





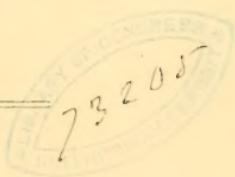




TRANSACTIONS  
OF THE  
**ENTOMOLOGICAL SOCIETY**  
OF  
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THE  
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OF  
LONDON  
FOR THE YEAR  
1871.



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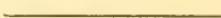
## ERRATA.

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Page 2, line 16, for "1858-9" read "1860."

Page 123, line 4, for "fucus," read "fusco."

Page 164, line 7, for "Centroptilum phæops," read "Baetis phæops."



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---

I. A *Monograph* on the *Ephemeridæ*. By the Rev. A. E. EATON, B.A.

[Read 5th December, 1870.]

---

Part I. The Nomenclature of the *Ephemeridæ*.

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THE present communication is an introduction to a series of papers on the *Ephemeridæ*. In these papers I hope to give a detailed account of the organization and development of some characteristic British species of the Family. My original plan was to treat of the British Fauna alone. In the course of my investigations, however, I found that the nomenclature of the Family at large was corrupt, and therefore I have been led to review the synonymy of the whole group. In order to accomplish this, I have been obliged to give at second-hand descriptions of many foreign species. These incorporated descriptions I have, for the sake of uniformity, translated into Latin.

It is always difficult, and sometimes impossible, to identify species by reference to mere colour descriptions and admeasurement, without recourse to the distinctions afforded by special structures. I have therefore avoided the use of analytic tables and diagnoses for the determination of species.

Structure has not hitherto received sufficient consideration in descriptive publications; which makes it necessary to examine all authentic specimens of described *Ephemeridæ* extant in collections, before the synonymy of the known species can be settled. With a view to reform, I have examined the undermentioned collections. Lists of the type specimens in each are given under the titles of the works in which they were originally described. Should I have opportunity, I will notice the contents of the principal French and German collections in some future part of my work.

Through the kindness of Dr. Gray, I had unlimited access to the collections in the British Museum, comprising Stephens' collection (see Steph. 1835-6), Mr. Wollaston's collection (see Hag. 1865), and the general collection of *Neuroptera* (see Walk. 1853 and 1858-9).

At the Linnean Society's Library I examined the collection of Linné (see Lin. 1746).

Mr. R. M'Lachlan has given me every assistance, by placing in my hands his valuable foreign collection (M'Lach. 1868, Etn. 1871), and his British collection (Etn. 1870), and making them to all intents my own.

Through the hospitality of Mr. J. C. Dale, I had the pleasure of spending several days in gathering information concerning the geographical range of species in his British collection, and in describing the rarities in his foreign collection (see Etn. 1871).

In the Museum at Oxford, with the permission of Professor Westwood, I inspected the University's general collection (Etn. 1871), Prof. Westwood's collection (Westw. 1840), and Mr. A. Ronalds' collection (Ron. 1836).

The cabinets of my own University contain no remarkable *Ephemeridæ*.

Some Australian species, sent by Professor M'Coy, of Melbourne, to Mr. F. Walker, were forwarded to me (Etn. 1871); and Mr. P. C. Wormald obliged me with the loan of his collection.

At Geneva, M. A. E. Pictet very kindly submitted to me the remains of Professor J. F. Pictet's collection (Pict. 1843-5), and some Spanish *Ephemeridæ* which he had himself collected (Ed. Pict. 1865).

M. de Selys-Longchamps' collection, containing valuable type specimens, was sent to me (see Lat. 1805; Guer. 1829-43; Ramb. 1842; Hag. 1858-9, 1861, 1864; Etn. 1871).

The late State Entomologist of Illinois entrusted me with some authentic specimens of American species which he transmitted for the British Museum (Walsh 1862-3).

My own types of new species are placed in the British Museum.

In the subjoined list of publications relating to the *Ephemeridae*, the titles of those which I have been unable to collate are distinguished by asterisks prefixed; and the names originated in each work are given after its title. My thanks are due to Mr. G. R. Crotch, of the Cambridge University Library, for the great assistance he has rendered me in the preparation of the bibliographical portion of this paper; and I am also under great obligations to Mr. J. C. Dale, Professor Westwood, Mr. C. O. Waterhouse, and Mr. R. M'Lachlan, for enabling me to give references to scarce books.

Authors anterior to those of the seventeenth Century are mentioned by Clutius (1634), and by Pictet (1843-5). The following list is arranged in chronological order, and the abbreviations employed in the citations are given in brackets, immediately after the year of publication.

1634 (Clut.). Aug. Cluyt, Opusc. duo singularia; ii. De Hemerobio sive Ephemero, pp. 61-103.

1662 (Mey). J. de Mey, in J. Göldart's Metamorph. et Hist. Nat. Ins. i. Appendix, pp. 193-200.

1675 (Swam.). J. Swammerdamm, Ephemeris vita.—[See Tyson, 1681.]

\*1680 (Bleg.). N. de Blegny, De quelques papillons qui paraissent une fois tous les ans sur les bords de la Meuse; in Temple d'Escale, An. 2e, p. 188 (Hag.).

1681, E. Tyson, (a translation of) Ephemeris vita, by J. Swammerdamm, pp. 44, pls. 8, 4to.

\*1718, J. J. Baier, De Ephemeris vita, Adagium medicinalium centuria, pp. 54 (Hag.).

\*1723 (Kul.). J. A. Kulmus, Von einem gewissen Fisch-Insect; in Bresl. Natur. u. Kunstgesch. pp. 292-3 (Hag.).

1735 (Lin. S. N. i). K. Linné, Systema Naturæ, ed. i.—Insecta,.... Angioptera, .... Ephemera.

1737-8 (Swam.). J. Swammerdamm, Biblia Naturæ, i. 234-70; ii. pls. xiii-xv.

1740 (Lin. S. N. ii). K. Linné, Systema Naturæ, ed. ii., p. 60. Gymnaaptera.

1741 (Targ.). G. Targioni-Tozzetti, Lettera sopra una numerosissima specie dei farfalle vedutasi in Firenze; pp. 32, frontisp. figs. 1-5.

1742 (Réaum.). R. A. F. de Réaumur, Des Mouches appellées Ephémères; Mém. pour servir à l'hist. des Ins. vi., pp. 457-522, pls. xlii-xlii.

1746 (Col.). P. Collinson, Some observations on a sort of *Libella* or *Ephemeron*; in Phil. Trans. vol. xliv., p. 329, pl. ii. 2-4.

1746 (Lin. F. S. i.). K. Linné, Fauna Suecica, ed. i. pp. 226-7, Nos. 750-5.

[In Linneé's own interleaved copy of this work, MS. names are written before the index numbers; viz.:—“*vulgata*” before 750; “*bioculata*” before 751; “*mutica*” after 752; “*culiciformis*” before 753; “*horaria*” before 754, above “*minima*” erased; and “*vespertina*” before 755. References are made in the text to some of his earlier publications; viz.:—after 751, Acta Upsal. (1736) p. 27. 2; after 754, Act. Ups. p. 27. 3; and to his Iter Öland. (Elandska Resa, 1745) p. 21.]

In his cabinet are—2 ♀ sub. spurious, and 1 ♂ sub. ticketted 750 (perhaps by Linné junr.) of *E. vulgata*; 2 ♂ im. spurious, of *L. marginata*; 1 ♀ sub. spurious, and 1 ♀ sub. ticketted “*nigra*” in Linné's MS., of *L. marginata*; 2 ♀ im. spurious, labelled “*culiciformis*,” of a *Cænis*; 2 ♀ im. spurious, of *C. dipterum*; 1 ♂ im. ticketted 751 (in the same handwriting as the 750 under the *E. vulgata* ♂ sub.) of *Siphlorus Linnæanus*, nov. sp.; and 2 ♀ im., unlabelled, and spurious, of *Heptagenia elegans*.

The Librarian of the Linnean Society (who rendered me every assistance during my examination of the collection), thinks that the numbers 750 and 751 are Linné's autograph, as the “*nigra*” undoubtedly is. There is a close resemblance between these figures and certain others in the handwriting in the Author's own books. However, notwithstanding that the tickets are apparently in Linné's autograph, and the specimens are seemingly Linnean, it is evident that the specimens ticketted 751 and *nigra* are not authentic, because they altogether disagree with the diagnoses 751 in F. S. i., and 1478 *nigra* in F. S. ii., respectively. The MS. reference to “Schaf. ic. 175, f. 1, 2” under *E. bioculata* (an entirely different insect from the one figured) in the Author's own copy of S. N. xii., suggests the possibility of the specimens in question having been placed by Linné in his cabinet after the publication of S. N. xii.; and if this were the case, these specimens having been newer than the original types, it is likely that they may have been in a better condition than those, and thus have stood a greater chance than they of being kept by the owner.]

1747 (Lin. S. N. v.). K. Linné, Systema Naturæ, ed. v. [Reprinted in 1748.] Ordo 3, Neuroptera, p. 62. *E. maculata*, *E. minima*.

1749 (Rœs.). A. J. Rösel, Insecten Belustigung. ii. 53-60, pl. xiii. 1-6.

[Pictet quotes certain names as of the authorship of Rösel (whose descriptions and figures are not named). These names probably originated in C. Schwarz's “Nomenclator über die in den Rösel'schen Insect. Belust. &c.,” which was published many years later (1793-1830).]

\*1753 (Pontop.). E. Pontoppidan, Det förste Förslag paa Norges naturlige Historie. Vol. ii. ch. ii. (An edition in German, 1754, and another in 1765; see Pontop. 1765).

1755 (De G.). K. de Geer, Observations sur les Ephémères; in Mém. Sav. Etr. Acad. Paris, ii. 461-9. pl. xvii. 1-2.

\*1757 (Schaf.). J. C. Schäffer, Das fliegende Uferas oder der Haft &c., p. 34. [Reprinted in his “Abhandlungen von Insecten,” iii. 30, pl. i.] (Hag. and Pict.).

1758 (Lin. S. N. x.). K. Linné, Systema Naturæ, ed. x; i. 546-7. *E. vulgata, bioculata, culiciformis, horaria, mutica, vespertina.*

[The author's interleaved copy of S. N. x. contains the following MS. notes and references :—

*E. vulgata*, Note; *E. cauda* 3-seta corpore luteo, alis hyalinis reticulatisque [= *E. danica*, Mül. ?]; ref. after 750, Geof. 2, p. 238, n. 1, Sulz. Ins. t. 17, f. 103. Note; *E. ———*, Rœs. ins. 2. aquat. t. 12, f. 2, 6. *E. cauda* triseta alis albis margine exteriore fusco. Habitat Upsaliae, Fabricius....Corpus fuseum [evidently *marginata*, L.]. On p. 547, and the opposite leaf—*E. bioculata*, ref. after 751, Geof. 2, p. 239, n. 5, t. 13, f. 4? Note; 2 alis ut totum corpus pallide flavescens. *E. culiciformis*, ref. after 753, Geof. 2, p. 240, n. 6: ref. after Roesel, Poda, ins. t. i. f. 10. *E. horaria*, ref. after 754, [Geof.] 2, p. 240, n. 8. *E. mutica*; Note, *E. cauda* biseta, alis albis hyalinis striatis, thorace fusco, ab domine albo; ref. Geof. 2, p. 240 [n. 7]. *E. vespertina*, Note; cauda triseta; ref. after Oel. 21, Geof. 2, p. 239, n. 4.

1760 (Kr.). C. C. Kramer, Dissertatio inauguralis, sistens specimen Insectologiarum Danicarum,...præside B. J. de Buckwald, M.D., p. 26. [A mere list.]

1761 (Lin. F. S. ii.). K. Linné, Fauna Suecica, ed. ii. pp. 376-8, Nos. 1472-80. *E. fuscata, diptera, nigra, striata*. [The Author's copy has no MS. notes.]

1761 (Sulz. Ken.). J. H. Sulzer, Die Kennzeichen der Insekten, p. 43, pl. xvii. 103.

1761 (Pod. Mus. Gr.). N. Poda, Insecta Musæi Græcensis, pp. 97-8, pl. i. 10. *E. ignita, maculata, speciosa*.

\*1763 (Pontoppidan). E. Pontoppidan, Den Danske Atlas, pl. i.

1763 (Scop. E. Carn.). G. A. Scopoli, Entomologia Carniolica, pp. 263-4, Nos. 683-7, pl. xxxviii. 683. *E. gemmata, albipes, parvula*.

1764 (Geof.). E. L. Geoffroy, Histoire Abrégée des Insectes qui se trouvent aux environs de Paris, ii. 231-41, Nos. 1-8, pl. xiii. 4.

1764 (Mül. F. Fr.). O. F. Müller, Fauna Insectorum Friedrichsdalina, p. 63, Nos. 551-7. *E. danica*.

1765 (Pontopp. Nat.). E. Pontoppidan, Die Naturhistorie in Denmark, p. 223, Nos. 1-3, pl. xvii. [A wretched figure.]

1766 (Schæf. Elem.). J. C. Schäffer, Elementa Entomologica, pl. lxii. 1-3.

\*1766-9 (Hout.). M. Houttuyn, Natuurkundige Beschrijving der Insekten (Hag.).

1767 (Lin. S. N. xii.). K. Linné, Systema Naturæ, ed. xii., part ii. pp. 906-7, Nos. 1-11. *E. lutea, marginata*.

[Linné's own (not interleaved) copy of S. N. xii. contains the following MS. references. On p. 906.—*E. vulgata*, after Carn. 683, f. 683, De Geer 2, t. 16, f. 1-9, 1-13; after Sulz. .... f. 103, Schæf. ic. 9, f. 5. *E. vespertina*, after Oel. 21, Rœs. ins. aqu. t. 17, f. 14. *E. bioculata*, after Suec. 1473, Schæf. ic. 175, f. 1, 2. On p. 907—*E. nigra*, after Suec. 1478, Schæf. ic. 154, f. 1, 2. *E. diptera*, after Suec. 1477, De Geer, 2, t. 18, f. 5.]

\*1769-72, J. Berkenhout, Outlines of the Natural History of Great Britain and Ireland. [The Entomology is reproduced in ed. ii., 1789.]

1771 (De G. Mem.). K. de Geer, Mémoires pour servir à l'histoire des Insectes, t. ii. part 2, pp. 621-56, Nos. 1-5, pls. xvi-xviii. [Pl. xvii. fig. 13, is not that of a gill of a true *Leptophlebia*.]

- \*[1773], J. Hill, A decade of curious insects, pls. vii, viii. [*E. culiciformis*, Hill, is a *Perla*; *E. rupestris*, Hill, is a *Trichopteron*.] (Hag.)
- \*1774 (Schæf. Abh.). J. C. Schäffer, Abhandlungen von Insecten, iii. 30. (Pict.).
- 1775 (Georg. Bem.). J. G. Georgi, Bemerkungen auf einer Reise im Rüssischen Reiche, i. 190. [A mere list.]
- 1775 (Fab. S. E.). J. C. Fabricius, Systema Entomologiae, pp. 303-304, Nos. 1-11. Ordo Synistata. *E. venosa*.
- 1776 (Schæf. Ic.). J. C. Schäffer, Icones Insectorum circa Ratisbonam indigenorum. Vol. i. pl. ix. 5, 6; xlii. 7. Vol. ii. pl. cliv. 1, 2; clvi. 2, 3; clixv. 1-3. Vol. iii. pl. cciv. 3; cxxix. 2, 3; cxxxix. 4, 5. [For Panzer's nomenclature, see Pz. 1804.]
- 1776 (Mül. Pr.). O. F. Müller, Zoologiae Danicae Prodromus, pp. 142-3, Nos. 1640-51. *E. plumosa*, *sulphurea*, *diaphana*, *luteola*, *russula*, *annulata*, *berolinensis*.
- 1776 (Sulz. Gesch.). J. H. Sulzer, Abgekürzte Geschichte der Insecten, pp. 169-71, pl. xxiv. 6, 7. *E. helvola*.
- 1776 (Schr. Beyt.). F. v. P. Schrank, Beyträge zur Naturgeschichte, p. 82. *E. flava*.
- 1777 (Fab. Gen.). J. C. Fabricius, Genera Insectorum, p. 244. *E. halterata*.
- 1781 (Barb.). J. Barbut, Les Genres des Insectes de Linné, pp. 209-13, pl. xi. 1-4.
- 1781 (Schr. En.). F. v. P. Schrank, Enumeratio insectorum Austriae indigenorum, pp. 302-5, Nos. 602-6.
- 1782 (Fab. Sp.). J. C. Fabricius, Species Insectorum, i. pp. 383-5, Nos. 1-12.
- 1782 (Har. Exp.). M. Harris, An Exposition of English Insects, pl. vi. 1-3.
- 1783 (Retz.). A. J. Retzius, Caroli De Geer Genera et Species Insectorum, pp. 56-7, Nos. 180-4. *E. communis*, *albipennis*, *cincta*, *fusco-grisea*.
- 1785 (Thunb.). K. P. Thunberg, Donationes Thunbergianæ; in Mus. Nat. Acad. Upsaliensis, p. 81. [A mere list.]
- 1785 (Fourc. E. Par.). A. F. Fourcroy, Entomologia Parisiensis, ii. 350-2, Nos. 1-8. *E. reticulata*, *viridescens*.
- 1787 (Fab. Mant.). J. C. Fabricius, Mantissa Insectorum, i. 243-4, Nos. 1-12.
- 1789 (Berk. Outl.). J. Berkenhout, Outlines of the Natural History of Gt. Britain and Ireland, ed. ii., i. 150, Nos. 1-5.
- 1789 (Raz.). G. de Razoumousky, Histoire Naturelle du Jorat, p. 210.
- 1789 (Vill.). C. J. de Villers, Caroli Linnaei Entomologia, iii. 16-22, Nos. 1-20, pl. vii. 3. *E. nervosa*.
- 1789 (Rœm. Gen.). J. J. Römer, Genera Insectorum Linnaei et Fabricii iconibus illustrata, pl. xxiv. 6, 7. Explic. p. 23. [Figures reproduced from Sulz. 1776.]
- 1789 (Zsch.). J. J. Zschach, Museum Leskeanum, i. 150, Nos. 13-20. [Names were assigned by Gmélén in 1790.]
- 1790 (Ros. F. Etr.). P. Rossi, Fauna Etrusca, ii. 7-9, Nos. 672-7.
- \*1790, J. G. Georgi, Versuch einer Beschreibung der Residenzstadt St. Petersburg. (Hag.)

1790 (Gmél.). J. F. Gmélins, Linnaei Systema Naturæ, ed. xiii., t. i. part v. pp. 2628-30, Nos. 1-18. *E. notatu, testacea, ferruginea, stigma, inanis.*

1791 (Ol. Ene. Méth.). G. A. Olivier, Article "Ephemera," in Encyclopédie Méthodique, vi. 404-22. *E. longicauda, virgo.*

1791 (Fisch. Vers.). J. B. Fischer, Versuch einer Naturgeschichte von Livland, pp. 337-8, Nos. 564-6.

1793 (Fab. E. S.). J. C. Fabricius, Entomologia Systematica emendata et aucta, t. iii. part i. pp. 68-71, Nos. 1-16. *E. marocana, brevicauda.*

\*1794, U. J. Seetzen, Beitrag zur Naturgeschichte der *Ephemera lutea*, L.; in Meyer's Magaz. f. d. Thiergeschichte, i. 41-63 (Hag.).

1795 (Don. B. I.). E. Donovan, Natural History of British Insects, iv. 53, pl. cxxviii.

\*1796 (Licht.). Lichtenstein, Cat. Mus. Holthuisen, iii. 193, No. 52. *E. noveboracana.* (Hag.)

1796 (Lat. Préc.). P. A. Latreille, Précis des Caractères Génériques des Insectes, p. 96.

1798 (Cuv. Tab. Elem.). G. L. C. D. Cuvier, Tableau Elem. de l'Hist. Nat. des Animaux, livr. vii. pp. 483-5. Agnathes.

1798 (Schr. F. B.). F. v. P. Schrank, Fauna Boica, pp. 196-9, Nos. 1937-49. *P. erythrophthalma, fuscula, familiaris.*

1798 (Ced.). J. Cederhjelm, Faunæ Ingrieæ Prodromus, pp. 133-5, Nos. 407-13.

1800-2, J. G. Georgi, Geogr. physik. und naturhist. Beschr. des Russischen Reichs. \*1800, Thl. iii. vi. 1802, p. 324. *E. fuliginosa.*

1801 (Web.). F. Weber, Observations Entomologicae, pp. 99-100. *E. atrostoma.*

1802 (Will.). Dr. Williamson, On the *Ephoron leukon*, usually called the White Fly of Passaik River; in Trans. Amer. Soc. Philad. v. 71-3.

1802 (Illig.). J. K. W. Illiger, Magazin für Insectenkunde, i. 187-8, No. 17. *E. flos-aquaæ.*

1802 (Walck.). C. A. Walckenaer, Faune Parisienne, ii. 7-10, Nos. 1-11.

\*1802. Elements of the Natural History of the Animal Kingdom; ed. anonym. [See 1817, Stewart.]

1804 (Pz. Explic. Schäf. Ie.). G. W. F. Panzer, in the explanation of Schäffer's Icones. (see 1776). *E. hyalina, Semblis marginata.*

1805 (Pz. F. Germ.). G. W. F. Panzer, Faunæ Insectorum Germanicæ Initia, Heft xciv, Nos. 16, 17.

1805 (Lat. H. N.). P. A. Latreille, Hist. Nat. des Crustacés et des Insectes, xiii. 93-100, Nos. 1-19. *E. Swammerdiana. Subulicornes.*

[In M. de Selys-Longchamps' collection is Latreille's type of *E. Swammerdiana, Pal. longicauda*, 1 ♂ subim.]

1806 (Dum. Z. Anal.). A. M. C. Duméril, Zoologie Analytique, pp. 246-7.

1806, G. Shaw, General Zoology, vol. vi. part ii. pp. 249-53, pl. 81-2. *E. Swammerdamiana.*

1807 (Lat. Gen.). P. A. Latreille, Genera Crustaceorum et Insectorum, iii. 184.

1810 (Lat. Con. Gen.). P. A. Latreille, Considerations Générales sur l'Ordre Naturel des Insectes, &c., p. 268 & p. 434.

1815, W. E. Leach, Article "Entomology" in Brewster's Edinburgh Encyclopaedia, ix. 137. Tribe 2, EPHemerides. Fam. 1, BAETIDA. Gen. 488, *Buetis*; *B. bioculatus*. Gen. 489, *Cloeon*; *C. pallida*, Leach, MSS. *E. diptera*, Lin. Fam. 2, EPHemerida. *E. vulgata*, Lin. [The article being contributed anonymously, Leach quoted his own MSS.]

1817 (Cuv. R. A. i.). G. L. C. D. Cuvier, Le Régne Animal, ed. i., t. iii. pp. 426-30.

1817 (Lamarck, i.). J. B. P. A. de M. Lamarck, Histoire Naturelle des Animaux sans Vertébres, iv. 218-22.

1817 (Sav.). J. C. L. de Savigny, Description de l'Egypte. Histoire Naturelle, Planches, t. ii. Névroptères, pl. ii. 4-8. [In t. i. 194, Explic. des Pls., he merely states that the figures belong to the Gen. *Ephemera*.]

1817 (Stew. Elem.). Stewart, Elements of the Natural History of the Animal Kingdom, ed. ii., vol. ii. pp. 224-6, Nos. 1-9.

\*1818, F. v. P. Gruithuisen, in Salz. Medic. Zeit. No. 92. Ephem. larva. (Hag.)

1819 (Sam. E. Com.). G. Samouelle, The Entomologist's useful Compendium, pp. 259-60, pl. vii. 2. Also p. 65. [An incorporation of Leach's MS. with modifications. Fam. *Ephemerulae* is put for Tribe *Ephemerides*, Leach; and Leach's named Families are ranked as nameless *Stirpes*.]

1821, W. Wood, Illustrations of the Linnaean Genera of Insects, ii. 21-3, pl. xlvi.

1823 (Dum. Con. Gen.). A. M. C. Duméril, Considerations Générales sur la Classe des Insectes, p. 204, pl. xxviii. 4, 5.

1823 (Say, W. Q. R.). T. Say, Descriptions of Neuroptera collected by the Expedition under Major S. H. Long; in \*The Western Quarterly Reporter, vol. ii. p. 162-3; repr. by Le Conte 1859, vol. i. 171-2. *Baetis femorata*, *Cloeon posticata*, *Ephemera cupida*.

1824 (Say, Long's 2d Exp.). T. Say, Narrative of an expedition to the source of St. Peter's River, under Major S. H. Long; \*W. Q. R. vol. ii. 303-5; ed. Le Conte 1859, vol. i. 203-4. *Baetis bilineata*, *alternata*, *alba*.

1824, J. Fleming, Article "Insecta," in Encyclopædia Britannica, Suppl. vol. v. 53. *Ephemeridae*.

1825 (Lat. Fam.). P. A. Latreille, Familles Naturelles du Régne Animal, p. 434.

1825 (Dum. Elem.). A. M. C. Duméril, Elemens des Sciences Naturelles, ii. 142, pl. v. 16-7.

1827, C. G. Carus, Entdeckung eines einf. Blutkreisl. &c., \*p. 16, pl. iii. Isis, iv. 317, pl. iv. 3. [Circulation in an *Ephem.* nymph.]

1828, O. G. Costa, Fauna di Aspromonte, pl. i. 2.

1829 (Cuv. R. A. ii.). G. L. C. D. Cuvier, Le Régne Animal, ed. ii. t. v. pp. 241-4.

1829 (Gor. & Prit.). Goring and Pritchard, Natural History Objects for the Microscope, \*ed. i; ed. iii. pp. 61-9, pl. ii. 4-6.

1829, J. F. Stephens, The Nomenclature of British Insects (ed. i. of the Catalogue) ii. 305-7, Nos. 3369-3409. [A mere list.]

1829, J. Curtis, A Guide to the Arrangement of British Insects, columns 132-3. [A mere list.]

1829-43 (Guér. Ic.). F. E. Guérin-Méneville, Iconographie du Régne Animal, vol. ii. part i. pl. ix. 7-9, vol. iii. 384. *E. limbata*.

[In M. de Selys-Longchamps' collections are Serville's types of *E. LIMBATA*, *Hexagenia*, 1 ♂ im.; *E. DIPTERA*, *Cloeon*, 1 ♂ im.]

1831, C. J. Carus, Fernere Untersuchungen über den Blutlauf in Kerfern; in Act. Acad. Leopold. Carol. Akad. t. xv. Abth. ii. p. 11. [A mere statement that circulation is observable in the wings of *E. lutea* and *marginata*.]

1832, R. Wagner, Beobachtungen über den Kreislauf des Blutes und den Bau des Rückengefäßes bei den Insecten; in Isis, ix. 322, pl. ii. 1.

1832 (Grif. A. K.). G. R. Gray, The Class "Insecta," in Griffith's Animal Kingdom, ii. 296 and 313-20, pl. xciv. 7, 9. [Figures from Guér. Ic.]

1833 (Bowerb.). J. S. Bowerbank, Observations on the circulation of blood in Insects; in Ent. Mag. i. 239-44, pl. ii. 1-6.

1834, A. H. Davis, Metamorph. of Ephemera; in Ent. Mag. ii. 322-3.

1834 (Sam. Ent. Cab.). G. Samouelle, Entomological Cabinet, ii. No. 53, pl. xxiv. 1.

1834 (Curt. Phil. Mag.). J. Curtis, Descriptions of some nondescript British species of May-flies of Anglers; in Lond. and Edinb. Philos. Mag. ser. 3, pp. 120-2. *E. fusca*. *B. dispar*, *costalis*, *elegans*, *mellea*, *straminea*, *flavescens*, *lateralis*, *semicolorata*, *carnea*, *vernus*, *autumnalis*. *C. marmoratum*, *obscurum*, *unicolore*, *dimidiatum*. *Brachycercus Harrisella*, *chironomiformis*, *minima*. [The numbers prefixed to the names in the text refer to the second ed. of the Guide.]

1834 (Curt. B. E.). J. Curtis, British Entomology, vol. xi. No. & pl. cccclxxxiv.

1835, E. Newman, The Grammar of Entomology, pp. 248 and 255. *Ephemerites* and *Ephemerina*.

1835 (Lamarck, ii.). J. B. P. A. de M. Lamarck, Hist. Nat. des Anim. sans Vertèbres, ed. ii., t. iv. 422-5. *E. Swammerdamia*.

1835-6, Allen Thompson, Article "Circulation," in Tod's Cyclopædia of Anatomy and Physiology, i. 651-2.

1835 (Ste. Ill.). J. F. Stephens, Illustrations of British Entomology, Mandib. vi. 53-70, pl. xxix. *E. cognata*, *tulcosa*, *submarginata*, *dispar*, *apicalis*, *rufescens*, *rosea*, *helvipes*, *dubia*, *minor*. *Cœnis macrura*, *dimidiata*, *pennata*, *interrupta*. *Ba. longicauda*, *subfuscata*, *obscura*, *cingulata*. *Cl. ochraceum*, *hyalinatum*, *albipenne*, *cognatum*, *virgo*.

[The specimens in Stephens' collection are named in accordance with his Catalogue, not with the Illustrations. The ticketted specimens, however, partake in some measure of the nature of type specimens. Many of them are no doubt the originals of the descriptions in the Illustrations; for Stephens had not access to many collections of *Ephemeridæ*; his descriptions are mostly taken from dried examples; and many of these specimens are of an older date than 1835. Those of them which conform to the descriptions in the Illustrations similarly named, may, therefore, be presumed to be virtually authentic.

The collection comprises:—*E. VULGATA*, 5 ♂ im.; *COGNATA*, 3 ♂, 5 ♀ im.; *STIGMA*, 2 ♂ im.; *TALCOSA* 1 ♀ im.; *LUTEA*, 1 *Heptagenia elegans*, ♂ im.; *MARGINATA*, 2 *H. semicolorata*, ♂ im.; *SUBMARGINATA*, 1 *L. helvipes*, ♀ im., & 1 *B. phaops*, ♂ im.; *DISPAR*, ♂, 1 im., 1 subim.; *NIGRICANS*, 4 ♂ im.; (*DILUTA*, absent); *APICALIS*, 2 *Eph. ignita*, ♂ im., and 1 *B. phaops*, ♂ im.; *RUFESCENS*, 2 ♂, 8 ♀ im.; *DUBIA*, 2 ♂ im.; *HELVIPES*, 1 ♀ im.; *ROSEA*, 1 ♂, 1 ♀ im.; (*VESPERTINA*, absent). (*CENIS MACRURA*, wanting); *C. PENNATA*, 1 ♀; *BREVICAUDA*, 1 ♀; *CHIRONOMIFORMIS*, 1 *macrura*, ♀; *DIMIDIATA*, 2 ♂, 1 ♀. *BAETIS CAUDATA*, 1 ♂, 2 ♀ im.; *VENOSA*, 1 ♂, 2 ♀ im.; *SUBFUSCA*, 1 ♀ im.; *FLAVESCENS*, ♂ 1 subim., ♀ 1 im.; *BASALIS*, 2 ♂ im.; *STRIATA*, *B. phaops*, ♀ 1 im., 1 subim.; *PILEOPA* (= *phaops*) 1 ♀ subim.; *OBSCURA*, 1 ♀ im.; *HORARIA*, 1 *Cloeon*, sp. dub., ♀ subim. and

*Eph. ignita*, 1 ♂, 1 ♀ im.; *CULICIFORMIS*, 4 *B. phæops*, ♂ im. and 1 *Cloeon*, sp. dub., ♀ subim.; *FUSCATA*, 1 *buceratus*, ♂ im., 1 *C. luteolum*, ♂ im., *binoculatus*, ♂ 1 im., 1 subim., 2 *phæops*, ♂ im.; *BIOCULATUS*, 1 ♂ im., 7 *luteolum*, ♂ im.; *CINGULATA*, 2 ♂ im. *CLOEON DIPTERA*, ♀ 5 im., 3 subim.; *OCHRACEA*, 2 *C. luteolum*, ♀ im., 1 *B. binoculatus*, ♀ subim.; *OBSCURA*, 1 *B. binoculatus*, ♀ damaged; *HYALINATA*, 3 *C. luteolum*, ♀ im.; *DORSALIS*, 3 *C. luteolum*, ♂ im.; *COGNATA*, 1 ♂ im.; *CONSOBRINUS*, ♂ 4 im., 1 subim.; *VIRGO*, 1 *dipterum*, ♂ im., 1 *russulum*, ♀ im., damaged. There are also—*E. minor*, 1 ♀ im.; *B. lateralis*, 1 ♂ im.; *B. annulata*, 1 ♀ im.; *B. parvula*, 1 ♂ im.; and *B. verna*, 1 ♀ im.

\*1836, F. J. Ehrenberger, *Dissertatio inauguralis Zoologica de Neuropterorum anatomia et physiologia*. (Hag.)

1836 (Westw. Part. Cyc.). J. O. Westwood, in Partington's British Cyclopædia, ii. 439. *Macro cercus*.

1836 (Ronalds i.). A. Ronalds, The Fly-fisher's Entomology, ed. i. [Pls. ix, xiii. & xiv. alone in this edition are worth citing. The figures in the later editions are mostly inferior to those in ed. i.]

[The types comprise,—ii. *Baetis phæops*, ♀ subim.; iii. *Heptagenia longicauda*, ♀ im.; viii. *H. venosa*, ♀ im.; xv. *H. longicauda*, subim.; xvi. *Baetis*, sp. dub., subim.; xvii. *Baetis*, sp. dub.; xix. *H. elegans*, ♀ 1 im., 1 subim.; xxii. *H. insignis*, ♂ subim.; xxiii. *Baetis*, sp. dub., subim.; xxv. a fragment; xxviii. *E. danica*, ♀ subim.; xxix. *E. danica*, ♀ im.; xxxi. *E. vulgata*, ♂ im.; xxxii. & xxxiii. absent; xxxviii. & xl. each *H. longicauda*, subim.; xlvi. *Cl. russulum*, ♀ subim. The Roman numerals are index numbers to the work.]

1837, G. Dahlbom, Kort Underättelser om skandinaviska Insekters, pp. 227-8, No. 151.

1838 (Curt. B. E.). J. Curtis, British Entomology, vol. xv., No. & pl. decviii.

1838, J. T. Laeordaire, Introduction à l'Entomologie, ii. 77. [Circulation described.]

1838 (Perch. Gen.). E. Guérin & A. R. Percheron, Genera des Insectes, &c., livr. vi. pl. iv. *E. albicans*.

1839 (Burm. Handb.). H. C. C. Burmeister, Handbuch der Entomologie, Bd. ii. Abth. ii. pp. 796-804 and 1015. *Oxy cypha lactea*, *luctuosa*, *discolor*. *Cloe halterata*, *pumila*. (*Baetis*) *fusca*, *marginalis*, *aurantiaca*, *reticulata*, *luridipennis*. *Palingenia horaria*, *dorsalis*.

1839, G. Newport, Article "Insecta," in Tod's Cyclopædia of Anatomy and Physiology, ii. 864, fig. 345; and (circulation) p. 979.

1839, T. Say, Descriptions of New N. American Neuropterous Insects; in Journ. Acad. Nat. Sci. Philadelphia, viii. 41-4; ed. Le Conte, 1859, ii. 411-13. *B. interpunctata*, *arida*, *verticis*, *obesa*. *E. hilaris*.

1840 (Zet.). J. W. Zetterstedt, Insecta Lapponica, columns 1044-6, Nos. 1-9. *E. hyalinata*, *vitrea*.

1840 (Westw. Intr.). J. O. Westwood, Introduction to the modern classification of Insects; vol. ii. Addenda, p. viii. Text, pp. 24-34, fig. lxi. 1-20. Generic Synopsis, p. 47, Addenda to the Generic Synopsis, 158. Neuropt. Biomorphotica. *Leptophlebia*, *Brachyphlebia*.

[The types in Prof. Westwood's Cabinet, are:—*LEPTOPHLEBIA*, 1 *marginalata*, ♀ im., and 1 *Eph. ignita*, ♂ im.; *BRACHYPHLEBIA*, 2 *Ba. binoculatus*, ♂ im.; *BAETIS*‡, *Heptag. elegans*.]

1840, Triepke, Einige Bemerkungen über *Ephemera flos aquæ*, Illiger; in Stet. Ent. Zeit. i. 54-8.

1840, F. S. Voigt, Lehrbuch der Zoologie, v. 309-11.

1840, G. A. W. Herrich-Schäffer, Fauna Ratisbonensis, von K. L. Koch, Dr. A. Schaeffer, und F. Forster, p. 346, Nos. 161-88. [A list.]

1840 (Blanch. N. H.). E. Blanchard, Hist. Nat. des Insectes, t. i. p. xxiv. Introd. Anatomie et Physiologie (circulation by Brullé); t. iii. 52-5, Nos. 1-11, pl. iii. 1.

1841 (Duf. Rech.). Léon Dufour, Récherches anatom. et physiolog. sur les Orthoptères, les Hyménoptères, et les Névroptères, part iii., in Mém. par divers savans, Instit. de France, t. viii. pp. 560-4, 578-82; pl. xi. 167-8, anatomy. P. 580, footnote, *E. flavigennis, nigrimana*.

1841 (Burm.). H. C. C. Burmeister, Article "Ephemera," in Ersch & Gruber's Encyclopädie der Wissenschaften. Theil xxxv. 312-16.

1842 (Ramb. Névr.). J. P. Rambur, Hist. Nat. des Ins. Névroptères, pp. 293-9, pl. viii. 2. *E. hispanica, angustipennis, flavicans, rufa, chlorotica, obscura, subinfuscata, brunnea, affinis*.

[The types sent to me by M. le Baron E. de Selys-Longchamps were:—  
E. LUTEA, 1 *E. glaucops*, ♀ im.; E. HISPANICA, 1 *E. danica*, ♂ im.; E. LONGICAUDA, 1 *Palingenia longicauda*, ♂ subim.; E. ANGUSTIPENNIS, 1 *Heptagenia*, ♀ subim.; E. FLAVICANS, 1 *Potamanthus luteus*, ♀ im.; E. RUFa, 1 *Heptagenia (venosa?)*, ♀ im.; E. CHLOROTICA, 1 *Pot. luteus*, ♂ subim.; CLOE OBSCURA, 4 *Cloeon*, ♀ subim.; C. SUBINFUSCATA, 1 *Cloeon*, ♀ subim.; C. BRUNNEA, 1 *Heptagenia lateralis*, ♂ subim.; C. AFFINIS, 1 *Cloeon dipterum*, ♂ im.; C. PUMILA, 1 *Cloeon russulum*, ♂ im.; C. HALTERATA, 1 *Cloeon russulum*, ♀ im.]

There were also CLOE DIPTERA, 1 *Cloeon dipterum*, ♀ im.; E. MADRITENSIS (Ramb. MS.), 1 *Heptag. angustipennis*, ♀ im.; E. LONGICAUDA, 1 *Pot. luteus*, ♂ im.; and a CENTROPTILUM LUTEOLUM, ♂ im.; from Rambur's collection, not types.]

1843, J. Atkinson, Notes on *Ephemera*, in The Zoologist, i. 272-5.

1843-5 (Pict. Eph.). F. J. Pictet, Hist. Nat. des Ins. Névroptères. Famille des Ephémérines. *E. glaucops, guttulata*. *Pal. puella, indica, Savignyi*. *Ba. fluminum, cyanops, montana, purpurascens, semitincta, cerea, flaveola, guttata, australasica*. *Potamanthus Ferreri, Geerii, castaneus, brunneus, gibbus, aeneus*, (and *erythrocephalus*, a misprint for *erythrophthalmus*). (*Cloe*) *Rhodani, translucida, alpina, melanonyx, litura, fasciata, undata*. (*Cenis*) *grisea, argentata, varicauda, oophora*. *Oligoneuria anomala*.

[As the authentic and spurious specimens are not distinguished in M. Pictet's collection, an accurate enumeration of them could not be made. The collection contained:—E. VULGATA, *E. danica*; DANICA, *vulgata*; GLAUCOPS. BA. FLUMINUM, subim.; VENOSA, im.; CYANOPS; PURPURASCENS, venosa, ♂ im.; SEMICOLORATA, ♂ and ♀ im.; SEMITINCTA, semicolorata, ♂ and ♀ im. POT. (marginatus, L.) unnamed; GEERII, *L. helvipes*, ♂ im. subim.; CINCTUS, *L. cincta*, and 1 *fusca*; ERYTHROPHTHALMUS, *E. ignita*. CLOE RHODANI, *B. Rhodani*, with 2 *C. luteolum*, subim., and 1 *C. russulum*, ♂ im.; PUMILA; TRANSLUCIDA, *C. luteolum*; MELANONYX, *C. russulum*, ♂ im., var. I; DIPTERA; CENIS LACTEA; (POLYMITARCYS SAVIGNII, unnamed).]

1845 (Schn.). W. G. Schneider, Verzeichniss der von Herrn Zeller im Jahre 1844 in Sicilien und Italien gesammelten Neuropteren, &c.; in Stet. Ent. Zeit. vi. 340, Nos. 13-14. (*Cloe* *fusca*).

1846 (Fons.). E. L. J. H. Boyer de Fonscolombe, Notes sur huit espèces nouvelles d'Hyménoptères et de Névroptères trouvées aux environs d'Aix; in Ann. Soc. Ent. Fr., ser. 2, t. iv. 49-51. *E. caliciformis* (a misprint).

1846 (?), (Lab. & Imh.). J. D. Labram and L. Imhoff, Insecten der Schweiz, Bd. iv. (one plate, not numbered).

1847, M. C. Verloren, Sur la circulation dans les Insectes; in Mém. Couron. Acad. Roy. Belg. t. xix. 49, pl. i.

1847, Ant. & Giov. Bap. Villa, Comparsa periodica delle Efimere nella Brianza; in Economista, Novemb. 1847, p. 1-6 [illustrated].

1847 (Lat. Nouv. Dict.). P. A. Latreille, Nouv. Dict. d'hist. Nat., t. x. 348-9, pl. xix. 5.

1848 (Corn.). C. Cornelius, Beiträge zur näheren Kenntniss der *Palinogenia longicauda*, Ol.; 38 pp., 4 pl.

1848 (Cuv. R. A., Crochard ed.). E. Blanchard, in Cuvier's Reg. Anim. by Crochard, t. xiii. 88-92, t. xiv. pl. cii. 1-1c.

1848 (Cal.). L. Calori, Sulla generazione vivipara della *Cloe diptera*; in \*Nouv. Ann. Sc. nat. Bologna, ix. 38-53, pls. ii-iii. 1-18; separate, pp. 16.

1849 (Hag. Ueber.). H. A. Hagen, Uebersicht der neueren Literatur, betreffend die Neuropteren Linne's; in Stet. Ent. Zeit. x. 354-71. [In the critique of Pict. Ephem. (1843-5), Dr. Hagen indicated in this paper a genus *Potamanthus*, restricted (type *P. gibbus*, Pict.); but he did not adopt the genus in his later writings. Mr. Walsh afterwards described this genus, with additional species, under the name *Ephemerella*. I have passed by Dr. Hagen's usage, and have adopted the later name for the genus.]

\*1850, L. H. Fischer, Beiträge zur Insecten-Fauna um Freiburg im Breisgau; in Jahresb. des Mannheim. Ver. für Naturk. pp. 60-70 (Hag.).

1851 (Siéb. Beitr. xii.). C. T. E. von Siebold, Beiträge zur Fauna der wirbellosen Thiere Preussens (12th Beitr.); in \*Neu. Preuss. Provinzial Blatt. Bd. xi. 3, Nos. 1-13. [A mere list.]

1851 (Blanch. Chili). E. Blanchard, in C. Gay's Historia fisica y politica de Chille, vi. 103-7; Atl. Zool. Ent. Nérop. lam. ii. 2-3. (*Cloe vitripennis*).

\*1852 (Imh. Bericht). L. Imhoff, *Oligoneuria rhenana*; in Bericht über Verhandl. d. naturf. Gesellsch. in Basel, x. 177-80. *O. rhenana*.

\*1853, J. A. Herklots, Het Haft, de langgestaarde Eendagsvlieg; in Jahrb. k. Zool. Genootsch. Amst. pp. 117-123.

\*1853, Forster, Notiz über die Eintagsfliege; in Corresp. Bl. zool. mineral. Ver. Regensburg, vii. 91-3.

1853 (Kirsch. Ent. Misc.). C. L. Kirschbaum, Entom. Miscellen; in Jahrb. Vereins f. Naturk. Nassau, Heft. ix. pp. 44-5.

1853 (Walk. Cat.). F. Walker, List of Neuropterous Insects in the British Museum. Part iii. pp. 535-85. *E. simulans*, *Colombia*, *decora*, *Hebes*, *australis*. *Pal. lata*, *viridescens*, *occultata*, *natata*, *humeralis*, *bicolor*, *pallipes*, *concinna*, *nebulosa*, *albiflum*, *latipennis*, *vitrea*. *Ba. angulata*, *remota*, *vicaria*, *basalis*, *tessellata*, *albivitta*, *annulata*, *Taprobanes*, *determinata*, *invaria*, *fusca*, *debilis*, *canadensis*, *fuscata*, *scita*, *torrida*, *ignota*. *Cæn. diminuta*, *sinensis*, *perpusilla*.

[The general collection of the British Museum contained in 1853:—*E. VULGATA*, ♂ 1 subim., 2 im., 1 *danica*, ♀ im.; *DANICA*, 2 ♀ im.; *SIMULANS*, 1 *decora*, ♂ subim.; *COLOMBIA*, 1 *Leptophlebia*, ♀ subim.; *DECORA*, 1 ♂ im.; (*HEBES*, wanting); *AUSTRALIS*, subim. 1 ♂, 3 ♀. *POT. LUTEUS*, 1 *Leptophlebia marginata*, ♂ subim.; *MARGINATUS*, 1 ♂ im.; *CINCTUS*, 1 *Leptophlebia fusca*, ♂ im.; *ERYTHROPHTHALMUS*, *Ephemerella ignita*, 2 ♀ im.; *ROSEUS*, *E. ignita*, 1 ♀ im.; *COSTALIS*, im. 1 ♂, 2 ♀. *PAL. VIRGO*, 1 ♂ subim.; *ALBICANS*, 1 ♀ im.; *LATA*, 3 ♂ subim.; *VIRIDESCENS*, 1 *H. bilineata*, ♀ subim.; *OCULTATA*, *bilineata*, 3 ♀ subim.; *NATATA*, 2 *E. decora*, ♀ subim.; *HUMERALIS*, 1 ♀ subim.; *BICOLOR*, 1 *Siphlurus*, ♀ subim.; *PALLIPES*, *Leptophlebia cupida*, 1 ♂ subim., 2 ♀ im.; *CONCINNA*, *L. cupida*, 1 ♂ im.; *NEBULOSA*, 2 *Leptophlebia*, ♂ im.;

ALBIFILUM, *Campsurus albifilum*, 1 ♂ im. & *A. curtus*, 1 ♂ im.; LATIPENNIS, 1 (♀ subim., ♀ im., ♂ im.), & 1 sp. dub. ♀ subim.; VITREA, 1 *Heptagenia*, ♀ subim. BA. FLUMINUM, *H. venosa*, 2 ♀ subim.; VENOSA, 1 *H. longicauda*, ♂ ♀ im.; MONTANA, 2 *H. insignis*, ♂ im.; LATERALIS, 1 ♀ im.; SEMICOLORATA, 1 ♂ im.; CEREA, 1 *H. flavipennis*, ♂ ♀ im.; FLAVEOLA, *H. 1 ♀ im.* subim., sp. dub. 1 ♀ subim.; AUSTRALASICA, 2 *Leptophlebia*, ♂ ♀ im.; ELEGANS, 1 *H. ♀ subim.*; SUBFUSCA, 1 *Leptophlebia marginata*, ♂ im.; LURIDIPENNIS, 1 *H. ♂ im.*; ANGULATA, 1 *Hexagenia bilineata*, ♂ im.; (REMOTA, wanting); VICARIA, 1 *H. ♂ im.*; BASALIS, 1 *H. ♂ im.*; TESSELLATA, 1 *H. vicaria*, ♀ subim.; ALBIVITTA, *Hexagenia*, ♂ 1 subim. 2 im.; ANNULATA, 1 *Siphlurus*, ♂ im.; TAPROBANES, 1 *Leptophlebia*, ♂ im.; DETERMINATA, 1 *H. ♂ im.* (now a fragment merely); INVARIA, 3 *Ephemerella*, ♂ im.; FUSCA, (a. b.) *H. ♂ ♀ im.*, (c), *Leptophlebia cupida*, 1 ♂ im.; DEBILIS, 1 *L. cupida*, ♂ im.; CANADENSIS, 2 *H. ♂ im.*; FUSCATA, 1 *Ephemerella invaria*, ♂ im. subim.; SCITA, 2 *Leptophlebia ♂ im.*; TORRIDA, 1 *H. ♀ im.*; IGNOTA, 1 *Isonychia*, ♂ im.; No. 45, 1 *Leptophlebia cupida*, ♀ im. CL. BIOCULATA, (e, f), 2 ♂ im., (g) sp. nondescript. 1 ♂ im.; PUMILA, 1 *B. binoculatus*, ♂ im.; TRANSLUCIDA, 2 *B. binoculatus*, ♀ im.; DIPTERA, (a-c) ♀ im.; CULICIFORMIS, 1 *Leptophlebia helvipes*, ♀ im.; STRIATA, 2 *Ephemerella ignita*, ♀ subim.; VERNA, 1 *B. phaëops*, ♂ im.; CINGULATA, 1 *Ephemerella ignita*, ♂ im.; HYALINATA, 1 *binoculatus* & 1 *luteolum*, ♀ im.; CÆN. BREVICAUDA, 1 ♀ im.; DIMINUTA, 1 ♂ im.; SILENSIS, 1 *Cloeon russulum*, ♂ im.; PERPUSILLA, 1 ♂ im.]

1854 (Pict. Trait. de Pal.). F. J. Pictet, Traité de Paléontologie (ed. 2) ii. 371. *Palingenia macrops*, *Baetis anomala*, *Potamanthus priscus*.

\*1854 (Letz.). K. Letzner, Ueber *Palingenia virgo*; in Arbeit. schles. Gesellsch. p. 101.

1854 (Hag.). H. A. Hagen, Ueber die Neuropteren der Bernstein Fauna; in Verh. zool.-bot. Ver. Wien, iv. 221-32. [A mere list, containing the new names:—*Palingenia gigas*, *Baetis longipes*.]

1854 (Hag.). H. A. Hagen, Auffällig nördliches Vorkommen dreier grosser südeuropäischer Insekten; in Stet. Ent. Zeit. xv. 316-19.

1855 (Hag.). H. A. Hagen, Die Ephemeren-Gattung *Oligoneuria*; in Stet. Ent. Zeit. xvi. 267-70, tab. i. *O. rhenana*, var. *pallida*.

1856 (Pict. & Hag.). F. J. Pictet and H. A. Hagen; in C. G. Berendt's Organische Reste im Bernstein, Bd. ii. 73-7, tab. vi. 1, 2; viii. 5. *Ba. gigantea*, *grossa*.

1856 (Ronalds, v.). A. Ronalds' Fly-fishers' Entomology, ed. v. [In this edition, names were added to the original explanations of plates, and No. 29 is an Ephemerid.]

1857 (Brau.). F. Brauer, Neuroptera Austriae, pp. xvi, xvii. 24-27.

1858-59 (Hag. Syn. Ceyl.). H. A. Hagen, Synopsis der Neuroptera Ceylons; in Verh. zool.-bot. Gesells. Wien, Part I, 1858, vol. viii. pp. 176-7, Nos. 22-31. *Pot. fasciatus*, *annulatus*, *femoralis*. (*Cloe*) *tristis*, *consueta*, *solida*, *signata*, *marginalis*. Part II, 1859, vol. ix. p. 206, Nos. 29-30.

[In the collection of M. de Selys-Longchamps are the types of:—*P. fasciatus*, *Ephemera*, 1 ♀ subim.; *P. annulatus*, *Leptophlebia*, 1 ♂ im.]

1859 (Hag.). H. A. Hagen, Ueber das Vorkommen von *Palingenia longicauda* in Preussen; in Stet. Ent. Zeit. xx. 431.

1859 (Schi.). J. C. Schiödte; in Berlin. Ent. Zeit. iii. 143.

1859 (Say, Le Conte rep.). J. L. Le Conte, The complete Writings of Thomas Say on the Entomology of N. America, i. 171-2 (Say, W. Q. R.); i. 203-4 (Say, Long's 2d. Exp.); ii. 411-13 (Say, Journ. Acad. Nat. Sc. Philad. 1839).

1860 (Walk.). F. Walker, Characters of undescribed Neuroptera in the collection of W. W. Saunders, Esq., F.R.S.; in Trans. Ent. Soc. Lond. N. S. vol. v. pp. 198-9. *E. dislocans*. *Pot. exspectans*. *Pal. continua*, *annulifera*. (*Cloeon*) *debilis*.

[The types, now in the British Museum, are *E. DISLOCANS*, *Leptophlebia*, 1 ♂ im.; *P. EXSPECTANS*, *Ephemera*, 1 ♀ subim.; *P. CONTINUA*, *Hexagenia albivitta*, 1 ♀ im.; *P. ANNULIFERA*, *Heptagenia*, 1 ♀ im.; *C. DEBILIS*, *Baetis*, 1 ♀ im.]

1860 (Kolen.). F. A. Kolenati, Einige neue Insekten-Arten von Alt-vater; in Wien. Ent. Monatschrift, iv. 383. *Ba. iridana*.

1860 (Hag.). H. A. Hagen, Examen des Névroptères (non Odonates) recueillis en Sicile par E. Bellier de la Chavignerie; in An. Soc. Ent. Fr. 3 ser., viii. 746. *Ba. Bellieri*.

[The type in M. de Selys-Longchamps' collection is *B. BELLIERI*, *Heptagenia*, 1 ♀ im.]

1861 (Hag.). H. A. Hagen, Synopsis of the Neuroptera of N. America, with a list of the S. American species; in Smithsonian Miscellaneous Collections, pp. 38-55. *E. pudica*. *Pal. Hecuba, decolorata*. *Ba. ignava*. (*Cloe*) *mollis*, *pygmaea*, *vicina*. *Cæ. amica*. [*Ba. tessellata* and *Cloe unicolor* are paronyms.]

[The types in the collection of M. de Selys-Longchamps are:—*P. HE-CUBA*, *Euthyploclia*, 1 ♀ im.; *B. VICARIA*, *Heptagenia luridipennis*, 1 ♂ im.; *C. MOLLIS*, *Leptophlebia*, 1 ♂ im.]

1861, F. Loew, Beiträge zur Kenntniss der Orthopteren; in Verh. zool.-bot. Gesells. Wien, xi. 409-10.

1862, B. D. Walsh, List of the Pseudo-Neuroptera of Illinois contained in the cabinet of the writer, &c.; in Proc. Acad. Nat. Sc. Philad. pp. 367-81. *Ba. sicca*. *Pot. odonatus*. *Pal. vittigera, flavescentia, pulchella, terminata*. *E. flaveola*. *Ephemerella excrucians, consimilis*. *Bætisca (obesa, Say)*. (*Cloe*) *ferruginea, fluctuans, dubia, mendax*.

[The types sent by the late Mr. Walsh to me were:—i. *PENTAG. VITTI-GERA*, 1 ♂ im.; ii. *HEXAG. LIMBATA*, 1 ♂ im.; iii. *HEPTAG. FLAVESCENS*, 1 ♂ im.; iv.-vii. *BÆTISCA OBESA*, 4 (♂ im., ♀ im., ♂ subim., ♂ pupal shell); viii. ix. *EPHEMERELLA EXCRUCIANS*, 2 *E. invaria*, ♂ im. The Roman numerals denote those on the tickets affixed to the types in the British Museum.]

1863 (Hag. & Walsh). Observations on certain N. American Neuroptera, by H. A. Hagen; with notes and descriptions of new species of N. American Pseudo-Neuroptera, by B. D. Walsh; in Proc. Ent. Soc. Philad. ii. 169-179 (Hag. Obs.); and ii. 188-207 (Walsh, Notes). *Cænis nigra* (undescribed). *Pentagenia*; *Hexagenia*; *Heptagenia*. *Pentag. quadri-punctata*. *Heptag. simplex, cruentata, maculipennis*. *E. myops*.

1863 (Hag. Brit. Syn.). H. A. Hagen, Synopsis of the British *Ephe-meridæ*; in Entomologist's Annual, pp. 1-35.

1863, J. Lubbock, On the development of *Chlocon* [*Ephemera*] *dimidiatum*, Part I; in Trans. Lin. Soc. Lond. xxiv. 61-78, pls. xvii-xviii.

1864, B. D. Walsh, On the pupa of the Ephemerinous genus *Batisca*; in Proc. Ent. Soc. Philad. pp. 200-6.

1864, J. F. Stein, Beitrag zur Neuropteren-Fauna Griechenlands; in Berlin. Ent. Zeit. vii. 411. *Pot. Krueperi*.

1864 (Meyer). L. R. Meyer-Dür, Zusammenstellung der auf meiner Reise durch Tessin und Ober Engadine, &c.; in Mith. Schw. Ent. Ges. i. 219-21. *Ba. Picteti*.

1864 (Hag.). H. A. Hagen, Névroptères (non Odonates) de la Corse, &c.; in An. Soc. Ent. Fr. ser. 4, vol. iv. pp. 38-9. *Ba. fluminum*, var.? *fallax*, *zebrata*. *Pot. modestus*.

[In the collection of M. de Selys-Longchamps are Dr. Hagen's types of *B. FLUMINUM*, *Hept. zebrata*, 1 ♂ im.; *B. FALLAX*, 1 *zebrata*, ♂ subim.; *B. ZEBRATA*, 1 ♂ subim., 1 ♀ im.; *B. VENOSA*, 1 subim., 1 ♀ im.; *P. MODESTUS*, 1 *Leptophlebia*, ♂ im., and 1 *B. Rhodani*, ♀ subim.; *C. PUMILA*, 1 *B.* ♀ subim.; *C. RHODANI*, 1 *B.* ♂ im.; *C. DIPTERA*, 2 *Cloeon*, ♂ im.]

1865 (Hag.). H. A. Hagen, The Neuroptera of Madeira; in The Entomologist's Monthly Magazine, i. 25-6. (*Cloeon maderensis*.)

[In Mr. Wollaston's collection (Brit. Mus.) are *C. DIPTERA*, 2 *Cloeon*, ♀ im.; *C. MADERENSIS*, *B. Rhodani*, ♂ 4 im., ♀ 2 im., 1 subim.]

1865 (Ed. Piet.). A. E. Pietet, Synopsis des Névroptères d'Espagne, pp. 22-6, pl. iii. *Ba. flavida*, *sylvicola*.

[In M. Ed. Pietet's collection were *B. FLAVIDA*, *Siphlurus*, ♂ im.; *B. SYLVICOLA*, *Heptagenia*, ♂ im., named; and *Ephemera ignita*, ♂ im., from San Ildefonso, unnamed.]

1865 (A. Mül.). A. Müller, Observations on the habits of *Oligoneuria rhenana*; in Ent. Mo. Mag. i. 262.

1865 (Etn.). A. E. Eaton, Occurrence of the female imago of *Cloeon* under submerged stones; in Ent. Mo. Mag. ii. 14. (*Baetis*.)

1865, Lubbock (see 1863), Part. II, in Trans. Lin. Soc. xxv. 477-92, pl. lviii-lx.

1865, W. Houghton, *Ephemera*, the May Fly; in The Intellectual Observer, vi. 147-54, pls. i, ii.

1866, Tuffen West, Description of the Skin cast by an *Ephemeron* in its Pseudimago condition; in Trans. Microscop. Soc. Lond. xiv. 69-70, pl. vii. 8-11.

1866 (A. Mül.). A. Müller, Further Notes on *Oligoneuria rhenana*; in Ent. Mo. Mag. ii. 182.

1866, F. Loew, in Verh. zool.-bot. Ges. Wien, xvi. 947.

1866 (Etn.). A. E. Eaton, On some species of the Orthopterous genus *Cloeon*, Leach, (as limited by M. Pietet); in Ann. & Mag. Nat. Hist. ser. 3, vol. xviii. pp. 145-8 (illustrated). *Cloeopsis*.

1867 (Etn.). A. E. Eaton, On some British Neuroptera; in Ann. & Mag. Nat. Hist. ser. 3, vol. xix. p. 401.

\*1867, M. T. Ratzel; in Zeitsch. f. wiss. Zool. xviii. 99. [On the egg of an Ephemerid.]

1867 (Oul.). B. Oulianine, (in Russian), Neuroptera and Orthoptera of the province of Moscow, pp. 25-9.

1868 (M'Lach.). R. M'Lachlan, On a new species belonging to the Ephemerideous Genus *Oligoneuriu*; in Ent. Mo. Mag. iv. 177-8. *O. Tri-meniana*. [The type is 1 ♀ im., in Mr. M'Lachlan's collection.]

\*1868, H. Gernacher, Beiträge zur Kenntniss des Eies der Ephemeriden; in Zeits. f. wiss. Zool. xix. 95.

1868 (Brau. Ver.). F. Brauer, Verzeichniss der bis jetzt bekannten Neuropteren im Sinne Linné's; in Verh. zool.-bot. Gesellsch. Wien, xviii. 361, 363, 387-9.

1868 (Brau. Reise Novara). F. Brauer, Reise der Fregatte Novara, Zool. Theil, Bd. ii. Abth. i. 104. [A list.]

1868, B. D. Walsh, The Bug-hunter in Egypt (S. Illinois); in The American Entomologist, i. 6, fig. i. b. c.

1868 (Hag.). H. A. Hagen, On *Lachlania abnormis*, a new Genus and Species from Cuba, belonging to the *Ephemerina*; in Proc. Boston Soc. Nat. Hist. pp. 372-4, fig.

1868 (Etn.). A. E. Eaton, in Trans. Ent. Soc. Lond. 1868, p. 142. *Ecdyonurus* (misreading for *Ecdyurus*).

1868 (Etn.). A. E. Eaton, An outline of a re-arrangement of the genera of *Ephemeridæ*; in Ent. Mo. Mag. v. 82-91. *Tricorythus*, *Campsurus*, *Polymitarcys*, *Coloburus*, *Siphurus* (mis-spelt *Siphlonurus*).

1868 (Etn.). A. E. Eaton, On some points in the anatomy of the immature *Cænis macrura* of Stephens; in Trans. Ent. Soc. Lond. 1868, pp. 279-82.

1869 (Ausser. Neur. Tirol.). C. Ausserer, Neurotteri Tirolesi; in Annuario della Soc. Natur. Modena, An. iv. 131-7.

1869 (Etn.). A. E. Eaton, On *Centroptilum*, a new genus of the *Ephemeridæ*; in Ent. Mo. Mag. vi. 132. *Centroptilum* (*luteolum*).

1870 (Etn.). A. E. Eaton, On some new British species of *Ephemeridæ*; in Trans. Ent. Soc. Lond. 1870, pp. 1-8. *E. lineata*. *Cl. simile*. *Centropt. pennulatum*. *Ba. scambus*, *atrebatinus*, *phaops*, *tenax*, *buceratus*, *niger*. *Siph. armatus*, *lacustris*. *Heptag. volitans*, *insignis*.

1870 (Etn.). A. E. Eaton, A Catalogue of British Neuroptera. [The Fam. *Ephemeridæ*]. Pp. 7-11. [A mere list.]

1871 (Etn.). A. E. Eaton. In this present monograph I describe the following new genera and species. (*Campsur.*) *cuspidatus*, *quadridentatus*; *Asthenopus curtus*; (*Polymit.*) *Sarignii*; *Euthyplocia*; (*Ephem.*) *immaculata*, *serica*; (*Leptophyl.*) *furcifera*, *inconspicua*, *dentata*, *strigata*, *nodularis*, *auriculata*, *mollis*; (*Centropt.*) *stenopteryx*; (*Baetis*) *finitimus*, *amnicus*, *pictus*; (*Siph.*) *Linnæanus*; *Isonychia manca*; (*Colobur.*) *haleuticus*; *Cronicus*; (*Heptag.*) *nivata*, *borealis*, *cupulata*, *alpicola*: in all, four new genera, twenty-four species.

[The types of new species described in (Etn. 1870) and (Etn. 1871) are in the following collections:—

In Mr. Wormald's, *S. armatus*; in Linné's, *S. Linnæanus*; in Mr. Walker's, *L. furcifera*, *C. haleuticus*; in Mr. Dale's, *C. 4-dentatus*, *S. Linnæanus*, *H. borealis*; in M. de Selys-Longchamps', *C. cuspidatus*, *Euthyplocia*, *L. mollis*; in the Oxford Museum, *E. immaculata*, *L. inconspicua*; in Mr. McLachlan's, *P. Sarignii*, *Euthyplocia*, *L. strigata*, *nodularis*, *auriculata*, *mollis*, *C. stenopteryx*, *B. pictus*, *I. manca*, *S. armatus*; the rest are in the British Museum.]

Nominibus homonymicis signa anteposita significant:—

|| nomen præoccupatum.

‡ nomen abusum.

Signo ! nomini auctoris præmisso, me exemplar typicum insecti sui vidisse, significatur.

Ante nomina generum numeralia loca systematica generum designant.

## INDEX SPECIERUM,

Operibus supra enumeratis descriptarum.

