedibus posticis nigris, alis nigricantibus apud marginem posticum pallidioribus, halteribus testaceis.

*Male and Female.* Dark green (male) or black (female). Face and pectus whitish; antennæ piceous; abdomen cupreous-black, dull testaceous towards the base; hind legs black, hind tibiæ towards the base and anterior legs dull testaceous; wings blackish, paler along the hind border, veins black, præbrachial vein and discal transverse vein straight; halteres testaceous. Length of the body 2 lines; of the wings  $3\frac{1}{2}$  lines.

### Fam. SYRPHIDÆ, *Leach.*

#### Gen. CERIA, *Fabr.*

63. CERIA SMARAGDINA, n. s. *Fœm.* Saturate metallico-viridis, subtilissime punctata, faciei lateribus cupreis, antennis nigris, arista nivea, thorace bivittato, abdomine æneo-viridi, tarsis nigris, alis dimidio costali nigro, halteribus testaceis.

*Female.* Deep metallic green, very finely punctured. Head blue in front, sides of the face cupreous-purple; mouth, antennæ, and tarsi black; arista snow-white; thorax with two almost contiguous darker stripes; abdomen æneous green, with the exception of the petiole, which is very thick; wings slightly greyish, costal half black; halteres testaceous. Length of the body 7 lines; of the wings 14 lines.

64. CERIA RELICTA, n. s. *Mas.* Nigra, faciei lateribus, thoracis maculis quatuor humeralibus, pectoris fasciis duabus lateralibus, scutello, abdominis maculis duabus basalibus fasciisque duabus flavis, tibiis flavescentibus apice piceis, alis apud costam nigris, halteribus testaceis.

*Male.* Black. Head yellow beneath, and in front with the exception of a black stripe on the disk of the face; arista white; thorax with two yellow spots on each side in front; scutellum yellow; pectus with an oblique yellow band on each side; abdomen not petiolated, with a tumid yellow spot on each side at the base, hind borders of the third and fourth segments yellow; femora at the tips and tibiæ yellow, the latter piceous towards the tips, tarsi piceous; wings greyish-black towards the costa, excepting a lurid costal streak which extends along half the length from the base; halteres testaceous. Length of the body 6 lines; of the wings 11 lines.

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65. CERIA RELICTA, n. s. *Fœm.* Nigra, faciei lateribus abdominisque fasciis duabus flavis, antennis ferrugineo variis, pedibus fulvis, alis cinereis costam versus nigris, halteribus stramineis.

*Female.* Black. Head yellow, beneath and in front with the exception of a black stripe on the disk of the face; first and third joints of the antennæ somewhat ferruginous, arista white; thorax with two indistinct yellowish marks on the transverse suture, hind border of the scutellum and hind borders of the second and third abdominal segments yellow; legs tawny, tibiæ paler towards the base; wings green, black for nearly half the breadth from the costa; halteres straw-colour. Length of the body 6 lines; of the wings 11 lines.

This may prove to be the female of *C. relictura*, notwithstanding its great difference from that species in the marks of the thorax and of the abdomen, and in the colour of the legs.

#### Gen. MICRODON, *Meig.*

66. MICRODON FULVICORNIS, n. s. *Mas*. Niger, aureo-subpubescens, antennis, abdomine, pedibus halteribusque fulvis, femoribus nigris, tibiis nigro vittatis, alis fuscis postice cinereis.

*Male*. Black. Head with gilded pubescence, cinereous behind and beneath; antennæ tawny, second joint above towards the tip and third joint piceous; thorax slightly covered with gilded tomentum; pectus with cinereous tomentum; abdomen with gilded tomentum towards the tip; legs tawny, femora mostly black, tibiæ with black stripes; wings cinereous, dark-brown about the costa, veinlet which bisects the subapical areolet incomplete, as it is also in the following species; halteres tawny. Length of the body 6 lines; of the wings 12 lines.

67. MICRODON APICALIS, n. s. *Mas et Fœm*. Niger, aureo-pubescens, thorace abdomineque fasciatis, pedibus halteribusque fulvis, alis nigro-fuscis postice obscure cinereis.

*Male and Female*. Black, with gilded tomentum, which forms two bands on the thorax, and one on each side of the pectus; abdomen with three gilded tomentose bands, the third subapical, first segment ferruginous beneath; legs tawny, femora at the base and coxæ black; wings blackish-brown, dark cinereous hindward; halteres tawny. Length of the body 5-6 lines; of the wings 10-12 lines.

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#### Gen. GRAPTOMYZA, *Wied*.

68. GRAPTOMYZA TIBIALIS, n. s. *Mas*. Testacea, vertice pectorisque fasciis duabus piceis, antennis supra nigris, abdominis lateribus fasciis duabus subtrigonis apiceque nigris, alis cinereis.

*Male*. Testaceous. Vertex and mouth piceous; epistoma with a piceous line on each side; third joint of the antennæ black above; abdomen black along each side and at the tip, and with two black bands which are angular in front; wings cinereous. Length of the body 3½ lines; of the wings 6 lines.

#### Gen. ERISTALIS, *Latr*.

69. Eristalis splendens, *Leguillon, Voy. aut. du Monde; Macq. Dipt. Exot.* 11. 2. 49. 28.

Inhabits also Solomon's Islands.

70. ERISTALIS RESOLUTUS, n. s. *Mas et Fœm*. Niger, capite antice albo, thorace vittis duabus fasciaque pectorisque disco cinereis, scutello fulvo, abdomine fasciis interruptis æneo-viridibus, tibiis basi fulvescentibus, alis fuscis (mas) aut obscure fuscis (fœm.) basi cinereis, halteribus testaceis.

*Male and Female*. Black. Head shining, with white tomentum beneath and on each side of the face; third joint of the antennæ piceous, arista simple; thorax with two cinereous stripes and with one cinereous band, somewhat chalybeous towards the scutellum, which is tawny; the band continued on each side of the pectus, whose disk is cinereous; abdomen with an interrupted æneous-green band on the second segment, third and fourth segments æneous-green, each with three large black spots; tibia somewhat tawny towards the base; wings brown (male) or dark brown (female), cinereous towards the base; halteres testaceous. Length of the body 6 lines; of the wings 10 lines.

71. ERISTALIS CONDUCTUS, n. s. *Fœm*. Niger, faciei lateribus albis, antennis, scutello, abdominis fasciis pedibusque testaceis, thorace antico albido, alis subcinereis apice obscurioribus.

*Female*. Black. Head shining, with white tomentum behind, beneath and on each side of the face; antennæ, scutellum, and legs testaceous, arista simple; thorax whitish in front, the whitish part continued in a short band on each side of the pectus; abdomen testaceous at the base and beneath, and with three testaceous bands; hind tibiæ with black tips; wings slightly greyish, darker towards the tips, cubital vein much less bent than usual; halteres testaceous. Length of the body 3½ lines; of the wings 6 lines.

72. ERISTALIS SUAVISSIMUS, n. s. *Fœm*. Fulvus, capite testaceo vertice nigro, thorace vittis quinque testaceis, abdomine nigro maculis sex lutescentibus, segmentorum marginibus posticis æneis, pedibus nigris testaceo fasciatis, alis sublimpidis punctis duobus costalibus nigris.

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*Female*. Tawny. Head with testaceous tomentum, vertex black, shining; antennæ testaceous, arista simple; thorax with five testaceous stripes; pectus with two oblique testaceous bands on each side; abdomen black, with six somewhat luteous spots, the basal pair larger and darker than the middle pair, which are larger than the hind pair, apical segment with two testaceous points, hind borders of the segments æneous above, testaceous beneath; legs black, tibiæ at the base and tarsi testaceous; wings nearly limpid, costa with two black points; halteres testaceous. Length of the body 5½ lines; of the wings 10 lines.

73. ERISTALIS MUSCOIDES, n. s. *Mas*. Cyaneo-viridis subchalybeus, capitis callo antennisque fulvis, faciei lateribus albo tomentosus, thorace subvittato, abdomine nigro maculis æneo-viridibus, pedibus nigris, alis subcinereis, halteribus albis.

*Male*. Bluish-green, with a slight chalybeous tinge. Face with white tomentum along each side, middle callus tawny, shining; antennæ pale tawny, arista plumose; thorax with three indistinct black stripes, the lateral pair oblique, callus on each side beneath pale tawny; abdomen black, second segment with a broad interrupted bluish green band, third segment with four æneous-green streaks, fourth segment also with four streaks which are united on the hind border, ventral segments whitish on each side; legs black; femora

bluish black towards the base; wings slightly cinereous; halteres white. Length of the body 4 lines; of the wings 8 lines.

Gen. HELOPHILUS, *Meigen*.

74. *Helophilus quadrivittatus*, *Wied. Auss. Zweifl.* 11. 168. 22. (Eristalis).

Inhabits also Hindostan.

75. *HELOPHILUS MESOLEUCUS*, n. s. *Fœm.* Niger, faciei lateribus niveo tomentosus, thorace vittis quatuor canis, scutello, abdominis fascia antica latissima interrupta basi que lutescentibus, alis cinereis, venis basi halteribusque fulvis.

*Female.* Black. Face with snow-white tomentum on each side; thorax with four hoary stripes; pectus with a cinereous disk; scutellum pale luteous; abdomen pale luteous at the base, and with a broad interrupted pale luteous band on the second segment, third and fourth segments somewhat chalybeous, the former livid along the fore border, under side with two lateral abbreviated pale luteous stripes; hind femora thick; wings grey, veins towards the base, and halteres, tawny. Length of the body 6½ lines; of the wings 12 lines.

Gen. XYLOTA, *Meigen*.

76. *XYLOTA VENTRALIS*, n. s. *Fœm.* Nigro-chalybea, capite albido tomentoso, scutello fulvo, vittis duabus ventralibus latis abbreviatis testaceis, pedibus piceo et testaceo variis, alis fuscis basi cinereis, halteribus testaceis.

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*Female.* Blackish chalybeous. Head with whitish tomentum, excepting the callus on the vertex and another on the front; mouth and antennæ black; scutellum tawny; abdomen beneath with two very broad testaceous stripes extending from the base to two-thirds of the length; legs dingy testaceous, femora and hind tibiæ partly piceous, hind femora thick, piceous, slightly chalybeous, armed with spines beneath; wings dark brown, cinereous towards the base; halteres testaceous. Length of the body 4½ lines; of the wings 8 lines.

Gen. ORTHONEURA, *Macq.*

77. *ORTHONEURA BASALIS*, n. s. *Fœm.* Chalybeo-nigra, nitens, cano-subtomentosa, antennis ferrugineis basi fulvis articulo tertio elongato, tarsis posterioribus piceis, tarsis anticis tibiisque anterioribus fulvis, his nigro fasciatis, alis subcinereis fusco fasciatis, halteribus testaceis.

*Female.* Chalybeous-black, very shining, partly and slightly covered with hoary tomentum; antennæ tawny, third joint ferruginous, long, linear, tawny at the base; anterior tibiæ tawny with a black band, fore tarsi tawny, hinder tarsi piceous; wings greyish, with a subapical brown band which is abbreviated hindward, veins towards the base and halteres testaceous; alulæ whitish. Length of the body 3½ lines; of the wings 6 lines.

Gen. SYRPHUS, *Fabr.*

78. *Syrphus ægrotus*, *Fabr.* See Vol. I. p. 124.

79. *Syrphus ericetorum*, *Fabr. Ent. Syst.* iv. 287. 34. Inhabits also Sierra Leone, Hindostan, and Java.

Fam. MUSCIDÆ, *Latr.*

Subfam. TACHINIDÆ, *Walk.*

Gen. MASICERA, *Macq.*

80. *MASICERA NOTABILIS*, n. s. *Mas.* Nigra, longiuscula, capite abdominisque fasciis albis, frontalibus atris, pectore cano, scutelli margine postico abdominisque lateribus ferrugineis, alis cinereis, venis fusco marginatis.

*Male.* Black, rather long, with long stout bristles; head white, silvery, with white hairs behind and beneath, frontalia deep black, widening slightly to the face, facialia without bristles, epistoma not prominent; eyes bare; palpi ferruginous at the tips; antennæ extending to the epistoma, third joint slightly widening towards the tip, nearly four times the length of the second, arista slender, very much longer than the third joint; pectus and sides of the thorax hoary, hind border of the scutellum ferruginous; abdomen fusiform, much longer than the thorax, with a broad slightly interrupted white band on the fore border of each segment, sides of the second and third segments slightly ferruginous; wings grey, veins black bordered with brown, præbrachial vein forming a slightly acute angle at its flexure, near which it is much curved inward, and is thence straight to its tip, discal transverse vein curved inward, parted by less than its length from the border, and by rather more than half its length from the flexure of the præbrachial; alulæ white; halteres testaceous. Length of the body 6 lines; of the wings 12 lines.

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81. MASICERA? TENTATA, n. s. Nigra, cinereo-tomentosa, capite argenteo frontalibus atris, antennarum articulo tertio basi rufo, thorace quadrivittato, abdomine?, pedibus longiusculis, alis nigricantibus postice cinereis.

Black, with cinereous tomentum and with moderately stout bristles. Head silvery with white hairs behind and beneath, frontalia deep black, slightly widening towards the face, facialia without bristles, epistoma not prominent; antennæ extending nearly to the epistoma; third joint cinereous, slender, linear, red towards the base, rounded at the tip, more than four times the length of the second; arista slender, much longer than the third joint; thorax with four slender black stripes; scutellum not cinereous; abdomen wanting; legs rather long and slender; wings blackish, cinereous hindward and at the tips, veins black, præbrachial vein forming a very obtuse angle at its flexure, from whence it is almost straight to its tip, discal transverse vein slightly undulating, parted by much less than its length from the border, and by a little less than its length from the flexure of the præbrachial; alulæ large, yellowish white; halteres piceous. Length of the body 4? lines; of the wings 7 lines.

82. MASICERA SOLENNIS, n. s. *Fœm.* Nigra, breviuscula, cinereo-tomentosa, capite albo, frontalibus atris, thorace quadrivittato, scutelli margine postico ferrugineo, abdomine subtessellato, alis cinereis.

*Female.* Black, rather short, with cinereous tomentum. Head white, with white hairs behind and beneath, frontalia deep black, widening towards the face, facialia without bristles, epistoma not prominent; eyes bare; antennæ almost reaching the epistoma, third joint cinereous, linear, rounded at the tip, more than four times the length of of the second, arista slightly stout towards the base, much longer than the third joint; thorax with four slender black stripes; scutellum ferruginous along the hind border; abdomen short-conical, with three broad interrupted cinereous bands; legs rather short; wings grey, veins black, præbrachial vein forming a slightly obtuse angle at its flexure, from whence it is almost straight to its tip, discal transverse vein nearly straight, parted by much less than its length from the border and by a little less than its length from the flexure of the præbrachial; alulæ cinereous. Length of the body 3 lines; of the wings 5 lines.

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83. MASICERA SIMPLEX, n. s. *Fœm.* Nigra, capite albo, frontalibus atris, thorace cinereo-tomentoso quadrivittato, abdomine fasciis cinereis late interruptis, alis cinereis.

*Female.* Black, with stout bristles. Head white, with white hairs beneath, frontalia deep black, linear, face oblique, facialia without bristles, epistoma not prominent; eyes bare; antennæ almost reaching the epistoma, third joint cinereous, linear, rather broad, almost truncated at the tip, about four times the length of the second, arista slender, very much longer than the third joint; thorax and pectus with cinereous tomentum, the former with four slender black stripes; abdomen shining, subelliptical, a little longer than the thorax, with a widely interrupted cinereous band on the fore border of each segment; legs stout; wings cinereous; veins black; præbrachial vein forming a very obtuse angle at its flexure, from whence it is straight to its tip, discal transverse vein almost straight, parted by hardly less than its length from the border, and by very much more than its length from the flexure of the præbrachial; alulæ white. Length of the body 3½ lines; of the wings 6 lines.

84. MASICERA GUTTATA, n. s. *Fœm.* Nigra, capite albo, frontalibus atris, thoracis vittis tribus pectoreque cinereis, abdomine guttis lateralibus albis, alis cinereis.

*Female.* Black, with short slight bristles. Head white, frontalia deep black, widening slightly towards the epistoma, face oblique, facialia without bristles, epistoma not prominent; antennæ reaching the epistoma, third joint linear, slightly truncated at the tip, full four times the length of the second, arista slender; thorax with three cinereous stripes; pectus cinereous; abdomen elongate-oval, a little longer than the thorax, a row of white dots along each side on the fore borders of the segments; wings cinereous, a little darker along the costa towards the base, veins black, præbrachial vein forming a very obtuse angle at its flexure, from whence it is almost straight to its tips; discal transverse vein straight, parted by more than its length from the border and by nearly twice its length from the flexure of the præbrachial; alulæ whitish. Length of the body 2½ lines; of the wings 4 lines.

#### Gen. EURYGASTER, *Macq.*

85. EURYGASTER TENTANS, n. s. *Fœm.* Nigra, latiuscula, cinereo tomentosa, capite albo, frontalibus atris, thorace vittis quatuor nigris, scutelli margine postico ferrugineo, abdomine subtessellato, alis cinereis apud costam subfuscis.

*Female.* Black, rather broad, with cinereous tomentum. Head white, with white hairs behind and beneath, frontalia deep black, narrow, widening towards the face, which is oblique, facialia with bristles along more than one-third of the length from the frontalia, epistoma not prominent; eyes pubescent, palpi ferruginous; antennæ extending to the epistoma, third joint cinereous, hardly widening from the base to the tip, which is somewhat truncated, arista slender, very much longer than the third joint; thorax with four indistinct black stripes; scutellum ferruginous hindward; abdomen conical, not longer than the thorax, with three broad, slightly interrupted, cinereous bands, second segment indistinctly ferruginous on each side; legs stout; wings grey, slightly brownish in front, veins black, testaceous towards the base, præbrachial vein forming an obtuse angle at its flexure, hardly curved inward from thence to its tip, discal transverse vein very slightly undulating, parted by much less than its length from the border and from the flexure of the præbrachial; alulæ whitish. Length of the body 4½ lines; of the wings 8 lines.

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86. EURYGASTER DECIPIENS, n. s. *Fœm.* Nigra, aureo-tomentosa, capite antico argenteo frontalibus atris, antennis ferrugineis, thorace vittis quatuor nigris, abdomine fulvo subtessellato vitta basali nigra, pedibus fulvis, alis cinereis.

*Female.* Black, stout, with gilded tomentum. Head silvery white in front and beneath, frontalia deep black, widening slightly towards the upright face, the bristles on each side hardly extending to the facialia, epistoma not prominent; eyes bare; antennæ ferruginous, extending to the epistoma, third joint linear, somewhat truncated at the tip, more than four times the length of the second joint, arista slender, much longer than the third joint; thorax with numerous long bristles, with four slight black stripes; pectus cinereous; abdomen tawny, conical, not longer than the thorax, with short stout bristles, and with three broad, slightly gilded, somewhat interrupted bands, a short black stripe at the base; legs tawny, stout, tibiæ darker than the femora, tarsi piceous; wings grey, somewhat darker in front, veins black, præbrachial vein forming a right angle at its flexure, near which it is much curved inward, discal transverse vein nearly straight, parted by more than half its length from the border, and by a little less than its length from the flexure of the præbrachial; alulæ slightly cinereous. Length of the body 4 lines; of the wings 7 lines.

87. EURYGASTER PHASIOIDES, n. s. *Mas.* Nigra, cano-tomentosa, capite albo frontalibus atris, antennis, scutello, abdomine femoribusque fulvis, abdomine fasciis duabus posticis albidis vittaque nigra, alis cinereis basi albis, costa plagaque nigricantibus.

*Male.* Black, with hoary tomentum. Head white, frontalia deep black, widening towards the upright face, facialia with bristles along more than half the length from the epistoma, which is not prominent; eyes bare; palpi testaceous; antennæ tawny, extending to the epistoma, third joint linear, slightly rounded at the tip, more than four times the length of the second joint, arista slender, much longer than the third joint; thorax with four very slender black stripes; abdomen tawny, short-oval, not longer than the thorax, with a black stripe which does not extend to the tip, third and fourth segments with a white band along each fore border; legs very stout, femora tawny; wings cinereous, white and with testaceous veins at the base, blackish along the costa, and with a broad black band which is abbreviated hindward, præbrachial vein forming an obtuse angle at its flexure, from whence it is very slightly curved inward to its tip, discal transverse vein nearly straight, parted by much less than its length from the border, and by hardly less than its length from the flexure of the præbrachial; alulæ whitish. Length of the body 3½ lines; of the wings 6 lines.

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### Subfam. DEXIDES, *Walk.*

#### Gen. RUTILIA, *Desv.*

88. Rutilia plumicornis, *Guérin, Macq. Dipt. Exot.* 11. 3. 82. 3. Pl. 9. f. 8.

Inhabits also Offak, New Guinea.

89. RUTILIA ANGUSTIPENNIS, n. s. *Fœm.* Nigro-viridis, capite cinereo frontalibus atris, thoracis lateribus subpurpurascens, scutello purpureo, abdomine viridi basi purpureo, tibiis ferrugineis, alis angustis lanceolatis obscure fuscis basi nigris.

*Female.* Blackish-green. Head cinereous, frontalia deep black, widening much towards the face, epistoma very prominent, arista stout, bare; thorax with almost obsolete stripes, purplish along each side; scutellum mostly purple; abdomen dark green, purple at the base; legs black, tibiæ ferruginous; wings narrow, lanceolate, dark brown, black towards the base, præbrachial vein forming a much rounded angle at its flexure, near which it is slightly curved inward, and is thence straight to its tip, discal transverse vein very slightly undulating, parted by less than half its length from the border, and by much more than half its length from the flexure of the præbrachial; alulæ dark brownish cinereous. Length of the body 8 lines; of the wings 16 lines.

#### Gen. DEXIA, *Meigen.*

90. DEXIA PECTORALIS, n. s. *Fœm.* Testacea, capite pectoreque albis frontalibus atris, antennis fulvis, thorace cinereo vittis quatuor nigris, abdomine fulvo apicem versus spinoso fasciis duabus nigris, pedibus longis tibiis tarsisque nigris, alis cinereis venis subfusco late marginatis.

*Female.* Testaceous. Head white, frontalia deep black, widening towards the face, facialia without bristles, epistoma prominent; antennæ tawny, not reaching the epistoma, third joint of the antennæ long, linear, arista plumose; thorax cinereous, with four black stripes, of which the inner pair are much narrower than the outer pair; scutellum tawny hindward; pectus white; abdomen tawny, with a few spines towards the tip, hind borders of the third and fourth segments and tips black; legs long, black, coxæ and femora testaceous; wings grey, veins very broadly bordered with pale brown, præbrachial vein forming a slightly obtuse angle at its flexure, between which and its tip it is slightly curved inward, discal transverse vein undulating, parted by about half its length from the border, and by a little less than its length from the flexure of the præbrachial; alulæ cinereous. Length of the body 4 lines; of the wings 9 lines.

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91. PROSENA ARGENTATA, n. s. *Mas et Fœm.* Testacea (mas) aut nigra (fœm.), capite thoraceque argenteis, antennis fulvis, abdomine longo fasciis vittaque nigris (mas) aut brevior fasciis cinereis lateribusque basi testaceis (fœm.), pedibus nigris femoribus testaceis, alis subfuscescentibus (mas) aut cinereis (fœm.).

*Male and Female.* Head and thorax with bright silvery tomentum, facialia without bristles, epistoma slightly prominent; eyes bare; mouth black, testaceous towards the base, full as long as the thorax; antennæ tawny, not reaching the epistoma, arista plumose; legs black, coxæ and femora testaceous; wings grey, veins black. *Male.* Testaceous. Pectus mostly white; abdomen elongate-conical, with slight whitish reflexions, dorsal stripe and hind borders of the segments black; legs long; wings brownish towards the costa and about the veins, præbrachial vein forming a slightly obtuse angle at its flexure, between which and its tip it is very slightly curved inward, discal transverse vein hardly undulating, parted by less than half its length from the border, and by less than its length from the flexure of the præbrachial. Length of the body 5 lines; of the wings 10 lines. *Female.* Black. Pectus silvery; scutellum deep black; abdomen conical, with broad cinereous bands, first and second segments with broad interrupted testaceous bands, a testaceous mark on each side of the third segment at the base; legs rather long, femora with black tips; præbrachial vein forming a right angle at its flexure, curved inward from thence to its tip, discal transverse vein curved inward near its hind end, parted by less than its length from the border and from the flexure of the præbrachial. Length of the body 3½ lines; of the wings 7 lines.

### Subfam. SARCOPHAGIDES, *Walk.*

#### Gen. SARCOPHAGA, *Meigen.*

92. SARCOPHAGA COMPTA, n. s. *Fœm.* Nigra, cinereo-tomentosa, capite aurato subtus fulvo piloso, thorace vittis tribus nigris, abdomine tessellato, alis obscure cinereis.

*Female.* Black, with cinereous tomentum. Head gilded in front, clothed behind and beneath with tawny hairs, frontalia deep black, hardly widening towards the face; thorax with three black very distinctly marked stripes, the middle one dilated on the scutellum; abdomen distinctly tessellated with six large cinereous excavated spots; wings grey, præbrachial vein forming a right angle at its flexure, near which it is much curved inward, and is thence straight to its tip, discal transverse vein hardly undulating, parted by much less than its length from the border, and by little more than half its length from the flexure of the præbrachial; alulæ white. Length of the body 5 lines; of the wings 10 lines.

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93. SARCOPHAGA INVARIA, n. s. *Mas et Fœm.* Nigra, cinereo-tomentosa, capite *maris* albo, thorace vittis quinque nigris, abdomine tessellato, alis cinereis.

*Male and Female.* Black, with cinereous tomentum. Thorax with five black stripes, the lateral pair incomplete; abdomen distinctly tessellated, the spots being much excavated; wings grey, præbrachial vein forming a right angle at its flexure, near which it is much curved inward, and is thence straight to its tip, discal transverse vein hardly undulating, parted by much less than its length from the border, and by rather more than half its length from the flexure of the præbrachial; alulæ white. *Male.* Head silvery white, frontalia deep black, linear; tomentum of the thorax and of the abdomen more whitish than that of the female. *Female.* Frontalia slightly widening towards the face. Length of the body 4—4½ lines; of the wings 8 lines.

### Subfam. MUSCIDES, *Walk.*

#### Gen. IDIA, *Meigen.*

94. IDIA AUSTRALIS, *Walk. Cat. Dipt.* pt. 4. 809.

Inhabits also Australia.

95. IDIA ÆQUALIS, n. s. *Fœm.* Ænea, capite subtuberculato, thoracis lateribus pectoreque albido-testaceis lineis duabus lateralibus æneis, abdomine fulvo fasciis tribus æneis, pedibus testaccis tibiis apice femoribusque æneis, alis cinereis apice nigris.

*Female.* Æneous-whitish, testaceous beneath. Head with minute tubercles on each side of the front, frontalia piceous, linear; thorax with an æneous stripe on each side in a line with the base of the wings, and with numerous points between these lines and the disk; abdomen pale tawny, with three æneous bands on the hind borders of the segments; legs testaceous, tibiæ towards the tips and femora æneous; wings greyish, with blackish tips, præbrachial vein forming an obtuse and much-rounded angle at its flexure, from whence it is almost straight to its tip, discal transverse vein parted by about half its length from the border and by about its length from the flexure of the præbrachial; alulæ very slightly cinereous; halteres testaceous. Length of the body 3½ lines; of the wings 6 lines.

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96. MUSCA GLORIOSA, n. s. (genus *Silbomyia*, *Macq.*) *Fœm.* Cyaneo-viridis, capite lætissime aurato frontalibus atris, antennis pedibusque nigris, thorace vittis quatuor cupreis, pectore maculis quatuor albis, abdomine viridi-cyaneo, vitta tenui purpurea, alis cinereis apud costam nigris, alulis albis.

*Female.* Golden green. Head brilliantly gilded, frontalia deep black, widening towards the face; a brilliantly-gilded lanceolate streak between the antennæ, which are black; epistoma piceous, slightly prominent; thorax with four cupreous stripes; pectus with four white tomentose spots; abdomen greenish blue with a very slender purple stripe; legs black, femora blackish green; wings grey, black for full one-third of the breadth from the costa, præbrachial vein forming a very obtuse angle at its flexure, from whence it is nearly straight to its tip, discal transverse vein very slightly undulating, parted by less than half its length from the border, and by more than half its length from the flexure of the præbrachial; alulæ pure white. Length of the body 6 lines; of the wings 12 lines.

97. MUSCA OPULENTA, N. S. (genus *Silbomyia*, *Macq.*) *Fœm.* Aureo-viridis, Capite Aurato, Frontalibus atris, antennis piceis, thorace vittis quatuor subobsoletis cupreis, pectore maculis duabus albis, alis cinereis apud costam nigris, alulis albis.

*Female.* Golden green. Head brightly gilded, frontalia deep black, linear, epistoma piceous, slightly prominent; antennæ piceous; thorax with four almost obsolete cupreous stripes; pectus with a spot of white tomentum on each side; abdomen with a very indistinct cupreous stripe; tibiæ and tarsi black; wings grey, black along the costa, præbrachial vein forming a right angle at its flexure, near which it is slightly curved inward, and is thence straight to its tip, discal transverse vein undulating, parted by more than half its length from the border and from the flexure of the præbrachial; alulæ white. Length of the body 4½ lines; of the wings 8 lines.

98. MUSCA MACULARIS, n. s. (genus *Chrysomyia*? *Desv.*) *Mas et Fœm.* Aureo-viridis, capite argenteo antice aurato frontalibus atris, antennis pedibusque nigris, thorace vittis tribus cupreis vix conspicuis, scutello cyaneo, pectore maculis quatuor lateralibus albo tomentosis, abdomine viridi-cyaneo maculis quatuor lateralibus albis, alis cinereis basi nigricantibus, alulis nigricantibus.

*Male and Female.* Golden green. Head brightly gilded, white behind; antennæ, tibiæ, and tarsi black; thorax with three indistinct cupreous stripes; scutellum blue; pectus with two white tomentose spots on each side; abdomen greenish blue with two transverse white spots on each side; femora blackish-green; wings grey, blackish at the base, præbrachial vein forming a slightly obtuse angle at its flexure, nearly straight from thence to its tip, discal transverse vein curved outward towards its fore end, parted by about half its length from the border, and by much less than its length from the flexure of the præbrachial; alulæ blackish. *Female.* Head with a silvery white vertex, frontalia deep black, linear. Length of the body 56 lines; of the wings 10-12 lines.

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99. MUSCA MARGINIFERA, n. s. (genus *Lucilia*, *Desv.*) *Fœm.* Viridi-cyanea, capite albido frontalibus atris, antennis pedibusque nigris, abdominis segmentis purpureo marginatis, alis cinereis basi subnigricantibus, alulis cinereis.

*Female.* Greenish-blue. Head whitish, frontalia deep black, linear, face and third joint of the antennæ cinereous; abdomen with a purple band on the hind border of each segment; legs black; wings grey, almost blackish at the base, præbrachial vein forming a hardly obtuse angle at its flexure, between which and its tip it is hardly curved inward, discal transverse vein nearly straight, parted by about half its length from the border, and by more than half its length from the flexure of the præbrachial; alulæ cinereous. Length of the body 4½ lines; of the wings 9 lines.

100. MUSCA BENEDICTA, n. s. (genus *Pyrellia*, *Desv.*) *Mas.* Aureo-viridis, capite albo, antennis pedibusque nigris, alis cinereis basi subluridis venis basi fulvis, alulis testaceo-cinereis. *Var.?* Abdominis apice purpureo.

*Male.* Golden green. Head white in front; antennæ and legs black; wings cinereous, slightly lurid towards the base, veins tawny towards the base, præbrachial vein curved at the flexure, almost straight from thence to the tip, discal transverse vein slightly undulating, parted by full half its length from the border, and by little less than its length from the flexure of the præbrachial; alulæ cinereous with a testaceous tinge. *Var.?* or a distinct species: darker; abdomen purple at the tip. Length of the body 3 lines; of the wings 6 lines.

101. MUSCA OBTUSA, n. s. (genus *Pyrellia*, *Desv.*) *Mas et Fœm.* Purpureo-cyanea, antennis pedibusque nigris, alis cinereis, alulis obscurioribus.

Very nearly allied to *M. refixa* and to *M. perfixa*, but differing slightly in the veins of the wings. *Male and Female.* Blue, more or less mingled with purple. Head black, slightly cinereous in front; antennæ and legs black; wings grey, veins black, præbrachial vein forming an almost angular curve at its flexure, nearly straight from thence to its tip, discal transverse vein very slightly undulating, parted by little more than half its length from the border, and by about its length from the flexure of the præbrachial; alulæ dark cinereous. Length of the body 2½—3 lines; of the wings 5-6 lines.

102. *Musca domestica*, *Linn.* See Vol. I. p. 128.

103. MUSCA OBSCURATA, n. s. *Fœm.* Nigra, subcinerascens, capite postico albo, thorace vittis quatuor angustis nigris, abdomine tessellato, alis obscure cinereis apud costam nigricantibus, alulis testaceo-cinereis.

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*Female.* Black, slightly covered with cinereous tomentum. Head white behind; thorax with four slender black stripes; abdomen distinctly tessellated with four rows of cinereous reflecting spots; wings very dark grey, blackish towards the costa, præbrachial vein forming a somewhat rounded and very slightly obtuse angle at its flexure, hardly curved inward from thence to its tip, discal transverse vein slightly undulating, parted by less than half its length from the body, and by more than half its length from the flexure of the præbrachial; alulæ cinereous, with a testaceous tinge. Length of the body 3½ lines; of the wings 7 lines.

104. MUSCA PATIENS, n. s. *Fœm.* Nigra, cinereo-tomentosa, frontalibus antennisque piceis, thorace vittis quatuor tenuissimis nigris, abdomine tessellato, alis cinereis.

*Female.* Black, with cinereous tomentum. Head whitish behind, frontalia piceous, linear; antennæ piceous; thorax with four very slender black stripes; abdomen tessellated; wings grey, veins black, præbrachial vein forming an obtuse and somewhat rounded angle at its flexure, from whence it is hardly curved inward to its tip, discal transverse vein undulating, parted by less than half its length from the border, and by more than half its length from the flexure of the præbrachial; alulæ slightly cinereous, with testaceous borders. Length of the body 3 lines; of the wings 6 lines.

105. MUSCA ERISTALOÏDES, n. s. (genus Pollenia? *Desv.*) *Mas et Fœm.* Aureo tomentosa, crassa, subtus testacea, capite antico albo frontalibus antice rufis, antennis piceis basi rufis, thorace vittis tribus abbreviatis fulvis, scutello cyaneo, abdomine cyaneo basi fasciisque duabus albis, pedibus fulvis, tibiis tarsisque nigris, alis cinereis apud costam fuscescentibus. *Var. mas.* Minor, thorace vittis tribus nigris.

*Male and Female.* Body thick; head white; frontalia of the female piceous, linear, red in front; epistoma prominent; proboscis long; palpi whitish; antennæ piceous, red at the base; thorax with gilded tomentum, and with three tawny bands which are abbreviated hindward, scutellum blue; pectus testaceous; abdomen blue, white at the base and with two white bands on the 3rd and 4th segments, 1st segment with a transverse blue spot on each side; legs tawny, tibiæ and tarsi black; wings grey, blackish along the exterior part of the costa, præbrachial vein forming a right but rounded angle at its flexure, near which it is curved inward and is thence straight to its tip, discal transverse vein slightly undulating, parted by a little more than half its length from the border, and by much more than half its length from the flexure of the præbrachial; alulæ testaceous. *Var. Male.* Smaller; thorax with three black stripes; abdomen with only one white band, which is on the 4th segment. Length of the body 4-5 lines; of the wings 8-10 lines.

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#### Gen. BENGALIA, *Desv.*

106. BENGALIA SPISSA, n. s. *Mas et Fœm.* Fulva, capite nigro antice albo, antennis testaceis, pectore fasciis duabus obliquis albidis, pedibus nigris femoribus basi coxisque fulvis, alis cinereis.

*Male and Female.* Tawny. Head black, with silvery tomentum in front, epistoma not prominent; palpi black; antennæ testaceous; pectus with an oblique whitish band on each side; legs black, femora towards the base and coxæ tawny; wings grey, veins black, testaceous towards the base, præbrachial vein forming an obtuse and rounded angle at its flexure, which is very near the border of the wing, straight from thence to its tip, discal transverse vein straight, parted by much less than its length from the border, and by very much more than its length from the flexure of the præbrachial; alulæ testaceous. Length of the body 3½ lines; of the wings 7 lines.

#### Subfam. ANTHOMYIDES, *Walk.*

##### Gen. ARICIA, *Macq.*

107. ARICIA SIGNIFICANS, n. s. *Mas et Fœm.* Fulva, subtus testacea, capite nigro argenteo-tomentoso, antennis testaceis, thorace vittis tribus albidis, abdominis apice piceo, alis cinereis.

*Male and Female.* Tawny, testaceous beneath. Head black, with silvery tomentum, vertex much broader in the female than in the male; palpi tawny; antennæ testaceous; thorax with three whitish stripes in the disk, and with one on each side; abdomen piceous at the tip; tarsi blackish towards the tips; wings cinereous, veins black, tawny towards the base, discal transverse vein hardly undulating, parted by more than its length from the præbrachial transverse, and by less than its length from the border; alulæ pale cinereous, with testaceous borders. Length of the body 4 lines; of the wings 7 lines.

108. ARICIA CANIVITTA, n. s. *Fœm.* Fulva, subtus testacea, capite nigro, facie argentea, palpis antennisque testaceis, thoracis disco, abdominis plagis duabus trigonis pedibusque nigris, thorace vitta cana, alis cinereis.

*Female.* Tawny, testaceous beneath. Head black, face silvery; palpi and antennæ testaceous; disk of the thorax blackish, with a broad hoary stripe; disk of the scutellum piceous; second and third segments of the abdomen with triangular black bands; legs black, coxæ and trochanters testaceous; wings grey, veins black, discal transverse vein hardly curved inward, parted by more than half its length from the border, and by a little less than its length from the præbrachial transverse; alulæ pale cinereous, with testaceous borders. Length of the body 3½ lines, of the wings 7 lines.

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Gen. ANTHOMYIA, *Meigen*.

109. ANTHOMYIA PROCELLARIA, n. s. *Mas.* Nigra, subtus albida, capite argenteo, thorace fasciis duabus (prima interrupta) albis, abdomine vitta tenui fascisque interruptis albidis, alis cinereis, halteribus testaceis.

Nearly allied to *A. pluvialis* and to *A. tonitru*. *Male*. Black, whitish beneath. Head silvery; thorax with two whitish bands, the first interrupted in the middle, widened on each side; scutellum elongate; abdomen with a slender whitish stripe, and with interrupted whitish bands, which are widened on each side; wings grey, veins black, discal transverse vein nearly straight, parted by less than half its length from the border and by hardly less than its length from the præbrachial transverse; alulæ grey, with testaceous borders; halteres testaceous. Length of the body 3 lines; of the wings 6 lines.

Gen. CÆNOSIA, *Meigen*.

110. CÆNOSIA LUTEICORNIS, n. s. *Mas.* Cana, capite antennisque pallide luteis, abdomine basi testaceo maculis octo nigris, pedibus halteribusque testaceis, alis sublimpidis apice nigris.

*Male*. Hoary. Head pale luteous, frontalia darker, widening towards the face; palpi white; antennæ pale luteous, extending to the epistoma, third joint long, slender, linear, arista plumose for half the length from the base; abdomen testaceous towards the base, with four dorsal black spots and with two black spots on each side towards the tip; legs testaceous; wings nearly limpid, with a black apical spot, discal transverse vein nearly straight, parted by less than its length from the border and by very much more than its length from the præbrachial transverse; alulæ white; halteres testaceous. Length of the body 3 lines; of the wings 5 lines.

Subfam. HELOMYZIDES, *Fallen*.

Gen. CÆLOPA, *Meigen*.

111. CÆLOPA INCONSPICUA, n. s. *Fœm.* Cinerea, antennis piceis, pectore antico, abdomine pedibusque fulvis, his nigro variis, alis cinereis, halteribus testaceis.

*Female*. Cinereous, flat. Antennæ piceous; fore part of the pectus, abdomen and legs tawny, the latter with diffuse blackish bands; wings grey, veins black, with the usual structure, tawny towards the base; halteres testaceous. Length of the body 2 lines; of the wings 3½ lines.

Gen. XARNUTA, *Walk*.

112. Xarnuta leucotelus, *Walk*. See Vol. I. p. 28.

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Gen. HELOMYZA, *Fallen*.

113. HELOMYZA PICIPES, n. s. *Fœm.* Fulva, capite, antennis femoribusque nigris, abdominis segmentis nigro marginatis, tibiis tarsisque piceis, alis cinereis apud costam luridis vena discali transversa fusco subnebulosa, halteribus testaceis. *Var.* Thoracis vitta lata abdomineque piceis.

*Female*. Tawny. Head and antennæ black, arista plumose; thorax with two slender, darker, almost obsolete stripes; hind borders of the abdominal segments black; legs piceous, femora black, coxæ tawny; wings grey, with a lurid tinge towards the costa, discal transverse vein straight, slightly clouded with brown, parted by about half its length from the border, and by more than twice its length from the præbrachial transverse; halteres testaceous. *Var.* Thorax with a broad piceous stripe; abdomen piceous. Length of the body 3 lines; of the wings 6 lines.

114. HELOMYZA ATRIPENNIS, n. s. *Mas.* Fulva, scutello nigro, pectore piceo, abdomine ferrugineo, alis nigris postice cinereis.

*Male*. Tawny. Antennæ pale tawny, arista plumose; thorax with two slender, darker, almost obsolete stripes; scutellum black; pectus piceous; abdomen ferruginous; wings black, cinereous along the hind border for more than half its length from the base, veins as in the preceding species. Length of the body 2½ lines; of the wings 5 lines.

115. HELOMYZA RESTITUTA, n. s. *Fœm.* Testacea, abdomine punctis sex nigris, alis cinereis apice nigricantibus venis transversis nigricante nebulosis.

*Female*. Testaceous. Third, fourth, and fifth segments of the abdomen with two black points on each fore border; wings grey, with a slight lurid tinge towards the costa, blackish at the tips, transverse veins clouded with blackish, veins with the usual structure. Length of the body 2½ lines; of the wings 5 lines.

Gen. DRYOMYZA, *Fallen*.

116. DRYOMYZA SEMICYANEA, n. s. *Fœm.* Ferruginea, vertice piceo, antennis fulvis, thorace cyanescente, abdomine cyaneo basi ferrugineo, pedibus testaceis, alis subcinereis apud costam luridis.

*Female.* Ferruginous. Vertex piceous, face slightly covered with whitish tomentum; antennæ tawny, arista very minutely pubescent; thorax tinged with blue; abdomen blue, tawny at the base; legs testaceous; wings greyish, lurid along the costa, veins tawny, præbrachial vein forming a very slight angle where it joins the discal transverse, with a slight curve from thence to its tip, præbrachial transverse stout, slightly clouded, discal transverse straight, upright, parted by much less than half its length from the border and by a little more than its length from the præbrachial transverse; halteres testaceous. Length of the body  $3\frac{1}{2}$ – $4\frac{1}{2}$  lines; of the wings 7-9 lines.

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Gen. SEPEDON, *Latr.*

117. SEPEDON COSTALIS, n. s. *Mas.* Cinerea, capite testaceo guttis quatuor nigris, antennis nigris basi testaceis arista alba, abdomine pedibusque fulvis femoribus posticis denticulatis, alis fuscescenti-cinereis, costa testacea.

*Male.* Cinereous. Head testaceous, with a black dot on each side above and two more towards the mouth; antennæ black, testaceous at the base, second joint very long, arista white; thorax with four slender indistinct darker lines, pectus hoary; abdomen and legs tawny, tarsi piceous, hind femora denticulated; wings brownish cinereous, slightly testaceous along the costa; halteres testaceous. Length of the body  $4\frac{1}{2}$  lines; of the wings 8 lines.

Subfam. LAUXANIDES, *Walk.*

Gen. LAUXANIA, *Latr.*

118. LAUXANIA DUPLICANS, n. s. *Fœm.* Nigro-cyanea, antennis piceis, articulo tertio longissimo, tarsis basi albidis, tibiis intermediis sordide albidis, alis limpidis.

*Female.* Blackish-blue, shining. Antennæ piceous, third joint very long, reddish beneath, arista bare; legs black, tarsi whitish towards the base, middle tibiæ dingy whitish; wings limpid, veins pale, discal transverse vein white, parted by a little less than its length from the border and by nearly twice its length from the præbrachial transverse; halteres white. Length of the body  $2$ – $2\frac{1}{2}$  lines; of the wings 3-4 lines.

119. LAUXANIA MINUENS, n. s. *Fœm.* Nigra, nitens, antennis longis arista nuda, tarsis albidis, alis sublimpidis, halteribus albis.

*Female.* Black, shining. Third joint of the antennæ long, arista bare; tarsi whitish; wings very slightly greyish, veins pale, of the usual structure; halteres white. Length of the body  $1\frac{1}{4}$  line; of the wings  $2\frac{1}{2}$  lines.

Gen. LONCHÆA, *Fallen.*

120. LONCHÆA? INOPS, n. s. *Mas et Fœm.* Nigra, nitens, antennis piceis arista plumosa, scutello ferrugineo, tibiis, tarsis halteribusque fulvis, alis subcinereis.

*Male and Female.* Black, shining. Antennæ piceous, third joint short, arista plumose; scutellum somewhat ferruginous; tibiæ, tarsi, and halteres tawny; wings slightly greyish, veins pale, discal transverse vein parted by much less than its length from the border and by nearly twice its length from the flexure of the præbrachial. Length of the body  $1\frac{1}{2}$  line; of the wings 3 lines.

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Subfam. ORTALIDES, *Haliday.*

Gen. LAMPROGASTER, *Macq.*

121. LAMPROGASTER QUADRILINEA, n. s. *Mas et Fœm.* Cyaneo-viridis; capite pedibusque nigris; antennis piceis, basi rufis; thorace vittis quatuor albidis; abdomine purpureo-cyaneo; alis limpidis, litura basali, fasciis duabus (prima abbreviata, secunda interrupta) strigaeque costali apicali nigris.

*Male and Female.* Bluish green. Head black; proboscis red at the tip; antennæ piceous, red at the base; thorax with two whitish stripes on each side; abdomen purplish blue; legs black, tarsi with pale tomentum towards the base; wings limpid, two black streaks, one basal including a limpid dot, the other apical, first band oblique, extending from the costa to the disk, second widely interrupted in the middle, its hind part occupying the discal transverse vein; veins black, testaceous along the costa; præbrachial vein forming a slight angle at its junction with the discal transverse, the latter parted by not more than one-fourth of its length from the border, and by more than its length from the præbrachial transverse. Length of the body  $3\frac{1}{2}$ – $4\frac{1}{2}$  lines; of the wings 7-9 lines.

122. LAMPROGASTER MARGINIFERA, n. s. *Fœm.* Testacea; capite maculis duabus fasciaque nigro-æneis; thoracis

disco nigro-æneo, vittis tribus testaceis, vittis duabus lateralibus albidis, scutelli margine testaceo; abdominis dorso nigro-æneo; alis limpidis, fasciis plurimis fuscis.

*Female.* Testaceous. Head with two blackish æneous spots on the vertex, and with a blackish æneous band in front; mouth and antennæ tawny; disk of the thorax blackish æneous, with three testaceous stripes which are united in front, the middle one slender, the lateral pair united on the border of the scutellum, a whitish stripe on each side; abdomen blackish æneous above; wings limpid, with eight or nine irregular brown bands; veins black, testaceous along the costa; discal transverse vein parted by much less than its length from the border, and by about its length from the præbrachial transverse. Length of the body 4 lines; of the wings 9 lines.

123. LAMPROGASTER DELECTANS, n. s. *Fœm.* Ferruginea; capite testaceo, postice albido, vertice luteo fasciis duabus nigris, vittis quatuor anticis antennisque nigris; thorace vittis septem et metathoracis fascia albidis; abdomine cyaneo-viridi, basi discoque fulvis; pedibus nigricantibus, femoribus testaceis apice nigris; alis sublimpidis, costa, striga obliqua subcostali guttaque marginali nigricantibus.

*Female.* Ferruginous. Head testaceous, whitish behind; vertex luteous, blackish in front and behind; fore part with four blackish stripes; antennæ blackish; thorax with seven whitish stripes, the middle one broad, the inner pair very slender, the second pair broad, the third pair lateral; abdomen bluish green, slightly varied with purple, base and fore part of the disk tawny; legs blackish; femora testaceous, with black tips; wings nearly limpid, with a slight lurid tinge in the discal areolet, blackish along the costa, and with a blackish oblique streak which extends from the costa along the præbrachial transverse vein; a blackish dot on the hind end of the discal transverse vein; veins black, discal transverse vein parted by about one-fourth of its length from the border, and by a little more than its length from the præbrachial transverse which is very oblique; alulæ white; halteres testaceous, with black knobs. Length of the body 5 lines; of the wings 9 lines.

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124. LAMPROGASTER SCUTELLARIS, n. s. *Mas.* Subcinereo-nigra; oculis albido submarginatis; thorace vittis tribus cinereis, vittis duabus lateralibus, scutelli subquadrati margine, tibiis intermediis tarsisque albidis; alis nigricantibus, fasciis duabus integris duabusque macularibus incompletis albidis.

*Male.* Black, with a slight cinereous tinge; eyes partly bordered with whitish; third joint of the antennæ elongate-conical; arista plumose, the bristles few; thorax with three indistinct cinereous stripes, and with two whitish lateral stripes; scutellum nearly quadrate, with a whitish border; middle tibiæ, knees and tarsi whitish, the latter with black tips; wings blackish, whitish at the base, and with four whitish bands, first and third bands entire, second and fourth macular, very irregular and incomplete; veins black; discal transverse vein straight, parted by about one-fourth of its length from the border, and by hardly more than its length from the præbrachial transverse. Length of the body 2 lines; of the wings 4 lines.

This species has some resemblance to the genus *Platystoma*, and differs rather from the characters of *Lamprogaster*; it and the two following species, which are still more aberrant, will probably be considered as three new genera.

125. LAMPROGASTER CELYPHOÏDES, n. s. *Mas et Fœm.* Atra, nitens, brevis, lata; capite, antennis pedibusque testaceis; abdomine nigro-cyaneo; alis limpidis, strigis transversis subcostalibus fuscescentibus.

*Male and Female.* Deep black, shining, short, broad. Head testaceous, face transverse; antennæ testaceous, third joint elongate-conical; arista bare; abdomen blackish blue, second segment very large, third and following not visible; legs testaceous; wings limpid, with four transverse pale brown subcostal streaks; discal transverse vein parted by less than half its length from the border, and by less than its length from the flexure of the præbrachial; halteres testaceous. Length of the body 2—2½ lines; of the wings 4½ lines.

126. LAMPROGASTER TETRYOÏDES, n. s. *Mas.* Atra, nitens, brevissima, latissima; capite transverso, subruguloso; thorace scitissime punctato; abdomine cyaneo; tarsis flavis; alis nigris albido punctatis apud marginem posticum obscure cinereis.

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*Male.* Deep black, shining, very short and broad. Head transverse, slightly rugulose; third joint of the antennæ conical; arista thinly plumose; thorax very finely punctured; scutellum almost semicircular; abdomen blue, smooth; tarsi yellow; wings black, dark grey towards the hind border, with whitish points towards the costa; discal transverse vein parted by about its length from the border and by more than its length from the præbrachial transverse. Length of the body 2½ lines; of the wings 5 lines.

#### Gen. PLATYSTOMA, *Latr.*

127. PLATYSTOMA FUSIFACIES, n. s. *Mas et Fœm.* Cinerea; capite postice et apud oculos albo; vertice pallide luteo (mas) aut rufo (fœm.); facie plana, fusiformi, subargentea; antennis piceis; thoracis vittis tribus pectoreque canis; abdomine conico punctis albis; alis limpidis, guttis transversis interioribus fascisque exterioribus nigricantibus.

*Male and Female.* Cinereous. Head white hindward and about the eyes, black and shining towards the mouth; vertex pale luteous in the male, red in the female; face flat, fusiform, somewhat silvery; antennæ piceous, third joint long, slender, linear, arista plumose; thorax with three hoary stripes, the middle one much broader than the lateral pair; pectus hoary; abdomen conical, with numerous white points; wings limpid, with blackish dots towards the base, and with four exterior blackish bands, two of which are dilated

towards the costa, and there contain some limpid dots; veins black, discal transverse vein straight, parted by about one-fourth of its length from the border, and by more than its length from the præbrachial transverse; halteres whitish. Length of the body  $3\frac{1}{2}$ -5 lines; of the wings 8-10 lines.

128. *PLATYSTOMA MULTIVITTA*, n. s. *Mas.* Cinerea; capite postice et apud oculos albo, vertice luteo, facie et antennis fulvis; thoracis vittis octo pectoreque canis; abdominis segmentis cano fasciatis; ventre ferrugineo; pedibus nigris; alis limpidis, fasciis quatuor strigisque interioribus nigricantibus.

*Male.* Cinereous. Head white behind and about the eyes, vertex luteous; face and antennæ tawny, third joint of the latter long, slender, linear; arista very slightly plumose; thorax with eight hoary stripes; pectus hoary; abdomen with a hoary band on the fore border of each segment; legs black; wings limpid, with four blackish bands, and with some blackish marks nearer the base; two blackish streaks between the first and second bands; veins black; discal transverse vein straight, parted by one-fourth of its length from the border, and by very much more than its length from the præbrachial transverse; halteres black. Length of the body 4 lines; of the wings 8 lines.

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#### Gen. DACUS, *Fabr.*

129. *DACUS EXPANDENS*, n. s. *Fœm.* Fulvus, latiusculus; antennarum articulo tertio piceo angusto lineari longissimo; abdomine vitta tenui nigricante; alis limpidis, costa vittaque postica fuscescentibus.

*Female.* Tawny, rather broad, very slightly covered with hoary tomentum, which forms stripes on the thorax and indistinct bands on the abdomen; third joint of the antennæ piceous, slender, linear, very long; arista bare; abdomen with a slender blackish stripe; wings limpid, brownish along the costa, and with a short oblique brownish stripe extending from the base to the interior border; veins black, discal transverse vein oblique, parted by full one-fourth of its length from the border, and by more than its length from the præbrachial transverse; halteres testaceous. Length of the body 4 lines; of the wings 8 lines.

130. *DACUS PECTORALIS*, n. s. *Fœm.* Cinereo-niger; capite fulvo, facie guttis duabus nigris; antennarum articulo tertio piceo angusto lineari longissimo; callis duabus humeralibus, fasciis duabus obliquis pectoralibus lateralibus, scutello tarsisque testaceis; thoracis vittis tribus abdominisque una canis; pedibus fulvis piceo cinctis; alis limpidis, costa vittaque postica fuscescentibus.

*Female.* Black, slightly covered with cinereous tomentum. Head tawny, with two small black dots on the face; third joint of the antennæ piceous, slender, linear, very long, arista bare; thorax with three indistinct hoary stripes; humeral calli, an oblique band on each side of the pectus, scutellum and tarsi, testaceous; abdomen with one hoary stripe; legs tawny, with diffuse piceous bands; wings limpid, brownish along the costa, and with a short oblique brownish stripe, extending from the base to the interior border; veins black; discal transverse vein parted by less than one-fourth of its length from the border, and by a little more than its length from the præbrachial transverse; halteres testaceous. Length of the body  $3\frac{3}{4}$  lines; of the wings  $7\frac{1}{2}$  lines.

131. *DACUS LATIFASCIA*, n. s. *Fœm.* Niger; capite postice et apud oculos albido; antennarum articulo tertio vix longo; thoracis fascia, metathorace pectorisque fasciis duabus obliquis canis; abdomine cyaneo; femoribus albidis apice nigris; alis albo-limpidis, costa atra, fasciis duabus latissimis nigris; halteribus testaceis.

*Female.* Black. Head whitish behind and about the eyes; third joint of the antennæ linear, round at the tip, hardly long, arista plumose; thorax with a band on the hind border of the scutum; metathorax and an oblique band on each side of the pectus hoary; abdomen blue; coxæ and femora whitish, the latter with black tips; wings limpid white, deep black along the costa, and with two very broad black bands; veins black; discal transverse vein very oblique, parted by about one-sixth of its length from the border, and by little more than half its length from the præbrachial transverse; halteres testaceous. Length of the body 4 lines; of the wings 8 lines.

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132. *DACUS MUTILLOIDES*, n. s. *Fœm.* Rufescens; capite nigro, postice et apud oculos albo; antennarum articulo tertio angusto lineari longissimo; thoracis vittis tribus, pectoris fasciis duabus obliquis lateralibus abdominisque fasciis duabus (secunda interrupta) albis, abdominis dimidio postico nigro-æneo; pedibus piceis; alis sublimpidis, costæ apice venisque transversis nigro nebulosis; halteribus albidis.

*Female.* Reddish. Head black, white behind and about the eyes and on the grooves of the face; antennæ black, reddish at the base, third joint slender, linear, very long, arista bare, rather stout; thorax with three whitish stripes; pectus with a more distinct oblique white band on each side; metathorax whitish; abdomen æneous, pubescent, finely punctured, reddish and slightly contracted towards the base, with two white bands, the second widely interrupted; oviduct long, lanceolate; legs piceous; wings nearly limpid, clouded with black at the tip of the costa and on the præbrachial transverse vein, hardly clouded on the discal transverse vein; veins black; discal transverse vein straight, parted by about one-fourth of its length from the border, and by much more than its length from the præbrachial transverse; halteres whitish. Length of the body 5 lines; of the wings 8 lines.

133. *DACUS LONGIVITTA*, n. s. *Mas.* Æneo-viridis, subpubescens, subtilissime punctatus; capite nigro apud oculos albido, epistomate ferrugineo, antennarum articulo tertio longo lineari; thorace subvittato; pedibus nigris, femoribus ferrugineis; alis subcinereis, costa vittaque apud venam præbrachialem nigris; halteribus piceis.



*Male.* Æneous green, with slight hoary tomentum, very finely punctured. Head black, whitish about the eyes; epistoma ferruginous, prominent; antennæ black, ferruginous at the base, third joint long, linear, conical at the tip; arista bare; thorax with an indistinct broad hoary stripe; abdomen compressed, nearly linear; legs black; femora ferruginous; wings slightly greyish, black along the costa and with a black stripe which extends along the præbrachial vein to the discal transverse vein; veins black; discal transverse vein straight, oblique, parted by a little more than half its length from the border, and by very much more than its length from the præbrachial transverse; halteres piceous. Length of the body 4-6 lines; of the wings 5-7 lines.

134. DACUS LATIVENTRIS, n. s. *Fœm.* Nigro-viridis, subtilissime punctatus; capite piceo apud oculos albido; antennis fulvis, articulo tertio sublanceolato; abdomine brevi, lato; pedibus nigris, femoribus anticis fulvis; alis subcinereis, costa vittaque apud venam præbrachialem nigris, vena discali transversa nigricante nebulosa; halteribus albidis.

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*Female.* Blackish green, very minutely punctured. Head piceous, whitish about the eyes; epistoma ferruginous, slightly prominent; antennæ tawny, third joint rather long, somewhat lanceolate, arista bare; abdomen nearly round, broader than the thorax; legs black, fore femora tawny; wings very slightly greyish, black along the costa to the tip of the præbrachial vein, with a black stripe along the præbrachial vein to the discal transverse vein, and with a blackish tinge about the discal transverse vein and along the adjoining part of the hind border; veins black, discal transverse straight, vein parted by less than half its length from the border, and by very much more than its length from the præbrachial transverse; halteres whitish. Length of the body 2 lines; of the wings 4 lines.

135. DACUS OBTRUDENS, n. s. *Mas.* Nigro-viridis, subtilissime punctatus; capite nigro apud oculos albido; antennis piceis basi rufescentibus, articulo tertio lineari longissimo; abdomine lineari maculis duabus lateralibus testaceis; pedibus nigris, femoribus apice tarsisque posticis basi fulvis; alis subcinereis, costa, apice maculaque apud venam transversam discalem nigricantibus; halteribus albis.

*Male.* Dark green, very minutely punctured. Head black, whitish about the eyes, ferruginous towards the epistoma; antennæ piceous, reddish towards the base; third joint linear, very long, arista bare; abdomen linear, compressed, with a testaceous spot on each side before the middle; legs black, femora tawny towards the tips, hind tarsi tawny at the base; wings slightly greyish, blackish along the costa and at the tips, and about the transverse veins; veins black, tawny at the base; discal transverse vein straight, oblique, parted by about half its length from the border, and by a little more than its length from the præbrachial transverse; halteres white. Length of the body 4 lines; of the wings 7 lines.

136. DACUS POMPILOIDES, n. s. *Mas.* Niger; capite albido, epistomate ferrugineo; antennis piceis basi rufis, articulo tertio longo lineari; abdomine nigro-cyaneo; pedibus piceis; alis subcinereis, striga costali basali, fascia tenui postice abbreviata et triente apicali strigam subcineream includente nigricantibus; halteribus albis.

*Male.* Black. Head with whitish tomentum, epistoma ferruginous, prominent; antennæ piceous, red at the base, third joint long, linear, arista bare; abdomen linear, blackish blue, longer than the thorax; legs piceous; wings slightly greyish, with a blackish costal streak extending from the base, with a slender blackish band which is abbreviated hindward, and with more than one-third of the apical part blackish and including a slightly greyish streak; veins black, discal transverse vein straight, oblique, parted by a little less than its length from the border and by about its length from the præbrachial transverse; halteres white. Length of the body 3½ lines; of the wings 6 lines.

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#### Gen. BREA, n. g.

*Platystomæ* affinis. *Facies* lata. *Antennæ* breves; articulus tertius longiconicus; arista nuda. *Femora* intermedia incrassata, denticulata.

Allied to *Platystoma*. Face broad; antennæ short, third joint elongate-conical; arista bare; middle femora incrassated, denticulated beneath.

137. BREA DISCALIS, n. s. *Mas.* Nigra; capite testaceo apud oculos albido, fronte ochracea; antennis piceis basi rufescentibus; thorace vitta lata cana; abdomine fulvo, disco nigro cupreo; pedibus fulvis, femoribus anticis apice tibiisque anticis basi nigris; alis sublimpidis, fascia media lata postice abbreviata guttam limpidam subcostalem includente lineaque transversa exteriore nigricantibus; halteribus testaceis.

*Male.* Black. Head testaceous, whitish about the eyes, front ochraceous; antennæ piceous, reddish at the base; thorax with a broad hoary stripe; abdomen tawny, with a blackish cupreous disk; legs tawny, fore femora at the tips and fore tibiæ at the base black; wings nearly limpid, with a broad middle blackish band, which is abbreviated hindward and includes a limpid dot by the costa, and has beyond it a blackish transverse line; veins black, testaceous towards the base; discal transverse vein straight, upright, parted by half its length from the border, and by much more than its length from the præbrachial transverse; halteres testaceous. Length of the body 4 lines; of the wings 7 lines.

138. BREA CONTRARIA, n. s. *Mas et Fœm.* Nigra; capite fulvo apud oculos albido, fronte ochracea; antennis rufescentibus; thorace vitta cana; abdomine purpureo apice cyaneo; pedibus nigris, femoribus anticis tarsisque testaceis; alis sublimpidis, fascia lata media postice abbreviata, guttis interioribus lineaque

transversa exteriore nigricantibus.

*Male and Female.* Black. Head tawny, whitish about the eyes; antennæ reddish; thorax with a hoary stripe; sides and pectus also hoary; abdomen purple, blue towards the tip; legs black; tarsi and fore femora testaceous; wings nearly limpid, with a broad blackish middle band which is abbreviated hindward, with some interior blackish dots, and with an exterior transverse blackish line; veins black; discal transverse vein straight, parted by less than half its length from the border, and by less than its length from the præbrachial transverse; halteres black. Length of the body 3—3½ lines; of the wings 6-7 lines.

#### Gen. ADRAMA, n. g.

*Mas. Corpus* longiusculum. *Caput* thorace vix latius, setis duabus posticis erectis. *Antennæ* sat longæ; articulus tertius linearis, apice conicus; arista pubescens. *Abdomen* sublineare, thorace longius et angustius. *Pedes* mediocres; femora posteriora spinis minutis armata. *Alæ* sat longæ. [Pg 118]

*Male.* Body rather long. Head transverse, hardly broader than the thorax, with two erect setæ on the hind part of the vertex; face vertical; epistoma slightly prominent. Antennæ nearly reaching the epistoma; third joint long, linear, conical at the tip; arista pubescent. Abdomen almost linear, longer and narrower than the thorax. Legs moderately long and slender; posterior femora with minute spines beneath. Wings rather long; discal transverse vein straight, upright, parted by hardly half its length from the border, and by rather more than its length from the præbrachial transverse.