- IV. ASTHENOPUS, n. g.=*Palingenia*, auct., p. Typ. *A. curtus*.  
*curtus*, ! nov. sp.; in *Palingenia*, Hag., *Campsurus*, Etn. [not described]; ♂ im.  
*dorsalis*, Burm.; in *Palingenia*, Burm.
- XX. BAETIS, Leach, 1815; Sam. 1819; Etn. 1868. Typ. *B. binoculatus*.  
 † *Baetis*, Say, Curt., et auct., p.=*Heptagenia*, &c.  
*albiritta*, ! Walk. Cat. 566; Hag. Am. Syn. 304, list; =*Hexagenia*, ♂ im.  
*albus (alba)*, Say, Long's 2d Exp. ii. 305; Le Conte, rep. i. 204; Walsh,  
 Proc. Ent. Soc. Philad. ii. 170, 193, Note 12, in *Cloe* (A.); in  
*Palingenia*, Hag. ♀.  
*alpinus*, Pict.; in *Cloe*, Pict.; *Cloeon*, Walk.  
*alternata*, Say, Long's 2d Exp. ii. 304; Le Conte, rep. i. 203; Hag. Am.  
 Syn. 49; Walsh. Proc. Acad. Nat. Sc. Philad. 1862, p. 369, &  
 Proc. Ent. Soc. Philad. ii. 169, 189=*Siphlurus*.  
*annicus*, ! nov. sp.  
*angulata*, ! Walk. Cat. 564=*Hexagenia bilineata*, ♂ im.  
*angustipennis*, ! Ramb. in *Ephemera*; Ed. Pict. Nevr. d'Esp. 23=*Hepta-*  
*genia*, ♀ subim.  
*annulata*, Pz., in *Ephemera*;—indeterminable.  
 || *annulata*, ! Walk. Cat. 567; Hag. Am. Syn. 48=*Siphlurus*; ♂ im.  
*anomala*, Pict. Trait. de Pal. ed. 2, ii. 371; Hag. Verh. zool.-bot. Ver.  
 Wien, 1854, p. 227; Hag. & Pict. Org. Rest. im Bernst. ii. 75,  
 pl. vi. 1, b. c.=*Cronicus*, ♂ im.  
*arida*, Say, Journ. Acad. Nat. Sc. Philad. viii. 42; Walk. Cat. 562; Lo  
 Conte, rep. ii. 412; Hag. Am. Syn. 46; Walsh, Proc. Acad. Nat.  
 Sc. Philad. 1862, p. 370, & Proc. Ent. Soc. Philad. ii. 170, 191,  
 Note 8, 192, Note 11=*Siphlurus*.  
*atrebatinus*, ! Etn. Trans. Ent. Soc. 1870, p. 4, ♂.  
*aurantiaca*, Burm. Handb. ii. 801; Her.-Schaf. 346; Pict. Ephem. 191;  
 Walk. Cat. 560=*Heptagenia iridana*?  
*australasica*, Pict. Ephem. 189, pl. xxiv. 1, 2; Walk. Cat. 559=*Lepto-*  
*phlebia*, ♂.  
*autumnalis*, Curt. Phil. Mag. 1834, p. 121; Ste. Ill. vi. 67=[probably a  
 monstrous ♂]*binoculatus*.  
*basalis*, ! Walk. Cat. 565 (nec Ste. Cat.); Hag. Am. Syn. 50=*Heptagenia*,  
 ♂ im.  
*Bellieri*, ! Hag. An. Soc. Ent. Fr. 1860, p. 746=*Heptagenia*, ♀ im.  
*bilineata*, Say, Long's 2d Exp. ii. 303; Le Conte, rep. i. 203=*Hexagenia*,  
 ♂ im.  
*binoculatus (bioculata)*, Lin., in *Ephemera*, Lin.; Leach, E. Ene. ix. 137;  
 Sam. E. Comp. 259, Ent. Cab. ii. n. 53, pl. xxiv. 1; Ste. Ill. vi.  
 65.  
*buceratus*, ! Etn. Trans. Ent. Soc. 1870, p. 5; ♂ im.  
*canadensis*, ! Walk. Cat. 569; Hag. Am. Syn. 47=*Heptagenia*, ♂ im.

BAETIS (*continued*).

- carnicæ*, Curt. Phil. Mag. 1834, p. 121; Ste. Ill. vi. 65; Pict. Ephem. 193; Walk. Cat. 566; determinable.
- cerea*, Pict. Ephem. 183, pl. xxiii. 2; Walk. Cat. 556= *Heptagenia flavi-pennis*, ♂ im.
- cingulata*, ! Ste. Ill. vi. 67= *Leptophlebia fusca*, ♂ im.
- costalis*, Curt. Phil. Mag. 1834, p. 120; Ste. Ill. vi. 64; Pict. Ephem. 194; Walk. Cat. 561= *Heptagenia elegans* (♀ im. s. s., Curt. ♂ im., ! Ste.).
- || *costalis*, Burm. Handb. ii. 800; Brau. Reise Novara (1868)= *Leptophlebia*, subim.
- culiciformis*, Lin.; in *Ephemera*, Lin.; sp. dub.
- † *culiciformis*, ! Ste. Ill. vi. 66= *phaeops*, ♂ im.
- cyanops*, Pict. Ephem. 171, pl. xx. 2; Walk. Cat. 556= *Heptagenia elegans*, ♂ im.
- debilis*, ! Walk. Cat. 569; Hag. Am. Syn. 46= *Leptophlebia cupida*, ♀ im.
- || *debilis*, ! Walk.; in *Cloeon*, Walk.= *Baetis*, ♀ im.
- ‡ *debilis*, Walsh, Proc. Acad. Nat. Sc. Philad. 1862, p. 371; Proc. Ent. Soc. Philad. ii. 170; (in *Baetis* [C], Walsh)= *Siphlurus*?
- determinata*, ! Walk. Cat. 567= *Heptagenia*, ♂ im.
- dispar*, Curt. Phil. Mag. 1834, p. 120; B. E. xi. 484; ! Ste. Ill. vi. 63= *Heptagenia venosa*, ♂ im.
- elegans*, Curt. Phil. Mag. 1834, p. 120; ! Ste. Ill. vi. 64; Pict. Ephem. 193; Walk. Cat. 560; Hag. Brit. Syn. 25= *Heptagenia*.
- fallax*, ! Hag. An. Soc. Ent. Fr. 1864, p. 38= *Heptagenia zebra*, ♂ subim.
- fasciatus*, Pict.; in *Cloe*, Pict.; *Cloeon*, Walk.
- femorata*, Say, W. Q. R. ii. 162; Le Conte, rep. i. 171; Hag. Am. Syn. 48; Walsh, Proc. Acad. Nat. Sc. Philad. 1862, p. 368, & Proc. Ent. Soc. Philad. ii. 169, 188, Note 6= *Siphlurus*.
- ? *ferrugineus*, Walsh; in *Cloe* (A), Walsh; ♂ im.
- finitimus*, ! nov. sp.
- flareola*, Pict. Ephem. 186, pl. xxiii. 4; ! Walk. Cat. 559; Hag. Am. Syn. 44= *Heptagenia*; ♀ im. Pict., ♀ subim. & im. Walk.
- flavescens*, Curt. Phil. Mag. 1834, p. 121; Pict. Ephem. 193; Walk. Cat. 561; probably *binoculatus*, subim.
- flavida*, ! Ed. Pict. Nevr. d'Esp. 24, pl. iii. 1-6= *Siphlurus*, im.
- fluctuans*, Walsh; in *Cloe* (B), Walsh.
- fluminum*, Pict. Ephem. 164, pl. xvi.-xix.; Lab. & Imh., Bd. iv.; Walk. Cat. 556; Brau. N. Aust. 26; Meyer-Dür, Mitt. Schw. Ent. Ges. i. 221; Ausser. Neur. Tirol. 134= *Heptagenia*.
- ‡ *fluminum*, ! Hag. An. Soc. Ent. Fr. 1864, p. 38; Stet. Ent. Zeit. xxvi. 229 (list)= *Heptagenia zebra*, ♂ im.
- forcipula*, Pict. Ephem. 169, Note= *Heptagenia venosa* ?, ♂ im.
- fusca*, Burm. Handb. ii. 800; Her.-Schæf. 346; Sieb. Beitr. xii. 3; [misprinted *fusa*, Walk. Cat. 541, in synon.]= *Leptophlebia respertina*.
- || *fusca*, ! Walk. Cat. 568; Hag. Am. Syn. 45= *Heptagenia*, im.
- fuscata*, Lin., in *Ephemera*; ! Ste. Ill. vi. 66= *binoculatus*, ♂ im.

## BAETIS (continued).

- fuscata*, ! Walk. Cat. 570; Hag. Am. Syn. 47 = *Ephemerella invaria*, im. ♂, & subim.
- ? *fuscus*, Schn.; in *Cloe*, Schn.
- gigantea*, Hag. & Pict. Org. Reste im Bernst. ii. 75; incertæ sedis.
- grossa*, Hag. & Pict. Org. Reste im Bernst. ii. 75; incertæ sedis.
- guttata*, Pict. Ephem. 187, pl. xxiv. 3; Walk. Cat. 559 = *Heptagenia*, ♀ im.
- horaria*, ! Ste. Ill. vi. 66; a *Cloeon*, ♀ subim., indeterminable.
- ignava*, ! Hag. Am. Syn. 47 = *Leptophlebia cupida*, ♀ subim.
- ignota*, ! Walk. Cat. 571 = *Isonychia*, ♂ im.
- interlineata*, Walsh, Proc. Ent. Soc. Philad. ii. 188; [for *Siphlurus femoratus*, Walsh, if distinct from *S. femoratus*, Say].
- interpunctata*, Say, Journ. Acad. Nat. Sc. Philad. viii. 41; Pict. Ephem. 194; Walk. Cat. 562; Le Conte, rep. ii. 411; Hag. Am. Syn. 44 = *Heptagenia*.
- invaria*, ! Walk. Cat. 568; Hag. Am. Syn. 48 = *Ephemerella*, ♂ im.
- iridana*, Kolen. Wien. Ent. Monatschr. iv. 383 = *Heptagenia*.
- lateralis*, Curt. Phil. Mag. 1834, p. 121; ! Ste. Ill. vi. 65; Pict. Ephem. 175, pl. xxi.; Walk. Cat. 557; Hag. Brit. Syn. 28 = *Heptagenia*.
- longicauda*, ! Ste. Ill. vi. 63; Pict. Ephem. 193; Walk. Cat. 560 = *Heptagenia*.
- ‡ *longicauda*, Hag. Brit. Syn. 24 = *Heptagenia flavigennis*, ♀ im.
- ‡ *longicauda*, ! Ronalds, ed. v. pl. ix. = *Heptagenia venosa*, ♀ im.
- longipes*, Hag. Verh. zool.-bot. Ver. Wien, 1854, p. 7; Hag. & Pict. Org. Rest. im Bernst. ii. 76; incertæ sedis.
- luridipennis*, Burm. Handb. ii. 801; Pict. Ephem. 192; ! Walk. Cat. 563, ♂ im.; Hag. Am. Syn. 49 = *Heptagenia*.
- lutea*, Hag. Brit. Syn. 23 = *Heptagenia elegans*.
- luteolus*, Mül.; in *Ephemera*, Mül.; ! Etn. Ent. Mo. Mag. v. 88 = *Centroptilum*.
- marginalis*, Burm. Handb. ii. 801; Her.-Schaf. 346; Sieb. Beit. xii. 3;—description = *Heptagenia elegans*? — [reference = *Potamanthus luteus*?]
- melanonyx*, Pict.; in *Cloe*, Pict.; *Cloeon*, Walk.
- mellea*, Curt. Phil. Mag. 1834, p. 121 = *Potamanthus luteus*, subim.
- montana*, Pict. Ephem. 172, pl. xx. 3; Walk. Cat. 557; Brau. N. Aust. 26; Ausser. Neur. Tirol. 134 = *Heptagenia*, ♂ im.
- ‡ ? *montana*, Hag. Brit. Syn. 26 = *Heptagenia insignis*, im.
- niger (nigra)*, Lin.; in *Ephemera*, Lin.; Ste. Ill. vi. 67; (Ronalds, ed. i. pl. ix. 16-17 [? 17, type]); ! Etn. Trans. Ent. Soc. 1870, p. 6.
- ? *nigra*, Hag. Stet. Ent. Zeit. xxvi. 229 = *Heptagenia*?
- noveboracana*, Licht.; in *Ephemera*, Licht.; Hag. Am. Syn. 50 = *Heptagenia luridipennis*?
- obesa*, Say, Journ. Acad. Nat. Sc. Philad. viii. 43; Pict. Ephem. 195; Walk. Cat. 563; Le Conte, rep. ii. 412; Hag. Am. Syn. 45 = *Bætisca*, subim.
- obscura*, ! Ste. Ill. vi. 65; Walk. Cat. 558 = *Ephemerella ignita*, ♀ im.
- ‡ *obscura*, Hag. Brit. Syn. 27; ? Pict. Ephem. 182, pl. xxiii. 1 = *Heptagenia lateralis*, ♂ im.

BAETIS (*continued*).

- phaeops*, ! Etn. Trans. Ent. Soc. 1870, p. 4.
- pictus*, ! nov. sp.
- Picteti*, Meyer-Dür, Mitt. Schw. Ent. Ges. i. 221= *Heptagenia*, subim.
- posticatus*, Say; in *Cloeon*, Say; *Cloe*, Hag.
- procellaria*, Fuessly, in *Ephemera*; Hag. Stet. Ent. Zeit. xxvi. 229; sp. incertæ sedis.
- propinquus*, Walsh; in *Cloe* (B), Walsh.
- pumilus*, Burm.; in *Cloe*, Burm.; *Cloeon*, Walk.
- purpurascens*, Piet. Ephem. 174, pl. xx. 4; Walk. Cat. 557; Brau. N. Aust. 26; Ausser. Neur. Tirol. 135= *Heptagenia venosa* ?
- pygmaeus*, Hag.; in *Cloe*, Hag.
- remota*, Walk. Cat. 564= *Coloburus humeralis*, im.
- reticulata*, Burm. Handb. ii. 801; Her.-Schæf. 346; Piet. Ephem. 192; Sieb. Beit. xii. 3; Walk. Cat. 561= *Leptophlebia helvipes*, subim. ?
- Rhodani*, ! Piet.; in *Cloe*, Piet.; *Cloeon*, Walk.
- scambus*, ! Etn. Trans. Ent. Soc. 1870, p. 3.
- scita*, ! Walk. Cat. 570= *Leptophlebia*.
- semicolorata*, Curt. Phil. Mag. 1834, p. 121; ! Ste. Ill. vi. 64, pl. xxix. 2, ♂ im.; Piet. Ephem. 178, pl. xxii. 4-9; Walk. Cat. 557; Hag. Brit. Syn. 26= *Heptagenia*.
- semitincta*, Piet. Ephem. 180, pl. xxii. 1-3; Walk. Cat. 558; Brau. N. Aust. 26; Ausser. Neur. Tirol. 133; (misprinted *semitireta* in Hag. Uebers. 368)= *Heptagenia semicolorata*, var. ? ?
- sicca*, Walsh, Proc. Acad. Nat. Sc. Philad. 1862, p. 371, Proc. Ent. Soc. Philad. ii. 170, 191, Notes 9, 10, 192, Note 11= *Siphlurus*.
- speciosus*, Pod.; in *Ephemera*, Pod.; sp. incerta.
- straminea*, Curt. Phil. Mag. 1834, p. 121= *Heptagenia elegans*, subim. *sicca*.
- striata*, ! Ste. Ill. vi. 65= *phaeops*, ♀.
- subfuscata*, ! Ste. Ill. vi. 64; Piet. Ephem. 194; Walk. Cat. 561= *Heptagenia longicauda*, ♀ im.
- sulphurea*, Piet. Ephem. 185, pl. xxiii. 3; Walk. Cat. 558; Ausser. Neur. Tirol. 134= *Heptagenia elegans*, ♂ im. ?
- sylvicola*, ! Ed. Piet. Nevr. d'Esp. 24, pl. iii. 7-12= *Heptagenia*, im.
- Taprobanes*, ! Walk. Cat. 567; Hag. Ceyl. Syn. 476= *Leptophlebia*, ♂ im.
- tenax*, ! Etn. Trans. Ent. Soc. 1870, p. 5; ♂ im.
- tessellata*, ! Walk. Cat. 566= *Heptagenia vicaria*, ♀ subim. ?
- || *tessellata*, Hag. Am. Syn. 50= either a *Heptagenia*, or *Leptophlebia Colombæ*, ♀ subim.; (preserved in alcohol).
- torrida*, ! Walk. Cat. 571= *Heptagenia*, ♀ im.
- undatus*, Piet.; in *Cloe*, Piet.; *Cloeon*, Walk.
- unicolor*, Hag.; in *Cloe*, Hag.
- venosa*, ! Ste. Ill. vi. 63; Burm. Handb. ii. 801; Her.-Schæf. 346; Piet. Ephem. 167, pl. xx. 1; Sieb. Beit. xii. 3; Walk. Cat. 556; Brau. N. Aust. 26; Hag. Brit. Syn. 22; Meyer-Dür, Mitt. Schw. Ent. Ges. i. 221; ! Hag. An. Soc. Ent. Fr. 1864, p. 38; Oul. 1867, p. 27; Ausser. Neur. Tirol. 133= *Heptagenia*.

## BAETIS (continued).

*verna*, ! Ste. Ill. vi. 66=*pheops*.

*vernus*, Curt. Phil. Mag. 1834, p. 121=*praece*.?

? *verticis*, Say, Journ. Acad. Nat. Sc. Philad. viii. 42; Walk. Cat. 562  
Le Conte, rep. ii. 412; Hag. Am. Syn. 46; Walsh, Proc. Ent. Soc. Philad. ii. 204, Note 19.

*vicaria*, ! Walk. Cat. 565; Hag. Am. Syn. 48=*Heptagenia*, ♂ im.

*zebrata*, ! Hag. An. Soc. Ent. Fr. 1864, p. 38=*Heptagenia*, ♂ subim. ♀ im.

XVII. BAETISCA, Walsh; in *Baetis*, Say. Typ. *B. obesa*.

*obesa*, Say, in *Baetis*, Say; ! Walsh, Proc. Acad. Nat. Sc. Philad. 1862, p. 378; Proc. Ent. Soc. Philad. ii. 187, iii. 200-6, fig.

BRACHYCERCUS, Curt. (1834)=*Cænis*, Ste. (1835-6), p.

*chironomiformis*, Curt. Phil. Mag. 1834, p. 122=*Cænis*.

*Harrisella*, Curt. ib.; (Har. Exp. pl. vi. 1-3)=*Cænis luctuosa*, ♀, ?

*minima*, Curt. ib.=*Cænis dimidiata* ?

BRACHYPHLEBIA, Westw. (1840)=*Baetis*, Leach (1815).

*bioculata*, ! Westw. Intr. ii. 25, Add. to Gen. Syn. 158=*Baetis binocularis*, ♂ im.

XV. CÆNIS, Ste. (1835-6); in *Ephemera*, Lin.; *Brachycercus*, Curt.; *Oxycypha*, Burm. Typ. *C. macrura*.

*amica*, Hag. Am. Syn. 55=*diminuta*, ♂ im. ?

*argentata*, Pict. Ephem. 279, pl. xlivi. 6; Walk. Cat. 581; ♀ subim.

*brevicauda*, ! Ste. Ill. vi. 61; Pict. Ephem. 286; Walk. Cat. 582=*dimidiata*, ♀ im.

*chironomiformis*, Curt. in *Brachycercus*; ! Ste. Ill. vi. 62; ♀ im. (misprinted *chironoformis*, Hag. Brit. Syn. 11, in synon.).

*dimidiata*, ! Ste. Ill. vi. 61; Pict. Ephem. 286; Walk. Cat. 582; Hag. Brit. Syn. 12; Oul. 1867, p. 27; im.

*diminuta*, ! Walk. Cat. 584; Hag. Am. Syn. 55; ♂ im.

*discolor*, Burm.; in *Oxycypha*, Burm.

*grisea*, Pict. Ephem. 278, pl. xlv. 1, 2; Walk. Cat. 581; Brau. N. Aust. 25; Ausser. Neur. Tirol. 133=*macrura*.

*halterata*, Hag. Brit. Syn. 11=*chironomiformis*.

‡ *halterata*, ! Etn. Trans. Ent. Soc. 1868, pp. 279, 280, 281=*luctuosa*, ♂ im. & nymph.

*Harrisella*, Ste. Ill. vi. 61; Pict. Ephem. 286; Walk. Cat. 583=*luctuosa*, ♀.

*hilaris*, Say; in *Ephemera*, Say; Walk. Cat. 583; Hag. Am. Syn. 54; Walsh, Proc. Acad. Nat. Sc. Philad. 1862, p. 381, Proc. Ent. Soc. Philad. ii. 179.

*interrupta*, Ste. Ill. vi. 62; Pict. Ephem. 287; Walk. Cat. 583=*macrura*, ♀.

*lactea*, Burm.; in *Oxycypha*, Burm.; ! Pict. Ephem. 276, pl. xlivi. 1-4 & xliiv.; Walk. Cat. 581; Hag. Stet. Ent. Zeit. xxvi. 229=*chironomiformis*.

*luctuosa*, Burm.; in *Oxycypha*, Burm.; Pict. Ephem. 283, pl. xlv. 3; Walk. Cat. 582; Hag. Stet. Ent. Zeit. xxvi. 229.

*macrura*, Ste. Ill. vi. 60, pl. xxix. 1; Walk. Cat. 583; Hag. Brit. Syn. 10; ! Etn. Trans. Ent. Soc. 1868, pp. 279-82.

## CÆNIS (continued).

[*nigra*, Hag. MS., Walsh, Proc. Ent. Soc. Philad. ii. 179; not described.]  
*oophora*, Pict. Ephem. 284, pl. xlv. 4; Walk. Cat. 582; ♀ im.  
*pennata*, ! Ste. Ill. vi. 61; Pict. Ephem. 286; Walk. Cat. 583= *dimidiata*, ♀ .  
*perpusilla*, ! Walk. Cat. 585; Hag. Ceyl. Syn. 477; ♂ im.  
*sinensis*, ! Walk. Cat. 584= *Cloeon russulum*, ♂ im.  
*varicauda*, (Sav. 1817, pl. ii. 6, 7), Pict. Ephem. 281, pl. xlvi. 5; Walk. Cat. 581= *Tricorythus*, ♂ im. ♀.

III. CAMPUSURUS, Etn. 1868; in *Ephemera*, Perch.; *Palingenia*, auct. Typ. *C. latipennis*.

*albicans*, Perch.; in *Ephemera*, Perch.; *Palingenia*, Pict.; ♂ im.

*albifilum*, ! Walk.; in *Palingenia*, Walk.; ♂ im.

*curtus*, ! Etn. Ent. Mo. Mag. v. 84 [not described]= *Asthenopus*, ♂ im.

*cuspidatus*, ! nov. sp., ♂ im.

*latipennis*, ! Walk.; in *Palingenia*, Walk.; ♂ im.

? *puella*, Pict.; in *Palingenia*, Pict.; ♀ im.

*quadridentatus*, ! nov. sp., ♂ im.

XIX. CENTROPTILUM, Etn. 1869; *Baetis* (A), Etn. 1868. Typ. *C. luteolum*.

*lituratum*, Pict.; in *Cloe*, Pict.; *Cloeon*, Walk.

*luteolum*, Mül.; in *Ephemera*, Mül.; *Baetis*, Etn. 1868; ! Etn. Ent. Mo. Mag. vi. 132.

*pennulatum*, ! Etn. Trans. Ent. Soc. 1870, p. 2.

*stenoptyx*, ! nov. sp.

CHLOEON, Lubbock (1863)= *Cloeon*, Leach (1815).

*dimidiatum*, Lub. Trans. Lin. Soc. xxiv. 61-7, pls. xvii-xviii; id. xxv. 477-95, pl. lviii-lix. 18= *Cloeon russulum*.

*dipterum*, Lub. lib. cit. xxv. pl. lix. 19-21= *Cloeon dipterum*.

*Cloe*, Burm. (1839)= *Baetis* & *Cloeon*, Leach, 1815, & *Centroptilum*, Etn. 1869.

*affinis*, ! Ramb. Nevr. 298= *Cloeon dipterum*, im.

*albipennis*, ! Ste. in *Cloeon*; Pict. Ephem. 271= *Centroptilum luteolum*, ♂ im.

*alpina*, Piet. Ephem. 257, pl. xl. 5= *Baetis*, ♂ im.

*auliciformis*, ! Ronalds, v. No. 25 [misprint for *culiciformis*]= *Baetis*, [sp. indeterminable].

*autumnalis*, Curt. in *Cloeon*; Pict. Ephem. 270; vide *Baetis*.

*bioculata*, Lin., in *Ephemera*, L.; Pict. Ephem. 244, pl. xxxiv-v.; Hag. Am. Syn. 52 (teste Walk., sed vide Walk. Cat. 572), Stet. Ent. Zeit. xxvi. 229; Oul. 1867, p. 28= *Baetis binoculatus*.

*brunnea*, ! Ramb. Nevr. 298; Walk. Cat. 577, var. ? *halterata*; Ed. Pict. Nevr. d'Esp. 26= *Heptagenia lateralis*, ♂ subim.

*cingulata*, ! Ste. in *Cloeon*; Pict. Ephem. 271= *Leptophlebia fusca*, ♂ im.

*cognata*, ! Ste. in *Cloeon*; Pict. Ephem. 272= *Cloeon dipterum*, ♂ im.

*consueta*, Hag. Ceyl. Syn. 477; incert. gen. (Gen. XXII).

*culiciformis*, Lin., in *Ephemera*, L.; Pict. Ephem. 270; Hag. Am. Syn. 54= *Baetis*, sp. dub.

*dimidiata*, Curt. in *Cloeon*; Pict. Ephem. 272= *Cloeon russulum*.

## CLOE (continued).

- diptera*, Burm. Handb. ii. 798; Her.-Schaf. 346; ! Piet. Ephem. 266, pl. xlii.; Schn. Stet. Ent. Zeit. vi. 340; Cal. (1848); Sieb. Beit. xii. 3; Brau. N. Aust. 26; ! Hag. An. Soc. Ent. Fr. 1864, p. 39, and Ent. Mo. Mag. ii. 25; Ed. Piet. Nevr. d'Esp. 25; Oul. 1867, p. 27; Ausser. Neur. Tirol. 135= *Cloeon dipterum*.
- † *diptera*, Ronalds, v. No. 16= *Baetis niger*, subim.
- dubia*, Walsh, Proc. Acad. Nat. Sc. Philad. 1862, p. 380, Proc. Ent. Soc. Philad. ii. 178= *Cloeon*.
- fasciata*, Piet. Ephem. 262, pl. xli. 4; Hag. Am. Syn. (list) 304= *Baetis*, ♀ im.
- ferruginea*, Walsh, Proc. Acad. Nat. Sc. Philad. 1862, p. 379=? *Baetis*, im., subim.
- fluctuans*, Walsh, l. c., & Proc. Ent. Soc. Philad. ii. 178= *Baetis*, ♀ im.
- fusca*, Schn. Stet. Ent. Zeit. vi. 340=? *Baetis*, ♀ im.
- fuscata*, Piet. Ephem. 251, pl. xl. 1; Oul. 1867, p. 28= *Leptophlebia cineta*, ♂ im.
- halterata*, Burm. Handb. ii. 798; Her.-Schaf. 346; ! Ramb. Nevr. 299; (misprinted *hatterata* in Sieb. Beitr. xiii. 3)= *Centroptilum luteolum*, ♂ im.
- horaria*, Lin., in *Ephemera*, L.; Ramb. Nevr. 299; Piet. Ephem. 270; Oul. 1867, p. 29=? *Cænis dimidiata*.
- hyalinata*, ! Ste., in *Cloeon*, Ste.; Piet. Ephem. 271= *Centroptilum luteolum*, ♀ im.
- litura*, Piet. Ephem. 260, pl. xli. 1-3= *Centroptilum*.
- maderensis*, ! Hag. Ent. Mo. Mag. ii. 25= *Baetis Rhodani*.
- marginalis*, Hag. Ceyl. Syn. i. 477, ii. 206; incert. sed. (Gen. XXII, ♀).
- melanonyx*, Piet. Ephem. 258, pl. xl. 6= *Baetis*, ♂ im.
- mendax*, Walsh, Proc. Acad. Nat. Sc. Philad. 1862, p. 381, & Proc. Ent. Soc. Philad. ii. 178= *Cloeon*.
- mollis*, ! Hag. Am. Syn. 52 [not described]= *Leptophlebia*, ♂ im.
- obscura*, ! Ramb. Nevr. 297= *Cloeon*, ♀ subim.
- ochracea*, ! Ste., in *Cloeon*, Ste.; Piet. Ephem. 271= *Centroptilum luteolum*, ♀ im.
- posticata*, Say, in *Cloeon*, Say; Hag. Am. Syn. 53= *Baetis*, ♂ im.
- propinqua*, Walsh, Proc. Ent. Soc. Philad. ii. 207; [for *vicina*, Walsh]= *Baetis*.
- pumila*, Burm. Handb. ii. 799; Her.-Schaf. 346; Piet. Ephem. 253, pl. xl. 2; Sieb. Beit. xii. 3; Brau. N. Aust. 26; ! Hag. An. Soc. Ent. Fr. 1864, p. 39; Meyer-Dür, Mitt. Schw. Ent. Ges. i. 221; Ausser. Neur. Tirol. 136= *Baetis*.
- † *pumila*, Hag., in *Cloeon*; Oul. 1867, p. 28= *Baetis binoculatus*.
- † *pumila*, ! Ramb. Nevr. 298= *Cloeon russulum*, ♂ im.
- pygmaea*, Hag. Am. Syn. 54; Walsh, Proc. Ent. Soc. Philad. ii. 178= *Baetis*, ♀ im.
- Rhodani*, ! Piet. Ephem. 248, pl. xxxvi-ix.; Brau. N. Aust. 26; ! Hag. An. Soc. Ent. Fr. 1864, p. 39; Meyer-Dür, Mitt. Schw. Ent. Ges. i. 221; ?, Oul. 1867, p. 28; Ausser. Neur. Tirol. 136= *Baetis*.

## CLOE (continued).

- signata*, Hag. Ceyl. Syn. i. 477, ii. 206; incert. gen. (Gen. XXII.)
- solida*, Hag. Ceyl. Syn. i. 477; incert. gen. (Gen. XXII. ♀).
- striata*, Lin., in *Ephemera*, L.; Pict. Ephem. 270; Oul. 1867, p. 28= *Baetis pumilus*, ?; vide *Ephemera*.
- subinfuscata*, ! Ramb. Nevr. 298; Walk. Cat. 577 (var. ? *halterata*) = *Cloeon*, ♀ subim.
- translucida*, ! Pict. Ephem. 255, pl. xl. 3, 4= *Centroptilum luteolum*, im.
- tristis*, Hag. Ceyl. Syn. i. 476; incert. gen. (Gen. XXII, ♀ subim.).
- undata*, Pict. Ephem. 264, pl. xli. 5; Hag. Am. Syn. 53= *Cloeon* ?, ♂ im.
- unicolor*, Curt., in *Cloeon*, Curt.; Burm. Handb. ii. 798; Pict. Ephem. 271; Sieb. Beit. xii. 3= *Cloeon*, sp. dub.
- || *unicolor*, Hag. Am. Syn. 54; ? Walsh, Proc. Acad. Philad. 1862, p. 380, & Proc. Ent. Soc. Philad. ii. 178= *Baetis*.
- verna*, Curt., in *Cloeon*, Curt.; Pict. Ephem. 270= *Baetis phœops* ?
- vespertina*, Lin., in *Ephemera*, L.; Oul. 1867, p. 29= *Leptophlebia* ?
- vicina*, Hag. Am. Syn. 54; Walsh, Proc. Ent. Soc. Philad. ii. 178= *Clocon*.
- ‡ *vicina*, Walsh, Proc. Acad. Nat. Sc. Philad. 1862, p. 380, & Proc. Ent. Soc. Philad. ii. 207, Note 20= *Baetis propinquus*.
- virgo*, ! Ste., in *Cloeon*, Ste.; Pict. Ephem. 272= *Cloeon dipterum*, ♂ im.
- XVIII. CLOEON, Leach (1815); in *Ephemera*, Lin.; Cloe, Burm. p.; *Cloeopsis*, Etn., olim. Typ. *C. dipterum*.
- albipenne*, ! Ste. Ill. vi. 69; *albipennis*, Walk. Cat. 579= *Centroptilum luteolum*, ♂ im.
- alpina*, Pict., in *Cloe*; Walk. Cat. 574= *Baetis*.
- autumnalis*, Curt., in *Baetis*, Curt.; Walk. Cat. 578; vide *Baetis*.
- bioculata*, L., in *Ephemera*, L.; Walk. Cat. 572, 1 a-f= *Baetis binoculatus*.
- ‡ *bioculatum*, Hag. Brit. Syn. 31; ! Etn. An. & Mag. Nat. Hist. 1866, p. 147= *Centroptilum luteolum*.
- cingulata*, Ste., in *Baetis*, Ste.; Walk. Cat. 578= *Leptophlebia fusca*, ♂ im.
- cognatum*, ! Ste. Ill. vi. 69; *cognata*, Walk. Cat. 579= *dipterum*, ♂ im.
- consobrinum*, ! Ste. Ill. vi. 69= *dipterum*, ♂ im.
- culiciformis*, ! Walk. Cat. 576= *Leptophlebia helvipes*, ♀ im.
- debilis*, ! Walk. Trans. Ent. Soc. N. S. v. 199= *Baetis*, ♀ im.
- dimidiatum*, Curt. Phil. Mag. 1834, p. 121; Hag. Brit. Syn. 32; *dimidiata*, Walk. Cat. 580= *russulum*.
- ‡ *dimidiatum*, ! Ste. Ill. vi. 69= *dipterum*, ♂ im.
- dipterum*, Lin., in *Ephemera*; Leach, E. Enc. ix. 137; Curt. Phil. Mag. 1834, p. 121; ! Ste. Ill. vi. 68, pl. xxix. 3; Hag. Brit. Syn. 29; *diptera*, Walk. Cat. 575.
- discolor*, Burm., in *Cloe*; Walk. Cat. 577= *Cœnis*.
- dubium*, Walsh; in *Cloe* (C), Walsh.
- fasciata*, Pict., in *Cloe*; Walk. Cat. 575= *Baetis* ?.
- fuscata*, Walk. Cat. 573= *Leptophlebia cincta*.
- halterata*, Burm., in *Cloe*; Walk. Cat. 577= *Centroptilum luteolum*, ♂ im.
- horaria*, Lin., in *Ephemera*, Lin.; Walk. Cat. 576; vide *Ephemera*.

## CLOEON (continued).

- hyalinatum*, ! Ste. Ill. vi. 68; *hyalinata*, Walk. Cat. 579= *Centroptilum luteolum*, ♀ im.  
*litura*, Pict., in *Cloe*; Walk. Cat. 574= *Centroptilum*.  
*marmoratum*, Curt. Phil. Mag. 1834, p. 121= *dipterum*, ♀ im.  
*melanonyx*, Pict., in *Cloe*; Walk. Cat. 574= *Baetis*.  
*mendax*, Walsh; in *Cloe* (C), Walsh.  
*obscurum*, Curt. Phil. Mag. 1834, p. 121= *dipterum*, subim.  
 || *obscurum*, ! Ramb.; in *Cloe*, Ramb.; ♀ subim.  
*ochraceum*, ! Ste. Ill. vi. 68; *ochracea*, Walk. Cat. 578= *Centroptilum luteolum*, ♀ im.  
*pallida*, Leach, E. Enc. ix. 137; Sam. E. Comp. 259= *dipterum*.  
*posticata*, Say, W. Q. R. ii. 162; Le Conte, repr. i. 172= *Baetis*, ♂ im.  
*pumila*, Burm., in *Cloe*; Walk. Cat. 573= *Baetis*.  
 † *pumilum*, Hag. Brit. Syn. 33; ! Etn. An. & Mag. Nat. Hist. 1866, p. 147  
     = *Baetis binoculatus*.  
*Rhodani*, Pict., in *Cloe*; Walk. Cat. 573; Hag. Brit. Syn. 31; ! Etn. An. & Mag. Nat. Hist. 1866, p. 147= *Baetis*.  
*russulum*, Mül.; in *Ephemera*, Mül.  
*simile*, ! Etn. Trans. Ent. Soc. 1870, p. 2.  
*striata*, Lin., in *Ephemera*; Walk. Cat. 576= *Baetis pumilus*?  
*subinfuscatum*, ! Ramb.; in *Cloe*, Ramb.; ♀ subim.  
*translucida*, Pict., in *Cloe*; Walk. Cat. 574= *Centroptilum luteolum*.  
*undata*, Pict., in *Cloe*; Walk. Cat. 575= *Baetis*.  
*unicolore*, Curt. Phil. Mag. 1834, p. 121; ! Ste. Ill. vi. 69; *unicolor*, Walk. Cat. 579= sp. *anceps*.  
*verna*, Curt. Phil. Mag. 1834, p. 121; ! Ste. Ill. vi. 69; ! Walk. Cat. 578= *Baetis phœops*, ♂ im.  
*vicinum*, Hag.; in *Cloe*, Hag.  
*virgo*, ! Ste. Ill. vi. 70; Walk. Cat. 580= *dipterum*, ♂ im.  
*vitripennis*, Blanch.; in *Ephemera* (*Cloe*), Blanch.  
 CLOEOPSIS, Etn. (1866)= *Cloeon*, Leach.  
*diptera*, Etn. An. & Mag. Nat. Hist. 1866, p. 146= *Cloeon dipterum*.  
*diptera*, var., Etn. op. cit. 1867, p. 401= *Cloeon russulum*.  
 XXIV. COLOBURUS, Etn. (1868); in *Palingenia*, Walk. Typ. *C. humeralis*.  
*haleuticus*, ! nov. sp., ♂ im.  
*humeralis*, ! Walk.; in *Palingenia*, Walk.  
 XXV. CRONICUS, nov. gen.  
*anomalus*, Pict.; in *Baetis*, Pict.  
 ECDYURUS, Etn. (1868); [mis-spelt *Ecdyonurus*]= *Heptagenia*.  
*venosus*, Fab., in *Ephemera*, Fab.; Etn. Trans. Ent. Soc. 1868, p. 141, n.  
 X. EPHEMERA, Lin. 1735; Sam. 1819; Piet. 1843-5; Hag.; Brau.;  
     Walsh; Houghton, 1865; Etn. = *Ephemera*, Lin. c.  
     3-set. p. Typ. *E. vulgata*.

## EPHEMERA (continued).

- albicans*, Perch. vi. pl. iv. 1= *Campsurus*, ♀ im.
- albipennis*, Retz. n. 181= *Leptophlebia vespertina*.
- || *albipennis*, Atk. Zool. i. 272-5= *Cænis dimidiata*.
- || *albipennis*, Fab. E. S. III. i. 70= *Leptophlebia cincta*.
- ‡ *albipennis*, Voigt, v. 310; Blanch. H. N. iii. 54, pl. iii. 1; Ramb. Névr. 296= *Polymitarcys virgo*.
- ‡ *albipennis*, Walek. ii. 9; Lat. H. N. xiii. 98?= *Baetis culiciformis*.
- alipes*, Scop. E. Carn. 264; Vill. iii. 22; Ol. Enc. Meth. vi. 421= *Centroptilum luteolum*, ♂ subim.?
- angustipennis*, ! Ramb. Névr. 295; Walk. Cat. 571= *Heptagenia*, subim. ♀.
- annulata*, Mül. Pr. 143= *Cloeon dipterum*.
- || *annulata*, Pz. Explie. Schæf. Ic. elvi.= *Baetis*, sp. anceps.
- apicalis*, ! Ste. Ill. vi. 59= *Ephemerella ignita*, ♂ im.
- astrostoma*, Web. 99= *Hexagenia*?, subim.
- australis*, ! Walk. Cat. 538= *Leptophlebia*.
- berolinensis*, Mül. Pr. 143, n.= *Heptagenia venosa*?
- bioculata*, Lin. (Act. Ups. 27); (i. F. S. 751); x. S. N. i. 547; ii. F. S. 1473; (Geof. ii. 239.5, pl. xiii. 4); Mül. F. Frid. 556; Lin. xii. S. N. 906; Georg. Bem. i. 190; Fab. S. E. 304 & Sp. In. i. 384; Thumb. 81; Fab. Mant. i. 244; Vill. iii. 18; Gmel. 2629; Ol. Enc. Meth. vi. 419; Fab. E. S. III. i. 70; Schr. F. B. II. ii. 199; Ced. 134; Walek. ii. 9; Lat. H. N. xiii. 97; Shaw, pl. lxxxi.; Lam. ed. 1, iv. 221; Stew. Elem. II. ii. 225; Guer. Ic. ii. pl. ix. 9; Grif. ii. pl. xciv. 9; Zet. 1046; Westw. Intr. ii. 25; Blanch. H. N. iii. 54= *Baetis binocularis*.
- ‡ *bioculata*, Fourc. E. Par. ii. 352= *Baetis phœops*, subim.?
- ‡ *bioculata*, Pz. Explie. Schæf. Ic. cxxix.= *Heptagenia fluminum*.
- ‡ *bioculata*, var., Pz. Explie. Schæf. Ic. cxxix. & F. Germ. heft. xciv. 17= *Heptagenia elegans*?
- ‡ *bioculata*, Röm. 23, pl. xxiv. 7= *præc.*?
- brevicauda*, Fab. E. S. III. i. 69; Walek. ii. 9; Lat. H. N. xiii. 96; Zet. 1045= *Cænis macrura*, ♀ subim.?
- ‡ *brevicauda*, Blanch. H. N. iii. 54= *Cænis luctuosa*.
- [*cellulosa*, Hag.= *Dictyonoeura*.]
- chlorotica*, ! Ramb. Névr. 296; Walk. Cat. 540= *Potamanthus luteus*, ♂ subim.
- cincta*, Retz. n. 182; (De G. Mem. ii. 650, pl. xvii. 17-18)= *Leptophlebia*.
- cognata*, ! Ste. Ill. vi. 56; Curt. B. E. xv. 708= *danica*.
- Colombiæ*, ! Walk. Cat. 537= *Leptophlebia*, ♀ subim.
- communis*, Retz. n. 180= *vulgata*.
- culiciformis*, Lin. (i. F. S. 753); x. S. N. i. 547; ii. F. S. 1475; (Pod. Mus. Gr. 98, pl. i. 10, ?; or is this *Leptophlebia marginata*?); Scop. E. Carn. 264; (Geof. ii. 240. 6); Lin. xii. S. N. 907; Fab. S. E. 304; Mül. Pr. 143; Fab. Sp. In. 385; Thumb. 81; Fourc. E. Par. ii. 352; Fab. Mant. i. 244; Berk. Syn. i. 150; Vill. iii. 20; Gmel. 2630; Ol. Enc. Meth. vi. 420 (excl. note); Fab. E. S. III. i. 71; Lat. H. N. xiii. 98, ?; Stew. Elem. II. ii. 225; Zet. 1046; Schi. Berl. E. Zeit. iii. 143= *Baetis*, sp. anceps.

## EPHEMERA (continued).

[*† culiciformis*, Hill, Dec. pl. vii.=*Perla*.]

*† culiciformis*, Ol. Enc. Meth. vi. 420, n.; Lat. H. N. xiii. 98?= *Baetis binoculatus*.

*† culiciformis*, Blanch. H. N. iii. 55= *Cloeon russulum*.

*† culiciformis*, Fonseca. An. Soc. Ent. Fr. 1816, p. 49= *Cloeon dipterum*.

*† culiciformis*, Scop. E. Carn. 264= *Centroptilum lituratum*.

*cupida*, Say, W. Q. R. ii. 163; Le Conte, rep. i. 172= *Leptophlebia*.

*danica*, Mül. F. Frid. 63, & Pr. 142; Vill. iii. 18; (Ronalds I., pl. xiii. 28-29); Walk. Cat. 535; Hag. Brit. Syn. 15.

*† danica*, Pict. Ephem. 130, pl. vii.; Oul. 1867, p. 26= *lineata*.

*† danica*, Ronalds V., No. 31= *vulgata*.

*decora*, ! Walk. Cat. 537; Hag. Am. Syn. 38; Walsh, Proc. Acad. Nat. Sc. Philad. 1862, p. 376, & Proc. Ent. Soc. Philad. ii. 177= *gut-tulata*.

*diaphana*, Mül. Pr. 143= *Baetis binoculatus*, ♂.

*diluta*, Ste. Ill. vi. 58= *Ephemerella ignita*.

*diptera*, Lin. ii. F. S. 1477; (Reaum. vi. pl. xlv.); (Pontop. Nat. Dan. 223, pl. xvii. ?); Lin. xii. S. N. 907, diag., nec obs.; (De G. Mem. ii. 656, pl. xviii. 1-9); Fab. S. E. 304, & Sp. In. i. 385; Retz. n. 184; Thunb. 81; Fab. Mant. i. 244; Raz. 210; Vill. iii. 20; (Zsch. i. 51, No. 19); Gmel. 2630; Ros. F. Etr. ii. 9; Ol. Enc. Meth. vi. 420; Fab. E. S. III. i. 71; Schr. F. B. II. ii. 199; Lat. H. N. xiii. 99; Shaw, 253; Lat. Gen. iii. 184; Leach, E. Enc. ix. 137, inter syn.; Cuv. R. A. ed. i., iii. 430; Lamarck, ed. i., iv. 221; Sam. E. Comp. 259; Cuv. R. A. ed. ii., 244; Blanch. R. A. (ed. Crochard) xiii. 92; Zet. 1046; Voigt, v. 311; Blanch. H. N. iii. 55; Duf. Rech. 580, note; Lat. Nouv. Dict. H. N. x. 349; Verl. Mem. 49, pl. i= *Cloeon dipterum*.

*dislocans*, ! Walk. Trans. Ent. Soc. N. S. v. 198= *Leptophlebia*, ♀ im.

*dispar*, ! Ste. Ill. vi. 58= *Leptophlebia helvipes*, im. & subim.

*dubia*, ! Ste. Ill. vi. 59= *Baetis phœops*, ♂ im.

*erythrophthalma*, Schr. F. B. II. ii. 197= *Ephemerella ignita*, ♂ im.

*exspectans*, ! Walk.; in *Potamanthus*, Walk.; ♀ subim.

*familiaris*, Schr. F. B. II. ii. 200, indeterminable.

*fasciata*, ! Hag.; in *Potamanthus*, Hag.

*ferruginea*; (Zsch. i. 50, No. 18); Gmel. 2630; Ol. Enc. Meth. vi. 422= *Heptagenia elegans*?

[*fimbriata*, Bremi, MS.; Hag. Stet. Ent. Zeit. xxvi. 229; not described.]

*flava*, Schr. Beyt. 82, & En. n. 605; Vill. iii. 22; Ol. Enc. Meth. vi. 421; Schr. F. B. II. ii. 200= *Baetis binoculatus*.

*flareola*, Walsh, Proc. Acad. Nat. Sc. Philad. 1862, p. 377, & Proc. Ent. Soc. Philad. ii. 178.

*flavicans*, ! Ramb. Névr. 296; Walk. Cat. 536, ? var.= *Potamanthus luteus*, ♀ im.

*flavipennis*, Duf. Réch. 580, n.= *Heptagenia*, ♀ subim.

*flosaque*, Illig. Mag. i. 187; Triepke, Stet. Ent. Zeit. i. 54-8= *Palingenia longicauda*.

*fuliginosa*, Georg. (1802), p. 324= *Palingenia longicauda*.

## EPHEMERA (continued).

*fusca*, Curt. Phil. Mag. 1834, p. 120 = *Leptophlebia*.

† *fusca*, ! Ste. Ill. vi. 58 = *Ephemerella ignita*, ♂ im.

*fuscata*, Lin. ii. F. S. 1474; Mül. F. Frid. 557; Lin. xii. S. N. 907; Thunb. 81; Vill. iii. 19; Gmel. 2629; Ol. Enc. Meth. vi. 419; Fab. E. S. III. i. 70; Walck. ii. 9; Lat. H. N. xiii. 97 = *Baetis binocularis*.

*fusco-grisea*, Retz. n. 183 = *Heptagenia venosa*, subim.

*fuscula*, Schr. F. B. II. ii. 199 = *Heptagenia semicolorata*, subim. ?

*gemmata*, Scop. E. Carn. 264; Mül. Pr. 143; Vill. iii. 22; Ol. Enc. Meth. vi. 421 = *Heptagenia*, ♀ incert. sp.

[*gigantea*, Illig. Mag. i. 188; not described.]

*glaurops*, ! Pict. Ephem. 132, pl. viii. 1-3; Walk. Cat. 536; Brau. N. Aust. 25; Hag. Brit. Syn. 16 (excl. Brit. subim.); Meyer, Mitt. Schw. Ent. Ges. i. 221; Oul. 1867, p. 26; Ausser. Neur. Tirol. 132. .

*guttata*, Blanch. Chili. vi. 106, Atl. Névr. ii. 2; in § *Baetis*, Blanch. = *Heptagenia*, ♀ im.

*guttulata*, Pict. Ephem. 135, pl. viii. 4; Walk. Cat. 536.

*halterata*, Fab. Gen. 244, & Sp. In. 384, & Mant. i. 243; Vill. iii. 18; Gmel. 2629; Ol. Enc. Meth. vi. 418; Fab. E. S. III. i. 69; Schr. F. B. II. ii. 198; Lat. H. N. xiii. 95; Shaw, pl. lxxxii; Zet. 1045 = *Leptophlebia cincta*? (supposing Fabricius' specimen to have been mutilated).

*Hebes*, Walk. Cat. 538; Hag. Am. Syn. 39 = *Leptophlebia cupida*?

*helvipes*, ! Ste. Ill. vi. 59 = *Leptophlebia*, ♀ im.

*helvola*, Sulz. Gesch. 171, pl. xxiv. 7; Røem. Gen. pl. xxiv. 7 = *Heptagenia elegans*?

*hilaris*, Say, Journ. Acad. Nat. Se. Philad. viii. 43; Le Conte, repr. ii. 413 = *Cænus*.

*hispanica*, ! Ramb. Névr. 294; Walk. Cat. 535 (*vulgata*, var. ?); E. Pict. Névr. d'Esp. 23 = *danica*, ♂ im.

*horaria*, Lin. (Act. Ups. 27; i. F. S. 754); x. S. N. i. 547; ii. F. S. 1477; (Geof. ii. 240.8); Pontop. Nat. Dan. 223; Lin. xii. S. N. 907; Fab. S. E. 304; Mül. Pr. 143; Fab. Sp. In. i. 358; Fourc. E. Par. ii. 352; Fab. Mant. i. 244; Berk. Synop. i. 150; Vill. iii. 20; Gmel. 2630; Ros. F. Etr. 9; Ol. Enc. Meth. vi. 419; Fisch. Vers. 566; Fab. E. S. III. i. 71; Schr. F. B. II. ii. 199; Ced. 135; Walck. ii. 10; Lat. H. N. xiii. 98; Stew. Elem. II. ii. 226 ?, = *Cænus dimidiata*?

*hyalina*, Pz. Expl. Schæf. Ic. xlvi. = *Potamanthus luteus*.

*hyalinata*, Zet. 1044 = *Leptophlebia cincta*.

*ignita*, Pod. Mus. Gr. 97 = *Ephemerella*, ♂ im.

*immaculata*, ! nov. sp., ♂ im.

*inanis* (Zsch. i. 50, No. 15); Gmel. 2629; Ol. Enc. Meth. vi. 421 = *Leptophlebia cincta*, ♂ im. (the abdominal segments being counted from behind forwards).

*limbata*, ! Guer. Ic. ii. pl. lx. 7, & iii. 384; Gray, Grif. Cl. Ins. ii. pl. xciv. 7; ! Ramb. Névr. 295, pl. viii. 2 = *Hexagenia*, ♂ im.

[*limnobia* and *limosa*, Zet. MS., for *E. vespertina*, Zet.]

*lineata*, ! Etn. Trans. Ent. Soc. 1870, p. 1.

## EPHEMERA (continued).

*longicauda*, Ol. Enc. Meth. vi. 418; Lat. H. N. xiii. 96; Lamarck, ed. i., iv. 221; ! Ramb. Nevr. 295= *Palingenia*.

*lutea*, Lin.; (Geof. ii. 238.2); Lin. xii. S. N. 906; Fab. S. E. 303; (? Schæf. Ic. i. pl. xlvi. 7); Schr. En. 603; Fab. Sp. In. i. 383, & Mant. i. 243; Vill. iii. 17; Rœm. 23; (Zsch. i. 50, No. 14); Gmel. 2628; Ros. F. Etr. ii. 8; Ol. Enc. Meth. vi. 417; Fisch. Vers. 565; Fab. E. S. III. i. 68; Seetzen (1794); Schr. F. B. II. ii. 197; Walek. ii. 8; Lat. H. N. xiii. 95; Blanch. H. N. iii. 54; Duf. Rech. 580, n.= *Potamanthus luteus*.

‡ *lutea*, Pz. Expl. Schæf. Ic. clxxv.= *Polymitarcys virgo*.

‡ *lutea*, Fourc. E. Par. ii. 352= *Baetis binoculatus*.

‡ *lutea*, Sulz. Gesch. 171, pl. xxiv. 6; Rœm. xxiv. 6; Burm. Handb. ii. 804; ! Ramb. Nevr. 294; Her.-Schæf. 316; Sieb. Beit. xii. 3= *glaurops*, ♀ im.?

‡ *lutea*, ! Ste. Ill. vi. 55= *Heptagenia elegans*, ♂ im.

*luteola*, Mül. Pr. 143= *Centroptilum luteolum*, ♀ im.

*maculata*, Lin. v. S. N. 62= *vulgata*.

|| *maculata*, Pod. Mus. Gr. 97= *Heptagenia* (?) *venosa*, subim.

‡ *maculata*, Vill. iii. 22= *E. danica*, ♂ im.

[*madritensis*, ! Ramb. MS.= *Heptagenia angustipennis*, ♀ im. ?]

*marginata*, Lin. xii. S. N. 906; Fab. S. E. 303, & Sp. In. i. 384, & Mant. i. 243; Vill. iii. 17; Gmel. 2628; Ol. Enc. Meth. vi. 417; Fab. E. S. III. i. 69; Schr. F. B. II. ii. 198; Ced. 134; Walck. ii. 8; Lat. H. N. xiii. 95; Shaw, pl. lxxxii.; Stew. Elem. II. ii. 225, pl. xvii. 14, 15; ! Ste. Ill. vi. 57; Zet. 1044; Blanch. H. N. iii. 54= *Leptophlebia*, ♂ im.

‡ *marginata*, Mül. Pr. 142= *Potamanthus luteus*?

‡ *marginata*, Gor. & Prit. 61-9, pl. ii. 4-6; Bowerb. E. M. i. 239-44, pl. ii. 1-6; Lacord. ii. 77; Brullé, Blanch. H. N. i. pl. xxiv.= *Cloeon dipterum* (aquat.).

*marocana*, Fab. E. S. III. i. 69= *Polymitarcys* (?) *virgo*.

*minima*, Lin. v. S. N. 62; Mül. Pr. 142; Schr. F. B. II. ii. 198= *Cœnis dimidiata*?

*minor*, ! Ste. Ill. vi. 60= *Leptophlebia fusca*, ♀ im.

*mutica*, Lin. (i. F. S. 52); x. S. N. i. 547; ii. F. S. 1479; (Geof. ii. 240.7)= *Baetis pumilus*, ♂ subim.?

*myops*, Walsh, Proc. Ent. Soc. Philad. ii. 207, note 20; ♂ im.

*natata*, ! Walk.; in *Palingenia*, Walk.; Hag. Am. Syn. 39; Walsh, Proc. Ent. Soc. Philad. ii. 177= *guttulata*, ♀ subim.

*nervosa*, Vill. iii. 22= *Heptagenia venosa*.

*nigra*, Lin. ii. F. S. 1478; xii. S. N. 907; Fab. S. E. 304; (Schæf. Ic. ii. pl. cliv. 1, 2?); Schr. En. 606; Fab. Sp. In. 385, & Mant. i. 244; Vill. iii. 19; Gmel. 2629; Ros. F. Etr. ii. 8; Ol. Enc. Meth. vi. 419; Fab. E. S. III. i. 70; Ced. 135; Walck. ii. 9; Lat. H. N. xiii. 98; Pz. Expl. Schæf. Ic. cliv.; Stew. Elem. II. ii. 225; Ste. Ill. vi. 67; Blanch. H. N. iii. 54= *Baetis niger*, subim.

‡ *nigra*, Fourc. E. Par. ii. 352= *Leptophlebia cincta*, subim.

*nigrimana*, Duf. Rech. 580, n.= *Heptagenia* (♀, sp. ?) im.

## EPHEMERA (continued).

- notata* (Zsch. i. 50, No. 16); Gmel. 2630; Ol. Enc. Meth. vi. 422 = *Baetis binoculatus*, ♀ im.
- noreboracana*, Licht. Cat. Mus. Holth. iii. 193 = *Heptagenia luridipennis*?
- parrula*, Scop. E. Carn. 264; Vill. iii. 22; Ol. Enc. Meth. vi. 421 = *Centroptilum luteolum*?
- plumosa*, Mül. Pr. 142 = *Cænis* (sp. ?).
- procellaria*, Schwarz, Nomencl. Rœs. Ins. Bel. pl. xii. 1-3 = *Leptophlebia marginata*?
- [*procera*, Hag. = *Dictyoneura*.]
- pudica*, Hag. Am. Syn. 39; Walsh, Proc. Ent. Soc. Philad. ii. 177; ♀ subim.; incertæ sedis.
- [*pusilla*, Zet. MS. = *Cænis macrura*, ♀ subim. ?]
- reticulata*, Fourc. E. Par. ii. 350 = *Potamanthus luteus*.
- rosea*, ! Ste. Ill. vi. 59 = *Ephemerella ignita*, im.
- rufa*, ! Ramb. Nevr. 296 = *Heptagenia venosa*, ♀ im. ?
- rufescens*, ! Ste. Ill. vi. 59 = *Ephemerella ignita*, im.
- [*rupestris*, Hill, Dec. 8; a *Trichopteron*.]
- russula*, Mül. Pr. 143 = *Cloeon*, ♂ im.
- serica*, ! nov. sp.
- simulans*, ! Walk. Cat. 536; Hag. Am. Syn. 38 = *guttulata*, ♂ subim.
- speciosa*, Pod. Mus. Gr. 98; Schr. En. 604; Vill. iii. 22; Ol. Enc. Meth. vi. 418; Lat. H. N. xiii. 97 = *Baetis*, sp. incert.
- stigma* (Zsch. i. 50, No. 20); Gmel. 2630; Ol. Enc. Meth. vi. 422 = *Heptagenia lateralis* or *semicolorata*, subim. ?
- || *stigma*, ! Ste. Ill. vi. 56 = *Leptophlebia marginata*, ♂ im.
- striata*, Lin. xii. S. N. 907; Fab. S. E. 304, & Sp. In. i. 385, & Mant. i. 244; Berk. Syn. i. 150; Vill. iii. 20; Gmel. 2630; Ol. Enc. Meth. vi. 420; Fab. E. S. III. i. 71; Ced. 135; Lat. H. N. xiii. 99; Stew. Elem. II. ii. 226 = *Baetis pumilus*, ♂ im. ?
- ‡ *striata*, Mül. Pr. 143 = *Cloeon dipterum*, ♀ im.
- ‡ *striata*, Blanch. H. N. iii. 55 = *Cloeon russulum*, im. ?
- ‡ *striata*, Walck. ii. 10 = *Baetis binoculatus*, subim. ?
- submarginata*, ! Ste. Ill. vi. 58 = *Leptophlebia helvipes*, ♀ im.
- sulphurea*, Mul. Pr. 142 = *Heptagenia elegans*, ?
- Swammerdamiana*, Shaw, vi. pl. lxxxii. = seq.
- Swammerdiana*, ! Lat. H. N. xiii. 96, & Gen. iii. 184; Cuv. R. A. ed. 1, iii. 430; ed. ii. 244; Lamarck, ed. 1, iv. 221; Blanch. R. A. ed. Crochard, xiii. 91, & H. N. iii. 54 = *Palingenia longicauda*.
- talcosa*, ! Ste. Ill. vi. 57 = *Leptophlebia marginata*, ♀ im.
- testacea* (Zsch. i. 50, No. 17); Gmel. 2630; Ol. Enc. Meth. vi. 422 = *Baetis phœops* ?
- venosa*, (De G. Mem. ii. 625, pl. xviii. 1-4), Fab. S. E. 304, & Sp. In. i. 384; Thunb. 81; Fab. Mant. i. 243; Gmel. 2629; Ol. Enc. Meth. vi. 418; Fab. E. S. III. i. 70; Lat. H. N. xiii. 97 = *Heptagenia*.
- ‡ *venosa*, Zet. 1045, ♂ = *Siphlurus*, sp. incert.
- vespertina*, Lin. (It. Cœl. 21; i. F. S. 755); x. S. N. i. 547; ii. F. S. 1480; (Geof. ii. 239. 4); Lin. xii. S. N. 906; (De G. Mem. ii.

## EPHEMERA (continued).

646, pl. xvii. 11-16); Fab. S. E. 303, & Sp. In. i. 384, & Mant. i. 243; Berk. Synop. i. 150?; Vill. iii. 17; Gmel. 2628; Ros. F. Etr. ii. 8; Ol. Enc. Meth. vi. 417; Fab. E. S. III. i. 69; Schr. F. B. II. ii. 197; Ced. 134; Walck. ii. 9; Lat. H. N. xiii. 95; Stew. Elem. II. ii. 225; Zet. 1045; Westw. Introd. ii. fig. 61, 19 (gill)=*Leptophlebia* (aquat. ??), im.

*virgo*, Ol., (Clut. title p. fig. & pp. 61, 87, 90?; Mey. 197?; Targ. 1741, figs. 1, 4?; Reaum. vi. pls. xlii.-xlii.; Schaf. 1757, 1779, Ic. ii. pl. clxxv. 1-3; Abh. iii. 30 pgs. pl. i.); Ol. Enc. Meth. vi. 419; Lat. H. N. xiii. 98, & Nouv. Dict. H. N. x. pl. xix. 5= *Polymitarcys*.

*viridescens*, Fourc. E. Par. ii. 351= *Leptophlebia marginata*, subim.

*vitrea*, Zet. 1045= *Leptophlebia cincta*, im.

*ritripennis*, Blanch. Chili. vi. 107, Atl. Nevr. ii. 3; in *Ephemera* (Cloe), Blanch.= *Cloeon*.

*vulgata*, Lin. (i. F. S. 750; De G. Obs. 463, pl. xvii. 2); Lin. x. S. N. i. 546; Kr. (1760) 26; Lin. ii. F. S. 1472; Sulz. (1761) 43, pl. xvii. 103; Scop. E. Carn. 263 (diagn.), pl. xxxviii. 683; (Geof. ii. 238. 1); Mül. F. Frid. 63; Pont. Nat. Dan. 223; Schaf. Elem. pl. lxii. 1-3; Lin. xii. S. N. 906; Hout. (1766-9); (De G. Mem. ii. 621, pls. xvi.-xvii. 1-10); Georg. Bem. i. 190; Fab. S. E. 303; (Schaf. Ic. i. pl. ix. 5-6); Mül. Pr. 142; Schr. En. 602; Fab. Sp. In. i. 383; Thunb. 81; Fourc. E. Par. ii. 351; Fab. Mant. i. 243; Berk. Syn. i. 150; Vill. iii. 16; (Zsch. i. 50, No. 13); Gmel. 2628; Ros. F. Etr. ii. 7; Ol. Enc. Meth. vi. 417; Fisch. Vers. 564; Fab. E. S. III. i. 68; Schr. F. B. II. ii. 196; Ced. 134; Walck. ii. 8; Lat. H. N. xiii. 94; Pz. Expl. Schaf. Ic. ix. 5-6, & F. Germ. heft. xciv. 16; Shaw, vi. pl. lxxxii.; Lat. Gen. iii. 184; Leach, E. Enc. ix. 137; Cuv. R. A. ed. 1, iii. 430; Lamarck, ed. 1, iv. 221; Stew. Elem. II. ii. 225; Cuv. R. A. ed. 2, v. 244; Guer. Ic. ii. pl. ix. 8 (aquat.); Gray, Grif. Cl. Ins. ii. pl. xciv. 8 (aquat.); ! Ste. Ill. vi. 55; (Ronalds I., pl. xiv. 30-31); Dalhborn, 228; Perch. vi. pl. iv. 1m.; Burn. Handb. ii. 804; Zet. 1044; Voigt, v. 311; Her.-Schaf. 346; Blanch. H. N. iii. 53; Duf. Rech. 580, n.; Lat. Nouv. Dict. H. N. x. 348; Sieb. Beit. xii. 3; Walk. Cat. 534; Hag. Brit. Syn. 14; Stein, Berl. Ent. Zeit. vii. 414; Hag. Stet. Ent. Zeit. xxvi. 229.

† *vulgata*, Don. B. I. iv. 53, pl. cxxviii.; Sam. E. Comp. 260, pl. vii. 2; Wood, ii. 21-3, pl. xlvi.; Dum. Cons. Gen. 204, pl. xxviii. 4, 5; Blanch. R. A. ed. Crochard, xiii. 91, xiv. pl. cii. 1-e; Newport, Tod's Cyc. ii. 864, fig. 345; Westw. Introd. ii. fig. 61, 1 (the abdominal spots being reversed)-15; Blanch. H. N. iii. 53; ! Ramb. Nevr. 293; Piet. Ephem. 126, pls. i-vi.; Ronalds V. no. 28; Brau. N. Aust. 25; E. Piet. Névr. d'Esp. 22; Oul. 1867, p. 25; Ausser. Neur. Tirol. 131= *danica*.

† *vulgata*, Wagner, Isis, 1832, p. 332, pl. ii. 1= *Baetis* (aquat.).

XVI. EPHEMERELLA, Walsh (1862); in *Ephemera*, e. 3-set., Pod.; *Potamanthus*, Pict.; *Baetis*, Walker. Typ. *E. invaria*.

*œnea*, Pict.; in *Potamanthus*, Pict.

*consimilis*, Walsh, Proc. Acad. Nat. Sc. Philad. 1862, p. 378; ♂ im.

*excrucians*, ! Walsh, lib. cit., p. 377, & Proc. Ent. Soc. Philad. ii. 178= *invaria*.

*gibba*, Pict.; in *Potamanthus*, Pict.

*ignita*, Pod.; in *Ephemera*, Pod.

*invaria*, ! Walk.; in *Baetis*, Walk.

- EPHORON, Will.**  
*leukon*, Will. Trans. Am. Soc. Philad. v. 71-3 = *Baetis* ?  
**IX. EUTHYPOLOIA, nov. gen.** Typ. *E. Hecuba*.  
*Hecuba*, ! Hag.; in *Palingenia*, Hag.; ♀ im.  
**HEMEROBius, Clut. cap. viii. fig. & p. 100** = *Palingenia longicauda*.  
**XXVI. HEPTAGENIA**, Walsh (1863); in *Ephemera*, Poda; *Baetis*, Say;  
*Palingenia*, Walk. Typ. *H. flavescens*.  
*alpicola*, ! nov. sp.  
*angustipennis*, ! Ramb.; in *Ephemera*, Ramb.; *Baetis*, Ed. Pict.  
*annulifera*, ! Walk.; in *Palingenia*, Walk.  
*basalis*, ! Walk.; in *Baetis*, Walk.  
*Bellieri*, ! Hag.; in *Baetis*, Hag.  
*borealis*, ! nov. sp., ♂ im.  
*canadensis*, ! Walk.; in *Baetis*, Walk.  
*cruentata*, Walsh, Proc. Ent. Soc. Philad. ii. 205, note 19.  
*cupulata*, ! nov. sp.  
*determinata*, ! Walk.; in *Baetis*, Walk.  
*elegans*, Curt.; in *Baetis*, Curt.  
*flaveola*, Pict.; in *Baetis*, Pict.  
*flavescens*, ! Walsh; in *Palingenia* (C), Walsh.  
*flavipennis*, Duf.; in *Ephemera*, Duf.  
*fluminum*, Pict.; in *Baetis*, Pict.  
*fusca*, ! Walk.; in *Baetis*, Walk.  
*guttata*, Pict.; in *Baetis*, Pict.  
*insignis*, ! (Ronalds I. pl. xi. 22); Etn. Trans. Ent. Soc. 1870, p. 7.  
*interpunctata*, Say; in *Baetis*, Say; *Palingenia* (C), Walsh (1862).  
*iridana*, Kolen.; in *Baetis*, Kolen.  
*lateralis*, Curt.; in *Baetis*, Curt.  
*longicauda*, ! Ste.; in *Baetis*, Ste.  
*luridipennis*, Burm.; in *Baetis*, Burm.  
*maculipennis*, Walsh, Proc. Ent. Soc. Philad. ii. 206, note 19.  
*montana*, Pict.; in *Baetis*, Pict.  
*nigrimana*, Duf.; in *Ephemera*, Duf.; sp. dub.  
*nivata*, ! nov. sp.  
*Picteti*, Meyer-Dür; in *Baetis*, Meyer-Dür.  
*pulchella*, Walsh; in *Palingenia* (C), Walsh.  
*semicolorata*, Curt.; in *Baetis*, Curt.  
*simplex*, Walsh, Proc. Ent. Soc. Philad. ii. 204, note 19.  
*sylvicola*, ! Ed. Pict.; in *Baetis*, Ed. Pict.  
*tessellata*, Hag.; in *Baetis*, Hag.; incertæ sedis (perhaps a *Leptophlebia*).  
*torrida*, ! Walk.; in *Baetis*, Walk.  
*venosa*, Fab.; in *Ephemera*, Fab.; *Baetis*, Ste.  
*vicaria*, ! Walk.; in *Baetis*, Walk.  
*vitrea*, ! Walk.; in *Palingenia*, Walk.

## HEPTAGENIA (continued).

*volitans*, ! Etn. Trans. Ent. Soc. 1870, p. 7, ♂ im.  
*zebrata*, ! Hag.; in *Baetis*, Hag.

VIII. HEXAGENIA, Walsh (1863); in *Ephemera*, Web.; *Baetis*, Say;  
*Palingenia*, Pict.

*albivitta*, ! Walk.; in *Baetis*, Walk.

? *atrostoma*, Web.; in *Ephemera*, Web.

*bilineata*, Say; in *Baetis*, Say; *Palingenia*, Walsh, 1862.

*decolorata*, Hag.; in *Palingenia*, Hag.

*limbata*, ! Guer.; in *Ephemera*, Guer.; *Palingenia*, Pict.

XXIII. ISONYCHIA, nov. gen. Typ. *I. manca*.

*manca*, ! nov. sp.

*ignota*, ! Walk.; in *Baetis*, Walk.

II. LACHLANIA, Hag. (1868). Typ. *L. abnormis*.

*abnormis*, Hag. Proc. Bost. Soc. Nat. Hist. 1868, p. 372-4, fig.; ♀ im.

XII. LEPTOPHLEBIA, Westw. (1810); in *Ephemera*, Reaumur; *Baetis*, Ste.; *Potamanthus*, Pict.; *Palingenia*, Walk.

*annulata*, ! Hag.; in *Potamanthus*, Hag.

*auriculata*, ! nov. sp.; ♂ im.

*australiasica*, Pict.; in *Baetis*, Pict.

*australis*, ! Walk.; in *Ephemera*, Walk.

*castanea*, Pict.; in *Potamanthus*, Pict.

*cincta*, Retz.; in *Ephemera*, Retz.

*Colombiae*, ! Walk.; in *Ephemera*, Walk.; *Palingenia*, Hag.

*costalis*, Burm.; in *Baetis*, Burm.

*cupida*, Say; in *Ephemera*, Say; *Potamanthus*, Hag.

*dentata*, ! nov. sp.; ♂ im.

*dislocans*, ! Walk.; in *Ephemera*, Walk.

*femoralis*, Hag.; in *Potamanthus*, Hag.

*fusca*, Curt.; in *Ephemera*, Curt.; *Potamanthus*, Pict.

*furcifera*, ! nov. sp.; ♂ im.

*helvipes*, ! Ste.; in *Ephemera*, Ste.

*inconspicua*, ! nov. sp.; ♂ im.

*Krueperi*, Stein; in *Potamanthus*, Stein.

*marginata*, Lin.; in *Ephemera*, Lin.; *Potamanthus*, Hag.

*modesta*, ! Hag.; in *Potamanthus*, Hag.

*mollis*, ! Hag.; in *Cloe*, Hag. [not described].

*nebulosa*, ! Walk.; in *Palingenia*, Walk.

*nodularis*, ! nov. sp.; ♂ im.

*Picteti*, Etn.; for *Potamanthus* † *marginatus*, Pict.

*prisca*, Pict.; in *Potamanthus*, Hag. & Pict.

*scita*, ! Walk.; in *Baetis*, Walk.

*strigata*, ! nov. sp.; ♀ im.

LEPTOPHLEBIA (*continued*).

*Taprobanes*, Walk. ; in *Baetis*, Walk.

*vespertina*, Lin. ; in *Ephemera*, Lin. ; *Cloe*, Oul.

**MACROCERCUS**, Westw. Partingt. Cyc. Nat. Hist. (1836) ii. 439 = *Caenis*.

I. **OLIGONEURIA**, Pict. (1843-5).

*anomala*, Pict. Ephem. 290, pl. xvii. ; Walk. Cat. 585 ; Hag. Stet. Ent. Zeit. xvi. 269, pl. i. ; Am. Syn. list, 304; ♀ im.

‡ *anomala*, Pict. Ephem. pl. xlvi. ; Kirsch. Jahrb. Naturk. Nassau, heft ix. 44-5 = *rhenana*.

*pallida*, (? Costa, Faun. Asprom. pl. i. 2); *O. rhenana*, var. *pallida*, Hag. Stet. Ent. Zeit. xvi. 268, pl. i.

*rhenana*, Imh. Bericht. x. 180; Hag. Stet. Ent. Zeit. xvi. 267, pl. i. ; Brau. N. Aust. 25; Mul. Ent. Mo. Mag. i. 262, ii. 182; ! Etn. Ent. Mo. Mag. v. 83.

*Trimeniana*, ! M'Lachl. Ent. Mo. Mag. iv. 177-8; Etn. *op. cit.* v. 83; ♀ im.

**OXYCYPHA**, Burm. (1839) [misprinted *Onycypha*, Ramb. Nevr.] = *Caenis*. *discolor*, Burm. Handb. ii. 797 = *Caenis*.

*lactea*, Burm. Handb. ii. 796 ; Her.-Schæf. 346; Sieb. Beit. xii. 3 = *Caenis chironomiformis*.

*luctuosa*, Burm. Handb. ii. 797; Her.-Schæf. 346; Sieb. Beit. xii. 3 = *Caenis*, ♂ im.

VI. **PALINGENIA**, Burm. (1839) ; in *Ephemera*, Ol. Typ. *P. longicauda*. *alba*, Say, in *Baetis*, Say; Hag. Am. Syn. 40 = *Baetis*, ♀.

*albicans*, Burm. Handb. ii. 803; Pict. Ephem. 149, pl. xiii. 1-3; ! Walk. Cat. 548 (excl. ♀ ?); Hag. Am. Syn. list, 304 = *Campsurus*.

*albifilum*, ! Walk. Cat. 554 (excl. var.); Hag. Am. Syn. list, 304 = *Campsurus*.

‡ *albifilum* var., ! Walk. loc. cit. = *Asthenopus curtus*, ♂ im.

*annulifera*, ! Walk. Trans. Ent. Soc. N. S. v. 199 = *Heptagenia*, ♀ im.

*astrostoma*, Web., in *Ephemera*, Web.; Pict. Ephem. 157; Walk. Cat. 550; Hag. Am. Syn. list 304 = *Hexagenia*?

*bicolor*, ! Walk. Cat. 552; Hag. Am. Syn. 43 = *Siphlurus*, ♀ subim.

*bilineata*, Say, in *Baetis*, Say; Walsh, Proc. Acad. Nat. Sc. Philad. 1862, p. 373, & Proc. Ent. Soc. Philad. ii. 174-5, 189, 199 = *Hexagenia*.

‡ *bilineata*, Hag. Am. Syn. 41 = *Hexagenia limbata*.

*Colombiæ*, ! Walk. ; Hag. Am. Syn. list, 304 = *Leptophlebia*, ♀ subim.

*concinna*, ! Walk. Cat. 553 = *Leptophlebia cupida*, ♂ im.

*continua*, ! Walk. Trans. Ent. Soc. N. S. v. 199 = *Hexagenia albivitta*, ♂ im.

*curta*, ! Hag. Am. Syn. list, 304; for *albifilum*, var., Walk. = *Asthenopus*.

*decolorata*, Hag. Am. Syn. 43 = *Hexagenia*, ♀ subim.

*dorsalis*, Burm. Handb. ii. 803, 1015; Pict. Ephem. 153, pl. xiii. 5; Walk. Cat. 549; Hag. Am. Syn. list, 304 = *Asthenopus*, ♀.

[*dorsigera*, Hag. Am. Syn. list; not described.]

*flavescens*, ! Walsh, Proc. Acad. Nat. Sc. Philad. 1862, p. 373, & Proc. Ent. Soc. Philad. ii. 177 = *Heptagenia*.

PALINGENIA (*continued*).

- fuliginosa*, Georg.; in *Ephemera*, Georg. = *longicauda*.  
*gigas*, Hag. Verh. zool.-bot. Ver. Wien, 1854, p. 227; incertæ sedis.  
*Hecuba*, ! Hag. Am. Syn. 40 = *Euthyploclia*, ♀ im.  
*horaria*, Burm. Handb. ii. 802; Her.-Schæf. 346; Sieb. Beit. xii. 3; Hag. Stet. Ent. Zeit. xxvi. 229; Loew, Verh. zool.-bot. Ges. Wien, xvi. 947 = *Polymitarcys virgo*.  
*humeralis*, ! Walk. Cat. 552 = *Coloburus*, ♀ subim.  
*indica*, Pict. Ephem. 151, pl. xiii. 4; Walk. Cat. 549 = *Polymitarcys*, ♀ im.  
*interpunctata*, Say, in *Bactis*, Say; Walsh, Proc. Acad. Nat. Sc. Philad. 1862, p. 374, & Proc. Ent. Soc. Philad. ii. 177, 190 = *Heptagenia*.  
*lata*, ! Walk. Cat. 550, ♂.  
*latipennis*, ! Walk. Cat. 554 (excl. var.); Hag. Am. Syn. list, 304 = *Campsurus*, im., subim.  
*limbata*, ! Pict. Ephem. 146, pl. xii.; Walk. Cat. 548; ! Walsh, Proc. Acad. Nat. Sc. Philad. 1862, p. 373, & Proc. Ent. Soc. Philad. ii. 176, 199, with No. 4 = *Hexagenia*.  
‡ *limbata*, Hag. Am. Syn. 42 = *Hexagenia bilineata*.  
*longicauda*, Ol., in *Ephemera*, Ol.; (Swam. 1675; ed. Tyson, p. 44, pl. i. v. 2 [aquat.] pl. v. 1, 3 et seq.-viii. [aer.]; Blegny, 1680; Schæf. Ic. iii. pl. cciv. 3); Burm. Handb. ii. 803; Her.-Schæf. 346; Pict. Ephem. 155, pls. xiv, xiv bis, xvi.; Corn. (1848); Walk. Cat. 549; Hag. Stet. Ent. Zeit. xv. 316-9, xx. 431; Loew, Verh. zool.-bot. Ges. Wien, xi. 409-10.  
*macrops*, Pict. Trait. d. Paleont. II. ii. 371; Hag. Verh. zool.-bot. Ver. Wien, 1854, p. 227; Pict. & Hag., Org. Rest. im Berns. ii. 74, pl. vi. 2 b., pl. viii. 5 = *Polymitarcys*.  
*natata*, ! Walk. Cat. 551 = *Ephemera guttulata*, ♀ subim.  
*nebulosa*, ! Walk. Cat. 554 = *Leptophlebia*, ♂ im.  
*occultata*, ! Walk. Cat. 551; Hag. Am. Syn. 43 = *Hexagenia bilineata*, ♀ subim.  
*pallipes*, ! Walk. Cat. 553 = *Leptophlebia cupida*, ♀.  
*puella*, Pict. Ephem. 145, pl. xi. 4-5; Walk. Cat. 548; Hag. Am. Syn. 40 = *Campsurus*, ♀ im.?  
*pulchella*, Walsh, Proc. Acad. Nat. Sc. Philad. 1862, p. 375, & Proc. Ent. Soc. Philad. ii. 177, 203 = *Heptagenia*.  
*Savignyi*, Pict. Ephem. 157; Walk. Cat. 550 [not described] = *Polymitarcys*.  
*terminata*, Walsh, Proc. Acad. Nat. Sc. Philad. 1862, p. 376, & Proc. Ent. Soc. Philad. ii. 177 = *Heptagenia pulchella*?  
[*umbrata*, Hag. Am. Syn. list, 304; not described.]  
*virgo*, Ol., in *Ephemera*, Ol.; Pict. Ephem. 141, pl. ix-xi. 3; Villa, 1847, 1-6; Walk. Cat. 547; Letzner, 1854; Brau. N. Aust. 25; Oul. 1867, p. 26; Ausser. Neur. Tirol. 132 = *Polymitarcys*.  
*viridescens*, ! Walk. Cat. 550 = *Hexagenia bilineata*, ♀ subim.  
*vittigera*, ! Walsh. Proc. Acad. Nat. Sc. Philad. 1862, p. 373, & Proc. Ent. Soc. Philad. ii. 174 = *Pentagenia*.  
*vitrea*, ! Walk. Cat. 555 = *Heptagenia*, ♀ subim.

VII. PENTAGENIA, Walsh (1863); in *Palingenia* (A), Walsh (1862).  
Typ. *P. vittigera*.

*quadripunctata*, Walsh, Proc. Ent. Soc. Philad. ii. 198, note 16; subim., ♀ im.

*vittigera*, ! Walsh; in *Palingenia*, Walsh.

V. POLYMITARCYS, Etn. (1868); in *Ephemera*, Ol.; *Palingenia*, Burm.  
Typ. *P. virgo*.

*indicus*, Piet.; in *Palingenia*, Piet.; ♀ im.

*macrops*, Hag.; in *Palingenia*, Hag.

*Savignii*, ! nov. sp. (Savigny, pl. ii. 5, *Ephemera*; in *Palingenia*, Piet.; not described).

*virgo*, Ol.; in *Ephemera*, Ol.; *Palingenia*, Piet.

XI. POTAMANTHUS, Piet. (1843-5); restricted, Etn. (1868); in *Ephemera*, auct.—Typ. *P. luteus*.

*aeneus*, Piet. Ephem. 229, pl. xxxiii.; Walk. Cat. 545 = *Ephemerella*, ♀ im.

*annulatus*, Hag. Ceyl. Syn. i. 476 = *Leptophlebia*, ♂.

*apicalis*, Ste., in *Ephemera*, Ste.; Piet. Ephem. 236; Walk. Cat. 544 = *Ephemerella ignita*, ♂ im.

*brunneus*, Piet. Ephem. 217, pl. xxvii.; Walk. Cat. 542 = *Leptophlebia fusca*.

*castaneus*, Piet. Ephem. 215, pl. xxvi. 4, 5; Walk. Cat. 542 = *Leptophlebia*, ♀ im.

*cinctus*, Retz., in *Ephemera*, Retz.; Piet. Ephem. 219, pl. xxviii. (excl. 5); Walk. Cat. 543; Brau. N. Aust. 27; Hag. Brit. Syn. 20; Ausser. Neur. Tirol. 137 = *Leptophlebia*.

*concinus*, ! Walk., in *Palingenia*, Walk.; Hag. Am. Syn. 51 = *Leptophlebia cupida*, ♂ im.

*costalis*, Burm., in *Baetis*, Burm.; Piet. Ephem. 237; Walk. Cat. 546 = *Leptophlebia*, subim.

*cupidus*, Say, in *Ephemera*, Say; Hag. Am. Syn. 51; Walsh, Proc. Acad. Nat. Sc. Philad. 1862, p. 372, & Proc. Ent. Soc. Philad. ii. 172, 189, 194, notes 14, 15 = *Leptophlebia*.

*dilutus*, Ste., in *Ephemera*, Ste.; Walk. Cat. 545; Hag. Brit. Syn. 19; [misprinted *dilectus*, Piet. Ephem. 236] = *Ephemerella ignita*.

*dispar*, ! Ste., in *Ephemera*, Ste.; Piet. Ephem. 234; Walk. Cat. 542 = *Leptophlebia helvipes*, ♂ im.

*erythrophthalmus*, Schr., in *Ephemera*, Schr.; Piet. Ephem. 222, pl. xxix. (misprinted *erythrocephalus*) aquat., pl. xxx.; Walk. Cat. 544; Hag. Brit. Syn. 21 = *Ephemerella ignita*.

*exspectans*, ! Walk. Trans. Ent. Soc. N. S. v. 198 = *Ephemera*, ♀ subim.

*fasciatus*, ! Hag. Ceyl. Syn. i. 476 = *Ephemera*.

*femoralis*, Hag. loc. cit. = *Leptophlebia*.

*Ferreri*, Piet. Ephem. 203, pl. xxv. 1; Walk. Cat. 539; ♂ im.

*fuscus*, Curt., in *Ephemera*, Curt.; Piet. Ephem. 235; Walk. Cat. 543; Hag. Brit. Syn. 19 = *Leptophlebia*.

*Geerii*, Piet. Ephem. 211, pl. xxvi. 1-3; Walk. Cat. 541; Brau. N. Aust. 27; Hag. Brit. Syn. 18; Ausser. Neur. Tirol. 136 = *Leptophlebia helvipes*.

*gibbus*, Piet. Ephem. 226, pl. xxxi.-xxxii. (aer.); Walk. Cat. 544 = *Ephemera*.

*halteratus*, Fab., in *Ephemera*, Fab.; Piet. Ephem. 236; Walk. Cat. 546 = *Leptophlebia cincta*, ♂ im.

POTAMANTHUS (*continued*).

- helripes*, ! Ste., in *Ephemera*, Ste.; Pict. Ephem. 235; Walk. Cat. 543= *Leptophlebia*, ♀ im.
- hyalinus*, Zet., in *Ephemera* [*hyalinata*], Zet.; Pict. Ephem. 237= *Leptophlebia cincta*.
- inanis*, Gmel., in *Ephemera*, Gmel.; Pict. Ephem. 235; Walk. Cat. 541= *Leptophlebia cincta*, ♂ im.
- || *inanis*, Pict. Ephem. 232, pl. xxiv. 4; Walk. Cat. 547; incertæ sedis (allied to *Tricorythus*); Gen. XIII.
- Krueperi*, Stein, Berl. Ent. Zeit. vii. 414= *Leptophlebia* ?, im.
- luteus*, Lin., in *Ephemera*, Lin.; Pict. Ephem. 205, pl. xxv. 2, 3; Walk. Cat. 539; Hag. Stet. Ent. Zeit. xxvi. 229.
- marginatus*, Lin., in *Ephemera*, Lin.; Hag. Brit. Syn. 17, & Stet. Ent. Zeit. xxvi. 229= *Leptophlebia*.
- † *marginatus*, Pict. Ephem. 208, pl. xxv. 4, 5; Walk. Cat. 540; ? Oul. 1867, p. 27= *Leptophlebia Picteti*.
- minor*, ! Ste., in *Ephemera*, Ste.; Pict. Ephem. 237; Walk. Cat. 546= *Leptophlebia fusca*, ♀ im.
- modestus*, ! Hag. An. Soc. Ent. Fr. 1864, p. 39= *Leptophlebia*.
- nebulosus*, ! Walk., in *Palingenia*, Walk.; Hag. Am. Syn. 52; Walsh, Proc. Ent. Soc. Philad. ii. 193, note 13, 194, note 15= *Leptophlebia*, ♂ im.
- odonatus*, Walsh, Proc. Acad. Nat. Sc. Philad. 1862, p. 372, & Proc. Ent. Soc. Philad. ii. 171= *nebulosus*, ♂ im.
- priscus*, Pict. Trait. d. Paleont. II. ii. 371; Hag. Verh. zool.-bot. Ver. Wien, 1854, p. 227; Pict. & Hag. Org. Reste im Bernst. ii. 77, pl. vi. 3, b= *Leptophlebia*.
- roseus*, Ste., in *Ephemera*, Ste.; Pict. Ephem. 236; Walk. Cat. 545= *Ephemerella ignita*, im.
- stigma*, ! Ste., in *Ephemera*, Ste.; Pict. Ephem. 235; Walk. Cat. 541= *Leptophlebia marginata*, ♂ im.
- submarginatus*, ! Ste., in *Ephemera*, Ste.; Pict. Ephem. 236; Walk. Cat. 545= *Leptophlebia helvipes*, ♀ im.
- talcosus*, ! Ste., in *Ephemera*, Ste.; Pict. Ephem. 234; Walk. Cat. 541= *Leptophlebia marginata*, ♀ im.
- † SEMBLIS, Pz. Expl. Schaf. Ic.
- ‡ *marginata*, Pz. op. cit. Ic. cciv.= *Palingenia longicauda*.
- XXI. SIPHURUS, Etn. (1868) [mis-spelt *Siphlonurus*]; in *Baetis*, Say; *Ephemera*, Zet.; *Palingenia*, Walk. Typ. *S. flavidus*.
- alternatus*, Say; in *Baetis*, Say; *Baetis* (A), Walsh.
- annulatus*, ! Walk; in *Baetis*, Walk.
- ? *aridus*, Say; in *Baetis*, Say; *Baetis* (B), Walsh.
- armatus*, ! Etn. Trans. Ent. Soc. 1870, p. 6; ♂ im.
- bicolor*, ! Walk.; in *Palingenia*, Walk.
- ? *debilis*, Walsh; in *Baetis* (C), Walsh.
- femoratus*, Say; in *Baetis*, Say; *Baetis* (A), Walsh.
- flavidus*, ! Ed. Pict.; in *Baetis*, Ed. Pict.
- lacustris*, ! Etn. Trans. Ent. Soc. 1870, p. 7.
- Linnaeanus*, ! nov. sp.; ♂ im.
- ? *siccus*, Walsh; in *Baetis* (B), Walsh.
- XIV. TRICORYTHUS, Etn. (1868); in *Ephemera*, Savigny; *Cænis*, Pict.
- varicauda*, Pict., (Savigny, pl. ii. 6, 7); in *Cænis*, Pict.

*Fossil Ephemeridæ.*

The oldest known fossil of this Family has been discovered in the Solenhofen slate. It is a fragment of a wing [Pl. I. fig. 10] and is in the British Museum. The best preserved of the extinct *Ephemeridæ* are those found in Stettin Amber. These species are such as would be likely to occur in a large river. They differ but slightly from extant species, and some of them are referable to recent European genera.

Many remains of insects from formations older than the Tertiary have been referred to the *Ephemeridæ*, but with doubtful accuracy. The following works contain notices of such fossils.

1845. Brodie's History of Fossil Insects, p. 127, pl. x. 4. [The actual specimen is in the British Museum; it exhibits an affinity to the *Planipennia*.]

1856. F. Goldenburg, in Dunker & Meyer's *Paleontographica*, iv. 33-5, pl. iii. 5 & vi. 5, 6, described and figured three species of a genus *Dictyoneura*.

[I consider this genus not to belong to the *Ephemeridæ*, because the subcosta ends abruptly at the nodus in the anterior wing; and because the thickened basal veinlet is absent. Dr. Dohrn ranks it with *Eugeroncon*.]

1861. H. A. Hagen, in Meyer's *Paleontogr.* x. 115-118, pl. xv. 2, 3, 5, described and figured *Ephemera cellulosa*, *E. ? procera*, and *E. mortua*, together with *E. prisca* (Syn. *Sciaria prisca*, Germar, Nov. Act. Leopold. xix. 211-212, pl. xxiii. 11; *Id.*, Giebel, *Insect. d. Vorwelt*, p. 230; *Deutschl. Petrefakt.*, p. 640). [*Cellulosa* and *procera* have since been referred to *Dictyoneura*. It is impossible to determine the nature of the others, from the figures.]

1864. J. D. Dana, in Silliman's *American Journal of Science*, xxxvii. 34, described the genera *Miamia* and *Hemeristia*.

[In 1866, Mr. S. H. Scudder erected a Family *Palcopterina* for these. Dr. Brauer, in 1866, cited them amongst the *Ephemeridæ*. Perhaps these genera are related to the *Planipennia*, as Mr. M'Lachlan suggests, or perhaps (but this is hardly probable) to *Dictyoneura*.]

1868. Dr. A. Dohrn, in Meyer's *Paleontogr.*, gave a figure and description of *Eugeron Bäckingii*. [He referred it to the same group as *Dictyoneura*. Dr. Brauer, in the same year, ranked it amongst the *Ephemeridæ*. The condition of the mouth-organs clearly separates it from the *Ephemeridæ*; and the neuration of the wings favours Dr. Dohrn's determination of its relationship.]

1867. J. W. Dawson, in the *Geological Magazine*, iv. 385-388, pl. xvii. 1-5, described and figured *Haplophlebius Barnesii*, *Platephemera antiqua*, *Homothetus fossilis*, and *Xenoneura antiquorum*. [They have all been regarded as allies of the *Ephemeridæ*. *Haplophlebius*, however, on account of the well-marked nodus in the fore-wing, and the character of the reticulation between the principal longitudinal nervures is, I think, related to *Dictyoneura* and *Eugeron*: *Platephemera* and *Homothetus* may possibly be of the *Ephemeridæ*, but there is nothing in the figures to make this certain: and there is no reason for considering that *Xenoneura* belongs to this Family.]

1868. S. H. Scudder, in Geol. Mag. v. 175-7, and 218-19, catalogued three genera in addition to those of Prof. Dawson's paper. [“*Gerephemera simplex* is represented by a slight fragment of the tip of a wing; the wing must have been large and broad; the veins distant, weak and simple. It is apparently a member of the family *Ephemerina*.” *Platephemera antiqua* is referred to the same family, although the base of the wing is wanting, as well as a piece of the tip. A fragment of what is “probably” a portion from the middle of a wing is named *Dyscritius vetustus*, notwithstanding that “it is impossible to determine” from it “either the approximate size of the insect, or the family to which it belongs.” *Lithentomum Hartii* is also described. Mr. Scudder correctly observes at p. 218, that *Palephemera mediana*, Hitchcock (previously named *Mormolocoides antiquorum*, Hitchcock) is not a nymph of an *Ephemeridæ*.]

1868. S. H. Scudder described, in the Paleontology of Illinois, p. 571-2, figs. 8-10, a genus *Euphemerites* with two species, *E. gigas* and *affinis*, which he ranks among the *Ephemeridæ*.

Palaeontologists have adopted a ridiculous course with regard to some insect fossils. Whenever an obscure fragment of a well-reticulate insect's wing is found in a rock, a genus is straightway set up, and the fossil named as a new *species*. The species is then referred to the *Ephemeridæ*, and is immediately pronounced to be a synthetic type of insects at present distantly related to one another in organization. This enunciation of synthetic types is often nothing less than a resort to random conjecture respecting the affinities of animals which the writer is at a loss to classify. An insect allied to the *Ephemeridæ* which chirped like a Locust (such as *Xenoneura* is imagined to have been), is a tolerable sample of these synthetic types.

When a fossil comprises only a fragment, or even a complete wing of an *Ephemerid*, it is hardly possible to determine the *genus*, and impossible to assert the *species*. The utmost that can be learned from such a specimen is the approximate relations of the insect. Neuration by itself is not sufficient to define the species or even the genera of recent *Ephemeridæ*.

The following list contains the names of the fossils hitherto reputed *Ephemeridæ* upon questionable grounds. I shall take no further notice of them.

Genus *DICTYONEURA*, Goldenb. 1856.

*anthracophila*, Goldenb. 1856.

*cellulosa*, Hag. 1861.

*Humboldtiana*, Goldenb. 1856.

*libelluloides*, Goldenb. 1856.

*procera*, Hag. 1861.

Genus *DYSKRITIUS*, Scud. 1868.

*vetustus*, Scud. 1868.

Genus *EPHEMERA*, Hag. 1861; (*nec Lin.*).

*cellulosa*, Hag. 1861= *Dictyoneura*.

? *morta*, Hag. 1861; *incertæ sedis*.

*prisca*, Germar, Hag. 1861; *vide Sciaria*.

*procera*, Hag. 1861= *Dictyoneura*.

Genus *EUGEREON*, Dohrn.

*Baeckingii*, Dohrn, 1868.

Genus *EPHEMERITES*, Geinitz, Hag. 1865; in Leonhard & Geinitz, Jahrb. f. Mineral. &c., 1865, p. 385 [Brauer].

Genus *EUPHEMERITES*, Scud. 1868.

*affinis*, Scud. 1868.

*gigas*, Scud. 1868.

Genus *GEREPHEMERA*, Scud. 1868.

*simplex*, Scud. 1868.

Genus *HAPLOPHLEBIUM*, Dawson, 1867.

*Barnesii*, Dawson, 1867.

Genus *HEMERISTIA*, Scud. 1864.

*Brownsoni*, Scud. 1864.

Genus *HOMOTHETUS*, Dawson, 1867.

*fossilis*, Dawson, 1867.

Genus *LITHENTOMUM*, Scud. 1868.

*Hartii*, Scud. 1868.

Genus *MIAMIA*, Scud. 1864.

*Brownsoni*, Scud. 1864.

Genus *MORMOLUCOIDES*, Hitchcock.

*antiquorum*, Hitchcock.

Genus *PALEPHEMERA*, Hitchcock= *Mormolucoides*.

*mediæva*, Hitchcock= *M. antiquorum*.

Genus *PLATEPHEMERA*, Dawson, 1867.

*antiqua*, Dawson, 1867.

Genus *SCIARIA*, Germar.

*prisca*, Germar; cf. *Ephemera*, Hag.; *incertæ sedis*.

Genus *XENONEURA*, Dawson, 1867.

*antiquorum*, Dawson, 1867.



## Family EPHEMERIDÆ.

(ARCIPTERA, Brullè; ANISOPTERA, Stephens).

The *Ephemeridæ* are hexapod insects which have many-jointed caudal setæ; which carry their fore-wings erect and unfolded; and which in the imago have abortive mouth organs.

Antennæ aristate; the basal two joints the largest, the bristle many-jointed. Ocelli three. Oculi compound or complex. Legs slender, the anterior pair the longest; tarsi distinctly jointed, terminated by claws. Anterior wings large, creased lengthwise, but never folded together; costa united by a stout cross-veinlet to the radius near the base of the wing; subcosta uninterrupted at the nodus. Posterior wings sometimes absent, sometimes rudimentary, at the utmost small. Abdomen ten-jointed: the first abdominal segment joined immovably to the metathorax; the ninth provided in the male with a pair of abdominal legs in the form of claspers (forceps); the tenth bearing (two at the fewest, three at the most) multiarticulate caudal setæ, which are used as balancers; the alimentary canal straight, apparently destitute of salivary glands, and inflated with gas; many short excretory tubules are appended to the large intestine; the penis is situate at the apex of the ninth segment, and is either hidden or exposed; the oviducts terminate in the joining of the eighth and seventh segments.

In coition, the male flies under the female and seizes her prothorax with his elongate anterior legs, simultaneously bending the tip of his abdomen upwards and forwards, and clasping the proper segment of her body with his forceps. During their connexion, which is of brief duration, the pair are chiefly supported by the female, and they gradually descend slowly in the air, sometimes even to the ground. When they separate, the male rejoins his companions. The female retires to the water, and deposits the eggs impregnated, settling again and again upon the surface of the water with extended setæ, until the extruded eggs become detached from the rest. This done, she, in some genera, returns to the general assembly, and pairs again, and then again deposits eggs; and so on, until all the eggs are disposed of: thus the same female may be served by several males; and likewise the same male may frequently serve several females,

not being exhausted by one union. But in other genera, the coitus once consummated, the eggs are deposited in one mass altogether.

The egg laid in the water, after some time develops into a nymph, which at first has only the two outer caudal setæ, and respires through the integument at large. But, subsequently, when the nymph increases in bulk, special breathing organs grow out from the postero-lateral region of some of the abdominal segments, as well as from the hinder segments of the thorax. These are usually lamellar in form, and nearly always external. The thoracic out-growths persist as the wings; those belonging to the abdominal segments are deciduous with the integument, and they are not reproduced after the insect emerges from the water as the sub-imago.\* A cloaca at the end of the intestine is a supplementary breathing organ. From the tenth segment, between the two setæ first formed, a third seta grows, which in some genera is afterwards cast off at the same time as the mouth-organs, and the gills. The tarsi are jointless, and end in a moveable claw. The food of the insect is obtained from the large quantities of mud which it swallows.

The adult nymph sometimes floats on the surface of the water, with the dorsum of the thorax exposed to the air, buoyed up by gas which at that time accumulates between the old and the young integuments, and in the emptied alimentary canal: and sometimes it crawls a short distance out of the water. In either case, the thorax opens along the middle dorsal suture. Through this opening the subimago extricates its head and fore-legs from the old skin: the wings suddenly expand fully; the hinder legs are freed, and then the insect creeps out, and flies heavily to some convenient resting place, where on alighting it assumes the posture characteristic of its genus. In some genera, the subimago is the permanent aerial state of the female; in most cases, however, the subimaginal pellicle is cast sooner or later, according to the temperature of the air and the habit of the genus. The dingy appearance of the subimago, the comparative shortness of its setæ and tarsi, and the ciliate terminal border of the wings, nearly always distinguish it from the imago.

\* The term "pseudimago" used by some authors is spurious, and "subimago" has precedence over "pro-imago."

It is well known that, in some genera, differences between the sexes are apparent in the oculi, setæ, and tarsi. The oculi are always smallest in the female, and in the male are sometimes divided into two parts. The female usually has shorter setæ than the male. The middle seta is often shorter than the two outer setæ, or altogether absent. Sometimes the male wants the middle seta, whilst the female has it equal to, or only shorter than, the others; frequently neither sex possesses the central seta. The proportions of the tarsal joints of the male are not the same as those of the female; and his anterior legs exceed hers in length.

The composition of the abdomen of *Ephemeridæ* has been the subject of much dispute. Some consider it to be ten-jointed, others reckon nine joints. The "tenth joint" throughout this paper means the dorsal arcus immediately above the setæ, the part from which the setæ proceed, and the ventral arc often formed of two valve-like pieces under the anus—the intermediate appendices of M. Pictet. The ninth joint is that which bears the forceps in the male, and which, in the female, is sometimes prolonged behind into a broad lobe beneath, concealing the tenth joint. This lamina has been mistaken for the egg-valve in some species. The eighth joint is the first posterior to the opening of the oviducts. From the apical edge of the seventh joint, beneath, the egg-valve grows out. The next five segments are not peculiar in point of structure. The first joint is immovably united with the metathorax, and often resembles it in colour. Hence certain Entomologists have reckoned this joint a part of the thoracic region. That this joint belongs to the abdomen may, however, be demonstrated in the nymphs of some genera, in which it is furnished with a moveable pair of branchial plates. Now the branchial out-growths of the thorax are always fixtures in the nymph. In certain four-winged genera, those branchial plates of the first segment are present, and may be contrasted with the rudimentary hind-wings.

In drying, the colour and form of *Ephemeridæ* soon change. Colour is of little importance, even in fresh examples; but form is necessary to the distinguishing of the species. They are, therefore, best preserved in a liquid. It is sufficient for ordinary purposes, to dip the freshly-killed specimen into dilute spirits, and then

transfer it to a tube, or homœopathic globule bottle, partly filled with water. Next, Price's glycerine is added to the water,—one or two drops a day,—until the bottle is gradually filled. A small drop of acetic acid may be added finally, to prevent the growth of mould. The name of the species may be written on the disk of the cork, the date and locality of capture round its side. Hind-wings of the species of *Baetis* and *Centroptilum* should be mounted on slips of glass, for microscopical examination. Pinned specimens are often difficult to determine, in consequence of their shrinking; to card them is to render them fit for nothing.

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### GENERUM DISTRIBUTIO GEOGRAPHICA.

Symbola ( ) species fossiles, [ ] nondescriptas, claudunt.

	Europa.	America.	Asia.	Africa.	Austral-asia.	Oceania.
Oligoneuria .....	2 ?	1	0	1	0	0
Lachlania .....	0	1	0	0	0	0
Campsurus .....	0	6	0	0	0	0
Asthenopus .....	0	2+[1]	0	0	0	0
Polymitarcys .....	1 +(1)	0	1+[2]	1+[1]	0	0
Palingenia .....	1	0	1	0	0	0
Pentagenia .....	0	2	0	0	0	0
Hexagenia .....	0	5	[1]	0	0	0
Euthyploca .....	0	1	0	0	0	0
Ephemera .....	4	3+[1]	4	0	0	0
Potamanthus .....	2	0	0	0	0	0
Leptophlebia I .....	0	0	3	2	9	0
" II .....	0	1	0	0	0	0
" III .....	7+(1)	2	0	0	0	0
" IV .....	0	2	0	0	0	0
" V .....	2	0	0	0	0	0
Genus [XIII] .....	0	1	0	0	0	0
Tricorythus .....	0	0	0	1	0	0
Cænis .....	6	2	1	1	0	0
Ephemerella .....	3	2	0	0	0	0
Bætisca .....	0	1	0	0	0	0
Cloeon .....	5	4	1+[1]	1	[1]	0
Centroptilum .....	4	1	0	0	0	0
Baetis .....	16	13+[2]	1+[1]	[1]	[2]	0
Siphlurus .....	3+[2]	7?	0	0	0	0
Genus [XXII] .....	0	0	5	0	0	0
Isonychia .....	0	1+?1	0	0	0	0
Coloburus .....	0	0	0	0	2	0
(Cronicus) .....	(1)	0	0	0	0	0
Heptagenia .....	20	16	2	0	0	2

## SPECIERUM DISTRIBUTIO GEOGRAPHICA.

Symbola ( ) species fossiles, [ ] ambiguæ definitas, claudunt.

---

Oligoneuria anomala . . .	Rio Janeiro.
"    rhenana . . .	Germany; Turin.
"    [pallida] . . .	Hungary.
"    Trimeniana . . .	Umroti District, Natal.
Lachlania abnormis . . .	Cuba.
Campsurus latipennis . . .	Para.
"    albifilum . . .	Para.
"    albicans . . .	Brazil.
"    cuspидatus . . .	Guatemala.
"    quadridentatus . . .	Santarem, Brazil.
, ? [puella] . . .	New Orleans.
Asthenopus curtus . . .	Para.
"    dorsalis . . .	Brazil.
Polymitareys virgo . . .	France; Germany; Madrid.
"    Savignii . . .	The Nile.
"    indicus . . .	Hindostan.
"    (macrops) . . .	Fossil in Amber.
Palingenia longicauda . . .	Central Europe; Caucasus.
"    lata . . .	Silhet; Sarawak.
Pentagenia vittigera . . .	Illinois; Texas.
"    quadripunctata . . .	Illinois.
Hexagenia albivitta . . .	The Amazons; Texas.
, ? [astrostoma] . . .	Brazil.
"    [decolorata] . . .	Matamoras; Tamaulipas.
"    limbata . . .	Texas; Illinois; Maryland.
"    bilineata . . .	Hudson's Bay Ter.; Canada; Texas; Mexico; Illinois.
Euthyploca Hecuba . . .	Vera Cruz; Mexico; Veragua.
Ephemera vulgata . . .	Northern & Central Europe.
"    guttulata . . .	Albany River; Canada; Northern United States.
"    flaveola . . .	Illinois; New York.
"    [myops] . . .	Illinois.
"    lineata . . .	S. England; France; Switzerland.
"    danica . . .	Northern & Central Europe & Spain.
"    glaucoptera . . .	Moscow; Germany; Switzerland; North Italy.
"    immaculata . . .	Cuna, Hindostan.
"    exspectans . . .	Hindostan.
"    fasciata . . .	Ceylon; Masuri, North India.
"    serica . . .	North China.
Potamanthus luteus . . .	England; France; Germany.
"    Ferreri . . .	Turin.

<i>Leptophlebia australis</i> .	.	Tasmania.
,, <i>australasica</i> .	.	Sidney; (Moreton Bay?).
,, <i>furcifera</i> .	.	Melbourne?
,, <i>inconspicua</i> .	.	Adelaide.
,, <i>dentata</i> .	.	New Zealand.
,, <i>strigata</i> .	.	North Australia.
,, [ <i>costalis</i> ] .	.	New Holland.
,, <i>nodularis</i> .	.	Christ Church, New Zealand.
,, <i>seita</i> .	.	New Zealand.
,, <i>Taprobanes</i> .	.	Ceylon.
,, <i>annulata</i> .	.	Rainbodde, Ceylon.
,, <i>femoralis</i> .	.	Rainbodde, Ceylon.
,, <i>dislocans</i> .	.	Cape of Good Hope.
,, <i>auriculata</i> .	.	Cape of Good Hope.
,, <i>Colombiæ</i> .	.	British Colombia.
,, <i>marginata</i> .	.	Temperate & Arctic Europe & America.
,, <i>helvipes</i> .	.	Gt. Britain; Germany; Switzerland.
,, <i>castanea</i> .	.	Villeneuve, Vaud.
,, <i>Krueperi</i> .	.	Greece.
,, <i>Picteti</i> .	.	Geneva.
,, ( <i>prisca</i> ) .	.	Fossil in Amber.
,, <i>cincta</i> .	.	Northern & Temperate Europe.
,, <i>vespertina</i> .	.	Scandinavia.
,, <i>mollis</i> .	.	West Farms, New York.
,, <i>cupida</i> .	.	Nova Scotia; Cincinnati; Washington.
,, <i>nebulosa</i> .	.	Albany River; Illinois.
,, <i>fusca</i> .	.	Gt. Britain; Switzerland.
,, <i>modesta</i> .	.	Carinthia; Corsica.
<i>Gen. XIII. inanis</i> .	.	Brazil.
<i>Tricorythus varicauda</i> .	.	Upper Egypt.
<i>Cænis</i> <i>maerura</i> .	.	Temperate Europe.
,, <i>chironomiformis</i>	.	England; Prussia; Geneva.
,, <i>dimidiata</i> .	.	Temperate Europe.
,, <i>diminuta</i> .	.	E. Florida.
,, <i>hilaris</i> .	.	Indiana.
,, <i>perpusilla</i> .	.	Ceylon.
,, [ <i>discolor</i> ] .	.	Cape of Good Hope.
,, [ <i>argentata</i> ] .	.	Sicily.
,, [ <i>oophora</i> ] .	.	Sardinia.
,, <i>luctuosa</i> .	.	England; Berlin; L. of Thun.
<i>Ephemerella ignita</i> .	.	Temperate Europe; Madrid.
,, <i>gibba</i> .	.	Villeneuve, Vaud.
,, <i>ænea</i> .	.	Mt. Salève, Geneva.
,, <i>invaria</i> .	.	Nova Scotia; Illinois.
,, [ <i>consimilis</i> ] .	.	Illinois.
<i>Bætisca</i> <i>obesa</i> .	.	Illinois; Indiana; Upper California.
<i>Cloeon</i> <i>dipterum</i> .	.	Europe; the Madeiras; Egypt.
,, <i>simile</i> .	.	England.
,, [ <i>subinfuscatum</i> ] .	.	Provence.

Cloeon	[obseurum]	.	France; near Paris?
"	russulum	.	Europe; North China.
"	mendax	.	Illinois.
"	dubium	.	Illinois.
"	vicinum	.	Washington.
"	vitripennis	.	Chili.
Centroptilum	Iuteolum	.	Alten; Temperate Europe.
"	pennulatum	.	England.
"	lituratum	.	Mt. Salève, Genevâ.
"	stenopteryx	.	Carinthia.
Baetis	binoculatus	.	Temperate & Arctic Europe; Hudson's Bay Territory.
"	debilis	.	Hindostan.
"	scambus	.	England.
"	finitimus	.	Val Montjoie.
"	atrebatinus	.	England.
"	Rhodani	.	Temperate Europe; the Madeiras.
"	phaëops	.	England.
"	tenax	.	England.
"	buceratus	.	England.
"	amnicus	.	Mt. Blanc District.
"	alpinus	.	Mt. Brevent, Val de Chamounix.
"	melanonyx	.	Val d'Entremont; Faucigny.
"	pumilus	.	Temperate Europe; Madrid; Corsica.
"	niger	.	England; ? Sweden.
"	[culiciformis]	.	Sweden.
"	[speciosus]	.	incog. (Europe).
"?	fuscus	.	Messina.
"	posticatus	.	Shippingport.
"	unicolor	.	Illinois; Washington; ? Porto Rico.
"	propinquus	.	Illinois.
"?	[verticis]	.	Indiana.
"	pygmæus	.	The S. Lawrence.
"	fluctuans	.	Illinois.
"	pictus	.	Texas.
"	undatus	.	Red River; New York; Mexico.
"	fasciatus	.	Brazil.
"?	ferrugineus	.	Illinois.
"?	[albus]	.	Winnepeek River.
"?	[Ephoron leukon]	.	Belville on the Passaic.
Siphlurus	flavidus	.	Spain.
"	armatus	.	Ireland; England.
"	lacustris	.	Wales.
"	Linnæanus	.	incog.
"	annulatus	.	Trenton Falls, New York.
"	[bicolor]	.	Albany River.
"	femoratus	.	Illinois; Ohio.
"	alternatus	.	Illinois; S. Peter's River; Washington.
"?	aridus	.	Illinois; Indiana.

Siphurus ?	siccus	.	.	Illinois.
„ ?	debilis	.	.	Illinois.
Gen. XXII.	[tristis]	.	.	Rainbodde, Ceylon.
„	[consueta]	.	.	Rainbodde.
„	[solida]	.	.	Rainbodde.
„	[signata]	.	.	Rainbodde.
„	[marginalis]	.	.	Rainbodde.
Isonychia	manca	.	.	Texas.
„ ?	[ignota]	.	.	? United States.
Coloburus	humeralis	.	.	Otago, New Zealand.
„	haleuticus	.	.	? Melbourne.
(Cronicus	anomalus)	.	.	Fossil in Amber.
Heptagenia	semicolorata	.	.	Gt. Britain; Switzerland; Austria.
„	[semitincta]	.	.	Versoix, Lake Leman.
„	nivata	.	.	Mt. Blanc District.
„	borealis	.	.	Finmark.
„	canadensis	.	.	Canada.
„	fusca	.	.	Albany River.
„	cupulata	.	.	N. China.
„	basalis	.	.	Lake Winnipeg.
„	maculipennis	.	.	Illinois; New York.
„	eruentata	.	.	Illinois.
„	simplex	.	.	Illinois.
„	pulchella	.	.	Illinois.
„	[terminata]	.	.	Illinois.
„	interpunctata	.	.	Illinois; Indiana.
„	flavescens	.	.	Illinois.
„	vitrea	.	.	Albany River.
„	[migrimana]	.	.	France.
„	flavipennis	.	.	England; France; Switzerland.
„	elegans	.	.	Temperate Europe; Hammerfest.
„	fluminum	.	.	Germany; Lake Leman.
„	sylvicola	.	.	Spain.
„	volitans	.	.	England.
„	alpicola	.	.	Mt. Blanc District; Carinthia.
„	iridana	.	.	Altvater.
„	[annulifera]	.	.	Hindostan.
„	luridipennis	.	.	Albany River; S. Lawrence.
„	flaveola	.	.	Tennessee; West Farms, New York.
„	vicaria	.	.	Canada.
„ ?	[tessellata, Hag.]	.	.	Puget Sound; Washington.
„	venosa	.	.	Scandinavia; Corsica; and Temperate Europe.
„	longicauda	.	.	Gt. Britain.
„	[angustipennis]	.	.	Madrid.
„	Picteti	.	.	Tessin; Ober Engadine.
„	insignis	.	.	England.
„	montana	.	.	Mt. Brevent; Austria.
„	lateralis	.	.	England, Wales; Carinthia; ? L. Leman; Spain.
„	[Bellieri]	.	.	Sicily.

Heptagenia zebra	.	Corsica.
" [gemma] .	.	" <i>Ciræ aquæductum Fodinarum Idren-sium.</i> "
" guttata .	.	Valdivia, Chili.
" torrida .	.	Philippine Isles.
" determinata .	.	Java.

Thus, the number of described recent species of *Ephemeridae* is about 178, exclusive of ten which are either hardly determinable, or probably mere conditions of well-characterised forms which have been otherwise named. There are three fossil species determinable.

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#### EPHEMERIDARUM GENERUM RECENTIUM SUMMA ANALYTICA.

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1 { Metathoracic wings present . . . . .	4
Metathoracic wings wanting . . . . .	2
2 { 3 long subequal caudal setæ . . . . .	3
2 { 2 long caudal setæ; the third rejected; Gen. XXII. ♀ ?; <i>Cloeon</i> , Pl. II. f. 7.	
3 { Cross-veinlets of wings numerous towards the anterior margin; Gen. XIII; <i>Tricorythus</i> , Pl. II. f. 3.	
3 { Cross-veinlets of wings disposed in very few transverse rows; <i>Cænis</i> , Pl. II. f. 4.	
4 { Longitudinal neuration of posterior wings considerably complex . . . . .	7
4 { Longitudinal neuration of posterior wings sparse (2-3 principal nervures only) . . . . .	5
5 { Lateral margins of the hinder abdominal segments simple . . . . .	6
5 { Lateral margins of the hinder abdominal segments produced into a slender subulate process on each side; <i>Lachlania</i> , Pl. I. f. 1; <i>Oligoneuria</i> , Pl. I. f. 2.	
6 { Posterior wings very narrow; <i>Centroptilum</i> , Pl. II. f. 8.	
6 { Posterior wings oblong, obtuse; Gen. XXII. ♀ ?; <i>Bautis</i> , Pl. II. f. 9, Pl. III. f. 1.	
7 { Posterior pairs of legs well developed . . . . .	10
7 { Posterior pairs of legs very short and feeble . . . . .	8
8 { Cross-veinlets in the marginal area before the nodus of the anterior wing, few and indistinct . . . . .	9
8 { Cross-veinlets in marginal area before the nodus of anterior wing, numerous and well defined; <i>Polymitarcys</i> , Pl. I. f. 5.	
9 { Terminal margin of anterior wing free from cross-veinlets; <i>Campsurus</i> , Pl. I. f. 4.	
9 { Terminal margin of anterior wing here and there met by cross-veinlets; <i>Asthenopus</i> , Pl. I. f. 3.	

10	{	Oculi even in both sexes . . . . .	14
	{	Oculi in ♂ ascalaphoid; i. e., intersected by a slightly impressed line . . . . .	11
11	{	Penultimate segment in ♀ beneath prolonged into a short lamellar process . . . . .	12
	{	Penultimate segment in ♀ beneath simple; <i>Potamanthus</i> , Pl. II. f. 1.	
12	{	Proximal joint of leg of forceps of ♂ short . . . . .	13
	{	Proximal joint of leg of forceps of ♂ the longest; Gen. XXII. ♂?; <i>Leptophlebia</i> , Pl. II. f. 2-2e.	
13	{	Hinder tarsi 4-jointed; <i>Ephemerella</i> , Pl. II. f. 5.	
	{	Hinder tarsi 5-jointed; <i>Coloburus</i> , Pl. III. f. 3.	
14	{	Penultimate segment in ♀ beneath prolonged into a short lamellar process . . . . .	15
	{	Penultimate segment in ♀ beneath simple . . . . .	16
15	{	Cross-veinlets crowded, indistinct; <i>Betisca</i> , Pl. II. f. 6.	
	{	Cross-veinlets regular, well-defined; <i>Isonychia</i> , Pl. III. f. 4; <i>Heptagenia</i> , Pl. III. f. 5.	
16	{	3 long caudal setæ . . . . .	17
	{	2 long caudal setæ . . . . .	18
17	{	Cross-veinlets crowded, well-defined; <i>Euthyplocia</i> , ♀, Pl. I. f. 8.	
	{	Cross-veinlets regular, well-defined; <i>Pentagenia</i> , ♀, Pl. I. f. 6; <i>Ephemera</i> , Pl. I. f. 9.	
18	{	Hinder tarsi 5-jointed; <i>Siphlurus</i> , Pl. III. f. 2.	
	{	Hinder tarsi 4-jointed . . . . .	
19	{	Middle seta very short; <i>Pentagenia</i> , ♂, Pl. I. f. 6; <i>Hexagenia</i> , Pl. I. f. 7.	19
	{	Middle seta rejected; <i>Palingenia</i> .	

Materials for a complete analysis of the genera of the *Ephemeridae* are not at hand. Of some, only one sex is at present known: of others, only mutilated specimens deprived of legs, or examples with the legs shrivelled up in drying, so as to prevent their proportions being made out, are in European collections. Our grounds for establishing comparisons between the genera are consequently very limited.

In determining from the imago the affinities of a genus, the principal points to be noted are,—First, the neuration of the anterior wing; Secondly, the structure of the hinder pairs of legs; and, Thirdly, sexual peculiarities.

In the neuration of the anterior wing, the most important features are the disposition of the nervures dis-

tributed to the *inner* and *terminal margins*. It should be noted whether the *longitudinal neurulation* is sparse and simple, or plentiful and complex: next, whether the *cross-veinlets* are scanty or numerous (especially in the *costal* and *subcostal areas* before the *nodi*): and then, whether the *interneuronal veinlets* of the terminal margin (if there be any of them) are derived from the longitudinal nervures, or from the cross-veinlets, or from the terminal margin only; and if they are only from the margin, it should be ascertained whether they are solitary or in pairs. Minute details of neurulation are valueless; only the general aspect or style of the neurulation need be studied.

In the hinder pairs of legs, the length of the *tibiae*, as compared with the *femora*, should be noted; then the number of the *tarsal joints*, and the form of the *ungues*. If a fifth joint is present in the *tarsus*, its joining with the *tibia* may be obliterated, or indistinct, or clearly defined.

As to the sexual peculiarities, it is important to examine first the *oculi*. Do the oculi of the male differ from those of the female in size only? or are they also divided into two parts? If they are divided, it must be ascertained whether the divisions are only ascalaphoid (as in *Leptophlebia*), or whether the upper part is elevated into a turbinate protuberance (as in *Baetis*). Next the *forceps* should be examined. Are the legs of the forceps sessile (as in *Baetis*)? or are they inserted upon a lamellar extension of the penultimate segment (as in *Siphlonurus*)? What are the relative proportions of their joints? It is also very important to note whether the female has or has not a lamellar extension of the ventral margin of the apex of the penultimate segment. Next the *setæ* should be examined. Are their joints long, or short? Have they long or short pubescence towards their tips? Is the middle seta as long as the others in both sexes? or abbreviated in both, or rejected in both? Or is it rejected by, or abbreviated in, the male only? Then it should be noted whether the *anterior legs* of the male have the femora unusually short, or not; and whether the anterior legs of the female are well developed or rudimentary. It should be ascertained also whether the *eggs* are extruded all at once, or not.

Last of all, the form and neuration of the posterior wings (if there be any) should be taken into consideration.

The abdomen may further be examined as to the mode in which the last segment is finished off beneath; whether by a simple membrane, or by plate-like folds of the integument beneath the insertion of the setæ (as in *Ephemera* and *Baetis*). In *Lachlania*, *Oligoneuria*, and *Cænis*, the posterior segments are furnished at the tip with slender lateral processes; on account of this and other reasons (*e. g.*, the structure of the setæ), I am inclined to consider the first two genera to be allied to *Cænis* more closely than might be inferred from the arrangement of the genera adopted by me. *Heptagenia* is the only genus known which possesses a true egg-valve.

In the immature insect, the attitude assumed by the subimago during repose is of value in classification. The points to be noted are whether it elevates the anterior legs, or not. If it does, are they held together, or separated? Are the wings spread abroad, or held upright? Are the caudal setæ laid together, or separated? The average duration of the subimago stage should also be taken into consideration. Does it last only a few minutes, or an hour or two, or a whole day, or longer? or is it the permanent state of the female?

In the nymph, *the habit of the insect* is of first importance. Does it burrow, or creep? or does it run and swim actively? These points can be inferred from the structure of its mandibles, legs (especially the anterior legs), setæ, and antennæ. Next in importance is *the structure of the branchial organs*. Are they *lamineæ fringed* with short slender processes? and, if so, are they simple (as in *Cænis*), or compound *lamineæ* (as in *Ephemera*)? Or are the *lamineæ* *fringeless*? If so, are the *lamineæ* simple (as in *Baetis*), or compound (as in *Cloeon*), or complex (as in *Ephemerella*)? or are they furnished at the base with a fascicle of branchial filaments (as in *Heptagenia*)? *Baetisca* has the branchiae concealed under an extension of the dorsum of the thorax. The *labium*, with *the two pairs of maxillæ and their palpi*, have next to be considered. Are the palpi of the lower maxillæ two-jointed, or three-jointed? Last of all, the *number and position of the branchial organs* must be noted,

and their relative sizes. In some genera there is a minute pair of branchial processes on the first abdominal segment, which is very liable to be overlooked. Sometimes the anterior pairs of plates differ in texture and form from those of the segments behind them. These last items have more to do with the determination of the order of succession of genera closely allied to one another, than with the determination of the position of a genus in the family at large.

Arrangements of genera founded upon the structure of the imago, or of the nymph, alone, can be only temporary. The relations of genera can be definitely ascertained, only by taking into consideration all the peculiarities presented by the structure of representative species at the principal epochs in the course of their development from the egg.

## NOTANDA.

long. al.=longitudo costæ alæ anticæ.

exp. al.=explicatio alarum anticarum.

set.=longitudo setarum caudalium; e. g., sub *Ephemera vulgata* legitur  
"set. 33 & 34-32 & 36 mm." i. e., longitudo setarum exterioris 33-32  
mm., interioris 34-36 mm.

mm.=millimetres; mensurâ Gallicâ adhibitâ.

im. & subim.=imago et subimago.

Symbola descriptionibus præposita significant,—

v. s.=vivum specimen.

v. v. s.=vidi specimen vivum.

s. s.=specimen siccum.

v. s. s.=vidi specimen siccum.

) !=vidi specimen genuinum siccum.

Cum terminologiâ doctoris Julii Müller,\* terminologia colorum una et eadem est, præter in locis sequentibus:—

Testaceus et luridus concolores putantur.

Isabellinus, Mül.=furfurosus (*Anglice*, bran-colour).

Fuscus et umbrinus, Mül., similiterque olivaceus et pistazinus, Mül., concolores esse putantur.

Ferrugineus=*Anglice*, steel-blue.

Rubiginosus=*Anglice*, rust-red.

\* Terminologia Entomologica. J. Müller. Brünn, 1860.

## Genus LACHLANIA.

(Ala, Pl. I. fig. 1.)

*Lachlania*, Hag. 1868.

Imago ♀. Caput transversum, ocellis subæqualibus; prothorax etiam transversus. Alæ quatuor. Setæ duæ. In dentibus segmentorum abdominis latera producuntur.

*Lachlania abnormis.**L. abnormis*, Hag. 1868.

Imago ♀, s. s. "Fusca, subtus pallida, capite, prothorace atque pedibus nigris. Alæ griseæ, pellucidæ, crassioribus nervorum griseo-fuscis: in anticis prima, secunda, et quarta venarum longitudinalium furcatæ sunt, et serie unâ transversalium intersecantur; in posticis venarum trium longitudinalium media furcata est, et nervi transversales absunt. Setæ albidæ." (Hag. abstract.)

Long. corp. ♀ 6-7, set. 5, exp. al. 18-19 mm.

Hab.—Cuba.

Dr. Hagen gives "ovivalvula transversa" as a character: but as he called the ventral process of the penultimate segment of *Leptophlebia* an egg-valve, it is uncertain whether *Lachlania* has a true egg-valve or not.

## Genus OLIGONEURIA.

*Oligoneuria*, Pict. 1843-5.

Neuratio alarum, in hoc genere, pro singulâ specie diversa est.

Imago. Oculi integri; prothorax transversus. Alæ quatuor; anticæ nervis longitudinalibus robustis parum divisis, et nervis transversalibus marginem costalem solum et alæ apicem versus: in processu tenui libero basis alæ anticæ supra singulariter excurrit. Pedes debiles, tibiis anticis femoribus multo longioribus; tarsi præcipue infirmi, quadri-articulati, unguibus obtusis. Abdominis segmenta singula intermedia lateribus in processu tenui utrinque producta. Setæ tres æquales. Pedes forcipis maris quadri-articulati, proximo articulorum longissimo. Ovivalvula femina caret.

The curious species comprised in this genus appear in considerable numbers towards evening. The males of the extra-European species being at present unknown, I have not separated the group, in spite of the differences of their wings. My divisions of the genus may be tabulated as follows:—

Alæ anticæ radius et subcosta confluentes : nervorum longitudinalium sequentium primus—

et tertius bifidi ; secundus obsolescens bipartitus :—

*O. Trimeniana* :

bipartitus ; secundus simplex ; tertius—

bifidus :—*O. rhenana* et *pallida*, (Pl. I. fig. 2).

simplex :—*O. anomala*.

### *Oligoneuria anomala.*

*O. anomala*, Pict. 1843-5.

Imago ♀, s. s. “Corpus fuscum vel brunneum. Alæ pallide griseæ ; anticæ nervis transversalibus circa sex. Setae longe pubescentes, pube sparsâ bases versus.” (Hag.)

Long. corp. ♀ 13, set. 8, exp. al. 32 mm.

Hab.—Rio Janeiro (Koll. MS.).

### *Oligoneuria rhenana.*

(Genitalia maris, Pl. III. fig. 7 ; caput, fig. 7a.)

*O. rhenana*, Imh. 1852. *O. anomala*, pars, Pict. 1843-5.

Subimago, v. v. s. Alæ fumatæ, costas versus saturatores. Setarum bases glabrae, apices pilosi.

Imago, v. v. s. Oculi atri ; caput et thorax lutescentes. “Abdomen albicans, segmentorum apices versus ochraceo tinctum,” juncturis obscuris, et setis albis. Pedum antici fuliginosi ; posteriores albi, femoribus cretaceis et unguibus obscuris. Alarum crassiores nervorum saturate fumati.

♀. “Corpo lutescenti, setis glabris ; et nervis alarum albicantium lutescentibus.” (Hag.)

Long. corp. ♂ 9-12, ♀ 7-9 ; set. ♂ im. 15, subim. 10 ; set. ♀ im. circa 4, subim. circa 3 ; exp. al. ♂ 23, ♀ 28 mm.

Hab.—The large rivers of Germany ; and at Turin (Hag.). July and August. I have taken specimens between Cologne and Bonn, in the evening, at the end

of July, on a Rhine steamer; but, unfortunately, I neglected to make a memorandum of the posture of the subimago; they were blown along the deck of the steamboat helplessly, being unable to maintain their footing.

*Oligoneuria pallida.*

(*Genitalia*, Pl. III. fig. 8. a-c; *caput*, fig. 8.)

*O. rhenana*, var. *pallida*, Hag. 1855.

Imago, s. s. *O. rhenanae* similis esse videtur. Dr. Hagen forcipem delineavit; sed figura a forcipe *O. rhenanae* longe discrepat.