139. ADRAMA SELECTA, n. s. *Mas.* Testacea; capite guttis tribus nigris; thorace disco antico vittisque duabus posterioribus nigris; tibiis tarsisque anticis piceis, tibiis posticis subpiceis; alis subfuscescentibus, fascia lata limpida nigricante marginata postice abbreviata.

*Male.* Testaceous. Head with a black dot above the antennæ and one on each side of the epistoma; thorax with the fore part of the disk black, and with two hindward black stripes; fore tibiæ and fore tarsi piceous; hind tibiæ somewhat piceous; wings slightly brownish, with two blackish bands, the first on the præbrachial transverse vein, abbreviated hindward, the second on the discal transverse vein, abbreviated in front, intermediate space limpid, veins testaceous, black towards the tips; halteres pale testaceous. Length of the body 4½ lines; of the wings 8 lines.

#### Gen. ORTALIS, *Fallen.*

140. ORTALIS PROMPTA, n. s. *Fœm.* Nigro-viridis; capite piceo apud oculos albido; antennis rufescentibus; thorace vitta abdomineque fasciis cinereis; pedibus nigris; alis limpidis, vittis tribus nigris, prima postice abbreviata, secunda tertiaque latis; halteribus albidis.

*Female.* Blackish green. Head piceous, whitish about the eyes; epistoma somewhat prominent; antennæ reddish, third joint somewhat lanceolate, piceous towards the tip; arista bare; thorax with a cinereous stripe; sides and pectus also cinereous; abdomen with two cinereous bands; legs black; wings limpid white, slightly cinereous towards the base, with three black bands, the first abbreviated hindward, the second and third very broad; veins black, discal transverse vein curved inward, parted by much less than its length from the border and by a little less than its length from the præbrachial transverse; halteres whitish. Length of the body 3½ lines; of the wings 6 lines.

141. ORTALIS COMPLENS, n. s. *Mas et Fœm.* Nigro-viridis; capite antennisque testaceis, articulo tertio brevi, arista plumosa; abdomine atro; pedibus testaceis, femoribus nigris; alis albo limpidis, strigis duabus apiceque nigro-cinereis, fasciis tribus satis nigricantibus; halteribus albis. *Mas.* Vertice luteo postice nigro, femoribus apice testaceis, alarum fasciis subconnexis. *Fœm.* Vertice nigro, tibiis nigris, posticis basi testaceis. [Pg 119]

*Male and Female.* Blackish green. Head testaceous; antennæ testaceous, third joint short, conical; arista plumose; abdomen deep black; legs testaceous; femora black; wings limpid white, with three broad blackish stripes, the second emitting a branch from its outer side to the costa, a streak connected with the outer side of the third band, and the tips blackish cinereous; discal transverse vein straight, parted by much less than its length from the border, and by a little more than its length from the præbrachial transverse; halteres white. *Male.* Vertex luteous, black hindward; femora with testaceous tips; bands of the wings partly connected. *Female.* Vertex black; tibiæ black, the hind pair testaceous towards the base. Length of the body 1½—2 lines; of the wings 3-4 lines.

#### Gen. TRYPETA, *Meigen.*

142. TRYPETA MULTISTRIGA, n. s. *Fœm.* Testacea; thorace pectoreque nigro-strigatis; abdomine maculis quatuor lateralibus anterioribus fascia lata apiceque nigris; femoribus posterioribus nigro vittatis; alis nigricantibus basi marginali maculis guttisque albis.

*Female.* Testaceous. Third joint of the antennæ short, conical; arista plumose; thorax with black bristles on each side, with eight black streaks, four in front, of which the middle pair are very short, four hindward, the middle pair short, the outer pair connected in front of the scutellum, two lateral black streaks; pectus with a black interrupted streak on each side; disk also black; abdomen with two transverse black spots on

each side towards the base, and with a broad black band; oviduct black, flat, lanceolate, obtuse at the tip; posterior femora striped with black; wings blackish, limpid for a space from the base along the costa and along the hind border, and with twelve white marks of various size, four discal, eight marginal; discal transverse vein nearly straight, parted by one-fourth of its length from the border, and by about its length from the præbrachial transverse. Length of the body  $3\frac{1}{2}$  lines; of the wings 6 lines.

143. TRYPETA DORSIGUTTA, n. s. *Mas.* Atra; capite piceo vitta testacea, subtus albo; antennis testaceis; thorace cinereo punctis lateralibus albis, pectore albido; abdominis segmentis testaceo marginatis; tibiis albido fasciatis, tarsis albidis; alis albo-limpidis, strigis basalibus fasciisque duabus latis nigricantibus, prima antice furcata; halteribus albis.

*Male.* Deep black. Head piceous, with cinereous tomentum, white behind and beneath, a testaceous stripe on the vertex; antennæ testaceous, black at the base, third joint conical, white at the base, arista plumose; thorax with cinereous tomentum, white points along each side; pectus whitish; hind borders of the abdominal segments testaceous with cinereous tomentum; tibiæ with a dingy whitish band; tarsi dingy whitish; wings limpid white, with several blackish marks towards the base and with two broad blackish bands, the first forked in front; discal transverse vein nearly straight, parted by less than its length from the border, and by more than twice its length from the præbrachial transverse; halteres white. Length of the body  $2\frac{1}{2}$  lines; of the wings 4 lines.

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144. TRYPETA BASALIS, n. s. *Mas.* Nigra, nitens; capite antennisque fulvis, vertice maculis duabus piceis; abdomine basi pedibusque testaceis; alis limpidis, striga basali, fasciis tribus costaque apicali nigricantibus; halteribus testaceis.

*Male.* Black, slender, shining. Head tawny, with two elongated piceous spots on the vertex; antennæ tawny, third joint linear, rather long, arista bare; abdomen nearly fusiform, testaceous at the base; legs testaceous; wings limpid, with a blackish oblique streak extending from the base, with three blackish bands, and with a blackish costal streak extending round the tip, first and third bands slender, second broad, abbreviated like the first hindward; discal transverse vein straight, parted by about one-fourth of its length from the border, and by less than its length from the præbrachial transverse; halteres testaceous. Length of the body  $1\frac{1}{2}$  line; of the wings 3 lines.

145. TRYPETA IMPLETA, n. s. *Fœm.* Cinerea; capite albido; antennarum articulo tertio albido apice nigro; thorace vitta fusca, scutello albido, abdomine nigro; pedibus albidis nigro fasciatis; alis albis, maculis plurimis nigricantibus ex parte confluentibus; halteribus albidis.

*Female.* Cinereous. Head whitish; third joint of the antennæ short, conical, whitish, blackish at the tip, arista plumose; thorax with a brown stripe; scutellum whitish; abdomen black; legs whitish, with black bands; wings white, with many blackish spots, some of them confluent; discal transverse vein straight, parted by much less than its length from the border, and by a little less than its length from the præbrachial transverse; halteres whitish. Length of the body  $1\frac{1}{2}$  line; of the wings 3 lines.

146. TRYPETA SUBOCELLIFERA, n. s. *Mas.* Cana; antennis albidis; thorace guttis fuscis, scutelli margine albido; abdomine fusco apicem versus cano maculis fuscis; pedibus albidis fusco fasciatis; alis limpidis, maculis nigricantibus pallido signatis ex parte confluentibus.

*Male.* Hoary. Antennæ whitish, third joint short, conical, arista plumose; thorax with some slight brown dots; scutellum brown, hind borders of the scutellum white; abdomen brown, hind borders of the segments and apical part cinereous, the latter with brown dots; legs whitish, with brown bands; wings limpid, with several blackish dots containing pale marks, some of them confluent and forming a middle band; discal transverse vein straight, enclosed in a pale streak, parted by much less than its length from the border and by much more than its length from the præbrachial transverse; halteres whitish. Length of the body  $1\frac{1}{2}$  line; of the wings 3 lines.

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## Subfam. ACHIIDES, *Walk.*

### Gen. ACHIAS, *Fabr.*

147. ACHIAS LONGIVIDENS, n. s. *Mas et Fœm.* Viridi-cinerea; capite testaceo fasciis duabus vittisque tribus anticis nigris; antennis nigris; thorace vittis quatuor purpureo-nigris, pectore ferrugineo; abdomine viridifulvo; pedibus piceis; alis limpidis, costa lurido-nigricante, vena transversa discali fusco nebulosa; halteribus testaceis apice nigris. *Mas.* Oculis longissime petiolatis, scutello viridi, femoribus basi fulvis. *Fœm.* Oculis subpetiolatis, scutello nigro-purpureo.

*Male and Female.* Greenish cinereous. Head with two black bands on the vertex and with four black stripes in front; antennæ black, third joint linear, very long, arista plumose; thorax with four purplish black stripes, middle pair abbreviated hindward and having behind them a spot of the same hue, lateral pair interrupted; pectus ferruginous; abdomen tawny, with bright green reflections, testaceous beneath; legs piceous; wings limpid, blackish, and with a lurid tinge along the costa, whence a short oblique blackish streak proceeds by the præbrachial transverse vein; discal transverse vein clouded with brown, hardly curved, parted by less than one-third of its length from the border, and by much more than its length from the præbrachial transverse, which is very oblique; halteres testaceous, with black tips. *Male.* Head with the fore black band

interrupted; eyes with very long petioles, the latter about three-fourths of the length of the body; scutellum green; femora tawny towards the base. *Female*. Eyes with short petioles, extending a little beyond the sides of the thorax; scutellum blackish purple. Length of the body 5-6 lines; of the wings 12-13 lines.

148. *ACHIAS LATIVIDENS*, n. s. *Fœm.* Viridi-cinerea; capite testaceo, vittis tribus anticis nigris, oculis subpetiolatis; antennæ nigris; thorace vittisquatuor purpureo-nigris, scutello cyaneo basi viridi, pectore fulvo; abdomine viridi-fulvo; pedibus nigris, femoribus basi luteis, tibiis luteo fasciatis; alis subcinereis, vitta costali nigricante interrupta lurida strigata, vena transversa discali fusco nebulosa; halteribus testaceis apice nigris.

*Female*. Greenish cinereous. Head testaceous, with three black stripes on the face; eyes very slightly petiolated; antennæ black; thorax with four purplish black stripes; scutellum blue, green at the base; pectus tawny; abdomen tawny, with bright green reflections; legs black; femora luteous towards the base; tibiæ with indistinct luteous bands; wings slightly greenish, with a blackish interrupted costal stripe containing luteous streaks; discal transverse vein clouded with brown; veins in structure like those of the preceding species; halteres testaceous, with black tips. Length of the body 6 lines; of the 13 lines.

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This species at first sight seems like a variety of the preceding one, but the petioles of the eyes are shorter and thicker, the costal stripes of the wings are interrupted, and the shade on the discal transverse vein is more diffuse.

149. *ACHIAS AMPLIVIDENS*, n. s. *Fœm.* Fulva, subtus testacea; oculis extantibus non petiolatis; thorace submetallico, vittis quinque cinereis; abdomine purpureo basi testaceo, tibiis tarsisque nigris; alis subcinereis, costa nigro-fusca, venis transversis nigro-fusco nebulosis.

*Female*. Tawny, testaceous beneath. Head testaceous; eyes very prominent, but hardly petiolated; antennæ tawny; thorax slightly metallic, with five cinereous stripes, which are abbreviated hindward, the inner pair slender; abdomen purple, testaceous at the base; legs black; coxæ and femora testaceous, the latter with black tips; wings slightly greyish, costal stripe brown, blackish towards the tip; præbrachial transverse vein clouded with blackish, discal transverse vein clouded with a much paler hue than that of the præbrachial transverse vein, in structure like those of the two preceding species; halteres testaceous, with black tips. Length of the body 4½ lines; of the wings 9 lines.

### Subfam.—?

Gen. POLYARA, n. g.

*Mas. Corpus* longiusculum. *Caput* transversum; facies lata, plana, non obliqua. *Palpi* lati. *Antennæ* parvæ; articulus tertius longiconicus; arista plumosa. *Thorax* oblongo-subquadratus. *Abdomen* sublineare, thorace multo longinus et angustius. *Pedes* breves, tenues. *Alæ* latiusculæ; venæ optime determinatæ; venæ duæ transversæ inter venas radialem et cubitalem; vena præbrachialis apicem versus valde flexa.

*Male*. Body rather long. Head transverse, a little broader than the thorax; face broad, flat, vertical. *Palpi* broad. *Antennæ* small; third joint elongate-conical, not extending more than half the length to the epistoma; arista plumose. *Thorax* oblong-subquadrate. *Abdomen* nearly linear, much longer and more slender than the thorax. Legs short, rather slender; fore femora somewhat setose beneath. Wings rather broad, flat in repose; veins very strongly marked; a transverse vein between the cubital and mediastinal veins; two transverse veins between the radial and cubital veins; cubital vein slightly angular between the præbrachial transverse vein and the tip of the wing; præbrachial vein much curved towards its tip.

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The structure of the wing veins in this genus is very peculiar, and it does not agree well with any of the established subfamilies of *Muscidæ*.

150. *POLYARA INSOLITA*, n. s. *Mas.* Testacea; faciei sulcis albidis; abdomine lutescente fulvo; alis subcinereis, nigricante-fusco submarginatis et subfasciatis.

*Male*. Testaceous, paler beneath. Facial grooves for the antennæ whitish; thorax with some almost obsolete stripes, the middle pair approximate, slender, somewhat more distinct than the others; abdomen somewhat lutescent-tawny; wings slightly greyish, irregularly blackish-brown along the costa, brown at the tips, and with a brown band which is indistinct in front but much darker on the discal transverse vein; præbrachial vein largely bordered with brown; veins black, testaceous towards the base, discal transverse vein straight, parted by about one-sixth of its length from the border, and by rather less than half its length from the præbrachial transverse; alulæ very small. Length of the body 5½ lines; of the wings 10 lines.

### Subfam. SEPSIDES, *Walk.*

Gen. ANGITULA, n. g.

*Fœm. Corpus* convexum, glaberrimum, nitidissimum. *Caput* subrotundum; epistoma valde prominens. *Antennæ* epistoma non attingentes; articulus tertius longiusculus, linearis, apice conicus; arista

subpubescens. *Thorax* anticus valde productus et attenuatus; scutellum hispinosum; metathorax magnus, declivis. *Abdomen* longi-subfusiforme; segmentum primum gibbosum. *Pedes* longi, graciles; coxæ anticæ longissimæ. *Alæ* longæ, angustæ; alulæ obsoletæ.

*Female*. Body convex, very smooth and shining. Head nearly round; front subquadrate; face short; epistoma very prominent. Mouth short. Antennæ not reaching the epistoma; third joint linear, rather long, conical at the tip; arista somewhat pubescent. Thorax much produced and attenuated in front; scutellum armed with two spines; metathorax slanting, well developed. Abdomen elongate-subfusiform, longer and much more slender than the thorax; first segment gibbous above. Legs long, slender, without bristles; fore coxæ very long. Wings long, narrow; discal transverse vein straight, upright, parted by less than half its length from the border, and by nearly twice its length from the præbrachial transverse.

151. ANGITULA LONGICOLLIS, n. s. *Fœm.* Nigro-ænea; capite subtus albido, frontis disco rufescente, fascia albida; antennis piceis basi rufis; pedibus nigris, femoribus basi coxisque anticis albidis; alis limpidis, costa nigra.

*Female*. Æneous black. Head whitish beneath, front with a reddish disk, face whitish. Antennæ piceous, first and second joints red; legs black, bare; femora towards the base and fore coxæ whitish; wings limpid, with a black costal line extending to the tip of the præbrachial vein; veins and halteres black. Length of the body 5 lines; of the wings 8 lines.

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#### Gen. SEPSIS, *Fallen*.

152. SEPSIS BASIFERA, n. s. *Mas et Fœm.* Nigra; thorace nigro-æneo; tarsi, femoribus basi pedibusque anticis testaceis; alis limpidis, costa basi nigra. *Mas*. Metatarsis intermediis dilatatis, alis apice vix nigricantibus. *Fœm.* Alis apice nigris.

*Male and Female*. Black, shining. Thorax æneous black; pectus cinereous; tarsi, femora at the base, and fore legs, pale testaceous; wings limpid; costa at the base and veins black. *Male*. Basal joint of the intermediate tarsi dilated; wings hardly blackish at the tips. *Female*. Wings black at the tips. Length of the body 2—2½ lines; of the wings 3—3½ lines.

#### Gen. CALOBATA, *Fabr.*

153. Calobata albitarsis, *Wied. Auss. Zweifl.* 71. 544. 22. Inhabits also Java and Australia.

154. Calobata indica, *Desv. Ess. Myod.* 737. 4. (Nerius). Inhabits also Hindostan.

155. Calobata Abana, *Walk. Cat. Dipt.* pt. 4. 1054.

156. CALOBATA SEPSOIDES, n. s. *Fœm.* Nigra; antennis ferrugineis, articulo tertio conico brevi, arista nuda; pedibus testaceis nigricante subnotatis, femoribus anticis nigris basi testaceis, tibiis anticis nigris, tarsis anticis niveis, posticis albidis; alis subcinereis, fasciis duabus indistinctis fuscescentibus.

*Female*. Black, shining. Antennæ ferruginous, third joint short, conical, arista bare; pectus slightly covered with cinereous tomentum; legs testaceous, with a few very indistinct blackish marks; fore femora black, testaceous towards the base; fore tibiæ black; fore tarsi snow-white, black at the base; hind tarsi whitish; wings greyish, with two almost obsolete brownish bands; discal transverse vein parted by less than its length from the border and by about four times its length from the præbrachial transverse. Length of the body 5 lines; of the wings 7 lines.

#### Gen. CARDIACEPHALA, *Macq.*

157. CARDIACEPHALA DEBILIS, n. s. *Fœm.* Testacea, gracilis; thorace linea transversa interrupta nigra; pedibus anticis parvis, posterioribus longis, tarsis albis brevissimis, tibiis anterioribus piceis; alis limpidis apice cinereis, fascia lata pallide lutea.

*Female*. Testaceous, slender. Vertex somewhat luteous; third joint of the antennæ conical, very short, arista bare; thorax attenuated in front, with a transverse interrupted black line hindward; abdomen longer than the thorax, lanceolate hindward; fore legs short, posterior legs long; tarsi white, very short; anterior tibiæ piceous; middle femora rather thicker than the hind pair; wings limpid, grey towards the tips, with a pale luteous middle band; veins testaceous, cubital and præbrachial converging towards the tips of the wings, discal transverse vein straight, parted by less than its length from the border and by about thrice its length from the præbrachial transverse. Length of the body 3½ lines; of the wings 5 lines.

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#### Subfam. PSILIDES, *Walk.*

#### Gen. LISSA, *Meigen*.

158. LISSA CYLINDRICA, n. s. *Mas*. Cyanea, gracilis, cylindrica; antennis piceis basi albidis, arista plumosa; abdomine piceo basi apiceque cyaneis; pedibus albidis, femoribus posterioribus nigris apice albidis, femoribus posticis subtus spinosis, tibiis posticis nigris; alis subcinereis apice subfuscis; halteribus albidis

apice nigris.

*Male.* Blue, slender, cylindrical. Head broader than the thorax; antennæ whitish, third joint piceous, arista plumose; abdomen piceous, slightly increasing in breadth to the tip, blue at the base and at the tip, hind borders of the first and second segments whitish; legs whitish, posterior femora black, whitish at the base and towards the tips, hind femora spinose beneath, hind tibiæ black; wings slightly greyish, brownish towards the tips; veins black, præbrachial and perbrachial very near together for more than half their length, discal transverse vein straight, parted by more than its length, and by about four times its length from the præbrachial transverse; halteres whitish, with black tips. Length of the body 3½ lines; of the wings 5 lines.

Gen. NERIUS, *Fabr.*

159. *Nerius duplicatus*, *Wied. Auss. Zweifl.* 11. 553. 8. Inhabits also Java.

Subfam. OSCINIDES, *Haliday.*

Gen. OSCINIS, *Fabr.*

160. *OSCINIS LINEIPLENA*, n. s. *Mas.* Fusca; capite subtus testaceo apud oculos albo, vitta frontali alba; thorace pectoreque lineis sex albidis; abdomine sordide testaceo, pedibus albidis, tibiis tarsisque apice femoribusque anticis nigris; alis subcinereis, halteribus albidis.

*Male.* Brown. Head testaceous in front and beneath, white about the eyes, with a white stripe on the front; thorax and pectus with six whitish stripes on each, thorax with an indistinct middle testaceous stripe; abdomen dull testaceous; legs whitish; tibiæ and tarsi at the tips and fore femora black; wings greyish; veins black, discal transverse vein oblique, parted by more than its length from the border, and by full twice its length from the præbrachial transverse; halteres whitish. Length of the body 2 lines; of the wings 3 lines.

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161. *OSCINIS NOCTILUX*, n. s. *Mas.* Atra; capite pallide flavo subtus albo; antennis luteis, arista nuda; scutello, maculis duabus pectoralibus abdominisque apice albis; tibiis tarsisque intermediis testaceis; alis nigris postice cinereis, halteribus niveis.

*Male.* Black. Head pale yellow, black hindward, white beneath; antennæ pale luteous, third joint very short, arista bare; scutellum white; pectus with a white spot on each side; abdomen white at the tip; middle legs with testaceous tibiæ and tarsi; hind wings blackish, cinereous hindward; halteres snow-white. Length of the body ¾ line; of the wings 1½ line.

Subfam. GEOMYZIDES, *Fallen.*

Gen. DROSOPHILA, *Fallen.*

162. *DROSOPHILA? FINIGUTTA*, n. s. *Mas.* Fulva; capite antice testaceo, antennis testaceis, articulo tertio conico; abdomine maculis quatuor apicalibus nigris, tarsis nigris; alis cinereis venis nigris.

*Male.* Tawny. Head testaceous in front; antennæ testaceous, third joint conical; abdomen with two black spots on each side at the tip; legs testaceous; tarsi black; wings grey; veins black, discal transverse vein straight, parted by full half its length from the border and by full twice its length from the præbrachial transverse; halteres testaceous. Length of the body 1½ line; of the wings 3 lines.

163. *DROSOPHILA? MELANOSPILA*. *Fœm.* Testacea; antennarum articulo tertio conico, arista plumosa; thoracis disco abdominisque guttis duabus apicalibus atris; tarsis piceis; alis subcinereis.

*Female.* Testaceous. Vertex luteous; third joint of the antennæ conical; arista plumose; disk of the thorax and a dot on each side of the tip of the abdomen deep black; tarsi piceous; wings slightly greyish; veins black, discal transverse vein straight, parted by about half its length from the border and by twice its length from the præbrachial transverse. Length of the body 1 line; of the wings 2 lines.

164. *DROSOPHILA? IMPARATA*. *Fœm.* Pallide testacea; pedibus pallidioribus; alis subcinereis, venis pallidis.

*Female.* Pale testaceous, with a few bristles. Legs paler than the body; wings slightly greyish; veins pale, discal transverse vein straight, parted by about twice its length from the border and by more than twice its length from the præbrachial transverse. Length of the body ¾ line; of the wings 1½ line.

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Subfam. HYDROMYZIDES, *Haliday.*

Gen. EPHYDRA, *Fallen.*

165. EPHYDRA? TACITURNA, n. s. *Fœm.* Atra, nitens, antennis nigris, arista plumosa, abdomine nigro-cupreo, pedibus nigro-piceis, alis nigricantibus, venis nigris.

*Female.* Deep black, shining. Antennæ black, third joint linear, rather long, arista plumose; legs blackish-piceous; wings blackish; veins black, discal transverse vein straight, parted by a little more than its length from the border. Length of the body 1½ line; of the wings 2½ lines.

### Fam. PHORIDÆ, *Haliday.*

Gen. PALLURA, n. g.

*Mas.* Corpus latiusculum, pubescens. Os retractum. Oculi pubescentes. Antennæ brevissimæ; arista longissima. Scutellum magnum, conicum. Abdomen subellipticum, thorace non longius. Pedes latiusculi, pubescentes, non setosi. Alæ amplæ, venis æqualibus.

*Male.* Body rather broad, pubescent. Proboscis small, withdrawn; eyes pubescent; antennæ very short, arista very long; scutellum large, conical, very prominent, extending beyond the base of the abdomen; abdomen nearly elliptical, not longer than the thorax; legs rather broad, pubescent, without bristles; wings rather long and broad; veins of equal size, costal vein ending at rather before half the length of the wing, radial ending at somewhat in front of the tip of the wing, cubital ending at hardly in front of the tip, præbrachial ending at a little behind the tip, pabrachial ending on the hind border at half the length of the wing, discal transverse vein straight, parted by more than twice its length from the border and from the præbrachial transverse.

166. PALLURA INVARIA. *Mas.* Lutea, immaculata, alis cinereis basi luteis, apice nigricantibus, venis nigris robustis.

*Male.* Luteous, of one colour. Wings grey, luteous at the base, blackish towards the tips; veins black, robust. Length of the body 3 lines; of the wings 6 lines.

### Fam. HIPPOBOSCIDÆ, *Leach.*

Gen. ORNITHOMYIA, *Leach.*

167. Ornithomyia parva?, *Macq. Hist. Nat. Dipt.* 11. 2. 279. 3.

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KEY ISLAND.

### Fam. ASILIDÆ, *Leach.*

Subfam. LAPHRITES, *Walk.*

Gen. LAPHRIA, *Fabr.*

1. LAPHRIA PARADISIACA, n. s. *Mas.* Cuprea, aureo pilosa, capite pectoreque argenteis albo pilosis, mystace subaurato setis nonnullis nigris, abdomine apice purpureo subtus albido piloso, pedibus cyaneo-purpureis albido pilosis, femoribus cyaneo-viridibus, alis nigricantibus basi cinereis, halteribus albidis nigro notatis.

*Male.* Cupreous, with gilded hairs. Head and pectus silvery, with white hairs; mystax slightly gilded, with a few long black bristles; antennæ and mouth black; abdomen purple at the tip, underside clothed with long whitish hairs, silvery white at the base, the following segments bordered with silvery white; legs blue and purple, thickly clothed with long whitish hairs, femora bluish-green, fore tibiæ with pale gilded down beneath, hind tibiæ with a black bristly apical tuft beneath; wings blackish, grey towards the base; halteres whitish, marked with black. Length of the body 11 lines; of the wings 20 lines.

2. LAPHRIA PLACENS, n. s. *Mas.* Cyanea, capite aurato, mystace setis paucis longis nigris; antennis nigris, articulo tertio fusiformi; pectore albido, abdomine angusto, femoribus intus tibiisque purpureis; alis nigricantibus basi cinereis, halteribus piceis.

*Male.* Blue. Head gilded in front, whitish behind; mystax with a few long black bristles; proboscis and antennæ black, third joint of the latter fusiform; pectus whitish; abdomen cylindrical, much narrower than the thorax, and about twice its length; femora on the inner side and tibiæ purple, tarsi black; wings blackish, cinereous towards the base; halteres piceous. Length of the body 4½ lines; of the wings 8 lines.

### Subfam. ASILITES, *Walk.*

Gen. ASILUS, *Linn.*

3. ASILUS SUPERVENIENS, n. s. *Mas.* Cinereous, capite subaurato, mystace aurato setis paucis nigris, thorace vittis tribus latissimis nigris, abdomine fulvescenti-cinereo, pedibus rufescentibus, femoribus nigro vittatis, tarsis nigris, alis cinereis apice nigricantibus, halteribus testaceis.

*Male.* Cinereous. Head slightly gilded, pale cinereous, and clothed with pale hairs behind; mystax composed of gilded bristles, above which there are a few shorter black bristles; antennæ black, third joint elongate-fusiform, arista much longer than the third joint; thorax with three very broad hardly divided black stripes; abdomen with a slight fawn-coloured tinge, tip black, sexualia very small; legs reddish, femora striped above with black, tarsi black, reddish at the base; wings cinereous, blackish towards the tips; halteres testaceous. Length of the body 8 lines; of the wings 14 lines.

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Gen. OMMATIUS, *Illiger.*

4. *Ommatius noctifer*, *Walk.* See page 88.

Fam. EMPIDÆ, *Leach.*

Gen. HYBOS, *Fabr.*

5. HYBOS DEFICIENS, n. s. *Mas.* Niger, thorace fulvo globoso macula dorsali nigra, abdomine basi fulvo, pedibus anterioribus testaceis, femoribus posticis subtus spinosis, alis cinereis apice obscurioribus, stigmatate venisque nigris, halteribus testaceis, apice piceis.

*Male.* Black. Thorax and pectus tawny, the former globose, with a black dorsal spot; abdomen tawny at the base; anterior legs testaceous, hind femora spinose beneath; wings grey, darker at the tips; stigma and veins black; halteres testaceous, with piceous tips. Length of the body 2 lines; of the wings 4 lines.

Fam. SYRPHIDÆ, *Leach.*

Gen. ERISTALIS, *Latr.*

6. *Eristalis resolutus*, *Walk.* See p. 95.

Gen. BACCHA, *Fabr.*

7. BACCHA PURPURICOLA, n. s. *Fœm.* Purpureo-fulva; capite chalybeo; antennis rufis; pedibus fulvis; tibiis posticis apice tarsisque posticis basi piceis; alis nigricantibus, apud costam obscurioribus, spatio apicali subcostali cinereo; halteribus testaceis.

*Female.* Tawny, tinged with purple. Head chalybeous; antennæ red; legs tawny, hind tibiæ piceous towards the tips, hind tarsi piceous towards the base; wings blackish, darker along the costa, cinereous towards the tips with the exception of the costa; halteres testaceous. Length of the body 5½ lines; of the wings 9 lines.

Fam. MUSCIDÆ, *Latr.*

Subfam. SARCOFAGIDES, *Walk.*

Gen. SARCOFAGA, *Meigen.*

8. SARCOFAGA BASALIS, n. s. *Mas.* Nigra, subaureo tomentosa; capite aurato; thorace vittis tribus nigris; abdomine albido tessellato; alis cinereis; venis lurido marginatis; alulis testaceis.

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*Male.* Black, with slightly gilded tomentum. Head gilded; frontalia deep black, hardly widening in front; thorax with three black stripes, an indistinct blackish line on each side of the middle stripe; abdomen tessellated with white; wings grey; veins bordered with a lurid hue, especially towards the costa; præbrachial vein forming a slightly acute angle at its flexure, near which it is much curved inward, and is thence straight to its tip; discal transverse vein slightly curved inward near its hind end, parted by a little more than half its length from the border and from the præbrachial transverse; alulæ testaceous. Length of the body 5½ lines; of the wings 9 lines.

Subfam. MUSCIDES, *Walk.*

Gen. IDIA, *Meigen.*

9. *Idia xanthogaster*, *Wied. Auss. Zweifl.* 11. 349. 2. Inhabits also Hindostan and Java.



10. *Idia testacea*, *Macq. Hist. Nat. Dipt.* 77. 246. 3. Inhabits also Mauritius.

Gen. *MUSCA*, *Linn.*

11. *Musca obtrusa*, *Walk.* See p. 105.

Subfam. *ANTHOMYIDES*, *Walk.*

Gen. *ARICIA*, *Macq.*

12. *ARICIA VICARIA*, n. s. *Fœm.* Fulva, subtus testacea; capite nigro, apud oculos albo; antennis testaceis; alis cinereis, apud costam luridis.

*Female.* Tawny, testaceous beneath. Head black, white about the eyes; antennæ testaceous; abdomen clothed with short black bristles; legs testaceous, tarsi piceous; wings grey, with a lurid tinge towards the costa; veins black, discal transverse vein nearly straight, parted by about its length from the border, and by a little more than its length from the præbrachial transverse; alulæ slightly testaceous; halteres testaceous. Length of the body 3½ lines; of the wings 6 lines.

13. *ARICIA SQUALENS*, n. s. *Fœm.* Nigra, cinereo tomentosa; facie argentea; antennis testaceis; thorace vittis nigris vittisque duabus lateralibus latis testaceis; abdomine obscure testaceo; pedibus piceis; femoribus nigris; tibiis anticis testaceis; alis cinereis; apud costam subluridis; venis halteribusque testaceis.

*Female.* Black, with cinereous tomentum. Face silvery white; antennæ pale testaceous, third joint long, linear, extending to the epistoma; thorax with black stripes, and on each side with a broad testaceous stripe; abdomen dull testaceous; legs piceous; femora black, fore tibiæ testaceous; wings grey, with a lurid tinge towards the costa; veins testaceous, discal transverse vein very slightly curved inward, parted by much less than its length from the border, and by a little more than its length from the præbrachial transverse; alulæ whitish; halteres testaceous. Length of the body 3 lines; of the wings 6 lines.