Long. corp. ♂ 9, ♀ 7; set. ♂ 10, ♀ 4; exp. al. ♂ 20, ♀ 24 mm.

*Hab.*—Hungary.

I have some doubt about the correctness of Dr. Hagen's figure of the forceps; for the relative proportions of the joints resemble those of the forceps of *Baetis* or *Ephemera*. There is great danger of misrepresentation being the utmost that one can extort from dried specimens.

*Oligoneuria Trimeniana.*

(*Processus ventralis penultimi segmentorum*, ♀, Pl. III. fig. 9, 9a.)

*O. Trimeniana*, McLach. 1868.

Imago, v. s. s. ♀. Caput et thorax lutei, pectore lutescenti. Alae pellucidae, venis fumato-albis. Pedes albicantes, femoribus furfrosis. Setae cretaceae, ad junc- turas apices versus sub-pilosae. Ovae virides.

Long. corp. ♀ 12, exp. al.  $41\frac{1}{2}$  mm.

*Hab.*—Mapulnulo Mission Station, Umroti District, Natal. March.

The wings have a satiny lustre.

Genus CAMPURUS.

(*Ala antica*, Pl. I. fig. 4.)

*Ephemera*, Perch. 1836; *Palingenia*, pars, Pict. 1843-5; *Campsurus*, Etn. 1868.

Imago. Oculi integri. Alae quatuor, anticæ reticulo subtili. Pedes debillimi, unguibus longis tenuibus obtusis

conformibus. ♂ seta media caret; pedum posteriores brevissimi, antici longi femoribus imprimis brevissimis; ultimi segmentorum latera breviter producuntur. ♀ setæ tres æquales; pedes breves debillimi (etiam antici); ovivalvula caret.

The genus *Campsurus* occupies in America the position of *Polymitareys* in the Old World. Many species of this genus are so alike in colour that it is difficult to discover the females. Their habitat is probably limited to large rivers of a tolerably high temperature.

*Campsurus latipennis.*

(Genitalia maris, Pl. III. fig. 10, 10a.)

*Palingenia latipennis*, Walk. 1853 (non var.).

Imago, v. s. s. ♂ ♀. Thorax fusco-luteus; prothorax tumescens, a fronte angustus, sulco longitudinali medio, et foveis lateralibus, alterâ pone oculos subtriangulari, alterâque apud coxam utrinque. Alarum anticarum area marginalis usque ad tertiam partem ab apice fuscescens, nervis transversalibus tenuibus subrectis simplicibus paucis claudentibus. Pedes antici fusi. Abdomen supra lineâ elevatâ longitudinali mediâ, et posterioribus segmentorum fuscis; infra testaceum. Setæ cretaceæ.

Long. corp. ♂ ♀ 7; al. ♂ 8, ♀ 9; set. ♂ 22 mm.

Hab.—Pará.

*Campsurus albifilum.*

(Genitalia maris, Pl. III. fig. 11.)

*Palingenia albifilum*, Walk. 1853.

Imago, v. s. s. ♂. Thorax fusco-testaceus; prothorax veluti in sp. præcedente. Alæ pellucidæ, anteriores nervorum cretacei; transversales apicales areæ marginalis anticae pauci subrecti. Pedes antici fusi, coxis testaceis. Abdomen ochraceum, setis albis; segmentorum apicalium quatuor, cæterum juncturæ, et lineæ longitudinalis elevatae dorsalis margines, cinereo tinctæ. Forceps et penis pallide lutescentes. Setæ albæ.

Long. corp. ♂ 12, al. 13, set. 47 mm.

Hab.—Pará.

*Campsurus albicans.*

*Ephemera albicans*, Perch. 183 $\emptyset$ ; *Palingenia albicans*,  
Burm. 1839.

Imago, s. s. Prothorax lutescens, latera versus violaceus; meso- et meta-thoraces fulvi. Alæ anticae albicantes, crassioribus nervorum et bases versus violaceo tinctæ; alæ posticæ fere in toto albæ. Pedes albicantes, tibiis et femoribus anticis solum violaceis. Caput nigrum. Abdomen pallidum, apicem versus fulvum.

Femina in Cat. Brit. Mus. descripta a mare *C. albicanis* longe discrepat. Pro specie innominata optime habebitur.

Long. corp. ♂ 10, exp. al. 30 mm.

Hab.—Brazil. (Perch.)

*Campsurus cuspidatus*, n. sp.

(Genitalia maris, Pl. III. fig. 12.)

Imago, v. s. s. ♂. Prothorax gibbus, virescenti-murinus. Alæ albæ, vitrinæ, invariæ. Abdomen supra fumato-albidum, infra fere cretaceum.

Long. corp. ♂ 10·5, al. 11 mm.

Hab.—Guatemala. (De Selys Longchamps.)

The name *cuspidatus* indicates the form of the last ventral plate.

*Campsurus quadridentatus*, n. sp.

(Genitalia maris, Pl. III. fig. 13.)

Imago, v. s. s. ♂. Thorax et pedes pallide testacei. Alæ opacæ; anticae subcostis et radiis nigricantibus. Abdomen ochraceum, atrescenti-umbratum, præcipue apicem versus, et lineâ longitudinali mediâ atrâ in segmentorum primis sex.

Long. corp. ♂ 12, al. 13 mm.

Hab.—Santarem, Brazil. (Bates.) June.

Named from the form of the last ventral plate.

*Campsurus puella.*

*Palingenia puella*, Pict. 1843-5.

Imago, ♀ s. s. "Caput et thorax lutescentes: pedes fuscescentes, apicibus femorum pallidis. Prothorax

tumescens, margine antico in angulo prominente producto." (Pict.)

Exp. al. ♀ 26 mm.

Hab.—New Orleans.

It is doubtful whether this species can be re-determined.

Genus *ASTHENOPUS*, nov. gen.

(*Ala antica*, Pl. I. fig. 3.)

*Palingenia*, p., Walk. 1853; *Campsurus* (B), Etn. 1868.

Imago. Oculi integri. Alæ quatuor. Pedes debiles veluti in *Campsuro*. ♂ Setæ duæ longæ; pedes forcipis tri-articulati; prothorax transversus. ♀ Seta intermedia brevissima, vel obsoleta.

The wing figured belongs to an undescribed species from Texas, specimens of which are in Mr. M'Lachlan's collection.

*Asthenopus curtus*, n. sp.

(*Genitalia maris*, Pl. III. fig. 14, 14 a b.)

*Palingenia albifilum*, var., Walk. 1853; *P. curta*, Hag. MS. 1861; *Campsurus curtus*, Etn. 1868.

Imago ♂, v. s. s. Prothorax transversus piceus; meso- et meta-thoraces lutei. Alæ anticæ obscuratae costas versus, nervis transversalibus areæ marginalis apicis paucis, simplicibus et subrectis. Pedum antici fuscæ; posteriores lutei. Abdomen supra nigricans, subtus ochraceum, immaculatum; segmentum singulum supra lineâ longitudinali mediâ, punctoque rotundato utrinque, pallidioribus. Setæ albæ.

Long. corp. ♂ 8, al. 10, set. 35 mm.

Hab.—Pará.

*Asthenopus dorsalis*.

*Palingenia dorsalis*, Burm. 1839.

Imago ♀, s. s. Prothorax transversus, tumescens, lutescens, maculâ in medio violaceâ. Caput nigricans. Ala antica nervis fuscescentibus, et margine costali vio-

laceo-fusco. Pedes antici nigricantes. Abdomen fulvo-griseum, strigâ supra fuscâ in medio, postice quam antice latori. Setae albicantes. (Pict.)

Long. corp. ♀ 11, exp. al. 38 mm.

*Hab.*—Brazil. (Burm.)

### Genus POLYMITARCYS.

(*Ala antica*, Pl. I. fig. 5.)

*Ephemera*, p., Ol. 1791; *Palingenia*, p., Burm. 1839; *Polymitarcys*, Etn. 1868.

Imago. Oculi integri; alae quatuor; pedes debillimi, femoribus brevissimis. ♂ Forcipis pes vel quadri- vel tri-articulatus, secundo articulorum longissimo. Setarum media est brevissima. Ungues antici tenues, obtusi et impares. ♀ caret ovivalvulâ, et setas tres aequales habet.

### *Polymitarcys virgo.*

(*Genitalia maris*, Pl. III. fig. 15, 15 a b.)

*Ephemera virgo*, Ol. 1791. *E. marocana* ?, Fab. 1793. *E. lutea*, Pz. 1804. *Palingenia horaria*, Burm. 1839. *E. albipennis*, Voigt, 1840. *Palin. virgo*, Pict. 1843-5.

Subimago, v. s. s. Imagine pallidior, setis pubescentibus.

Imago, v. s. s. ♂. "Oculi atri; caput infra in fronte atrum." Prothorax testaceus; meso- et meta-thoraces lutescentes. Alæ albæ; nervi transversales apicales areæ marginalis simplices et subrecti. "Pedes albicantes, femoribus anticis infra cum tibiis suis fere in toto atris." Abdomen cretaceum, griseo-nebulosum apicem versus. Setae et forfex albæ.

Long. corp. ♂ ♀ 16-17; exp. al. ♀ 33; set. ♂ im. 23, subim. 18; set. ♀ im. 13 mm.

*Hab.*—Central Europe, in large rivers (*e. g.*, Paris, Cologne, and Mannheim); Madrid.

The subimagines rise from the rivers in immense numbers late in the evening, in August, and soon moult. The species from Morocco is possibly distinct from *P. virgo*.

*Polymitarcys Savignii*, n. sp.

(*Genitalia maris*, Pl. III. fig. 16, 16 a.)

(*Ephemera*, Sav. 1817; *Palingenia Savignyi*, Pict. 1843-5.)

Imago ♂, v. s. s. Capitis vertex cinereus. Prothorax murinus, linea longitudinali in medio atra; meso- et meta-thoraces lutescentes. Alæ albæ; anticeæ costis et subcostis in majore parte nigricantibus. Pedum antici griseo-tincti, posteriores cretacei. Abdomen cinerascens, juncturis, lateribus, ventreque sub-ochraceis, et setis albis. Nervi transversales apicales areæ marginalis anticeæ simplices et subrecti.

Long. corp. 10, al. 11 mm.

Hab.—The Nile.

M. E. Pictet has several specimens of this species.

*Polymitarcys indicus.*

*Palingenia indica*, Pict. 1843-5.

Subimago ♀, s. s. "Caput parvum, nigricans. Prothorax brevis, gibbosus, et fulvus, in medio fuscus. Mesothorax fulvus, strigis longitudinalibus tribus, quarum duæ alarum radices versus prodeunt. Area marginalis antica violaceo-tincta. Pedes antici fulvi, tibiis strigisque in femoribus singulis nigricantibus. Setæ parum ciliatæ, fulvæ." (Pict.)

Long. corp. ♀ 12, exp. al. 30 mm.

Hab.—The East Indies.

Mr. M'Lachlan possesses specimens of two other species, undescribed, from N. W. India and Bombay.

*Polymitarcys macrops.*

*Palingenia macrops*, Hag. 1856.

Apex areæ marginalis anticeæ nervis reticulatis.

Species in electro.

Long. corp. ♂ subim. 11, exp. al. 23 mm.

Genus PALINGENIA.

*Ephemera*, p., Ol. 1791; *Palingenia*, p., Burm. 1839; restricted, Westw. 1840.

Nympha fodiens. Segmentorum abdominis 2-7 branchiifera; laminæ branchiales duplices, et bene fimbriatae.

Palpi maxillares tri-articulati; inferiores ultimis articulorum late expansi. Mandibulæ antice longe prolongatae, per-robustæ, extrinsecus serratae. Frons bicornuta, cornibus dentatis, dentibusque lateralibus. Labrum subrotundatum, apice acuto. Tibiae anticae intus dentatae. (Corn.)

Inter ultimam metamorphosem exuvias alarum mas saepe evertit; feminæ tamen subimago saepissime status adultus est, pelle retenta. (Swam.)

Imago. Oculi integri. Setarum media est brevissima. Alæ quatuor. Tarsi postici quadri-articulati. Ovivalvula femina caret. Forcipis pedes pedicillati, quadri- vel forsitan quinque-articulati, proximis articulorum longissimis.

The nymphs live in burrows which they excavate a little below the water-mark, in the clayey banks of large and tranquil rivers.

### *Palingenia longicauda.*

(Genitalia maris, Pl. III. fig. 17, 17a.)

*Hemerobius*, Clut. 1634. *Ephemera longicauda*, Ol. 1791. *E. fuliginosa*, Georgi, 1802. *E. flosaque*, Illig. 1802. *Semblis marginata*, Pz. 1804. *E. Swammerdiana*, Lat. 1805; *E. Swammerdamiana*, Shaw, 1806.

Pedes postici bi-unguiculati.

Imago, v. s. s. ♂. Alæ cervinæ, nervis luridis. "Thorax luteus; prothorax longitudinaliter quinque-striatus," (Pict.). Tarsorum posticorum primus, secundus et tertius articulorum subæquales, quarto paulo breviores. Ungues tenues conformes. Abdomen supra saturate umbrinum. Pedes, venter, setæque, pallide lurido-ochracei.

Long. corp. ♂ 23, al. 24, set. 70 mm. (Pict.)

*Hab.*—The large rivers of Central Europe (*e. g.* in Germany, Hungary, Austria, and the Netherlands); also in the Caucasus. About Midsummer.

Swammerdam's supposition, that the aquatic stages of development occupy three years, seems merely a gratuitous surmise; for he reared no specimens, and founded his conjecture upon the differences of size presented by the nymphs alone. But though in this instance Swammerdam was inaccurate, his famous treatise will remain a monument of his perseverance, and his extraordinary powers of research.

*Palingenia lata.*

(Genitalia maris, Pl. III. fig. 18, 18 a b.)

*Palingenia lata*, Walk. 1853.

Tarsi postici uni-unguiculati.

Adult. ♂, v. s. s. Alæ et thorax fuliginosi. Prothorax lineis longitudinalibus fuscis impressis quinque, viz.: in medio unâ, latero-dorsalibus duabus, alterisque intermediis duabus. Pedes sub-fuliginosi, vel testaceo-cervini; tarsorum posteriores uni-unguiculati, proximis articulorum paulo cæteris longioribus. Abdomen supra fuscum. Setæ lutescentes pilosæ.

Long. corp. ♂ 20, set. supra 70, exp. al. 43 mm.

Hab.—Silhet and Sarawak.

The specimens from Borneo have paler legs than those from India.

## Genus PENTAGENIA.

(Ala antica, Pl. I. fig. 6.)

*Palingenia* (Δ), Walsh, 1862 ; *Pentagenia*, Walsh, 1863.

Imago. Alæ quatuor. Oculi integri. Setarum media in ♂ brevissima, in ♀ cæteris parum brevior. Tarsus posticus quadri-articulatus; articulorum tres priores æquales, et quarto breviores; unguis dissimiles. Femina caret ovivalvula. Pedes forcipis quadri-articulati, secundo articulorum longissimo.

*Pentagenia vittigera.*

(Genitalia maris, Pl. IV. fig. 1.)

*Pul. vittigera*, Walsh, 1862 ; *Pent. vittigera*, Walsh, 1863.

Subimago. “ Alæ opacæ, flavescentes.”

Imago, v. s. s. ♂. “ Oculorum partes superiores exemplaris viventis flavescentes, inferiores rubiginosæ.” (Walsh.) Medium dorsi fuliginosum; latera venterque testacea, paucis segmentorum apicalium flavis exceptis. Nervi alarum pallidissime testacei, vel electro colorati; plurimis nervorum transversalium in areâ marginali, puncto nodali subcostæ, lineâque infra eundem in quoque nervorum (præter unum) sequentium duorum, atris. Pedes

subtestacei; antici apicibus femorum juncturisque tarso-rum fuscis. Apud segmentorum abdominis juncturas dorsales, lineæ flavescentes duæ breves divergentes sunt. Setæ albæ pubescentes.

♀ simillima, pedibus sub-gambosis. Alæ, bases ver-sus, et in areis marginalibus imprimis, lurido tinctæ.

Long. corp. ♂ 17-19, ♀ 17-20; al. 18-19; set. ♂ 40-50 & 5, subim. 18 & 4.5; set. ♀ 13 & 10.5-20 & 15 mm.

*Hab.*—Illinois and Texas.

*Pentagenia quadripunctata.*

*P. 4-punctata*, Walsh, 1863.

Subimago. “Alæ opace albicantes.”

Imago ♀. “Striga dorsalis picea in segmento singulo abdominis hexagonum symmetricum format. Ala antica in medio serie curvata punctorum fuscorum nebulis parvis cinctorum; viz.—in costa uno, unoque in nervorum sequentium quarto, sexto, et nono.

Long. corp. 19.5; exp. alar. 40; set. ♀ 22.5 & 19.5, subim. 17 & 14; set. ♂ subim. 15 & 3 mm.

*Hab.*—Illinois.

Genus HEXAGENIA.

(Ala antica, Pl. I. fig. 7.)

*Baetis*, p., Say, 1824; *Ephemera*, Guér. 1829-43; *Palingenia*, p., Piet. 1843-5; *Palingenia* (*B*), Walsh, 1862; *Hexagenia*, Walsh, 1863.

Nympha fodiens a Dom. Walsh, in “The American Naturalist, Oct. 1868,” figuratur.

Imago. Oculi integri. Setarum media brevissima. Alæ quatuor. Tarsus posticus quadri-articulatus, primo articulorum vix secundo longiore; ungues dissimiles. Ovivalvula femina caret. Pedes forcipis quadri-articulati; articulorum secundus est longissimus.

*Hexagenia albivitta.*

(Forceps, Pl. IV. fig. 2, 2 a.)

*Baetis albivitta*, Walk. 1853. *Palingenia continua*, Walsh, 1860.

Subimago paulo imagine obscurior.

Imago ♂, v. s. s. Dorsum atrum, strigâ longitudinali latâ mediâ niveâ, in prothorace oblongâ; in

meso- et meta-thoracibus mitriformi, et in abdomine marginibus serratis, claudente in segmentis singulis apicalibus lineas duas breves divergentes atras. Venter sub-hepaticoloratus, striga longitudinali testacea, atque apicibus segmentorum obscuratis. Alæ vitrinæ, pallido fuliginoso tinctæ, nervis piceis; anticarum costæ fuscae; posticarum nervi transversales obscure marginati. Pedes testacei; antici fuscescentes, tarsis atris, ultimis articulorum fuscis. Setæ cervinæ, fusco cinctæ.

Long. corp. ♂ 15, al. 15; set. im. 35, subim. 23 mm.  
*Hab.*—The Amazons and Texas.

Mr. M'Lachlan has a specimen of an undescribed Indian species, in some respects closely related to this.

*Hexagenia (?) atrostoma.*

*Ephemera atrostoma*, Weber, 1801; *Palingenia atrostoma*, Pict. 1843-5.

“E. flava, dorso alisque fuscis, ore oculisquo atris. Thorax marginatus canaliculatusque. Abdomen caudâ bisetâ, setis longissimis flavis.” (Weber.)

*Hab.*—Brazil (Weber).

*Hexagenia decolorata.*

*Palingenia decolorata*, Hag. 1861.

Imago in spiritu ætheris conservata. “Lutea; caput fusco-nigrum; pedum antici nigricantes, posteriores lutei; abdomen luteum, strigis lateralibus obscure fuscis, et setis luteis; alæ vitrinæ, flavescenti tinctæ, nervis luteis, subcostis fuscis exceptis.” (Hag.)

Long. corp. 16, set. 30 (?); exp. al. 30 mm.

*Hab.*—Mexico; Matamoras; Tamaulipas. Common. (Hag.)

Perhaps this is only a colour variety of the following species, but I am unable to decide the point.

*Hexagenia limbata.*

(Forceps, Pl. IV. fig. 3, 3a.)

*Ephemera limbata*, Guer. 1829-43; *Palingenia limbata*, Pict. 1843-5. *Palingenia bilineata*, Hag. 1861.

Subimago, v. s. s. Alæ pallido flavicantes, plurimis nervorum transversalium corvinis. Setæ pilosæ.

Imago, v. s. s. ♂ "Oculorum partes superiores acute virescenti-flavæ, partes inferiores nigræ. Setæ fuscæ, proximis dimidiorum articulorum pallidis." (Walsh, v. s.) Strigæ laterales dorsi prothoracis nigræ retro producuntur, et findentes juxta bases alarum, circa mesothoracis apicem desinunt. Alarum nervi plerumque picei, bases versus pallidi; interdum vero longitudinales lutei, et transversales solum picei sunt. "Pedes antici fusi, basibus plerumque articulorum tarsalium 2, 3, 4, albocantibus vel flavescentibus; posteriores acute flavescentes, paucis articulorum tarsalium cum apicibus, quintoque in toto, fuscis. Abdomen supra striga in medio fusca, lineisque lateralibus obliquis ab apicibus segmentorum "quibus in trigonis paribus flavicantibus vel fulvescentibus latera dorsi finduntur."

♀. A ♂ in nervis alarum vitriniis ("hyaline" Walsh) vel flavescentibus discrepat. Setæ flavæ.

Long. corp. ♂ 20-21, ♀ 22; set. ♂ 40, ♀ subim. 20; exp. al. ♂ 38, ♀ 30 mm. (Pict.)

Hab.—Arctic America, Texas and Mexico; in largo rivers. Mr. M'Lachlan has many specimens.

### *Hexagenia bilineata.*

(Forceps, Pl. IV. fig. 4.)

*Baetis bilineata*, Say, 1824. *Palingenia viridescens & occultata*, Walk. 1853. *Baetis angulata*, Walk. 1853. *Palingenia limbata*, Hag. 1861. *Palingenia bilineata*, Walsh, 1863.

Subimago, v. s. s. Alæ griseæ, nervis piceis, bases versus lutescentes. Alarum posteriores apud margines terminales atro limbatæ.

Imago, v. s. s. ♂ "Oculorum dimidiorum superiora cinamomeo-fusca, inferiora atra" (Walsh, v. s.). Pedum antici picei, apicibus tibiarum et proximis articulorum tarsorum atris; "interdum 2, 3 et 4tus articulorum bases versus pallidiores sunt: posteriores in s. s. ochracei; vel (veluti in v. s.) femoribus obscure virescentibus, cum genubus, tibiis, tarsisque fuscis. Nervi alarum picei; harum anterior areis marginali et submarginali, atque posterior margine terminati, fuscis.

♀ s. s. "Dorsum prothoracis in fronte et ad latera nigrum. Abdominis striga dorsalis maculam cretaceam

oblongam vel triangulam apud latera segmenti singuli utrinque relinquit; striga ipsa segmentorumque apicibus fuscis." (Walsh.)

Long. corp. ♂ 17-21, ♀ 21-29; set. ♂ 42-51, subim. 18; set. ♀ 20, subim. 18-19; al. ♂ 17-20, ♀ 21-23 mm.

*Hab.*—Arctic America, to New Orleans; in lakes and rivers.

The *Hexageniæ* are said to appear in suitable localities in astounding profusion. The late Mr. Walsh says he has seen shrubs broken down by the accumulated masses of one species upon them! The name of the shrub, and how many thousand specimens of the *Hexagenia* in question go to the pound, are unfortunately omitted from his observations.

Genus EUTHYPLOCIA, nov. gen.

(Alæ anticae partes, Pl. I. fig. 8, 8a.)

*Palingenia*, p., Hag. 1861.

Imago ♀. Alæ quatuor. Setæ tres, longæ, subæquales.

*Euthyplocia Hecuba.*

*Palingenia Hecuba*, Hag. 1861.

Imago, v. s. s. ♀. "Capite nigro-fusco; prothoraco fusco, polito; coxis luteis; alis magnis opacis, cervino-tinctis, costas versus obscurationibus, nervis griseis. Abdomen supra nigro-fuscum, subtus lutescens; setis saturate fumatis." (Hag.)

Long. corp. 22, exp. al. 78 mm.

*Hab.*—Vera Cruz (Sallé); Veragua.

There is a specimen of this insect in Mr. M'Lachlan's collection, and another (the type) in that of Baron De Selys Longchamps. The legs are lost, and the colours are so faded, that I have preferred citing the old description to redescribing the species. In what Dr. Hagen suspects to be the male, the undivided eyes are almost contiguous, the median seta is very long, and the anterior legs are long and feeble.

## Genus EPHEMERA.

(Ala antica, in parte, Pl. I. fig. 9.)

*Ephemera*, Lin. 1735.\*

*Nympha fodiens*. Segmentorum abdominis 1-7 branchiifera: laminarum primæ minutissimæ, bipartitæ, dimidiis linearibus marginibus integris; posteriores quoque duplices, sed dimidiis acute lanceolatis, marginibus bene fimbriatis. Palpi maxillares bi-articulati: superiores longi, hirsuti, secundo articulorum primo longiore: inferiores apicibus articulorum ultimorum dilatis, obliquis. Mandibulæ latus externum in cornu prorecto longissimo valdo prorsus producitur. Frons breviter bicornuta, cornibus simplicibus.

Alis conniventibus erectis, pedibus anticis elevatis et prorectis, setisque caudalibus subparallelis, subimago quiescit. Setarum laterales inter se approximantur vel subtus vel supra medium.

Imago. Oculi integri; alæ quatuor; setæ tres longæ, subæquales. Tarsi postici quadri-articulati; articulorum tres priores subæquales; unguis dissimiles. Pedes forcipis quadri-articulati, secundo articulorum longissimo. Ovivalvulâ femina caret.

Species of this genus usually appear in moderate numbers. The apical cross-veinlets of the marginal area of the fore-wing are variable in the same species. The pale spots of the thorax of the subimago, mentioned in the description of *E. vulgata*, are found in the other European species.

*Ephemera vulgata*.

(Genitalia maris, Pl. IV. fig. 5, 5a. Maculæ abdominales, fig. 5b.)

*Ephemera maculata*, Lin. 1747. *E. vulgata* [De G. 1755]; Lin. 1758. *E. communis*, Retz. 1783. *E. danica*, Ronalds, 1856.

Subimago, v. v. s. Alæ vel flavo-virentes, vel virescenti-griseæ, vel cinereæ, nervis fuscis; anticæ in medio fusco vel piceo maculatae; nervi transversales maris corvino marginati: margines terminales late griseo tincti.

\* *Ephemerum*, Hampe (1844), is a genus of the *Phascei*, an Order of the Acrocarpous Mosses.

Vertex capitis maculâ luteâ: prothorax lineis longitudinalibus duabus atris; mesothorax supra maculâ magnâ lutescente, ex quâ in fronte et a posteriore strigæ curvatae duæ producuntur; metathorax luteus, maculis L-formatis nigris duabus.

Imago, v. v. s. ♂. Caput atrum, oculis supra fuliginosis, infra vel paulo saturatioribus vel nigris. Thoracis tergum aterrimum nitens. Alæ virescenti-griseæ vel pallidissime flavo-virentes, maculis piccis et nervis atris: posteriores marginibus terminalibus late, et nervis transversalibus anguste, griseo tinetis. Pedes olivacei; antici femoribus atro-piceis, et tarsis fuscis; posteriores tibiis tarsisque fulvis, apicibus articulorum ultimorum et unguibus fuscis. Abdomen umbrino-olivaceum, juncturis et apicibus segmentorum plus aut minus ochraceis: triangulos acutos duos, lineasque interpositas breves duas, segmentorum posteriorum supra quidque habet, infraque lineas longitudinales atras quatuor, viz., duas longas sub-parallelas, et duas breves divergentes: in anterioribus segmentorum trianguli in strigis curvatis se convertunt, et notulae interpositæ obsolescuntur. Setæ fuscæ, juncturis fuliginosis, atque pubescentes, præcipue apices versus. Forceps fuscus.

♀ plane omnino mari similis, alis pallidioribus exceptis.

Var. ♂ et ♀, v. v. s. Pro maculis trigonalibus, linea curvatae segmentis singulis sunt.

Long. corp. 14-22; al. ♂ 16-17, ♀ 18-24; set. ♂ im. 33 & 34-32 & 36, subim. 16 & 17-19.5 & 21; set. ♀ im. 22 & 24-26, subim. 17 & 16-18 & 19 mm.

*Hab.*—Moscow (Oul.); Scandinavia (Zet.); England, Germany, France, and Switzerland. May and June.

This species is plentiful in warm rivers and tranquil streams in England, and in some of the Swiss lakes (*e. g.*, near Brunnig).

### *Ephemera guttulata.*

(Genitalia maris, Pl. IV. fig. 6, 6a. Maculæ abdominales, fig. 6b.)

*Ephemera guttulata*, Pict. 1843-5. *Ephemera decora*, *E. simulans* & *Palingenia natata*, Walk. 1853. *Ephemera natata*, Hag. 1861.

Subimago, v. s. s. ♂ ♀. Alæ vix nigricantes, maculis et marginibus nervorum transversalium piceis. Pedes purpureo-brunnei. Setæ fuliginosæ, juncturis obscuris.

Imago, v. s. s. ♂. Alæ vitrinæ, in nervis transversalibus piceo crebre maculatae. Pedes et setæ lutei, juncturis fuscescentibus. Maculæ magnæ dorsi abdominis transversæ, subquadratæ, angulis posticis retro productis, et lateribus emarginatis: venter bilineatus.

♀ simillima, alis sparse maculatis.

Long. corp. ♂ 11, ♀ 13-15; al. ♂ 13-15, ♀ 15-19; set. ♂ im. 25, subim. 14; set. ♀ subim. 15 mm.

*Hab.*—From Northern Illinois and from Connecticut northwards; in rivers.

This species resembles *E. vulgata* in having the back of the abdomen spotted instead of being merely streaked, and also in the general formation of the male genital organs. M. Pictet's specimen seems, from the figure, to have been a male imago.

### *Ephemera flaveola.*

#### *E. flaveola*, Walsh, 1862.

Subimago, v. s. s. "Alæ fumatæ. Setæ obscure et pallide virescentes."

Imago, v. s. ♂. "Vertex capitidis rubiginosus; tergum thoracis pallidius. Alæ vitrinæ; anticæ apud costas flavescenti-tinctæ, et tribus prioribus nervorum longitudinalium flavescentibus. Pedes flavescentes; antici apicibus femorum et tibiarum, proximis articulorum tarsalium et apicibus juncturisque cæterum, rubiginosis. Abdomen flavescens, strigâ pallidâ utrinque segmentorum 3-7. Setæ albicantes, juncturis fuscis."

♀ v. s. "Abdomen vitelli-coloratum. Nervi transversales alarum fusci, eis ad apices et apud margines terminales exceptis."

Long. corp. ♂ 7·5-9·5, ♀ 9-10·5; set. ♂ im. 20 & 14, subim. 12 & 10; set. ♀ im. 12 & 10; exp. al. ♂ 17-19, ♀ 19-20. (Walsh.)

*Hab.*—Rock Island, Illinois (Walsh); and New York.

*Ephemera myops.**E. myops*, Walsh, 1863.

“*Ephemerâ flaveolâ major*; oculi eis speciei illius minores, et ab ipsis remoti. Segmentorum abdominis 1-5 rubiginosa, sextum et nonum pallidiora, septimum et octavum flavescentia: vel omnia segmentorum flavescentia sunt.

Long. corp. ♂ 12-13; exp. al. 26-27; set. 27 & 19-29 & 21 mm.

*Hab.*—Rock Island, Illinois.” (Walsh.)

Dr. Hagen ad paginam 177 operis supra citati (Walsh 1863) diagnosem quam forsan ad *E. myopis* varietatem pertineat donavit:—

“Alæ vitrinæ, maculosæ. Abdomen flavum, immaculatum. *E. danicæ* subsimilis.”

Long. corp. 19, exp. al. 42 mm.

*Hab.*—New York. (Hag.)

*Ephemera lineata.*

(Genitalia maris, Pl. IV. fig. 7, 7a. Notæ abdominales, fig. 7b.)

*E. danica*, Pict. 1843-5 (*nec* Mül.). *E. lineata*, Etn. 1870.

Subimago, v. v. s. Alæ virescenti-griseæ, marginibus terminalibus pallido griseo late tinctis, et nervis transversalibus atris. Horum pauci in medio alæ anticeæ atro-brunneo marginati sunt, ideoque seriem macularum formant.

Imago, v. v. s. ♂. Thorax supra fusco-piceus. Alæ vitrinæ, nervis et maculis atris; anticeæ in areis marginali submarginali, atque late marginem terminalem versus, corvino tinctæ. Pedum anteriores femoribus piccis, tibiis tarsisque atris: posteriores virescenti-grisei, coxis, maculis utrinque femorum, et apicibus junciturisque tarsorum, atris. Abdomen fusco-virescenti-griseum, apicem versus lutescens: segmentorum posteriora singula strigis atris dorsalibus sex, infraque lineis longitudinalibus atris duabus; illarum due longæ unaque brevis utrinque supra medium dorsi sunt. Setæ fuscae, juncturis atris; forceps lutescens. Strigarum duas broves ab anterioribus segmentorum absunt.

♀. Simillima mari. Prothoracis tergum virescenti griseum, strigis lateralibus atris duabus. Meso- et metathoraces lutei, strigis obscuris inter alas duabus. Alæ vitrinæ, nervis transversalibus atris, et nervis longitudinalibus cum areis marginalibus et submarginalibus, virescenti-griseis. Pedes antici fusci, apicibus femoris, tibiæ, articulorumque tarsalium, atque tibiæ basi, atris. Caput ochraceum, circa ocellos luteum, oculis (veluti in ♂) fuligineo-umbrinis.

Long. corp. ♂ 15-20, ♀ 21-25; al. ♂ 16, ♀ 20-21; set. ♂ 30 & 35-6; set. ♀ im. 24 & 26-25 & 24, subim. 15 mm.

*Hab.*—The Thames, and the Kennet, near Reading; near Paris; and Genthod, near Geneva. June and July. It frequents rivers or tranquil waters.

I have no doubt that the two females referred by Dr. Hagen to *E. glaucoptera*, Pict. subim. (Hag. 1863), were specimens of *E. lineata*. The *E. danica* of M. Pictet's collection is *E. vulgata*, Lin.

### *Ephemera danica.*

(Genitalia maris, Pl. IV. fig. 8. Maculæ abdominalis, fig. 8a.)

*E. danica*, Mül. 1764. *E. maculata*, Vill. 1789. *E. vulgata*, Don. 1795. *E. cognata*, Ste. 1835-6. *E. hispanica*, Rbr. 1842.

Subimago, v. v. s. Alæ fumatæ, nervis atris, lutescentibus bases versus; vel flavo-virentes. Pedes lutei, tibiis et tarsis posticorum flavo-virescentibus, apicibus articulorum nigricantibus. Abdomen flavicans, maculis corvinis, et setis piceis.

Imago, v. v. s. ♂. Caput et tergum thoracis aterrima vel picea; os et prosternum straminea; oculi fuliginosi. Alæ vix corvinæ; anticae areis marginalibus et submarginalibus anthracinis, maculis fuscis, et nervis atris. Pedum antici atri; posteriores atro-fusci, juncturis saturatiорibus. Abdomen cretaceum, postice sæpe fusco suffusum: posteriora segmentorum strigas quatuor supra habent, infraque lineas longas, atras vel fuscas, duas; anteriora lineis intermediis supra carent, vel etiam omnibus. Setæ piceæ.

♀ abdomine pallide ochraceo, lineis et strigis fuscis. Alæ vitrinae : anticae in areis marginalibus et submarginalibus, posticæ margines terminales versus, nigricantictæ. Pedum posteriores saturate virescente grisei, juncturis atris.

Long. corp. ♂ 16, ♀ 16-23; al. ♂ 16, ♀ 14-22; set. ♂ 35 & 30, ♀ 14-25, subim. 17 mm.

*Hab.*—Spain (Rbr.) ; France (Blanch.) ; England ; Lapland (Pict.) ; Moscow (Oul.) ; Belgium and Germany. In brooks, streams, and cold swift rivers ; from May to July.

This is the May-fly of anglers. Fishermen apply various names to it, according to the state and sex ; thus the “Green Drake” (♀ subim.), “Bastard Drake” (♂ subim.), and the “May-fly” (♀ im.). It frequents colder and more rapid streams than *E. vulgata*. Mr. E. Brown, of Burton-on-Trent, tells me that on one occasion he saw the River Dove almost covered with the subimago, at a part where it is upwards of twenty or thirty feet broad.

### *Ephemerella glaucops.*

(Forceps, Pl. IV. fig. 9.)

*E. lutea*, Sulz. 1776 : (nec Lin.). *E. glaucops*, Pict. 1843-5.

Subimago, v. s. s. Alæ pallide cervino tinctæ, nervis transversalibus atris rufo-cervino marginatis, ideoque in medio alæ anticae et prope basin maculas formantibus ; margines terminales, vel griseo vel rufo-cervino late tincti ; nervi longitudinales flavescentes. Oculi saturate cæsii.

Imago ♂, v. v. s. Oculi supra vel olivacei vel rubigineo-lutescentes, infra saturate olivacei vel purpureo-rubiginei : os flavescentis. Corpus rubigineo-luteum vel luteum ; “prothorax maculis fuscis duabus” (Pict.). Alæ vitrinae, maculis paucis, et margines terminales versus tinctæ, longitudinalibus nervorum (transversalibus ipsis atris) et marginibus transversalium, atque areis marginalibus et submarginalibus, plus aut minus lutescentibus. Pedum antici lutescentes, apud juncturas atri : posteriores testacei, juncturis saturationibus vel virescenti-grisei. Segmentorum abdominis posteriora singula strigas atras

quatuor supra habent, infraque lineas duas; strigis intermediiis duabus anteriora segmentorum carent. Forfex lutea, juncturis atris vel piceis. Setæ fuliginosæ, juncturis obscuris.

♀ v. s. s. Simillima, sed mari pallidior.

Long. corp. ♂ 16-17, ♀ 16; al. ♂ 14-15, ♀ 16; set. ♂ 23, subim. 17, ♀ im. 14 mm.

*Hab.*—Moscow (Oul.); Germany (Burm.); Switzerland and North Italy. In lakes; the end of July, and August.

*Ephemera immaculata*, n. sp.

(Forceps, Pl. IV. fig. 10.)

Imago, v. s. s. ♂. Thoracis tergum brunneo-luteum. Pedum antici picei, femoribus bases versus pallidioribus; posteriores brunneo-testacei. Alæ vitrinae, immaculatae; anticæ areis submarginalibus, posticæ apud margines terminales, fuliginoso tinctæ; nervi obscuri. Abdomen fuscum, apicibus segmentorum lineisque spiracularibus saturationibus. Setæ umbrinæ, invariæ.

Long. corp. ♂ 10·5, al. 11 mm.

*Hab.*—Cuna, Hindostan.

In the Oxford Museum.

*Ephemera exspectans.*

*Potamanthus exspectans*, Walk. 1860.

Subimago, v. s. s. Alæ pallide furfurosaæ, nervis transversalibus purpureo-brunneis. Tergum thoracis fulvescens, strigâ utrinque fuscâ. Abdomen lineis longitudinalibus tenuibus atris, supra quatuor, infra duabus. Setæ olivaceo-luteaæ, juncturis fuscis. Pedes lurido-ochracei.

Long. corp. ♀ subim. 11, al. 14 mm.

*Hab.*—Hindostan.

*Ephemera fasciata.*

(Genitalia maris, Pl. IV. fig. 11, 11a.)

*Potamanthus fasciatus*, Hag. 1858.

Subimago, v. s. s. ♀. Alæ cervinae; anticæ nervis transversalibus atris, paucis in areâ marginali juxta sub-

costam obscure marginatis, et arcis submarginalibus cum crassioribus nervorum longitudinalium lutescentibus. Pedes pubescentes.

Imago, v. s. s. ♂. Thoracis tergum testaceum. Alæ vitrinæ; anticæ apud costas et apices versus pallide luteo tinctæ; nervorum longitudinales furfurosi, transversales atri, puncto nodali subcostæ subfuliginoso. Pedes pallide testacei; antici tarsis nigricantibus (prioribus articulorum fuscis exceptis) et tibiis fuseis. Abdomen sub-ochraceum vel stramineum, supra lineis longitudinalibus duabus, et maculâ parvâ trigonali ad apicem cujusque segmentorum posteriorum utrinque, atris: prioribus segmentorum trianguli absunt. Setæ furfrosæ, juncturis saturati-ribus.

Long. corp. ♂ 13-14, al. 14-15, set. ♂ im. 32-40, ♀ 15 mm.

Hab.—Rainbodde, Ceylon; Masuri, North India.

*Ephemera serica*, n. sp.

(Genitalia maris, Pl. IV. fig. 12, 12a.)

Subimago, v. s. s. Alæ pallide testaceæ; feminæ plures nervorum transversalium, qui tres priores nervorum longitudinalium alæ anticæ interjacent, et pauci cæterorum, atri; in mari quidem plures etiam cæterorum atri sunt.

Imago, v. s. s. ♂. Caput lutescens, circa ocellos rufo-brunneum. Tergum thoracis furfurosum vel brunneo-ochraceum, macula elongata utrinque prothoracis atra. Alæ vitrinæ, nervis veluti in subimagine; punctum rotundatum apud punctum nodale, et alia in mediis nervorum transversalium circa medium alæ picea; alæ posticæ immaculatæ. Pedes ochracei, coxis singulis maculis, apicibus femorum et tibiarum anticarum, atque basibus harum, atris. Abdomen pallide ochraceum, lineis longitudinalibus atris tribus infra et supra. Setæ ochraceæ, irregulariter atro annulatae.

♀ simillima.

Long. corp. ♂ 11, ♀ 14; al. ♂ 13, ♀ 18; set. ♀ subim. 17 mm.

Hab.—Northern China.

## Genus POTAMANTHUS.

(Ala antica, in parte, Pl. II. fig. 1.)

*Ephemera*, p., Lin. 1767. *Baetis*, p., Curt. 1834. *Potamanthus*, p., Pict. 1843-5; Etn. 1868.

Imago. Oculi maris subpartiti. Alæ quatuor. Setæ tres subæquales. Artus forcipis tri-articulati, proximo articulorum longissimo. Tarsi postici quinque-articulati: articulorum primus brevissimus, tibiae adnatus, vix obsoletus; secundus tertio vel quarto multo longior: unguis dissimiles. Ovivalvulâ femina caret.

*Potamanthus luteus.*

(Genitalia maris, Pl. IV. fig. 13, 13a.)

*Ephemera lutea*, Lin. 1767. *E. marginata*,? Mül. 1776. *E. reticulata*, Fourc. 1785. *E. hyalina*, Pz. 1804. *Baetis mellea*, Curt. 1834. *B. marginalis*, Burm. 1839. *E. flavi-cans* & *E. chlorotica*, Ramb. 1842. *P. luteus*, Pict. 1843-5.

Subimago, v. s. s. ♂. Alæ flavæ, costas versus paulo saturationes, nervis tranversalibus nigris.

♀. Alæ virescenti-griseo tinctæ, apud bases flavescentes, nervis flavescentibus.

Imago, v. s. s. ♂. Thoracis tergum luteum vel ochraceo-furfurosum. Alæ vitrinæ, flavescentes costas versus; nervorum longitudinales flavi, transversales atri. Pedum antici sub-furfurosi, tarsis pallidis, sed apicibus tibiarum, juncturis et proximis articulorum tarsalium fuscis; posteriores straminei, unguibus juncturisque tarsorum obscuris. Abdominis dorsum furfurosum, juncturis saturationibus: segmentum singulum puncto sublaterali apicali fusco, et puncto basali in linea spiraculari nigro, utrinque. Forceps flavus vel stramineus. Setæ sub-furfurosaæ, juncturis piceis, breviterque pubescentes.

♀. "Clarior mari, macula fusca super prothoracem, et juncturis tarsorum anticorum obscure fuscis." (Pict.)

Long. corp. ♂ 10-11, ♀ 9; al. ♂ 12-13; exp. al. ♀ 29; set. ♂ im. 15-19, ♀ 12 mm.

Hab.—England (Curt. & M'Lach.); France (Geof.); Germany (Sulz., Pict.).

*Potamanthus Ferreri.**P. Ferreri*, Pict. 1843-5.

**Imago, ♂.** "Thorax pallide furfurosus, maculâ dorsali pone prothoracem fuscâ. Alæ vitrinæ, nervis pallidisime flavescentibus, et pluribus transversalium indiscretis. Pedum antici pallide fusci, femoribus coxisque saturatioribus, et juncturis flavis; posteriores pallide furfrosi, invari. Abdominis dorsum fuscum, latera versus fulvum, maculâ mediâ trigonali super singula segmenta; venter fulvus. Setæ et forceps pallide flavæ."

Long. corp. ♂ 13, set. 18, exp. al. 30 mm.

*Hab.*—Turin (Pict.).

Genus *LEPTOPHLEBIA*.

(Ala antica, Pl. II. fig. 2a.)

*Ephemera*, p., Lin. 1746. *Baetis*, p., Burm. 1839. *Leptophlebia*, p., Westw. 1840. *Potamanthus*, p., Pict. 1843-5. *Palingenia*, p., Walk. 1853. *Leptophlebia* (restricted), Etn. 1868.

**Imago.** Alæ quatuor. Setarum media est longa vel abbreviata. Oculi maris sub-partiti.

It is with very great hesitation that I venture provisionally to retain in this genus the majority of the species placed in it. Ignorance of their preparatory stages of development compels one to class them all together, for the present. The group to which *L. fusca* belongs seems at first sight to be clearly distinct from the rest; but the nymph of *L. fusca* resembles that figured by Professor Pictet as the nymph of *L. cineta*; and besides this, in the closely allied genus *Baetis*, it is found that considerable differences in the form and neuration of the posterior wings of species are compatible with their being in the same genus: therefore *L. fusca*, in spite of appearances, can hardly be separated from the group of which *L. marginata* is the type, with safety. On the other hand, the differences between the group last mentioned, and that of which *L. cupida* is the type, are, upon the whole, equivalent to those between *Ephemera* and *Hexagenia*; therefore it may be a mistake to consider them as sections merely of one genus. When the nymphs are known, all doubts will be set at rest; but not until then. Most likely

differences will be detected between the maxillæ and maxillary palpi of the typical species of the several series, sufficiently marked to require their generic separation.

Series 1. Sp. typica, *L. australis*.

Imago. Tarsus posticus veluti in *Potamanthro*, sed unguibus conformibus uncinatis. Setarum trium media quidem est longa, et cæteris subæqualis: plerumquo tamen abrumpitur, igiturque cauda biseta esse videtur. Forcipis artus tri-articulati, proximo articulorum longissimo. Costæ alarum posticarum haud excisæ sunt (nisi in *L. auriculata*).

Occurrunt species in Australia, et circa litora Oceani Indici usque ad Promontorium Spei Bonæ.

*Leptophlebia australis*.

(Genitalia maris, Pl. IV. fig. 14, 14a. Alæ anticæ areæ marg. apex, fig. 14b.)

*Ephemera australis*, Walk. 1853.

Subimago, v. s. s. Alarum anticarum nervi transversales fusco vel virescenti-griseo marginati, marginibus plus aut minus coufluentibus: paucitas illorum spatium lambda-forme clarum relinquit, quod apicem angulum quo analem oblique interjacit, atque ad basin alæ crus breve emittit.

Imago, v. s. s. ♂. Tergum thoracis piceum, politum. Alæ vitrinæ, nervis luteo-piceis, et apice areæ marginalis anticæ sub-virescenti-griseo, nervulis transversalibus numerosis obliquis et subrectis. Pedum antici fusco-picei, posteriores flavescentes, femoribus obscure nigro bicinctis, et tarsis testaceis. Abdomen luteo-fuscum vel luteo-castaneum. Setæ piceæ.

Long. corp. ♂ 7-10, al. 9-11, set. 23 & 22 mm.

Hab.—Tasmania. (Brit. Mus.)

*Leptophlebia australasica*.

(Ala antica, Pl. II. fig. 2. Genitalia maris, Pl. IV. fig. 15, 15 a, b.)

*Baetis australasica*, Pict. 1843-5.

Subimago, s. s. "Alæ nigricantes, nervis saturatiōribus." (Pict. e figura.)

Imago, v. s. s. ♂. Thoracis tergum atro-piceum. Alæ vitrinae, lurido sub-tinctæ, nervis atro-piceis; margines virescenti-grisei nervorum simplicium transversalium in arcis marginalibus et submarginalibus, in apicibus illarum confluent. Pedum antici atro-picei; posteriores rufo-lutei, femoribus atro bicineticis. Abdominis dorsum rufo-fuscum, venter rufo-luteus; segmentorum 2-8 singula maculis apicalibus utrinque juxta media rotundatis atris, lineisque obscuris obliquis ex apicibus retrorsum fere ad bases productis.

♀. Simillima. Processus ventralis e segmentorum penultimo excisus.

Long. corp. ♂ 9-10; al. ♂ ♀ 11; set. ♂ 32 mm.

Hab.—Sidney and (?) Melbourne.

*Leptophlebia furcifera*, nov. sp.

(Genitalia maris, Pl. IV. fig. 16, 16b. Areæ marginalis apex, fig. 16a.)

Imago, v. s. s. ♂. Tergum mesothoracis brunneoluteum: metathorax aterrimo-sanguineus. Pedum posteriores (exemplar anticis caruit) testacei, femoribus fusco bicineticis, at trochanteribus juxta bases obscure fuscis. Alæ vitrinae, iridi-coloratæ, nervis piceis: anticæ apex areæ marginalis rufo-fusco tinctus, nervis transversalibus simplicibus numerosis subrectis et obliquis; cæteri nervorum transversalium inter costam, subcostam, duosque nervorum longitudinalium sequentium rufo-fusco marginati: puncta nodalia subcostæ nervique sequentis nebulis parvis fuliginosis, veluti etiam punctum bifurcationis quarti nervorum pone costam, circumfunduntur. Abdomen sanguineo-atrum, lineâ in medio longitudinali, lineis spiracularibus, maculisque trigonalibus latero-apicalibus segmentorum 2-6, pallidis. Setæ cretaceæ, juncturis in vices atris.

Long. corp. ♂, et al. 11, set. 13 & 16 mm.

Hab.—Melbourne. (M'Coy.)

*Leptophlebia inconspicua*, nov. sp.

(Genitalia maris, Pl. IV. fig. 17, 17b. Areæ marginalis apex, fig. 17a.)

Imago, v. s. s. ♂. Thoracis tergum politum. Alæ vix lacteo tinctæ, nervis piceis. Pedes picei; interdum

tarsi antici et posteriores pedum pallidiores sunt. Abdomen apicem versus piceum, segmentis intermediis pallidioribus, maculis parvis ovalibus ad latera dorsi flavescentibus. Setæ fuscae, juncturis saturatioribus.

Long. corp. ♂ 5-6, al. 6-7 mm.

Hab.—Adelaide.

*Leptophlebia dentata*, nov. sp.

(Genitalia maris, Pl. IV. fig. 18, 18a, b; feminæ, fig. 18c.  
Areæ marginalis apex, fig. 18d.)

Imago, v. s. s. ♂. Thoracis tergum furfurosum. Alæ cano tinctæ, nervis transversalibus anguste marginatis: juxta punctum nodale subcostæ, atque in areæ marginalis apice, sunt labeculæ atræ: areæ marginalis et submarginalis obscure luteæ. Pedes lutei, juncturis tarsorum piceis, et apicibus tibiarum anticarum atris. Abdomen adusto-umbrinum, apicibus segmentorum saturatioribus. Setæ pilosæ, ochraceæ, juncturis obscuris.

♀ simillima. Processus ventralis penultimi segmentorum emarginatus.

Long. corp. ♂ 8, ♀ 7-9; al. ♂ 11, ♀ 7-13; set. ♂ 18, ♀ 15-16 mm.

Hab.—New Zealand.

*Leptophlebia strigata*, nov. sp.

(Lamina penult. segment., Pl. IV. fig. 19.)

Imago, v. s. s. ♀. Thoracis tergum fusco-fulvum, lineis longitudinalibus duabus utrinque prothoracis atris, quarum exteriores ad bases alarum anticarum prodeunt. Alæ vitrinæ, nervis piceis, juxta bases luridæ; anteriores prope costas umbrino-fulvæ. Pedes saturate furfurosi, femoribus obscure bicinctis, cingulis anticorum plus aut minus confluentibus; tibiæ tarsique pallidi, juncturis saturatioribus. Abdomen auroreum, strigis duabus longitudinalibus atris (e triangulis truncatis continuis constructis), lineâque utrinque singulo segmento apicali obliquâ nigrâ: subtus lineâ longitudinali simplici in medio aterrimâ. Setæ pallide rubiginosæ, juncturis obscuris.

Long. corp. ♀ 22, al. 16, set. 23 & 19 mm.

Hab.—North Australia.

*Leptophlebia costalis.*

*Baetis costalis*, Burm. 1839; *Potamanthus costalis*, Pict. 1843-5.

Subimago, s. s. ♂. "Nigra, linea thoracis ante alas albida, abdomine pedibusque rufo-cingulatis; alis subfumatis, venis omnibus areæ marginalis primæ et secundæ infuscatis." (Burm.)

Long. corp. ♂ 6."

Hab.—New Holland. Perhaps allied to *L. dentata*.

*Leptophlebia nodularis*, nov. sp.

(Genitalia maris, Pl. IV. fig. 20, 20 b, c. Ala postica, fig. 20a.)

Subimago, v. s. s. Alæ vix nigricantes; antice nervis transversalibus anguste nigricanti marginatis, marginibus plus minusve apud medium alæ et inter medium apicemque confluentibus; posticæ unicolores.

Imago, v. s. s. ♂. Thorax supra atro-piceus. Alæ vitrinæ, nervis atris; nervi transversales areæ marginalis areæque submarginalis anguste et obscure marginati, atque inter se apud medium costæ iterumque paulo ante apicem approximantes, ita ut pæne maculas fingant; areæ pars basalis fusca. Pedum antici obscure lutescentes, femore in medio, genu, tibiæque apice nigro circumdati; posteriores furfurosi, femoribus solum nigro cinctis. Abdomen decoloratum. Setæ albicantes, bene nigro annulatæ.

Long. corp. ♂ 9; al. 10-12; set. 16 mm.

Hab.—Christchurch, New Zealand (Fereday). The penis has no appendages.

*Leptophlebia scita.*

(Genitalia maris, Pl. IV. fig. 21, 21a.)

*Baetis scita*, Walk. 1853.

Subimago, v. s. s. Alæ vel nigricantes, vel fuliginosæ, nervis atris (transversalibus marginibus saturatioribus); antica maculâ pallidâ in medio: apud punctum nodale subcostæ hujus, et in apice quoque areæ marginalis, tres vel quatuor nervorum transversalium ferme inter se approximant, ita ut maculas saturatiiores duas faciant.

Imago, v. s. s. ♂. Thoracis tergum fuliginosum. Alæ vitrinæ, cano tinctæ, nervis fuscis: antica maculâ basali, marginibus angustis nervorum areæ marginalis, maculisque super costam duabus quasi in subimagine, fuscis. Posterores pedum lutei, femoribus in mediis obscure punctatis, tarsisque fuscescentibus. Abdomen saturate fuscum, apicibus segmentorum saturationibus; segmentorum intermedia singula maculis brevibus trigonalibus duabus juxta bases, flavescentibus. Setae albæ, vel cinereæ, juncturis subinde saturatis. Forceps luteus.

♀ mari simillima.

Long. corp. ♂ 6, al. 7-8 mm.

Hab.—New Zealand.

*Leptophlebia Taprobanes.*

(Genitalia maris, Pl. IV. fig. 22, 22a.)

*Baetis Taprobanes*, Walk. 1853.

Imago, v. s. s. ♂. Corpus atrum. Pedum antici atri, posteriores picei. Alæ vitrinæ, pallidissime fusco tinctæ, nervis fuscis: antica areis marginali atque submarginali fuscis, apicibus saturationibus, nervis transversalibus in apice illius simplicibus rectisque. Abdominis juncturæ pallidæ. Setæ fuscæ.

Long. al. ♂ 12, set. super 30 mm.

Hab.—Ceylon.

*Leptophlebia annulata.*

(Genitalia maris, Pl. IV. fig. 23, 23 a, b.)

*Potamanthus annulatus*, Hag. 1858.

Subimago, s. s. ♂. "Alis nigro fumosis." (Hag.)

Imago, v. s. s. ♂. Tergum thoracis fuscum. Alæ vitrinæ, nervis atris: anticæ juxta costas fusco tinctæ, nervis transversalibus numerosis curvatis simplicibusque in areis marginalibus apices versus. Pedes saturate fusi. Abdomen testaceum, apicibus segmentorum fuscis. Setæ fuliginosæ.

Long. corp. ♂ 9, al. 10, set. 35 & 37 mm.

Hab.—Rainbodde, Ceylon.

*Leptophlebia femoralis.**Potamanthus femoralis*, Hag. 1858.

Subimago, s. s. "Alis griseo fumatis."

Imago, s. s. "Capite thoraceque fusco-aeneis, pedibus pallidis, femoribus cingulo medio nigro, setis brunneis, abdomine albido, apice fusco, segmentis omnibus apice fusco marginatis; alis vitreis, venis fuscis." (Hag.)

Long. set. ♂ 33, ♀ 15; exp. al. ♂ ♀ 18 mm.

Hab.—Rainbodde.

*Leptophlebia dislocans.**Ephemera dislocans*, Walk. 1860.

Imago, v. s. s. ♀. Alæ vitrinæ, vix lacteo tinctæ, nervis umbrinis: horum transversales in medio atque apud costam alæ anticae fusco marginati, et apicem areæ marginalis versus recti, obliqui et fere simplices. Pedes luteo-picei, femoribus annulis in mediis piceis. Abdomen luteo-castaneum, apicibus segmentorum piceis: segmentum singulum strigâ obliquâ indiscretâ laterali. Setæ piceæ.

Long. al. ♀ 6, set. 18 mm.

Hab.—The Cape of Good Hope.

*Leptophlebia auriculata*, nov. sp.

(Genitalia maris, Pl. IV. fig. 24, 24a. Ala postica, fig. 24b.)

Imago, v. s. s. ♂. Picea, thorace atro. Alæ vitrinæ, nervis atro-piceis; nervi transversales in apice areæ marginalis simplices; alæ posticæ piceo tinctæ, spatio subcostali incolorato. Pedum antici picei; posteriores rufo-picei: femora omnia atro-bicincta (vel? bimaculata). Abdomen juncturis saturationibus, et setis vel atro-piceis, vel corvino-atris.

Long. corp. ♂ et al. 9, set. 20 mm.

Hab.—Graham's Town.

The form of the hind-wing rather closely resembles that of one of the less oblique species of *Arivula* or *Perna*. The name has reference to the excessive dilatation of the marginal area, which reminds one of the "ears" of such shells.

Series 2. Sp. typica, *L. Colombiæ*.

Subimago, ♀. Tarsorum antici quinque-articulati, posteriores quadri-articulati: articulorum penultimus cæteris brevior, duo priores æquales. Alæ posticæ minimæ. Setæ tres æquales.

*Leptophlebia Colombiæ*.

*Ephemera Colombiæ*, Walk. 1853; *Palingenia Colombiæ*, Hag. 1861.

Subimago, v. s. s. ♀. Thoracis tergum luteum. Alæ semi-opacæ, sub-testaceæ; nervi transversales apicales areæ marginalis antice numerosi, simplices, obliqui, et curvati. Pedum antici saturate caryophyllei, tarsis luteis; posteriores lutei. Abdomen supra castaneum, infra lutescens; segmenta intermedia singula apicibus strigisque lateralibus obliquis atris. Setæ fuliginosæ, junc-turis et mediis articulorum saturatioribus.

Long. corp. ♀ 10, al. 15, set. 9 mm.

Hab.—British Columbia.

Perhaps *Baeotis tessellata*, Hag., is to be referred to this species (see *Heptagenia tessellata*).

Series 3. Sp. typica, *L. marginata*.

*Nympha reptans*, laminis branchialibus pinnati-partitis pæne filiforme-dissectis. (Pict.)

Alis erectis, setisque lateralibus a media varis, stans super pedes omnes, subimago quiescit.

Imago. Pedibus anticis elevatis et divergentibus mas dormit. ♀ Tarsi ferme quadri-articulati (rarissime articulus quintus tibiae adnatus obscure indicatur): articulorum penultimus cæteris brevior, duo priores subæquales; unguis postici dissimiles. Setæ tres æquales vel sub-æquales. Pedum forcipis numerus articulorum a duobus ad quatuor pro specie variat, primus tamen semper long-issimus est. Costæ alarum posticarum haud excisæ.

*Leptophlebia marginata*.

(Genitalia maris, Pl. IV. fig. 25, 25 a, b. Alæ anticæ pars, Pl. II. fig. 2a.)

*Ephemera marginata*, Lin. 1767. *E. viridescens*, Fourc. 1785. *E. procellaria*, Schwarz, Nomencl. Rösels. Insect.

Belust. *E. stigma & talcosa*, Ste. 1835-6; *Potamanthus stigma & talcosus*, Pict. 1843-5. *P. marginatus*, Hag. 1863.

Subimago, v. v. s. Alæ fuliginosæ vel corvinæ, venis flavescentibus, transversalibus anguste nigricante marginatis; posticæ bases versus vel in toto pallidiores, nervis transversalibus apud margines terminales nigricantibus.

Imago, v. v. s. ♂. Oculi piceo-hepaticolores, vel rufo-fuliginosi. Tergum thoracis fuscum vel aterrimum, politum. Alæ vitrinæ, nervis fuscis: antica apicibus areæ marginalis et areæ submarginalis fuscis vel sub-fuliginosis. Pedum antici nigro-picei, tarsis cinereis: posteriores picei vel fusco-lutei, tibiis interdum brunneis, tarsisque plus minusve fuliginosis. Abdomen ferme supra fuscum vel fusco-piceum, juncturis flavescentibus, infra fuliginosum, juncturis pallidis, et maculis saturatioribus sub plexus nervorum: interdum tamen segmentorum 2-7 cinerea sunt, lineis spiracularibus saturatis, maculisque sub plexus nervorum luteis, atque cætera sunt fusco-picea. Setæ atræ, vel cinereæ, juncturis vix obscuratis. Forceps fuliginosus vel testaceus.

♀ vel mari similis; vel ab domine supra piceo, apicibus segmentorum saturatioribus, et subtus atro-fuliginoso, tibiis anticis testaceis. Processus ventralis penultiimi segmentorum incisus est.

Long. corp. ♂ 6-12, ♀ 6-11; al. ♂ 7-11, ♀ 7-12; set. ♂ im. 12-20, subim. 9; set. ♀ im. 8-16 mm.

*Hab.*—Temperate and Arctic Europe and America. In England it appears in April, May, July, September and October, and frequents rivers.

### *Leptophlebia helvipes.*

(Genitalia maris, Pl. IV. fig. 26, 26 a-c. Ala postica, fig 26d.)

*Ephemera helvipes, dispar & submarginata*, Ste. 1835-6. *Potamanthus Geerii, helvipes, dispar, & submarginatus*, Pict. 1843-5. *Baetis reticulata*, ? Burm. 1839. *Cloeon culiciformis*, Walk. 1853.

Subimago, v. v. s. Alæ cervinæ vel nigricantes, nervis transversalibus late nigro-marginatis; paucitas horum in medio alæ anticæ maculam transversalem circa costæ medium pellucidam facit.

Imago, v. v. s. Oculi supra saturate purpureo-brunnei, subtus fusti. Tergum thoracis aternum, politum. Alæ vitrinæ, crassioribus nervorum furfrosis. Pedum antici atri, tarsis corvinis; posteriores picei, tibiis tarsisque fuliginosis. Abdomen supra fusco-piceum, juncturis intermediis pallidis; subtus fusco-fuliginosum, maculis obscuris sub plexus nervorum. Forceps furfrosus. Setæ testaceæ, juncturis saturatis.

♀ simillima mari, processu ventrali penultimi segmentorum acute exciso.

Long. corp. ♂ 10-11, ♀ 9-11; al. ♂ 10-11, ♀ 10-13; set. ♂ im. 12 & 13-14 & 16, subim. 7; set. ♀ im. 9-13, subim. 9 & 10-10 & 12 mm.

Hab.—Great Britain; Germany; and Switzerland (Pict. Mus.). In May, June, July, and August, frequenting streams, rivers and lakes. The name is applicable to dried specimens.

### *Leptophlebia castanea.*

*Potamanthus castaneus*, Pict. 1843-5.

Subimago, v. s. "Præcedenti similis, macula tamen cordiformi super mesothoracis apicem, et juncturis thoracis, pallidis."

Imago, ♂ v. s. "Oculi latericio-rubentes; aliter feminæ similis."

♀. "Tergum thoracis striga pallida longitudinali. Pedes setæque pallide fusti." (Pict.)

Long. corp., al., et set. ♀ circa 8 mm.

Hab.—A small stream near the marsh of Villeneuve, at the upper end of the Lake of Geneva, in July. The body of this species is of a maroon-brown colour. (Pict.)

### *Leptophlebia (?) Krueperi.*

*Potamanthus Krueperi*, Stein, 1864.

Imago, s. s. ♂. "Picea, pleuris pedibus abdomeque aurantiacis, alis posticis læte fuscis, setis caudalibus flavescentibus obscure annulatis. Alæ anticæ apud costas vix flavescentes."

Long. corp. ♂ 10·5, exp. al. 12 mm.

Hab.—Greece. In the collection of the Berlin Museum.

*Leptophlebia Picteti.*

*Potamanthus marginatus*, Pict. 1845-5 (nec Lin.).

Subimago. "Alæ obscure griseæ; antica areâ marginali pallide fuscâ."

Imago, ♂. "Oculi obscuri. Tergum thoracis atrum, prothorace fusco. Alæ vitrinae, nervis longitudinalibus rufescentibus; anticæ areis marginalibus et submarginalibus fuscis. Pedes rufescentes; tibiæ singulæ basibus lineisque ex eis productis, et punctis prope apices, atris. Abdomen acute fuscum supra, apicibus segmentorum saturatioribus, præcipue latera versus. Forfex setæque fuscae."

♀ "mare saturatior." (Pict).

Long. corp. ♂ 8, ♀ 7; set. ♂ 10, ♀ subim. 9; al. exp. ♂ 18, ♀ 20 mm.

Hab.—Near Geneva, principally in October.

*Leptophlebia prisca.*

*Potamanthus priscus*, Pict. 1854.

Exp. al. 13 mm.

Species in electro.

*Leptophlebia cincta.*

(Genitalia maris, Pl. IV. fig. 27.)

*Ephemera halterata* (?), Fab. 1777. *E. cincta*, Retz. 1783. *E. nigra*, Fourc. 1785. *E. inanis*, Gmel. 1790-3. *E. albipennis*, Fab. 1793. *E. hyalinata & vitrea*, Zet. 1840. *Potamanthus cinetus*, *inanis*, *halteratus*, *hyalinus*, & *Cloe fuscata*, Pict. 1843-5. *Clocon fuscata*, Walk. 1853.

Subimago, v. v. s. Alæ atræ, nervis obscure flavescentibus. Thorax piceus vel atro-piceus. Abdomen (♂) cinereum, apicem versus fuscum, apicibus segmentorum obscure canis.

Imago, v. v. s. ♂. Oculi supra fuliginosi, infra atri. Tergum thoracis aternum, politum. Alæ vitrinae, crassioribus nervorum vix electro-coloratis. Pedes albi vel cretacei, femoribus anticis saturatioribus, et tibiis tarsisque sub-testaceis. Abdomen rarissime in toto fuscum; plerumque tamen segmentorum 2-7 vitrea sunt,

apicibus interdum lutescenti suffusis, lineis spiracularibus in parte atris, et plexibus nervorum rubiginosis; atque apicalia sunt fusca vel picea, juncturis vel flavescentibus vel rufescentibus. Setae forfexque albantes; haec vel tri- vel quadri-articulata, et basin versus nigricana.

♀. Nervi crassi alarum picei. Pedes setæque testacei, posterioribus tarsorum alblicantibus. Abdomen saturate fusco-piceum, juncturis flavescentibus, et processu penulti-  
mi segmentorum late exciso.

Long. corp. ♂ ♀ 7-8; al. ♂ ♀ 7-9; set. ♂ im. 8 & 9 -8 & 11, subim. 9 & 7; set. ♀ im. 7 & 10-8 & 11 mm.

*Hab.*—Northern and Temperate Europe, in streams and rivers. June, July, and August.

### *Leptophlebia vespertina.*

*Ephemera vespertina*, Lin. 1758. *E. albipennis*, Retz. 1783. *Baetis fusca*, Burm. 1839. *Cloe vespertina*, Oul. 1867.

Subimago, s. s. “Nigra, alis posticis albis. Est inter minores generis sui, toto corpore et alis anticis nigris; solæ alæ posticæ albæ, quibus ab omnibus generis sui speciebus manifeste differt.

*Hab.*—Copiose in Smoldaniâ ad fluvium Sathaella.” (Lin. abstract.)

### *Leptophlebia mollis*, n. sp.

(*Forceps maris*, Pl. IV. fig. 28.)

*Cloe mollis*, Hag. 1861; not described.

Subimago, v. s. s. Alæ pallidissime brunnescenti-albæ. Abdomen feminæ fuscum.

Imago, v. s. s. ♂. Tergum thoracis vel luteo-piceum, vel saturate fuscum. Pedum antici testacei, tarsis albis; posteriores pallidissime testacei. Alæ vitreæ. Segmentorum abdominis 2-7 alba, juncturis obscuris; cætera luteo-picea.

Long. corp. ♂ 6, ♀ 5; al. ♂ 7, ♀ 7·5 mm.

*Hab.*—West Farm, New York.

### Series 4. Sp. *typica*, *L. cupida*.

Imago. Alæ posticæ, et genitalia, eis specierum in serie præcedenti similes. Setarum media manifeste

brevissima. Tarsorum posteriores quinque-articulati; articulorum primus obsolescens, tibiæ adnatus, secundus tertio subæqualis, quartus cæteris brevior; itaque sœpe quadri-articulati esse videntur.

*Leptophlebia cupida.*

(Genitalia maris, Pl. IV. fig. 29, 29a; feminæ, fig. 29b.  
Alæ anticæ pars, Pl. II. fig. 2b.)

*Ephemera cupida*, Say, 1823. *Palingenia concinna, pallipes*, *Baetis debilis* & (?) *E. hebes*, Walk. 1853. *Potamanthus cupidus, concinnus*, & *Baetis ignava*, Hag. 1861.

Subimago, v. s. s. Alæ pallide nigricantes; "posteriores apices versus vix saturatores." (Say.)

Imago, v. s. s. ♂. "Oculi supra fuscescentes, infra atri" (Say, e v. s.). Tergum thoracis piceum vel fuscum. Alæ vitrinæ, nervis et apice areæ marginalis anticæ pallide fusco-piceis. Pedum antici fuscescentes vel vix rufescentes, tarsis atris; posteriores testacei, tarsis nigricantibus. Abdomen piceum, "supra juncturis, linea longitudinali in medio strigisque brevibus duabus apud basin segmenti singuli, pallidis" (Say, e v. s.). Setæ fuscae, juncturis obscuris.

♀. Alæ vitrinæ, vix lurido tinctæ. Processus ventralis penultiimi segmentorum emarginatus.

Long. corp. ♂ 8, ♀ 10; al. ♂ 8, ♀ 11; set. ♂ subim. 14, ♀ 15 mm.

Hab.—Nova Scotia (Walk.); the Ohio River near Cincinnati (Say); Washington (Hag.), &c.

*Leptophlebia nebulosa.*

(Genitalia maris, Pl. V. fig. 1, 1a.)

*Palingenia nebulosa*, Walk. 1853; *Potamanthus nebulosus*, Hag. 1861. *Pot. odonatus*, Walsh, 1862.

Imago ♂, v. s. s. Thoracis tergum piceum. Alæ vitrinæ, nervis piceis; anticæ singulæ nebulis magnis rotundatis apices versus subfuscotentibus. Pedum antici fusci, posteriores testacei. Abdomen supra piceum, subtus subtestaceum. Setæ testaceaæ, juncturis piceis.

Long. corp. ♂ 10, al. 10-11, set. 30 & 6 mm.

Hab.—S. Martin's Falls, River Albany, Hudson's Bay (Walk.); Illinois (Walsh).

Series 5. Sp. typica, *L. fusca*.

*Nympha reptans*. Segmentorum abdominis 1-7 brauchiifera; laminæ branchiales simplices, pinnati-partitæ quidem, sed paene filiforme-dissectæ. Palpi maxillares tri-articulati; superioris primus articulorum largus cæterisque conjunctim longior, secundus tertio subæqualis; inferioris ultimus articulorum penultimo longior.

*Imago*. Posteriorum alarum margo costalis valde excisus. Tarsorum posteriores quinque-articulati; articulorum primus obsolescens, tibiæ adnatus, brevis, secundus longior, tertius et quartus secundo sensim breviores; unguis dissimiles. Artus forcipis primus articulorum aliis longitudine subæqualis.

*Leptophlebia fusca*.

(*Ala antica*, Pl. II. fig. 2 c. *Genitalia maris*, Pl. V. fig. 2, 2 a. *Ala postica*, fig. 2 b.)

*Ephemera fusca*, Curt. 1834. *E. minor* & *Baetis cingulata*, Ste. 1835-6. *Potamanthus brunneus*, *fuscus*, *minor* & *Cloe cingulata*, Pict. 1843-5. *Cloeon cingulata*, Walk. 1853.

Subimago, v. v. s. Alæ cinereæ, nervis piceis. Thorax piceus: tibiarum anticæ subfuliginosæ, posteriores cervinæ.

Imago, v. v. s. ♂. Oculi saturate fuliginosi. Tergum thoracis aternum politum. Alæ vitrinæ, nervis fuscis. Pedes brunneo-olivacei, femoribus et tibiis anticis piceis. Abdomen fusco-piceum, juncturis flavescentibus, setis et forcipe fuscis (in s. s. saturate fulvis).

♀ mari similis, tarsis anticis pallidis. Setæ fuliginosæ, juncturis vix saturatoribus. Processus ventralis penultiimi segmentorum late excisus.

Long. corp. ♂ 5-7, ♀ 6-7; al. ♂ ♀ 6-7; set. ♂ 8 & 12 -11 & 12, ♀ 8-9, subim. 6 mm.

*Hab.*—Great Britain; Interlaken; Mt. Saleve (Pict.). In brooks and rivers. The end of May to August.

A pair of branchial plates is omitted from Professor Pictet's figure of the nymph, which is, in other respects, a good representation of it.

*Leptophlebia modesta.*

(Genitalia maris, Pl. V. fig. 3, 3 a, b.)

*Potamanthus modestus*, Hag. 1864.

Subimago, v. s. s. Alarum anticæ murinæ, posticæ cervinæ.

Imago, v. s. s. ♂. Thoracis tergum piceum vel ater-rimum. Alæ vitrinæ, venis testaceis vel fuscis; posticæ vix lacteo tinctæ. Pedum antici picei; posteriores sat-urate fusci. Abdomen fusco-piceum. Setæ virescenti-griseæ vel fuliginosæ, juncturis atris.

♀. "Processus ventralis penultiimi segmentorum bifidus." (Hag.)

Long. corp. ♂ 6-7; al. ♂ ♀ 8-9; set. ♂ circa 10 mm.

Hab.—Carinthia (Zeller MS.) ; Corsica (Hag.).

Dr. Hagen's diagnosis of the subimago seems to suit *L. modesta*; but the specimen associated with the types of the imago in M. de Selys Longchamps' collection is *Baetis Rhodani*, ♀ subim.

Genus [————].

Imago diptera, caudâ trisetâ; *Leptophlebia* approxime affinis.

[————] *inanis*.

*Potamanthus inanis* ||, Pict. 1843-5.

Imago, s. s. "Caput nigrum; thorax acute fuscus. Alæ vitreæ, nervis tenuibus, fuscis; vix griseo tinctæ, sed apud costas obscuriores, et ad bases flavescentes. Pedes fusi. Abdomen albido, apice fusco; segmenta pallida, singula maculâ magnâ fuscâ utrinque. Setæ griseæ, nigro-punctatæ." (Pict.)

Hab.—Brazil. (Pict.)

In the Vienna Museum.

Professor Pictet thought that the forceps had little lamellar limbs: but he was not sure that the shape of these might not have become changed after death.

## Genus TRICORYTHUS.

(Ala mesothoracica, Pl. II. fig. 3.)

*Ephemera*, Sav. 1817. *Cænis*, Pict. 1843-5. *Tricorythus*, Etn. 1868.

Imago. Alæ duæ; setæ tres æquales; oculi maris integræ. A nervis alarum facillime e *Cæni* distinguitur.

*Tricorythus varicauda.**Cænis varicauda*, Pict. 1843-5.

Imago, s. s. "Pallide luteus, vel ochraceus; oculis maculaque in vertice atris: suturis (?) mesothoracis dorsi quoque atris; alis vix flavescentibus, costis subcostisque paulo saturationibus; et pedibus luteis vel ochraceis griseo variis. Segmentorum abdominis quinque apicalia punctis singulis ventralibus nigris. Setæ albæ, anguste nigro annulatae." (Pict.)

Long. corp. ♂ 4, set. 9; exp. al. 10 mm.

Hab.—Upper Egypt.

## Genus CÆNIS.

*Cænis*, Ste. 1835-6. *Brachycercus*, Curt. 1834. *Macrocercus*, Westw. 1836. *Oxycypha*, Burm. 1839. *Cæneus*, Agassiz, Nomenclat.\*

(Ala antica, Pl. II. fig. 4.)

Nympha fodiens. Segmentorum abdominis 1, 3, 4, 5, 6, 7 branchiifera: laminarum anticæ minutæ, erectæ; secundæ magnæ, crassæ, cæteras tegentes; reliquæ tenuissimæ, semiovatæ, bene fimbriatae, imbricatae, graduatim minores a fronte retrorsum; omnes simplices. Pedes femoribus vel compressis vel gracilibus secundum speciem. Caput vel inerme, vel cornibus tribus frontalibus armatum. Palpi maxillares tri-articulati: superioris proximus articulorum largus, tertio longitudine

\* *Brachycercus* being a sexual name gives place to *Cænis*. *Cænia*, Newman, 1838, is a genus of Diptera. *Cænis* was changed by Poseidon into an invulnerable man named *Cæneus*, one of the *Lapithæ*. He being buried alive by the Centaurs in the course of the famous battle, was thereupon transformed into a bird. She somehow seems to have regained her original form; for Virgil narrates the meeting of Æneas with *Cænis* in Hades, in Æn. vi. 448.

æqualis; secundus brevior: inferioris primus articulorum multo largissimus, cæteris conjunctim longitudine subæqualis; tertius conicus, secundo semi-æqualis.

Pedibus anticis depressis, alis duabus late expansis (fero nunquam erectis), et setis tribus subæqualibus pubescentibus parallelis, subimago quiescit.

Imago. Caput et prothorax transversi; oculi remoti, integri. Alæ duæ magnæ, in longitudinem marginium terminalium ciliatæ. Tarsi quinque-articulati (intermedii interdum tamen quadri-articulati): posticus proximo articulorum brevissimo, tibiaeque adnato, secundo tertio et quarto brevibus subæqualibus, quinto cæteris longiore: anticornum ungues breves, obtusi, conformes; posteriorum ungues dissimiles. Setæ tres subæquales, internodis (in ♂) longis. Forcipis pedes inarticulati. Ovivalvulâ femina caret. Latera segmentorum abdominis plus minusve retro producta.

These insects live a very short time in their adult state. They fly in dense crowds over gentle streams, rivers and lakes, early in the morning and late in the day, at the beginning and end of summer. Dr. Hagen says that, in Prussia, the English species sometimes appear "in such quantities that objects near the water are covered an inch thick, and in the *Curische Nehrung* they are used to feed the pigs." With us, they are less abundant.

### *Cænis macrura.*

(Genitalia maris, Pl. V. fig. 4.)

*Ephemera brevicauda*, Fab. (? sub. ?) 1793. *C. macrura* & *interrupta*, Ste. 1835-6. [*E. pusilla*, Zet. MS., 1840.] *C. grisea*, Pict. 1843-5.

Subimago, v. v. s. Alæ griseo vel nigricanti tinctæ, præcipue costas versus. Setæ nigricantes.

Imago, v. v. s. Caput nigrum, articulis antennarum proximis duobus, et juncturâ capiti-thoracicâ, cervinis. Prothorax corvinus: meso- et meta-thoraces aterrimi nitentes. Pedes ♂ femoribus atris, tibiis tarsisque pallide nigricantibus: ♀ femoribus anticis griseis, posticis cretaceis. Abdomen ♂ griseum, latera versus corvinum; segmentorum intermedia singula supra lineis in mediis longitudinalibus, punctis duobus apud bases duo-

busque subtus circa media, pellucidis: ♀ abdomine nigricante, latera juncturasque versus ochraceo, et subtus virescenti-griseo tincto. E lateribus segmentorum apicalium setulæ tenues pallidæ breves producuntur. Setæ obscuræ, juncturis nigricantibus.

Long. corp. ♂ 4-5, ♀ 6; al. ♂ 4-5, ♀ 7; set. ♂ im. 14 & 15-15 & 16, subim. 3; set. ♀ im. 3·5 & 2, subim. 3 mm.

*Hab.*—England; Switzerland; Voslau (Brauer); Lapland (Zet.). May to September.

Spiders' webs and painted surfaces have provided me with dried specimens in widely distant localities. They fly at Reading from about 4·45 until 8 or 9 a.m., and again in the cool of the afternoon and evening, in June. I have seen subimagines with the dew thick upon their wings, resting on a flood-gate of the canal at 5.30 a.m. in June; and when the sunlight reached them, they immediately began to moult.

### *Cœnis (?) chironomiformis.*

(?) *Brachycercus chironomiformis*, Curt. 1834; (?) *Cœnis chironomiformis*, Ste. 1835-6. *Oxycypha lactea*, Burm. 1839; *Cœnis lactea*, Pict. 1843-5. (?) *C. halterata*, Hag. 1863.

(Margine membranæ subgenitalis ♂ anguste furfuroso, haud nigro veluti in præcedente.)

Imago, v. s. s. Caput et thorax brunneo-lutescentes, nervis alarum obscuris. Pedes albantes, femoribus anticis brunneis. Abdomen supra griseum, apicibus segmentorum et linea longitudinali media alblicantibus, “strigisque indistinctis e spiraculis atris; venter flavescentis” (Hag.). Setæ sub-fuscescentes; forceps et margo membranæ subgenitalis anguste furfurosi absque macula basali obscura.

Long. corp. ♀ 4; exp. al. ♀ 7; set. ♀ 11 mm (Pict.).

*Hab.*—England (Curt.); Prussia (Burm., Hag.); Lake of Geneva (Pict.). In May.

The only specimens I have seen of this insect are in M. Pictet's collection: one (or more) of them is in spirits. The penis of this specimen was very similar in form to that of a dried specimen of *C. macrura*.

*Cœnis dimidiata.*

(Genitalia maris, Pl. V. fig. 5. Ala antica, Pl. II. fig. 4.)

*Ephemera minima*, (?) Lin. 1747. *E. horaria*, (?) Lin. 1758. *Brachycercus minima*, (?) Curt. 1834. *Cœnis dimidiata*, *brevicauda* & *pennata*, Ste. 1835-6. *Cloe horaria*, (?) Ramb. 1842. *E. albipennis*, Atk. 1843. *Cloeon horaria*, (?) Walk. 1853.

Subimago, v. v. s. Alæ canæ, areis et marginali et submarginali fuliginosis paene usque ad apices. Setæ albæ, pubescentes.

Imago, v. v. s. Caput et prothorax fusci, obscuri, antennis albis, oculis atris. Meso- et meta-thoraces picei. Pedum antici sub-fuliginosi, femoribus griseis; posteriores cani, puncto atro ante femoris apicem. Abdomen vel in toto album vel cretaceum; sœpissime tribus segmentorum apicalium tantum cretaceis, et cæteris griseis, juncturis lineaque longitudinali media cretaceis. Ventris segmenta sœpe griseo bi-punctata sunt. Genitalia et setæ albæ.

Long. corp. ♂ 3-5, ♀ 4; al. ♂ 4, ♀ 3; set. ♂ 18 & 13, subim. 3 & 2·5-3 & 3·5; set. ♀ 3, subim. 2·25 mm.

Hab.—England; Visp in the Valais; Belgium (De Selys Mus.); Prussia (Hag.); Moscow (Oul.). From June to August.

*Cœnis diminuta.*

*C. diminuta*, Walk. 1853. *C. amica*, (?) Hag. 1861.

(Genitalia maris eis praecedentis parum similia.)

Imago, v. s. s. Thorax luteus: alis vitreis, costas versus nigricantibus; pedibus albis, femoribus anticis cinerascentibus. Segmentorum abdominis anteriora subvirescenti-grisea, posteriora cretacea; segmentis singulis ad latera lineis obscuris longitudinalibus. Genitalia et setæ albæ.

Long. corp. ♂ 2·5, al. 3, set. 10·5 mm.

Hab.—S. John's Bluff, East Florida (E. Doubleday); Pennsylvania (Hag.).

The posterior femora of *C. amica*, Hag., have each a superior subapical black spot; but I suspect it will be found to be identical with *C. diminuta*, Walk.

*Cænis hilaris.*

*Ephemera hilaris*, Say, 1839; *C. hilaris*, Walk. 1853.

Imago, v. s. ? “Thorax pallide fulvus, alis costas versus obscuris. Abdomen album, segmentis apicalibus singulis utrinque punctis tribus fuscis.” (Say, abstract.)

Long. corp. 2 mm.

Hab.—Indiana. September. (Say.)

*Cænis perpusilla.*

*C. perpusilla*, Walk. 1853.

Imago, v. s. s. ♂. “Testacea; alæ antice sub-cineræ: pedes setæque albi.”

Long. corp. 2·5, set. 12, exp. al. 6 mm.

Hab.—Ceylon. (Walk.)

*Cænis discolor.*

*Oæcycypha discolor*, Burm. 1839; *Cænis discolor*, Pict. 1843-5; *Cloeon discolor*, Walk. 1853.

Subimago, ? s. s. “Supra cinerea, subtus pallida; alis infuscatis, costa obscuratiori; his filamentisque analibus longius pilosis.”

Long. corp. ♀ 2·5 lin.

Hab.—Cape of Good Hope. (Burm.)

*Cænis argentata.*

*C. argentata*, Pict. 1843-5.

(Confer cum *C. macrurâ* et *C. dimidiatâ*.)

Subimago, s. s. “Caput et thorax grisei, fulgore argenteo; prothorax vix clarior. Alæ griseæ, costis subcostisque nigris. Pedum antici grisei; posteriores albi. Abdomen basin versus griseum, apice albo. Setæ albæ, vix nigro annulatis.” (Pict.)

Long. corp. ♀ 4, exp. al. 8, set. 3 mm.

Hab.—Sicily. (Pict.)

*Cænis oophora.**C. oophora*, Pict. 1843-5.

Fusca; alis albicantibus, pedibus flavescentibus. (Pict.)

Long. corp. ♀ im. 4, exp. al. 11 mm.

Hab.—Sardinia. (Kollar.)

It is just possible that this species may be rediscovered, and determined by comparison with Pictet's figure; but the chances are small.

*Cænis luctuosa.*

(*Forceps maris*, Pl. V. fig. 6.)

(?) *Brachycercus Harrisella*, Curt. 1834; (?) *C. Harrisella*, Ste. 1835-6. *Oeycypha luctuosa*, Burm. 1839. *Ephemeræ brevicaula*, Blanch. 1840. *Cænis luctuosa*, Pict. 1843-5. *C. halterata* (*nymphæ*), Etn. 1868.

Subimago, v. v. s. Caput et prothorax corvini; meso- et meta-thoraces atri. Alæ nigricantes, nervis obscuris. Pedes albi, interdum vix fumati; antici tibiis tarsis et femorum apicibus anthracinæ. Abdomen pallide fulvum, setis atris.

Imago, v. v. s. ♂ & ♀. Caput et thorax picei, suturis et lateribus fuliginosis; tarsis anticis fuliginosis, et pedibus posticis nigricantibus juncturis atris. Abdomen rufo-fuliginosum, lineâ obscurâ brevi ad latera utrinque in singulis juncturis: forcipe setisque griseis vel nigricantibus.

Long. corp. ♂ 6·5, ♀ 5·7; al. ♂ 6, ♀ 5·5; set. ♂ im. 25, subim. 4; set. ♀ subim. 3 & 4 mm.

Hab.—Somersetshire and Berkshire; Berlin (Burm.); Lake of Thun (Pict.).

The name of this species probably has reference to the pale oblong spots near the bases of the long bristle-like processes from the lateral edges of segments 7, 8 & 9. These bristles are found in all the English species, and are longer in the imago than in any other stage of development.

## Genus EPHEMERELLA.

(Ala antica, Pl. II. fig. 5.)

*Ephemera*, p., Pod. 1761; *Potamanthus*, p., Pict. 1843-5; *Potamanthus*, restrict., Hag. 1849; *Ephemerella*, Walsh, 1862.\*

Nympha reptans, laminis branchialibus complexis quatuor. Segmentorum branchiifera sunt 4, 5, 6 et septimum. Palpi maxillares tri-articulati: superiores brevissimi, ultimis articulorum penultimis longioribus; inferiores duabus prioribus articulorum subæqualibus, ultimis brevissimis.

Ei *Leptophlebiæ* subimagineis habitas similis est.

Imago. Alæ quatuor; setæ tres, subæquales; oculi maris sub-partiti. Tarsi quinque-articulati; articulorum proximus obsolescens, tibiae adnatus, secundus tertio subæqualis, quartus brevior: unguis dissimiles. Pes forcipis tri-articulatus, secundo articulorum longissimo. Lamina ♀ ventralis e penultimo segmentorum; sed ovivalvula caret.

*Ephemerella ignita.*

(Genitalia maris, Pl. V. fig. 7. Ala postica, fig. 7a.)

*Ephemera ignita*, Pod. 1761. *E. erythrophthalma*, Schr. 1798. *E. fusca*, diluta, apicalis, rufescens, rosea & *Baetis obscura*, Ste. 1835-6; *Potamanthus erythrophthalmus*, apicalis, dilectus, roseus & *erythrocephalus*, Pict. 1843-5.

Subimago, v. v. s. Alarum anticæ saturate cinereæ, posticæ albo-cervinæ.

Imago, v. v. s. ♂. Oculi supra brunneo-carnei, vel carnei; partes inferiores olivaceæ vel flavo-olivaceæ. Thoracis tergum fuscum. Alæ vitrinæ, crassioribus nervorum longitudinalium cum punctis nodalibus vix piceis, vel electro-coloratis. Pedes paene sulphurei: antici tibiis lutescentibus, et tarsis obscure testaceis; posteriores tarsis testaceis. Abdomen supra saturate fuscum, lateribus juncturisque ochraceis; subtus hepaticoloratum, interdum fuliginoso tinctum, lineis brevibus divergentibus

\* *Ephemerella*, Schimp (1850, or 1860), is a genus of the *Phascei*, an order of the Acrocarpous section of the Mosses.

duabus punctisque sequentibus duobus apud basin singuli segmenti obscure indicatis. Setæ fuliginosæ, juncturis saturatioribus; forceps testaceus.

♀. Oculi flavo-olivacei. Tibiae anticæ testaceæ. Puncta nodalia alarum eis maris distinctiora. Processus ventralis penultimi segmentorum retusus.

Long. corp. ♂ 8-9; al. ♂ 9, ♀ 10-11; set. ♂ 10 & 11-12 & 11, subim. 8 & 7; set. ♀ 8 & 9, subim. 7 & 9 mm.

*Hab.*—Great Britain, Germany, Switzerland; also Madrid (E. Pict. Mus.). Frequent streams and rivers. June to September.

### *Ephemerella gibba.*

*Potamanthus gibbus*, Pict. 1843-5.

Subimago. “Alæ saturate griseæ, apud bases lutescentes.”

Imago, v. s. ♂. “Oculi acute rubri. Corpus fusco-rubiginosum; alis vitreis; pedibus fulvis, anticis femoribus tarsisque fuscescentibus; setis fulvis, juncturis atris.”

♀. “Pallidior mare; capite thoraceque fulvis, illo atro-punctato, punctis super verticem confluentibus, hoc punctis parvis duobus fuscis in medio prothoracis tergi, et pluribus commissurarum dorsalium mesothoracis fuscis. Abdomen rufescens, supra punctis obscuris duobus in medio segmenti singuli.” (Pict.)

Long. corp. ♂ 6-7, ♀ 7; set. ♂ 9, subim. 7; set. ♀ 8, subim. 7; exp. al. ♂ 15-16, ♀ 21 mm.

*Hab.*—A streamlet near Villencuve, at the head of the Lake of Geneva; in July (Pict.).

### *Ephemerella ænea.*

*Potamanthus æneus*, Pict. 1843-5.

Subimago. “Alæ griseæ; antica basi subcostæ fulvâ.”

Imago, ♀. “Caput et oculi fulvi, maculâ supra fuscâ. Prothorax maculâ utrinque fuscâ; mesothorax æneus, politus. Alæ vitræ, iridicoloratæ; nervorum longitudinales fulvi, transversales grisei. Pedes fulvi, juncturis tarsisque nigricantibus. Abdomen olivaceo-fuscum; setæ testaceæ, juncturis atris.” (Pict.)

Long. corp. ♀ 6, set. 8; exp. al. 18 mm.

*Hab.*—Mt. Saleve. (Pict.)

Professor Pictet's figure of the nymph of *E. aenea* closely resembles a dark variety of the nymph of *E. ignita*.

*Ephemerella invaria.*

(*Genitalia maris*, Pl. V. fig. 8, 8a.)

*Baetis invaria* & *fuscata*, Walk. 1853. *Ephemerella excrucians*, Walsh, 1862.

Subimago, v. s. s. Alæ setæque pallide nigricantes.

Imago, v. s. s. - ♂. "Oculi supra flavi, infra fuscii" (Walsh, e v. s.). Tergum thoracis saturate luteum, vel fuscum. Alæ vitreæ, vix flavæ apud costas; crassioribus nervorum lutescentibus vel fuscis. Pedum antici picei; posteriores testacei, tarsis subtestaceis, apicibus juncturisque fuscis vel rubiginoso-luteis. Abdomen supra piceum vel fuscum, vel rubiginosum, apicibus segmentorum saturatioribus; subtus testaceum. "Sætæ albantes, juncturis fuscis." (Walsh.)

♀ mari simillima.

Long. ♂ 5·5-7·5, ♀ 5·5-6·5; set. ♂ 11-13, ♀ 10-12·5; exp. al. ♂ 14·5-20, ♀ 15-19 mm.

*Hab.*—Nova Scotia (Walker); Illinois (Walsh).

*Ephemerella consimilis.*

*E. consimilis*, Walsh, 1862.

Imago, ♂. "Pedes immaculati; antici apicibus tibiarum et proximis articulorum tarsalium fuscis." (Walsh.)

Mr. Walsh describes the prescutum of the mesothorax as being "half as long again as wide," and the mesothorax itself as "being 4-5 times as long as wide;" whereas, in the preceding species, the one "is scarcely longer than wide," the other is "scarcely three times longer than broad."

Long. corp. ♂ 5, set. circa 5; exp. al. 14 mm.

*Hab.*—Rock Island, Illinois (Walsh).

## Genus BÆTISCA.

(Ala antica, Pl. II. fig. 6.)

*Baetis*, p., Say, 1839; *Bætisca*, Walsh, 1862.

*Nympha reptans*: “adulta laminis branchialibus externis caret; primun tamen segmentorum laminam duplice obtectam utrinque habet. A thorace segmentorum abdominis quinque priorum dorsa obteguntur, elementis tergi thoracis confluentibus et retrorsum productis; itaque ne quidem alæ, nedum thoracis commissuræ, videri possint” (Walsh). Caput a fronte bicorné; labium integrum; maxillarum inferioris palpus bi-articulatus, ultimo articulorum singulariter bifido, et pæne cheliformi.

Imago. Alæ quatuor; setarum media abortiva; oculi maris integri. Tarsi quinque-articulati; articulorum primus longus, tibiæ adnatus, secundus primo brevior sed tertio æqualis, quartus paulo brevior; ungues dissimiles. Pes forcipis tri-articulatus; articulorum primus longus, secundus longissimus, et tertius brevissimus. Femina ovivalvulâ caret; processus ventralis penultimo segmentorum excurrit.

*Bætisca obesa*.

(Genitalia maris, Pl. V. fig. 9.)

*Baetis obesa*, Say, 1839; *Bætisca obesa*, Walsh, 1862.

Subimago, v. s. s. Alæ corvinæ, lineolis brevibus transversalibus numerosis pellucidis; antica semifasciis transversalibus pellucidis duabus, una e costa prope apicem, alteraque basi propiore. (Say & Walsh.)

Imago, v. s. s. ♂. Rufo-fusca. Alæ vitreæ, nervis tenuissimis; “anticarum costæ subcostæque lutescentes.” Pedes testacei; antici gamboso tincti, juncturis et ultimo articulorum tarsalium obscuris; posteriores ultimis articulorum quoque obscuris. Prosternum prominens, bidentatum. Abdomen subtus, præcipue apicem versus, rubido-albo tinctum: segmentorum penultimum linea longitudinali in medio ventris fusca. Setæ pubescentes, albæ, juncturis obscuris.

♀ simillima mari, processu ventrali segmentorum penultimi breviter inciso.

Long. corp. ♂ 7-8, ♀ 6-8; set. ♂ ♀ im. 6-7, ♀ subim. 4-5; exp. al. ♂ 20-22, ♀ 22-25 mm.

Hab.—Illinois (Walsh), Indiana (Say); and California.

#### Genus CLOEON.

(Ala mesothoracica, Pl. II. fig. 7.)

*Ephemera*, p., Lin. 1761; *Cloeon*, Leach, 1815; *Cloe*, p., Burm. 1839; *Caenis*, p., Walk. 1853; *Chloeon*, Lubbock, 1863; *Cloeopsis*, Etn. 1866.

Nymphæ natans, laminis branchialibus utrinque septem: laminarum septima simplex, cæteræ bilamellares, omnes marginibus integris. Palpi biarticulati, articulis longitudine æqualibus; inferiores depresso, apicibus obliquis; superiores tenuissimi, filiformes.

Alis erectis setisque divergentibus subimago quiescit stans in pedes omnes.

Imago. Alæ setæque duæ. Oculi maris bipartiti, parte superiori sub-turbinata. Tarsorum posteriores quadri-articulati; articulorum primus multo longissimus, tibiæ adnatus, secundus brevis, tertius brevissimus; unguis dissimiles. Pes forcipis tri-articulatus, secundo articulorum longissimo: penis occultus. Ovivalvula femina caret.

#### *Cloeon dipteron.*

(Forceps, Pl. V. fig. 10.)

*Ephemera diptera*, Lin. 1761. *E. striata* & *annulata*, Müll. 1776. *Cloeon pallida*, Leach, MS., 1815. *E. marginata*, Gor. & Pritch. 1829. *C. marmoratum* & *obscurum*, Curt. 1834. *C. cognatum*, *dimidiatum*, *virgo* & *consobrinum*, Ste. 1835-6. *Cloe diptera*, Burm. 1839. *Cloe affinis*, Ramb. 1842. *Cloe virgo* & *cognata*, Pict. 1843-5. *E. culiciformis*, Fonscol. 1846. *C. diptera* & *cognata*, Walk. 1853. *Chloeon dipteron*, Lubbock, 1863-5; *Cloeopsis diptera*, p., Etn. 1866.

Subimago, v. s. s. Alæ pallide cervino tinctæ.

Imago, v. v. s. ♂. Oculi turbinati sub-carnei, vel rufo-hepaticolorati; inferi atro-picei. Tergum tho-

racis aterrimum, politum. Alæ vitrinæ, nervis quasi atris; horum tres priores incolorati: nervulæ apicales areae marginalis rectæ, paucæ (3-5), atque vix obliquæ. Pedum antici femoribus vel albidis apicibus cretaceis, vel virescenti-cinerascentibus, singulis maculis præ-apicalibus rufescensibus, et tibiis tarsisque vel cinereis vel carbonariis: posteriores albantes vel cretacei, macula femoribus saepe indiscreta, atque juncturis et articulis terminalibus tarsorum (proxima juncturarum excepta) atris. Abdomen supra atro-piceum, juncturis ochraceis; infra saturate cinereum, maculis rubiginosis duabus in juncturis albidis singulis. Setæ albæ, juncturis in vices late atris. Forceps cinerascens, proximis articulorum fuscis.

Var. ♂. v. s. s. Parvum. Segmentorum abdominis 2-7 grisea, apicibus strigaque trigonali ex eis utrinque producta rubiginosis: tria apicalia picea.

*Hab.*—Belgium.

♀. Corpus luteum. Oculi olivacei, obscure bicincti. Capitis vertex rufescente bi-strigatus. Alæ vitrinae, areis et marginalibus et submarginalibus tribusque prioribus nervorum longitudinalium electro-coloratis, nervis transversalibus inclausis albis; caeteri nervorum atri: horum plures transversalium incrassati. Pedum antici gambosi, tibiis tarsisque testaceis juncturis obscuris: posteriores femoribus fere electro-coloratis, cingulis et præapicali et apicali rufescensibus, tibiis tarsisque testaceis, unguibus et 2-4 juncturarum obscuris. Setæ rubido-albæ, juncturis in vices late atris.

Long. corp. ♂ 5-10, ♀ 11; al. ♂ 6-11, ♀ 10; set. ♂ 13-20, subim. 14; set. ♀ 12-15, subim. 12 mm.

*Hab.*—Europe, and the Madeiras. In tranquil waters: May to July.

I have seen female specimens of two species of *Cloeon* very closely related to *C. dipterum*; one inhabits N. W. India, the other Knysna, S. Africa.

*Cloeon simile.*

(Forceps, Pl. V. fig. 11.)

*C. simile*, Etn. 1870.

Subimago, v. v. s. Alæ murinae, apud costas et bases vix subflavescentes, nervis furfurosis. Setæ fusco-atrae. Oculi turbinati maris subolivacei.

**Imago**, v. v. s. ♂. Oculi turbinati olivacei, vel saturate virescenti-sulphurei; inferiores atro-picei, vel atro-virentes. Thoracis tergum vel aterrimum, vel fuscum, politum. Alae vitrinæ; subcosta tertiusque nervorum longitudinalium substraminei; nervulæ apicales areae marginalis multæ, sparsim conjunctæ. Pedes olivacei; posteriores tarsis saturationibus; antici tibiis viridi-griseis vel atro-virentibus, et tarsis griseis vel atris. Abdominis dorsum piceo-fuscum; venter cinereus, apice vix fulvescenti. Forceps virescenti-albus. Setæ rubido-albæ, juncturis rubescensibus.

♀ mari simillima. Oculi atri. Caput circa ocellos castaneum, lineis vel strigis duabus concoloribus super verticem: carina facialis tuberculos duos parvos piceos utrinque habet. Abdomen supra luteo-fuscum, juncturis luridis, et tracheis subcutaneis obscuris; subtus olivaceum, ultimo segmentorum penultimoque stramineis. Pedes viridi-olivacei, tibiis tarsisque saturationibus.

Long. corp. ♂ 9, ♀ 10; al. ♂ 8, ♀ 10-11; set. ♂ 14-15, subim. 9; set. ♀ 10-14, subim. 7-9 mm.

*Hab.*—Near Retford, in Nottinghamshire, and at Quy Fen, near Cambridge. September and October; in still water.

The name *simile* has reference to the similarity between the sexes.

*Cloeon subinfuscatum.*

*Cloe subinfuscata*, Ramb. 1842.

Subimago, v. s. s. ♀. Alæ saturate corvinæ, nervis longitudinalibus luteis: nervulæ apicales areae marginalis multæ (circa 12) sparsimque divisæ. Thorax lutescens, pedibus luteo-luridis. Setæ juncturis obscuris.

Long. corp. ♀ 9, al. 11 mm.

*Hab.*—Provence. (Rambur.)

*Cloeon obscurum.*

*Cloe obscura*, Ramb. 1842: nec Curt.

Subimago, ♀, v. s. s. Alæ murinæ, nervis luteis: nervulæ apicales areae marginalis simplices (circa 8 in numero), et irregulariter flexuosæ. Thorax rufo-testaceus: pedes testacei.

Long. al. 9, corp. 6 mm.

Hab.—France; probably near Paris.

The name will not obtain, Curtis having previously applied “*C. obscurum*” to *C. dipterum*, subim.

*Cloeon russulum.*

(Forceps, Pl. V. fig. 12.)

*Ephemera russula*, Mül. 1776. *Cloeon dimidiatum*, Curt. 1834. *E. culiciformis & striata* (?), Blanch. 1840. *Cloe pumila*, Ramb. 1842. *Cloe dimidiata*, Pict. 1843-5; *Cloeon dimidiata & Cœnis sinensis*, Walk. 1853; *Chloeon dimidiatum*, Lubbock, 1863 & -5. *Clocoptis diptera*, var., Etn. 1866 & -7.

Subimago, v. v. s. Alæ canæ; apud crassiores nervorum saepe gramineo tinctæ. Setæ cinerascentes.

Imago, v. v. s. Variabilissima colore: ♂ maribus *Cloconis similis*, *Baetis binoculati* atque varietatum hujus, ♀ uxoribus *Centroptili luteoli* et *Baetis binoculuti* colore similis.

Var. 1. ♂. *Cloeoni simili similis*. Oculi turbinati fuliginosi. Tergum thoracis aternum politum. Pedes pallide virescenti-flavescentes, tarsis nigricantibus. Abdomen saturate fuscum, juncturis flavescentibus, tracheisque subcutaneis atris. Setæ albæ, juncturis rufescensibus. Forceps albus, apices versus nigricans.

Hab.—Reading (Berkshire), and near Cambridge; as well as in the Valais Canton, near Visp.

Var. 2. ♂. *Baeti binoculato similis*. Oculi turbinati sulphurei vel flavi; inferiores fuliginosi, vel virescenti-cinerei, vel etiam glauci. Tergum thoracis fuscum, vel fusco-luteum, vel saturate surfurosum vel testaceo-furfurorum. Alæ vitrinae; nervulæ apicales areæ marginalis (6-8) obliquæ, interdum sparse furcatæ prope subcostam. Pedum antici virescenti-grisei, tibiis tarsisque griseis vel canis; posteriores cretacei vel sulphurei, tibiis tarsisque obscure albis. Segmentorum abdominis 3-6 vel 7 alba, vix aut ne vix quidem lurido suffusa; cætera supra furfurosa vel fusca, juncturis ochraceis, et subtus plus aut minus ochracea. Setæ albæ, juncturis interdum anguste obscuris.

*Hab.*—Temperate Europe, and North China. This is the normal form.

Var. 3. ♂ feminæ similis, oculis thoraceque eis ♂ var. 2 similibus.

♀. Oculi cæsii, vel atro-fuliginosi. Capitis vertex strigis longitudinalibus rufescentibus duabus. Thoracis tergum furfurosum, vel pallidissime sub-flavum, interdum aternum, politum : mesothoracis apex nonnunquam gramineus. Alæ vitrinæ, bases versus saepè gramineo tinctæ. Femora gramineo-alba, tibiae tarsique albi, ultimis articulorum cinereis. Abdomen supra vel pallide sub-olivaceum, vel furfuroso-album : segmentorum 2-7 singula macula parva in medio dorsi, duabus apud junc- turam apicalem, et linea curvata indisereta utrinque, furfrosis; striga juxta spiracula cum tracheis subcu- taneis atris. Interdum abdomen est fuscum. Setæ albæ.

*Hab.*—Temperate Europe.

Long. corp. ♂ 5-9, ♀ 7-8; al. ♂ ♀ 7-8; set. ♂ 13-15, subim. 9; ♀ 10-12, subim. 6-8 mm.

*Hab.*—Temperate Europe and Northern China.

#### *Cloeon mendax.*

*Cloe (C) mendax*, Walsh, 1862.

Subimago. “Alæ sub-opacæ, vix nigricanti tinctæ.”

Imago, ♂. “Pallide rubiginosum, alis vitreis. Pedes pallidi, apicibus tarsorum obscuris. Abdomen subtus pallide virescens, pellucidum, apicem versus opacum.”

♀. “Supra pallidior; interdum thorace sub-vires- centi.” (Walsh.)

Long. corp. ♂ 4, ♀ 4-5; set. ♀ 9, ♂ subim. 8; exp. al. ♂ ♀ 14 mm.

*Hab.*—Rock Island, Illinois. (Walsh.)

#### *Cloeon dubium.*

*Cloe (C) dubia*, Walsh, 1862.

Subimago. “Alæ fumatæ, nervis longitudinalibus saturatioribus.”

Imago, ♂. *Bacti propinquum* similis (*q. cf.*) sed minor. Maculæ laterales in abdominis medio pellu-

cidæ. Inter nervos longitudinales, super marginem terminalem, nervulæ forsan duplices sint."

♀. "Caput, thorax et abdomen pallide rubiginosi: horum primum et ultimum interdum obfuscata. Femur anticum plus aut minus rubiginosum. Venter pallide flavus vel virescens." (Walsh.)

Long. corp. ♂ 2·5-4, ♀ 2·5-3; set. ♂ 4·5-5·5, ♀ 3-4·5; exp. al. ♂ ♀ 8-10·5 mm.

Hab.—Rock Island, Illinois. (Walsh.)

### *Cloeon vicinum.*

*Cloe vicina*, Hag. 1861.

Imago. ♂. Oculi rufi. Thorax fulvus, alis vitreis. Pedes albicantes; antici bases versus fulvi. Abdomen album, pellucidum, tribus segmentorum apicalium supra fuscis, et setis albidis."

♀. "Corpus cretaceum, alis vitreis, pedibus et setis albicantibus." (Hag.)

Long. corp. ♂ 4; set. ♂ 10, ♀ 6; exp. al. 10 mm.

Hab.—Washington. (Hag.)

### *Cloeon vitripenne.*

*Ephemera (Cloe) vitripennis*, Blanch. 1851.

Imago. "Fusco-virescens; capite supra flavo-rufo; alis vitreis, iridicoloratis; pedibus pallide testaceis, mediis et apicibus femorum plus aut minus fuscis." (Blanch.)

Hab.—Chili. (Blanch.)

### Genus CENTROPTILUM.

(Ala antica, Pl. II. fig. 8.)

*Ephemera*, p., Mül. 1776; *Cloeon*, p., Ste. 1835-6; *Cloe*, p., Burm. 1839; *Baetis* (A), Etn. 1868; *Centroptilum*, Etn. 1869.

Nympha agilis; segmentorum abdominis 1-7 laminis branchialibus simplicibus et integris, ovatis vel obovatis. Maxillarum superiores palpis quadri-articulatis; articulorum primus brevissimus, secundus longus et cæteris conjunctim æqualis. Maxillarum inferiores dimidiis labii

subæquales, acute subtrigonales, angustæ, palpis biarticulatis, depressis, articulis longitudine subæqualibus; articulorum ultimus apice late expanso subtruncato.

Ei *Cloeonis* subimarinis habitus admodum similis est.

Imago. *Cloeoni simillima*; nisi alis posticis binervatis, et per-angustis.

### *Centroptilum luteolum.*

(*Forceps et ala postica*, Pl. V. fig. 13, 13a.)

*Ephemera luteola*, Mül. 1776. (?) *E. albipes & parvula*, Scop. 1763. *Cloeon ochraceum, hyalinatum & albipenne*, Ste. 1835-6. *Cloe halterata*, Burm. 1839. *Cloe translucida, ochracea, hyalinata & albipennis*, Pict. 1843-5; *Cloeon translucida, halterata, hyalinata, albipennis & ochracea*, Walk. 1853. *Cloeon bioculatum*, Hag. 1863. *Baetis luteolus*, Etn. 1868; *Centroptilum luteolum*, Etn. 1869.

Subimago, v. v. s. Alæ vix fumatæ, vel pallidissime flavescentes. Femora ochracea, tibiæ cinereæ, tarsi nigricantes; setæ fumatæ vel cinereæ.

Imago, v. v. s. ♂. Oculi turbinati acute vel saturate carnei, inferiores sub-olivacei. Tergum thoracis fuscum, vel piceum, vel atrum. Alæ vitreæ, nervis longitudinalibus vix flavescentibus. Pedes cretacei, tibiis tarsisque plus aut minus canis vel fumatis. Segmentorum abdominis sex priora vitrina, alba, maculis apud apices utrinque furfurosis, aut apicibus in toto furfurosis; cætera furfurosa vel fusca, juncturis ochraceis; venter pallidus, apice testaceo. Setæ forcepsque albæ.

♀. Dorsum furfurosum, vel testaceum, vel fusco-olivaceum; venter pallidus. Oculi olivacei, vel atrovirentes, vel atri. Thoracis tergum umbrinum, vel fusco-olivaceum. Pedes vel virescenti-flavi, tibiis tarsisque pallide virescenti-griseis, vel flavescentes, tibiis tarsisque canis. Abdomen interdum ochraceo-furfurosum; tracheæ subcutaneæ saturiores.

Long. corp. ♂ 6-7, ♀ 5-6; al. ♂ ♀ 6-7; set. ♂ 10-14, subim. 7; set. ♀ subim. 6-9 mm.

Hab.—Switzerland, Germany, Great Britain and Norway (Alten); also Hudson's Bay territory. April to November.

*Centroptilum pennulatum.*

(Forceps et ala postica, Pl. V. fig. 14, 14a.)

*C. pennulatum*, Etn. 1870.

Imago, v. v. s. ♂. Oculi turbinati carnei, inferiores olivacei vel atri. Prothorax supra nigricanus vel furfurosus; meso- et meta-thoraces fuscæ vel furfurosi. Alæ vitrinae. Femora alba, apicibus cretaceis; tibiae tarsiæque albi, ultimis articulorum vix cervinis. Segmentorum abdominis 2-6 vitrina, alba, juncturis vix castaneis; cætera supra castaneo-rubiginosa, infra ochro-leuca. Setæ forfexque albæ.

♀. Oculi virescenti-grisei: vertex capitis flavus, striga lata longitudinali saturate rubiginosa. Tergum thoracis furfurosum. Pedes cani, femoribus subcretaceis, vel gamboso-albidis. Abdomen supra pallide virescenti-griseum, juncturis pallidioribus; infra pallidum immaculatum: striga dorsalis longitudinalis in medio, apices segmentorum, et maculæ trigonales ex his ad latera prorectæ, lutescentes. Setæ pedesque eis maris similes.

Long. corp. ♂ 8-9, ♀ 8; al. ♂ ♀ 8; set. ♂ 14-17, ♀ 11 mm.

Hab.—The Manifold, Ilam, Staffordshire, and Grazely, near Reading. August to October.

*Centroptilum lituratum.*

*Ephemera culiciformis*, Scop. 1763 (nec Lin.). *Cloe litura*, Pict. 1843-5; *Cloeon litura*, Walk. 1853.

Subimago. “Alæ pallide fuscescenti-griseæ. Setæ fuscæ.”

Imago, ♂. “Oculi turbinati sulphurei. Tergum thoracis fuscum, strigâ atrâ in medio a fronte retrorsum sed non metathorace tenus attinente: metathorax punctis atris duobus. Alæ vitrinae; pedes flavescentes. Abdomen rufo-fulgum, apicem versus obscurius, maculis lateralibus. Setæ flavescentes, juncturis atris.”

♀. “Flava, oculis nigris, lineis rufescensibus parvis duabus super mesothoracem, et maculis paucis lateralibus super abdomen.” (Pict.)

Long. corp. ♂ 8, set. 12, exp. al. 17 mm.

Hab.—Mt. Saleve (Pict.); in the autumn.

*Centroptilum stenopteryx*, n. sp.

(Ala postica et forceps, Pl. V. fig. 15, 15a.)

Subimago, v. s. s. ♀. Alæ vix fumatæ. Thorax ochraceus, pedibus testaceis, tarsis pallidis.

Imago, v. s. s. ♂ uxori simillimus, corpore furfuroso, setis albis. [Oculi turbinati olim rufescentes ?].

Long. corp. ♂ 4, ♀ 4·5; al. ♂ 4, ♀ 5·5; set. ♂ ♀ 5-6 mm.

*Hab.*—Carinthia (Zeller's MS.).

## Genus BAETIS.

(Ala antica, Pl. II. fig. 9.)

*Ephemera*, p., Lin. 1746; *Baetis*, Leach, 1815; *Cloe*, p., Burm. 1839; *Brachyphlebia*, Westw. 1840; *Cloeon*, p., Walk. 1853.

Nympha agilis, laminis branchialibus simplicibus, integris, ovatis vel obovatis, septem utrinque. Palpi maxillares biarticulati, articulis longitudine subæqualibus; superiores teretes; inferiores proximis articulorum subcylindricis, apicalibus depresso et spathulatis atque lateraliter incisis. Dimidia labii acuta, subulata, maxillis angustiora.

Subimago inter quem *Cloeoni* vel *Centroptilo* simulat.

Imago. Oculi maris partiti, superioribus dimidiorum sub-turbinatis. Alæ quatuor; posteriores minimæ, oblongæ, costâ unidentatâ, atque tribus vel duobus nervorum longitudinalium, quorum secundus vel simplex vel divisus sit. Setæ duæ (*B. ferrugineus* tamen tertiam medium brevissimam habet). Forceps artus quadriarticulati, penultimis articulorum plerumque longissimis. Femina ovivalvulâ caret; nisi fugax sit.

The species mostly inhabit rivers and streamlets. They appear principally in spring and early in the autumn; but the exact period depends upon climate. Monstrous specimens seem to be more frequently met with in the autumn than in the spring; they throw much light upon the morphology of insects in general.

*Baetis binoculatus.*

(Forceps et ala postica, Pl. V. fig. 16, 16a.)

*Ephemera bioculata*, Lin. 1758. *E. fuscata*, Lin. 1761. *E. diaphana*, Mül. 1776. *E. flava*, Schr. 1776. *E. lutea*, Fourc. 1785. *E. notata*, Gmel. 1790-3. *E. culiciformis*, p., Ol. 1791. *E. striata*, (?) Walck. 1802. *Baetis bioculatus*, Leach, 1815; *B. bioculata*, Sam. 1819. *B. flavescens* (subim.) & *autumnalis* (monstr. ♂), Curt. 1834. *B. fuscata*, (?) Ste. 1835-6. *Brachyphlebia bioculata*, Westw. 1840; *Cloe bioculata* & *autumnalis*, Pict. 1843-5; *Cloeon bioculata* (excl. g.), *autumnalis* & *striata*, (?) Walk. 1853. *Cloeon pumilum*, Hag. 1863; *Cloe pumila*, Oul. 1867.

Subimago, v. v. s. Alarum anticæ fumatae, posteriores cretaceæ. Pedes maris femoribus virescenti-albis, tibiis fumatis, et tarsis nigricantibus; femina femoribus anticis viridi-olivaceis, maculis obscuris singulis apices versus, atque posterioribus femorum et tibiarum stramineis, tarsis omnibus corvinis. Setæ fumatae.

Imago, v. v. s. ♂. Oculi turbinati citrini, vel acute flavi; inferiores flavo-, vel atro-virentes.

Var. 1. ♂. Thoracis tergum furfurosum, vel fuscum, vel atro-piceum. Alæ vitrinae, fulgore auroreo, et nervis albicantibus. Pedes cretacei; tibiæ tarsique antici atque unguis fumati; posteriores tibiarum albæ. Segmentorum abdominis 2-6 vel 7 cretacea vel flavo-alba, spiraculis rubiginosis vel atris; cætera supra vel furfurosa, vel fusca, vel fusco-olivacea, juncturis sulphureis; subtus ochracea vel saturate olivacea. Setæ albæ.

♀ et Var. 2 ♂. Corpus pallide fuscum, vel fusco-olivaceum: subtus olivaceum. Oculi feminæ atri, vel atro-picei. Alæ vitrinae, nervis fuscis, vel piceis. Pedum antici femoribus fusco-olivaceis, tibiis et tarsis fuliginosis, vel tibiis corvinis et tarsis anthracinis: posteriores femoribus prasino-olivaceis, obscure apud apices maculatis, vel annulatis atque tarsis griseis. Abdomen supra apicibus segmentorum anguste fuscis, et tracheis subcutaneis vel atris vel fuliginosis: segmentum singulum subtus apud basin punctis obscuris duobus. Setæ vel virescenti-albæ, vel albæ atque bases versus nigricantes, vel cinereæ atque bases versus corvinæ vel atræ.

Long. corp. ♂ 6-8, ♀ 4-7; al. ♂ 6-8, ♀ 6-7; set. ♂ 12-14, subim. 7-10, ♀ 10-12, subim. 8-10 mm.

*Hab.*—Great Britain, France, Switzerland (Pict.), Germany, Moscow (Oul.), Scandinavia, and Hudson's Bay (Dale Mus.). May to October. In rivers.

Mr. Walker's specimen from N. America (g., Brit. Mus. Cat.) represents a distinct and undescribed species.

*Baetis debilis.*

*Cloeon debilis*, Walk. 1860.

Imago ♀, v. s. s. “Fulva, capite nigro, abdomine testaceo; setis pedibusque albis, alis vitreis, venis albis.”

Long. corp. 5, exp. al. 12 mm.

*Hab.*—Hindostan. (Walk.)

This species can only be identified by the type.

*Baetis scambus.*

(Forceps et ala postica, Pl. V. fig. 17, 17a.)

*B. scambus*, Etn. 1870.

Subimago, v. v. s. ♂. Alæ setæque cinereæ. Pedes cretacei vel virescenti-albi, tibiis tarsisque cinereis. Forceps cretaceus.

♀. Femora maculis vix discretis, subapicalibus cinereis.

Imago, v. v. s. ♂. Oculi turbinati caryophyllacci, vel caryophyllaceo-fuliginosi: inferiores nigri. Tergum thoracis aternum vel piceum: alæ vitrinæ. Pedes cretacei vel virescenti-grisei; tarsis anticis fumosis, posterioribusque tibiarum et tarsorum virescenti-albis, junc-turis et unguibus vix obscuris. Abdominis segmentorum quatuor apicalia fusca, caetera alba vel virescenti-alba, fusco vix suffusa. Setæ albæ, prioribus juncturarum vix obscuris.

♀. Corpus olivaceo-fuscum. Alæ vitrinæ, nervis atropiceis. Oculi saturate olivacei. Femora olivacea; tibiae tarsique saturate fumosi. Setæ quoque fumosæ, junc-turis vix obscuris.

Long. corp. ♂ 6, ♀ 6·5; al. ♂ 6, ♀ 7; set. ♂ 12, subim. 7; set. ♀ 9-10, subim. 5 mm.

*Hab.*—Ashbourne and Norbury, Derbyshire. June and September.

*Baetis finitimus*, nov. sp.

(Forceps et ala postica, Pl. V. fig. 18, 18a.)

Imago, v. v. s. ♂. Oculi turbinati fuliginosi. Thoracis tergum aternum politum. Alæ vitrinæ, nervis pellucidis. Pedes albi; antici femoribus cretaceis. Abdomen album, tribus segmentorum apicalium fuscis. Setæ forcepsque albæ.

Var. v. v. s. Abdomen fuscum. Pedes virescenti-grisei, femoribus apices versus punctis singulis paulo obscuris, et tarsis anticis fere griseis.

♀, v. v. s. Oculi atro-fuliginosi. Pedes virescenti-nigri, tibiis et tarsis saturate albis. Abdomen piceum, apicibus segmentorum obscuratis. Setæ albæ.

Long. corp. ♂ ♀ 5; al. ♂ ♀ 6; set. ♂ 12-16, ♀ 7 mm.

Hab.—The streamlet by the Oratory, on the right-hand side of the Val Montjoie, between Contamines and Notre Dame de la Gorge. July.

*Baetis atrebatinus*.

(Forceps et ala postica, Pl. V. fig. 19, 19a.)

*B. atrebatinus*, Etn. 1870.

Subimago, v. v. s. Alæ ♂ cinereæ: ♀ saturate fumatae. Pedes ♂ olivacei vel saturate virescenti-grisei, posterioribus tibiarum cinereis et lineis singulis brevibus externo-basalibus atris: tarsorum antici atris, posteriores saturate nigricantes juncturis atris, omnes ultimis articulorum piceis: ♀ tarsis rufo-piceis, juncturis atris. Setæ ♂ corvinæ, ♀ atro-piceæ.

Imago, v. v. s. ♂. Oculorum turbinati rufo-hepati-colorati, inferiores fuliginosi. Tergum thoracis aternum politum. Alæ vitrinæ; anticæ tribus prioribus nervorum longitudinalium virescenti-griseis. Pedum antici femoribus atro-virentibus, tibiis atris singulis maculis pallidis sub-apicalibus, et tarsis saturatissime cinereis; posteriores saturate olivacei, apicibus tibiarum tarsorumque virescenti-griseis. Segmentorum abdominis 2-7 fumata, singula lineis brevibus punctisque obscuris duo-

bus dorsalibus, subtus strigis atris duabus, atque juncturis virescenti-albis; cætera fusco-picea, juncturis flavis. Setæ rubido-albæ, juncturis obscuris. Forceps fumatus.

♀ mari simillima; secundo articulorum antennalium fere omnino rubiginoso, vertice capitis inter ocellos piceo; abdomine vel luteo- vel rufo-piceo, juncturis ochraceis, setisque fuliginosis.

Long. corp. ♂ 7, ♀ 8; al. ♂ 6-7, ♀ 8; set. ♂ 11-13, subim. 8·5; set. ♀ 8-10, subim. 7·5 mm.

Hab.—The river Kennet near Reading, Berkshire; in October.

### *Baetis Rhodani.*

(Forceps et ala postica, Pl. V. fig. 20, 20a.)

*Cloe Rhodani*, Pict. 1843-5; *Cloeon Rhodani*, Walk. 1853. *Cloe maderensis*, Hag. 1865.

Imago, v. v. s. ♂. Oculi turbinati lateritio-fuliginosi. Thoracis tergum aternum politum. Alæ vitreæ, nervis vix fuscis. Pedum antici tibiis tarsisque nigricantibus; posteriores pallidiores, femoribus saturate virescenti-griseis vel pallide olivaceis, et tarsi vel atris vel nigricantibus. Dorsum abdominis fusco-virescenti-griseum, juncturis ochraceis vel canis, et tribus segmentorum apicalium saturationibus; subtus saturate virescenti-griseum, segmentis singulis saepe strigis brevibus divergentibus prope bases, punctisque sequentibus duobus, nigricantibus. Setæ virescenti-griseæ, juncturis fuliginosis vel rubiginosis.

Var. ♂ im. v. v. s. Oculi turbinati carneo-hepaticolorati; inferiores saturate virescenti-grisei. Thoracis tergum luteum, postice nigro maculatum. Pedes cretacei, unguibus atris; antici gamboso tincti, tarsi fumatis. Alæ vitrinæ, nervis virescenti-griseis, subcostis radiisque bases versus atris. Abdomen album, quatuor segmentorum apicalium luteis; segmenta pallida, apicibus luteo marginatis, marginibus ad latera antice productis. Forceps albus. Setæ albæ, juncturis rubiginosis.

Hab.—In the same stream as *B. finitimus* (p. 113).

♀ im. mari simillima. Tergum thoracis interdum brunneo-fuscum. Abdomen opacum.

Subimago, v. v. s. ♂. Alæ cinereæ. Pedum antici virescenti-grisei, maculis singulis crescentiformibus femorum apices versus obscuris, tibiis nigricantibus, et tarsis atris; posteriores cretacei, tibiis fumatis, et tarsis atris. Setæ atro-corvinæ.

Long. corp. ♂ 5·5-9, ♀ 6·5; al. ♂ 5·5-9, ♀ 12; set. ♂ 13-19, subim. 10·5; set. ♀ 16 mm.

Hab.—Dovedale, Derbyshire, and Dorset; Geneva and Contamines; Corsica (Bellier); and Madeira (Wollaston). April to October.

The Wollastonian specimens ticketted 69 & 70 appear to me the same species as the others.

*Baetis phæops.*

(Forceps et ala postica, Pl. V. fig. 21, 21a.)

*Ephemera bioculata* (?), Fourc. 1785. *E. testacea* (?), Gmel. 1790-3. *Baetis vernus* (?), Curt. 1834. *B. culiciformis*, (*phæopa*), *striata*, *verna*, & *E. dubia*, Ste. 1835-6. *Cloe verna*, Pict. 1843-5; *Cloeon verna*, Walk. 1853. *Baetis phæops*, Etn. 1870.

Subimago, v. v. s. Alæ fumatæ vel murinæ. Femora testaceo- vel prasino-grisea, vel etiam virescenti-alba, maculis singulis obscuris v-formatis prope apices; tibiæ fumatæ, apicibus anticarum atris; tarsorum antici atri, posteriores cinerei juncturis atris. Setæ forfexque fumatæ.

Imago, v. v. s. ♂. Oculorum turbinati fuliginosi, inferiores corvini. Tergum thoracis aternum vel piceum, politum, in exemplari recens nato fuscum. Alæ vitrinæ, nervis longitudinalibus sub-fuscis, et fulgore hyacinthino. Pedum antici femoribus sub-olivaceis, tibiis tarsisque canis, maculâ rotundatâ obscurâ prope apicem cujusque illarum; posteriores femoribus vel virescenti-griseis vel prasino-cretaceis, tibiis albis, et tarsis canis. Abdomen vel dorso fusco et ventre cinereo; vel dorso piceo-fusco, juncturis canis; vel virescenti-griseo, tribus segmentorum apicalium saturate fuscis. Setæ albæ vel fumatæ. Pes forcipis duobus prioribus articulorum canis, et cæteris albis.

♀ mari simillima. Oculi atro-fuliginosi, vel atri. Tergum thoracis vel atrum, vel piceum, vel piceo-fuscum.

Pedes femoribus olivaceis; crura cana vel anthracina juncturis atris, sed antica saturatiōra. Setae albæ, corvinæ bases versus.

Long. corp. ♂ ♀ 6-8; al. ♂ 6-7, ♀ 7-9; set. ♂ 14-16, subim. 5; set. ♀ 10-12, subim. 7 mm.

*Hab.*—Great Britain, and Norway (Hammerfest and Alten). It mostly inhabits streams and rivulets, and appears in England in May, June, September and October.

### *Baetis tenax.*

(Forceps et ala postica, Pl. V. fig. 22, 22a.)

*B. tenax*, Etn. 1870.

Imago, v. v. s. ♂. Oculorum turbinati saturate fuliginosi, inferiores nigro-fuliginosi. Tergum thoracis aterrimum, politum. Alæ vitrinæ, nervis albido-pellucidis. Pedes femoribus olivaceis, anticis crurum cinereis, et posterioribus fumosis juncturis vix obscuris. Abdomen fusco-olivaceum, juncturis pallidis, et setis albis. Pes forcipis albicans, proximo articulorum interdum obscuriori.

♀ mari simillima.

Long. corp. ♂ 6-8, al. 7, set. 14-16 mm.

*Hab.*—Ashbourne Green, Derbyshire; in rills and streamlets. June.

### *Baetis buceratus.*

(Forceps et ala postica. Pl. V. fig. 23, 23a.)

*B. buceratus*, Etn. 1870.