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Subfam. *ORTALIDES*, *Haliday.*

Gen. *LAMPROGASTER*, *Macq.*

14. *LAMPROGASTER VENTRALIS*, n. s. *Fœm.* Testaceo-cinerea; capite apud oculos albo, vertice luteo, facie pallide fulva; thorace lineis septem indistinctis nigricantibus; abdomine fusco maculis dorsalibus canis, subtus cavo lateribus ferrugineis; pedibus nigris, tibiis ferrugineo fasciatis; alis limpidis basi subttestaceis, fasciis incompletis guttisque fuscis apud costam nigricantibus.

*Female.* Cinereous, with a testaceous tinge. Head white about the eyes, vertex luteous; face pale tawny, with white grooves for the antennæ; antennæ tawny, small; arista slightly plumose at the base; thorax with seven indistinct blackish lines; abdomen brown, with dorsal hoary nearly triangular spots, under side marsupial-like or with a pouch, ferruginous on each side; legs black, each tibia with a ferruginous band; wings limpid, slightly testaceous at the base, with brown dots and bands, the latter abbreviated hindward, blackish towards the costa; veins black, testaceous towards the base; discal transverse vein straight, parted by about one-third of its length from the border and by much more than its length from the præbrachial transverse; alulæ cinereous; halteres testaceous. Length of the body 5 lines; of the wings 10 lines.

Gen. *TRYPETA*, *Meigen.*

15. *TRYPETA RORIPENNIS*, n. s. *Fœm.* Fusca; capite nigro, facie alba; antennis nigris rufo-fasciatis; thorace vittis quatuor canis; abdominis segmentis testaceo marginatis; pedibus nigris, tarsis halteribusque testaceis; alis nigris, punctis plurimis albis.

*Female.* Brown. Head black; face white; antennæ black, third joint red, linear, rather long, black towards the tip; arista plumose; thorax with four hoary stripes; abdominal segments with testaceous hind borders; legs black, tarsi testaceous; wings black, with very numerous white points, a few of which are rather larger than the others; discal transverse vein straight, parted by less than its length from the border, and by more than twice its length from the præbrachial transverse; halteres testaceous. Length of the body 2 lines; of the wings 4 lines.

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This Collection of Hymenoptera is the most important contribution which has been made to the Aculeata through the exertions of Mr. Wallace; in point of geographical distribution, it adds much to our knowledge. In the Aru, Key, and neighbouring islands, we meet with the extreme range of the Australian insect-fauna; and as might be expected, it is found amongst the Vespidae Group, and in one or two instances in the Formicidæ. The latter, being frequently conveyed from one island to another, can perhaps scarcely be considered indicative of natural geographical distribution. Of the forty-six species of the Formicidous Group, only six were previously known to science. Of the genus *Podomyrma* here established, one species only, from Adelaide, was previously known; it is one of the most distinct and remarkable genera in the family. The *Pompilidæ* are species of great beauty, some closely resembling those of Australia in the banding and maculation of their wings; amongst the *Vespidæ* will be found some of the most elegant and beautiful forms in the whole of that protean family of Hymenoptera.

## Fam. ANDRENIDÆ.

### Gen. PROSOPIS.

1. PROSOPIS MALACHISIS. *P. nigro-cæruleo-viridis*, nitida et delicatulè punctata; alis hyalinis.

*Female.* Length  $4\frac{1}{2}$  lines. Deep blue-green, with tints of purple in certain lights, particularly on the head, the clypeus with a central longitudinal ridge, its anterior margin slightly emarginate; the flagellum rufopiceous beneath, the ocelli white. Thorax: the wings hyaline and brilliantly iridescent; the legs dark rufopiceous with a bright purple tinge. Abdomen delicately punctured, the head and thorax more strongly so; the latter with a semicircular enclosed space at its base, which is smooth and shining.

*Hab.* Key Island.

### Gen. NOMIA.

1. NOMIA CINCTA. *N. nigra*, capite thoraceque punctatis, pedibus ferrugineis; segmentis abdominis apice fulvotestaceo late fasciatis.

*Female.* Length 5 lines. Black: the two basal joints of the flagellum, the apical margin of the clypeus, the labrum, mandibles, and legs ferruginous; the wings fulvo-hyaline, the nervures ferruginous, the tegulæ more or less rufo-testaceous; the sides of the metathorax with tufts of pale fulvous pubescence and the floccus on the posterior femora of the same colour, the tibiæ and tarsi with short ferruginous pubescence. Abdomen shining, the apical margins of the segments broadly fulvo-testaceous, very bright, having a golden lustre.

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*Hab.* Key Island.

2. NOMIA LONGICORNIS. *N. nigra*, lucida et delicatulè punctata, facie pube brevi griseâ tectâ, femorum posticorum flocco pallido, tibiis externè fusco-pubescentibus; maris antennis, capite thoraceque longioribus.

*Male.* Length 4 lines. Brassy, with tints of green on the clypeus, metathorax, and thorax beneath; the head and thorax very closely and finely punctured; the clypeus produced and highly polished; the mandibles rufo-testaceous, the antennæ as long as the head and thorax. Thorax: the wings hyaline and splendidly iridescent, the tegulæ and the tarsi rufo-testaceous. Abdomen closely punctured, the apical margins of the segments smooth and shining; the head and thorax above with a pale fulvous pubescence, that on the sides of the metathorax and legs pale and glittering; the abdomen has a pale scattered glittering pubescence.

*Hab.* Aru.

3. NOMIA DENTATA. *N. nigra* et punctata, facie metathoracisque lateribus cinereo-pubescentibus, postscutello medio unidentato. *Mas.* antennis filiformibus longitudine thoracis.

*Female.* Length 5 lines. Black; head and thorax rather finely punctured; the face covered with short cinereous pubescence; the clypeus naked and much produced, the anterior margin and the tips of the mandibles ferruginous; the cheek with long whitish pubescence. Thorax: the sides of the metathorax, the floccus on the posterior femora and the postscutellum with whitish pubescence, the latter produced in the middle into a blunt tooth; the legs fusco-ferruginous, with the anterior tibiæ and apical joints of the tarsi brighter; wings hyaline and iridescent. Abdomen shining and punctured, the apical margins of the two basal segments broadly depressed, and more finely and closely punctured than the rest; the apical margins of the second, third, and fourth segments pale testaceous; the apical margins of the two basal segments narrowly fringed with white pubescence, usually more or less interrupted in the middle.

*Male.* Resembles the female very closely, but has the face much more pubescent; the antennæ filiform and longer than the head and thorax; the scutellum armed at its posterior lateral angles with an acute tooth; the metathorax truncate and slightly concave, its base with short longitudinal grooves, the lateral margins fringed with long pubescence.

*Hab.* Aru.

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### Subfam. DASYGASTRÆ.

#### Gen. MEGACHILE, *Latr.*

1. MEGACHILE LATERITIA. *M. nigra*, abdomine pube ferrugineâ vestito, alis fuscis.

*Female.* Length 8 lines. Black; head and thorax very closely and finely punctured; the mandibles with a single blunt tooth at their apex; the anterior margin of the clypeus transverse. Thorax: the wings brown, the posterior pair palest, their base subhyaline. Abdomen clothed with bright brick-red pubescence above and beneath; the basal segment with bright yellow pubescence above.

*Hab.* Aru.

2. MEGACHILE SCABROSA. *M. nigra*, metathorace anticè rudè scabrato, abdomine subtùs nigro-pubescente.

*Female.* Length 5½ lines. Black; the clypeus, mesothorax anteriorly, and the posterior tibiæ outside coarsely rugose, the roughness on the thorax consisting of transverse little elevated points; the face with a thin griseous pubescence; the anterior margin of the clypeus fringed with fulvous hairs; the cheeks have a long pale fulvous pubescence. Thorax: the wings hyaline, the nervures black. Abdomen smooth and shining, with black pubescence beneath; beneath, the apical margins of the segments with a fringe of very short white pubescence.

*Hab.* Aru.

3. MEGACHILE INSULARIS. *M. nigra*, nitida, delicatulè punctata, facie pube pallidè fulvâ vestitâ, abdomine subtùs pube lætè ferrugineâ vestito, alis hyalinis.

*Female.* Length 5½ lines. Black; the head and thorax finely and closely punctured, the abdomen delicately so; the face clothed with pale fulvous pubescence, the mandibles with two blunt teeth at their apex; the clypeus shining and strongly punctured. Thorax: the wings subhyaline with a slight cloud at their apex; the basal joint of the posterior tarsi with a dense dark ferruginous pubescence within. Abdomen: the four basal segments with transverse impressed lines in the middle; beneath, clothed with bright ferruginous pubescence; the abdomen has an obscure æneous tinge above.

*Hab.* Aru.

#### Gen. CROCISA, *Jurine.*

1. *Crocisa nitidula*, *Fabr. Syst. Piez.* p. 386. 2.

*Hab.* Aru; Key Island; Australia; Amboyna.

#### Gen. ALLODAPE, *St.-Farg.*

1. ALLODAPE NITIDA. *A. nitida nigra*, clypeo flavo, alis hyalinis, abdomine ad apicem punctato.

*Female.* Length 3 lines. Black and shining; the clypeus yellow, produced in front; the sides of the face depressed; the ocelli prominent and reddish. Thorax very smooth and shining; the wings colourless and iridescent, their extreme base yellowish, the nervures and stigma brown, the tegulæ pale testaceous-yellow; the posterior tibiæ with a scopa of glittering white hairs, the tarsi ferruginous and with glittering hairs. Abdomen, from the third segment to the apex, gradually more and more strongly and closely punctured.

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*Hab.* Aru.

#### Gen. XYLOCOPA, *Latr.*

1. *Xylocopa æstuans*, *Linn. Syst. Nat.* i. p. 961. 53 ♀; *St.-Farg. Hym.* ii. p. 193. 36 ♂ ♀.

*Hab.* Aru; India; Singapore; Celebes.

#### Gen. SAROPODA, *Latr.*

1. *Saropoda bombiformis*, *Smith, Cat. Hym. Ins.* p. 2. p. 318. 6.

*Hab.* Aru; Australia (Richmond River).

Gen. ANTHOPHORA, *Latr.*

1. *Anthophora zonata*, *Linn. Syst. Nat.*

*Hab.* Aru Island; Celebes; Ceylon; India; Borneo; Hong-Kong; Shanghai; Philippine Islands.

2. ANTHOPHORA ELEGANS. *A. nigra*, pube capitis thoracisque nigrâ, abdomine fasciis quatuor lætè cæruleis ornato; tibiis posticis ferrugineo-pubescentibus.

*Female.* Length 6 lines. Black; the labrum, a narrow line down the middle and another on each side of the clypeus, a minute spot above it, and the scape in front testaceous yellow, the base of the mandibles of a paler colour; the flagellum fulvous beneath. Thorax: the pubescence black; wings subhyaline, the nervures dark rufo-fuscous, tegulæ obscurely testaceous. Abdomen with four fasciæ of brilliant blue, which is changeable, with pearly tints in different lights; the posterior tibiæ densely clothed outside with fulvo-ferruginous pubescence; the pubescence inside is black.

*Hab.* Key Island.

Gen. TRIGONA, *Jurine.*

1. *Trigona læviceps*, *Smith, Cat. Hym. Ins., Journ. Proc. Linn. Soc.* ii. p. 51. 8.

*Hab.* Aru; Singapore; India.

Fam. FORMICIDÆ.

Gen. FORMICA.

1. *Formica virescens*, *Fabr. Ent. Syst.* ii. p. 355. 23 ♂ ♀.—*Lasius virescens*, *Fabr. Syst. Piez.* p. 417. 8. [Pg 136]

2. *Formica gracilipes*, *Smith, Cat. Hym. Ins., Journ. Proc. Linn. Soc.* ii. p. 55. 13 ♀.

3. FORMICA FRAGILIS. *F. pallidè testacea*, elongata et gracilis, capite posticè angustato; thorace medio compresso, pedibus elongatis; squamâ incrassatâ triangulatâ.

*Worker.* Length 3½ lines. Pale rufo-testaceous, smooth and slightly shining; antennæ elongate, longer than the body, the flagellum slender and filiform, the scape nearly as long as the head and thorax; head oblong, narrowed behind the eyes into a kind of neck, the sides parallel before the eyes, which are black and round, the clypeus slightly emarginate anteriorly, the mandibles finely serrated on their inner margin and terminating in a bent acute tooth. Thorax elongate, narrowest in the middle, the prothorax forming a neck anteriorly; legs elongate and very slender. Abdomen ovate, the node of the petiole incrassate, and viewed sideways is triangular or wedge-shaped.

*Hab.* Aru.

This is one of those remarkable forms which recede so greatly from the normal type of *Formica* as apparently to indicate a generic distinction; but in those exotic species of which we have obtained all the forms, we find many which approach closely to the present insect, which is probably only the small worker of some already described species. No one would venture, without the authority of the personal observation of some competent naturalist, to unite all the forms of any exotic species of *Formica*.

4. FORMICA FLAVITARSUS. *F. nigra*, elongata et gracilis; thorace posticè compresso, pedibus elongatis, tarsis flavis.

*Worker.* Length 4 lines. Black and subopaque; head elongate, narrowed behind, the clypeus truncate anteriorly, the mandibles pale ferruginous; antennæ elongate and slender, the flagellum filiform and pale rufo-testaceous; the thorax and legs elongate, the latter slender with their tarsi pale rufo-testaceous. Abdomen ovate, the scale of the petiole incrassate and slightly notched above.

*Hab.* Aru.

5. FORMICA COXALIS. *F. nigra*, nitida; flagello, coxis et abdomine subtùs pallidè testaceis.

*Worker major.* Length 5 lines. Black and very delicately roughened with a fine transverse waved striation only perceptible under a good magnifying power. Head large, much wider than the thorax, oblong-ovate with a deep emargination behind; the clypeus slightly produced and truncate anteriorly, the angles of the truncation rounded, and with a central shining carina; the flagellum, except the tarsal joint, pale rufo-testaceous. Thorax elongate, compressed behind, the coxæ pale rufo-testaceous. Abdomen ovate, the scale of the petiole incrassate, somewhat wedge-shaped when viewed sideways, the abdomen sparingly sprinkled with long pale hairs.

6. FORMICA CORDATA. *F. pallidè rufa*; abdomine fusco, capite cordato.

*Worker*. Length 2 lines. Pale rufo-testaceous; the head heart-shaped; the eyes black, the flagellum fusco-ferruginous with the basal joints pale; the mandibles ferruginous. Thorax narrow, deeply strangulated at the base of the metathorax. Abdomen more or less fuscous, the node of the petiole narrow and pointed above; the entire insect is smooth and shining.

*Hab.* Aru.

The *worker minor* is rather smaller and has the abdomen darker, in all the specimens received, but in other respects agrees with the above.

7. FORMICA OCULATA. *F. pallidè ferruginea*; capite oblongo, oculis magnis, thorace compresso.

*Worker*. Length  $2\frac{1}{2}$  lines. Pale ferruginous, with the vertex and apex of the abdomen black; the head oblong, the sides nearly parallel, with the anterior margin truncate; the mandibles with fine acute teeth on their inner margin; the antennæ inserted wide apart about the middle of the head; the eyes very large and ovate, placed backwards on the sides of the head, reaching to the posterior margin of the vertex, forming as it were its posterior lateral angles. The thorax narrow and compressed behind; abdomen ovate, entirely smooth and shining.

*Hab.* Aru.

8. FORMICA MUTILATA. *F. nigra*; capite oblongo, truncato anticè et sanguineo, antennis tarsisque rufo-testaceis.

*Worker*. Length  $2\frac{3}{4}$  lines. Black and shining; the head truncate anteriorly, the antennæ inserted wide apart, about the middle, the face blood-red before their insertion and deeply striated longitudinally, behind the antennæ the head is black, smooth, and shining; the eyes ovate and placed backwards on the sides of the head. Thorax rounded in front and strangulated between the meso- and metathorax, the latter obliquely truncate; legs rather short and stout, the femora compressed, the anterior pair broadly dilated, the base and apex of the femora, the tibiæ, and tarsi rufo-testaceous, the tibiæ with a darker stain behind. Abdomen oblong-ovate, the apical margins of the segments narrowly pale testaceous; the scale of the petiole compressed, with its superior margin rounded.

*Hab.* Aru.

This is a very singular insect in many respects, and closely resembles in form the *Formica truncata* of Spinola.

9. FORMICA QUADRICEPS. *F. nigra, nitida*; capite anticè obliquè truncato, thorace posticè compresso.

*Worker*. Length  $3\frac{1}{2}$  lines. Shining black; head oblong-quadrate, slightly narrowed anteriorly, with the sides nearly straight, the posterior angles rounded, and very slightly emarginate behind; the head obliquely truncate from the base of the clypeus; the truncation as well as the mandibles obscurely ferruginous; the apex of the flagellum and the apical joints of the tarsi pale rufo-testaceous. Thorax rounded anteriorly, compressed behind, with the metathorax abruptly truncate. The scale of the petiole narrow, incrassate, its anterior margin slightly curved, its posterior margin straight; the abdomen ovate.

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*Worker minor*. About 3 lines long, very like the larger *worker*, the head being truncate in front; but it is, in proportion to the thorax, narrower; the latter is compressed and abruptly truncate; in other respects it agrees with the *worker major*.

*Hab.* Aru.

10. FORMICA LÆVISSIMA. *F. nigra nitida lævissima*, sparse pilosa; squamâ oblongâ subdepressâ.

*Worker*. Length 4 lines. Jet-black, very smooth and shining; head wider than the thorax, slightly emarginate behind, the sides slightly rounded; the anterior margin of the clypeus rounded, the mandibles striated and obscurely ferruginous; the scape with a few glittering silvery-white hairs. Thorax not quite so wide as the head anteriorly, narrowed behind, with the disk somewhat flattened, slightly convex, a deep strangulation between the meso- and metathorax, the latter obliquely rounded; the legs and abdomen sprinkled with glittering white hairs. The node of the petiole incrassate, very slightly elevated; viewed sideways, broadly wedge-shaped; the abdomen ovate.

*Hab.* Aru.

11. FORMICA NITIDA. *F. capite abdomineque nigris, antennis thoraceque pedibusque rufo-testaceis lævissimis et lucidis*.

*Worker*. Length 4 lines. Head and abdomen shining black; the flagellum, thorax, legs, and scale of the petiole rufo-testaceous; the legs palest; the scape fuscous, with its base pale; the head large, wider than the abdomen, and emarginate behind; the clypeus and mandibles obscurely ferruginous. Thorax compressed, not strangulated in the middle. The scale of the petiole narrow, with its margin rounded above; abdomen ovate, and sprinkled with a few erect pale hairs.

*Hab.* Aru.

12. FORMICA SCRUTATOR. F. nigerrima, mandibulis tarsorumque articulo apicali pallidè ferrugineis, thorace medio profundè coarctato.

*Worker.* Length  $1\frac{1}{2}$ –2 lines. Shining black; the mandibles pale, ferruginous, with their inner margins finely denticulate; the eyes placed rather forwards on the sides of the head, the latter emarginate behind. Thorax deeply strangulated in the middle; the metathorax elevated and obliquely truncate behind. Abdomen ovate; the scale of the petiole sub-incrassate, with its margin rounded above; the insect very thinly covered with a fine cinereous pile.

*Hab.* Aru.

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13. FORMICA ANGULATA. F. nigra nitida; flagello capite anticè pedibusque obscurè ferrugineis, metathorace angulato.

*Worker.* Length 3 lines. Shining black; head of moderate size; the clypeus and mandibles obscure ferruginous; the flagellum fusco-ferruginous, with the tip pale testaceous. Thorax rounded anteriorly and compressed behind; the scutellum prominent, forming a small tubercle; the metathorax obliquely truncate, the margin of the truncation elevated, so that when viewed sideways the metathorax forms an obtuse angular shape. Abdomen ovate, the node of the peduncle elevated, incrassate, rounded anteriorly, and flat behind.

*Hab.* Aru.

#### Gen. POLYRHACHIS, *Smith.*

1. Formica sericata, *Guér. Voy. Coq. Zool.* ii. 203; *Atlas Ins.* pl. 8. f. 2, 2 a, b, c, d, ♂. (Polyrhachis sericata, *Smith, Append. Cat. Form.* p. 200.)

*Hab.* Aru; New Hebrides.

2. Formica sexspinosa, *Latr. Hist. Nat. Fourm.* p. 126, pl. iv. f. 21 ♂. (Polyrhachis sexspinosa, *Smith, Cat. Form.* p. 56. 3.)

*Hab.* Aru; India; Philippine Islands.

3. POLYRHACHIS MARGINATUS. *P. niger*; antennis, palpis pedibusque ferrugineis; thoracis marginibus recurvis, metathorace petiolique squamulâ bidentatis.

*Worker.* Length  $2\frac{1}{2}$  lines. Black; the antennæ and legs ferruginous; the head and thorax rugose; the prothorax transverse, its anterior margin slightly curved, with the lateral angles produced forwards and very acute; the thorax narrowed to the metathorax, which is armed with two divergent acute spines. Abdomen velvety black and globose; the scale of the petiole produced laterally into long, bent, acute spines, which curve backwards to the shape of the abdomen.

*Hab.* Aru.

4. POLYRHACHIS HOSTILIS. *P. niger*, longitudinaliter striatus, thoracis marginibus expansis, metathorace squamulâque petioli spinis duabus crassis acutis curvatis.

*Worker.* Length 3 lines. Black; the head and thorax longitudinally striated, the abdomen very finely and evenly so; the prothorax transverse, wider than the head, the anterior and lateral margins recurved, the latter acute at their anterior angles, and rounded at the posterior ones; the lateral margins of the mesothorax recurved, a deep notch between the meso- and metathorax; the latter with a long, stout, curved, acute spine on each side. The scale of the petiole produced above on each side, into a long, curved, stout, acute spine, which curves backwards round the sides of the abdomen.

*Hab.* Aru.

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5. POLYRHACHIS LONGIPES. *P. niger*; flagelli dimidio apicali tibiisque anticis pallidè ferrugineis, prothorace petiolique squamulâ bidentatis.

*Worker.* Length 3 lines. Black; the head and thorax finely rugose; the antennæ elongate, longer than the insect; the apical half of the flagellum pale ferruginous. Thorax rounded above, the sides not margined; two spines on the thorax anteriorly, two on the metathorax, and two on the scale of the petiole; the legs elongate, with the anterior tibiæ ferruginous. Abdomen globose, sometimes rufo-fuscous, or the base obscurely rufous.

*Hab.* Aru.

6. POLYRHACHIS SERRATUS. *P. niger*; capite thoraceque rugosis, abdomine densè punctato, squamâ petioli transversâ, margine superno serratâ.

*Worker.* Length 2 lines. Black, with the antennæ and legs ferruginous. Thorax oblong-quadrate or very slightly narrowed towards the metathorax, slightly convex above, not margined at the sides, the divisions not perceptible; the head and thorax rugose and pubescent. Abdomen globose, shining, and closely punctured; the scale of the petiole transverse above, produced into an acute spine on each side, the upper

margin finely serrated, the lateral margins narrowed to their base, and having two or three small sharp spines.

*Hab. Aru.*

7. POLYRHACHIS SCUTULATUS. *P. niger*, fortiter politus et lucidus, metathorace petiolique squamulâ dente longo curvato acuto in latere utroque, pedibus nigro-ferrugineis.

*Worker.* Length  $2\frac{3}{4}$  lines. Black and very smooth and shining; the legs dark ferruginous. Thorax: the disk expanded, slightly convex above, with the margins acute and curving upwards; the anterior margin transverse, rather wider than the head, with the lateral angles slightly curved forwards, and very acute; the lateral margins of the prothorax curved backwards and inwards; the margins of the mesothorax are rounded; the pro- and mesothorax highly polished above, forming an escutcheon-shaped disk; the metathorax opaque, and sprinkled with a few short glittering hairs, armed posteriorly with two long very acute spines, divergent and directed backwards. Abdomen globose; the scale of the petiole with two long curved acute spines, directed backwards to the curve of the abdomen.

*Hab. Aru.*

8. POLYRHACHIS MUCRONATUS. *P. lævis*, nitidus, niger; thorace spinis duabus crassis compressis acutis posticè armato.

*Worker.* Length  $2\frac{1}{2}$  lines. Black, smooth, and shining, very delicately and indistinctly aciculate; the antennæ beneath and the tibiæ and femora obscurely ferruginous, the anterior and intermediate tibiæ brightest; the apex of the mandibles ferruginous. Thorax transverse in front, or very slightly curved, with the lateral angles acute; the thorax is rounded above, and not margined at the sides; the metathorax armed with two long, stout, acute compressed spines; the spines divergent, as well as two on the scale of the petiole, which are long and very acute. Abdomen globose.

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*Hab. Aru.*

9. POLYRHACHIS GEOMETRICUS. *P. niger*; antennarum apice, tibiis tarsorumque apice ferrugineis, thorace circulariter striato.

*Worker.* Length 2 lines. Black; the apical joints of the flagellum, the anterior legs, the anterior and intermediate tibiæ, and the apical joints of the tarsi pale ferruginous; the extreme base of the anterior tarsi black. Thorax rounded above, not margined, gradually narrowed posteriorly; the prothorax of the same width as the head, its lateral angles toothed; the disk with a circular striation. Abdomen globose and pubescent; the scale of the petiole compressed, its superior margin rounded, and with four minute teeth.

*Hab. Aru.*

10. POLYRHACHIS IRRITABILIS. *P. niger*, pube pallidè aureâ vestitus; thorace quadridentato, petioli squamulâ bidentatâ.

*Female.* Length  $6\frac{1}{2}$  lines. Black, and densely clothed with short pale golden pubescence; all parts of the insect sprinkled with erect cinereous hairs; the mandibles shining black, the palpi pale testaceous; the head elongate, the eyes placed high on the sides of the head, ferruginous and very prominent. Thorax elongate-ovate; the prothorax with a short, stout, acute tooth on each side, slightly curved and directed forwards; the metathorax with a similar tooth on each side directed backwards; the wings subhyaline, the nervures fuscous; the legs fusco-ferruginous, the femora and coxæ brightest. Abdomen ovate; the scale incrassate, armed above with two stout acute teeth.

*Hab. Aru.*

This is probably the female of *P. sexspinosus*.

11. POLYRHACHIS LÆVISSIMUS. *P. niger*, lævis nitidusque; metathorace bispinoso, petioli squamulâ quadrispinosâ, pedibus ferrugineis.

*Worker.* Length  $2\frac{3}{4}$  lines. Black, very smooth and shining; the legs ferruginous, with the coxæ, articulations, and the tarsi black. The thorax not flattened above, or margined at the sides; the division between the pro- and mesothorax distinct, that between the meso- and metathorax not discernible, the latter with two erect acute spines; the scale of the petiole with four short acute spines. Abdomen globose.

*Hab. Aru.*

This species is very like *P. mucronatus*; on close examination, however, it is seen to be very distinct: it may be at once distinguished by its larger head, which is wider than the thorax, rounded behind the eyes, and widely emarginate behind.

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12. POLYRHACHIS BELLICOSUS. *P. capite abdomineque nigris*, thorace femoribusque rufis, thorace quadrispinoso, petioli squamulâ bihamatâ.

*Worker.* Length  $3\frac{1}{2}$  lines. Black, with the scale of the petiole, thorax, coxæ, and femora blood-red. Thorax: the lateral margins raised above, with two slightly curved divergent spines in front, and two stout, acute,

long curved spines in the middle, directed backwards; the scale of the petiole forming a long erect pedestal, which terminates above in two much bent acute hooks, directed backwards, and being as high as the basal segment of the abdomen; the spines and hooks black at the apex. Abdomen ovate.

*Hab.* Aru.

13. POLYRHACHIS HECTOR. *P. niger et vestitus* pube pallidè aureâ; prothorace petiolique squamulâ bispinosis, pedibus ferrugineis.

*Worker.* Length 3 lines. Black; the apex of the scape and the legs ferruginous; the extreme base of the tibiæ and the tarsi black; a stout acute spine on each side of the prothorax, directed forwards; the thorax flattened above, its lateral margins raised; the divisions of the segments very distinctly impressed; the pale golden pubescence on the abdomen thinner than on the head and thorax. The scale of the petiole angled at the sides towards its summit, the angles dentate, the upper margin straight, and at each lateral angle an acute spine, directed backwards, and curved to the shape of the abdomen; the spines parallel.

*Hab.* Aru.

14. POLYRHACHIS RUFOFEMORATUS. *P. niger, lævis, nitidus;* femoribus abdominisque squamulâ ferrugineis.

*Worker.* Length  $3\frac{1}{2}$  lines. Black; head oblong; the eyes placed high at the sides near the vertex, the front very prominent, with two elevated carinæ in the middle, at the outside of which the antennæ are inserted. Thorax: the divisions strongly marked, flattened above with the sides elevated; the prothorax with an acute spine on each side anteriorly; the coxæ and femora ferruginous, with the apex of the latter more or less fuscous. Abdomen: the base and the scale ferruginous, the latter angled at the sides and emarginate above.

*Hab.* Aru.

#### Gen. PONERA, *Latr.*

1. *Ponera rugosa*, *Smith, Cat. Hym. Ins. Proc. Linn. Soc. ii. 66. 5.*

*Hab.* Aru. Borneo.

2. PONERA SCULPTURATA. *P. nitida nigra;* capite, thorace abdominisque segmentis primo et secundo profundè striatis, nodo spinis duabus acutis armato; pedibus abdomineque apice ferrugineis.

*Worker.* Length 5 lines. Black and shiny, the legs obscurely ferruginous as well as the mandibles; the head strongly and evenly striated longitudinally. The prothorax with a circular striation above; behind, the thorax is compressed, the sides being obliquely striated, the striæ uniting and crossing the central ridge of the thorax. The node of the petiole and basal segment of the abdomen with a curved striation, the second segment longitudinally striated and depressed at its base, which is smooth and shining; the basal half of the third segment is longitudinally striated.

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*Hab.* Aru.

This species is at first sight very like the *P. geometrica* from Singapore; but the striation of the abdomen alone will serve to distinguish it.

3. PONERA PARALLELA. *P. nigra, opaca;* antennis, mandibulis, pedibus abdominisque apice ferrugineis.

*Worker.* Length  $3\frac{1}{4}$  lines. Opake black; the antennæ thick and scarcely as long as the thorax, their apex and the mandibles bright ferruginous; the legs somewhat obscure ferruginous, with the articulations much brighter; the head a little wider than the thorax and subovate; the thorax, node of the petiole, and the abdomen of nearly equal width, the abdomen being slightly the widest; the node of the petiole nearly quadrate; the apical margin of the first segment and base of the second slightly depressed.

*Hab.* Aru.

4. PONERA QUADRIDENTATA. *P. atro-fusca;* antennis, facie anticè, antennis, mandibulis, tibiis tarsisque ferrugineis; alis subhyalinis.

*Female.* Length  $3\frac{1}{2}$  lines. Nigro-fuscous; the antennæ with a carina between their base, the face anteriorly, the mandibles, the legs, and the abdomen at its apex and beneath, ferruginous; the femora and coxæ above, fuscous; the head subquadrate with the angles rounded; the eyes small and placed forwards on the sides of the head towards the base of the mandibles, the latter with four strong teeth on their inner margin. Thorax oblong-ovate with the metathorax truncate; the wings fusco-hyaline, the stigma large and black. Abdomen: the second segment slightly narrowed at its base, the node of the petiole incrassate and compressed, its upper margin rounded. The insect entirely covered with a short downy cinereous pile, the abdomen having also a number of scattered erect glittering hairs.

*Hab.* Aru.

#### Gen. ECTATOMMA, *Smith.*



1. ECTATOMMA RUGOSA. *E. fusco-brunnea*; capite, thorace, nodoque rugosis; abdomine delicatulè aciculato.

*Worker.* Length 4 lines. Obscure fusco-ferruginous, the antennæ and legs bright ferruginous; the head, thorax, and node of the petiole coarsely rugose; the eyes very prominent and glassy; the mandibles longitudinally but very delicately striated, their inner margin edentate; the thorax slightly narrowed behind. Abdomen very delicately aciculate.

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*Male.* Length 3½ lines. Of the same colour, and sculptured like the worker; the head rounded behind the eyes and narrowed before them; the eyes very large, prominent and ovate; the ocelli very bright and prominent; antennæ elongate and slender, the scape short, not longer than the second joint of the flagellum. Thorax: the scutellum prominent, forming a rounded tubercle, the metathorax elongate and oblique. Abdomen aciculate as in the worker, but much more deeply strangulated between the first and second segments; the petiole rugose and clavate.