Subimago, v. v. s. Alarum anticæ fumatæ, posticæ pallidiores. Pedum antici femoribus olivaceis, tibiis nigricantibus, et tarsis atris; posteriores vel olivacei tarsis et maculis præ-apicalibus femorum crescentiformibus atris, vel femoribus saturate cretaceis, tibiis fumosis, et tarsis atris. Setæ piceæ. Pes forcipis primo et secundo articulorum pallidis, reliquis fumosis.

Imago, v. v. s. ♂. Oculi turbinati saturate fuliginosi, vel fuliginoso-hepaticolorati. Tergum thoracis

aterrium. Alæ vitrinæ, tribus prioribus nervorum longitudinalium vix obscuris. Pedum antici saturate olivacei, cruribus atro-corvinis, vel nigricantibus maculis præ-apicalibus tibiarum atris, et juncturis tibio-tarsalibus albicantibus: posteriores vel femoribus et tibiis olivaceis atque tarsis fumosis, vel tarsis atro-corvinis juncturis atris; vel cruribus pallide nigricantibus, juncturis vix obscuris; vel cruribus albis, juncturis atris. Abdomen supra vel fusco-piceum, juncturis pallidis; vel cum 2-6 segmentorum virescenti-griseis, et interdum apicibus, lineolis divergentibus duabus dorsalibus, atque strigis e spiraculis, obscuris: infra nigricans, juncturis albidis, saepe duobus segmentorum apicalium ochraceis. Pes forcipis primo et secundo articulorum olivaceis, et cæteris plus aut minus nigricantibus; aut primo solum olivaceo. Setæ nigricantes, saepe albicantes apices versus.

I neglected to describe the female.

Long. corp. ♂ 8-9, al. 8, set. 10-16 mm.

*Hab.*—The Holybrook and Kennet, near Reading. April and May.

*Baetis amnicus*, nov. sp.

(Forceps et ala postica, Pl. V. fig. 24, 24a.)

Imago, v. v. s. ♂. Oculi turbinati saturate fuliginosi; inferiores atro-fuliginosi. Thoracis tergum aterrium, suturis pallidis. Alæ vitrinæ, lurido tinctæ, nervis atro-olivaceis; anticæ areis marginalibus apices versus paulo obscuratioribus. Pedum antici saturate virescenti-grisei, tibiis tarsisque fumatis vel nigricantibus; posteriores femoribus interdum vix ochraceo-tinctis, genubus rufescenti strigatis, tibiis fere cervinis, et tarsis obscuris juncturis nigris. Abdomen supra fuscum, juncturis vix pallidis; subtus in majore parte cinereum. Setæ albæ vel cinereæ, bases versus juncturis obscuris. Forceps ater, apices versus saturate fuliginosus.

♀. Alæ vitrinæ, nervis virescenti-griseis. Pedes virescenti-grisei vel olivacei, tibiis tarsisque nigricantibus. Setæ nigricantes.

Long. corp. ♂ 9-10, ♀ 7; al. ♂ 10, ♀ 8; set. ♂ 26, ♀ 13 mm.

*Hab.*—Barberine, Nant Bourant, and Mottet, at an altitude of some 4560 feet. July. In mountain torrents, whence the specific name.

*Baetis alpinus.*

*Cloe alpina*, Pict. 1843-5; *Cloeon alpina*, Walk. 1853.

Imago, ♂. "Oculi rufi. Tergum thoracis saturate fuscum. Alæ vitreæ, nervis fulvis, paucis distinctioribus in areæ marginalis apice. Abdomen fuscum, juncturis albidis; setæ albæ, juncturis fuscis." (Pict.)

Long. corp. ♂ 10, set. 11, exp. al. 23 mm.

Hab.—A stream from Mt. Brevent in the valley of Chamounix, in August. (Pict.)

*Baetis melanonyx.*

*Cloe melanonyx*, Pict. 1843-5; *Cloeon melanonyx*, Walk. 1853.

Imago, ♂. "Corpus saturate fuscum, ventre pallidiore. Oculi turbinati rufi. Pedum antici fusci; posteriores cretacei, unguibus atris. Alæ vitreæ, nervis fuscis, transversalibus subtilissimis. Setæ flavescentes, juncturis fuscis." (Pict.)

Long. corp. ♂ 7, set. 9, exp. al. 18 mm.

Hab.—La Valle d'Entremont, Faucigny; at the end of June. (Were the eyes reddened in alcohol?).

*Baetis pumilus.*

(Forceps et ala postica, Pl. V. fig. 25, 25a.)

*Ephemera mutica* (?), Lin. 1758 = *E. striata*, Lin. 1761.  
*Cloe pumila*, Burm. 1839. *C. striata* (?), Pict. 1843-5.  
*Cloeon pumila*, Walk. 1853. *B. pumilus*, Etn. 1870.

Subimago, v. v. s. Alæ anthracinæ: pedes virescenti-grisei, tarsis nigricantibus; setæ nigricantes.

Imago, v. v. s. ♂. Oculi turbinati atro-fuliginosi. Tergum thoracis aternum, politum. Alæ vitrinae, fulgore taloso. Pedes albi, tarsis, apicibus tibiarum, femoribusque anticis, nigricantibus. Segmentorum abdominis 2-7 alba, pellucida; cætera supra furfuroso-fusca vel fusco-castanea, subitus fusca. Forceps et setæ albæ.

♀. Capitis vertex strigis duabus piceo-rufescensibus. Tergum thoracis atrum. Pedes virescenti-grisei, tarsis fuscis. Abdomen supra fusco-furfurosum, juncturis, et

sæpe lineâ longitudinali in medio, strigisque curvatis duabus ad bases segmentorum singulorum intermediorum, ochraceis; subtus serie notularum L-formatarum hepaticoloratarum utrinque. Setæ vix cervinæ. Oculi olivacei.

Long. corp. ♂ ♀ 5-7; al. ♂ 4-6, ♀ 6-8; set. ♂ 11-13, subim. 10; set. ♀ 7-5-10, subim. 10 mm.

*Hab.*—Wales, England, Belgium, Germany, Austria, Switzerland and Corsica. It frequents rivers, from May to October.

### *Baetis niger.*

(*Forceps et ala postica*, Pl. V. fig. 26, 26a.)

*Ephemera nigra*, Lin. 1761. *Cloe diptera*, Ronalds, 1856. *B. niger*, Etn. 1870.

Subimago, v. v. s. Alæ atrescentes. Pedes ♂ pallide fumati; ♀ femoribus prasinis, strigis singulis brevibus obscuris ab apicibus anticorum, tibiis fumatis, et tarsis cervinis ultimis articulorum fumatis. Setæ ♂ griseæ, ♀ cinereæ.

Imago, v. v. s. ♂. Oculi turbinati fuliginosi. Tergum thoracis aternum, politum. Alæ vitrinæ. Pedes vel fumati, vel saturate virescenti-albi, vel prasini; posterioribus crurum fumatis, anticis cinereis cum apicibus tibiarum obscuris. Segmentorum abdominis 2-7 fumata; cætera supra vel rubigineo-fusca, vel piceo-fusca, subtus virescenti-grisea. Setæ albæ vel canæ, sæpe juncturis vix obscuris.

♀. Oculi fusco-fuliginosi. Pedes virescenti-testacei, juncturis tarsorum nigrantibus. Abdomen supra castaneo-piceum, juncturis et sæpe strigis brevibus tribus ad bases paucorum intermediorum ochraceis; subtus fuliginosum vel hepaticoloratum, pallidum, sæpe notulis lateralibus L-formatis obscuris. Setæ fumatæ, vel canæ, vel canæ juncturis rufescensibus.

Long. corp. ♂ ♀ 6-7.5; al. ♂ ♀ 6-7; set. ♂ 10-11, subim. 9; set. ♀ 6-8.5, subim. 7 mm.

*Hab.*—England, and perhaps Sweden. May and June, and also September.

I have seen an undescribed Australian species, which is allied to some of the foregoing European species.

*Baetis (?) fuscus.**Cloe fusca*, Schn. 1845.

Imago, ♀. "Tergum thoracis fuscum; alæ vitrinæ, nervis fuscis, antica area costali apicem versus fulvescente, et nervis transversalibus pluribus. Pedes saturate testacei. Abdomen supra rufescens, apicibus segmentorum brunneis; subtus testaceum. Setæ saturate testaceæ, fusco annulatæ."

Long. corp. ♀ 2·75," set. 6·25."

Hab.—Messina. April. (Schn.)\*

*Baetis posticatus.**Cloeon posticata*, Say, 1823; *Cloe posticata*, Hag. 1861.

Imago, v. s. ♂. "Oculi turbinati saturate rufo-fusci. Tergum thoracis aternum. Alæ vitrinæ. Pedes albi; antici vix obscuriores bases (femorum ?) versus. Segmentorum abdominis 2-7 pallide cœrulecenti-hyalina, cætera saturate fusca. Setæ albæ." (Say.)

Long. corp. 8, set. 19 mm.

Hab.—"Shippingsport. End of May."

*Baetis unicolor.**Cloe unicolor*, Hag. 1861 (nec Curt., Burm.).

Imago, s. s. ♂. "Corpus saturate piceum. Alæ vitrinæ, interdum nervis longitudinalibus obscuris; pos-

\* The following European species are of uncertain position, and hardly recognizable.

1. *Baetis culiciformis.*

*Ephemera culiciformis*, Lin. 1758. *E. albipennis*, Walck. 1802. *Cloe culiciformis*, Pict. 1843-5.

Imago. "Eph. cauda biseta, alis albis, corpore fusco." (Lin. 1758.)

"*Culice paulo major*. Thorax nigricans. Abdomen fuscum. Setæ caudales longitudine corporis. Tubercula duo supra oculos, crassa, magna, livida." (Lin. 1761.)

Hab.—Sweden.

2. *Baetis speciosus.**Ephemera speciosa*, Pod. 1761.

Imago. "E. speciosa, pedibus anticis longissimis cyaneis, alis albis, corpore fusco." (Pod.)

Long. corp. 3 lin.

Hab.—Ineog.

ticæ inter nervos duos sub-opacæ. Pedes pallide flavescentes, apicibus tarsorum obscuris. Setæ pallidæ, apices versus obscuræ.

♀. "Vertex capitis strigis longitudinalibus latis duabus. Abdomen acute rubiginosum, juncturis et maculis lateralibus pallidis." (Walsh.)

♀. s. s. "Æneo-fuscescens, alis vitreis, pedibus pallide flavescentibus, et setis albis." (Hag.)

Long. corp. ♂ 2·5, ♀ 4·5; set. ♂ 5, ♀ 6-10; exp. al. ♂ 9, ♀ 10-13 mm.

Hab.—Washington, and (?) Porto Rico (Hag.); Rock Island, Illinois (Walsh.).

### *Baetis propinquus.*

*Cloe vicina*, Walsh, 1862 (*nec* Hag. 1861). *C. propinqua*, Walsh, 1863.

Subimago. "Alæ fumatæ, nervis longitudinalibus saturationibus."

Imago. ♂. "Piceus. Alæ vitrinæ; posticæ inter nervos duos opacæ. Pedes pallidi, femoribus anticus pallide rubiginosis et apicibus tarsorum obscuris. Segmentorum abdominis 2-7 alba, pellucida, punctis lateralibus (ad spiracula?) obscuris; cætera supra picea, subtus opace albicantia. Setæ albicantes, interdum annulatæ."

♀. "Corpus supra vel rubiginoso-piceum, vel rubiginosum. Abdomen subtus rubido-album. Femora antica fere nunquam maculata." (Walsh.)

Long. corp. ♂ 3·5, ♀ 3·5-4·5; set. ♂ 7·5-10, subim. 5; set. ♀ 5-9, subim. 4; exp. al. ♂ 9-11, ♀ 8·5-14 mm.

Hab.—Rock Island, Illinois. (Walsh.)

Mr. Walsh considers it to be very closely related to *B. posticatus*.\*

\* The same author supposes that the following may be a *Baetis*.

#### *Baetis verticis.*

*B. verticis*, Say, 1839.

"Corpus ochroleucum vel cretaceum. Thorax strigis rubiginosis duabus, antice confluentibus et postice obsolescentibus; plurimi nervorum alarum atri; pedes albi, antici apieibus femorum rubiginosis, et apieibus tibiarum juncturisque tarsorum fuscis."

Long. corp. et set. supra 6 mm.

Hab.—Indiana (Say).

*Baetis pygmæus.**Cloe pygmæa*, Hag. 1861.

Imago, s. s. ♀. "Corpus fusco-griscum, alis vitreis, pedibus setisque albis." (Hag.)

Long. corp. 3, exp. al. 6 mm.

Hab.—The St. Lawrence. (Hag.)

*Baetis fluctuans.**Cloe (B) fluctuans*, Walsh, 1862.

Imago, ♀. "Corpus brunneo-album. Thorax supra strigis longitudinalibus brunneis duabus, postice confluentibus. Alæ vitrinæ, nervis longitudinalibus plerumque brunneis, interdum quoque brunneo marginatis bases versus: area marginalis anterioris maculis parvis brunneis quindecim vel sedecim, paucis confluentibus; striga pallida brunnea pone subcostam, cuius margo posticus variabilis et irregularis, interdum sex- vel septem-dentatus, maculas rotundas pellucidas (circa xiv.), paucis confluentibus, inclaudit. Abdomen plerumque brunneo-album, interdum brunneo varium, interdum etiam pallide brunneum, sexto segmentorum brunneo. Tarsorum apices juncturæque fusi." (Walsh.)

Long. corp. ♀ 6-7, set. 10·5-12, exp. al. 13·5-17 mm.

Hab.—Rock Island, Illinois.

*Baetis pictus*, nov. sp.

(Ala postica, Pl. V. fig. 27.)

Subimago, v. s. s. ♂ ♀. Alæ nigricantes, nervis transversalibus marginibus anguste obscuris. Pedes pallidi, juncturis tarsorum obscuris. Corpus subpiceum.

Imago, v. s. s. ♂. Thorax supra fusco-piceus. Alæ vitrinæ, invariæ, nervis pellucidis. Pedes veluti in ♀. Abdomen olivaceo-fuscum, in medio paulo pallidius; subtus saturate rubido-album, rubido crebrissime punctatum. Setæ albæ, juncturis obscuris.

♀. Tergum thoracis saturate lutescens. Alæ vitrinæ, nervis longitudinalibus piceis, et transversalibus opace

albis : area marginalis anticae fusco variegata ; area submarginalis plus aut minus fusca, interdum maculis rotundis pellucidis inclausis, apice fusco nebuloso ; margo terminalis peranguste fuscus et albo invicem marginatus : ala postica saepe apud basin et usque ad costae medium fuscescens. Pedes testacei, vel cervino-albicantes, femoribus punctis rotundis fuligineis irroratis, paucis confluentibus, atque tarsis albicantibus juncturis et ultimis articulorum fuliginosis. (Abdomen decoloratum.) Setæ albæ, juncturis atris.

Long. corp. ♂ 5-6.5; al. ♂ 6.5-7, ♀ 7; set. ♂ circa 14, ♀ circa 15 mm.

Hab.—Texas.

*Baetis (?) undatus.*

*Cloe undata*, Pict. 1843-5; *Cloeon undata*, Walk. 1853.

Imago, ♀. s. s. "Pallide flavescens. Alæ vitrinæ ; antica apud marginem costalem fusca, maculis rotundis pellucidis variata, fasciâ transversali in medio nebulosâ, et nebulâ magnâ super marginem terminalem, fuscescentibus. Setæ albidæ, juncturis in ♂ atris, in ♀ fuscis" (Pict.). "Pedes flavescentes ; tarsorum apices obscuri" (♂, Hag.).

Long. corp. ♀ 7, set. 10, exp. al. 15-19 mm.

Hab.—Red River, and New York (Hag.); Mexico (Pict.).

*Baetis fasciatus.*

*Cloe fasciata*, Pict. 1843-5; *Cloeon fasciata*, Walk. 1853.

Imago, ♀. s. s. "Tergum thoracis pallide fuscum. Alæ vitreæ : antica margine costali, fasciis transversalibus obliquis duabus, strigis transversali obliquâ prope marginem terminalem alterâque brevi super marginem terminalem ita conjunctis ut maculas pellucidas claudunt, et maculâ trigonali e costa inter strigam et ultimam fasciarum fasciæ ipsi conjunctâ, et denique maculâ conspicuâ in medio inter basin et primam fasciarum, fuscis. Abdomen saturate fuscum, setis lutescentibus fusco annulatis." (Pict.)

Long. corp. ♀ 7, set. 8, exp. al. 19 mm.

Hab.—Brazil. (Pict.)

Some undescribed Australian species, which have the anterior wings more or less coloured along the costa, have been submitted to my inspection. I have seen, besides these, a Californian undescribed species, with the wings very distinctly marked with fuscous blotches along the costa, and with an unusual number of cross-veinlets in the wing. Their wings are figured in Pl. V. fig. 28, 29; Pl. III. fig. 1.

*Baetis ferrugineus.*

*Cloe (A) ferruginea*, Walsh, 1862.

Subimago. "Alæ fumatæ; posteriores et anticarum postcostæ pallidiores. Ala antica crassioribus nervorum et paucis aliis, bases versus, fuscis, atque nervis transversalibus cum horum marginibus albido-pellucidis."

Imago, s. s. ♂. Corpus ferrugineum (rubiginosum). Alæ vitrinæ; anticæ apud costas vix flavescentes, tribus prioribus nervorum longitudinalium flavescentibus, sed paucis aliis fuscescentibus. Pedes pallide flavescentes, apicibus tibiarum et tarsorum, juncturis tarsorum, et proximo articulorum tarsi antici, fuscis. Abdomen supra rufesceni-brunneo irroratum, interdum pâne piceum; subtus pallide rubido-album. Setæ forcepsque albicantes; illarum intermedia brevissima." (Walsh.)

Long. corp. ♂ 6·5-9·5; set. 15-17; al. exp. 15-18 mm.

Hab.—Rock Island, Illinois (Walsh).\*

\* Mr. Walsh thinks that the following species may be allied to *B. ferrugineus*.

*Baetis albus.*

*B. alba*, Say, 1824; *Palingenia alba*, Hag. 1861.

♀. Album; vertice fuso. Thorax vix flavescenti-brunneo tintetus; "prothorax quadratus, cretaceus" (Hag.). Alæ albidae, nervulis apud costas obscuris. Pedes albi; antici breves, obscuri.

Long. corp. 11, exp. al. 22 mm. (Hag.)

Hab.—The North Red River (Hag.); Winnipeg River (Say).

*Ephoron leukon*, Williamson, 1802.

"Oculi nigri. Thorax fuscus. Alæ, abdomen, et pedes albi. Alæ patentes, reticulatae; setæ duæ."

Long. corp. 12 mm.

Hab.—The River Passaick, in the immediate vicinity of Belville; from the end of July to the middle of August. They begin to rise about forty minutes after sunset, moult about half a minute afterwards, and fly nearly as fast as dragon-flies. (Williamson.)

I have reasons for supposing that *Tipulæ* are called dragon-flies in some parts of England; and if the *Ephoron leukon* flies as fast as these, its habits conform, thus far, to those of British species of *Heptagenia*.

## Genus SIPHLURUS.

(Ala antica, Pl. III. fig. 2.)

*Baetis*, p., Say, 1823; *Ephemera*, p., Zet. 1840; *Pallingenia*, p., Walk. 1853; *Siphlonurus* (err.), Etn. 1868.

Nympha agilis, laminis branchialibus utrinque septem: laminarum duæ priores duplices, cæteræ simplices, omnes integræ. Palpi tri-articulati, superiores proximo articulorum cæteris subæquali, et ultimo penultimo breviori; inferiores proximo articulorum quoque cæteris subæquali et valde depresso, secundo fere obconico apice obliquo, et vix tertio longiori.

Super pedes omnes, alis erectis, setisque divergentibus subimago stat.

Imago. Oculi ♂ integri; setæ duæ longæ (residuum intermediae interdum articulatum); alæ quatuor; tarsi quinque-articulati, proximo articulorum interdum tibiæ adnato. Forcipis pedes quadri-articulati (nisi articulus quintus basalis laminâ ventrali penultiimi segmentorum obtegatur); articulorum primus largus, secundus longissimus. Femina caret ovivalvulâ; neque laminam ventralem penultiimi segmentorum habet.

The species inhabit lakes and rivers, in the Palæarctic and Nearctic Regions.

From having omitted to note down the tarsal characters of all the species examined by me, I am, unfortunately, unable to adopt Mr. Walsh's convenient sections of the genus; which are founded upon the structure of the tarsus.

*Siphlurus flavidus.*

(Apex abdominis supra, Pl. V. fig. 30.)

*Baetis flava*, Ed. Pict. 1865.

Imago, v. s. s. ♂. "Oculi cæruleo-atri. Corpus furfrosum vel lutescens. Alæ vix opacæ, nervis fuscis; anticæ juxta bases, et in areis marginali et submarginali apices versus, pallide flavicantes. Pedes fulvi, juncturis fuscis. Abdomen juncturis, et maculis longitudinalibus apicem versus, fuscis;" subtus maculâ U-formatâ in segmento singulo: "processum depresso

acutum, penultimum segmentorum utrinque habet. Setæ flavescentes, juncturis vix obscuris."

" ♀ pallidior." (E. Pict.)

Long. corp. ♂ ♀ 12, exp. al. ♂ 27, ♀ 31 mm.

Hab.—San Ildefonso. July.

### *Siphlurus armatus.*

(Forceps, Pl. VI. fig. 1, 1a.)

*S. armatus*, Etn. 1870.

Imago, v. s. s. ♂. Tergum thoracis luteo-piceum. Alæ virescenti-griseo suffusæ, nervis piceis. Pedum antici picei; posteriores lutei vel furfurosi. Abdomen supra fuscum, juncturis latera versus pallidis; subtus lutescens vel ochraceum, strigis U-formati in posterioribus segmentorum. Setæ cervino-albidæ, vel subfulvæ, juncturis fuscis, pubescentes. Forceps piceus.

Long. corp. ♂ 14-15, al. 16, set. 24-25 mm.

Hab.—Killarney (M'Lach.), and Bishop's Wood, Middlesex (Wormald). In July.

Mr. McLachlan has an undescribed foreign species closely allied to *S. armatus*, probably from Germany.

### *Siphlurus lacustris.*

(Forceps maris, Pl. VI. fig. 2.)

*S. lacustris*, Etn. 1870.

Subimago, v. v. s. ♂. Alæ cinereæ vel nigricantes.

Imago, v. v. s. ♂. Oculi supra saturate fuliginosi, subtus saturate virescenti-grisei. Tergum thoracis aternum, politum. Alæ vitrinae, nervis piceis, fulgore hyacinthino; apex areæ marginalis et areæ submarginalis anticæ pallide virescenti-albus. Pedum antici atrovirentes, cruribus saturate corvinis; posteriores saturate virescenti-grisei, tarsis infra spinulosis.\* Abdomen supra piceo-fuscum, juncturis ochraceis; subtus saturate virescenti-griseum, tribus segmentorum apicalium fulvescentibus, singulis strigis U-formati obscuris; sub prioribus segmentorum strigæ duæ, antice convergentes, obscuræ. Setæ virescenti-griseæ, bases versus fuliginosæ, juncturis vix obscuris.

Long. corp. ♂ 15, al. 14, set. 20, subim. 11 mm.

Hab.—Llyn Llydaw, Snowdon. August.

\* Several other species likewise have the tarsi spinulose beneath.

Anglers in Wales, mistaking this for *Ephemera danica*, are greatly astonished at seeing the subimago rise out of the cold tranquil "llyns." One of my specimens remained a subimago during the greater part of two days.

There are some specimens of a small undescribed (probably German) species in Mr. M'Lachlan's possession, which is very similar to *S. lacustris*.

*Siphlurus Linnæanus*, nov. sp.

(*Forceps maris*, Pl. VI. fig. 3. *Notulæ ventrales*, fig. 3a.)

Imago, v. s. s. ♂. Tergum thoracis fusco-rubiginosum. Alæ vitrinæ, vix fusco suffusæ, nervis longitudinalibus piceis, bases versus testaceis. Pedes ochracei, femoribus singulis cingulis mediis obscuris. Dorsum abdominis fuscum, apicibus segmentorum saturationibus, et triangulis pallidis ad latera segmentorum intermediorum: subtus 2-8 segmentorum pallide ochracea, singula signis obscuris bicornutis punctisque atris duobus eleganter notata; cætera subtus saturate rubiginosa. Setæ ochro-leucæ, juncturis fuscis.

Long. corp. ♂ 15, set. 26, al. exp. 26 mm.

Hab.—Incog. There is a specimen in the Linnæan cabinet, and the abdomen of a male in Mr. Dale's collection.

*Siphlurus annulatus*.

(*Forceps maris*, Pl. VI. fig. 4a. *Notulæ ventrales*, fig. 4.)

*Baetis annulata*, Walk. 1853.

Imago, v. s. s. ♂. Tergum thoracis brunneo-luteum. Alæ vitrinæ, vix lactescentes, nervis piceis: apex areæ marginalis anticæ nebulâ pallidissimâ fuscâ. Pedes ochracei, juncturis et femorum cingulis mediis piceis. Dorsum abdominis pallide fuscum, latera versus ochraceum: venter ochraceus, segmento singulo intermedio strigis longitudinalibus duabus punctisque tribus fuscis. Setæ ochraceæ, juncturis piceis.

Long. corp. ♂ 13, al. 15, set. 18 mm.

Hab.—Trenton Falls, New York.

*Siphlurus bicolor.**Palingenia bicolor*, Walk. 1853.

Subimago, ♀. v. s. s. Alæ fuscæ, nervis transversalibus marginibus saturationibus, iis in apice areæ marginalis anticæ subrectis. Tergum thoracis luteum. Pedum antici luteo-fusci, tarsis pallidioribus; posteriores ochracei. Setæ luteæ.

Long. corp. ♀ 11, al. 14 mm.

Hab.—St. Martin's Falls, River Albany, Hudson's Bay (Barnston).

*Siphlurus femoratus.*

*Baetis femorata*, Say, 1823; *B. femorata*, (?) Walsh; vel (?) *Baetis* (A) *interlineata*, Walsh, 1863.

Subimago. “Alæ ♂ niveæ, nervis cum marginibus suis fuscis; ♀ alæ albantes, nervis fuscis fusco marginalis.” (Say.)

Imago, v. s. ♂. “Piceus. Oculi supra margaritacei, singuli maculâ mobili atrâ; subtus pallide fusci. Alæ vitrinæ: anticæ tribus prioribus nervorum longitudinale et paucis sequentium, atque nervis transversalibus areæ submarginalis cum paucis aliis bases alarum versus, fuscis; macula brunnea in disco, lineaque atra in costæ medio, interdum quoque areis marginalibus apices versus, obscuratis: posticæ seriebus singulis brevibus nervorum transversalium fuscorum ad bases costarum brunneo nebulosis. Pedum antici pallide brunnei, interdum proximis dimidiorum saturationibus; posteriores pallidiores; omnes femoribus brunneo bi-cinctis, tibiis ad bases et apices tarsisque ad juncturas brunneis. Segmentorum abdominis 4-5 alba, pellucida, singula fasciis apicalibus angustis piceis, maculis dorsalibus in mediis utrinque obscuris, maculisque lateralibus pallidis; venter albicans, pellucidus. Setæ albæ, annulatæ.”

♀. “Segmentorum abdominis 1-5 supra piceo-brunnea, bases versus pallidiora. Alæ posticæ in toto vitrinæ.” (Walsh.)

Long. corp. ♂ 12-13.5, ♀ 12.5-14; set. ♂ 20-24, ♀ 13-16; exp. al. ♂ 25-28, ♀ 28-29 mm.

Hab.—Cincinnati (Say); Rock Island, Illinois (Walsh).

*Siphlurus alternatus.*

*Baetis alternata*, Say, 1824; in sect. A, Walsh.

Subimago. "Alæ fumatæ, apicibus posticarum pallide virescentibus."

Imago, s. s. ♂. "Picco-brunneus. Alæ vitrinæ, nervis fuscis. Pedum antici pallide brunnei, coxâ, cingulo præ-apicali femoris, juncturisque tarsorum, brunneis: posteriores pallidiores. Segmentorum abdominis 2-9 vel 4-9 singula maculis trigonalibus lateralibus flavescentibus duabus supra juxta bases, plus aut minus confluentibus; subtus pallida, singula maculis parvis basalibus in mediis, punctis transversalibus in mediis duobus, lineisque utrinque obliquis sub-abbreviatis, brunneis. Setæ albocantantes, juncturis brunneis."

♀. "Caput carinis divergentibus inter ocellos duabus, marginibus antico et laterali verticis (vel etiam interdum carina in medio hujus), strigisque brevibus utrinque duabus, flavescentibus." (Walsh.)

Long. corp. ♂ 10·5-12·5, ♀ 10-12; set. ♂ 19-31, subim. 13; set. ♀ 18-19, subim. 14-15; exp. al. ♂ 23-30, ♀ 26-32 mm.

Hab.—Rock Island, Illinois, and the River Des Plaines near Chicago (Walsh); Washington (Hag.); St. Peter's River (Say).

*Siphlurus aridus.*

*Baetis arida*, Say, 1839; in sect. B, Walsh.

Subimago. "Alæ nigricante suffusæ, præcipue apices versus, et nervis transversalibus fusco marginatis."

Imago. ♂. "Caput pallidum, maculâ magnâ intra posteriores ocellorum orbitas utrinque atrâ. Thorax piceus. Alæ vitrinæ, nervis pallidissime hyalinis, interdum bases costarum versus fuscescentibus. Pedum antici vel apicibus tarsorum, tibiis, et femoribus usque ad media, obscure virescenti-fuscis; vel pallide virescentibus, vix ad apices versus obfuscatis; vel in toto fuscis vel piceis: posteriores virescenti-albi, apicibus tarsorum vix obscuris. Segmentorum abdominis 1-8 supra picea, singula maculis

lateralibus trigonalibus vel semi-orbicularibus pallide rubiginosis ad bases; ultimum pallide rubiginosum. Setæ virescenti-albæ."

♀. "Nervi alarum pallide fusci. Segmentorum abdominis 1-8 supra saturate rubiginosa et maculata veluti in ♂." (Walsh.)

Long. corp. ♂ 8-12, ♀ 9-13; set. ♂ 18-23, subim. 12-14; set. ♀ 17-26, subim. 10-14; exp. al. ♂ 20-25.5, ♀ 23.5-32 mm.

*Hab.*—Rock Island, Illinois (Walsh); Indiana, about the middle of June (Say).

### *Siphlurus siccus.*

*Baetis (B) siccus*, Walsh, 1862.

Imago, ♂. "A præcedente discrepat in orbitis ocellorum posticorum intus haud plane obscuris; in nervis alarum fuscis; in pedibus anticis piceis, apicibus tibiarum atris, et proximis articulorum tarsalium pallidis (juncturis suis exceptis); in dorso abdominis piceo, immaculato; et in setis virescenti-albis, juncuturis anguste fuscis."

♀. "Tarsus anticus fuscus, proximo articulorum pallido. Dorsum abdominis saturate rubiginosum, immaculatum." (Walsh.)

Long. corp. ♂ 8.5-10, ♀ 8.5-11.5; set. ♂ 19, ♀ 15; exp. al. ♂ 19-22, ♀ 23-27 mm.

*Hab.*—Rock Island, Illinois (Walsh).

### *Siphlurus debilis.*

*Baetis (C) debilis*, Walsh, 1862; (*nec* Walk. 1853).

Subimago. "Alæ fumatæ, nervis fuscis."

Imago, v. s. ♂. "Oculi supra brunnei, subtus fuscæ. Thorax piceus. Alæ vitrinae, nervis pallide hyalinis, tribus prioribus nervorum longitudinalium, bases (et interdum quoque apices) versus, fuscis. Pedes pallide virescentes, genubus cingulisque femorum fuscis; antici apicibus tibiarum, juncuturis, et ultimis articulorum tarsalium, fuscis; posteriores apicibus articulorum tarsalium fuscis. Abdomen rubiginosum, apicibus segmentorum piceis. Setæ albicantes."

♀. "Pallidior. Thorace flavescens. Nervi alarum costas et apices versus nigricantes." (Walsh.)

Long. corp. ♂ 4-5.5, ♀ 5-7; set. ♂ 13-14, subim. circa 5; set. ♀ 8-12; exp. al. ♂ 13-15, ♀ 15-16 mm.

*Hab.*—Rock Island, Illinois (Walsh).

At this point is resumed the series of genera which have a short ventral lamina, produced from the tip of the penultimate segment of the female; which series comprises *Leptophlebia*, *Ephemerella*, *Bætisca*, *Isonychia*, *Coloburus* and *Heptagenia*.\*

\* Species generis incerti.

The following Cingalese species have been classed in *Cloe* by Dr. Hagen; but most likely a new genus will have to be erected for them. I have seen only one female subimago of what I suppose to be *C. tristis*, Hag.; and therefore I am not in a position to describe the genus. This female has hind-wings unconfomable to those of *Bætis*, and a ventral plate produced from the apex of the penultimate segment; but no egg-valve. According to Dr. Hagen, the male has three long setæ. The name *Cloe* cannot be retained for them. Some of them may belong to *Leptophlebia*.

#### Sectio I. Alæ quatuor.

No. 1. — *tristis*.

*Cloe tristis*, Hag. 1858.

Subimago ♀, s. s. "Nigra, pedibus luteis, femoribus anticis nigris; setis griseis, incisuris nigris; alis nigris, opacis."

Long. set. ♀ subim. 15, exp. al. 13 mm.

*Hab.*—Rainbodde. (Hag.)

No. 2. — *consueta*.

*Cloe consueta*, Hag. 1858.

Subimago. "Alis paulo griseis opacis."

Imago. "Capite nigro, thorace brunneo, pedibus pallidis, abdomine pallido, apicibus segmentorum anguste brunneo marginatis, setis pallidis incisuris basalibus nigris; alis vitreis (hyalinis), venis pallidis; ♀ (?) thorace medio luteo, abdomine brunneo."

Long. set. ♀ 10, exp. al. 12 mm.

*Hab.*—Rainbodde. (Hag.)

No. 3. — *solida*.

*Cloe solida*, Hag. 1858.

Subimago (?). "Alis griseis opacis, thorace abdomineque luteis."

Imago ♀. "Fusco-anea, abdomine subtus pallido, pedibus luteis, setis griseis incisuris nigris, alis vitrinis."

Long. set. 7, exp. al. 10 mm.

*Hab.*—Rainbodde. (Hag.)

## Genus COLOBURUS.

(Ala antica, Pl. III. fig. 3.)

*Palingenia*, p., et *Baetis* p., Walk. 1853; *Coloburus*, Etn. 1868.

Imago. Oculi ♂ sub-partiti; alæ quatuor; setarum media brevissima, articulata. Tarsi postici quinque-articulati: articulorum primus tibiæ adnatus, vix discretus, secundo longior; secundus in ♀ tertio æqualis; secundus, tertius et quartus in ♂ primo graduatim minores. Femina caret ovivalvulâ; processus ventralis tamen brevis laminaris e penultiimi segmentorum apice producitur. Pedes forcipis quadri-articulati; articulorum proximus largus, secundo brevior; secundus reliquis longitudine subæqualis.

*Coloburus humeralis.*

(Genitalia maris, Pl. VI. fig. 6, 6a; feminæ, 6b.)

*Palingenia humeralis* & *Baetis remota*, Walk. 1853; *Coloburus humeralis*, Etn. 1868.

Subimago, v. s. s. ♀. Alæ anticæ canæ, juxta bases ochraceæ, apices versus fuscescentes, nervis transversalibus murino marginatis, præcipue costas versus. Setæ rubiginosæ, juncturis obscuris.

Imago, v. s. s. ♂. Thorax supra fuscus, politus. Alæ cano tinctæ, pellucidæ, nervis atris, juxta bases ochraceæ; antica area submarginali et areæ marginalis apice subfuscis, atque pluribus nervorum transversalium inter-

No. 4. — *signata*.*Cloe signata*, Hag. 1858.

Imago. "Capite nigro, thorace fusco-æneo, abdomine fusco, subtus basibus segmentorum pallidis; pedibus albidois, femoribus in mediis, cum genu, nigro annulatis; setis albidois, incisuris nigris."

Long. set. 8, exp. al. 12 mm.

Hab.—Rainbodde. (Hag.)

Sectio II. Alæ duæ.

No. 5. — *marginalis*.*Cloe marginalis*, Hag. 1858.

Subimago. "Luteo-fusca, abdomine fusco, pedibus luteis, setis griseis; alis griseis, margine costali fusco."

Imago, ♀. "Nigra, pedibus anticis nigris, posticis luteis; setis albis, nigro articulatis; alis vitrinis, margine costali vix obscuriori."

Long. set. ♀ 16, subim. 7; exp. al. 10-14 mm.

Hab.—Rainbodde. (Hag.)

costam duosque nervorum sequentium fusco marginatis. Pedum antici fuscæ; posteriores fulvo-lutei, apicibus tibiarum et articulorum tarsalium fuscis. Abdomen supra fuscescens.

♀. Alæ eis maris simillimæ, sed juxta bases luteæ. Pedum antici brunneo-lutei; posteriores lutei, apicibus tibiarum ultimisque articulorum tarsalium subfuscis.

Long. corp. ♂ 10, ♀ 7-10; al. ♂ 15, ♀ 13-17; set. ♂ 20 & 2, ♀ 15 & 1, subim. 12-13 & 1 mm.

*Hab.*—Otago, New Zealand.

*Coloburus haleuticus*, nov. sp.

(*Forceps maris*, Pl. VI. fig. 7, 7a.)

Imago, v. s. s. ♂. Thorax supra surfurosus. Alæ vitrinæ, lacteo tinctæ, juxta bases subfuscæ, nervis atropiceis; apices areæ marginalis et areæ submarginalis virescenti-grisei. Pedum antici rufo-picei; posteriores brunneo-lutescentes. Abdomen supra rufo-fuscum, junc-turis paulo obscuris, lineis spiracularibus testaceis, ven-tre rufo-lutescenti. Setae fuscae, pubescentes: forceps testaceus, apices versus piceo tinctus.

Long. corp. ♂ 11, al. 15, set. 20 & 5 mm.

*Hab.*—Melbourne (?) [M'Coy].

Genus *CRONICUS*, nov. gen.\*

*Baetis*, p., Pict. 1854.

Imago. *Heptageniæ* affinis. Forcipis maris pedes quadri-articulati; articulorum penultimus longus, secundo vix brevior, primus et ultimus brevissimi. Setarum media brevissima.

*Cronicus anomalus*.

(*Forceps*, Pl. VI. fig. 8.)

*Baetis anomala*, Pict. 1854.

Long. corp. ♂ 10, exp. al. 20 mm.

Species in electro.

\* Derivation.—*κρονίκος*, old-fashioned, out of date.

Whether the *Baetis gigantea*, *grossa*, and *longipes* of MM. Pictet and Hagen (1856) belong to this genus or not, I am unable to say, because they are not figured, and I have not seen the types.

Genus ISONYCHIA, nov. gen.

(*Ala antica*, Pl. III. fig. 4.)

*Baetis*, p., Walk. 1853.

Imago, ♀. Alæ quatuor: setarum media sæpissime rejicitur, interdum tamen rudimentum brevissimum retinetur. Tarsi quinque-articulati; articulorum posteriorum primus secundo subæqualis, et tertius etiam quarto subæqualis, sed secundus tertio paulo longior: ungues uncinati, conformes. Ovivalvula caret; sed processus laminaris ventralis e penultimi segmentorum apice producitur. Oculi ♂ integri.

Forsan ad *Isonychiam* species *Siphluri* in *Baetis* serie B (Walsh), et *Ephemera pudica* (Hag.), pertinere inveniantur.

*Isonychia manca*, nov. sp.

(Genitalia, Pl. VI. fig. 5, 5a.)

Subimago, ♂ ♀. v. s. s. Alæ nigricantes, venis saturate et anguste marginatis; post-costas versus pallidiores.

Imago, v. s. s. ♂. Thoracis tergum luteo-furfurosum. Alæ vix lurido tinctæ, nervis vix luridis. Pedum antici femoribus olivaceo-piceis, apicibus saturate piceis, tibiis atro-piceis, tarsis testaceis juncturis atris; posteriores stramineo-gambosi, unguibus vix obscuris. Abdomen decoloratum. Setæ pallidissime ochraceæ, proximis juncturarum obscuris.

♀. Thoracis tergum et caput furfurosa, apud latera interdum fusco-picea. Alæ vitrinæ, vix lacteo vel lurido tinctæ; nervorum longitudinales picei, transversales atri. Pedum antici apicibus femorum piceis, tibiis atris, duobus proximis articulorum tarsalium albicantibus, cæteris nigricantibus; posteriores ochracei, unguibus obscuris. Abdomen rufo-piceum, setis cretaceis, breviter pubescens-tibus. Interdum pedes antici sunt picei, tarsis murinis.

Long. corp. ♂ 10, ♀ 7-12, al. ♂ 10, ♀ 11.5-13, set. ♂ 18, ♀ 20-22 mm.

Hab.—Texas (M'Lach.).

*Isonychia ignota.*

(Genitalia maris, Pl. VI. fig. 29.)

*Baetis ignota*, Walk. 1853.

Imago, v. s. s. ♂. Thoracis tergum brunneo-piceum. Alæ vitrinae, nervis testaceis. Pedum antici fusco-picei, juncturis pallidis; posteriores lurido-straminei. Abdomen supra piceum, apicibus segmentorum obscuris: “venter rubiginosus” (Walk.). Setæ bases versus sub-fuliginosæ.

Long. corp. ♂ 10·5, al. 12 mm.

Hab.—Incog. (? United States.)

## Genus HEPTAGENIA.

(Ala antica, Pl. III. fig. 5.)

*Ephemera*, p., Pod. 1761; *Baetis* (A), Curt. 1834 (nec Leach, 1815); *Heptagenia*, Walsh, 1863; *Ecdyurus*, Etn. 1868.

Nympha agile reptans, laminis branchialibus utrinque septem; laminæ simplices integræ, fasciculis e radicibus singulis filamentorum branchialium. Femora late compressa, ciliata. Caput late depresso: labrum induplicatum, transversum, obtuse triangulare, apice emarginato. Palpi maxillares bi-articulati: maxillarum superiores lamineæ, intus ciliatæ, antice (*i. e.*, apud apices) pectinatæ, palpis tenuibus; inferiores palpis robustis ultimis articulorum bifidis, dimidiis imbricatis. Labium ovale minutum, palpis inarticulatis, brevissimis, ob-ovatis.

Subimago in habitu *Siphluro* admodum similis est.

Imago. Alæ quatuor: setarum media caret: oculi maris simplices. Tarsorum posteriores quinque-articulati; articulorum secundus, tertius, et quartus graduatim decrescentes: unguis dissimiles. Forcipis maris artus tri-articulati, proximis articulorum longissimis, ex apice processus ventralis procedentes. Ovivalvulam et processum ventrale penultimi segmentorum femina habet.

The species frequent streams and rivers in the Palæoarctic and Nearctic regions, the Andes, and the Malay Archipelago.

*Heptagenia semicolorata.*

(Genitalia maris, Pl. VI. fig. 9.)

*Ephemera stigma* (?), Gmel. 1790-3. *E. fuscula* (?), Schr. 1798 (subim.). *Baetis semicolorata*, Curt. 1834. *B. semitincta* (?), Pict. 1843-5.\*

Subimago, v. v. s. Alæ anticae griseæ; posticæ pallide cervinæ vel fumatae. Pedes virescenti-grisei, femoribus in mediis obscure punctatis, tarsisque corvinis vel atro-virescentibus. Setæ nigricantes. Oculi maris saturate olivacei, cingulis atris in mediis.

Imago, v. v. s. ♂. Oculi supra saturate picei, cingulis subtus atris marginibus cærulecenti-griseis. Tergum thoracis fusco-luteum. Alæ vitrinae, nervis et basibus rubiginosis. Pedes virescenti-grisei, strigis abbreviatis longitudinalibus in mediis femorum, cruribus anticis nigricantibus, sed posterioribus tarsorum vel ochraceo-fumosis, vel stramineis plus aut minus corvino tinctis, vel fulvis unguibus obscuris. Abdomen supra fuscum, apicibus segmentorum obscuris et juncturis pallidis; subtus saturate murinum. Setæ fuliginosæ, vel nigricantes.

♀. Alæ vitrinae, crassioribus nervorum longitudinalium testaceis, tenuioribus atro-fuscis, et transversalibus atris; vel omnibus testaceis. Oculi atro-olivacei. Abdomen supra ochraceo-furfurosum, juncturis pallidissimis; subtus testaceum. Processus ventralis penultiimi segmentorum emarginatus.

Long. corp. ♂ 7·5-10, ♀ 7·5-9; al. ♂ 10, ♀ 10·5; set. ♂ 23-25, subim. 8-9; set. ♀ 14, subim. 10 mm.

Hab.—Great Britain, Switzerland, and Austria; in cold streams and the rapids of rivers. June to September.

\* The specimens labelled *semitincta* in M. Ed. Pictet's collection, are indistinguishable from a pale variety of *semicolorata*, which occurs in the Lake District of England. It seems advisable, notwithstanding, to state M. Pictet's criteria of *semitincta*, in case the species should be really distinct from one another.

Subimago. "Alæ pallide flavescenti-griseæ. Corpus virescenti-flavescens."

Imago. "Thorax striga dorsali pallida. Femora antica acute fulva."

Hab.—A small stream at Versoix, on the Lake of Geneva, in the middle of June. (Pict.)

One can hardly doubt that it is a species distinct from *semicolorata*.

*Heptagenia nivata*, nov. sp.

(Genitalia maris, Pl. VI. fig. 10.)

Subimago, v. v. s. ♂ ♀. Alarum anticæ saturate cinereæ; posteriores pallidiores. Pedes olivacei, tarsis nigricantibus; antici obscuratores. Setæ nigræ.

Imago, v. v. s. ♂. Oculi atro-fuliginei, infra paulo olivaceo tineti. Tergum thoracis aterrimum, politum. Alæ vitrinæ, invariae; nervi virescenti-grisei, post-cubitales recti. Pedum antici atro-olivacei, tibiis et tarsis atris; posteriores olivacei, tibiis saturate virescenti-albis vel cretaceis, atque tarsis olivaceo tinctis. Abdomen supra fuscum, juncturis paulo pallidioribus; subtus olivaceum. Setæ nigricantes, juncturis anguste obscuris.

♀. Post-cubitales vix irregulares. Pedum antici tibiis tarsisque saturate nigricantibus; posteriores tibiis cretaceis, et tarsis nigricantibus unguibus pallidis. Abdomen subtus olivaceum, maculis ganglialibus paulo obscuratioribus. Lamina ventralis penultiimi segmentorum apico lente emarginato.

Long. corp. ♂ ♀ 11; al. ♂ 12, ♀ 17; set. ♂ 27, subim. 8; set. ♀ 12-15 mm.

*Hab.*—The stream at Barberine; and Lac de Combal. July. It is named *nivata* from its haunts being chilled with snow.

*Heptagenia borealis*, nov. sp.

(Genitalia maris, Pl. VI. fig. 11.)

Imago, v. s. s. ♂. Thoracis tergum piceum. Alæ vitrinæ; nervorum longitudinales pallide fusci. Pedes pallide fusci. Abdomen ochraceum, pellucidum; supra apicibus et paucis segmentorum apicalium fuscis. Setæ cervinæ, juncturis fuscis.

Long. corp. & al. ♂ 10 mm.

*Hab.*—Finmark, between Kautokeino and Karaswando. (Walk. MS.) July or August.\*

\* An account of Messrs. Walker and Christy's journey is given in the Entomological Magazine (1837) iv. 462-83.

*Heptagenia canadensis.*

(Genitalia maris, Pl. VI. fig. 12, 12a.)

*Baetis canadensis*, Walk. 1853.

Imago, v. s. s. ♂. Thorax supra saturate luteus. Alæ vitrinæ, nervis fuscis; areæ marginalis et submarginalis vix fuscescentes, nebulâ apicali breviter apud marginem terminalem productâ, et duobus nervorum transversalium prope punctum nodale nebulis singulis rotundatis obscuris, nebulis interdum tamen confluentibus. Pedes pallide testacei, juncturis tarsorum fuscis, apicibus tibiarum atris, et femoribus obscure bicingulatis. Abdomen supra sub-ochraceum, apicibus segmentorum strigisque lateralibus obliquis fuscis; subtus stramineum. Setæ pallidæ, juncturis fuscis.

Long. corp. ♂ 9, al. 10, set. supra 18 mm.

Hab.—Canada.

*Heptagenia fusca.*

(Genitalia maris, Pl. VI. fig. 13, 13a, b.)

*Baetis fusca*, Walk. 1853.

Imago, v. s. s. ♂ ♀. Tergum thoracis castaneo-piceum. Alæ vitrinæ, nervis pallide fuscis, et apice areæ marginalis anticae vix fuscescente. Pedum antici fusci: posteriores saturate testacei: femora strigis singulis brevibus in mediis longitudinalibus atris. Abdomen fuscum, apicibus segmentorum saturationibus.

Long. corp. ♂ ♀ 6-7, al. 9-10 mm.

Hab.—St. Martin's Falls, Albany R., Hudson's Bay.

*Heptagenia cupulata*, nov. sp.

(Genitalia maris, Pl. VI. fig. 14, 14a.)

Subimago, v. s. s. Alæ testaceæ, nervis fuscis.

Imago, v. s. s. ♂. Thoracis tergum luteum. Alæ vitrinæ: anticae areis marginalibus et submarginalibus apices versus fuscescentibus, longitudinalibus nervorum piceis et transversalibus atris, (basi subcostæ et nervo transversali crasso juxta basin areæ marginalis aurantiacis

exceptis); posticæ nervis bases versus testaceis, et apud margines terminales anguste corvino tinctæ. Pedes saturatissime lutei. Abdomen supra furfurosum, strigâ longitudinali mediâ, apicibus segmentorum, strigisque lateralibus obliquis, fuliginosis. Setæ saturate hepaticoloratæ.

♀ ovivalvulâ acutâ, processuque ventrali penultiimi segmentorum integro, sinu longitudinali.

Long. corp. ♂ 18, ♀ 16, set. ♂ 48, ♀ 54 mm.

Hab.—Northern China.

The neuration of the fore-wing is peculiar.

### *Heptagenia basalis.*

(Genitalia maris, Pl. VI. fig. 15, 15a.)

*Buetis basalis*, Walk. 1853; nec Steph. MS.

Imago, v. s. s. ♂. Tergum thoracis piceum. Alæ vitreæ, nervis piceis: anticæ vix fusco tinctæ marginem interiorem versus, nervis transversalibus in areis marginalibus et submarginalibus plus aut minus obscure marginatis, marginibus nonnunquam confluentibus, itaque maculam formantibus ad punctum nodale alteramque inter hoc et alæ apicem; posteriores bases versus vix fusco-piceo tinctæ. (Exemplar pedibus caret). Abdomen piceum, juncturis pallidis. Setæ cervinæ, juncturis fuscis.

Long. corp. ♂ 15, al. 13, set. 21 mm.

Hab.—Lake Winnipeg.

### *Heptagenia maculipennis.*

*H. maculipennis*, Walsh, 1863.

Subimago. “Alæ griseo tinctæ, nervis transversalibus obscure marginatis.”

Imago. ♂. “Pallide flavicans. Capitis vertex rubiginosus; orbitæ ocellorum griseæ. Tergum thoracis rubiginosum. Alæ vitrinæ, nervis longitudinalibus tenuibus obscuris, et pluribus transversalium atris: horum ii super interiorem submarginem alæ anticæ, atque omnes alæ posticæ, vitrei sunt. Nervi transversales anthracini in area marginali alæ anticæ adeo collocantur ut quasi maculas forment; viz., nervi circa quatuor prope basin,

quorum primus aream submarginalem quoque transit, marginibus late anthracinis; deinde spatium; postea tres ad punctum nodale, paucis sequentibus; deinde circa medium spatii sequentis alii quatuor vel quinque; denique nervi ad spatia solita positi usque ad apicem. Pedes albicantes, femoribus flavescentibus, sèpissime strigis tenuibus singulis brevibus subtus apices; unguis apices que tibiarum anticarum fusi. Dorsum abdominis apicem versus piceum; setæ forcepsque albidæ."

♀. "Pallidior. Abdominis segmenta apicalia supra albicantia, plus aut minus rubiginoso tincta. In posterioribus tarsorum primus articulorum tarsalium secundo æqualis: tibia antica apice fere nunquam fusco. Maculæ costales alæ anticæ eis maris paulo pallidiores" (Walsh). Penultiimi segmentorum processus ventralis integer esse mihi videtur.

Long. corp. ♂ 4·5-6, ♀ 5-6; set. ♂ 12-15, subim. 7·5; set. ♀ 9-12, subim. 8; exp. al. ♂ 14-17, ♀ 15-17 mm.

*Hab.*—Rock Island, Illinois (Walsh); New York (M'Lach. Mus.).

### *Heptagenia cruentata.*

*H. cruentata*, Walsh, 1863.

Subimago. "Alæ opace flavescentes. Setæ nigricantes (vel griseæ ?), juncturis vix fuscis."

Imago, v. s. ♂. Flavescens. Oculi cærulescenti-grisei, lineis singulis atris intersectis. Tergum thoracis sanguineum. Alæ vitrinæ, nervis fuscis, bases versus vitreis, costisque in majore parte flavescentibus; subcosta apud punctum nodale incrassata atque obfuscata. Femorum dimidia apicalia annulis confluentibus pallide sanguineis bicincta; tibiae quoque bases et apices versus pallide sanguineæ; tarsorum juncturæ atque unguis obscuri. Abdomen supra sanguineum, juncturis saturatioribus. Forceps pallidus, apicibus fuscis. Setæ albidæ, juncturis in vices anguste lateque obscuris."

♀. "Plerumque mari pallidior. Venter interdum sanguineus." (Walsh.)

Long. corp. ♂ 7-8, ♀ 8-9; set. ♂ 25-27, subim. 12-15; set. ♀ 17-20; exp. al. ♂ 19-20, ♀ 22-23·5 mm.

*Hab.*—Rock Island, Illinois (Walsh).

*Heptagenia simplex.**H. simplex*, Walsh, 1863.

Subimago. "Alæ flavescentes; costa feminæ unius fusca."

Imago, v. s. ♂. "Ab acute flavo ad albidum varians. Oculi virescenti-sulphurei; orbitæ ocellorum nigricantes. Tergum thoracis carneum. Alæ vitrinæ, nervis apicalibus, et interdum quoque eis in arcis marginalibus, fuscis. Pedes albi, femoribus flavis vel cretaceis, apicibusque tarsorum fuscis: antici apicibus tibiarum atque interdum juncturis tarsorum fuscis. Abdomen vitreum, segmentis apicalibus (2-3) flavescensibus vel albidis. Setæ albæ, nigricantes apices versus. Forceps albus."

♀. "Abdomen flavum, nisi vacuum sit, setis albis. Pedes apicibus tarsorum solum fuscescentibus. Nervi alarum anticearum vitrei, costis subcostisque flavescensibus, paucisque nervorum transversalium inter horum apices obscuris, exceptis." (Walsh.)

Long. corp. ♂ 6-8, ♀ 6·5-9; set. ♂ 14-18·5, subim. 10·5; set. ♀ 14-16, subim. 10-15; exp. al. ♂ 16-20·5, ♀ 19-25·5 mm.

*Hab.*—Rock Island, Illinois (Walsh).

*Heptagenia pulchella.*

*Palingenia* (C) *pulchella*, Walsh, 1862. (?) *Pal.* (C) *terminata*, Walsh, 1862.\*

Subimago. "Alæ sub-opacæ, fusco nebulosæ, nervis transversalibus fuscis, obscure marginatis. Setæ vix pilosæ, nisi juxta bases."

Imago, v. s. ♂ "Oculi margaritacei, vel atrescentes. Thoracis tergum rubigineo-piceum, meso- et meta-thoracis scutellis albidis. Alæ vitreae: anticeæ areis marginalibus apices versus pallide brunneo nebulosis, et nervis transversalibus fuscis, eis prope basin areæ marginalis lutescentibus exceptis; posticeæ pluribus nervorum pellucidis. Pedum antici pallide flavescentes, femoribus fusco bicinctis, apicibus tibiarum tarsorumque cum junc-

\* Utrum *H. terminata* sit varietas *H. pulchella*, an species vera, Dominus Walsh dubitat. In *H. terminata* sex priora segmentorum abdominis immaculata, pedumque posteriores pallide flavescentes sunt. Forsan quoque oculi maris flavescentes fuerint.

turis horum fuscis; posteriores albidi, similiterque signati. Segmentorum abdominis 1-6 albida, punctis singulis lateralibus prope apices magnis fuscis; cætera rubiginoso-picea: venter albicans. Setæ fuscæ, pallidiores apices versus."

♀. "Vertex capitis et tergum thoracis albicantes: ille luteo, hoc vel luteo vel rubiginoso variat. Abdomen flavum, maculis veluti in mari." (Walsh.)

Long. corp. ♂ 5-8, ♀ 5.5-8; set. ♂ 17-21, subim. 10-13; set. ♀ 15-16, subim. 8-13; exp. al. ♂ 15-21, ♀ 17-23 mm.

Hab.—Rock Island, Illinois (Walsh).

### *Heptagenia interpunctata.*

*Baetis interpunctata*, Say, 1839; *Palingenia* (C) *interpunctata*, Walsh, 1862.

Subimago. "Alæ primo flavescenti tinctæ; denique fuscæ, opacæ."

Imago, v. s. ♂. "Flavescens. Oculi pallide virescenti-sulphurei; macula atra inter oculos, alteraque infra antennas; orbitæ ocellorum fuscae. Tergum thoracis piceum, triangula basali lineisque singulis lateralibus prothoracis atris. Alæ vitrinæ; anticæ prope costas, præcipue apices versus, lutescenti-brunneo nebulosæ; in medio alæ, inter tertium atque quartum nervorum longitudinalium, striga brevis crassa atra jacet; nervi fusi, costa in majore parte flavescenti excepta: posticæ apud apices brunneæ. Pedum antici pallide virescenti-flavi (sulphurei ?), femoribus fusco bicinctis, apicibus junciturisque tibiarum et tarsorum quoque fuscis; posteriores pallidiores. Abdomen pallide opace viridescens, strigâ dorsali et dimidiis apicalibus segmentorum piceis; subtus apicibus segmentorum obscuris. Setæ pallidæ, virescentes, juncturis fuscis."

♀. "Tergum thoracis luteum, plerumque puncto tantum super prothoracem nigro. Abdomen supra flavum, notis angustioribus, et subtus notis ♂ pallidioribus. Setæ albidae. Alæ anticæ apud costas flavescentes, nervis transversalibus e postcostâ (sicut nervi alarum posticarum) pellucidis et flavescentibus" (Walsh).

Long. corp. ♂ 7-10, ♀ 5-10; set. ♂ 20-25, subim. 9-15; set. ♀ 14-24, subim. 7-14; exp. al. ♂ 17-25, ♀ 18.5-30 mm.

*Hab.*—Rock Island, Illinois (Walsh); Indiana (Say).

*Heptagenia flavescens.*

(Genitalia maris, Pl. VI. fig. 16.)

*Palingenia* (C) *flavescens*, Walsh, 1862.

Subimago. ♂. “Alæ vel subfuscantes, colore nervorum indistinctiori quam in imagine; vel subflavescentes, sub-opacæ, nervis flavescentibus, transversalibus in mediis apicesque versus exceptis. Segmentorum abdominis sex priora flava, strigis parentia. Setæ invariae.”

Imago, v. s. s. ♂. Thoracis tergum luteum, vel “rubiginosum vel piceum.” Alæ vitrinae, fulgore lacteo; nervi picei, costis et subcostis majore parte flavescentibus exceptis; punctum nodale indistinctum; areæ marginalis apex virescenti-griseo vel “pallide rubiginoso” nebulosus. Pedum antici sub-gambosi, vel “pallide rubiginosi,” femoribus bicinctis, apicibus juncturisque tibiarum et tarsorum fuscis; posteriores testacei, “apicibus femorum” juncturisque tarsorum obscuris. Abdomen supra rufo-fuscum vel “rubiginosum,” juncturis obscuris; sex priora segmentorum strigis pallidis duabus sub-distinctis, cætera lutescentia: subtus testaceum, apicem versus lutescens. Setæ albicantes, juncturis fuscis. “Venter in v.s. pallide virescens, apice excepto.”

♀. “Pallidior, abdome supra pallide fusco vel rubiginoso, carens vittis. Plurimi nervorum transversalium areæ marginalis pellucidi.” (Walsh.)

Long. corp. ♂ 9-13, ♀ 10-13; set. ♂ ♀ 27-38, subim. ♂ 17, ♀ 13; exp. al. ♂ 24-29, ♀ 27-34 mm.

*Hab.*—Rock Island, Illinois (Walsh).\*

\* *Heptagenia vitrea.*

*Palingenia vitrea*, Walk. 1853.

Subimago, v. s. s. ♀. “Testacea; femora fusco sub-notata; alæ albidae, sub-opacæ, nervis testaceis” (Walker).

Long. corp. 6, exp. al. 12 mm.

*Hab.*—St. Martin's Falls, Albany River, Hudson's Bay.

This species can be recognized in no other way, than by comparing specimens with the original type in the British Museum.

*Heptagenia nigrimana.**Ephemera nigrimana*, Duf. 1841.

Imago, v. s. ♂. "Subtestacea, oculis fusco-æneis flavo circumdati; alis diaphanis, costa subflavescenti, venis obscuris: abdomine testaceo, segmentis utrinque lineola obscura obliqua; pedibus pallidis, anticis nigris; setis nigris." (Duf.)

Long. corp. 5 lin. Gallic.

Hab.—Incog.; probably France.

*Heptagenia flavipennis.*

(Genitalia ♂, Pl. VI. fig. 17, 17a; ♀ 17b, c.)

*Ephemera flavipennis*, Duf. 1841. *Baetis cerea*, Pict. 1843-5. *B. longicauda*, Hag. 1863; (nec Steph. 1835-6).

Subimago, v. v. s. ♂. Oculi graminei. Alæ acute virescenti-flavæ, marginibus terminalibus viridi-nigricanti anguste limbatis, atque strigis transversalibus duabus interdum abruptis anticarum apices versus ejusdem coloris; puncta nodalia costæ subcostæque, atque nervi transversales in areae marginalis apice, atri. Pedes furfrosi, femoribus obscure carneo bicinctis, et tarsis apicibusque tibiarum anticarum corvinis. Setæ furfrosæ, juncturis vix obscuris.

♀. Caput maculâ trigonali utrinque apud oculos supra et infra obscurâ.

Imago, v. v. s. ♂. Oculi flavo-prasini, vel viridi-olivacei. Thoracis tergum furfurosum. Alæ vitrinæ, flavo-virenti suffusæ, præcipue costas versus; nervorum longitudinales saturate virentes, transversales punctaque nodalia atri. Pedes veluti in subimagine; tarsi antici tamen brunneo-fuliginosi, apicibus articulorum obscuris. Abdomen supra vel virescenti-griseum, vel flavo-virens, vel sulphureum, apicibus segmentorum anguste corvinis, atque tribus segmentorum apicalium furfrosis; subtus immaculatum. Setæ luteæ, juncturis obscuris.

♀. Pallidior. Alæ antice vitrinæ, fulgore pruinoso, areis marginalibus et submarginalibus virescenti-griseo tinctis. Abdomen supra pallidissime virescenti-flavum, apicibus segmentorum anguste corvinis. Ovivalvula processusque ventralis penultimi segmentorum integri.

Long. corp. ♂ 12-13, ♀ 14; al. ♂ 14-15, ♀ 17; set. ♂ 20-33, subim. 24, ♀ 21 mm.

*Hab.*—The Kennet and Holybrook, near Reading; and the Lake of Geneva (Pict.). June and July. The sub-imago rises mostly in the evening after sunset.

*Heptagenia elegans.*

(Genitalia ♂, Pl. VI. fig. 18; ♀ 18a, b.)

(?) *Ephemera sulphurea*, Mül. 1776 = *E. helvola*, Sulz. 1776 = *E. bioculata*, Röm. 1789 (nec Lin.). (?) *E. ferruginea*, Gmel. 1790-3. *E. bioculata*, var. (?), Pz. 1804 (nec Lin.). *Baetis elegans*, *costalis* & *straminea*, Curt. 1834. *E. lutea*, Ste. 1835-6 (nec Lin.). (?) *B. marginalis*, Burm. 1839. *B. cyanops* & (?) *sulphurea*, Pict. 1843-5. *B. lutea*, Hag. 1863.

Subimago, v. v. s. Oculi saturate olivacei, vel graminei; caput maculâ parvâ utrinque infra oculos atrâ, atque aliâ rhombicâ supra juxta oculos lûteâ. Lineola pone coxas anticas, et punctum ante poneque coxas intermedias utrinque, atra. Alæ primo unicolores, sulphureæ; tum striga transversalis vix distincta nascitur apud angulum interno-terminalem alæ anticæ, alteraque inter hanc et alæ apicem, atque limbus griseus mediocris super marginem terminalem; denique nervi transversales atri fiunt. Pedes pallidissime ochracei, tarsis pallide nigricantibus. Setæ nigricantes.