*Hab.* Aru.

#### Gen. ODONTOMACHUS, *Latr.*

1. *Odontomachus simillimus*, *Smith, Cat. Form.* p. 80. 11 ♀.

*Hab.* Aru. Ceylon.

2. ODONTOMACHUS TYRANNICUS. *O. capite thoraceque nigris, antennis abdomineque ferrugineis, margine interno mandibulorum serratulo.*

*Worker.* Length 7 lines. Head oblong, narrowed behind, posteriorly deeply emarginate; the mandibles rufo-piceous, brightest at their apex, which is armed with two long teeth which are bent abruptly inwards, their tips black; the anterior portion of the head striated obliquely from the centre; the head, behind the anterior sulcation, very smooth and shining and having a deep longitudinal central depression. Thorax transversely striated, the articulations of the legs and the tarsi ferruginous. Abdomen smooth, shining, and ferruginous; the node of the petiole incrassate, cylindric, and tapering upwards into a very acute spine.

*Hab.* Aru.

3. ODONTOMACHUS MALIGNUS. *O. ferrugineus; capite suprâ obliquè striato; margine interno mandibulorum confertim serrato; metathorace transversim striato; squamâ unispinosâ; abdomine lævissimo.*

*Worker.* Length 7 lines. Ferruginous; the flagellum and legs palest; head much narrowed behind, the posterior margin deeply emarginate; mandibles smooth and shining, their inner margin strongly serrated, their apex abruptly bent or elbowed, and armed with two stout teeth; the face anteriorly evenly striated obliquely; the head behind the anterior sulcation very delicately striated obliquely. The prothorax smooth and shining, the meso- and metathorax transversely striated. Abdomen very smooth and shining; the node of the petiole incrassate and tapering upwards into an acute spine.

*Hab.* Aru.

This species most closely resembles *O. maxillaris* from Brazil; but its smooth polished prothorax alone would distinguish it; its head is much broader anteriorly, and less elongate.

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#### Gen. PSEUDOMYRMA, *Guér.*

1. PSEUDOMYRMA LÆVICEPS. *P. nigra, lævis et nitida; antennis, mandibulis, tibiis anterioribus, tarsisque rufo-fulvis.*

*Worker.* Length 2¼ lines. Black and shining; head very smooth and slightly emarginate behind, the eyes large and ovate; the mandibles and antennæ rufo-fulvous. Thorax with the sides flattened, the disk slightly convex; a deep strangulation between the meso- and metathorax, the latter rounded above and oblique behind; the trochanters, articulations of the legs, and the tarsi rufo-fulvous. Abdomen thinly covered with a fine cinereous pile; the first node of the petiole somewhat oblong-ovate, the second subglobose, the petiole of the first node short.

*Hab.* Aru.

#### Gen. PODOMYRMA, *Smith.*

*Head* oblong in the *female*, rather wider than the thorax; in the *worker* subovate and much wider; *eyes* small, ovate and placed about the middle at the sides of the head; *antennæ* geniculated, the scape about two thirds of the length of the flagellum which is clavate, the club three-jointed; the *mandibles* stout and dentate; the *labial palpi* 3-jointed; the *maxillary palpi* 4-jointed. *Thorax*, oblong-ovate in the *female*, in the *worker* transverse in front and narrowed behind with the metathorax bidentate; the anterior wings with one elongate marginal cell and two submarginal cells, the second extending to the apex of the wing; the legs stout, the femora incrassate; abdomen ovate, the peduncle with two nodes.

The insects included in this genus are undoubtedly most nearly allied to those belonging to the genus *Myrmecina*; but, excepting that they agree in having the same number of joints in the palpi, they have little resemblance to each other. With the exception of the genus *Myrmecia*, these are the largest insects in the subfamily Myrmicidæ; and all the species are distinguished by their remarkably thickened femora and margined thorax: we are unacquainted with the males.

1. *PODOMYRMA FEMORATA*. *P. ferruginea*; capite oblongo, obliquè striato, thorace abdomineque lævibus nitidis; alis subhyalinis fusco-nebulosis; femoribus valdè incrassatis, basi tenuissimis, femoribus posticis infra compressis.

*Female*. Length 8 lines. Rufo-testaceous; the mandibles and anterior margin of the face black, the inner margin of the mandibles rufo-piceous and armed with six short stout teeth, the apical tooth largest. The head oblong, slightly narrowed posteriorly and emarginate behind, longitudinally striated, the striæ diverging from the centre at the anterior ocellus; at half the distance between the posterior ocelli and the margin of the vertex the striæ are transverse. Thorax smooth and shining, with scattered fulvous hairs; the wings fusco-hyaline, with a dark fuscous stain occupying the marginal cell and traversing the course of all the nervures; the legs with the femora much incrassated, the posterior pair compressed beneath into a flattened process or keel. Abdomen ovate, smooth, shining, and with a scattered fulvous pubescence; the first node of the petiole rounded in front, narrowed and truncate behind, with a large compressed tooth beneath; the second node subglobose.

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*Worker major*. Length 4 lines. Ferruginous, entirely smooth and shining; the thorax, legs, and abdomen more or less obscure, the femora being usually rufo-piceous; the mandibles striated with their margins black. Thorax nearly flat above, very slightly convex with the sides margined, the anterior margin slightly rounded, the lateral angles produced into small acute spines; a deep strangulation at the base of the metathorax, a little before which the lateral margins are produced into an angular tooth, the metathorax with two short acute spines; the femora thickly incrassate. Abdomen ovate.

*Hab.* Aru.

2. *PODOMYRMA STRIATA*. *P. ferruginea*; capite thoraceque longitudinaliter striatis, femoribus valdè incrassatis, basi tenuissimis.

*Worker*. Length 3 lines. Rufo-ferruginous with the abdomen obscure, becoming blackish at the apex, the head coarsely striated, with a central portion from the insertion of the antennæ to the hinder margin of the vertex delicately so; the mandibles striated, with the teeth on their inner margin black. Thorax rugose-striate, the anterior lateral angles dentate, the metathorax without spines; the femora thickly incrassate and greatly attenuated at their base. Abdomen ovate, smooth and shining; the nodes of the petiole rugose.

*Hab.* Aru.

This species resembles *P. femorata*, but is easily distinguished by its striated head and thorax; the latter is similarly flattened above and margined at the sides; the femora are also thickened precisely as in that species.

3. *PODOMYRMA LÆVIFRONS*. *P. obscurè ferruginea*; capite abdomineque lævissimis lucidisque; thorace longitudinaliter striato; femoribus medio valdè incrassatis, basi tenuissimis.

*Worker*. Length 2½ lines. Head and abdomen smooth, shining black, in some examples fusco-ferruginous; the antennæ, legs, and thorax ferruginous, the latter longitudinally striated; the thorax margined at the sides, the disk slightly convex, the anterior margin slightly rounded, with the lateral angles armed with short acute spines, the thorax deeply strangulated posteriorly, the metathorax not spined; the femora thickly swollen in the middle and very slender at their base and apex. Abdomen ovate, the first node of the petiole oblong, the second globose.

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*Hab.* Aru.

There is considerable variation in intensity of colouring in examples of this species, the thorax and legs being sometimes pale ferruginous; in the specimen described they are dark; every shade of gradation occurs in different individuals.

4. *PODOMYRMA BASALIS*. *P. fusco-ferruginea*; abdominis basi pallidè testacea; femoribus medio incrassatis, basi tenuibus.

*Worker*. Length 3 lines. Obscurely ferruginous, the scape of the antennæ, the base of the femora and the tibiæ pale ferruginous; the base of the abdomen pale testaceous; the head and thorax with deep coarse longitudinal furrows; the flagellum blackish-brown towards its apex, with the extreme tip pale. Thorax: the anterior margin slightly rounded with the lateral angles very acute; the femora very thickly incrassate in the middle; the apex of the tibiæ ferruginous. Abdomen smooth and shining; the basal half pale testaceous, the apical half and the following segments black; the nodes of the petiole rugose; the first node elongate, with a short acute tooth at the base above, and a blunt one beneath.

*Hab.* Aru.

Gen. MYRMICA, *Latr.*

1. MYRMICA PARALLELA. *M. rufo-fulva*; antennis pedibusque pallidè testaceis; abdomine fusco-ferrugineo; capite thoraceque longitudinaliter striatis.

*Worker.* Length 1 line. Head and thorax ferruginous and longitudinally and evenly striated; antennæ and legs pale rufo-testaceous. Thorax margined at the sides, the disk slightly convex, the anterior margin transverse, the lateral angles acute; the metathorax with two short spines; abdomen dark fusco-ferruginous, the nodes of the petiole subrugose; club of the antennæ 3-jointed.

*Hab.* Aru.

2. MYRMICA SCABROSA. *M. nigra*; capite thoraceque scabrosis, metathorace bispinoso, abdomine ovato lævi.

*Worker.* Length 1 line. Black; the head, thorax, and nodes of the petiole roughened; the mandibles, flagellum and tarsi rufo-testaceous; the lateral angles of the prothorax acute, the sides narrowed slightly to the base of the metathorax, the spines on the latter acute; nodes of the petiole globose. Abdomen ovate, smooth and shining; club of the antennæ 3-jointed.

*Hab.* Aru.

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3. MYRMICA THORACICA. *M. capite abdomineque nigris*; antennis, mandibulis thorace pedibusque flavis.

*Worker.* Length  $\frac{3}{4}$  line. Head and abdomen jet-black; the antennæ, thorax, and legs of a clear honey-yellow; the mandibles of a more obscure yellow; the anterior margin of the thorax transverse, the lateral angles acute, narrowed from thence to the base of the mesothorax, the disk anteriorly slightly convex; the metathorax armed with two acute spines. Abdomen nearly round, and very smooth and shining; the first node of the petiole vertical anteriorly, and gradually rounded behind, the second node transverse, its anterior margin straight, the angles rounded, the sides narrowed towards the abdomen; the club of the antennæ 3-jointed.

*Hab.* Aru.

The singular form of the thorax of this species, as well as the construction of the nodes of the petiole, appear to indicate an uncharacterized division of the genus *Myrmica*.

4. MYRMICA SUSPICIOSA. *M. rufo-testacea, lævis, tota nitidissima nuda*; mandibulis, antennis, pedum articulationibus tarsisque palles-centibus; metathoracis spinis minutissimis.

*Worker.* Length 1 line. Rufo-testaceous and very smooth and shining; the antennæ as long as the insect; the flagellum, mandibles, tarsi, and articulations of the legs pale testaceous. The thorax narrowed anteriorly into a short neck, behind which it is dilated, the sides being rounded, the meso- and metathorax narrower and of nearly equal width, the spines of the metathorax minute and slender. The first node of the petiole somewhat wedge-shaped, the second globose, the abdomen very smooth and shining; club of the antennæ 3-jointed.

*Hab.* Aru.

I can detect no specific difference between this and *Myrmica lævigata*, taken by myself in the neighbourhood of London; but it is not uncommonly met with in hothouses, near to which I captured my specimen. I believe *M. lævigata* is identical with *Æcophthora pusilla*, the House-Ant of Madeira.

5. MYRMICA MELLEA. *M. capite thoraceque flavis*; abdomine pallidè fusco.

*Worker.* Length  $1\frac{1}{4}$  line. Head, antennæ, thorax, and legs honey-yellow and very smooth and shining; thorax strangulated at the base of the metathorax, which is not spined; the first node of the abdomen is oblique anteriorly, and vertical behind, the second node subglobose. Abdomen: the base honey-yellow, the apical margin of the first segment, and the following segments entirely, pale fuscous; the club of the antennæ 2-jointed.

*Hab.* Aru.

6. MYRMICA CARINATA. *M. obscurè fusco-ferruginea*; thorace rufo-fulvo; capite thoraceque carinis irregularibus; metathorace spinis duabus longis armato.

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*Worker.* Length  $1\frac{1}{4}$  lines. Head and abdomen black, with more or less of an obscure ferruginous tinge, particularly at the vertex and base of the abdomen; the thorax and nodes of the petiole ferruginous; the legs rufo-piceous, with the tarsi and articulations ferruginous, the antennæ and mandibles ferruginous; the head and thorax with irregular distant longitudinal carinæ; the sides of the thorax rugose; the spines on the metathorax long and acute; the abdomen very smooth and shining; the club of the antennæ 3-jointed.

*Hab.* Aru.

Gen. CREMATOGASTER, *Lund.*

1. *Crematogaster obscura*, *Smith, Cat. Hym. Ins., Journ. Proc. Linn. Soc. ii. 76. 4 ♂.*

*Hab.* Aru; Borneo.

2. CREMATOGASTER ELEGANS. *C. pallidè rufo-testaceus*; abdomine nigerrimo nitido; thorace bispinoso.

*Worker.* Length  $\frac{3}{4}$  line. Entirely pale rufo-testaceous, excepting the eyes and abdomen which are jet black; the nodes of the petiole pale, smooth, and shining. Head about the same width as the abdomen. The lateral angles of the anterior margin of the prothorax acute, the metathorax armed with two long acute spines. Abdomen heart-shaped, its apex acute.

*Hab.* Aru.

3. CREMATOGASTER INSULARIS. *C. niger, lævis et nitidus*; antennis tarsisque pallidè testaceis; thorace spinis duabus acutis armato.

*Worker.* Length  $1\frac{1}{4}$  line. Black, smooth and shining; the vertex, thorax and nodes of the peduncle with an obscure ferruginous tinge; the antennæ, tarsi, and articulations of the legs pale rufo-testaceous; the spines which arm the metathorax stout, elongate, and acute, with their apex pale testaceous. Abdomen heart-shaped and very acute at the apex.

*Hab.* Aru.

#### Gen. SOLENOPSIS, *Westw.*

1. SOLENOPSIS CEPHALOTES. *S. pallidè ferruginea*; capite maximè in medio sulcato, abdomine apice fusco.

*Worker major.* Length  $2\frac{1}{2}$  lines. Pale ferruginous, with the anterior part of the face darker, the mandibles incrassate and very dark fusco-ferruginous; head very large and divided by a deep longitudinal channel, emarginate behind, nearly quadrate; the eyes small and placed forwards on the sides of the head. The metathorax truncate, not spined. Abdomen ovate, truncate at the base, its apex fuscous; the first node of the petiole compressed, its margin rounded above, the second node incrassate and subglobose; club of the antennæ 2-jointed.

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*Worker minor.* Length  $1\frac{1}{2}$  line. Of the same colour as the *worker major*, but with the head of the ordinary size and slightly narrowed behind, the mandibles of the same colour as the head; the legs and antennæ longer, as well as the petiole of the abdomen; the body is very smooth and shining, the club of the antennæ 2-jointed.

*Hab.* Aru.

#### Subfam. CRYPTOCERIDÆ, *Smith.*

##### Gen. MERANOPLUS, *Smith.*

1. MERANOPLUS SPINOSUS. *M. castaneo-rufus*; abdomine nigro, thorace sexspinoso; abdomine ovato.

*Worker.* Length  $1\frac{1}{2}$  line. Head and thorax rugose; the antennæ and tarsi rufo-testaceous; the eyes rather prominent, the groove above them at the sides of the head extending backwards to the vertex. Thorax: the anterior margin curved forwards, the lateral angles produced into a bifurcate process on each side, behind the processes, slightly narrowed to the base of a long curved tooth; the posterior margin emarginate with a long sharp spine at each angle of the emargination; the node of the petiole globose. Abdomen black, smooth and shining.

*Hab.* Aru.

#### Fam. MUTILLIDÆ, *Leach.*

##### Gen. MUTILLA, *Linn.*

1. Mutilla Sibylla, *Smith, Proc. Linn. Soc. ii. 86. 11 ♀.*

*Hab.* Aru; Borneo; Celebes.

2. MUTILLA MANIFESTA. *M. capite abdomineque nigris, thorace sanguineo-rubro, maris alis nigro-fuscis.*

*Female.* Length  $4\frac{3}{4}$  lines. Head black and rugose. The thorax blood-red and coarsely rugose, its anterior margin widest and straight, the sides gradually narrowed to the apex in a slight curve; the lateral margins have two teeth not wide apart. Abdomen black, rugose, and slightly shining, with black pubescence above; on the under surface it is glittering silvery-white; the legs and sides of the thorax have a similar pubescence.

*Male.* The same size as the female, and the same colour; the eyes notched. The thorax oblong-quadrate, the posterior lateral angles acute; the tegulæ large and red; the wings dark brown, with their extreme base

hyaline. Abdomen shining black, the first and second segments strongly punctured, the rest much more finely and not very closely so.

*Hab.* Aru.

3. *MUTILLA CARINATA*. *M.* capite thoraceque metallico-purpureis viridi tinctis, pedibus ferrugineis, abdomine nigro, basi pallido fasciatâ, segmento secundo ad apicem fasciâ bilobatâ ornato.

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*Female*. Length  $4\frac{1}{4}$  lines. The head and thorax of a metallic purple tint with shades of green and copper; the scape of the antennæ, the mandibles, palpi, and legs ferruginous; the head and thorax closely and strongly punctured. The abdomen velvety black; the base truncate, the truncation smooth and shining; its margin carinate; the upper surface of the basal segment yellowish-white, a broad bilobed fascia of the same colour at the apical margin of the second segment; the apex ferruginous. *Male*. The head and thorax metallic green, strongly and closely punctured; abdomen black and shining, much more finely punctured than the thorax; wings light brown, with their base and extreme apex hyaline; the legs ferruginous.

*Hab.* Aru.

4. *MUTILLA NIGRA*. *M.* nigra et punctata, abdomine lævi et nitido, delicatulè punctato, alis fuscis, basi hyalinis.

*Male*. Length  $6\frac{1}{2}$  lines. Black; head and thorax closely and strongly punctured; the eyes slightly notched; the face with silvery-white pubescence, the mandibles shining, the palpi black. Thorax: the metathorax densely clothed with yellowish-white pubescence; the legs with glittering white hairs, the calcaria white; wings brown with their base hyaline. Abdomen smooth and shining, delicately and sparingly punctured, with a few silvery hairs at the sides.

*Hab.* Aru.

5. *MUTILLA EXILIS*. *M.* nigra et punctata; abdomine lævigato, nitido; alis subhyalinis; facie et metathorace pube argentatâ vestitis.

*Male*. Length  $6\frac{1}{2}$  lines. Black; head and thorax strongly punctured; the eyes emarginate, the face with glittering silvery-white pubescence, the cheek thinly sprinkled with silvery hairs; the palpi testaceous. Thorax: the metathorax densely clothed with silvery pubescence, beneath, at the sides, and also the legs with scattered silvery hairs, the calcaria white; the tegulæ shining; the wings subhyaline with the nervures dark fuscous. Abdomen shining black, smooth, and very delicately and sparingly punctured, the apical margins of the segments very thinly fringed with glittering silvery hairs.

*Hab.* Aru.

### Tribe FOSSORES, *Latr.*

### Fam. SCOLIADÆ, *Leach.*

### Gen. MYZINE.

1. *MYZINE TENUICORNIS*. *M.* nigra, alis hyalinis, abdomine nitido flavoque variegato.

*Male*. Length 7 lines. Black; the head and thorax very closely punctured, thinly clothed with griseous pubescence, that on the face, thorax beneath, and on the coxæ most dense and glittering; antennæ more slender than is usual in this genus, and tapering to their apex, the joints slightly subarcuate; the mandibles bidentate at their apex and with a yellow spot at their base. Thorax: the posterior margin of the prothorax, a spot beneath the wings, the tegulæ, and the postscutellum yellow; the anterior and intermediate tibiæ ferruginous and more or less dusky above, the posterior pair ferruginous beneath. Abdomen shining, the margins of the segments deeply depressed; a small ovate spot on each side of the first segment, the second and three following segments with a narrow stripe on each side in the middle, yellow; the yellow markings obscure; the apical segment coarsely rugose; beneath, the segments are closely and strongly punctured.

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*Hab.* Aru.

### Gen. SCOLIA, *Fabr.*

Division I. The anterior wings with two submarginal cells and two recurrent nervures.

1. *Scolia grossa*, *Burm. Abh. Nat. Ges. Halle*, i. p. 23. (*Tiphia grossa*, *Fabr. Syst. Piez.* p. 232. 4.)

*Hab.* Aru; Java.

The specimens of this species received from Aru are only 9 lines in length; I have examined others from Celebes, Borneo, India, and Java, showing every difference between 9 lines and 18 lines.

Division II. Anterior wings with two submarginal cells and one recurrent nervure.

2. *SCOLIA NITIDA*. *S.* nitida, aterrima; alis æneo et violaceo splendidè micantibus.

*Female.* Length 11 lines. Shining jet-black, the abdomen with prismatic tints. The flagellum fusco-ferruginous beneath, the mandibles ferruginous at their apex; the wings dark brown with a splendid lustre of coppery and golden tints mixed with shades of violet. The head with a few punctures behind the ocelli; the thorax with scattered punctures; the metathorax finely but not closely punctured; the disk of the mesothorax impunctate; the abdomen with fine scattered punctures; the apical segment opaque, rugose, and with its apical margin pale testaceous; the abdomen beneath with strong distant punctures.

*Hab.* Aru.

3. SCOLIA FULGIDIPENNIS. *S. nitida*, nigra; abdomine prismatico, alis fuscis viride et violaceo micantibus.

*Female.* Length 12-13 lines. Jet-black, shining; head very smooth, the hinder margin of the vertex finely punctured, the face with a few fine scattered punctures; the flagellum obscurely rufo-fuscous. Thorax finely punctured, the disk of the mesothorax impunctate; wings dark brown with a splendid green iridescence, with violet tints towards their base; the legs thickly spinose and pubescent; the calcaria simple. Abdomen with scattered fine punctures; the apical segment densely clothed with black pubescence; beneath, with strong scattered punctures.

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*Male.* Rather smaller than the female, much more closely punctured, and not so shining and smooth; the face with a transverse arched carina above the insertion of the antennæ, which enters the emargination of the eyes; the clypeus strongly punctured; in other respects resembling the female.

*Hab.* Aru.

This species belongs to Guérin's division Liacos, of which *S. dimidiata* is the type; the third discoidal cell is petiolated, the petiole entering the second submarginal about the middle.

4. SCOLIA INSULARIS. *S. nitida* nigra; abdomine prismatico, alis obscurè fuscis cupreo submicantibus.

*Male.* Length 7-9 lines. Shining black; head punctured, the vertex most finely and distinctly so. Thorax punctured, the disk of the mesothorax impunctate, the punctures wide apart on the scutellum and metathorax; the wings dark brown with a coppery iridescence, which has a remarkable dimness as if breathed upon. The basal segment of the abdomen strongly and closely punctured; the following segments more finely and distantly punctured, particularly the second and third segments.

*Hab.* Key Island.

5. SCOLIA QUADRICEPS. *S. nitida* nigra; fœminæ capite magno subquadrato, alis fuscis cupreo iridescentibus.

*Female.* Length 6-8 lines. Black and shining; head subquadrate, smooth and shining, as wide as the thorax, with a few punctures at the sides of the face and between the antennæ. Thorax finely punctured, with the disk of the mesothorax impunctate; wings dark brown with a rich coppery iridescence. Abdomen with a fine prismatic lustre, closely and strongly punctured towards the apex and at the extreme base, the second segment and the middle of the third with only a few very fine scattered punctures.

*Hab.* Aru.

This species also belongs to the division Liacos; the petiolated cell is small and oblong-quadrate; the male exactly resembles the female, except that its head is smaller and narrower than the thorax; the abdomen is rather more strongly punctured.

#### Gen. POMPILUS, *Fabr.*

1. POMPILUS DUBIUS. *P. niger*, pilis mutabili-sericeis tectus; alis subhyalinis, apice nebuloso.

*Female.* Length  $4\frac{1}{4}$  lines. Black and covered with a thin changeable silvery pile, which is most dense on the sides of the metathorax and base of the segments of the abdomen. The vertex emarginate behind, the eyes very large, their inner orbits emarginate, reaching high on the sides of the head nearly to the margin of the vertex; the clypeus emarginate in front, the labrum produced. Thorax: the prothorax subelongate, narrowed anteriorly; the wings subhyaline, their apex clouded; the intermediate and posterior tibiæ with a double row of spines; all the tarsi simple; the calcaria stout and elongate. Abdomen shining, with the margins of the segments slightly depressed.

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*Hab.* Aru.

#### Subgen. AGENIA, *Schiödte.*

1. Agenia blanda, *Guér. Voy. Coq. Zool.* pt. 2. ii. p. 260.

*Hab.* Celebes; India; Singapore; Malacca; Borneo; Key Island.

2. AGENIA CALLISTO. *A. nigra*, pilis sericeis vestita; facie thoraceque subtùs pube argentato-albâ densè: vestitis; alis fasciis duabus angustis.

*Female.* Length 8 lines. Black; the face, clypeus, and cheeks with a dense silvery-white pile; the tips of the

mandibles obscurely ferruginous, the palpi black. Thorax with a brilliant silvery-white pile on the sides, beneath, and on the coxæ; the metathorax transversely rugose; the wings hyaline; the anterior pair with a narrow fuscous fascia at the apex of the externo-medial cell, and a second rather broader at the base of the marginal cell, which does not quite cross the wing; the apex of the wing fuscous. Abdomen petiolated, smooth and shining, with a beautiful glossy pile, which is most dense at the sides; the apical segment longitudinally subcarinated in the middle above.

*Hab.* Aru.

3. AGENIA JUCUNDA. *A. nitida nigra*; facie metathorace abdomineque pube sericeâ vestitis; antennis, pedibus, abdominisque marginibus apicalibus ferrugineis; alis hyalinis.

*Female.* Length 5½ lines. Black; head, pro- and mesothorax, as well as the scutellum, glassy-smooth and shining; the face covered with silvery-white pile; the antennæ, tips of the mandibles, and the legs ferruginous; the palpi elongate and pale rufo-testaceous. Thorax: the wings hyaline and iridescent, the nervures very slender and pale rufo-testaceous, the stigma fuscous; the metathorax rounded behind, transversely rugose, and covered with silvery-white pile. Abdomen petiolated; the apical margins of the second and following segments ferruginous, the apical segment entirely so; the ferruginous band on each segment produced in the middle into an angular shape; on the abdomen beneath they are similarly produced; the basal segment entirely ferruginous, with a black spot on each side.

*Hab.* Aru.

4. AGENIA ALTHEA. *A. nigra*; facie pube argentato-albâ vestitâ, thorace abdomineque sericeo pubescentibus; alis hyalinis, venis nigris.

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*Female.* Length 5 lines. Black; the face silvery; the anterior margin of the clypeus rounded and narrowly smooth and shining; tips of the mandibles ferruginous; the mandibles elongate and pale rufo-testaceous. Thorax: the metathorax finely transversely rugose, the sides with bright silvery-white pubescence; the coxæ, the thorax beneath and on the sides, with fine silky sericeous pile; the anterior tibiæ and tarsi, and all the femora at their apex beneath, ferruginous; wings hyaline and iridescent, nervures black; the outer margin of the tegulæ testaceous. Abdomen shining, and with a fine silvery sericeous pile; the apical margins of the segments narrowly rufo-piceous; the terminal segment with an elongate, smooth, shining space, which extends to the apex, which is testaceous.

*Hab.* Aru.

5. AGENIA ALCYONE. *A. nigra*, pilis sericeis cinereis vestita; antennis pedibusque ferrugineis, alis hyalinis; abdomine petiolato; marginibus apicalibus segmentorum flavis.

*Male.* Length 7 lines. Black; the antennæ, tips of the mandibles, and the legs ferruginous; the scape in front, a narrow line on the inner orbit of the eyes, and the anterior portion of the clypeus yellow; the antennæ fuscous above towards their base. Thorax: the femora beneath towards their base, the trochanters and coxæ, except their apex, black; the apical joints of the intermediate and posterior tarsi fuscous; wings hyaline, the nervures fusco-ferruginous, the tegulæ reddish-yellow. Abdomen petiolated; the apical margins of the segments with reddish-yellow fasciæ; beneath, the margins of the segments are rufo-piceous, not fasciated.

*Hab.* Aru.

6. AGENIA AMALTHEA. *A. nigra*, pilis tenuibus cinereis sericeis vestita; antennis anticè pedibusque anticis et intermediis anticè ferrugineis; abdomine petiolato; alis hyalinis bifasciatis.

*Female.* Length 6 lines. Black; the face densely covered with silvery pile; the antennæ in front, the anterior margin of the clypeus and the tips of the mandibles ferruginous; palpi elongate and pale rufo-testaceous. Thorax: the posterior margin of the prothorax narrowly, the tegulæ, the anterior and intermediate femora in front, the posterior pair towards their apex beneath, the anterior tibiæ and tarsi, the intermediate and posterior tibiæ more or less beneath, and their tarsi, ferruginous; the tarsi sometimes dusky above; the wings hyaline, a narrow fuscous fascia at the apex of the externo-medial cell, and a broad one crossing at, and being the width of, the second and third submarginal cells; tips of the wings milky-white; the metathorax rounded posteriorly, transversely finely rugose and densely covered with short silvery-white pubescence at the sides and apex. Abdomen petiolated, smooth and shining, with the apex and the margins of the segments narrowly rufo-piceous.

*Hab.* Aru.

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#### Gen. PRIOCNEMIS, *Schiödte*.

1. PRIOCNEMIS PULCHERRIMUS. *P. lætè ruber*; alis flavo-hyalinis, apice latè fusco, abdominis lateribus nigris.

*Female.* Length 7½ lines. Bright red; the anterior margin of the clypeus with a minute tooth in the centre; the tips of the mandibles fuscous. The metathorax slightly striated transversely, and with a central as well as a lateral longitudinal groove; the wings flavo-hyaline, their apex with a fuscous cloud, which commences at the base of the first discoidal cell, the extreme tips pale; the tibiæ and tarsi with short slender spines; the

extreme apex of the joints of the posterior tarsi black. Abdomen: the short petiole of the basal segment, and the sides of the second, third, and fourth segments black, leaving a red line down the middle of each; beneath, the second, third, and base of the fourth segments black.

*Hab.* Aru.

2. *PRIOCNEMIS FERVIDUS*. *P.* capite, antennis, thorace pedibusque ferrugineis; abdomine nigro; alis fuscis basi subhyalinis.

*Female.* Length 9 lines. Ferruginous, with the abdomen black; the anterior margin of the clypeus rounded. The metathorax transversely rugose; the pectus, and coxæ at their base within, black; wings brown, with a violet iridescence, their base rufo-hyaline; the intermediate and posterior tibiæ with a double row of spines, all the tarsi spinose. Abdomen shining black, with the extreme apex slightly ferruginous.

*Hab.* Aru.

#### Gen. *MACROMERIS*, *St.-Farg.*

1. *MACROMERIS IRIDIPENNIS*. *M.* cæruleo-nigra; abdomine iridescente, alis cæruleo-violaceoque splendide micantibus; pedibus mutieis, simplicibus.

*Female.* Length 12 lines. Blue-black; abdomen with a changeable iridescent pile; head and thorax with a black velvety pubescence; the metathorax very finely rugose and opaque; the legs simple; the posterior tibiæ villose within; the wings very dark brown, with a splendid violet and blue iridescence.

*Male.* Very closely resembling the female, but rather smaller; the anterior and intermediate femora more incrassate, and all the femora with a simple row of teeth or serrations on their inferior margins.

*Hab.* Aru.

Although this species of *Macromeris* is very similar in colour to the *M. violacea* of St.-Fargeau, the femora are not so thick as in that species, not in fact much more so than in the female; and the row of teeth beneath is a strong specific character.

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#### Gen. *SALIUS*, *Fabr.*

1. *SALIUS MALIGNUS*. *S.* niger, pube cinereâ sericeâ vestitus; alis fuscis, albo fasciatis.

*Female.* Length 9 lines. Black, and covered with a fine thin ashy pile; the scape in front, and the anterior margin of the clypeus narrowly, obscure yellow; the mandibles ferruginous at their apex, which has a single notch; the palpi pale rufo-testaceous. Thorax: the prothorax with a slightly interrupted narrow fascia a little before its posterior margin, and the scutellum, yellow; the anterior femora broadly dilated, and, as well as the anterior tibiæ, ferruginous within; the intermediate tibiæ ferruginous at their apex in front, and the posterior pair with a yellowish-white spot at their base outside; the calcaria pale testaceous, the claws ferruginous, the anterior tarsi entirely so, but more or less obscure; the posterior tibiæ slightly spinose; the anterior wings brown, with a white fascia crossing at the first discoidal cell, and a second at the apex of the third submarginal, the extreme base and the anterior margin of the externo-medial cell hyaline. Abdomen: the apical margins of the segments with a little bright silvery pile.