Imago, v. v. s. ♂. Oculi supra saturate virescenti-cæsii, et subtus subgraminei, maculis singulis rotundis mobilibus lineolis curvatis concentricis circumjectis; vel atri. Caput maculatum veluti in subimagine. Thoracis tergum furfurosum. Alæ vitrinae, fulgore pruinoso, nervis plerumque corvinis vel atris; anticæ areis marginalibus et submarginalibus flavicantibus, apicibus virescenti-griseo tinctis. Pedes parum gambosi, vel flavo-virescentes; antici furfuroso tincti, tarsis fumatis, et juncturis tarsorum apicibusque femorum atris; posteriores apicibus tibiarum et tarsis fumatis, juncturis atris. Segmentorum abdominis sex priora supra pallide fuscescentia, vel virescenti-olivacea, juncturis atro-piceis, saepo

vasi dorsali, lineisque curvatis ex basi ejusque duabus, indistincte pallidioribus, atque lateribus ventreque pallidissime olivaceis; cætera supra furfurosa, subtus ochracea. Setæ albo-fumatæ, juncturis fuscis.

♀. Oculi prasini, vel glauci, vel etiam atri. Alæ vitrinæ, parum sulphureo vel gamboso tinctæ apud areas marginales et submarginales, nisi in toto vix sulphureæ; nervis atris, crassioribus longitudinalium gambosis exceptis. Pedes gambosi, tarsis fumatis, juncturis atris. Dorsum abdominis flavo-virens vel flavo-ochraceum, juncturis obscuris, et tribus segmentorum apicalium flavis vel ochraceis; venter immaculatus. Setæ albæ, vel fumato-albæ, juncturis obscuris. Ovivalvula obtusa; processus ventralis penultiimi segmentorum paulo retusus.

Long. corp. ♂ 9-10, ♀ 9-11; al. ♂ 10-12, ♀ 11-13; set. ♂ 19-23, ♀ 14-19, subim. ♂ & ♀ 13-15 mm.

*Hab.*—Switzerland, Germany, Belgium, Great Britain, and Norway (Hammerfest). May to September; in streams and rivers.

### *Heptagenia fluminum.*

*Ephemera bioculata*, Pz. 1804 (*nec Lin.*). *Baetis fluminum*, Pict. 1843-5.

Subimago (e figurâ Pict.). ♂. “Alæ cervinæ; anterior striga transversali abbreviata ex angulo interno-terminali, alteraque paulo postea e costa, deinde lineis transversalibus e costa tribus apicem versus, atque nebula transversali inter strigas et basin, atrescentibus.”

♀. “Alæ virescenti-griseæ, invariæ.”

Imago, ♂. “Oculi cyanei (Pict.) vel graminei (Lab. & Imh.). Thoracis tergum lutescens vel saturate furfursum. Alæ vitrinæ, nervis tenuibus atris, et areis marginalibus antarcarum flavescenti tinctis. Pedes lutescentes, tarsis fuscescentibus. Abdomen lutescens, apicibus segmentorum et maculis trigonalibus latero-apicalibus fuscis. Setæ lutescentes vel furfurosæ, juncturis pallide fuscis.”

♀. “Simillima mari; abdominis segmenta singula lineolis dorsalibus abbreviatis atris in mediis longitudinalibus.”

Long. corp. ♂ 12-13, ♀ 12; set. ♂ 30, subim. 13, ♀ 20, subim. 13; exp. al. ♂ 25-27, ♀ 30 mm.

Hab.—Germany (Panzer); the Rhone about Geneva, to the further extremity of the Lake. (Pict.)

*Heptagenia sylvicola.*

*Baetis sylvicola*, Ed. Pict. 1865.

Imago, v. s. s. ♂. "Tergum thoracis luteum, metathorace flavescenti. Alæ vitrinæ, nervis lutescentibus; apex areæ marginalis flavescentes. Pedes lutei; antici nigricantes. Abdomen luteum, juncturis nigricantibus, ultimoque segmentorum flavo. Setæ fulvæ, juncturis nigricantibus. Forceps nigricans." (Ed. Pict.) Venter serie macularum trigonalium, quarum apices ante diriguntur.

♀. "Simillima mari. Processus ventralis penultimi segmentorum abdominis integer." (Ed. Pict. & e fig.)

Long. corp. ♂ 12, ♀ 13; exp. al. ♂ 31, ♀ 33 mm.

Hab.—San Ildefonso, in July (Ed. Pict.).

*Heptagenia volitans.*

(Genitalia maris, Pl. VI. fig. 20.)

*H. volitans*, Etn. 1870.

Imago, v. v. s. ♂. Oculi supra fusco-picei, subtus testacei. Thoracis tergum atro-fuscum. Alæ vitrinæ, nervis atris, tribus prioribus longitudinalium nigricantibus exceptis; apex areæ marginalis vix virescenti-griseo tinctus. Pedum antici tibiis tarsisque fuscis, et femoribus obscure bicinctis; posteriores fumato-luridi, femoribus saturate carneo bicinctis, tarsis fuscis, et interdum tibiis testaceis. Abdomen supra fuscum, apicibus segmentorum fuliginoso-fuscis, maculisque trigonalibus lateralibus saturate virescenti-griseis: subtus saturate virescenti-griseum, immaculatum, vel perraro locis plexorum nervorum strigisque sequentibus duabus vix obscure indicatis; interdum quoque infra penultimum segmentorum notæ L-formatae dueæ fuscae sunt. Setæ pallide virescenti-griseæ, juncturis atris vel atro-fuscis.

Long. corp. ♂ 12-15; al. 13-14; set. 25-28 mm.

Hab.—The Thames above Pangbourne, and the Holybrook near Reading; in May. The name has reference to a habit of the *Heptagenia* of hovering steadily when there is a gentle breeze.

*Heptagenia alpicola*, nov. sp.

(Genitalia maris, Pl. VI. fig. 19.)

Imago, v. v. s. ♂. Oculi fuliginosi. Thoracis tergum fusco-luteum. Alæ vitrinæ, nervis piceis, interdum areæ marginalis apice nigricante. Pedes rufo-picei: antici tarsis corvinis, vel tibiis et tarsis atris; posteriores tarsis paulo obscuratis, vel saturate piceis. Abdomen supra luteum vel saturate griseum, marginibus latis segmentorum apicalibus, strigaque in medio longitudinali, subfuscis vel fuscis. Venter pallidus, striga longitudinali angulatim in medio segmenti singuli dilatata subfusca; segmentorum penultimum luteum. Setæ fuliginosæ. Forceps fumatus, proximis articulorum fuliginosis.

Long. corp. ♂ 13-14; al. 15-16; set. 41-44 mm.

Hab.—Near Contamines, Val Montjoie; Carinthia.

*Heptagenia iridana*.

(?) *Baetis aurantiaca*, Burm. 1839.\* *B. iridana*, Kolen. 1860.

Imago. "Corpore rufo-brunneo, segmentis abdominalis dorsalibus postice late brunneo marginatis; alis iridinis, tribus nervorum anteriorum flavis, reliquis brunneis, pterostigmate [i. e., apice areæ marginalis] infumato vel flavescenti. Venter luteo-brunneus, setis obscurior." (Kolen.)

Long. corp. 3·5; al. 5; set. 12."

Hab.—Altwater, in August and September, at an altitude of 4000 feet. The type is in the Royal Polytechnic, Brunn.

*Heptagenia annulifera*.*Palingenia annulifera*, Walk. 1860.

Imago, v. s. s. ♀. Thorax furfurosus, lateribus proet meta-thoracis dorsi pallidioribus. Alæ vitrinæ, nervis

\* Burmeister's diagnosis of *B. aurantiaca* is as follows:—

Imago. "Rufo-testacea, segmentis abdominalibus utrinque linea obliqua nigra; alis gracilibus hyalinis."

Long. corp. 3·5 lin.

Hab.—Halle.

piceis, et horum transversalibus fusco marginatis. "Pedes albidi, [femoribus] nigro-fasciatis." Abdomen testaceum, strigis singulis trigonalibus obliquis utrinque segmentorum, punctisque dorsalibus atris. Setæ cervinæ, junc- turis atris. Processus ventralis penultimi segmentorum integer.

Long. corp. ♀ 6; al. 8; set. supra 10 mm.

Hab.—Hindostan.

### *Heptagenia luridipennis.*

(Genitalia maris, Pl. VI. fig. 21, 21a.)

(?) *Ephemera noveboracana*, Licht. 1796. *Baetis luridi- pennis*, Burm. 1839. (?) *B. noveboracana*, Hag. 1861.

Subimago, v. s. s. Alæ pallide fusco tinctæ, nervis obscuris.

Imago, v. s. s. ♂. Thoracis tergum brunneo-luteum; abdomen paulo obscurius. Alæ vitrinae, crassioribus nervorum longitudinalium brunneis vel testaceis, et transversalibus piceis; apices areæ marginalis et areæ submarginalis paulo infuscatae. Pedum antici sub-testacei vel gambosi, femoribus obscure bicinctis, apicibus tibiarum fuscis, et tarsis pallidis; posteriores pallidiores. Abdomen supra brunneo-luteum, vel fuscum, apicibus segmentorum strigisque lateralibus obliquis obscuris. Setæ pallidissime cervinæ, junc- turis obscuris.

♀. Simillima mari. Venter immaculatus. Processus ventralis penultimi segmentorum emarginatus esse videtur.

Long. corp. ♂ 11, ♀ 10; al. ♂ 13, ♀ 15; set. ♂ circa 25, ♀ subim. circa 15 mm.

Hab.—St. Martin's Falls, Albany River, Hudson's Bay (Barnston); the St. Lawrence, Canada (De Selys).

### *Heptagenia flaveola.*

(Genitalia maris, Pl. VI. fig. 22, 22a.)

*Baetis flaveola*, Pict. 1843-5.

Subimago, v. s. s. Alæ cervino-albæ; nervorum longitudinales testacei, transversales in mari nigrantes, in femina atri.

Imago, v. s. s. ♂. Thoracis tergum rufo-luteum. Alæ vitrinæ; anticæ nervis atris, tribus prioribus longitudinalium testaceis exceptis; posticæ nervis pellucidis. Pedes lividi vel straminei, femoribus fusco bicinctis, juncturisque obscuris; tarsi antici albicantes, juncturis obscuris. Abdomen tribus segmentorum apicalium rufo-luteis, et cæteris ochroleucis juncturis fuscis; venter immaculatus. Setæ albo-cervinæ, juncturis vix obscuris.

♀. Corpus ochraceum, juncturis abdominalibus anguste nigricantibus. Processus ventralis penultiimi segmentorum vix emarginatus. Alæ fulgore fere talcoso.

Long. corp. ♂ 9, ♀ 8-10; al. ♂ 10, ♀ 11-13; set. ♂ 20, ♀ subim. 16 mm.

Hab.—St. Martin's Falls (Barnston); Tennessee (Pöppig); West Farms, New York (Angus, MS.).

### *Heptagenia vicaria.*

(Genitalia maris, Pl. VI. fig. 23, 23a.)

*Baetis vicaria*, Walk. 1853 (imago). (?) *B. tessellata*, Walk. 1853 (subimago, ♀).\*

Subimago ? (*tessellata*, Walk.), v. s. s. Alæ pallidissime fusco suffusæ, nervis testaceo-brunneis, et horum transversalibus fuliginoso marginatis.

Imago, v. s. s. ♂. Thoracis tergum brunneo-luteum. Alæ vitrinæ, nervis fuscescentibus; apex areæ marginalis anticæ pallidissime fuscescente vel virescenti-griseo tinctus. Abdomen supra pallide fuscum: dorsum venterque utrinque serie signorum 6-formatorum fulvorum,

\* From one or two particulars in the description, I am inclined to think that *Baetis tessellata*, Hag., may be a *Leptophlebia*. It may be *L. columbiæ*, Walk., on the point of casting the subimaginal pellicle.

*Baetis tessellata*, Hag. 1861; (nec. Walk. 1853).

Subimago. ♀. "Alæ griseæ, nervis luridis, et maculis quadratis pellucidis numerosis; posticæ minimæ. Thorax luteus; mesothorax linea fusca utrinque. Pedes lutei, apicibus tarsorum fuscis. Abdominis segmenta lutea, maculis trigonalibus latero-dorsalibus utrinque fuscis duabus." (Hag.)

Long. corp. ♀ 16, exp. al. 26 mm.

Hab.—Puget Sound, Washington Territory (Hag.).

As the type is in alcohol (in the Berlin Museum) its affinities can be easily determined.

et apud basin segmenti singuli supra lineolæ pallidæ longitudinales due sunt. Setæ fuscæ, juncturis obscuris. Pedes saturate rubiginosi, femoribus bicinctis.

♀. Processus ventralis penultimi segmentorum integer.

Long. corp. ♂ 12; al. ♂ 13, ♀ 14.5; set. ♂ 35 mm.

*Hab.*—The St. Lawrence; Chicago; Washington (Hagen); Savannah (Osten Sacken).

### *Heptagenia venosa.*

(*Genitalia maris*, Pl. VI. fig. 24.)

(?) *Ephemera maculata*, Pod. 1761. *E. venosa*, Fab. 1775. (?) *E. berolinensis*, Mül. 1776. *E. fusco-grisea*, Retz. 1783. *E. nervosa*,\* Vill. 1789. *Baetis dispar*, Curt. 1834. *B. venosa*, Ste. 1835-6. *E. rufa*, Ramb. 1842. (?) *B. purpurascens* & *forecipula*, Pict. 1843-5. *B. longicauda*, Ron. 1856 (*nec Ste.*). *Ecdyurus venosus*, Etn. 1868.

Subimago, v. v. s. Alæ pallidissime cervinæ, nervis transversalibus fuscis nigricanti marginatis, fasciis transversalibus pallidis indistinetis duabus trajectis; area submarginalis areæque marginalis apex flavescenti tincti, fasciis obscuris interrupti. Pedes cinereo-olivacei, tarsis cinereis. Setæ fuscæ.

Imago, v. v. s. ♂. Oculi supra atro-picei, vel picei; subtus apud orbitas ochracei, linea grisea interposita. Thoracis tergum fuscum. Alæ vitriæ, nervis corvinis; apex areæ marginalis nigricanti tinctus. Pedum antici fusco-corvini, tarsis corvinis; posteriores saturate virescenti-grisei, genubus tarsisque corvinis. Abdomen supra fuscum, vel fuliginoso-hepaticoloratum, latera versus pallido testaceum, strigis lateralibus fuscis obliquis; subtus saturate brunneo-hepaticoloratum. Setæ fuscae.

♀. Mari simillima. Processus ventralis penultimi segmentorum integer.

Long. corp. ♂ 12-14, ♀ 12-18; al. ♂ 13, ♀ 15-17; set. ♂ 30-48, ♀ 15, subim. 17 mm.

*Hab.*—Scandinavia (Zet.); England; Belgium (De Selys); France; Switzerland; Dalmatia (Pict.); Corsica (Hag.). In streams. June.

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\* M. Pictet (1843-5) unfortunately cited this synonyme as one originated by Fabricius.

Var. (?) *forcipula*.( *Baetis forcipula*, Pict. 1843-5.)*Hab.*—Germany, Austria, Bohemia, Bavaria, and Piedmont (Pict.). Undescribed.

Specimens probably exist in the Vienna Museum.

*Heptagenia longicauda*.( *Genitalia maris*, Pl. VI. fig. 25.)*Baetis longicauda & subfusca*, Ste. 1835-6.

*Subimago*, v. v. s. ♀. Alæ pallide fumato-nigricantes, nervis sub-furfurosis, transversalibus anguste cinereo marginatis. Pedum antici picei, tibiis nigricanti tinctis, et tarsis anthracinis; posteriores femoribus olivaceis, tibiis nigricantibus, et tarsis corvinis.

*Imago*, v. v. s. ♂. Oculi atro-fuliginosi. Thoracis tergum aterrimum, vel atro-fuscum, politum. Alæ vel vitrinæ, vel vix virescenti-griseo tinctæ, nervis atro-piceis: apex areæ marginalis anticæ vix virescenti-griseus. Pedum antici atro-picei, femoribus apud bases pallidioribus; posteriores femoribus fuscis, vel fusco-luteis, tibiis testaceis, et tarsis vel corvinis vel saturate hepaticoloratis. Abdomen supra umbrinum vel rubido-fuscum, juncturis pallidis, et apicibus segmentorum fuscis; latera dorsi bases segmentorum versus flavescentia, strigis singulis saturate fuscis obliquis ex horum apicibus; venter fuliginoso-hepaticoloratus. Setæ et forceps atro-piceæ.

♀. Simillima mari sed pallidior. Alæ vitrinæ, nervis fusco-piceis: areæ marginalis et submarginalis anticæ tantum apices versus vix virescenti-griseo tinctæ. Processus ventralis penultimi segmentorum integer.

Long. corp. ♂ 11-12, ♀ 9; al. ♂ 11, ♀ 11-15; set. ♂ 27, ♀ 15, subim. 12 mm.

*Hab.*—Great Britain. July to September. In cold streams and rivers.

*Heptagenia angustipennis*.

*Ephemera angustipennis*, Ramb. 1842; *Baetis angustipennis*, Ed. Pict. 1865.

*Subimago*, v. s. s. ♀. Alæ cervinæ; nervorum longitudinales testacei, transversales nigricantes, anguste mar-

ginati. Pedes lutescentes, femoribus obscure annulatis, anticis tibiarum luteis, posterioribus testaceis, et tarsis fuscis. Setæ fuliginosæ.

Imago, (?) (*Ephemeru madritensis*, Ramb. MS.) v. s. s. ♀. Thoracis tergum luteum. Alæ vitrinæ; nervorum longitudinales testacei, transversales picei. Pedes postici femoribus luteis, singulis cingulis nigris, tibiis testaceis, et tarsis luteis. Processus ventralis penultiimi segmentorum vix retusus.

Long. al. im. 14, subim. 11 mm.

Hab.—Madrid (Ramb.).

### *Heptagenia Picteti.*

*Baetis Picteti*, Meyer-Dür, 1864.

Subimago, s. s. "Alæ albantes, nervis longitudinalibus atro-fuliginosis, et cæteris atris; antica parte tertia basali, fasciisque transversalibus quatuor (quarum prima atque tertia abbreviatæ sunt), et vestigio quoque quintæ apud apicem, griseis. Tergum thoracis fuscum, politum. Pedes fuscescentes, cruribus pallidioribus. Abdomen fuscum, juncturis pallidis. Setæ albantes, annulis pallidis."

Long. corp. 5·5, al. 7, set. 5-6 lin.

Hab.—Tessin and Ober Engadine (Meyer-Dür).

### *Heptagenia insignis.*

(Genitalia maris, Pl. VI. fig. 26, 26a; notæ ventrales abdominis, fig. 26b.)

*Baetis montana*, Hag. 1863; (*nec Pict.*). *H. insignis*, Etn. 1870.

Subimago, v. v. s. Alæ pallide cervinæ, apud bases et costas vix sulphureo tinctæ, nervis ipsis sulphureis vel olivaceis; antica apud marginem terminalem cinerea, marginibus nervorum transversalium atris.

Imago, v. v. s. ♂ & ♀. Oculi sub-olivacei, strigis singulis fuscis intersectis. Thoracis tergum fuscum vel sub-olivaceum [piceum in s. s.]. Alæ vitrinæ, nervis piceis, costis et subcostis plus aut minus fuscis: areæ anterioris marginalis et submarginalis vix virescenti-griseo bases versus tinctæ, apicibus nigricantibus. Pedum antici atro-picci vel corvini, juncturis apicalibus tarsorum

pallidioribus; posteriores sub-olivacei, vel virescenti-olivacei, tarsis atrescentibus. Abdomen sub-olivaceum, vel pallide virescenti-griseum, apice lutescenti; segmentorum apices, strigæque laterales ex his oblique productæ, atri; sæpe quoque series centralis est feminæ strigarum brevium nigricantium: venter maculatus similiter ac in Tab. VI., fig. 26b, effingitur. Setæ atræ, piceæ apices versus. Forceps corvinus. Processus ventralis penultiimi segmentorum integer.

Long. corp. ♂ 11-12, ♀ 12-14; exp. al. ♂ 13-17, ♀ 13-15; set. ♂ 22-23, subim. 14-20, ♀ 20, subim. 15 mm.

*Hab.*—England. May, June, and July or August. In rivers.

### *Heptagenia montana.*

*Baetis montana*, Pict. 1843-5.

Imago, v. s. ♂. “Caput nigrum, oculis cyaneis. Prothorax supra rufescens, maculâ in medio nigrâ: meso- et meta-thoraces supra atri. Alæ vitrinæ, nervis tenuibus nigris; apex areæ marginalis anticae fuscescens. Pedum antici nigri: posteriores fulvi. Abdomen supra griseofuscum (in figurâ ochraceo-olivaceum, juncturis et strigis lateralibus obliquis obscuris), setis fuscis” (Pict.).

Long. corp. ♂ 13, set. 30, exp. al. 28 mm.

*Hab.*—Near a small stream from Brevet, above Chamonix (Pict.); and on the Austrian mountains (Brauer).

### *Heptagenia Bellieri.*

*Baetis Bellieri*, Hag. 1860.

Imago, v. s. s. ♀. Alæ vitrinæ, lacteo tinctæ, nervis piceis; apex areæ marginalis paulo infuscatus. Pedum antici picei; posteriores testacei, tarsis fuscis. Setæ piceæ. Processus ventralis penultiimi segmentorum integer.

Long. al. 14 mm.

*Hab.*—Sicily (Hag.). According to Dr. Hagen, this species somewhat resembles the preceding one in colour.

*Heptagenia zebra.*

(Genitalia maris, Pl. VI. fig. 28.)

*Baetis zebra* ( $\delta$  subim.,  $\varphi$  im.), *fallax* ( $\delta$  subim.), *fluminum* [nec Pict.] ( $\delta$  im.), Hag. 1864.

Subimago, v. s. s.  $\delta$ . Alæ cervinæ; nervorum longitudinales testacei, transversales per-anguste nigro marginati.

Imago, v. s. s.  $\delta$ . Thoracis tergum fuscum. Alæ vitrinæ, nervis piceis. Pedum antici femoribus fuscescentibus, cingulis et apicibus atro-piceis, tibiis atro-piceis, et tarsis fuliginosis; posteriores femoribus fusco-testaceis, cingulis in mediis et apicibus sub-piceis, cruribusque fuliginosis. Abdomen supra pallide olivaceo-fuscum, latera versus flavescens, apicibus segmentorum anguste piceis. Setæ fuliginosæ.

$\varphi$ . Thoracis tergum furfurosum. Alæ vitrinæ, crassioribus nervorum longitudinalium testaceis, et transversalibus atris. Pedes lutescenti-electrini, cingulis et apicibus femorum nigris. Abdomen supra fuscum, apicibus segmentorum obscuris; strigæ laterales obliquæ e basibus segmentorum utrinque atræ; subtus segmentum singulum maculis trigonalibus basalibus duabus atris. Setæ albantes, juncturis nigris. Processus ventralis penultiimi segmentorum integer.

Long. al.  $\delta$  9-10,  $\varphi$  12; set.  $\delta$  20, subim. 12,  $\varphi$  15 mm.

Hab.—Corsica (Hag.).

*Heptagenia lateralis.*

(Genitalia maris, Pl. VI. fig. 27.)

(?) *Ephemera stigma*, Gmel. 1790-3. *Baetis lateralis*, Curt. 1834. *Cloe brunnea*, Ramb. 1842. *B. obscura*, Hag. 1863; (?) Pict. 1843-5; (nec Ste.).

Subimago, v. s. s. Alæ saturate cervinæ, invariæ; interdum tamen tribus prioribus nervorum longitudinalium ochraceis.

Imago, v. v. s.  $\delta$ . Oculi atro-fuliginosi. Pedum antici atro-fusei, cruribus atro-piceis; posteriores sub-

fusci, tarsis piceis. Nervi alarum fusci. Venter virescenti-fuliginosus; forceps ater; setæ saturate fuliginosæ. Reliqua veluti in femina.

♀. Oculi atro-fuliginosi. Thoracis tergum aterrimum, politum. Ale vitrinæ, nervis piceis. Pedum antici atropicei, tarsis atris; posteriores saturate picei, femoribus vix annulatis, et tarsis atris. Abdomen supra hepatico-fuscum, apicibus segmentorum vix obscuris, nisi maculis trigonalibus apud latera obscuris: venter fuscus, juncturis virescenti-griseis, et interdum plexu nervorum ventralium penultimi segmentorum vix hepaticolorato. Setæ corvinæ. Processus ventralis penultimi segmentorum integer.

Long. corp. ♂ 5-9, ♀ 7; exp. al. ♂ ♀ 6-9; set. ♂ 19, subim. 10, ♀ 8 mm.

Hab.—England and Wales; Carinthia; Switzerland (Pict.); the South of Spain (Ramb.). July and August. In mountain torrents, and cold streams.

M. Pictet's description of *B. obscura* was probably drawn up from a dried specimen.

### *Heptagenia guttata.*

*Baetis guttata*, Pict. 1843-5; *Ephemera (Baetis) guttata*, Blanch. 1851.

Imago, s. s. ♀. Caput et thorax fusci, flavo variegati ("punctati," Pict.). Alæ vitreæ, nervis atris; area marginalis pallidissime fuscescens. Pedes flavescentes; femora apicibus maculisque singulis in mediis, tibiæque apicibus, nigris. Abdomen flavum (in figurâ fuscum), apicibus segmentorum strigisque lateralibus ex his oblique productis, atque seriebus strigarum longitudinalium supra subtusque duabus, atris. Setæ flavescentes, juncturis in vices late et anguste nigro annulatis." (Pict. & Blanch.)

Long. corp. ♀ 12, set. 18, exp. al. 29 mm.

Hab.—Valdivia, Chili (Blanch.).

The following is probably an indeterminable species of *Heptagenia*.

*Ephemera gemmata*, Scop. 1763.

Imago, s. s. ♀. "E. gemmata. Tubercula tria frontalia, diaphana, crystallina, nigra, punctulata [ocelli]. Corpus rufum. Incisuræ abdominis marginibus flavicantibus. Setæ caudales unciales."

Long. 7.5."

Hab.—Circa aquæductum Fodinarum Idrensum (Scop.).

*Heptagenia torrida.**Baetis torrida*, Walk. 1853.

Imago, v. s. s. ♀. Thoracis tergum castaneo-piceum. Alæ vix fusco suffusæ: antica areis marginali submarginalique saturationibus. Pedum antici rufo-picei; posteriores saturate furfurosi, apicibus femorum rufo-piceis. Abdomen (decoloratum) apicibus segmentorum obscuris; setis carens. Processus ventralis penultimi segmentorum integer.

Long. corp. ♀ 8, exp. al. circa 20 mm.

Hab.—The Philippine Islands.

*Heptagenia determinata.**Baetis determinata*, Walk. 1853.

Imago, v. s. s. ♂. (reliquiæ typi). Picea. Thorax strigâ dorsali longitudinali fulvâ. Alæ vitrinæ: antica costâ apud basin saturate ochraceâ, nervis fuscis, atque areis marginali submarginalique quasi incrassatis et fuscis. Pedes furfurosi, tarsis et apicibus femorum fuscis. “Abdomen strigâ latâ flavescenti, notis paucis piceis incaulis.” (Walk.)

Long. corp. ♂ 11, al. 24 mm.

Hab.—Java.

In this genus the cross-veinlets in the apex of the marginal area of the anterior wing vary in character in the same species, so much so, that they may be simple and free, or divided and conjoined, in either sex of a species, indifferently. Sometimes, however, they are of slight service. *H. elegans* and some other yellowish species have two evanescent dark triangular dorsal dashes between the wings of the subimago, which I have purposely omitted to mention in the descriptions.

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## EXPLICATIO TABULARUM.

Signum asterisci \* iis figuris appositum est quas ex aliis operibus receperimus; omnes reliquæ icones sunt originales, a nobis secundum naturam operose camera lucida delineatae, et magnitudine auctæ.

## Tab. I. Venæ alarum antiecarum.

- Fig. \*1. *Lachlaniae abnormis.*  
 2. *Oligoneuriæ rhenanæ.*  
 3. *Asthenopi* (sp. nondescript.); in Mus. M'Lach.; de Texas.  
 4. *Campsuri latipennis* (in parte).  
 5. *Polymitarcos virginis.*  
 6. *Pentageniæ vittigeræ.*  
 7. *Hexageniæ limbatæ* (in parte).  
 8. *Euthyplociæ Hecubæ* (in parte); 8a, apex alæ.  
 9. *Ephemeræ vulgatæ* (in parte).  
 10. Fragmentum fossile Oolithicum, speciei generis incerti *Ephemeræ affinis*, de Solenhofen. Ex exemplari in Musæo Britannico; magnitud. auct. (7×7).

## Tab. II. Venæ alarum anticarum.

- Fig. 1. *Potamanthi lutei* (in parte).  
 2. *Leptophlebiæ australasicæ.*  
 2a. *Leptophlebiæ marginatae* (in parte).  
 2b. *Leptophlebiæ cupidæ* (in parte).  
 2c. *Leptophlebiæ fuscae.*  
 \*3. *Tricorythi varicaudæ*, ♀. \*3a ♂.  
 4. *Cænis dimidiata.*  
 5. *Ephemerella ignitæ* (in parte).  
 6. *Bætiscæ obesaæ* (in parte).  
 7. *Cloeonis similis* (in parte).  
 8. *Centroptili luteoli* (in parte).  
 9. *Baetis binoculati.*

## \* Note :—

- Tab. I. fig. 1 ..... is from..... Packard's Guide to the Study of Insects. Fig. 578.
- Tab. II. fig. 3, 3a       ,,       Savigny's Description de l'Egypte (1817), Tab. II. fig. 6, 7.
- Tab. III. fig. 7a-8c     ,,       Dr. Hagen, in Stet. Ent. Zeit. (1855), Tab. I.
- Tab. III. fig. 17a       ,,       C. Cornelius (1848).
- Tab. V. fig. 30         ,,       Ed. Pictet, in Synopsis des Névroptères d'Espagne, Tab. III. fig. 1.
- Tab. VI. fig. 8         ,,       Hagen, in Berendt's Organische Reste im Bernstein (1856) Bd. II. Tab. VI. fig. 1.

## TAB. III.

Figs. 1-5. Venæ alarum anticarum.

- Fig. 1. *Baetis* (sp. nondescript.) in parte; de California.
2. *Siphluri lacustris.*
  3. *Coloburi humeralis.*
  4. *Isonychia manca.*
  5. *Heptagenia elegans.*
  6. *Mensura gallica* (centimetres and millimetres).
  - 6a. " " anglicana (inches and lines).
  7. *Oligoneuria rhenana*, ♂ im. genitalia infra.
  - \* 7a. " " " caput oblique.
  - \* 8. " *pallida*, " "
  - \* 8a. " " " penis.
  - \* 8b. " " " pes forcipis.
  - \* 8c. " " ♀ im. processus ventralis penulti seg-  
mentorum.
  9. " *Trimeniana*, " processus ventralis penult. segm.  
infra.
  - 9a. " " " processus ventralis penult. segm.  
oblique.
  10. *Campsuri latipennis*, ♂ im. genitalia infra.
  - 10a. " " " "
  11. " *albifili*, " "
  12. " *cuspidati*, " "
  13. " *quadridentati*, " "
  14. *Asthenopi curti*, " "
  - 14a. b. " " " partes apicales penis.
  15. *Polymitarcos virginis*, " pes forcipis.
  - 15a. " " subim. "
  - 15b. " " im. penis.
  16. " *Savignii*, " pes forcipis.
  - 16a. " " " penis.
  17. *Palingenia longicaudæ*, " pes forcipis.
  - \*17a. " " " penis.
  - 18-18a. " *late*, " pes forcipis; subim. & im.
  - 18b. " " " penis infra.

## TAB. IV.

- Fig. 1. *Pentagenia vittigeræ*, ♂ im. genitalia infra.
2. *Hexagenia albivittata*, " "
  - 2a. " " " pedis forcipis articuli apicales.
  3. " *limbatæ*, " pes forcipis.
  - 3a. " " " pedis forcipis articuli apicales.

TAB. IV.—*contin.*Fig. 4. *Hexageniæ bilineatæ*, ♂ im. pes forcipis.

5.	<i>Ephemeræ vulgatae</i> ,		genitalia infra.
5a.	"	"	penis.
5b.	"	"	maculæ dorsales abdominis.
6.	"	<i>guttulatae</i> ,	genitalia infra.
6a.	"	"	pedis forcipis articuli apicales.
6b.	"	"	maculæ dorsales abdominis.
7.	"	<i>lineatae</i> ,	genitalia infra.
7a.	"	"	pedis forcipis articuli apicales.
7b.	"	"	notæ dorsales abdominis.
8.	"	<i>danicæ</i> ,	genitalia infra.
8a.	"	"	maculæ dorsales abdominis.
9.	"	<i>glaukopis</i> ,	pes forcipis.
10.	"	<i>immaculatae</i> ,	" "
11.	"	<i>fasciatae</i> ,	" "
11a.	"	"	penis oblique.
12.	"	<i>sericæ</i> ,	genitalia infra.
12a.	"	"	pes forcipis.
13.	<i>Potamanthi lutei</i> ,		" "
13a.	"	"	penis infra.
14.	<i>Leptophlebiæ australis</i> ,	"	pes forcipis.
14a.	"	"	penis.
14b.	"	"	apex areæ marginalis al. ant.
15.	"	<i>australasicæ</i> ,	pes forcipis.
15a.	"	"	pedis forcipis articuli apicales.
15b.	"	"	penis infra.
16.	"	<i>furciferæ</i> ,	pes forcipis.
16a.	"	"	apex areæ marginalis.
16b.	"	"	penis infra.
17.	"	<i>inconspicua</i> ,	pes forcipis.
17a.	"	"	apex areæ marginalis.
17b.	"	"	penis infra.
18.	"	<i>dentatae</i> ,	pes forcipis.
18a.	"	"	pedis forcipis articuli apicales.
18b.	"	"	penis infra.
18c.	"	"	♀ im. apex processus ventralis penult. segment.
18d.	"	"	apex areæ marginalis.
19.	"	<i>strigatae</i> ,	latus processus ventralis penult. segment.
20.	"	<i>nodularis</i> ,	♂ im. pes forcipis.
20a.	"	"	ala postica.
20b.	"	"	penis oblique.
20c.	"	"	penis infra (haud appendiculatus).

TAB. IV.—*contin.*Fig. 21. *Leptophlebia scitæ*, ♂ im. pes forcipis.

21a.	"	"	"	penis infra.
22.	"	<i>Taprobanes</i> ,	"	pes forcipis.
22a.	"	"	"	penis oblique.
23.	"	<i>annulatae</i> ,	"	pes forcipis.
23a.	"	"	"	pedis forcipis apex.
23b.	"	"	"	penis infra.
24.	"	<i>auriculatae</i> ,	"	pes forcipis.
24a.	"	"	"	penis infra.
24b.	"	"	"	ala postica.
25.	"	<i>marginatae</i> ,	"	pes forcipis.
25a.	"	"	"	pedis forcipis apex.
25b.	"	"	"	penis infra appendiculatus.
26.	"	<i>helvipedis</i> ,	"	pes forcipis.
26a.	"	"	"	penis supra.
26b.	"	"	"	penis oblique.
26c.	"	"	"	pedis forcipis apex.
26d.	"	"	"	ala postica.
27.	"	<i>cinctæ</i> ,	"	genitalia infra.
27a.	"	"	"	pedis forcipis apex.
28.	"	<i>mollis</i> ,	"	forceps infra.
28a.	"	"	"	latus penis infra.
29.	"	<i>cupidæ</i> ,	"	pes forcipis.
29a.	"	"	"	penis infra.
29b.	"	"	♀ im.	processus ventralis penult. seg-
				ment.

## TAB. V.

Fig. 1. *Leptophlebia nebulosæ*, ♂ im. pes forcipis infra.

1a.	"	"	"	latis penis infra.
2.	"	<i>fuscae</i> ,	"	pes forcipis.
2a.	"	"	"	penis infra.
2b.	"	"	"	ala postica.
3.	"	<i>modestæ</i> ,	"	pes forcipis infra.
3a.	"	"	"	penis infra.
3b.	"	"	"	penis oblique.
4.	<i>Cænis macruræ</i> ,		"	genitalia infra.
5.	"	<i>dimidiatae</i> ,	"	genitalia infra.
6.	"	<i>luctuosæ</i> ,	"	forceps et membrana infra geni- talia.

TAB. V.—*contin.*

Fig. 7. *Ephemeralæ ignitæ*, ♂ im. genitalia infra.

- |     |                           |                  |   |                  |
|-----|---------------------------|------------------|---|------------------|
| 7a. | ,                         | ,                | , | ala postica.     |
| 8.  | ,                         | <i>invariæ</i> , | , | pes forcipis.    |
| 8a. | ,                         | "                | , | penis infra.     |
| 9.  | <i>Batiscæ obesæ</i> ,    |                  | , | genitalia infra. |
| 10. | <i>Cloeonis dipteri</i> , |                  | , | pes forcipis.    |
| 11. | ,                         | <i>similis</i> , | , | pes forcipis.    |
| 12. | ,                         | <i>russuli</i> , | , | pes forcipis.    |

[13-26, pedes forcipium; 13a-26a, alæ posticæ:]—

- |          |                              |                                 |                       |  |
|----------|------------------------------|---------------------------------|-----------------------|--|
| 13, 13a. | <i>Centroptili luteoli</i> , | ♂                               | im.                   |  |
| 14, 14a. | ,                            | <i>pennulati</i> ,              | ,                     |  |
| 15, 15a. | ,                            | <i>stenopterygis</i> ,          | ♂ im.                 |  |
| 16, 16a. | <i>Baetis binoculati</i> ,   | ♂                               | im.                   |  |
| 17, 17a. | ,                            | <i>scambi</i> ,                 | ,                     |  |
| 18, 18a. | ,                            | <i>finitimi</i> ,               | ,                     |  |
| 19, 19a. | ,                            | <i>atrebatini</i> ,             | ,                     |  |
| 20, 20a. | ,                            | <i>Rhodani</i> ,                | ,                     |  |
| 21, 21a. | ,                            | <i>phaeopis</i> ,               | ,                     |  |
| 22, 22a. | ,                            | <i>tenacis</i> ,                | ,                     |  |
| 23, 23a. | ,                            | <i>bucerati</i> ,               | ,                     |  |
| 24, 24a. | ,                            | <i>amnici</i> ,                 | ,                     |  |
| 25, 25a. | ,                            | <i>pumili</i> ,                 | ,                     |  |
| 26, 26a. | ,                            | <i>nigri</i> ,                  | ,                     |  |
| 27.      | ,                            | <i>picti</i> ,                  | ,                     |  |
| 28.      | ,                            | sp. nondescript. de California, | ala postica.          | (Pro alâ<br>anticâ vide Tab. III. fig. 1.) |
| 29.      | ,                            | sp. nondescript. ex Australia,  | ala postica.          |  |
| *30.     | <i>Siphluri flavigeni</i> ,  | ♂ im.                           | apex abdominis supra. |  |

## TAB. VI.

Fig. 1. *Siphluri armati*, ♂ im. pes forcipis infra.

- |     |                          |                    |   |   |
|-----|--------------------------|--------------------|---|---|
| 1a. | ,                        | ,                  | , | latus penis infra.                        |
| 2.  | ,                        | <i>lacustris</i> , | , | pes forcipis infra.                       |
| 3.  | ,                        | <i>Linnæani</i> ,  | , | pes forcipis infra.                       |
| 3a. | ,                        | "                  | , | notæ ventrales abdominis.                 |
| 4.  | ,                        | <i>annulati</i> ,  | , | notæ ventrales abdominis.                 |
| 4a. | ,                        | "                  | , | pes forcipis infra.                       |
| 5.  | <i>Isonychiæ mancæ</i> , |                    | , | pes forcipis infra.                       |
| 5a. | ,                        | "                  | ♀ | processus ventralis penult. seg-<br>ment. |

TAB. VI.—*contin.*

Fig. 6. *Coloburi humeralis*, ♂ im. pes forcipis oblique.

6a.	"	"	"	penis infra.
6b.	"	"	♀ "	processus ventralis penult. segment.
7.	"	<i>haleutici</i> ,	♂ "	pes forcipis oblique.
7a.	"	"	"	penis apex infra.
*8.	<i>Cronici anomali</i> ,		"	forceps infra.
9.	<i>Heptagenia semicolorata</i> ,	"		genitalia infra.
10.	"	<i>nivata</i> ,	"	genitalia infra.
11.	"	<i>borealis</i> ,	"	genitalia infra.
12.	"	<i>canadensis</i> ,	"	genitalia infra.
12a.	"	"	"	latus penis supra.
13.	"	<i>fusca</i> ,	"	penis supra.
13a.	"	"	"	penis infra.
13b.	"	"	"	pedis forcipis apex.
14.	"	<i>cupulata</i> ,	"	genitalia infra.
14a.	"	"	"	latus penis supra.
15.	"	<i>basalis</i> ,	"	pes forcipis infra.
15a.	"	"	"	penis supra.
16.	"	<i>flavescens</i> ,	"	genitalia infra.
17.	"	<i>flavipennis</i> ,	"	genitalia infra.
17a.	"	♂ subim.	penis infra.	
17b.	"	"	♀ im.	processus ventralis apex.
17c.	"	"	"	ovivalvula apex.
18.	"	<i>elegantis</i> ,	♂ im.	genitalia infra.
18a.	"	"	♀ im.	processus ventralis apex.
18b.	"	"	"	ovivalvula apex.
19.	"	<i>alpicola</i> ,	♂ im.	genitalia infra.
20.	"	<i>volitantis</i> ,	"	genitalia infra.
21.	"	<i>luridipennis</i> ,	"	penis.
21a.	"	"	"	penis infra.
22.	"	<i>flaveola</i> ,	"	pes forcipis.
22a.	"	"	"	penis infra.
23.	"	<i>vicaria</i> ,	"	penis infra.
23a.	"	"	"	latus penis supra.
24.	"	<i>venosa</i> ,	"	genitalia infra.
25.	"	<i>longicaudata</i> ,	"	genitalia infra.
26.	"	<i>insignis</i> ,	"	genitalia infra.
26a.	"	"	"	penis.
26b.	"	"	"	notæ ventrales abdominis.

TAB. VI.—*contin.*

- Fig. 27. *Heptagenia lateralis*, ♂ im. genitalia infra.  
 28. „ „ *zebratæ*, „ genitalia infra.  
 29. *Isonychia ignotæ*, „ apex penis infra.
- 
- 

## ADDENDA.

- Page 47. To *Centroptilum luteolum*, add Hudson's Bay Territory.  
 To *Centroptilum phaops*, add Norway (Hammerfest and Alten).
- Page 68, note.\* Add—*Ephemerum*, Tournefort (1694-1700)=*Tradescantia*, Lin., is the typical genus of *Ephemeræ*, Batsch (1802)=*Commelynaceæ*, an Order of Endogens. *Ephemerum*, Dodon (Ersch & Grüber) or Reichenbach (Lindley)=*Lysimachia*, Lin., a genus of *Primulaceæ*.
- Page 134. In *Isonychia*, the termination *-onychia* is adopted on account of *-onyx* being used as a generic termination in the names of some *Chelonii*. *Ephemera pudica*, Hag., is almost certain to be identical with *I. manca*; this species often has a close reticulation contiguous to the veins of the *inner margin* of the fore-wing, somewhat like that in the wing of *Polymitareys*.
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II. *New Species of Diurnal Lepidoptera from South and Central America.* By W. C. HEWITSON, F.L.S.

[Read 2nd January, 1871.]

*Heterochroa Makkeda.*

*Male.* Upperside: dark brown. Both wings crossed obliquely by a broad band from the costal margin of the anterior wing to the abdominal fold of the posterior wing; orange on the anterior wing, and divided by the nervures into eight parts, the fourth part projecting beyond the rest towards the apex; white on the posterior wing, with its outer border broadly orange. Anterior wing with some black lines and an orange band in and below the cell, and a subapical bifid orange spot; crossed by two submarginal rufous bands. Posterior wing crossed by three similar bands; an orange spot at the anal angle, marked by two black spots.

Underside: as above, except that it is rufous-brown, that the bands and spots are all white or lilac-white; that the anterior wing has the central band broken into spots by a rufous line, a third subapical spot, and a triangular bifid white spot at the base, and that the posterior wing has two white bands across the base, and covering the abdominal fold, and a short linear band between them and the central band.

Exp.  $2\frac{1}{10}$  inches.

*Hab.*—Pará. In the collection of W. C. Hewitson.

Easily known from all the other species by having the central band of the posterior wing divided longitudinally into white and red. On the underside it scarcely differs from *H. Erotia*.

*Heterochroa Zalmona.*

*Male.* Upperside: dark brown. Anterior wing with indistinct bands of paler colour in and below the cell; crossed transversely near the middle from the costal margin to near the anal angle, by a slightly indented band of orange, divided into seven parts by the nervures;

five indistinct subapical spots. Posterior wing crossed obliquely by four bands of paler colour, converging towards the anal angle, the fourth band submarginal.

Underside: rufous, clouded with brown towards the outer margins of both wings. Anterior wing with a bifid spot at the base, an oblong spot bordered with black in the middle of the cell, and four small spots below these, all silvery-white; the band of the upperside and five subapical spots white. Posterior wing crossed before the middle by two parallel bands of silvery-white, the band nearest the base broken in the middle; crossed at the middle by a band of black, and beyond the middle by a submarginal band of seven silvery-white spots.

Exp.  $2\frac{1}{10}$  inches.

*Hab.*—New Granada. In the collection of W. W. Saunders and W. C. Hewitson.

Nearly allied to *H. Epione*, which, instead of having the transverse white bands of equal breadth, parallel to each other, and slightly curved towards the base as in this species, has the second band very broad, and with its outer border curved towards the outer margin of the wing.

### *Eurygona argentea.*

*Male.* Upperside: dark brown. Anterior wing rufous below the median nervure, from the base towards the middle of the wing, where it ends in a more distinct round spot. Posterior wing with a longitudinal rufous band from the base to the outer margin.

Underside: silvery-white. Anterior wing with four transverse bands, and the outer margin, dark brown. Posterior wing crossed by six brown bands, all tending towards the anal angle: two from the base, a third from the costal margin united to the fourth, which runs near the inner margin, the other two submarginal, the outer one marked by a small black spot; the outer margin black, marked by a large orange spot.

Exp. 1 in.

*Hab.*—Nicaragua (Chontales). In the collection of Thomas Belt.

Unlike any other species, and one of the most beautiful.

*Pyrrhopyga Crida.*

Upper and underside: blue-black. The head and anus scarlet; the antennæ black. Anterior wing crossed transversely at the middle, from the sub-costal nervure to near the anal angle, by a narrow, trifid, transparent, glossy white band.

Exp. 2 inches.

Hab.—Nicaragua (Chontales). In the collection of Thomas Belt.

*Pyrrhopyga eximia.*

Upperside. Anterior wing dark green-brown, with a spot in the cell, and an oblique, continuous, very transparent, and highly polished white band, beyond the middle, nearly parallel to the outer margin, extending from the costal margin to the submedian nervure, and divided into seven parts by the nervures. Posterior wing pale yellow, tinted with orange towards the base; the base, a central transverse band, the nervures, and the inner and outer margins dark brown.

Underside: as above, except that there is a subcostal ochreous band on the anterior wing, and that the brown on the outer margin of the posterior wing is much narrower.

Exp. 2 inches.

Hab.—Venezuela (*Göring*). In the collection of W. C. Hewitson.



III. Descriptions of a new genus and six new species of Pierinæ. By A. G. BUTLER, F.L.S., &c.

[Read 6th February, 1871.]

THE new genus and new species described in this paper are as under:—

<i>Ixias venatus</i>	.	.	White Nile.
<i>Kricogonia Fantasia</i>	.	.	Nicaragua.
<i>Callidryas fornax</i>	.	.	Chili.
„ <i>Jaresia</i>	.	.	Pará.
<i>Euchloë limonea</i>	.	.	Mexico.
<i>Larinopoda</i> (n. g.) <i>lycænoides</i>			West Africa.

Genus *Ixiás*, Hübner.

*Ixias venatus*, n. sp. (Pl. VII. fig. 7.)

Wings above, creamy-white; front-wings with base broadly dusky; a dark brown disco-cellular spot, the apex, outer margin, extremities of nervures, a round spot between second and third median branches, and an arched streak connecting it with apical patch, dark-brown; hind-wings with a brown disco-cellular point; the outer half of nervures dusky; seven triangular marginal dark brown spots at extremities of nervures: body blackish: wings below, pale ochreous; front-wings with interno-discal area white; base sulphur-yellow; disco-cellular spot as above; costa, outer half of nervures, a streak across subcostals, and a spot between median branches as above, dark brown; hind-wings with basal costa orange, nervures blackish, spots as above; an arched lunulate streak, parallel to outer margin from costa to below first median branch: body white.

Expanse of wings, 1 inch, 11 lines.

Hab.—White Nile. (Petherick.) Coll. B. M.

Most nearly allied to *I. Eulimene*, but very distinct from any described species.

## Genus KRICOGONIA, Reakirt.

*Kricogonia Fantasia*, n. sp. (Pl. VII. fig. 6.)

♀. Wings above, greenish-white; front-wings with the basal costa dusky sulphur-yellow; a pale brown marginal band beginning broad on costa, and tapering to near the anal angle; hind-wings tinted with pale sulphur; front-wings, below, with the greater part of the discoidal cell and basal half of the costal area bright sulphur-yellow; apical half of the costal area and apex tapering to near the anal angle, tinted with pale sulphur; hind-wings as above, but brighter towards the base; body creamy-white; anus brownish.

Expanse of wings, 2 inches, 4 lines, to 1 inch, 8 lines.

Hab.—Nicaragua. (*De Latre.*) Coll. B. M.

Most nearly allied to *K. Lyside* (*Castalia* Butl., *nec* Fabr.), but at once distinguishable by the marginal band and differently coloured bases of the wings.

## Genus CALLIDRYAS, Boisduval.

*Callidryas fornae*, n. sp.

♀. Allied to *C. Larra*; wings above, bright sulphur-yellow; front-wings with apical and external areas densely irrorated with dull crimson; a black discocellular spot; apex and terminations of nervures brown; a biangulated discal series of blackish spots bounded externally on the disc by yellow spots, the largest nearest to the anal angle; hind-wings with external area to cell dull crimson, enclosing one or two yellowish spots towards the costa; apices of nervures blackish; cilia yellow; abdominal area pale yellow; body yellow, thorax clothed with silky grayish hairs; wings below golden yellow; the apical half orange-tinted; the whole surface irregularly patched with red; all the markings (which are arranged as in *C. Philea*, ♀) are broad and dull red; two silver spots at the end of the cell in both wings; but those of the front-wings badly defined: body golden-yellow.

Expanse of wings, 2 inches, 10 lines.

Hab.—Chili. Coll. Kaden in Coll. Druce.

Intermediate between *C. Avellaneda* and *C. Larra*, and one of the most beautiful species in the genus.

*Callidryas Jaresia*, n. sp.

♀. Wings above, orange-yellow; margin and disco-cellular spot black, as in *C. Statira*; abdominal area pale ochreous; body grayish; wings below, satiny ochraceous, becoming pearly towards external margin; markings as in *C. Statira*, but more sharply defined and rosy; the marginal band of front-wings not confounded with the discal series of spots, and the disco-cellular spots better defined; a rosy point at the base of the front-wings; body ochreous.

Expanse of wings, 2 inches, 9 lines.

Hab.—Pará. Colls. Hewitson, Wallace, and Druce.

I think it just possible that this may be the female of *C. Wallacei*, Felder, which, however, I have only seen from Peru and Bolivia; perhaps it is more likely to be an extreme form of *C. Statira*, it, however, differs constantly in its more robust form, and in the other characters mentioned above.

## Genus BELENOIS, Hübner.

*Belenois Cynis*, var., Hewitson. (Pl. VII. fig. 1.)

♂. Differs from the typical form in the absence of the marginal spots of hind-wings, and the restricted gray area at the base of the wings on the under-surface.

Expanse of wings, 2 inches,  $1\frac{1}{2}$  lines.

Hab.—Ayerpanas, Malacca. (Roberts.) Coll. Roberts and B. M.

My figure of this variety was taken from an example lent to me some years ago by Lieutenant Roberts: a similar example has since been presented by him to the National Collection; before we received this specimen, I supposed two examples of *P. Illana*, Felder (a local form of *P. Polisma*, Hewitson), to be the true *P. Cynis*, the insect being so labelled by Mr. White when I first arranged the collection; I consequently took *P. Illana* under the name of *P. Cynis*, as the type of my new genus *Phrißura*, an unfortunate error, considering that *P. Cynis* does not possess the anal tuft peculiar to the species of *Phrißura*, and, moreover, agrees in venation, and in every other character, with the species of the genus *Belenois*.

## Genus EUCHLOE, Hübner.

*Euchloë Limonea*, n. sp.

♂. Allied to *E. Scolymus* and *Genutia*; front-wings strongly falcate, above yellowish-white, apex sulphur-yellow; a squainose olivaceous marginal band from the termination of the first subcostal to the termination of the third median branch, bounded within by an oblique elongate-ovate orange band; a pyriform disco-cellular spot; base blackish; hind-wings sulphur-yellow; base blackish; ground-colour of wings below as above; front-wings, apex sparsely irrorated with olivaceous and brown scales; subapical orange band visible through the wing; nervures black-tipped; hind-wings marbled, almost as in *E. Genutia*, with squamose olivaceous spots; body whitish, abdomen sulphur-yellow.

Expanse of wings, 2 inches.

*Hab.*—Mexico. Coll. W. W. Saunders.

This very distinct species of the section *Midea*, is intermediate in character between *E. Scolymus* and *E. Genutia*.

## LARINOPODA, n. gen.

Allied to *Euchloë*, but with the aspect of *Nychitona* (*Pontia* of recent authors).

Wings pyriform; front-wings with five subcostal branches, the first emitted at a short distance before the end of the cell, the second immediately before the end, the third half-way between the cell and apex; the fourth and fifth at two-thirds of the distance from the cell to the apex: upper disco-cellular short, slanting obliquely inwards; lower, three times the length of upper, angulated, slanting obliquely outwards; median branches emitted near together; hind-wings with subcostals emitted close together, so as to reduce the upper disco-cellular to a point; lower disco-cellular very oblique, about eight times the length of the upper; second and third median branches emitted at about half the distance from each other that exists between the second and first; body short, robust; abdomen swollen beneath; legs thick; antennæ short, slender, feebly clubbed; palpi long, slender, not hairy.

*Larinopoda lycaenoides*, n. sp. (Pl. VII. figs. 2-5.)

♀. Wings above, white (like rice-paper), basal costa and apex of the front-wings brownish; thorax brownish, abdomen white, palpi orange.

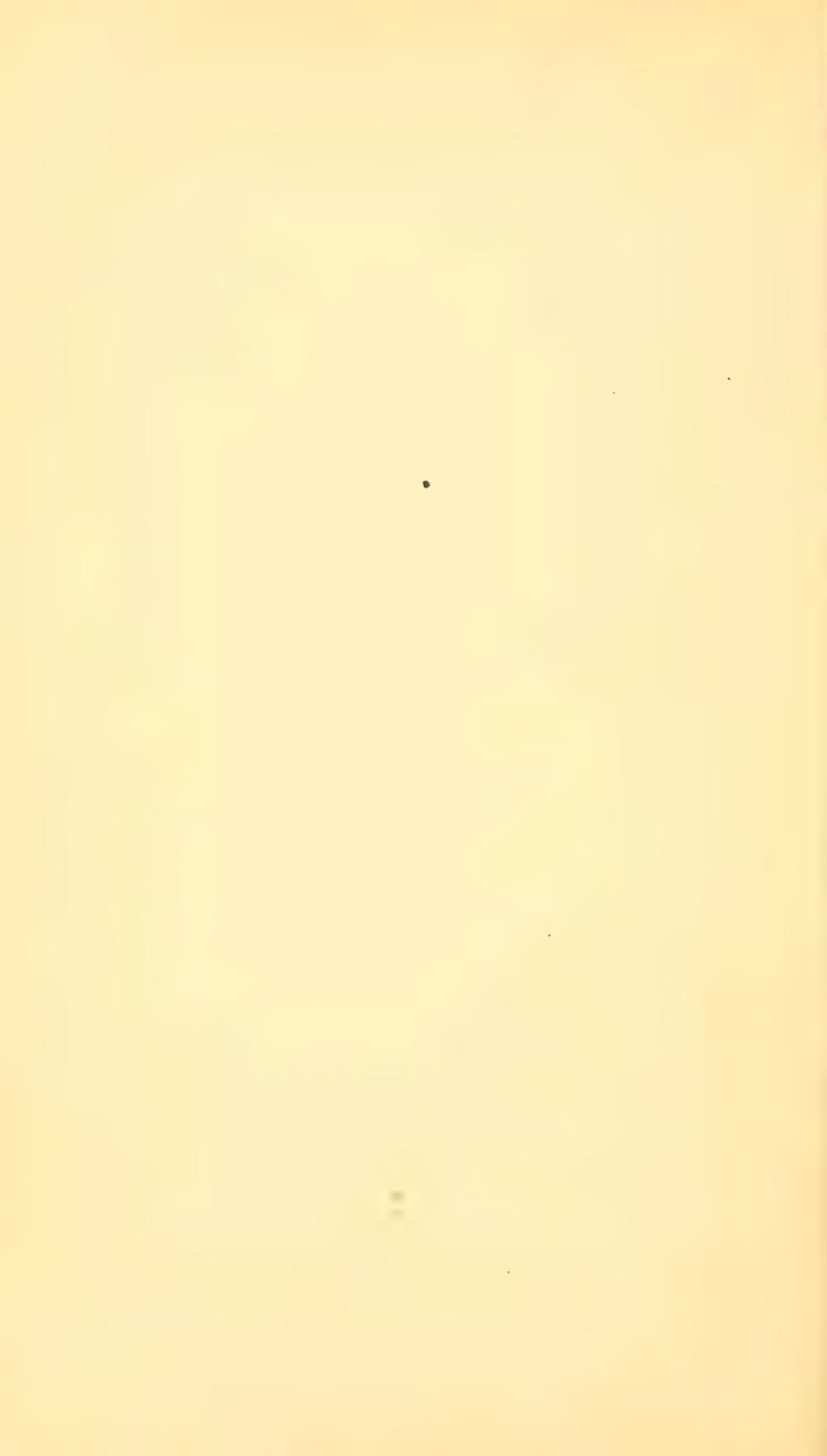
Wings below, white; front-wings with a rounded blackish costal spot above the termination of the cell, and two or three at the apex; basal costa speckled with black atoms; hind-wings with a brown subapical spot, and an indistinct point placed obliquely below it; a black spot just below the origin of the first median branch; body white, legs and palpi orange-yellow.

Expanse of wings, 1 inch, 9 lines.

Hab.—West Africa. Coll. W. W. Saunders.

The above genus, though evidently belonging to the *Pierinæ*, seems, in some respects, intermediate between the *Eronia* group of that subfamily and the genus *Delenura* of Trimen (*Lycæninae*), and bears out the view maintained by those Lepidopterists who place these two subfamilies in juxtaposition; its natural position in the *Pierinæ* is between *Nepheronia* and *Euchloë*.

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IV. *On the dispersal of non-migratory Insects by atmospheric agencies.* By ALBERT MÜLLER, F.R.G.S., &c.

[Read 20th February, 1871.]

IF any of my friends, who may do me the honour of perusing this paper, should feel tempted to say that it appears "like a wild flower, where it was least expected," I would tell them, that the subject of Insect diffusion has long had a share of my limited leisure, but that I would not yet have ventured upon publishing my reflections, had I not been reminded by the annual address (1870) of our late president Mr. H. W. Bates, that it is probable the amount of migration and dissemination by winds, currents, and other means, is much underrated by some Entomologists.

It is not within the scope of my theme to consider the great number of instances which literature records of migratory insects.\* They are mostly prompted to undertake their wanderings by instinct, climatic or meteorological influences, scarcity of food, and probably other causes at present unknown to us; and we are all more or less familiar with the accounts given of the travelling *Lepidoptera*, viz.: the larvæ of several *Pieridæ*, of *Gastropacha processionea* and *pinivora*, and of *Leucanidæ* (army-worms), the imagines of *V. cardui*, *urticæ*, of several *Papilionidæ*, *Pieridæ*, *Uranidæ*, *Sphingidæ*, the 'Bugong' moths, &c.; among *Coleoptera*, several *Hydradephaga*, *Melolonthidæ*, *Lucanidæ*, *Coccinellidæ*, *Apion vernale*, &c.; amongst *Hymenoptera*, *Formicidæ*, and *Apidæ*; in the *Neuroptera* (in the Linnaean sense), *Libellulidæ*, *Termitidæ*; in *Orthoptera*, *Blattidæ*, *Locustidæ*, *Acridiidæ*, &c.; in the *Diptera*, the larvæ of several *Sciaridæ* ('Heerwurm'); the imagines of a *Bibio*, and sundry *Syrphidæ*; whilst the hosts of *Aphidæ*, and a few species belonging to *Notonecta* and *Aphrophora* may be taken as representing the erratic *Hemiptera*.

All these Insects are, so to say, travellers by choice or profession, and very little surprise need greet their appearance, isolated or *en masse*, in any part of the globe. But it is very different with the normally more or less

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\* A general survey of the subject has been given by C. Cornelius, in his work "Zug und Wanderthiere aller Thierklassen," Berlin, 1865.

stationary or else local insect tribes, which, by habit, food, or bodily organization, are confined to their native haunts. Their appearance in out of the way localities deserves to be fully investigated, and in following their tracks, we may join Thomas Moore, in saying:

“ Poor wanderers of a stormy day,  
From wave to wave we are driven,  
And fancy’s flash and reason’s ray,  
Serve but to light the troubled way.”

Various authors have lit up parts of the troubled way of these insect-waifs, by throwing reason’s ray on the means of their accidental transportation. Sir Charles Lyell, Messrs. Kirby, Darwin, Wallace, Wollaston, Bates, and other naturalists, have shown what human agency, for instance, trade and navigation,\* the carrying by larger animals and birds, by the ocean and rivers, by floating trunks of trees, and matted floating islands, pumice stone,† icebergs, and other drifting objects, and what atmospheric conveyance can, in some cases, accomplish.

But I agree with Mr. Bates, that the amount of dissemination by atmospheric means is still much underrated, and it has therefore appeared desirable to me, to bring together into a small compass, some of the leading facts which have forced on my mind the conclusion, that aerial involuntary locomotion is a most active agency in regulating the distribution of sedentary terrestrial Entoma.

It is well known that Monads, Infusoria, winged and other seeds, the ashes of volcanic eruptions, the sands of the deserts of Africa and America, and other substances, are carried over land and sea by heavy gales. Fishes and newts have been known to be taken up by waterspouts or whirlwinds, and deposited far from their original localities, when the forces which had raised them, were spent. A. von Humboldt has recorded that small

\* Consult Von Frauenfeld’s paper in Verhandl. zool.-bot. G. in Wien, XVII. pp. 425-464, 1867.

† I have often found such floating and porous pumice stones on the Rhine, along the line of rejectamenta left by the spring floods, and I used to find these stones resorted to by various small *Carabidae*, such as *Bembidium*, *Anchomenus*, *Loricera*, *Chlaenius*, *Omophron*, and others. I can therefore confirm Mr. Bates’ supposition (*Naturalist on the River Amazon*, 2nd ed. 1864, p. 299), that they often serve as vehicles for insects and seeds to distant shores. I have also seen such stones left high and dry by a freshet, the pores filled with river mud, and seeds germinating in it.  
A. M.

songsters and butterflies were met by him several times in the South Sea, during gales blowing away from the land, and that, just as involuntarily, insects are often carried to the height of 15,000 to 18,000 feet above the plains. This illustrious savant says that the warmed surface of the earth causes a vertical current of air, by which light bodies are driven upwards, in confirmation of which explanation he gives the observation of M. Boussingault, who, together with his companion, Don Mariano de Rivero, saw rise from the valley of Caracas, whitish illuminated bodies mounting up to the height of 5,400 feet to the summit of the Silla, and then sink towards the adjoining coast. This was at midday, and lasted an hour without interruption. Taken at first for a swarm of small birds, these bodies were afterwards recognized as small balls of accumulated blades of the grass *Vilfa tenacissima*.\* The same author observes that Captain Fremont met with bees on the peak in the Rocky Mountains, bearing Fremont's name, and that, perhaps, like the butterflies met with by himself in much higher regions of the Andes, also within the line of perpetual snow, they were involuntarily carried up by ascending currents of air.† Mr. Wollaston says: "Unwilling victims, . . . . are ever and anon hurried to comparatively distant lands by the very winds that blow; and not only to distant lands, but over altitudes in which the severity of the cold would quickly annihilate them, were they (as, perhaps, usually happens) to be deposited there on their headlong and compulsory course."‡ Sir Charles Lyell observes that, "as almost all insects are winged, they can readily spread themselves wherever their progress is not opposed by uncongenial climates, or by seas, mountains, and other physical impediments; and these barriers they can sometimes surmount, by abandoning themselves to violent gales, which may, in a few hours, carry them to very considerable distances."§ Our president, Mr. A. R. Wallace, has lately reminded us that violent gales of wind, for example, will carry bodies of greater specific gravity than beetles for many miles

\* A. von Humboldt, 'Ansichten der Natur,' 1860, vol. II. p. 30.

† Ibid. Vol. I. p. 42.

‡ 'On the variation of species,' p. 148, 1856.