*Hab.* Aru.

#### Gen. *MYGNIMIA*, *Smith.*

1. *MYGNIMIA ASPASIA*. *M.* cæruleo-nigra; capite thoraceque pube holosericeâ vestitis; alis fulvo-hyalinis; abdomine pilis iridescentibus vestito.

*Female.* Length 14 lines. Black, with shades of blue in certain lights; the abdomen with bright tints of blue and violet, caused by fine iridescent changeable pile; the legs have a similar pile, very bright on the femora within; the head and thorax with a short black velvety pubescence; the wings flavo-hyaline; the nervures pale ferruginous; the extreme base of the wings blackish, their apical margins with a narrow fuscous border. The legs spinose; the posterior tibiæ with a double row of strong serrations.

#### Gen. *SPHEX*, *Fabr.*

1. *SPHEX ARGENTATA*, *Dahlb. Hym. Eur. i. 25. 1.*

*Hab.* Aru; Celebes; Sumatra; India; Greece; Africa; East Florida.

2. *SPHEX SERICEA*, *Fabr. Syst. Piez. 211. 19.*

*Hab.* Aru; Malacca; Borneo; Java; Philippine Islands.

3. *SPHEX AURIFRONS*. *S.* niger; facie pube aureâ vestitâ, alis flavo-hyalinis apice fuscis, abdomine pilis sericeo-



aureis vestito.

*Female.* Black; the face densely clothed with golden pubescence, the head having a number of scattered long golden-yellow hairs. Thorax thinly covered with long yellow pubescence, which is most dense at the sides of the metathorax; the tibiæ, tarsi, and posterior femora ferruginous; the claw-joint of the tarsi black; the tibiæ and tarsi with black spines; the wings fulvo-hyaline, their apex with a narrow fuscous border, the nervures ferruginous. Abdomen covered with a fine, thin, golden-reflecting pile; the apical margins of the segments rufo-testaceous, the testaceous margin produced in the middle into a triangular shape, most conspicuously so on the segments beneath.

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*Hab.* Aru.

4. SPHEX NITIDIVENTRIS. *S. niger*; abdomine nigro-cæruleo, lævigato, nitido; alis fuscis.

*Female.* Length 12 lines. Black; the face with silvery pubescence, and thinly covered with long black hairs; the clypeus with a central longitudinal carina at the base, which terminates at the middle, from whence to the anterior margin is a broad, smooth, shining space. Thorax shining and finely punctured; the metathorax opaque and covered with long, loose, black pubescence; the legs shining, the posterior tibiæ with shining grey pile within; wings brown, darkest at their base. Abdomen blue, and very smooth and shining, oblong-ovate; the apical segment vertical.

*Hab.* Aru.

5. SPHEX SEPICOLA. *S. niger*; facie pube aureâ vestitâ; alis subhyalinis apice fuscis; abdomine nitido.

*Female.* Length 9 lines. Black; the face densely clothed with golden pubescence, the cheeks with iridescent pile, with a long, loose, scattered pale yellow pubescence on the head and thorax; the mandibles smooth, shining black. The disk of the thorax with an obscure chalybeous tint, shining and finely punctured; the metathorax opaque and finely rugose; the wings subhyaline, their apical margins fuscous, the nervures fusco-ferruginous. Abdomen with a slender subelongate petiole, and with a thin, silky, grey pile; the apical margins of the segments narrowly and obscurely rufo-piceous.

*Male.* Rather smaller than the female, more slender and more pubescent, the pubescence on the face paler.

*Hab.* Aru.

6. SPHEX GRATIOSA. *S. capite thoraceque nigris, abdomine cæruleo, alis fusco-hyalinis.*

*Male.* Length 10 lines. Head and thorax black; the face densely clothed with pale golden pubescence; the labrum and mandibles highly polished, very smooth and shining; a thin pale pubescence is scattered over the head, pro- and mesothorax, the latter obscurely chalybeous above, shining, and finely and closely punctured, with an abbreviated, deeply impressed line in the middle anteriorly; the posterior margin of the prothorax covered with shining silvery pubescence; the metathorax opaque, and clothed with black pubescence; wings fusco-hyaline, the anterior pair darkest towards their base, the nervures dark fusco-ferruginous, nearly black. Abdomen smooth, shining dark blue; beneath, the margins of the segments have a bright, glittering, pale-golden pile.

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#### Gen. PELOPÆUS, *Latr.*

1. PELOPÆUS LABORIOSUS. *P. niger*; scapo anticè, pedibus petioloque rufescenti-flavis, alis hyalinis fulvo tinctis.

*Female.* Length 12 lines. Black, with black pubescence on the head and thorax; the face with a fine cinereous pile; the scape yellow in front; the mandibles smooth and shining. Thorax: the legs pale ferruginous, the posterior femora darkest; the coxæ, the anterior and intermediate trochanters, and base of the femora black; wings fulvo-hyaline, the nervures ferruginous; the metathorax obliquely striated. Abdomen slightly shining at the base, with the petiole reddish-yellow.

*Hab.* Aru.

#### Gen. LARRADA, *Smith.*

1. LARRADA MODESTA. *L. nigra*; abdomine pilis argentatis fasciato; alis hyalinis.

*Female.* Length 6½ lines. Black; the face covered with silvery down; the mandibles smooth, shining, black, and fringed beneath with fulvous hairs, the cheeks silvery. Thorax slightly shining, closely and delicately punctured; the metathorax opaque and transversely striated; wings subhyaline, with a fuscous border at their apex, the nervures black. Abdomen slightly shining; the apical margins of the first, second, and third segments with fascia of silvery pile, which is very brilliant in certain lights.

*Male* closely resembles the female, but has an additional fascia on the abdomen.

*Hab.* Aru.

#### Gen. LARRA, *Fabr.*

1. LARRA SIMILLIMA. *L. nigra*, pulchre prismatica, maculis fasciisque variis flavis ornata.

*Female*. Length 6½ lines. Black; the abdomen with tints of blue violet; the thorax slightly prismatic; the labrum, clypeus, an angular scape above, an abbreviated line on the inner orbits of the eyes, the scape in front, and the antennæ beneath, yellow; the cheeks with a silvery reflexion. The thorax beneath, and the metathorax, with a shining white silvery pile; the anterior and intermediate femora and tibiæ beneath yellow; the tarsi pale ferruginous, and more or less fuscous above; wings subhyaline, the nervures fuscous; a spot on the lateral posterior angles of the metathorax, two ovate spots on the scutellum, and a line on the postscutellum yellow. Abdomen: the basal segment with a broadly interrupted fascia a little before its apical margin; the second and fourth segments with a narrow yellow fascia at their apical margins, which is widened laterally; beneath, the second and third segments with a yellow spot on each side.

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The *Male* differs from the female in having a large quadrate black spot on the clypeus, and a spot at the base of the labrum; there is also a narrow yellow line on the posterior margin of the prothorax; and the third segment of the abdomen has a yellow fascia: it is also rather smaller.

*Hab.* Aru.

This insect very closely resembles *Larra prismatica*, from Borneo, Malacca, and Celebes, of which it may be a variety.

#### Gen. BEMBEX, *Fabr.*

1. *Bembex melancholieca*, *Smith, Cat. Hym.* pt. iv. p. 328; *Proc. Linn. Soc.* ii. p. 105.

*Hab.* Aru; Sumatra; Borneo.

Many of the specimens from Aru are less highly coloured than those of Sumatra or Borneo: the yellow markings on the abdomen are frequently much obliterated in the females; others are as highly coloured as any examples I have seen.

#### Gen. PISON, *Spin.*

1. *PISON NITIDUS*. *P. nitidus*, niger, distinctè punctatus; alis subhyalinis, venis fuscis; segmentis abdominalibus apice depressis.

*Female*. Length 5 lines. Black and shining; the head and thorax strongly punctured; the face beneath, the antennæ, the clypeus, cheeks, and the sides of the segments of the abdomen covered with a silvery down; the palpi pale testaceous; the mandibles obscurely ferruginous at their apex. The metathorax transversely striated behind, with a central longitudinal impressed line above, which is transversely striated, and terminates in a deep fovea just beyond the verge of the posterior inclined truncation; the wings subhyaline; the nervures dark fuscous; the first recurrent nervure received at the apex of the first submarginal cell, and the second at the base of the third submarginal. Abdomen shining, and more delicately punctured than the thorax; the margins of the segments deeply depressed.

*Hab.* Aru, Key Island.

#### Gen. GORYTES, *Latr.*

1. *GORYTES CONSTRICTUS*. *G. niger*; clypei lateribus flavis; collari, tuberculis postscutelloque flavis; segmentorum abdominis marginibus apicalibus flavis constrictis, pedibusque flavo variegatis.

*Female*. Length 6 lines. Black; the head and thorax very closely punctured and opaque, the head slightly shining on the vertex; the antennæ beneath and the apical half of the mandibles ferruginous, the latter black at their tips; the clypeus yellow at the sides, and coarsely rugose in front. Thorax: the metathorax coarsely longitudinally rugose, with cinereous pubescence at the sides; the antennæ and intermediate tibiæ, the tarsi, and articulations of the legs reddish-yellow; wings subhyaline, with a fuscous cloud in the marginal cell, which passes beyond to the apex of the wings; the nervures fusco-ferruginous; the tegulæ ferruginous. Abdomen shining, covered with a thin, fine, cinereous pile, and with the margins of the segments constricted; the apical margins of the segments with narrow yellow fasciæ, that on the fourth abbreviated on each side, on the fifth it is obsolete; beneath, the second segment is opaque, finely punctured, and pilose; the following segments smooth, shining, and with five scattered punctures.

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The *Male* strongly resembles the female, but is smaller and less variegated with yellow; the face covered with silvery down; the scape and base of the flagellum ferruginous beneath; the clypeus yellow, except its extreme base. The thorax black, with the legs rufo-piceous; the tibiæ and tarsi pale ferruginous, variegated with yellow; the sides of the thorax beneath the wings longitudinally striated in both sexes, most conspicuously so in the male. The abdomen with three narrow interrupted fasciæ.

*Hab.* Aru.

2. *GORYTES VAGUS*. *G. niger*; clypeo maculis duabus flavis notato; postscutello et segmentis primo et secundo fasciâ apicali flavis, fasciâ in segmento primo subinterrupto.

*Female.* Length 6 lines. Black; the head finely punctured and shining; the anterior margin of the clypeus emarginate in the middle, and more deeply so on each side; on each side of the clypeus, at its base, is an oblique yellow spot, and anteriorly it is roughly punctured; the mandibles roughened at their base, their apical half smooth, shining, and ferruginous, with their apex black. Thorax subopaque, very closely punctured, and slightly shining; the metathorax coarsely longitudinally rugose-striate; the postscutellum yellow; wings subhyaline and iridescent, the nervures fusco-ferruginous; a dark fuscous cloud occupies the marginal cell. Abdomen smooth and shining, with a slightly interrupted fascia a little before the apical margin of the basal segment; the second segment has a fascia at its apical margin; both are yellowish white; the first is gradually widened towards the sides of the segment, the second abruptly widened, with the angle of the widened portion pointed inwards; beneath the abdomen is glossy, with the basal segment closely punctured and subopaque; the margins of abdominal segments slightly constricted.

*Hab.* Key Island.

Gen. TRYPOXYLON, *Latr.*

1. TRYPOXYLON EXIMIUM. *T. nigrum*; clypeo argentato-pubescente; abdominis segmentis secundo tertio quartoque basi rubris; alis hyalinis.

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*Female.* Length 8½ lines. Black, smooth, and shining; the head and thorax very delicately punctured; the face and clypeus below the insertion of the antennæ densely covered with silvery-white pubescence; the anterior margin of the clypeus rounded and much produced, with a slight curving upwards at its margin; the mandibles yellow, with their apex ferruginous; the palpi pale testaceous; the inner orbits of the eyes very deeply notched. Thorax: the metathorax, the sides, and beneath with a thin silvery-white pubescence, most dense on the former; the metathorax not distinctly enclosed at its base, but with two shallow impressed lines, which mark the form of the usual enclosed space; a central longitudinal channel extends from its base to the apex, slightly subinterrupted in the middle; the wings hyaline and iridescent, the nervures dark fuscous; the anterior and intermediate tibiæ in front, their tarsi, the apical joints of the posterior pair, and the base of the tibiæ very pale ferruginous; the claw-joint of the intermediate and posterior tarsi fuscous above; the calcaria pale testaceous. Abdomen, the second, third, and base of the fourth segment more or less ferruginous; the apex of the basal petiolated joint ferruginous beneath.

*Hab.* Aru and Key Island.

Gen. CRABRO, *Fabr.*

1. CRABRO SOLITARIUS. *C. niger*; abdomine petiolato; scapo flagellique articulo ultimo, collari, tuberculis, postscutelli maculis duabus flavis; pedibus petioloque basi ferrugineis.

*Female.* Length 5 lines. Black and opaque; the head large, quadrate, and wider than the thorax; the ocelli in a curve on the vertex; the clypeus covered with silvery pubescence, carinated in the middle, and slightly produced; the scape and basal joint of the flagellum pale yellow. Thorax: an interrupted line on the collar, the tubercles, a spot beneath the wings, and two minute ones on the postscutellum yellow; the disk of the thorax longitudinally delicately rugose; the metathorax obliquely striated, with an enclosed space at its base, and having a central longitudinal channel, the side covered with thin silvery pubescence; the wings hyaline and iridescent, the nervures fuscous; the legs ferruginous, variegated with yellow. Abdomen: the basal petiolated segment ferruginous, with its apical half black above; the apical segment with an angular shape at its base, which is smooth and shining, with its lateral margins carinate, the extreme apex ferruginous; beneath smooth and shining, with the apical margins rufo-piceous.

*Hab.* Aru.

This species would, according to the views of some Hymenopterists, belong to the genus *Rhopalum* of Kirby.

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Group SOLITARY WASPS.

Fam. EUMENIDÆ, *Westw.*

Gen. EUMENES, *Latr.*

1. Eumenes arcuata, *Fabr. Syst. Piez.* 287. 11.

*Hab.* Key Island; coast of New Guinea (Triton Bay); Australia.

Gen. PACHYMENES, *Sauss.*

1. PACHYMENES VIRIDIS. *P. lætè viridis*; facie pube argentato-albâ tectâ; alis hyalinis.

*Female.* Length 8 lines. Bright green; the head, thorax, and basal segment of the abdomen rugose, the rest of the abdomen finely and very closely punctured; the clypeus thinly covered with a fine silvery-white

pubescence, its apex produced and truncate. Thorax: the metathorax rounded behind, a deep longitudinal impressed line in the middle, and with fine silvery down at the sides and behind; the wings subhyaline, with a fuscous stain along the anterior margin of the superior pair; the legs rufo-piceous; the coxæ, femora, and tibiæ more or less tinged with green.

*Hab.* Aru.

Gen. RHYNCHIUM, *Spin.*

1. *Rhynchium mirabile*, *Sauss. Mon. Guêpes Sol.* 106. 6, t. 14. f. 5 ♀.

*Hab.* Aru; Tasmania.

The *Male* of this fine species closely resembles the female; it is black, with a transverse spot above the insertion of the antennæ, an abbreviated narrow line behind the eyes, another on the lower margin of their emargination; the scape in front and the clypeus yellow, the latter notched at its apex; a minute yellow spot at the base of the mandibles; the antennæ, tibiæ, apex of the femora, and the tarsi ferruginous; the basal joint of the intermediate and posterior tarsi dusky; the intermediate femora deeply excavated or hollowed beneath; the prothorax yellow above; the metathorax truncate, transversely striated with several minute teeth on the lateral margins; the wings hyaline, tinted with yellow, their apical margins slightly clouded; the apical margins of all the segments of the abdomen bordered with yellow, that on the first segment narrowest. The only particulars in which the female apparently differs from Saussure's description, is that the second fascia on the abdomen is *widest at the sides*, and there are *three little teeth* on each side of the margins of the metathorax.

The *Female* is also in the Paris Museum.

2. *Rhynchium superbum*, *Sauss. Mon. Guêpes Sol.* p. 113. 18.

*Hab.* Aru: New Holland.

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Our example of this species slightly differs in coloration from the description of Saussure. He says, "black, with the vertex, the front, the prothorax, and the border of all the segments of the abdomen, except the first, yellow; the wings yellow;" in the Aru specimen, the sinus of the eyes, a spot above the clypeus, a reversed crescent-shaped spot crossing the ocelli, two oblique spots behind them, and a broad elongate stripe behind the eyes yellow. These slight differences cannot characterize more than a variety; in every other particular they exactly correspond.

Gen. ODYNERUS, *Latr.*

1. ODYNERUS PETIOLATUS. *O. niger*; clypeo apiculato; capite, thorace abdomineque flavo variis; abdomine petiolato; alis subhyalinis.

*Female.* Length  $7\frac{1}{2}$  lines. Black; head and thorax strongly punctured; two confluent spots between the antennæ, a line on the inner orbits of the eyes, terminating in their emargination, an oblong spot behind them, a spot at the base of the mandibles, the scape in front, and the clypeus yellow; the latter with a large black spot in the middle, and with its anterior margin prolonged into an acute point; the mandibles ferruginous, with their base and margins black; the flagellum fulvous beneath. Thorax: an interrupted line on the collar, a spot beneath the wings, the outer margin of the tegulæ, two spots on the scutellum, two longitudinal curved lines on the metathorax, extending from the base to the apex, yellow; the yellow lines on the metathorax curving inwards. The tibiæ, tarsi, and apex of the femora ferruginous; the intermediate and posterior tibiæ with a fuscous line outside, a spot on the coxæ outside, a stripe at the apex of the anterior femora beneath, another on the intermediate pair, and a line on the anterior tibiæ, behind, yellow; wings subhyaline, their margins fuscous. Abdomen petiolated; a fascia on the apical margins of all the segments, and the petiole, yellow; the third and following fasciæ narrowest; all the fasciæ continued beneath the abdomen.

*Hab.* Aru.

2. ODYNERUS AGILIS. *O. niger*; capite thoraceque distinctè, abdomine delicatulè punctatis; pedibus ferrugineis; abdominis segmentis duobus basalibus flavo fasciatis; alis subhyalinis.

*Male.* Length 6 lines. Black; the scape in front, a line on the inner margin of the eyes, terminating in their emargination, an abbreviated line behind them, and the clypeus yellow; the latter deeply emarginate, forming two teeth. Thorax: a line in the middle of the anterior margin of the prothorax, two spots on the verge of the emargination of the metathorax, and a fascia on the apical margins of the first and second segments of the abdomen yellow; the legs ferruginous; the wings subhyaline, the anterior margin of the superior pair fuscous; the outer margin of the tegulæ yellowish.

*Hab.* Aru.

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3. ODYNERUS MULTIPICTUS. *O. niger*, flavo maculatus et punctatus; pedibus flavis, alis hyalinis.

*Female.* Length 4 lines. Black; the head and thorax strongly punctured, the abdomen finely and distantly so;

the clypeus, a spot above it, the inner and outer orbits of the eyes, and the scape in front yellow; the clypeus deeply emarginate in front; the mandibles ferruginous, with a yellow spot at their base. Thorax: the prothorax in front, the tegulæ and two spots beneath the wings, the scutellum, and sides of the metathorax yellow; the legs yellow, with ferruginous stains; the femora with a black or dark stain above; wings hyaline, with a fuscous stain along the anterior border of the superior pair. Abdomen: a yellow fascia on the apical margins of the two basal segments; the three following segments with very narrow yellow borders, and the apical segment entirely reddish-yellow.

*Hab.* Aru.

4. ODYNERUS MODESTUS. *O. niger*; abdominis segmentis duobus basalibus flavo fasciatis; tibiis tarsisque femigineis; alis hyalinis; abdominis segmento primo basi transversim bicarinato.

*Female.* Length 4 lines. Black; head and thorax coarsely punctured; the vertex swollen; the scape of the antennæ, a spot between them, and the clypeus yellow; the latter with a transverse black spot in the middle, deeply notched in front, and having a carina on each side, in a line with the angle or tooth of the emargination; the flagellum ferruginous towards the apex beneath; wings hyaline, with a fuscous cloud in the marginal cell; the tibiæ and tarsi ferruginous. Abdomen: the base truncate, with an oblique space above the truncation, the margin of both defined by an elevated ridge or carina; a narrow fascia on the apical margin of the basal segment, and a broader one on the second; the latter continued beneath the abdomen.

*Hab.* Aru.

This species is undoubtedly allied to *O. Sichellii* of Saussure; but, beside differing in the colour of its legs, and of the bands of the abdomen, it wants the strong tubercle at the base of the second segment of the latter.

### Gen. ALASTOR, *St.-Farg.*

1. ALASTOR UNIFASCIATUS. *A. niger*; maculâ inter antennis, abdominisque margine apicali et segmento secundo flavis; alis fuscis.

*Female.* Length 6½ lines. Black; the head and thorax strongly punctured; the face, sides of the clypeus, cheeks, and base of the mandibles with a fine silky silvery-white pubescence; the clypeus convex, its anterior margin emarginate; from each angle of the emargination a shining carina runs more than halfway up the clypeus; a minute spot between the antennæ, and two on the anterior margin of the prothorax, yellow; the wings fuscous, palest at their posterior margins. Abdomen finely and closely punctured; the third segment strongly so; a broad yellow fascia on the apical margin of the second segment.

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*Hab.* Aru.

2. ALASTOR APICATUS. *A. niger*; abdominis segmentis primo et secundo aurantiaco-rubris; alis fuscis.

*Male.* Length 5½ lines. Black; the head and thorax strongly punctured; a spot between the antennæ, the scape in front, and the clypeus yellow; the latter with a large black spot at its base, anteriorly deeply emarginate; wings fuscous; the tegulæ with a rufo-testaceous spot at their outer margins; the tarsi and articulations of the legs ferruginous. Abdomen bright orange-red, with the third and following segments black; the base rugose, the second segment finely punctured, the rest much more strongly so.

*Hab.* Aru.

## Group SOCIAL WASPS.

### Fam. VESPIDÆ, *Steph.*

1. ISCHNOGASTER IRIDIPENNIS. *I. rufescenti-fuscus flavo varius*; vertice et metathorace nigris, alis subhyalinis et pulcherrimè iridescentibus.

*Male.* Length 7¼ lines. Head yellow, above the insertion of the antennæ black; antennæ black, with the scape, basal joint of the antennæ, and the mandibles ferruginous; the flagellum obscurely ferruginous beneath; the clypeus produced at the apex into an acute tooth. Thorax pale ferruginous; the metathorax black, with a ferruginous spot on each side in front; the scutellum with a reddish-brown spot in the middle, the postscutellum yellow and subinterrupted in the middle; the sides of the thorax yellow anteriorly, the yellow portion with two black spots; the legs slightly variegated with yellow; wings subhyaline and brilliantly iridescent, the marginal cell with a fuscous cloud. Abdomen brown; the petiole pale testaceous at its apex and ferruginous beneath, longer than the head and thorax; the second segment has a yellow macula on each side, and, beneath, a smaller spot on each side in a line with the side spots; the first segment has its basal portion yellow beneath, and a blackish spot in the centre rather behind the middle.

*Hab.* Aru.

This species in many particulars agrees with the *I. nitidipennis* of Saussure, but differs in too many, I think,

to be considered the same species; the second recurrent nervure is straight at the upper extremity, then curved towards the margin of the wing, and again straight at its lower extremity; the third submarginal cell is much wider than the fourth.

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Gen. ICARIA, *Sauss.*

1. *Icaria maculiventris*, *Sauss. Mon. Guêpes Soc.* p. 23. 1.—*Rhopalidia maculiventris*, *Guér. Voy. Coq. Zool.* ii. pt. 2. *Ins.* p. 267, pl. 9. fig. 8.

*Hab.* Aru; New Guinea.

2. ICARIA NIGRA. *I. nigra*; clypeo anticè angulato; metathorace concavo et transversim striato; alis hyalinis.

*Female.* Length 6 lines. Black, punctured and opaque; the clypeus terminating in a sharp-pointed angle; the base and apex of the mandibles rufo-piceous; the scape ferruginous in front; the face with a thin, fine, griseous pubescence. Thorax slightly margined in front; an obscure testaceous spot on each side of the postscutellum, the metathorax concave and transversely striated; wings hyaline. Abdomen with a short petiole to the basal segment, which is very short and campanulate; at its posterior margin are two minute, obscure, pale spots; beneath, the margins of the apical segments are rufo-piceous.

*Hab.* Aru.

3. ICARIA FASCIATA. *I. nigra*; clypei margine antico, maculis duabus postscutelli flavis; segmentis abdominis ad apicem flavo angustè fasciatis.

*Female.* Length 5 lines. Black; the clypeus angular in front, its anterior margin and a spot on the mandibles yellow; the antennæ rufo-testaceous beneath. Thorax: the anterior margin of the prothorax slightly rebordered; the anterior coxæ with a spot in front and two spots on the postscutellum yellow; the anterior and intermediate tibiæ beneath, the tarsi beneath and the claw-joint entirely, ferruginous; wings hyaline with a fuscous stain along the anterior margin of the superior pair; the metathorax oblique and slightly concave, with an acute stout tooth on each side. Abdomen: the basal segment campanulate, the petiole short; a narrow yellow fascia on the apical margin of all the segments.

*Hab.* Aru.

4. ICARIA BRUNNEA. *I. rufescenti-fusca*; coxis femoribusque obscuris; alis hyalinis.

*Female.* Length 3½ lines. Reddish-brown; head and thorax punctured, the abdomen finely rugose; the clypeus and mandibles pale ferruginous, the former with a darker spot in the middle, the anterior margin angular. The anterior margin of the prothorax slightly rebordered; the wings hyaline and iridescent, with a fuscous stain along the anterior margin of the superior pair; the metathorax abruptly truncate. Abdomen: the basal margin of the third and following segments black.

*Hab.* Aru.

5. ICARIA GRACILIS. *I. nigra* flavo variegata; abdominis segmento basali elongato, gracili et petiolato; alis hyalinis.

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*Female.* Length 7 lines. Black; the scape in front, the sides and apical margin of the clypeus, and a spot at the base of the mandibles yellow; the cheeks reddish-yellow; the antennæ ferruginous; the head covered with short griseous pubescence. Thorax with obscure ferruginous tints and a short griseous pubescence, most dense on the sides and beneath; the anterior margin of the prothorax, the tegulæ, scutellum and postscutellum, a broad stripe on each side of the metathorax, the coxæ, and the anterior and intermediate femora, at their apex beneath, yellow; the scutellum with a ferruginous stain in the middle, the postscutellum with a black stain, the coxæ ferruginous above, the tibiæ and tarsi ferruginous beneath; wings hyaline, with a fuscous stain along the anterior margin of the superior pair. Abdomen: a yellow fascia on the apical margin of the first and second segments; that on the following segments rufo-testaceous.

*Hab.* Aru.

6. ICARIA UNICOLOR. *I. rufescenti-fusca*, tenuiter cinereo-pubescentis.

*Female.* Length 5 lines. Reddish-brown, covered with a thin cinereous pubescence; the clypeus acutely angular anteriorly; the metathorax oblique and delicately striated transversely; wings fusco-hyaline; the petiole of the abdomen long, the segment campanulated and narrow.

*Hab.* Key Island.

Gen. POLISTES, *Latr.*

1. *Polistes tepidus*, *Fabr. Syst. Piez.* p. 271. 7.

*Hab.* Aru; Key Island; Solomon Islands; New Guinea; Australia.

2. *Polistes diabolicus*, *Sauss. Mon. Guêpes Soc.* 68. 26, t. 6. f. 7.

*Hab.* Aru; Java; Timor.

3. *Polistes stigma*, *Fabr. Syst. Piez.* p. 261. 41.

*Hab.* Aru; Celebes; Ceram; India.

*Var.* The specimens from Aru differ from the typical ones in wanting the two longitudinal yellow lines on the metathorax, which is entirely black. Saussure has a variety with the metathorax black between the lines; of two examples from Celebes, one has the yellow lines entire, the other has them abbreviated at half their length.

4. *POLISTES NIGRIFRONS*. *P.* capite thoraceque nigris, flavo et ferrugineo variegatis; abdomine ferrugineo, segmentis basi nigris, marginibus apicalibus flavis.

*Female.* Length 8 lines. Head and thorax black; the anterior margin of the clypeus angular and narrowly rufo-testaceous; the mandibles, palpi, and antennæ ferruginous; the scape, and flagellum above, except the basal joint, fuscous; the outer orbits of the eyes with a narrow yellow line. The anterior margin of the prothorax slightly rebordered, the posterior margin ferruginous; the outer margin of the tegulæ reddish-yellow; wings subhyaline with a fusco-ferruginous stain along the anterior margins of the superior pair; the metathorax finely striated transversely, and with two yellow stripes running upwards halfway from the base, the posterior margin of the pectus, tips of the coxæ, the femora at their base and apex, the tibiæ and tarsi beneath, ferruginous; tips of the femora, and tibiæ above, yellowish. Abdomen ferruginous, with the base of the second and following segments black; the first and three following segments with a yellow fascia on their apical margins; beneath, the two basal segments entirely ferruginous.

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*Hab.* Aru.

This species is closely allied to the *P. fastidiosus* of Saussure, and, notwithstanding the difference in colouring, may possibly, I think, be an extreme variety of that species.

5. *POLISTES ELEGANS*. *P.* ferrugineus; capite thoraceque flavo variis; segmentis abdominis flavo marginatis.

*Female.* Length 8 lines. Ferruginous; the clypeus, mandibles, cheeks, and the face, as high as the middle of the emargination of the eyes, yellow. Thorax: the margins of the prothorax, two longitudinal stripes on the mesothorax, the scutellum, postscutellum, and sides of the metathorax broadly, yellow; the legs beneath, the coxæ and the sides of the thorax spotted with yellow; the intermediate and posterior coxæ spotted with ferruginous or fusco-ferruginous; the metathorax finely striated transversely; the wings hyaline with the nervures ferruginous. Abdomen: the first and three following segments with yellow marginal fasciæ, that on the fourth usually more or less obliterated.

*Hab.* Aru; Key Island.

## Fam. EVANIDÆ, *Leach.*

### Gen. FÆNUS, *Fabr.*

1. *FÆNUS GRACILIS*. *F.* niger, facie lateribusque thoracis argenteo pilosis; pedibus anticis et intermediis pallidè rufo-testaceis, tibiis posticis basi tarsisque albis; abdomine subtùs rufo-testaceo.

*Female.* Length 6 lines. Black; subopaque; the face, sides of the thorax and beneath with silvery pubescence; the mandibles, palpi, and scape in front rufo-testaceous. Thorax: the anterior and intermediate legs rufo-testaceous, the femora having a darker stain above; the posterior legs black, with the base of the tibiæ and the tarsi white. Abdomen rufo-testaceous beneath; the ovipositor white at its apex.

*Hab.* Aru.

### Gen. STENOPHASMUS.

Head globose; antennæ longer than the body, and very slender and setaceous; the prothorax forming a slender neck; the anterior wings with one marginal and three submarginal cells; the femora slightly incrassate, not denticulate; the tarsi 5-jointed. Abdomen petiolated, the petiole as long as the abdomen; the ovipositor as long as the petiole and abdomen united.

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This genus is founded on the examination of a single individual, which in general appearance exactly resembles the smaller species of the genus *Megischus*; on examination, however, it will be found that it differs from that genus in theuration of the anterior wings; its femora are not denticulate, in which character it differs from both *Megischus* and *Stephanus*; with the latter genus it agrees in having 5-jointed tarsi.

1. *STENOPHASMUS RUFICEPS*. *S.* niger; capite et antennarum basi rufis; ovipositore tarsisque pallidè testaceis; petiolo abdominis cylindrico; alis subhyalinis.

*Female.* Length 5 lines. Black, slightly shining; head globose, red and sprinkled with white hairs, and

delicately striated transversely. Thorax sprinkled with white pubescence above, the sides more thickly clothed with the same; above, the thorax is transversely rugose, on the metathorax becoming more regularly striate; the metathorax has a central longitudinal carina and also one on each side; the legs sprinkled with erect white hairs; the tarsi pale rufo-testaceous with the claw-joint black; wings subhyaline, with a broad light-fuscous stain along the centre of the anterior pair; a hyaline streak crosses them at the base of the stigma. Abdomen: the petiole as long as the thorax, narrowest at the base of the abdomen; it is rugose at the base; the ovipositor pale testaceous.

*Hab.* Aru.

## Fam. ICHNEUMONIDÆ, *Leach.*

### Gen. ICHNEUMON.

1. ICHNEUMON INSULARIS. *I. niger*; capite thoraceque albo variegatis; abdominis segmentorum primo, secundo tertioque albo maculatis.

Length  $7\frac{1}{2}$  lines. Black; the orbits of the eyes, the face before the antennæ, the mandibles and palpi yellowish-white; the flagellum with the joints from the 14th to 25th white. Thorax: a line on each side before the tegulæ, a spot beneath the wings, two at the sides of the pectus, the anterior coxæ in front, and a narrow line on each side of the scutellum yellowish-white; the anterior and intermediate legs and a spot beneath the posterior tibiæ rufo-testaceous; the wings hyaline, the nervures black. Abdomen: a minute spot at the lateral apical margins of the three basal segments, and a large central one on the two apical segments, white.

*Hab.* Key Island.

### Gen. CRYPTUS, *Fabr.*

1. CRYPTUS SCUTELLATUS. *C. ferrugineus*; tibiis posticis tarsisque albo annulatis; scutello tuberculato.

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*Female.* Length 5 lines. Ferruginous; the face testaceous-yellow, an elongate black spot on the vertex enclosing the ocelli and extending to the insertion of the antennæ; the latter black, with the scape ferruginous in front. Thorax: the scutellum elevated, forming a compressed tubercle, its side view wedge-shaped; the wings hyaline the nervures black, the base of the wings yellowish; the apical joints of the intermediate tarsi, the tips of the posterior femora, the extreme base of the tibiæ, their apical half, and the tarsi black; the intermediate portion of the tibiæ yellow; the apical segment of the abdomen black.

*Hab.* Aru.

### Gen. MESOSTENUS, *Grav.*

1. MESOSTENUS PICTUS. *M. niger*; capite thoraceque flavo striatis et punctatis; pedibus flavis nigro et ferrugineo lavatis; segmentis abdominalibus flavo marginatis; alis hyalinis.

*Female.* Length 8 lines. Black; a large ovate spot on the cheeks touching the mandibles, the labrum, palpi, inner orbits of the eyes, and from the 7th to the 10th joints of the antennæ yellowish-white. Thorax: an ovate spot in the middle of the disk of the mesothorax, the tegulæ, a spot beneath them, two larger spots beneath the wings, the scutellum, a spot on the postscutellum uniting with another at the base of the metathorax, a trilobed spot at its apex, and a subovate one on each side yellowish-white; the coxæ white with black stains on the intermediate and posterior pairs; the femora white beneath, the anterior and intermediate pairs with a black line above, the posterior pair ferruginous above; the tibiæ and tarsi whitish beneath, stained more or less fusco-ferruginous above; wings hyaline. Abdomen: all the segments with yellowish-white fasciæ on their apical margins, the fasciæ continued beneath; the ovipositor about the length of the abdomen, the valves broadest at their apex.

*Hab.* Aru.

2. MESOSTENUS AGILIS. *M. niger*; antennis medio albis; thorace pedibusque albo variegatis; abdominis marginibus fasciis albis.

*Female.* Length 5 lines. Black; the joints of the antennæ, from the 6th to 13th, white, the vertex also white. Thorax: a spot in the middle of the disk of the mesothorax, the scutellum, a spot on the postscutellum, two beneath the wings, the apex of the metathorax, and a spot on each side white; the legs white, the anterior pair slightly fuscous above; the intermediate femora and tibiæ beneath, and the tarsi above, black; the posterior femora above and beneath the tibiæ, except their extreme base and the base and apex of the tarsi, black; wings hyaline, the nervures black. Abdomen: the apical margins of the segments, excepting the fourth and fifth, with white fasciæ, the second and third fasciæ attenuated in the middle.

*Hab.* Aru.

3. MESOSTENUS ALBOPICTUS. *M. niger*, albo varius; alis hyalinis.

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*Female*. Length 7 lines. Black; the clypeus, mandibles, palpi, the joints of the antennæ from the sixth to the thirteenth, and a broad stripe at the inner orbits of the eyes white. Thorax: an ovate spot on each side of the prothorax above, a similar spot in the middle of the mesothorax, the tegulæ, scutellum and postscutellum, a T-shaped spot reversed on the metathorax, a large quadrate one on its sides, three irregular-shaped maculæ beneath the wings, and the anterior and intermediate legs white, the legs with a black line above; the posterior legs have a large spot on the coxæ behind, the trochanters, the tibiæ, and tarsi white, the tibiæ black at their apex, and the femora palish at their base outside; the wings hyaline and iridescent, with the nervures black. The abdomen beneath, and the apical margins of the segments above, white.

*Male*. Rather smaller than the female, but only differs otherwise in the colour of the legs, the anterior and intermediate pairs being entirely yellowish-white, excepting the intermediate tibiæ and tarsi, which are slightly fuscous above; the posterior femora are ferruginous, the tibiæ and tarsi white, with the base and apex of the two former black as well as the apical joint of the tarsi.

*Hab.* Key Island.

#### Gen. PIMPLA, *Fabr.*

1. PIMPLA OCHRACEA. *P. ochracea*; antennis ferrugineis; facie luteâ; alis hyalinis, apice fuscis.

*Female*. Length 5 lines. Entirely ochraceous, with the face and scape in front yellow; the body beneath is pale ochraceous; the antennæ ferruginous, above dusky; the eyes emarginate within; the tarsi have the tips of the claws black; the wings flavo-hyaline, with the apex of the anterior pair fuscous, the nervures black, becoming yellow at the base of the wings. The head, thorax, legs and base of the abdomen smooth and shining; the abdomen, except at the base, finely punctured; a transverse impressed row of punctures a little before the apical margin of each segment, and the space between impunctate.

*Hab.* Aru.

2. PIMPLA BRACONOIDES. *P. rufo-flava*; antennis tarsisque et abdominis dimidio posteriori nigris; alis fuscis, dimidio basali flavis.

*Female*. Length 6 lines. Ferruginous; the posterior tarsi and the fourth and following segments of the abdomen black; the head is reddish yellow, the eyes brown; the scape and two or three of the basal joints of the flagellum ferruginous, the rest fuscous; the basal half of the wings flavo-hyaline, the apical half fuscous; the stigma yellow, with a subhyaline macula beneath, and two other similar irregular-shaped spots. The abdomen with two longitudinal carinæ on the basal segment, and a transverse curved impressed line on the other segments.

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*Hab.* Key Island.

This species might at first sight be mistaken for a species of the genus *Bracon*. The male only differs from the female in having the abdomen black, with only the basal segment yellow; the wings are only very slightly yellow at their base; it is also rather smaller.

3. PIMPLA PENETRANS. *P. flavo-ferruginea*; flagello fusco; alis flavo-hyalinis, apice fuscis.

*Female*. Length 4¼ lines. Reddish yellow, smooth, and shining; the face testaceous, with slight fuscous stains; the scape and two or three of the basal joints of the flagellum yellow in front; the wings hyaline, with a yellowish tinge; the nervures black, except the costal nervure, which is ferruginous towards the base, the apex of the wings slightly clouded; the posterior tibiæ fuscous above. Abdomen: the segments with slightly impressed oblique depressions, the ovipositor shorter than the abdomen, and black.

The *Male* only differs in having the abdomen rather more slender.

*Hab.* Aru.

4. PIMPLA FERRUGINEA. *P. flavo-ferruginea*; antennis supra fuscis; alis hyalinis.

*Female*. Length 5½ lines. Ferruginous, with the head and thorax beneath yellow-testaceous; the coxæ also are of the same colour; the flagellum slightly fuscous above; the wings flavo-hyaline, the nervures black; the two basal segments of the abdomen shining, the third and the following segments subopaque; the ovipositor as long as the abdomen.

*Hab.* Key Island.

5. PIMPLA PLAGIATA. *P. flavo-rufa*; antennis strigisque tribus mesothoracis nigris; alis hyalinis, apice cellulæ marginalis fusco unimaculato.

*Female*. Length 5½ lines. Yellow, the legs with ferruginous stains; the antennæ black, with the scape yellow in front; the head with a large ovate black spot behind the ocelli. Thorax finely punctured on the disk of metathorax, which has three longitudinal broad black stripes, a narrow black line on the posterior margin of both the scutellum and postscutellum; wings hyaline, the nervures black, with a dark fuscous spot at the apex of the marginal cell. Abdomen reddish-yellow, with the apical margins of the segments yellow; the

ovipositor black, and shorter than the abdomen.

*Hab. Aru.*

Gen. RHYSSA, *Grav.*

1. RHYSSA MACULIPENNIS. *R. rufescenti-flava*; antennis et vertice nigris; alis hyalinis, plaga nigro-fusca.

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*Male.* Length 9 lines. Ferruginous; the head of a yellow testaceous, with the vertex and antennæ black; the scape ferruginous in front; the mandibles black. Thorax: the mesothorax and scutellum transversely rugose, the former with two deeply impressed lines in front, which converge inwards, and meet in the middle of the disk; wings hyaline, with a yellow tinge on the anterior pair, the nervures black; a black stripe crosses the middle of the marginal cell, and terminates at the inferior margin of the discoidal cell; the legs ferruginous, with the posterior tarsi black. Abdomen smooth, shining, ferruginous.

*Hab. Aru.*

2. RHYSSA VESTIGATOR. *R. ferruginea*; antennis, mesothorace, metathoracisque basi nigris; abdomine lineari, nitido et lævi; alis hyalinis, apice subfuscato.

*Male.* Length 9 lines. Head testaceous-yellow, with the vertex ferruginous; the antennæ fusco-ferruginous. Thorax black, with the prothorax, a large oblique spot beneath the wings, the scutellum, and metathorax yellow, the base of the latter black; the mesothorax and scutellum rugose; the metathorax smooth and shining; the legs ferruginous, with the anterior coxæ in front and the posterior pair behind yellow; the posterior coxæ black beneath; wings hyaline, faintly clouded at their apical margins. Abdomen elongate, linear, glossy, smooth, and shining, ferruginous, with the base and lateral margins blackish.

*Hab. Aru.*

Gen. BRACON, *Fabr.*

1. BRACON BASALIS. *B. capite*, thorace, pedibus anticis et intermediis, femoribus posticis ferrugineis; tibiis tarsisque et abdomine nigris, segmento basali flavo; alis fusco-hyalinis.

*Female.* Length  $4\frac{1}{4}$  lines. The head, scape in front, thorax, anterior and intermediate legs, the posterior coxæ, trochanters, and femora, and the first segment of the abdomen, and a semicircular spot in the middle of the base of the second, yellow-ferruginous; the antennæ, the posterior tibiæ and tarsi, fuscous; abdomen shining black; the thorax smooth and shining; the wings fusco-hyaline. The basal segment of the abdomen with a longitudinal impressed line on each side, the second segment with an oblique depression, the third with an impressed line, curved forwards and extending to the lateral margins; the base of the segment has a row of short, deeply impressed striæ; the ovipositor shorter than the abdomen.

*Hab. Aru.*

2. BRACON ALBO-MARGINATUS. *B. capite*, thorace pedibusque ferrugineis; abdomine nigris annulis albomarginatis; alis fusco-hyalinis.

*Female.* Length  $4\frac{1}{2}$  lines. Head, thorax, and legs ferruginous, smooth, and shining; antennæ and abdomen black, the latter smooth and shining, the posterior margins of the third and following segments with a narrow bluish-white fascia; the posterior tarsi slightly fuscous; the wings fusco-hyaline; the ovipositor a little longer than the abdomen.

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*Hab. Aru.*

3. BRACON NIGRIPENNIS. *B. thorace*, pedibus anticis et intermediis, femoribusque posticis ferrugineis; tibiis tarsisque posticis et abdomine nigris; alis nigro-fuscis; capite luteo-testaceo.

*Female.* Length 9 lines. Head testaceous, the antennæ black. Thorax, anterior and intermediate legs, the posterior coxæ, trochanters and femora, the tegulæ, extreme base of the wings, and the base of the stigma ferruginous; the thorax smooth and shining; the wings brown-black, with a small hyaline spot in the first submarginal cell. Abdomen longitudinally aciculate, a central carina at the base of the first segment, the second segment with an oblique impressed line running from the lateral angles of its basal margin, and meeting in the centre of its posterior margin; the margins of all the segments constricted; the ovipositor shorter than the abdomen.

*Hab. Aru.*

4. BRACON EXOLETUS. *B. niger*; capite, thorace, pedibus anterioribus et intermediis ferrugineis; alis subhyalinis.

*Female.* Length 5 lines. Head, scape of the antennæ, thorax, anterior and intermediate legs, ferruginous; flagellum and tips of the mandibles black. Thorax smooth and shining; wings fusco-hyaline, the nervures dark brown; the posterior legs fusco-ferruginous. Abdomen rugose and subopaque; the basal segment black in the middle, with the base and lateral margins ferruginous, the sides deeply channeled; the second segment with an arrow-headed shining space in the middle of its base; the ovipositor shorter than the

abdomen.

*Hab. Aru.*

5. BRACON ABDOMINALIS. *B. rufo-flavus*; antennis fuscis; alis subhyalinis; abdomine ovato.

*Female.* Length 3 lines. Reddish yellow; head and thorax smooth and shining; the head narrower than the thorax; wings fusco-hyaline; abdomen ovate, broader than the thorax, the first and second segments rugose, with deep sculptured impressions; the second segment has an ovate shining space in the middle at its basal margin; the third segment is deeply depressed and sculptured at the base, leaving a transverse arched space at its apex, the width of the entire segment; the following segments have their margins very deeply depressed.

*Hab. Aru.*

6. BRACON NITIDUS. *B. niger*; capite, thorace pedibusque et abdominis segmento primo ferrugineis, totis nitidissimis.

*Female.* Length 4 lines. Ferruginous, with the flagellum, second and following segments shining black; the thorax smooth and shining, with the scutellum prominent; the wings subhyaline, their apical margins clouded, their extreme base yellowish, the nervures dark brown, the stigma black. Abdomen: the second and third segments with deeply impressed oblique lines on each side, and the basal margins of the following segments depressed.

[Pg 176]

*Hab. Aru.*

7. BRACON PALLIFRONS. *B. niger*; thorace pedibusque anticis et intermediis ferrugineis; alis fuscis.

*Female.* Length 6 lines. Head obscure, testaceous yellow; the eyes brown; the antennæ black. Thorax and the anterior and intermediate legs ferruginous; an ovate black spot on the metathorax; and the posterior legs black, with the articulations obscurely ferruginous; wings dark fuscous, with the nervures and stigma black, the base of the latter yellowish, and a hyaline streak beneath it, which crosses the first submarginal cell. Abdomen black and shining; the first segment with some coarse striae at the apex; the second with a central forked carina and an oblique one on each side running inwards to the apex of the segment; between the carinæ are a number of deep grooves; the lateral margins of the three basal segments carinated; the third segment has a row of short deep striæ at its base; the ovipositor longer than the body.

*Hab. Aru.*

8. BRACON INTRUDENS. *B. niger*; thorace, pedibus anticis intermediisque et abdominis segmento basali ferrugineis; alis hyalinis.

*Female.* Length 5 lines. Black; the thorax, anterior and intermediate legs, the articulations of the posterior pair, and the base of the abdomen ferruginous, entirely smooth and shining; the wings subhyaline, the nervures fusco-ferruginous, an irregular fuscous stain at the base of the first submarginal cell, extending beyond it. Abdomen: the basal segment margined at the sides; the second segment with an oblique deeply impressed line running inwards, not quite meeting or extending to the apical margin.

*Hab. Aru.*

#### Gen. AGATHIS, *Latr.*

1. AGATHIS FUMIPENNIS. *A. ferruginea*; capite, abdominis apice tarsisque posticis nigris; alis obscure fuscis.

*Female.* Length 4 lines. Reddish-yellow; the head, apical joint of the intermediate tarsi, the apex of the posterior tibiæ, and the third and following segments of the abdomen black; the thorax and legs with a thin, short, pale fulvous pubescence; the head and abdomen smooth and shining; the head produced before the eyes into a kind of beak, rufo-piceous anteriorly. Thorax narrowed before the wings, which are dark fuscous, with a hyaline irregular mark below the stigma, crossing the submarginal cell; the anterior margin of the anterior wings pubescent; the metathorax broad, margined laterally, with a central forked carina, and a crooked one on each side; the posterior legs incrassate. Abdomen with the sides of the upper surface carinated.

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*Hab. Aru.*

#### Fam. CHRYSIDIDÆ, *Leach.*

##### Gen. STILBUM, *Spin.*

1. Stilbum splendidum, *Fabr. Syst. Piez.* p. 170. 1.

*Hab. Aru*; Senegal; Java; Bengal.

2. Stilbum amethystinum, *Fabr. Syst. Piez.* p. 176. 32.

*Hab.* Aru; Australia.

Fabricius includes this insect in the genus *Chrysis*; the typical specimen, however, proves that it belongs to the more modern genus *Stilbum*: it is very distinct from *S. splendidum*, being much more strongly and coarsely punctured; and the teeth which arm the apical segment are differently disposed on the margin.

### Fam. TENTHREDINIDÆ, *Leach.*

#### Gen. ORYSSUS, *Fabr.*

1. ORYSSUS MACULIPENNIS. *O. niger*, punctatus; pedibus ferrugineis; alis fuscis fasciâ hyalinâ ante cellulam marginalem sitâ.

*Female.* Length  $5\frac{1}{2}$  lines. Black; the head rugose, the front coarsely so, with a row of transverse tubercles running from the vertex along the inner orbits of the eyes, and crossing the front at half their length; the cheeks with a cinereous down, and a line of silvery-white pubescence or down, along the outer orbits of the eyes. Thorax coarsely punctured; the mesothorax with a central longitudinal smooth elevation; wings fuscous, with a broad transverse hyaline fascia before the base of the marginal cell, the tips of the wings hyaline; the legs ferruginous, with the coxæ and trochanters black; the posterior tibiæ with a double row of serrations outside. Abdomen shining and closely punctured; the base and apex coarsely so.

*Hab.* Aru.

#### Gen. XYPHIDRIA, *Latr.*

1. XYPHIDRIA RUFIPES. *X. nigra*; mandibulis, antennarum scapo, pedibusque ferrugineis; alis hyalinis et iridescentibus.

*Female.* Length 4 lines. Black and shining; the vertex highly polished; the front from the posterior ocelli forwards closely punctured and opaque; the mandibles, scape, and basal joint of the flagellum ferruginous. The thorax anteriorly punctured and opaque, posteriorly shining, and with a few punctures at the base of the scutellum; wings hyaline and iridescent, the nervures black, the extreme base of the wings and the tegulæ pale testaceous; the legs pale ferruginous, with the claws of the tarsi darker. Abdomen: the base of the segments depressed and very delicately and closely punctured, subopaque; the apical half highly polished and shining; beneath obscurely rufo-piceous.

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*Hab.* Aru.

#### Gen. TREMEX, *Jurine.*

1. TREMEX INSIGNIS. *T. nigro-purpureus*; abdominis fasciis basalibus albis; alis nigris cupreo nitentibus.

*Female.* Length 11 lines. Obscure steel-blue, with shades of green, purple and violet; the head and thorax punctured; the prothorax with an oblique smooth shining space on each side; the wings very dark brown, with a brilliant coppery effulgence. The base of the abdomen opaque, velvety, purple-black; the first segment with a transverse cream-coloured fascia in the middle, the second very slightly whitish at its base; the rest of the abdomen is highly polished, and has a scattered, short, black pubescence.

*Hab.* Aru.

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Note on Two Insect-products from Persia. By DANIEL HANBURY, Esq., F.L.S.

[Read December 16th, 1858.]

In the month of June last, my friend Professor Guibourt, of Paris, laid before the Académie des Sciences<sup>[G]</sup> some account of a remarkable substance called *Tréhala*, the cocoon of a Curculionidous insect found in Persia, where, as well as in other parts of the East, it enjoys some celebrity as the basis of a mucilaginous drink administered to the sick.

Specimens of this substance, as well as of another insect-product of Persia, together with the insects themselves, were presented a few years ago to the British Museum by W. K. Loftus, Esq., who obtained them while engaged by the British Government on the question of the Turco-Persian boundaries.

The precise determination of the species of these insects being a matter of doubt, they have at my request been lately examined by M. Jekel, of Paris, an entomologist with whom the family of

*Curculionidæ* has long been an especial study. One of these insects M. Jekel has identified with a species of wide distribution; the other proving undescribed, he has drawn up a description of it, which, accompanied by a figure, I have the honour to lay before the Linnean Society. To this, I venture to add a few observations upon the productions to which I have alluded.

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The first of these is *Tréhala* or *Tricala*, under which name it formed part of the Collection of *Materia Medica* sent by M. Della Sudda, of Constantinople, to the Paris Exhibition of 1855, and since deposited in the *Ecole de Pharmacie* in Paris.

*Tréhala* (fig. 2) consists of cocoons of an ovoid or globular form, about  $\frac{3}{4}$  of an inch in length; their inner surface is composed of a smooth, hard, dusky layer, external to which is a thick, rough, tuberculated coating of a greyish-white colour and earthy appearance. Some of the cocoons have attached to them the remains of the tomentose stalk of the plant upon which they were formed; others have portions of a tomentose spiny leaf built into them; and, more rarely, one finds portions of the flowering heads of the plant, a species of *Echinops*, similarly enclosed. Many of the cocoons are open at one end and empty; others have a longitudinal aperture, originally closed by the stalk of the plant, and still contain the insect; a few are entirely closed. Specimens of this insect, extracted from the cocoons sent to Paris, were examined in 1856 by my friend Mr. W. Wilson Saunders, who pronounced them to be *Larinus maculatus* of Faldermann,—a determination also arrived at by M. Jekel from specimens presented by Mr. Loftus to the British Museum. Respecting these latter, one of which is represented in fig. 1, M. Jekel makes the following remarks:—

"LARINUS MACULATUS, *Faldermann, Faun. Transcauc.* ii. p. 228, 449, tab. 6. f. 10, et iii. p. 198.—*Schönh. Gen. et Sp. Curcul.* iii. p. 112 et vii. 2. p. 7.—*Hochhuth, Bull. Moscou*, 1847, No. 2. p. 538 (var.  $\gamma$ ).

"Var.  $\gamma$ . *Larin. Onopordinis*, *Sch. loc. cit.* iii. p. 111 (excl. synonym.).

"Of this species, Mr. Loftus captured several specimens, all of small size: from some of them the pollinosity had been rubbed off, as is represented in the figure by Mr. Ford (*vide* fig. 1), which shows only a part of the inferior layer of tomentum and the greyish ground of the dorsal and lateral maculæ; the latter, being the most densely coloured in fresh specimens, are always the most persistent. These belong to Schönherr's var.  $\gamma$ , which that author formerly regarded as the *Larinus Onopordinis*, Fabr. Others of Mr. Loftus's specimens, which are very fresh, belong to var.  $\beta$ ; none to the typical variety, which is often larger in size.

"This species has a very extended habitat: I have received it from European Turkey (Frivaldski), Beyrouth, Caucasus, Persia (Dupont), &c. &c.; and it is recorded by Schönherr as also found in Barbary and Portugal.

"This is the insect which proceeds from the rough chalky-looking nidus figured by Mr. Ford. (*Vide* fig. 2.)"

The entomological question being so far disposed of, I may be permitted a few remarks upon the properties which have obtained for *Tréhala* a place among drugs and dietetic substances.

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The first author who gives any account of the substance is Father Ange, who, in his '*Pharmacopœa Persica*<sup>[H]</sup>,' describes it in the following terms:—"Est autem istud medicamentum veluti *tragea* ex nucleo pistacii integro confecta; nam revera saccharum istud exterius corrugatum et agglomeratum adhæret cuidam nucleo, in quo non fructus, sed vermiculus quidam nigricans Persice *C-hezoukek* bombycis instar reconditur et moritur."

Father Ange also states that the substance is called in Persian *Schakar tibal* (شکر تیغال), literally *Sugar of nests*; but his Arabic names, *Schakar el ma-ascher* (شکر المعشر) and *Saccar el aschaar*, apply to an entirely different substance, namely to a saccharine matter exuded, after the punctures of an insect, from the stems of *Calotropis procera*, R. Br.<sup>[I]</sup>, of which plant he gives a quaint but tolerably characteristic description.

Mr. Loftus, who obtained the specimens which he presented to the British Museum, at Kirrind in Persia, in September, 1851, gives as the Persian name of the cocoons *Shek roukeh*—a term, probably, the same as the "*C-hezoukek*" (a misprint?) of Father Ange, but the signification of which I have not been able to discover.

Another notice of the same substance, with a figure, is briefly given in Dr. Honigberger's '*Thirty-five Years in the East*' (Lond. 1852, vol. ii. pp. 305-6), where we read that *Manna teeghul* or *Shukure teeghal*, which are certain insect-nests of a hard texture, rough on the outside, smooth within, about half an inch in length, and of a whitish colour, are imported into Lahore from Hindostan.

M. Bourlier published in 1857 an interesting note on the same substance<sup>[J]</sup>, which has been followed by M. Guibourt's communication to the Académie des Sciences, and still later by a memoir on the chemical history of Tréhala, by M. Marcellin Berthelot, also presented to the Academy<sup>[K]</sup>.

From the investigations of M. Guibourt, it appears that the cocoons are composed of a large proportion of starch (identical with that found in the stem of the *Echinops*, upon which the insect forms its nest), of gum, a peculiar saccharine matter, a bitter principle, besides earthy and alkaline salts.

The saccharine principle, which has been especially examined by M. Berthelot, and named by him *Tréhalose*, is a body analogous to cane-sugar, but possessing distinctive properties, which separate it from that and all other varieties of sugar.

M. Bourlier states that *Tréhala*, which is abundant in the shops of the Jew drug-dealers of Constantinople, is frequently used by the Arab and Turkish physicians in the form of a decoction, which is regarded by them as of peculiar efficacy in diseases of the respiratory organs.

The second insect-product to which I would draw attention, is a saccharine substance resembling dark honey. Mr. Loftus, who obtained it near Kirrind, 13th July, 1851, and whose specimen is in the British Museum, states that it is exuded from a species of thistle when pierced by a Rhynchophorous insect; but he fails to inform us for what purposes it is used by the inhabitants.

Mr. Loftus having also presented the Museum with excellent specimens both of the plant and insect, I am able to state that the former is *Echinops persicus*, Fisch., and the latter a new species of *Larinus*, to which M. Jekel has applied the name *Larinus mellificus*, and of which he has drawn up the following description:—

"*LARINUS MELLIFICUS*, *Jekel* (fig. 3). Breviter ovatus, convexus, niger, nitidus; infra subtiliter, lateribus thoracis margineque elytrorum intus medio versus angulariter ampliata, apicem occupante griseo-cinerascenti tomentosus; rostro leviter punctato, basi utrinque bicanaliculato cum elevatione media lata subcariniformi; thorace subconico antice tubulato, supra confertim sat rude punctato, lateribus subrugoso; elytris striato-punctatis, interstitiis latis, planis, transversim subtilissime rugulosis, cum abdomine tenuissime alutaceis, punctis majoribus remotioribus impressis; pectore, lateribus, pedibusque rugoso-punctatis, femoribus infra fortiter oblique costato-rugosis; tibiis intus, anticis fortius crenulatis. Long. (rostr. excl.) 16-18, lat. elytr. 8-9 mill.

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"Patria—Persia, prope Kirrind, ubi *Echinopsidis* speciem frequentat, cujus plantæ caules ab hoc insecto puncti materiam quamdam saccharinam sudant." *W. K. Loftus*, Mus. Brit.

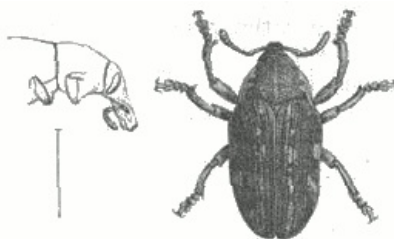


Fig. 1. *Larinus maculatus*, Falderm.

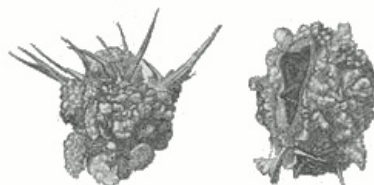


Fig. 2. The cocoons of *Larinus maculatus*, called in Turkish Tréhala.



Fig. 3. *Larinus mellificus*, Jekel.

Very similar to *L. Onopordinis*, but proportionably more elongate and less convex; rostrum and

thorax longer; pilosity of the body underneath much thinner and shorter; thighs thicker, more clavate, the anterior evidently costate-rugose underneath; without whitish marks on the elytra, and without that layer of light-brown earth-like pollinose transudation which is often wanting in rubbed specimens of *Larinus Onopordinis*. The freshest specimens have the griseous margin of the elytra, which parts from the base under the shoulder, obliquely and angularly ampliate interiorly towards the middle, where it reaches the second stria. This griseous pilosity fills all the tips of the elytra, leaving bare only the sutures, an angular notch behind the middle (which forms with that apical part of the suture a kind of hook on each elytron), and two round spots, one submarginal fronting the tip of the notch, the other larger, discoidal, behind the foot of the notch, much above the tip.

FOOTNOTES:

[G] Comptes Rendus, 21 Juin, 1858, p. 1213.

[H] Pharmacopœa Persica ex idiomate Persico in Latinum conversa. Lutet. Paris., 1681, p. 361.

[I] This saccharine substance is noticed by Avicenna as *Zuccarum alhusar* (Lib. ii. Tract. ii. cap. 756, ed. Valgr. Venet. 1564), and also by Matthiolus (Comm. in Lib. ii. Diosc. cap. 75). It is likewise referred to by Endlicher (Enchiridion Botanicum, p. 300), Royle (Illustr. of the Bot. of the Himalayan Mountains, vol. i. p. 275), Merat and De Lens (Dict. de Matière Médicale, l. i. p. 467), &c.

[J] Revue Pharmaceutique de 1856, par Dorvault, p. 37.

[K] Comptes Rendus, 28 Juin 1858, p. 1276.

Catalogue of the Heterocerous Lepidoptera collected at Singapore by Mr. A. R. WALLACE, with Descriptions of New Species. By FRANCIS WALKER, Esq., F.L.S.

[Read Feb. 17, 1859.]

Fam. URANIIDÆ, *Westwood*.

Gen. NYCTALEMON, *Dalman*.

1. Nyctalemon Hector, *White, Walk. Cat. Lep. Het.* vii. 1771.

Inhabits also Borneo.

Fam. AGARISTIDÆ, *Swainson*.

Gen. EUSEMIA, *Dalman*.

2. Eusemia maculatrix, *Westwood, Cat. Orient. Ent.* 67, pl. 33. f. 1.

Inhabits also Hindostan and Java.

3. Eusemia mollis, *Walk. Cat. Lep. Het.* vii. 1774.

Inhabits also Hindostan.

Fam. ZYGÆNIDÆ, *Leach*.

Gen. SYNTOMIS, *Illiger*.

4. SYNTOMIS ANNOSA, n. s. *Fœm.* Cinereo-fusca; capite, antennis apice, humeris abdominisque maculis lateralibus albis; alis maculis quatuor vitreis.

*Female.* Cinereous brown. Head white. Antennæ serrated, white towards the tips. Thorax with a large white spot on each side in front. Abdomen somewhat compressed towards the base, with white spots along each side. Wings long, with the discal areolets from the base to beyond the middle mostly vitreous, but having the veins bordered with brown. Length of the body 9 lines; of the wings 22 lines.

5. SYNTOMIS CHLOROLEUCA, n. s. *Fœm.* Nigro-viridis; fronte, antennis apice, humeris abdominisque fasciis

*Female.* Blackish-green. Front, antennæ towards the tips, and two humeral spots white. Antennæ simple. Abdomen with a white band at the base, and with another on the fifth segment, and with white ventral bands. Wings purplish-black; fore wings with four vitreous spots; the fore one of the interior pair not one-third of the size of the hind one, which is very long; the fore one of the exterior pair much narrower than the hind one, and accompanied at its inner end by an elongated vitreous point; hind wings with an elongated vitreous spot. Length of the body 4½ lines; of the wings 12 lines.

6. SYNTOMIS XANTHOMELA, n. s. *Mas.* Nigra; fronte, thoracis margine antico abdominisque fasciis ochraceis; antennis apice albis, abdominis fasciculo pallide cinereo; alis anticis maculis quinque vitreis, posticis maculis duabus vitreis.

*Male.* Black. Front, fore borders of the thorax and hind borders of the abdominal segments ochraceous; dorsal tuft pale cinereous, rather large. Antennæ simple, white towards the tips. Fore wings with five vitreous spots, of which the basal one is small and round, and the other four large and elongated; the exterior pair intersected by the black veins. Hind wings with two vitreous spots, of which one is basal and the other discal. Length of the body 4 lines; of the wings 9 lines.

## Fam. LITHOSIIDÆ.

### Gen. NYCTEMERA, *Hübner.*

7. NYCTEMERA MUNDIPICTA, n. s. *Mas et Fœm.* Fusca; capite thoraceque albo vittatis; abdomine albo guttis dorsalibus fuscis; alis anticis basi albo venosis, fascia exteriori obliqua postice abbreviata alba, posticis albis fusco marginatis. *Fœm.* Thorace fascia postica lutea, abdomine fusco fasciis albis; alis anticis fascia latiore vix abbreviata.

*Male.* Brown. Head and thorax with white lines. Antennæ moderately pectinated. Pectus with black spots, luteous on each side. Abdomen white, with brown dorsal dots; tip luteous. Legs white. Fore wings with white veins towards the base, and with an exterior oblique white band, which is narrower hindward, and ends at some distance from the interior border. Hind wings white, with a broad brown border. *Female?* Larger. Antennæ slightly pectinated. Thorax with a slight luteous band in front, and another hindward. Abdomen brown, with a white band on the hind border of each segment; under side white, with brown spots along each side. Fore wings with the band much broader, hardly straightened hindward, and ending very near the interior border. Length of the body 5-6 lines; of the wings 16-20 lines.

### Gen. CYCLOSIA, *Hübner.*

8. CYCLOSIA SUBMACULANS, n. s. *Mas.* Nigra, velutina, squamis nonnullis cyaneis, subtus albo cyaneoque fasciata; alis anticis purpureo-nigris, punctis paucis exterioribus, alis posticis fuscis, punctis submarginalibus albis; alis quatuor subtus fuscis, guttis exterioribus et submarginalibus albis.

*Male.* Black, with a few metallic blue specks, and with metallic bluish-white pectoral spots and ventral bands. Antennæ slightly pectinated. Wings velvety, rather long, brown beneath, with an exterior and a submarginal row of white dots; fore wings purplish-black, with a few exterior and submarginal white points; hind wings brown, with submarginal white points. Length of the body 9 lines; of the wings 28 lines.

9. CYCLOSIA NIVIPETENS, n. s. *Mas.* Cinereo-nigra; antennis cyaneo-nigris subpectinatis; alis anticis fascia lata submarginali alba.

*Male.* Cinereous-black. Antennæ bluish-black. Fore wings with a broad, submarginal, upright, white band, which is much narrower hindward, and is intersected by the black veins. Length of the body 7 lines; of the wings 22 lines.

### Gen. PIDORUS, *Walk.*

10. PIDORUS CONSTRICTUS, n. s. *Mas.* Cyaneo-niger, subtus testaceus; antennis pectinatis corpore vix brevioribus; thoracis margine antico coccineo; alis angustis, anticis fascia exteriori subrecta subobliqua flavo-alba, posticis cinereo-nigris.

*Male.* Bluish-black, testaceous beneath. Antennæ moderately pectinated, hardly shorter than the body. Thorax crimson along the fore border. Wings narrow, somewhat testaceous beneath towards the base; fore wings with a slightly oblique, hardly curved, yellowish-white exterior band; hind wings cinereous-black. Length of the body 5 lines; of the wings 16 lines.

### Gen. HYPSEA, *Hübner.*

11. Hypsa silvandra, *Cram. Pap. Exot.* iv. 155, pl. 369. f. D (Phalæna).



Inhabits also Hindostan, China, and Australia.

12. *Hypsa egens*, *Walk. Cat. Lep. Het.* 11. 453. 12.

Inhabits also Hindostan and Java.

Gen. *SETINA*, *Schranck*.

13. *SETINA BIPUNCTATA*, n. s. *Mas.* Flava; alis anticis punctis duobus basalibus guttaque discali nigris.

*Male.* Yellow, closely allied to *S. apicalis* (Cat. Lep. Het. 521). Fore wings black along the costa towards the base, where there are two black points; a small black dot at the tip of the discal areolet. Hind wings a little paler than the fore wings. Length of the body 3 lines; of the wings 8 lines.

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Gen. *BIZONE*, *Walk.*

14. *Bizone hamata*, *Walk. Cat. Lep. Het.* 88. 5493.

Inhabits also China.

Gen. *DEIOPEIA*, *Stephens.*

15. *DEIOPEIA DETRACTA*, n. s. *Fœm.* Pallide lutea; thorace guttis nigris; alis sat angustis nigro guttatis, fimbria pallida nitente; alis anticis nigro transverse quadristrigatis.

*Female.* Pale luteous. Thorax with six black dots. Wings narrower than in the other species of this genus, with black dots, of which the most part are towards the exterior border, where they form two irregular lines, and are somewhat confluent on the under side; fringe whitish, shining. Fore wings with four short transverse various black streaks, of which the first and the second form an interrupted line. Length of the body 5 lines; of the wings 14 lines.

Gen. *DARANTASIA*, n. g.

*Fœm. Corpus* sat robustum. *Proboscis* distincta. *Palpi* porrecti, breves, caput non superantes; articulus tertius longiconicus, acutus, secundi dimidio non longior. *Antennæ* setaceæ, simplices, gracillimæ. *Abdomen* subconicum, alas posticas superans; sexualia sat magna. *Pedes* breves, nudi, sat validi, calcaribus robustis sat longis. *Alæ* breviusculæ, sat angustæ; anticæ apud costam convexæ, apice rotundatæ, margine exteriore perobliquo.

Allied to *Lemyra* (Cat. Lep. Het. vii. 1690).

*Female.* Body rather stout. Proboscis moderately long. Palpi porrect, short, not extending beyond the head; third joint elongate-conical, acute, about half the length of the second. Antennæ setaceous, simple, very slender, full half the length of the body. Abdomen nearly conical, extending somewhat beyond the hind wings; anal appendages rather large. Legs short, bare, rather stout; spurs stout, rather long. Wings rather short and narrow; fore wings convex along the costa, rounded at the tips, extremely oblique along the exterior border.

16. *DARANTASIA CUNEIPLANA*, n. s. *Mas.* Nigra; corpore subtus, capite, thoracis fasciis duabus anticis maculaque postica abdominisque fasciis posticis luteis; pedibus luteis, tibiis supra nigris; alis anticis luteo octo-strigatis, posticis luteo strigatis.

*Male.* Black, mostly luteous beneath. Head luteous. Thorax with two luteous bands in front, and with a luteous spot hindward. Abdomen with luteous bands hindward. Legs luteous; tibiæ black above. Fore wings with eight wedge-shaped luteous streaks, of which three are near the base, two subcostal, two hindward, and one submarginal and transverse. Hind wings with three luteous streaks, of which the first and second are connected exteriorly, and the third is short, broad, and submarginal. Length of the body 3½ lines; of the wings 8 lines.

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Fam. *LIPARIDÆ*, *Boisduval.*

Gen. *ARTAXA*, *Walk.*

17. *ARTAXA VARIANS*, *Walk. Cat. Lep. Het.* iv. 796.

Inhabits also West Africa, Hindostan, and China.

Gen. *PANTANA*, *Walk.*

18. *PANTANA BICOLOR*, *Walk. Cat. Lep. Het.* iv. 820.

*Note.*—*P. dispar*, a native of Hindostan, and *P. ampla*, a native of China, may be varieties of this species.

## Fam. NOTODONTIDÆ, *Stephens*.

### Gen. DARABITTA, n. g.

*Fœm.* *Corpus* vix robustum. *Proboscis* brevis. *Palpi* longiusculi, oblique ascendentes, non pilosi. *Antennæ* validæ, subcompressæ, breviusculæ, simplices. *Abdomen* conicum, alas posticas non superans. *Pedes* squamosi, læves, breviusculi, sat graciles, calcaribus longis. *Alæ* latiusculæ, non longæ; anticæ apud costam rectæ, apice subrotundatæ, margine exteriori vix convexo.

This genus hardly belongs to the *Notodontidæ*; but its precise situation seems to be uncertain. *Female*. Body hardly stout. Proboscis short. Palpi rather long and slender, not pilose, obliquely ascending, rising a little higher than the vertex; third joint elongate-conical, less than half the length of the second. Antennæ stout, bare, slightly compressed, little longer than the thorax; joints few. Abdomen conical, not extending beyond the hind wings. Legs squamous, smooth, rather short and slender; spurs long. Wings rather broad, not long; fore wings straight along the costa, slightly rounded at the tips; exterior border hardly convex, very slightly oblique.

19. DARABITTA STRIGICOSTA, n. s. *Fœm.* Rufa, vix cinerascens; alis anticis linea submarginali e punctis nigris, lineolis tribus costalibus obliquis albis, prima angulata, secunda tertiaque connexis.

*Female*. Red, with a slight cinereous tinge, more cinereous beneath. Antennæ pale. Fore wings with three white oblique costal streaks; first streak forming an outward angle; second connected in the disk with the third, which is oblique in the contrary direction; a row of submarginal black points. Length of the body 3 lines; of the wings 8 lines.

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## Fam. LIMACODIDÆ, *Duponchel*.

### Gen. MIRESA, *Walk*.

20. MIRESA CURVIFERA, n. s. *Mas.* Rufa, crassa, brevis; antennis late pectinatis; alis anticis linea exteriori arcuata nivea, spatio contiguo exteriori obscuriore.

*Male*. Red, thick, short. Palpi porrect, extending a little beyond the head. Antennæ shorter than the thorax, broadly pectinated except towards the tips. Abdomen short, obtuse, not extending beyond the hind wings. Legs short. Wings not broad. Fore wings straight along the costa, rounded at the tips, darker on the exterior side of a curved transverse bright white line, which is somewhat beyond the middle; exterior border rather oblique. Hind wings a little paler than the fore wings. Length of the body 4½ lines; of the wings 12 lines.

## Fam. SATURNIIDÆ, *Walk*.

### Gen. ATTACUS, *Linn*.

21. ATTACUS ATLAS, *Linn. Syst. Nat.* 808.

Inhabits also Hindostan, Ceylon, China, and Borneo.

## Fam. BOMBYCIDÆ.

### Gen. BOMBYX, *Linn*.

22. BOMBYX SUBNOTATA. *Mas.* Ferruginea, crassa; antennis late pectinatis; abdominis apice lamina lateralibus fimbriatis; alis anticis margine exteriori subundulato subexciso, macula subtus costali subapicali flava.

*Male*. Ferruginous, thick, pilose. Mouth obsolete. Antennæ broadly pectinated. Abdomen much more slender than the thorax, not extending beyond the hind wings; anal lateral appendages fringed. Legs short, stout. Fore wings rounded at the tips, extremely oblique along the exterior border, which is slightly angular in the middle and slightly excavated on each side; under side with a yellow costal spot near the tip. Hind wings with the interior border densely fringed towards the tip. Length of the body 7 lines; of the wings 16 lines.

## Fam. LEUCANIDÆ, *Guénée*.

### Gen. MYTHIMNA, *Hübner*.

23. MYTHIMNA INDUCENS, n. s. *Fœm.* Lateritio-rufa, subtus albida; palporum articulo tertio brevissimo; abdomine rufescenti-cano; alarum anticarum puncto discali nigro, lineis duabus nigricantibus subarcuatis indistinctis, alis posticis rufescenti-canis.

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*Female.* Brick-red colour, mostly whitish beneath. Palpi obliquely ascending, not rising to the height of the vertex; third joint extremely small, less than one-sixth of the length of the second. Abdomen reddish-hoary, extending but little beyond the hind wings. Legs stout, squamous; spurs moderately long. Fore wings very slightly convex along the costa, rectangular at the tips; exterior border slightly oblique, nearly straight; two slender, indistinct, slightly curved, blackish lines, having between them a more distinct black discal point. Hind wings reddish-hoary, the reddish tinge most prevalent towards the exterior border. Length of the body 7 lines; of the wings 18 lines.

### Fam. GONOPTERIDÆ, *Guénée.*

#### Gen. ANOMIS, *Hübner.*

24. ANOMIS MUTILATA, n. s. *Mas.* Rufa, robusta, subtus rufescenti-cinerea; palpis longis subascendentibus; abdomine latiusculo; alarum anticarum lineis tribus indistinctis angulosis nigricantibus, orbiculari alba punctiformi, margine exteriori postico perobliquo subexcavato.

*Male.* Red, stout, reddish cinereous beneath. Palpi long, obliquely ascending; third joint slender, linear, obtuse at the tip, a little shorter than the second. Antennæ stout, with extremely short setæ. Abdomen rather broad, extending a little beyond the hind wings. Fore wings with three blackish, indistinct, slightly diffuse, zigzag lines, which are slightly bordered hindward with pale yellow; orbicular mark white, punctiform; exterior border slightly angular, hardly oblique, and slightly truncated on the fore half, extremely oblique and with two slight excavations on the hind half; fringe partly white. Hind wings not paler than the fore wings. Length of the body 7 lines; of the wings 18 lines.

#### Gen. THALATTA, *Walk.*

25. *Thalatta aurigutta*, *Walk. Cat. Lep. Het. xv. 1793.*

### Fam. HYPOGRAMMIDÆ, *Guénée.*

#### Gen. BRIARDA, *Walk.*

26. BRIARDA PLAGIFERA, n. s. *Mas.* Ferrugineo-cinerea; capite thoraceque antico nigricantibus; tibiis ciliatis; alis sat angustis subdenticulatis, anticarum fascia basali, macula discali maculaque costali exteriori nigricantibus, lineis exteriori et submarginali fuscis duplicatis denticulatis subnebulosis; alis posticis pallide cinereis, semihyalinis, fusco latissime marginatis.

*Male.* Cinereous, tinged with ferruginous. Head and fore part of the thorax blackish. Palpi obliquely ascending; third joint linear, conical at the tip, about half the length of the second. Antennæ hardly setose. Abdomen extending a little beyond the hind wings. Legs rather stout; tibiæ fringed; spurs very long. Wings rather narrow, slightly denticulated. Fore wings slightly rounded at the tips, very oblique along the exterior border; a blackish band near the base, abbreviated hindward; a large blackish spot on the reniform mark, and a diffuse blackish spot near the tip of the costa; exterior and submarginal lines brown, double, denticulated, with the space along their borders somewhat clouded. Hind wings pale cinereous, semihyaline, with very broad brown borders. Length of the body 9 lines; of the wings 22 lines.

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### Fam. CATEPHIDÆ, *Guénée.*

#### Gen. STEIRIA, *Walk.*

27. STEIRIA PHRYGANEOIDES, n. s. *Mas.* Pallide cinerea, rufescente conspersa; palpis longis vix ascendentibus; alis sat angustis denticulatis; alarum anticarum squamis nonnullis nigris fuscisque, marginibus exteriori et interiori non conspersis, reniformi magna; alis posticis pallide cinereis, fusco late marginatis.

*Male.* Pale cinereous, thickly speckled with ferruginous red. Palpi long, hardly ascending, almost straight; third joint linear, obtuse at the tip, rather shorter than the second. Antennæ bare. Abdomen conical, extending rather beyond the hind wings; apical tuft small. Legs rather long and slender, almost bare; spurs very long. Wings rather narrow; exterior border denticulated. Fore wings with the speckles mostly confluent in the disk, mostly wanting along the interior and exterior borders; several black and brown speckles, some of which border the large reniform mark. Hind wings pale cinereous, with a broad brown border. Length of the body 8 lines; of the wings 20 lines.

Fam. OPHIDERIDÆ, *Guénée*.

Gen. OPHIDERES, *Boisduval*.

28. *Ophideres Salaminia*, *Cram. Pap. Exot.* 71. 117, pl. 174. fig. A.

Inhabits also Hindostan, Ceylon, Java, and China.

29. *Ophideres discrepans*, *Walk. Cat. Lep. Het.* xiii. 1227.

30. *Ophideres smaragdipicta*, *Walk. Cat. Lep. Het.* xiii. 1229.

Fam. PHYLLODIDÆ, *Guénée*.

Gen. LYGNIODES, *Guénée*.

31. *Lygniodes endoleuca*, *Guén. Noct.* iii. 124.

Inhabits also Java.

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Fam. EREBIDÆ, *Guénée*.

Gen. SYPNA, *Guénée*.

32. *Sypna subsignata*, *Walk. Cat. Lep. Het.* xiv. 1261.

Fam. OMMATOPHORIDÆ, *Guénée*.

Gen. PATULA, *Guénée*.

33. *Patula macrops*, *Linn. Syst. Nat.* 225 (Noctua).

Inhabits also West and South Africa, Madagascar, Hindostan, and Ceylon.

Gen. ARGIVA, *Hübner*.

34. *Argiva hieroglyphica*, *Drury, Ins. Exot.* 11. 3, pl. 2. f. 1 (Noctua).

Inhabits also Madagascar, Hindostan, and Ceylon.

Fam. OPHIUSIDÆ, *Guénée*.

Gen. CÆCILIA, *Walk.*

35. *Cæcilia complexa*, *Walk. Cat. Lep. Het.* xv. 1825.

Gen. OPHISMA, *Guénée*.

36. *Ophisma Umminia*, *Cram. Pap. Exot.* 111. 137, pl. 267. f. 7 (Noctua).

Inhabits also Java and Sumatra.

Gen. ACHÆA, *Hübner*.

37. *Achæa mercatoria*, *Fabr. Ent. Syst.* 111. 2, 62. 175. (Noctua).

Inhabits also Hindostan and Java.

Fam. THERMESIDÆ, *Guénée*.

Gen. THERMESIA, *Hübner*.

38. *THERMESIA? RECUSATA*, n. s. *Mas.* Rufescenti-cinerea, robusta, nigricante conspersa, capite thoraceque antico fuscis; palpis longissimis ascendentibus subarcuatis; antennis subsetosis, alis linea exteriori recta obliqua nigricante extus diffusa, linea interiori tenui subarcuata nigricante, linea submarginali e punctis

lineaque marginali nigris.

*Male.* Reddish cinereous, stout, with blackish speckles. Head and fore part of the thorax brown. Frontal tuft acute. Palpi very long, slightly curved, nearly vertical; third joint linear, acute, shorter than the second. Antennæ slightly setose. Abdomen hardly extending beyond the hind wings. Wings with the speckles here and there confluent; lines blackish; interior line slender, slightly curved; exterior line straight, oblique, diffuse on the outer side, extending almost to the tips of the fore wings; submarginal line represented by points; marginal line slightly undulating. Fore wings rectangular at the tips; exterior border slightly bent; its fore part not oblique; orbicular and reniform marks indistinct. Length of the body 6 lines; of the wings 16 lines.

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Gen. HYPERNARIA, *Guénée.*

39. HYPERNARIA DIFFUNDENS, n. s. *Fœm.* Cinerea, robusta, fusco conspersa; palporum articulo secundo extus fusco, tertio aciculari longissimo, alarum lineis interiore et exteriori vagis dentatis lineaque media recta sat obliqua squamis fuscis, punctis marginalibus atris, alis anticis acutis, orbiculari punctiformi atra, litura reniformi angusta fusco marginata extus excavata.

*Female.* Cinereous, stout, speckled with brown. Palpi very slightly curved; second joint brown on the outer side; third acicular, a little shorter than the second. Antennæ minutely setose. Abdomen not extending beyond the hind wings. Wings with the interior and exterior lines angulose, diffuse, composed of brown speckles; middle line more oblique, straight, slender, double, obsolete towards the costa of the fore wings, bordered with diffuse angular streaks of brown speckles; marginal points deep black. Fore wings acute; orbicular mark black, punctiform; reniform narrow, brown, bordered, excavated on the outer side; exterior border slightly convex. Length of the body 10 lines; of the wings 22 lines.

Gen. UGIA, *Walk.*

40. Ugia disjungens, *Walk. Cat. Lep. Het.* xv. 1860.

Fam. PLATYDIDÆ, *Guénée.*

Gen. MASCA, *Walk.*

41. Masca abactalis, *Walk. Cat. Lep. Het.* xvi. 9.

Fam. HYPENIDÆ, *Herr.-Schæffer.*

Gen. HYPENA, *Schranck.*

42. Hypena ruralis, *Walk. Cat. Lep. Het.* xvi. 65.

Inhabits also Ceylon.

Gen. MACNA, *Walk.*

43. Macna pomalis, *Walk. Cat. Lep. Het.* xvi. 78.

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Fam. MARGARODIDÆ, *Guénée.*

Gen. MARGARODES, *Guénée.*

44. Margarodes Amphitritalis, *Guén. Delt. et Pyral.* 307, 327.

Inhabits also Hindostan.

Gen. NEURINA, *Guénée.*

45. Neurina Procopialis, *Cram. Pap. Exot.* iv. 152, pl. 368. f. E. (Phalæna Pyralis Procopia.)

Inhabits also Hindostan and Java.

Fam. ENNOMIDÆ, *Guénée.*

Gen. BULONGA, n. g.

*Corpus* gracile. *Proboscis* brevissima. *Palpi* breves, porrecti, angulati. *Antennæ* simplices. *Abdomen* conicum. *Pedes* graciles, nudi, calcaribus non longis, tibiis anticis brevissimis. *Alæ* sat latæ; anticæ acutæ, margine exteriore sat obliquo; posticæ abdomen superantes.

Body slender. Proboscis very short. Palpi as long as the breadth of the head; second joint obliquely ascending; third porrect, rather shorter than the second, with which it forms an obtuse angle. Antennæ simply filiform. Abdomen conical. Legs slender, bare; spurs rather short; fore tibiæ very short. Wings rather broad; fore wings rectangular at the tips; costa hardly convex; exterior border rather oblique. Hind wings with the interior angle prominent, acute.

46. BULONGA SCHISTACEARIA, n. s. *Fœm.* Glauco-cinerea, alis nitentibus, linea marginali nigra fimbria interlineata, anticis fusco quadrilineatis, posticis trilineatis.

*Female.* Glauco-cinereous, paler beneath. Head and palpi reddish. Wings shining; marginal line black; fringe pale cinereous, including a darker line. Fore wings with four straight oblique brown lines; second line broader than the first, apparent also on the hind wings; third narrower and darker than the others, blackish, and still more distinct on the hind wings, where it is bordered with whitish on the outer side; fourth more indistinct than the others, still more indistinct on the hind wings. Length of the body 6 lines; of the wings 16 lines.

Fam. AMPHIDASYDÆ, Guénée.

Gen. DARISTANE, n. g.

*Mas.* *Corpus* robustum. *Proboscis* brevissima. *Palpi* validi, breves obtusi, oblique ascendentes; articulus tertius minimus. *Antennæ* setaceæ, simplices. *Abdomen* conicum, alas posticas non superans. *Pedes* validi, breviusculi; tibiæ anticæ brevissimæ, posteriores latissimæ, calcaribus longis. *Alæ* breviusculæ, sat latæ; anticæ acutæ.

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*Male.* Body robust. Proboscis very short. Palpi short, stout, obtuse, obliquely ascending; third joint very small. Antennæ setaceous, simple. Abdomen conical, not extending beyond the hind wings. Legs stout, rather short; tibiæ pilose; fore tibiæ very short; posterior tibiæ very broad, especially the middle pair. Wings rather short, moderately broad. Fore wings straight along the costa, acutely rectangular at the tips; exterior border rather oblique.

47. DARISTANE TIBIARIA, n. s. *Mas.* Cinerea, nitens, alis nigro conspersis, fascia media rufescente non bene determinata, anticis costa albida nigro punctata.

*Male.* Cinereous, shining, a little paler beneath. Wings speckled with black; an indistinct oblique reddish middle band; costa of the fore wings whitish, with black points. Length of the body 5 lines; of the wings 12 lines.

Fam. PALYADÆ, Guénée.

Gen. EUMELEA, Duncan.

48. Eumelea Rosaliata, *Cram. Pap. Exot.* iv. 152, pl. 368. f. F. (Phalæna Geometra Rosalia.)

Inhabits also Amboyna.

Fam. EPHYRIDÆ, Guénée.

Gen. EPHYRA, Duponchel.

49. EPHYRA QUADRISTRIARIA, n. s. *Fœm.* Rufescens, subtus flava, alis flavis rufescente conspersis, fascia exteriore proobliqua rufescente, anticis acutis, lituris duabus costalibus obliquis fuscis.

*Female.* Reddish, yellow beneath. Proboscis short. Palpi short, slightly ascending; third joint linear, obtuse, a little shorter than the second. Antennæ short, stout, setaceous. Abdomen not extending beyond the hind wings. Legs bare, rather long and slender; spurs long. Wings yellow, with reddish speckles, and with a straight reddish band, which extends from beyond the middle of the interior border of the hind wings to the tips of the fore wings. Fore wings acute, with two oblique brown costal marks; exterior border rather oblique. Length of the body 4 lines; of the wings 12 lines.

Gen. ANISODES, Guénée.

50. ANISODES EXPUNCTARIA, n. s. *Fœm.* Luteo-cervina, palpis longis angulatis, antennis breviusculis, alis ferrugineo subconspersis, linea media fusca undulata valde indistincta, lineis interiore et exteriori punctis nigris, punctis marginalibus nigris.

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*Female.* Pale luteous fawn colour. Proboscis short. Palpi long, slightly decumbent; third joint a little shorter than the second, with which it forms an obtuse angle. Antennæ simple, short. Wings minutely and indistinctly sprinkled with ferruginous; a brown, diffuse, undulating, very indistinct middle line, which is obsolete in the hind wings; interior and exterior lines indicated by widely separated black points; marginal points black. Fore wings rectangular at the tips; exterior border slightly oblique. Length of the body 6 lines; of the wings 8 lines.

Fam. ACIDALIDÆ, *Guénée.*

Gen. SYNEGIA, *Guénée.*

51. *Synegia botydaria*, *Guén. Uran. et Phal.* i. 423. 694.

Inhabits also Borneo.

Gen. DRAPETODES, *Guénée.*

52. *Drapetodes mitaria*, *Guén. Uran. et Phal.* i. 424. 695.

Inhabits also Hindostan.

Gen. TIMANDRA, *Duponchel.*

53. *TIMANDRA AJAIA*, n. s. *Mas.* Glaucescenti-cinerea; antennis setosis, alis linea perobliqua fusca antice abbreviata, linea marginali nigra, anticis valde acutis, reniformi tenui fusca.

*Male.* Cinereous, with a glaucous tinge. Proboscis short. Palpi very short, obliquely ascending; third joint extremely small. Antennæ setose, somewhat shorter than the body. Wings with a straight, very oblique, brown line, which extends from the middle of the interior border of the hind wings towards the tip of the fore wings, on approaching which it is obsolete; marginal line black. Fore wings very acute; exterior border extremely oblique; reniform mark brown, very slender. Hind wings extending beyond the abdomen. Length of the body 6 lines; of the wings 17 lines.

Gen. ZANCLOPTERYX, *Herr.-Schæffer.*

54. *Zanclopteryx saponaria*, *Herr.-Schæffer, Guén. Uran. et Phal.* 11. 16, 915.

Inhabits also Ceylon.

Fam. MICRONIDÆ, *Guénée.*

Gen. MICRONIA, *Guénée.*

55. *Micronia rectinervata*, *Guén. Uran. et Phal.* 11. 27, 933.

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Fam. ZERENIDÆ.

Gen. STALAGMIA, *Guénée.*

56. *Stalagmia guttaria*, *Guér. Icon. Regn. Anim. Ins.* pl. 90 (Phalæna).

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Catalogue of the Heterocerous Lepidopterous Insects collected at Malacca by Mr. A. R. WALLACE, with Descriptions of New Species. By FRANCIS WALKER.

Fam. SPHINGIDÆ, *Leach.*

Gen. MACROGLOSSA, *Ochsenheimer.*

1. *Macroglossa Passalus*, *Drury, Exot. Ins.* ii. 52, pl. 29. f. 2 (Sphinx).

Inhabits also Hindostan and Java.

2. *Macroglossa corythus*, *Boisd. MSS.; Walk. Cat. Lep. Het.* viii. 92. 14.

Inhabits also Hindostan, Ceylon, and Java.

### Fam. AGARISTIDÆ, *Swainson.*

#### Gen. EUSEMIA, *Dalman.*

3. *Eusemia maculatrix*, *Westw.* (See Singapore Sp. No. 2.)

4. *Eusemia mollis*, *Walk.* (See Singapore Sp. No. 3.)

5. *EUSEMIA SUBDIVES*, n. s. *Mas.* Atræ, antennis subpectinatis, abdomine fasciis luteis, alis anticis fascia exteriore recta non obliqua testacea; posticis ochraceis atro marginatis.

*Male.* Deep black. Antennæ slightly pectinated, slightly hooked at the tips. Abdomen with a luteous band on the hind border of each segment. Fore wings with an upright, straight, testaceous exterior band, which does not extend to the interior border. Hind wings bright ochraceous, with a deep black border, which is irregular on the inner side and is joined in front to a black spot, the latter, on the under side, containing a white curved line. Length of the body 9 lines; of the wings 28 lines.

### Fam. LITHOSIIDÆ, *Stephens.*

#### Gen. NYCTEMERA, *Hübner.*

6. *Nyctemera tripunctaria*, *Linn. Syst. Nat.* 864. 226 (Geometra).

Inhabits also Hindostan and China.

#### Gen. EUSCHEMA, *Hübner.*

7. *Euschema subrepleta*, *Walk. Cat. Lep. Het.* xi. 406. 3.

Inhabits also Ceylon and Borneo.

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### Fam. LIPARIDÆ, *Boisduval.*

#### Gen. PANTANA.

8. *Pantana bicolor*, *Walk.* (See Singapore Sp. No. 17.)

### Fam. ORTHOSIDÆ, *Guénée.*

#### Gen. CAREA, *Walk.*

9. *Carea varipes*, *Walk. Cat. Lep. Het.* x. 475.

### Fam. HYBLÆIDÆ, *Guénée.*

#### Gen. HYBLÆA, *Fabr.*

10. *Hyblæa tortricoides*, *Guén. Noct.* ii. 391.

Inhabits also Borneo.

11. *Hyblæa erycinoides*, *Walk. Cat. Lep. Het.* xv. 1792.

### Fam. PHYLLODIDÆ, *Guénée.*

#### Gen. LYGNIODES, *Guénée.*



Fam. OPHIUSIDÆ, Guénée.

Gen. OPHIUSA, Ochseneheimer.

13. *Ophiusa fulvotænia*, Guén. Noct. iii. 272. 1710.

Inhabits also Hindostan, Ceylon, Java, and Sumatra.

Fam. THERMESIDÆ, Guénée.

Gen. COTUZA, Walk.

14. *COTUZA CONFIRMATA*, n. s. *Mas.* Cinereo-ferruginea, robusta, dense vestita, subtus alba; palpis latis compressis oblique ascendentibus; articulo tertio minimo, antennis plus dimidio basali subpectinatis, alis linea, media recta perobliqua nigro-fusca antice angulosa et retracta, linea exteriori e denticulis nigro-fuscis albido terminatis, fimbria apice alba, alis anticis subhamatis, linea interiore nigro-fusca undulata orbiculari nigra punctiformi, reniformi et litura costali albis nigro marginatis.

*Male.* Cinereous-ferruginous, stout, densely pilose, white beneath. Palpi broad, compressed, obliquely ascending, not rising higher than the head; third joint obtuse, extremely short. Antennæ slightly pectinated to nearly two-thirds of the length, bare from thence to the tips. Abdomen not extending beyond the hind wings. Legs white; tibiæ ferruginous above. Wings ample; a blackish brown, straight, very oblique line, which is zigzag, and retracted towards the costa of the fore wings; exterior line composed of blackish-brown, very acute, whitish-pointed angles; fringe white exteriorly. Fore wings slightly hooked, with an interior undulating blackish-brown line; orbicular mark black, punctiform; reniform white, black-bordered, forming a triangular spot and an anterior point; a small exterior white costa, with mark. Length of the body 11 lines; of the wings 28 lines.

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Fam. ACIDALIDÆ, Guénée.

Gen. ZANCLOPTERYX, Herr.-Schæff.

15. *Zanclopteryx saponaria*, Herr.-Schæff. (See Singapore Species, No. 54.)

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### Transcriber's Notes:

1. Chrysophila changed to Chrysopila in the index to match the text referred to.
2. Stenophasimis changed to Stenophasmus in the index to match the text referred to.
3. A number of words occur throughout the book in accented and non-accented forms. These were left as in the original text.

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