§ 'Principles of Geology,' 9th edit., p. 656.

through the air ; and storms and hurricanes are of such frequent occurrence, that they must have played a large part in stocking all uninhabited lands. (Address, &c., to the Ent. Soc. Lond. 23rd January, 1871.) A small longicorn beetle was observed to fly on board a vessel 500 miles off the west coast of Africa.\* A moth belonging to the genus *Andea* was captured at sea, more than 200 miles from the west coast of Africa, and a butterfly and several grasshoppers were noticed on board the ship, all of which are said to have been borne over the sea by the trade wind.† A *Colymbetes* once flew on board the "Beagle," when forty-five miles distant from the nearest land : how much further it might have flown with a favouring gale no one can tell.‡ The beetles in Madeira, as observed by Mr. Wollaston, lie much concealed until the wind lulls and the sun shines; § a fact which I have found to hold good with all orders almost everywhere. I have collected in mountains, but more particularly in the bleak range of the Swiss Jura, near the Creux du Vent, where I have noticed that a breeze has the immediate effect of sending every flying creature either to the nearest rock, or into the very short herbage for shelter. This universal habit of mountain insects seems to denote their appreciation of the dangers which may arise to them from atmospheric disturbances.

Taking all these facts (selected at random) into consideration, and bearing in mind the towering and soaring,|| often out of sight, of many butterflies and moths, the cloud-like swarms of *Formicidæ*, *Tipulidæ*, and other *Diptera*, dancing round church towers,¶ and over the tops of

\* 'Zoologist,' 1864, p. 8920.

† B. T. Lowne, in Trans. Ent. Soc. Lond. ser. 3, vol. 2, proc. p. 39.

‡ Darwin, 'Origin of Species,' 3rd ed. 1861, p. 417.

§ *Ibid.* p. 153.

|| Soaring of a moth, *Anisoneura hypocyana*; read Charles Horne's note, 'Zoologist,' 1869, pp. 176-7.

¶ *Vide* Bond, in Trans. Ent. Soc. Lond. ser. 3, vol 2, proc. p. 114:—"Millions of swarming reddish ants round the tower of St. Maurice at Coburg, mistaken for curls of smoke....Firemen called out, &c.;" and Wormald, *ibid.*, stating that he "had seen something very similar at St. Albans, on the 26th of August, when a swarm of small black ants presented the appearance of smoke issuing from the Abbey."

trees,\* or on cliffs exposed to all the vehemence of sudden gusts of wind ; the circling flight of *Anoxia australis* over the highest ashy cone of Vesuvius, observed by Dr. C. A. Dohrn in 1856;† the occurrence of *Chlorops lineata* enclosed in a hailstone, as recorded by Mr. F. Walker,‡ coupled with Mr. Pascoe's remark, that though insect swarms were not common on or very near to the surface of the earth, there must be great abundance of insect life in the upper atmosphere, and that the destruction of insects at a considerable elevation by swifts, must of itself be enormous,§ I think I have proved that the very habits of many insects are favourable to their forced removal by aerial disturbances.

But there is some other more direct kind of evidence to be related. On the 2nd January, 1868, a storm raged over Teneriffe, which felled the celebrated Dragon tree of Orotava, and uprooted the Cochineal plantations of the island, carrying many plants clear away. Numerous living larvæ of all sizes belonging to *Aegosoma scabri-corne*, were scattered far and wide from the broken bole of an old lime tree at Basle, blown down during a violent hailstorm on the 8th March, 1868.|| In an article on Argentine Coleoptera by Ed. Steinheil, printed in the "Atti della Società Italiana di Scienze naturali, 1869," it is stated of *Calosoma bonariense*, Dej., that this, and other *Carabidæ*, could be collected in numbers in the

\* Haliday records of *Culer detritus*, that it is seen in Ireland "in the evening, in columns about the tops of trees, appearing like smoke at the distance of a furlong." (Entom. Mag. vol. I. p. 151, 1833.)

Fairmaire says:—"qu'il a vu à Stockholm, autour de peupliers, au milieu de la ville, d'immenses quantités d'insectes, probablement des Diptères et Névroptères, qui formaient des véritables nuées ressemblant à de la fumée, à l'éxtrémité des branches. Au dire de MM. Boheman et Sundevall, ce fait se reproduit chaque été et avec un développement plus grand." Bullet. de la Soc. Ent. de France, 1856, p. lii.

On the 12th and 13th August, 1865, the high tops of most pear trees in the commune of Roggwyl, cant. Thurgovie, Switzerland, were observed to be crowned with gyrating small blackish clouds of winged ants, presenting the appearance of curls of smoke. A west wind arose, and suddenly swept the swarms away.

† 'Stett. Ent. Zeit.' 1870, p. 423.

‡ 'Ent. Weekly Intelligencer,' Vol. 7, p. 76, 1859.

§ Trans. Ent. Soc. Lond., 1869, proc., p. xxvi.

|| *Ibid.* 1870, proc., p. xxxviii.

middle of November 1865, and at about the same period in 1866, in the streets and houses of Buenos Ayres, and that they were wafted there by the Pampéro, the stormy west wind, which brings bright weather from the neighbouring Pampa, after the rain. It is stated, that this was a "true rain" of insects, and that the houses, cellars, terraces, rooms, &c., were swarming with the creatures. Dr. C. A. Dohrn says, in allusion to this fact, which was observed by Strobel, that, if the latter were right in his supposition that the said insect rain in November is a periodical event, Professor Burmeister would certainly be in a position either to confirm, or negatively to answer it.\* In connection with this record, it seems desirable to mention that Professor Lacordaire says, in his "Introduction à l'Entomologie," p. 494, that for two consecutive years, while he was at Buenos Ayres, this town was, every spring, for eight days, visited by millions of *Harpalus cupripennis*, which arrived daily in the dawn of the morning, and had to be swept away every morning from the outside of the houses, where they were piled up several feet in height." † Professor Westwood has recorded swarms of *Harpalus* near Dover, on the 12th August, 1839. ‡

Monsieur Rouzet states, that on the 21st May 1856, the exterior Boulevard of the Barrière du Père Lachaise at Paris, was covered with multitudes of *Rhizophagus parallelicollis*, Gyll., to a height of from five to six millimètres, and along the walls they lay a centimètre high, for a distance of more than a kilomètre. A storm came on in the evening and swept them all away, so that none were left the next day.—*Bulletin de la Soc. Ent. de France*, 1856, p. lii.

Captain Fitzroy tells us in his "Narrative of the Surveying Voyages of H.M. ships 'Adventure' and 'Beagle,'" that, "between the La Plata and the Rio Negro, myriads of white butterflies surrounded the ships in such quantities that the seamen said, 'it snows butterflies !'" They were brought by a gale from the north-west, which increased for a time.

\* Stettin. Ent. Z., 1870, p. 428.

† Quoted by Cornelius, 'Wanderthiere,' p. 230.

‡ Trans. Ent. Soc. Lond. ser. 1. vol. V., proc., p. 24.

Caldcleugh relates in his "Travels in South America," that he experienced in 22° north latitude, a violent gale accompanied by thunder, lightning, and a waterspout, and that afterwards, on the deck, and in the tackle, a number of butterflies were found.

Cornelius, in referring to the two preceding facts, points out, that here we meet with swarms of butterflies in casual connection with grand natural phenomena, such as strong gusts of wind and violent tempests, and that it seems to him very well admissible, that during great storms, but especially in the course of waterspouts and tornados, a large number of such insects are swept together, and carried over land and sea.\* The same author observes, that, in preference, he would assert this for mixed swarms, consisting of several kinds of insects. An instance of such an assemblage is related by Van Bemmelen, † who met with unspeakable numbers of white butterflies, principally *Pieris brassicæ*, one or two species of *Sphæcæ*, and *Diptera* agreeing with *Musca vomitoria*, Linn., arriving from the sea in the Downs near Nordwyk aan Zee, at eleven o'clock, a.m., on the 13th July, 1855. On reaching the Downs, they lessened the rapidity of their flight; some settled, others kept on their course. The flying past was observed for an hour; the direction was W.N.W. to E.S.E., the wind was W.N.W., and gentle.

The above are by no means all the observations referring to the occasional transportation of non-migratory insects which have been made, but I opine that enough has been said to prove that, whenever atmospheric disturbances occur suddenly, considerable numbers of more or less stationary insects are likely to be, or are in reality, removed to distant quarters. Who has not seen the clouds fly overhead with astounding rapidity, and what insect could resist the direction of the current of air thus indicated, even for hundreds of feet away from the moving mass?. In mountainous districts particularly, the clouds as they closely encircle a peak for a time, must often bring or carry off such castaways.

A local phenomenon connected with the forced dispersal of living beings, occurs constantly on the Alps; I

\* 'Wanderthiere,' p. 255.

† Handelingen nederl. Entom. Vereen, 1857, p. 91.

allude to the avalanche. Wherever strong inclines annually receive and discharge large masses of snow, there the dreaded spectacle may occur. Many thousands of feet overhead, the fleet step of the chamois, the rising of a bird, or a stone detached by the action of the frost, may loosen a small lump of snow, which rolls down and detaches others, their weight and rapidity of fall increase, whole fields of snow loosened by the wind called "Föhn" follow, and down the mass rushes, mile after mile, carrying everything before and with it, snow and ice, rock, forest, chalet, meadow, man and brute! The body of air quickly displaced by this moving mass, rushes in front with the rapidity of lightning: woe betide the living creature within its reach; hurled along with thousands of fellow sufferers, it finds itself in a few minutes deposited miles away from its home; eggs, larvæ, pupæ, all—the very bush on which they were surprised—the very sod which had harboured them, have joined the flight, and for miles down the valley the windows rattle, and the doors slam with the impetus they have received from the sudden shock of air.

I mention this Alpine scene, to show the power of the atmosphere in dealing with organized nature. I feel certain that a great many so-called faunistic novelties, are the mere wrecks of hosts of insects distributed by currents of air; the results of their carrying powers are often before us, but as it is the wholesome habit of man with "the bare back," to seek shelter when the storm rages, no doubt they are mostly overlooked. However, just as the floating belts of *Aphidæ*, *Syrphidæ*, and *Coccinellidæ* around our coasts, as the rows of dead locusts on the banks of southern waters, as the white "*Uferaas*," the remains of *Ephemeridæ* lining continental rivers, indicate the destructive power of the watery element, so the atmosphere, too, has its great wreck chart spread out for those who will read it. It has this in common with the new charts of the mariner, that, excepting general outlines, it presents to the eye a white surface, which becomes gradually dotted over with little blotches, denoting the spots where living freights have suffered shipwreck. Wherever a certain altitude presents the needful conditions, or when winter clothes the land with snow, our map is spread; and I will now endeavour to point out some of the wrecks, which human observation has marked upon it.

1672. Nov. 20. S. F. Frenzel records a fall of insects, with snow, in Hungary.—*Dissertatio de Insectis*, 1673.

1672. D. M. Moller writes a “Meditatio de insectis quibusdam Hungaricis prodigiosis anno proxime preterito ex aere una cum nive in agros delapsis.”—(No doubt the same fall as the one above) 1673.

1722. An account is given in this year of “snowed” worms.—*Breslau. Naturg. u. Kunstgesch. Vers.* 19, p. 166.

1749. De Geer records the occurrence in Sweden, of the larva of *Telephorus fuscus* on the snow in winter.—*Vetensk. Acad. Handl.* Vol. 10, p. 76.

1749. T. Hesselius records finding living insect larvæ on the snow, in Sweden.—*Vetensk. Acad. Handl.* Vol. 10, p. 75. (Refers perhaps to the preceding instance.)

1753. M. C. Hanow records a fall of snow-worms in Germany.—*Titius, Seltenheiten*, Vol. 1, p. 456.

1758. Another instance occurs of larvæ found on the snow, in Germany.—*Stuttgart. Phys. Econ. Anz.* Vol. 1, p. 157.

1806. Schramm publishes a note on the snowing of larvæ in Silesia.—*Verhandl. G. z. B. d. Naturkunde Schlesien's*, p. 217.

1811. J. S. Capieux makes some remarks on the appearance of many larvæ which had been seen in sundry places in Saxony on the snow.—*Leipzig Intelligenz Bl.*, No. 12, p. 97.

1828. G. Fischer von Waldheim reports on larvæ of *Telephorus fuscus* found alive on the snow.—*Bullet. du Nord.*, p. 45.

1847. January 30. Snow, together with larvæ, fell in the Eifel.—*Allgem. deut. Naturhist. Zeit.* Vol II. p. 176.

1849. January 24. Count C. Tyzenhaus records a fall of *Telephorus fuscus* in Lithuania.—*Revue et Magas. Zool.* Vol. I. p. 72.

1856. Professor Oswald Heer records the occurrence of larvæ, to the number of 300,000, of *Telephorus fuscus*, on snow in Switzerland.—*Vierteljahrsschrift d. naturf. G. in Zürich*, Vol. I. p. 85.\*

Most of these records refer to *Telephorus fuscus*, which passes its metamorphosis underground in the roots of trees, in large numbers. Such trees being uprooted by storms, the larvæ become exposed, and liable to be carried away. But it is needless to inquire, in this paper, into the real value of all these records of the fall of insects with, or on snow; some are *bonâ file* occurrences, witnessed by careful observers; others must be taken *cum grano salis*; and a few may be referred to early and wholesale eclosions from the pupa-state. In the latter category must be placed the often observed occurrence of *Cynips aptera* on the snow.

I may insert here, that in 1765, a list was published of a quantity of insects found after rain,† and that probably the reason why we do not possess more evidence of the fall of insects together with fluid water, is to be

\* The above chronological list is compiled from Dr. Hagen's ‘Bibliotheca entomologica.’

† Frank. Samml. Vol. VII. p. 362, 1765.

sought in the circumstance of their being thus far more likely to escape notice, than if they were deposited on the unsullied surface of freshly fallen snow. But that such falls must occur, is shown by the fact of the fly found in a hail-stone, which I have already alluded to.

So far, I have only stated the evidence afforded by insects deposited in the plains.

Ascending now the mountains, we ought to expect to find similar wrecks of insect transports, if the theory that atmospheric involuntary locomotion is a powerful agency of dispersal, be worth holding.

And so we do, here are the proofs tabulated :—

### P Y R E N E E S.

MALADETTA.

Observed on the snowy dome of the glacier, at a height of about 11,000 feet, great numbers of a *Chrysopa*, both flying and crawling on the snow. July.

Glacier of the Vignemale, at a nearly equal height, obtained a fine series of *Ichneumon antennatorius*, Grav. They were picked up at intervals of a few yards, alive but feeble, each one being at the bottom of a small pit or depression in the snow. With them, in equal abundance, a moth, probably *P. gamma*. Also a few *Lygaeus equestris*, noticed by Ramond in his attempt to scale the Touquerone glacier, leading up to Mont Perdu.

(Rev. T. A. Marshall, Ent. Mo. Mag., Vol. 5, p. 170; Dec. 1868.)

### A L P S.

MONT BLANC.

14,800 feet (Parisian).

"Last year, one of my friends, Dr. Ordinaire, made an ascent of Mont Blanc. On arriving at the summit, the first object that attracted his attention, was a *Plusia gamma*, kicking in the snow." (Bruand, Catal. des Lepidopt. du Dépt. du Doubs, 1845, p. 83.) Ad. & Aug. Speyer say in reference to this observation, "so much is certain, that only an accident, and ascending current of air of rare steadiness and intensity, could have brought the creature into that inhospitable region. (Die geograph. Verbreit. der Schmetterlinge Deutschlands und der Schweiz." 2nd part, 1862, p. 29.)

### MONTE MORO.

"At an elevation of about 8000 feet, in small cylindrical holes in the snow, in each either a small lump that looked like peat, or more frequently an insect, invariably either *Dipterous* or *Ichneumonideous*." One insect found lying on the snow was still living, viz., *Cryptus tarsoleucus*. F. P. Pascoe, Proc. Ent. Soc. Lond. Vol. 3, April, 1865. Further particulars in my paper, Zoologist, 1866, p. 273; and discussion of the same in Trans. Ent. Soc. Lond., 3rd ser., vol. v., proc., p. xix.; and Dr. Imhoff's note in the 'Zoologist', 1866, p. 390.

## ST. GOTTHARD.

"I well remember, at the head of the pass during the month of May, to have been forcibly struck by the great accumulation of insect-life at the bottom of some rounded depressions in the snow, which had melted so as to expose the soil beneath it, thus, forming as it were, black oases amidst an ocean of unsullied white. They were chiefly *Coleoptera*." (T. V. Wolaston, *Zoologist*, 1866, p. 313. and compare this paper for arguments *pro* and *con.* the alpine origin of the insects in question.)

## TIMBL.

## (Passeier Grund.)

Ascending the heights towards the glacier, between 5900–8000, *Aphodius discus* is met with, "and on my second journey when I intentionally searched the snow-field, I found it strewn over with them in great numbers, if not carried there by whirlwinds, as I am inclined to suppose by the many *Noctua*, *Diptera*, and a *Culopus serraticornis* struggling with death, which were lying about." P. V. Gredler, 'Verhandl. etc., des siebenbürg Vereins für Naturwissenschaft.' 1856, No. 2.

## CARINTHIAN ALPS.

"F. Löw published (*Verh. zool.-bot. Ges. in Wien*, xvii. pp. 751-752) a note on the species of Insects found on the snow in Carinthia (elevation 2700-3400) by R. Kaiser, in the winters of 1858, 1861, and 1862. The number of species is small, but included a new *Homalota* (*H. glacialis*, Mill.); two species of *Nabis* occurred, and *Achorutes murorum* in great quantities." ('Zool. Record,' 1867, p. 204.)

Without prejudicing the question, how many or how few of the observations mentioned in this table, refer to insects peculiar to the neighbourhood of the snow-fields and glaciers on which they were found, I think it will be allowed for each individual instance, that ascending currents of air, or whirlwinds, such as often happen in mountain regions, were the main causes of their reaching their inhospitable and, probably, last resting-places. But the winds which deposited them there, might have carried them beyond the respective mountains, and might have allowed them to settle in more comfortable quarters; and if these premises are granted, then my object of proving the forced dispersal of non-migratory *Articulata* by atmospheric agencies is reached.

Most of the facts collected in this paper refer to the dissemination of living insects in continental Europe only, but it stands to reason, that if my conclusions are correct as regards continents, the *modus operandi* of Nature will be often a similar one as regards the populating of islands. Only, of course, the chances of life for castaways are in this case much lessened; not because their chances on arrival are worse, but because they probably often find a watery grave before reaching land.

It also seems to me, that the array of facts adduced here is a justification for the opinion, that instead of being an accidental and isolated event, the involuntary dissemination of stationary insects will be eventually found to be mostly regulated by the periodical disturbances of the atmosphere, aided by their own locomotive powers in some instances, and in others by the habits of life which expose them to its constant influence.

As the ploughshare breaks up the green sward of arable land, and disturbs the closely interwoven roots of the existing assemblages of plants, so do tornados, whirlwinds, and storms furrow the surface of our globe in all directions, unsettling and scattering prosperous communities of living creatures, and rendering many of them for a time the helplessly drifting waifs of an ocean

“Whose every wave breaks on a living shore.”

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V. Notes on some British species of *Oxypoda*, with descriptions of new species. By DAVID SHARP, M.B.

[Read 6th March, 1871.]

IN offering some descriptions of new species of *Oxypoda* to the Society, I feel that some words of apology are due; the species of this genus being already in such a state of confusion, that it will certainly be correctly considered that an entire revision of the genus is required, rather than descriptions of isolated species. The difficulty, but at the same time, the absolute necessity, of inspecting the actual types of the authors of species in this genus, prevents me from undertaking the former task. And as all the efforts to identify the species here described, of myself and other British Entomologists, have failed, I feel myself entitled to describe, and so furnish them with names (perhaps temporary in some cases).

*O. SPECTABILIS*. This was founded by Märkel on a colour-variety of *Aleochara ruficornis*, Gyll.; as, however, there was a prior and different *Aleochara ruficornis*, Grav., Gyllenhal's name cannot be adopted, and Märkel's name had better be taken for that of the species.

*O. UMBRATA*, Grav. Much confusion has existed as to this, the name having been applied by Erichson to a different species from that recognized by Gyllenhal as the *O. umbrata* of Grav. Kraatz has already cleared this up, by giving another name (*humidula*) to the Erichsonian *umbrata*. But still another error remains, for Erichson described the true *umbrata*, under the name of *cuniculina*, and, moreover, under this name, it appears to me, that he confounded two species. I give herewith a description of the one I suppose to be new.

*O. PECTITA*, nov. sp. Elongata, sericeo-pubescent, opaca fusco-nigra, elytris paulo dilutioribus, antennarum basi, palpisque obscure testaceis, pedibus testaceis; dense subtilissimeque punctato, thorace obsolete canaliculato. Long. 1½ lin.

*O. cuniculina*, Er., *ex parte* (forte).

Allied to *O. umbrata*, Grav. (Gyll., Th.), and about the same size, but as broad in the middle, with the

thorax narrower, and less transverse, and having an obsolete, but always more or less distinct, central longitudinal channel, the hind-body less pointed at the extremity, and the thorax and elytra not quite so finely punctured. The antennæ are pitchy in colour, with the basal joint yellowish, and the next pitchy-yellow; they are thickened towards the apex, the third joint is distinctly shorter than the second, the fourth joint is smaller than the others, and about as long as broad, joints 6-10 are slightly transverse. The head is blackish, about half as broad as the elytra; the thorax is about half as broad again as it is long; it is convex transversely, but not longitudinally, it has an indistinct central longitudinal channel, and is densely and finely punctured and pubescent (owing to the channel, this pubescence has the appearance of being combed or parted on each side). The elytra are rather lighter in colour than the head and thorax, are about one-third longer than the latter, and are densely and finely punctured. The hind-body, though distinctly narrowed to the apex, is not very pointed, it is throughout very finely and very densely punctured, the extremity, and sometimes the hind margins, of the segments, being ferruginous. The legs are yellow. Distributed throughout England and Scotland, but rather rare.

The next species is very different from any other I am acquainted with.

O. EDINENSIS, nov. sp. Brevior, nigra, subnitida, antennarum basi, thorace, elytrisque obscure ferrugineis, pedibus testaceis; abdomine apicem versus subangustato, dense subtiliter punctata, elytris thorace paulo longioribus. Long.  $1\frac{1}{2}$  lin.

*Obs.* Statura fere *O. lentulae*, Er., sed magis nitida, et colore dilutiore, elytris brevioribus, capiteque angustiore distincta.

The antennæ are pitchy in colour, sometimes a little paler at the base, they are but slightly thickened towards the apex, third joint slightly shorter than the second, fourth a little smaller than the fifth, 6-10 slightly transverse, eleventh joint scarcely so long as the two preceding together. The head is pitchy, or pitchy-black, more than half as broad as the elytra, closely and finely punctured, rather shining; the palpi are yellowish. The thorax is as

broad as the elytra, rounded at the sides, one-half broader than long, with a very indistinct central channel, finely and closely punctured, but rather shining. The elytra are scarcely longer than the thorax, of an obscure brownish colour, rather shining, closely and finely punctured. The hind-body is but little narrowed towards the apex, is extremely densely and finely punctured, but not altogether dull. The legs are yellowish.

A series of this species was captured some years ago, near Edinburgh, by Dr. McNab, and myself. Mr. Crotch has sent it to some of the continental entomologists, but it has not been identified.

*O. VERECUNDA*, nov. sp. Obscure testacea, abdomine medio nigricante, pedibus testaceis, dense subtilissime punctata, opaca sat elongata, abdomine apicem versus angustato. Long.  $1\frac{1}{4}$  lin.

A rather narrow dull species, of a dusky testaceous colour, with the middle of the hind-body darker, and the legs yellow. The antennæ are moderately long, not stout, a little thickened towards the apex, of a dirty yellowish colour, yellow at the base, basal joints slender, second considerably longer than the third, 4th, 5th, and 6th differing but little from one another, each a little broader than the preceding one, 7-10 transverse, eleventh joint large, about as long as the two preceding together. Head rather more than half the width of the thorax, closely and finely punctured, the palpi yellowish. Thorax rather narrowed to the front, about one-half broader than long, without channel, closely and very finely punctured, finely but distinctly pubescent, and rendered dull by this pubescence. Elytra a little longer than the thorax, very closely and finely punctured and pubescent. Hind-body narrowed towards the apex, but not extremely so, ferruginous at the base, blackish in the middle, yellowish at the extremity, extremely finely and densely punctured, near the extremity on the upper-side with well-marked black outstanding setæ. Legs yellow, moderately long and slender.

This insect possesses no particularly striking character, and seeing the confusion prevailing in the genus, I omit comparison with other species (as I should thus admit two elements of uncertainty in place of one into my

reader's chance of identifying it), but will remark, that its nearest ally in this country is the *O. exoleta* of our collections.

It is not common, but I have taken it near London, and in the Fens.

*O. NIGRINA*, Wat. It has been attempted by M. Fauvel to identify this species with the *sericea* of Heer, but, according to Kraatz, *sericea*, Heer, is probably the *umbrata* of Grav. At any rate, Mr. Waterhouse has supplied us with a good name for the species, which we need not abandon till it is satisfactorily identified with some prior species.

*O. EXIGUA*. M. Fauvel has also stated, that a British specimen sent under this name is rather *O. investigatorum*, of Kraatz; but Mr. Rye subsequently sent the specimen so identified to Kraatz, who states that it is not his *investigatorum*. It seems to me not improbable that it is the true *O. exigua* of Er. At any rate, it had better stand under that name at present.

*O. RECONDITA*, Kr. The species, designated as *O. lucens*, Muls., in Mr. Waterhouse's catalogue, has been identified with *O. recondita*, Kr., by Mr. Crotch. It agrees, at any rate, better with the latter description than with that of Mulsant.

*O. WATERHOUSEI*, Rye, = *O. nigrofusca*, Wat. This species also has not yet been reconciled with a continental one. The name under which Mr. Waterhouse described it has been changed, because of a prior species of the name by Stephens. Stephens was so extremely careless, as to describe in his 'Illustrations' only a few pages from one another, two insects under the name of *Aleochara nigro-fusca*; the first (Vol. V. p. 129) is quite worthless, and not an *Oxypoda* (probably not, at least); the second (Vol. V. p. 150) might, possibly, be a description of a small immature *O. longiuscula*; in Stephens' 'Manual,' this latter *A. nigrofusca* has been referred to the genus *Oxypoda*, the description being abbreviated, and rendered worthless, *O. longiuscula*, moreover, being described but a few lines further on. I cannot but regret that Mr. Waterhouse's name has been changed on account of such a confusion of rubbish.

*O. RIPARIA*, Fair. 1859 (*nec* Th. 1855). This name must be changed as above indicated, and I propose for it the name of *O. mutata*, and subjoin a diagnosis of it.

*O. MUTATA*. Elongata, rufo ferruginea, abdomine medio nigricante, antennis pedibusque testaceis, dense fortiter, subrugulose-punctata, abdomine apicem versus paulo angustato. Long.  $1\frac{1}{3}$  lin.

This species is distinguished from all our other British species by its stronger and dense punctuation. Fairmaire describes the head as black, but I do not find it so in our British examples.

*O. BRACHYPTERA*, Steph. Elongata, subparallela, haud nitida, rufo-ferruginea, abdomine medio late nigricante, dense, subtiliter punctata, elytris thorace paulo brevioribus, fereque angustioribus. Long. 1 lin.

*Aleochara brachyptera*, Steph. Ill. Brit. Ent. V. p. 128.

*Oxypoda forticornis*, Fair. Ann. Fr. 1859, p. 37 (forte).

Of an elongate, narrow, and rather parallel form, but with the extremity of the abdomen distinctly narrowed. The antennæ and legs are yellowish; the head, thorax, and elytra of an obscure reddish colour; the hind-body reddish at the base, and at the extremity, black in the middle. The antennæ are rather long and stout for the size of the insect, a little thickened towards the apex, the basal joints being stout; the second joint much longer than the third, the third triangular, being much narrowed at the base, fourth joint slightly transverse, 5-10 strongly so, eleventh joint long and stout, quite as long as the two preceding together. Head rather broad, much narrower than the thorax. Thorax nearly twice as broad as it is long, not much rounded at the sides, but a little rounded and narrowed towards the anterior angles, thickly and finely punctured with a short pubescence; the elytra are rather shorter than the thorax, and even a little narrower than it, closely and finely punctured, but rather more coarsely than the thorax; hind-body densely and finely punctured with a close, not altogether fine pubescence; the setæ of the extremity small and indistinct.

This little species is clearly the *Aleochara brachyptera* of Stephens' description above referred to. It must be very

close to *O. ferruginea*, Er., but even if it prove identical, Stephens' description and name have the priority. Fairmaire's description of *O. forticornis*, applies so accurately to it, that I think there is little doubt of its being the same species, though it is referred to a vastly different one in Harold's catalogue.

*O. TARDA*, nov. sp. Opaca, subparallelia, nigra, thorace elytrisque obscure ferrugineis, antennis, pedibus, abdominisque apice obscure testaceis, dense subtiliter punctata ; elytris thoracis longitudinis. Long.  $1\frac{1}{4}$  lin.

Closely allied to the preceding species, but larger, darker in colour, with the antennæ scarcely so large, for the size of the insect; the elytra a little longer, and the base of the hind-body not paler than the middle : in all other respects similar. The thorax is variable in colour, being sometimes obscurely ferruginous, sometimes nearly black.

All the specimens I have seen of this species have been captured in the salt marshes near Dumfries.

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VI. *Observations on Immature Sexuality and Alternate Generation in Insects.* By B. T. LOWNE, M.R.C.S. Eng.

[Read 6th March, 1871.]

WHILST in Palestine, in 1864, about the 23rd of January, I was encamped with the Rev. H. B. Tristram and party at Enjedi, where I found a large black and yellow species of *Petasia* (*Orthoptera*), both in its larval and imaginal forms, in abundance, feeding upon the leaves of *Calotropis procera*. I cannot give the specific name of the insect, and I believe it has not hitherto been described.

I was surprised to find the larvae of this insect copulating in considerable numbers. Until lately, I knew of no similar case, but my friend, Dr. J. A. Power, tells me that *Ischnodemus sabuleti* is frequently taken in the same condition, whilst in the so-called pupa-state.

When in Australia, ten years ago, I remember observing numerous individuals of a large wingless *Blatta* in the same condition, but this observation has evidently a totally distinct value, as the *Blatta* in question is not known to me ever to produce wings: hence this is only a similar phenomenon to that observed in the *Cimex lectularius*, an apterous, or more strictly speaking, a larval form in a sexually mature condition.

The following facts, also communicated to me by Dr. J. A. Power, seem to me to unite these phenomena by transitional forms. Several species of *Hemiptera*, as, for instance, *Bryocoris pteridis*, although sexually mature, have a very immature or undeveloped appearance; others, as all the British species of *Nabis*, rarely attain their true imaginal characters in either sex; the female of *Sphyracephalus ambulans*, which is, as a rule, apterous, has been known in one or two instances only, to be furnished with wings, so that this may be considered as a parallel instance; and, lastly, both sexes of *Velia* are almost always apterous, although they occasionally produce wings.

I have not included in this list cases in which the females only are constantly apterous, because this condition may arise from other causes; but where either one

or both sexes occasionally produce wings, I think we see forms intermediate between apterous, and winged sexually mature ones.

Two views may be taken of the significance of these facts. We may see a transitional condition between a larva like progenitor and an imaginal descendant, or we may see a transition from a winged to an apterous perfect insect.

My own belief is, that we see a transition from a winged to an apterous mature form, and this belief is based on the following facts.

*Firstly*; that larvae have been observed copulating, and that there is a decided tendency in many animals for the sexual organs to attain maturity before the animal attains all its adult characters.

*Secondly*; the rare appearance of wings in many *Homoptera*, especially in the female of *Sphyracephalus ambulans*, appears more like reversion to a lost ancestral form than a tendency to develop a winged one.

*Thirdly*; because the sexual organs of insects first appear at a very early period of life, and undergo, in some instances at least, gradual development, until the insect arrives at maturity, although all the other organs undergo a very remarkable metamorphosis. Indeed there is good reason to believe, that the remarkable larval reproduction of *Cecidomyidae*, depends on the premature development of the sexual organs in the larva.

On the other hand, the principal objection to this view that has occurred to my mind is, that the larva of the *Ametabola* is usually believed to have existed in a mature condition before any winged insects had been developed. Fritz Müller says, "It seems to me, that valid reasons may be brought up in favour of the opinion, that the most ancient insects approached more nearly to the existing *Orthoptera*, and, perhaps, to the wingless *Blattidae*, than to any other existing order." And although Gerstäcker and others have shown, very conclusively to my mind, that the larval forms of the *Metabola* are not direct or inherited, but indirect or acquired, I am not aware that any one has advanced this hypothesis with regard to the metamorphosis of the *Ametabola*.

I shall now consider, at some length, the facts bearing upon the above reasons in favour of, and against the views I have advanced.

*First.* With regard to the early sexual maturity of larval forms.

I have already given instances, in the sexual condition, of the larva of *Petasia* and *Ischnodemus*, but one of the most striking facts of this kind is said to occur amongst the *Echinodermata*: last summer, Mr. Alex. Agassiz related the instance to which I refer, at a meeting of the Royal Society, at the conclusion of one of Dr. Carpenter's "Papers on Deep Sea Life." It was this remark of Mr. Agassiz that first led me to suspect that the wingless forms of *Hemiptera* and *Orthoptera* might have arisen from early maturity of the sexual organs.

Mr. Agassiz stated, that the young of a Mexican *Echinoderm* become sexually mature on the coast of Norway, to which its larvæ are transported by the gulf stream. The two sexually mature forms are apparently very distinct species, but to anyone who knows the young of the Mexican form, the Norwegian species is clearly only an immature condition of it, with fully developed sexual organs.\*

*Second.* I have cited the rare appearance of wings in certain *Hemiptera*, in support of my views. The whole subject, however, of the correlations of the development of the sexual and cutaneous organs in insects is remarkably complex, but I will endeavour to put before you some of the more important facts bearing upon it.

It must be admitted, that the development of the female generative organs, and ova, has a very decided influence in arresting the development of cutaneous organs, in comparison with the development of the corresponding structures in the male.

It is not a little remarkable that, whilst in Vertebrates the male seems to require a higher elaboration (if I may use the term with a kind of indefinite meaning), for its development, so in insects, the female requires a larger supply of nourishment, and more favourable conditions.

\* See Mr. Darwin's 'Descent of Man,' vol. ii. p. 215, for numerous other instances of this nature. Also Mr. Cope, 'On the origin of genera,' in Proc. Acad. Nat. Sc. Philadelphia, Oct. 1868; who I find has already arrived at similar conclusions on the effect of retardation and acceleration of sexual development, though I cannot follow his deductions.

In support of these statements, I will briefly bring one or two facts before you. Certain monstrous conditions in Vertebrates, in which almost all the parts of the body are doubled, are nearly, if not always, female; whilst in insects the male is sometimes developed agamically, as in the bee; and the males are usually smaller than the females.

Dr. H. Landois\* published some very remarkable facts, which appear to me to have received considerably less attention than they deserve, owing to the flood of controversy, which originated in certain mistakes made by the author, and which led him to disbelieve in Parthenogenesis.

Dr. Landois stated, that whole broods of some insects are often either entirely composed of males or females only. He affirmed that ill-fed larvæ always produced males, whilst well-fed ones usually produced females. In this there was clearly some error of observation, as it is a well-known fact, that the sex may be determined from an examination of the embryo long before it leaves the egg.

On the other hand, I am not inclined to look upon Dr. Landois' statement as altogether incorrect. The only insect I have ever bred in large numbers is the blow-fly, and I found that nearly all the insects bred from the large well-fed larvæ bought at the fishing-tackle shops were female, whilst ill-fed small larvæ have usually produced males. There may be an error in this observation, and it has occurred to me that it is possible the breeders of the maggots may pick out the largest larvæ, which are the females, for their best customers, the large shops: selling the smaller male larvæ to the smaller tradesmen. Still I cannot find that this is actually the case. From the large number of pupæ that always died, usually more than half, I am rather inclined to believe that a large supply of highly nutritive food may act injuriously on the male larvæ, especially if they are stimulated to feed by a higher temperature than the normal one, by causing an abnormal development, of the fat bodies for instance, at the expense of the structures destined to form the pupa. It is easy to understand why too little food would produce males only, as the females would perish before arriving at maturity.

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\* 'Zeitschrift für wissensch. Zool.,' Band 17, s. 375.

Dr. Landois, who has never, so far as I know, stated any clear and obvious facts incorrectly, although he has, unfortunately, drawn some very erroneous inferences, states very clearly that, when he half-starved his larvae, males only were produced, but that when well-fed, there were many more females than males. Whatever the explanation may be, I am strongly inclined to give credit to the fact.

I mention these facts, because I believe that certain cutaneous appendages, as the gigantic mandibles and thoracic horns of many males, are complimentary to the sexual organs. That, in point of fact, they are produced by the excess of nutriment in the male, which, in the female, would go to form the generative organs and ova. It may be urged that this is an improbable explanation, but it does not appear so to my mind, when we remember the large amount of the generative product in the female, compared with that produced by the male.

I think it may be noticed, that all those insects which exhibit the cutaneous horns and great mandibles in the male, feed on wood and other vegetable substances, or decaying animal matters that afford a very limited amount of nutriment, which necessitates the laying by of great stores of nutriment by the female for the after-nourishment of her ova.\* The males usually exhibit two tolerably distinct forms, one with very large mandibles or horns, and another with these organs scarcely larger than those of the female in the case of the mandibles, and very small in the case of thoracic horns, or other structures absent in the other sex.

It has occurred to me, that the males with the large cutaneous appendages may be those which are bred and nourished with the females, whilst those with the smaller horns may have been nourished by food not sufficiently nutritive to produce females. Hence the small horned males would have fewer offspring than the long-horned males; and the horns would tend continually to increase in size, although under bad or poor feeding in the larval condition, they may frequently be considerably reduced. I very much doubt if the theory of ornament and sexual selection can be applied to beetles, owing to the very

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\* These are chiefly developed from the great fat bodies of the female.

low development of their nervous system, although I should unhesitatingly apply it to the higher *Hymenoptera* and *Diptera*. I see, however, that Mr. Darwin has in his last work\* applied the principle to account for the production of these horns.†

This long digression leads me to the wings of insects, which are really quite analogous to the cutaneous knobs and horns, so far as their relation to the nourishment of the body is concerned. The absence of wings in the female is well known to be excessively frequent, and there is no more remarkable instance, showing their relation to the female sexual organs, than the phenomena observed in *Aphis*.

The agamic *Aphides*, which have excessively imperfect female sexual organs, without either sperm sacs or collateral ‡ (shell-secreting?) glands, frequently have wings, whilst these never occur in those sexually perfect.

From all the above facts, I think it probable, that the apterous condition of female insects is an acquired one, dependent on the amount of nourishment received by the larva. I also think it highly improbable that the wings could have been developed by natural selection in one sex alone, without having been inherited by the other sex, in some few insects. And I think it more probable, that altered conditions of larval life, have gradually led to suppression of the wings in one sex, and that the winged forms are reverions to an anterior type.

*Third.* The early appearance of the sexual organs, their peculiar mode of development, and their occasional premature development, may now be considered.

\* 'Descent of Man.'

† Closely related to this question, is the wider one of coloration in insects, and, as Mr. Darwin has suggested to me, the greater variability of the males than of the females. I have already noticed elsewhere, that the oxidization of the fat bodies of the larva of the blow-fly, produces the pigment with which the integument is coloured. The fat bodies also produce the material from which the sexual elements, as well as most of the tissues are nourished, hence the male element being much less than the female, more material remains for the development of colour and of the other organs. As the best fed forms are usually more variable, and as the amount of pigment is closely correlated with the conditions of the fat bodies of the larva, I think it probable that both coloration and variability may be directly influenced by sex, in the manner above indicated.

‡ I believe these glands in the fly, secrete the very hard, opaque egg-shell which surrounds the eggs when they are laid.

The facts I related at the commencement of this paper, referred exclusively to the *Ametabola*. I have not observed that the larvæ of the *Metabola* ever become truly sexually mature, but I think I shall be able to show that it is highly probable the phenomenon of viviparous generation in the gall-gnats, arises from the early maturation of the ovaries.

It has been already noticed that the sex of the *Metabola* may be discovered by an examination of the sexual organs of the embryo some time before birth. I have only observed the development of these organs in the blow-fly, and in this insect they are the only larval organs that are continuously developed, and which persist in the adult fly.

There are only three structures in the larva, which do not undergo disintegration during the development of the pupa. These are the imaginal discs, the nervous system, and the sexual organs. The imaginal discs do not persist in the perfect fly; they unite and form a pupa-skin, entirely homologous to the pupa-skin of a moth or butterfly; the dried larval skin becoming converted into a kind of cocoon. The nervous system undergoes rapid redevelopment, new structures being formed to subserve new functions; the sexual organs, alone, undergo ordinary development.\*

I think we see the effect of the accelerated development of ovaries, in the viviparous agamic generation of Cecidomyian larvæ. Dr. Leuckart's † observations leave no doubt, in my mind, that the germ stocks of the Cecidomyian larva are actually modified ovaries, and that the development of the new larva, within the body of the mother, is the result of the non-development of the accessory sexual organs, the oviduct, vagina, &c. The agamic nature of the process is no objection to this theory, as we know that parthogenesis is by no means uncommon amongst perfect insects, even when they are ready to produce young in the ordinary way.

I cannot refrain from quoting Leuckart's own expression on this subject:—"The asexual propagation of the

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\* For further details, see my work on the 'Anatomy of the Fly.'

† Ann. Nat. History, 1866.

*Cecidomyiidae* unmistakeably approaches the phenomenon in *Aphides*; the only difference is, that the germ chamber of the Cecidomyian larva becomes detached, and moves about in the cavity of the mother; whilst in *Aphides*, the germ chambers remain permanently attached by an apparatus, which in form and arrangement, reproduces the conditions of the ordinary female organs."

In the agamic form of *Aphides*, we observe the same tendency to the non-development of the accessory sexual organs, in the absence of the spermathecae and collateral glands.

*Lastly.* With regard to the objection that the winged forms of insects are probably derived from the apterous or larval forms, I am far from being sure that such is really the case.

With respect to the *Metabola*, I think Gerstäcker, and others, have clearly shown that the larva is an acquired and not an original form.

If further evidence be needed on this point, I think it is afforded by the relation borne by the larva of the *Diptera* to the embryo and perfect insect. As this relation is highly remarkable, and as it is directly concerned in the conclusions I have arrived at on the relation of the larva of the *Metabola* and *Ametabola*, I will say a few words on the subject.

The embryo of the blow-fly, twelve hours after impregnation, bears a closer resemblance to the pupa, than it does at any subsequent period of larval life. During the remaining twelve hours of embryonic life, a very remarkable change takes place; all those parts of the embryo which correspond with the head of the perfect fly, become converted into the imaginal discs of Weismann; and do not again make their appearance externally until the pupa-state is assumed. This is quite analogous to the so-called hyper-metamorphosis of some *Coleoptera*: and especially reminds one of the manner of development in some *Crustacea*, where the embryo is surrounded, during development, by a kind of larval skin.

The embryos of *Ligia* and other Isopods, with their larva-like skin, afford, to my mind, a clue to the origin of the metainnorphosis of the Insecta. Suppose the embryos

of these Crustacea to be born invested in their maggot-like integument, and to pass the first half of their existence in this condition, and we should have a condition very like that observed in the metamorphosis of the *Metabola*.

With regard to the primitive ancestral forms of the Insecta we know nothing; but I think there can be little doubt that they were nearly allied to the existing *Orthoptera*. Nevertheless, I think it quite probable, that the larva may have undergone even greater modifications than the imaginal forms, owing to the greater variability of the conditions to which larvæ are subjected.

I believe the great modification of the Insecta from their original type may, probably, have originated from modifications of the larva and imago re-acting on each other. The larva of one Ametabol form, *Aphis*, is known to reproduce agamically; a condition which I am not aware has ever been observed in a direct larva, but which occurs in acquired larval forms.

I have drawn up a table, which gives the views I have arrived at, concerning the relation of the various larval forms in the *Annulosa* and *Annuloida*. (*Vide p. 202.*)

The five spaces, one under the other, are intended to represent consecutive conditions. The forms in the lower lines in each column are supposed to have been produced by successive modifications from those above them in the same column. Thus the original larval and perfect forms of insects and trematoids are supposed to be unknown, and the pupa form is supposed to have been acquired before the present larval form.

In conclusion, I may say that I only look upon the hypothesis which has made the frame-work of my present paper, as highly probable. When it first occurred to me, I mentioned my ideas to Mr. Darwin; his kind encouragement, and the wish he expressed that I should publish my views were the main causes of my elaborating it to a greater extent. I then found it led me deeply into a most difficult labyrinth, which I have done my best to trace. I do not even think, myself, that I have established my main hypothesis, but I trust I have brought together the seed which may, ultimately, produce good fruit.

NOTE.—I would suggest, that some of the ideas I have thrown out concerning the horns of many *Lamellicorns*, might be easily worked out by some Entomologist living in the country, by rearing the insects, and watching the results with different kinds of food. In London, with much other work, I could not possibly undertake the care of large numbers of living insects.

CRUSTACEA.	INSECTA.		SCOLOCIDA.
	AMETABOLA	METABOLA	
Inherited, or direct larva.	Unknown ancestral forms, perhaps represented by embryonic states, and hyper-metamor- phosis.		Never producing young larvæ like <i>Cecidomyidæ</i> & <i>Cercaria</i> . Originally sexually mature like <i>Nau- plius</i> , <i>Zoea</i> , &c.
Perfect form. }			Sexually mature.
	Imago.*	Imago.*	Adult form* (Fluke).
	Acquired larval form.	Acquired pupal form.	Sexually mature, some- times reproducing agami- cally, like <i>Aphis</i> , and many other insects.
		Acquired larval form.	Exhibiting a tendency to sexual maturity. The wingless condition of some moths may be look- ed upon as an acquired form approximating the pupa state.
		Acquired larval form.	Sometimes reproducing larvæ, which ultimately produce the adult form, passing through the pupa state, like <i>Cercaria</i> , <i>Ceci- domyidæ</i> .

\* Highly modified from forms parallel with the adult Crustacea.

VII. *On Additions to the Atlantic Coleoptera.* By T.  
VERNON WOLLASTON, M.A., F.L.S.

IN the following Paper I propose to notice such additions to the 'Coleoptera Atlantidum' as have been brought to light (since the publication of that volume in 1865) up to the present date, *i. e.*, to the close of 1870; and I would also take advantage of the opportunity thus afforded, to give such corrections in the general nomenclature as may seem desirable, as well as to add occasional items of information (lately gleaned) when appearing of sufficient interest to be worth placing upon record. A few remarks, indeed, of that particular kind, together with the diagnosis of *four* actual novelties to the catalogue, formed the subject-matter of a short Appendix to my 'Coloptera Hesperidum' in 1867; and these, therefore, I must, however briefly, recapitulate, in order that the present memoir may include every correction and addition which it is necessary to take account of (so far, at least, as I am aware) since the 'Coleoptera Altantidum' made its appearance.

The number of additions to the *combined fauna* of the three archipelagos (namely, the Madeiras, Salvages, and Canaries,) which I am enabled to record in this Paper is exactly thirty-three; but as two *supposed* species have been expunged from the Madeirian list,\* the 1449 species which were cited in the 'Coleoptera Altantidum,' will be increased to 1480. The thirty-three accessions to the general catalogue are as follows:—

	Madeiras.	Canaries.
<i>Stenolophus exiguus</i> , <i>Dej.</i> . . . . X		
<i>Trechus debilis</i> , <i>W.</i> . . . . X		
<i>Scutopterus imbricatus</i> , <i>W.</i> . . . . X		
<i>Eunectes helvolus</i> , <i>Kl.</i> . . . . X		
<i>Ochthebius algicola</i> , <i>W.</i> . . . . X		
<i>Philhydrus maritimus</i> , <i>Th.</i> . . . . . X		
<i>Aerotrichis brevicornis</i> , <i>Mots.</i> . . . . X		
<i>ovatula</i> , <i>Mots.</i> . . . . X		
<i>Tarphius lutulentus</i> , <i>W.</i> . . . . X		
<i>Meligethes Ryei</i> , <i>W.</i> . . . . . X		
<i>Læmophlaeus suffusus</i> , <i>W.</i> . . . . X		

\* The two species which have been suppressed in the Madeirian list are *Trechus quadricollis* and *Tarphius Wolffii*.

	Madeiras.	Canaries.
<i>Cryptophagus pilosus</i> , <i>Gyll.</i>	.	X
<i>Corticaria ciliata</i> , <i>Mots.</i>	.	X
— <i>transversalis</i> , <i>Gyll.</i>	.	X
<i>Latridius nodifer</i> , <i>Westw.</i>	.	X
— <i>Watsoni</i> , <i>W.</i>	.	X
<i>Hoplia Peronii</i> , <i>Blanch.</i>	.	X
<i>Trichius fortunatarum</i> , <i>Blanch.</i>	.	X
<i>Anobium nitidulum</i> , <i>W.</i>	.	X
<i>Caulotrupis pyricollis</i> , <i>W.</i>	.	X
<i>Phytonomus variabilis</i> , <i>Hbst.</i>	.	X
<i>Atlantis lauripotens</i> , <i>W.</i>	.	X
<i>Scymnus epistemooides</i> , <i>W.</i>	.	X
<i>Cephennium mycetæoides</i> , <i>W.</i>	.	X
— <i>australe</i> , <i>W.</i>	.	X
<i>Pselaphus minyops</i> , <i>W.</i>	.	X
<i>Falagria longipes</i> , <i>W.</i>	.	X
<i>Homalota Sharpiana</i> , <i>W.</i>	.	X
<i>Plaeusa infima</i> , <i>Erich.</i>	.	X
<i>Aleochara clavicornis</i> , <i>Redt.</i>	.	X
<i>Oligota ruficornis</i> , <i>Sharp</i>	.	X
<i>Lithocharis ripicola</i> , <i>Kraatz</i>	.	X
<i>Homalium concinnum</i> , <i>Mshm.</i>	.	X

The sixteen which are italicized I have treated as new to science, though at least one of them (if not more), namely the *Latridius Watsoni*, is in all probability a mere accidental importation (through the medium of commerce) from some other country. Two, however, out of the thirty-three, namely *Phytonomus variabilis* and *Atlantis lauripotens*, are simply reinstated, having originally been admitted by myself as distinct species, but afterwards suppressed.

According to the most recent calculations (as now ascertained), the 1480 species which have hitherto been brought to light in these particular Atlantic archipelagos, are distributed thus:—

Madeiras.....	694	} †
Salvages .....	27	
Canaries.....	1013	

As regards the ascertained faunas of the separate islands themselves, the following Table will show to what

† The numbers formerly recorded, were—for the Madeiras, 664; the Salvages, 24; the Canaries, 1008.

extent they have been increased since the 'Coleoptera Atlantidum' made its appearance (in 1865).

		Old No.	Additions.	New No.
Madeira proper	.	598	32-2*	628
Porto Santo	.	160	3	163
3 Desertas	.	87	2	89
2 Salvages	.	24	3	27
Lanzarote	.	277	2	279
Fuerteventura	.	261	2	263
Grand Canary	.	341	1	342
Teneriffe	.	578	4	582
Gomera	.	396	1	397
Palma	.	258	1	259
Hierro	.	224	1	225

Besides, however, the thirty-three actual *additions* to the general catalogue, recorded above, there are ten species which were well known in the Atlantic list, but which have recently been detected on islands *different from those* which were cited as their *habitats* in the 'Coleoptera Atlantidum.' These ten *local* accessions may (as regard their newly-ascertained islands *only*) be thus tabulated:—

	Hierro	—	—	—	—	—	—	—	—
Palm.	—	—	—	—	—	—	—	—	—
Gom.	—	—	—	—	—	—	—	—	—
Ten.	—	—	—	—	—	—	—	—	—
G. Can.	—	—	—	—	—	—	—	—	—
Fuert.	—	—	—	—	—	—	—	—	—
Lanz.	—	—	—	—	—	—	—	—	—
Salv.	—	—	—	—	—	—	—	—	—
Des.	—	—	—	—	—	—	—	—	—
X	—	—	—	—	—	—	—	—	—
X	—	—	—	—	—	—	—	—	—
—	—	X	—	—	—	—	—	—	—
—	X	—	—	—	—	—	—	—	—
—	—	—	—	X	—	—	—	—	—
—	—	—	X	—	X	—	—	—	—
—	—	—	—	X	X	—	—	—	—
—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—
X	—	—	—	—	—	—	—	—	—

It only remains now to remark, as indeed will be gathered from the present paper, that (for the various rea-

\* *Vide* foot-note on p. 1.

sons given *in situ*) the titles of certain species have to be altered. And, as a help therefore to the eye, I may briefly add, that the changes in nomenclature which have become necessary are the following:—

<i>Calathus advena</i> , <i>W.</i>	. . . .	= <i>Calathus canariensis</i> , <i>Har.</i>
<i>Bembidium concolor</i> , <i>Br.</i>	. . . .	= <i>Bembidium fortunatum</i> , <i>W.</i>
<i>Philhydrus melanocephalus</i> , <i>W.</i> (nec <i>Oliv.</i> )	. . . .	= <i>Philhydrus politus</i> , <i>Küst.</i>
<i>Sacium pusillum</i> , <i>W.</i> (nec <i>Gyll.</i> )	. . . .	= <i>Sacium maderæ</i> , <i>Kr.</i>
<i>Arthrolips obscurus</i> , <i>W.</i> (nec <i>Sahlb.</i> )	. . . .	= <i>Arthrolips piceus</i> , <i>Com.</i>
<i>Acrotrichis Montandonii</i> , <i>W.</i> (nec <i>Allib.</i> )	. . . .	= <i>Acrotrichis nigricornis</i> , <i>Mots.</i>
— <i>Guerinii</i> , <i>W.</i> (nec <i>Allib.</i> )	. . . .	= — <i>obscena</i> , <i>W.</i>
<i>Ptenidium levigatum</i> , <i>W.</i> (nec <i>Gillm.</i> )	. . . .	= <i>Ptenidium Bruckii</i> , <i>Matth.</i>
— <i>apicale</i> , <i>W.</i> (nec <i>Gillm.</i> )	. . . .	= — <i>atomaroides</i> , <i>Mots.</i>
<i>Ptinella Proteus</i> , <i>Matth.</i>	. . . .	= <i>Ptinella testacea</i> , <i>Heer.</i>
<i>Meligethes tristis</i> , <i>W.</i> (nec <i>St.</i> )	. . . .	= <i>Meligethes seniculus</i> , <i>Er.</i>
<i>Silvanus unidentatus</i> , <i>W.</i> (nec <i>Oliv.</i> )	. . . .	= <i>Silvanus bidentatus</i> , <i>F.</i>
<i>Corticaria tenella</i> , <i>W.</i>	. . . .	= <i>Corticaria delicatula</i> , <i>W.</i>
<i>Saprinus nitidulus</i> , <i>F.</i>	. . . .	= <i>Saprinus semistriatus</i> , <i>Herbst.</i>
<i>Oxyomus Heinekeni</i> , <i>W.</i>	. . . .	= <i>Atænius stercorator</i> , <i>F.</i>
— <i>brevicollis</i> , <i>W.</i>	. . . .	= <i>Atænius brevicollis</i> , <i>W.</i>
<i>Acmeodera ornata</i> , <i>W.</i>	. . . .	= <i>Acmeodera elegans</i> , <i>Har.</i>
<i>Anobium striatum</i> , <i>Oliv.</i>	. . . .	= <i>Anobium domesticum</i> , <i>Fourc.</i>
<i>Hylastes trifolii</i> , <i>Mull.</i>	. . . .	= <i>Hylastes obscurus</i> , <i>Mshm.</i>
<i>Rhyncolus crassirostris</i> , <i>W.</i>	. . . .	= <i>Rhyncolus pinipotens</i> , <i>W.</i>
<i>Nanophyes longulus</i> , <i>W.</i>	. . . .	= <i>Nanophyes Chevrieri</i> , <i>Gyll.</i>
<i>Hypera lunata</i> , <i>W.</i>	. . . .	= <i>Phytonomus dauci</i> , <i>Oliv.</i>
— <i>irrorata</i> , <i>W.</i>	. . . .	= — <i>irroratus</i> , <i>W.</i>
— <i>murina</i> , <i>F.</i>	. . . .	= — <i>murinus</i> , <i>F.</i>
<i>Scoliocerus maderæ</i> , <i>W.</i>	. . . .	= <i>Cathormiocerus maderæ</i> , <i>W.</i>
— <i>curvipes</i> , <i>W.</i>	. . . .	= — <i>curvipes</i> , <i>W.</i>
<i>Bruchus subellipticus</i> , <i>W.</i>	. . . .	= <i>Bruchus irresectus</i> , <i>Fhs.</i>
<i>Helops congener</i> , <i>W.</i>	. . . .	= <i>Helops conformis</i> , <i>Gemm.</i>
<i>Seydmænus castaneus</i> , <i>W.</i>	. . . .	= <i>Seydmænus castanicolor</i> , <i>Har.</i>
<i>Phlœopora corticina</i> , <i>W.</i>	. . . .	= <i>Phlœopora reptans</i> , <i>Grav.</i>
<i>Homolota obliquepunctata</i> , <i>W.</i>	. . . .	= <i>Homalota pavens</i> , <i>Er.</i>
<i>Oligota inflata</i> , <i>W.</i> (nec <i>Mann.</i> )	. . . .	= <i>Oligota parva</i> , <i>Kr.</i>
<i>Heterothops minutus</i> , <i>W.</i>	. . . .	= <i>Heterothops dissimilis</i> , <i>Grav.</i>

Ocyphus curtipennis, W.	.	.	.	= Ocyphus canariensis Har.
— punctatissimus, W.	.	.	.	= — fortunatarum, W.
Philonthus seybalarius, Nordm.	.	.	.	= Philonthus longicornis, Steph.
— marcidus, W.	.	.	.	= — concinnus, Grav.
— proximus, W.	.	.	.	= — ventralis, Grav.
— punctipennis, W.	.	.	.	= — turbidus, Er.
Leptacinus linearis, Grav.	.	.	.	= Leptacinus pusillus, Steph.
Scopaeus trossulus, W.	.	.	.	= Scopaeus sericans, Muls. et Rey.
Lithocharis fuscula, W. (nec Mann.)				= Lithocharis apicalis, Kr.
— tricolor, Mshm.	.	.	.	= — ruficollis, Kr.
Sunius angustatus, Payk.	.	.	.	= Sunius gracilis, Payk.
Stenus fulvescens, W.	.	.	.	= Stenus Wollastoni, Har.
Bledius januvianus, W.	.	.	.	= Bledius vitulus, Er.
Trogophlœus exilis, W.	.	.	.	= Trogophlœus pusillus, Grav.

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Since the appearance of the 'Coleoptera Atlantidum,' a very important accession to our knowledge has been made, through the publication, by Mr. G. R. Crotch, of a list of the Coleoptera which were obtained by Mr. Godman at the Azores; and this catalogue, although far from extensive, is at any rate sufficient for a rough estimate of the general character of the beetle population of that hitherto uninvestigated archipelago,—and sufficient, too, I think, to affiliate the latter with the more southern Groups. Indeed, the existence of such types as *Tarphius*, *Laparocerus*, and *Hegeter*, even apart from the many other points of conspicuous contact which it is next to impossible to account for on any theory of accidental dissemination, are topographically so significant, that scarcely any additional evidence could be necessary in order to stamp the fauna as unmistakably "Atlantic." Yet, although superfluous to allude to them, species like *Calosoma azoricum* (which, while absent from Madeira, reappears on the Canaries and Cape Verdes), the *Phlaeophagus tenax* (so characteristic of the laurel regions of Madeira), the *Opatrium hispidum* (which permeates nearly

every portion of the three more southern archipelagos), and the *Homalium clavicorne* (which swarms in the rotten *Euphorbia*-stems of the Madeiran Group) are, in a geographical point of view, hardly less important. The entire number of species obtained by Mr. Godman was 212; and of these Mr. Crotch remarks that "175 are common to Europe, 140 to Madeira, and 116 to the Canaries." The "140," however, may be increased at any rate to 144; for during our late sojourn at Madeira we met with the following species which are recorded by Mr. Crotch, but which had not until then been observed in any of the islands which constitute the more southern clusters:—viz., *Stenolophus exiguus*, Dej.; *Latridius nodifer*, Westw.; *Lithocaris ripicola*, Kr.; and *L. apicalis*, Kr.

Although it is not my intention in this memoir to discuss the *quæstio vexata* of geographical distribution, I nevertheless can scarcely omit a brief notice of two very remarkable papers on some of the complex problems which arise out of that particular subject—both of which have made their appearance within the last few months, and which alike enter largely into the supposed "origin" of the fauna of the Atlantic islands. The publications to which I allude are (1) by Mr. A. Murray, "On the Geographical Relations of the chief Coleopterous Faunæ," which appeared in the Linnean Society's Journal in October 1870; and (2) the extremely interesting Presidential Address of Mr. Wallace, read before the Entomological Society of London in January last. Although with numerous and unmistakable points in common, the authors referred-to account for the colonization of these various sub-African archipelagos by methods which we cannot but regard as not merely dissimilar but even antagonistic,—Mr. Murray contending that a land-passage (both *inter se* and with south-western Europe) is absolutely indispensable, and that *accidental dispersion* (as a general principle) between countries widely separated from each other by an oceanic barrier "is in its very nature *exceptional*, and one which *cannot be expected to make its impress on a whole fauna*;" whilst Mr. Wallace, on the other hand, affirms his belief that "The Azores, and in a less degree Madeira, appear to teach us this important lesson in the laws of distribution of birds and insects," namely, that the fauna has been de-

terminated "almost wholly by such *exceptional* causes as storms and hurricanes, which still continue to bring immigrants from the nearest lands."

Without recapitulating the various arguments and evidence for these two opposite modes of colonization, I feel bound to add that my own views (as elsewhere, and oftentimes, expressed) are *more* in accordance with those propounded by Mr. Murray than with the theory of exceptional, atmospheric dissemination which is so ably advocated by Mr. Wallace. That storms and hurricanes may have played a decided part, at rare intervals, in the accidental transportation of living organisms into many a remote island I would not for an instant wish to dispute; but, nevertheless, after much consideration *in situ*, and with no other desire (through many years) than to arrive simply at the truth, I cannot convince myself that any such abnormal methods of dispersion have done *much* towards bringing about the phenomena in the Atlantic archipelagos which we now witness, and which appear to me to be dependant rather upon causes which *geologically* perhaps might (whether correctly so or not) be defined as "*exceptional*," and of which an "*overwhelming catastrophe*," involving its legitimate results, whether from upheaval or depression, may be selected as an intelligible example.

Judging simply from the Coleopterous statistics, from the exact phenomena which present themselves on the various portions of these scattered archipelagos, and from the unmistakable manner in which the most *characteristic* forms permeate the entire province (in nearly every instance increasing steadily, both as regards species and individual numbers, up to some central nucleus, and then gradually diminishing as we proceed towards the south), I feel more and more convinced that nothing but a land of passage *between at any rate the consecutive Groups*, destined to be broken up at some later period by a gigantic convulsion, will satisfy the requirements of the Atlantic problem, and harmonize its otherwise discordant parts. Yet, although I can see (or, rather, think that I can see) a nearly equal necessity for a north-easterly extension of that *quondam* tract, I should imagine (from the much greater preponderance of significant European types in

the more central archipelago) that it was the *Canaries*, and not Madeira, from which the *Mediterranean* branch took its rise. And if this be the case, it appears to me that a north-westerly prolongation, or fork, from Teneriffe (*via* the Salvages) to Madeira, and thence continued to the Azores, would give all that we require (in conjunction with its partial *subsequent* disruption) to render the phenomena, as now met with, intelligible.

If we accept some such explanation as this, the accidental methods of conveyance across wide oceanic barriers (whether on the water or through the air), whilst credited with an appreciable amount of possible results, would not be required; for in that case the modes of progression, even amongst species which are by nature phlegmatic and stationary, become comparatively simple, being over a continuous land. Yet I cannot but think, where an unbroken tract has to be taken into account, that we can ill-afford to dispense with the agency of even the *ordinary* winds (which in this Atlantic region blow nearly uninterruptedly from the north-east) in promoting the gradual migration of the insect inhabitants; for it must be remembered that a considerable number of the latter, however sedentary in their modes of life, and disinclined (like the *Tarphi*) to wander from a single spot, undergo their transformations within the pithy stems of plants, and these latter when accidentally broken off, or rent by storms, would be conveyed at all events slight distances even by the common breezes, and would thus transport their inmates, whilst in the larva state, to places near at hand which the *imago* would never have colonized. I lay unusual stress upon this fact, because if the winds are to have any acknowledged influence in conveying living organisms across a *broad expanse of sea*, it is clear that they must (as rightly contended by Mr. Wallace) be of an altogether *exceptional* kind,—indeed, emphatically, “storms and hurricanes,” phenomena which are not only somewhat rare in these particular latitudes, but which, when they arise, blow almost invariably from the *south* (thus implying a migration in an *opposite* direction from that which the facts, as now observed, most plainly indicate); and moreover the sluggish, apterous types, which are the ones so largely represented in these *Atlantic islands*, possess (on the average) bodies which are comparatively unwieldy, and of all others the *least* suitable for atmos-

pheric propulsion; whereas over an unbroken region positive hurricanes would not be necessary for our purpose—the general *tendency* of the insect fauna (including the wingless tribes) being manifestly to follow the course of the most prevalent winds.\* And that the winds in even remote times have blown from the same quarter as they do now is proved to a demonstration by the fact, that nearly every extinct crater which I have hitherto inspected throughout the three archipelagos (and in the Canarian Group there are scores of them) are more or less broken into, or open, on the north-eastern side; thus evidently showing in which direction it was that the breeze was most persistent.

Into the geological difficulties of the problem I do not profess to enter; they may, or may not, be insuperable. But any experienced observer, who has examined critically the various phenomena *in situ*, could scarcely fail, I think, to arrive at the conclusion that at all events the several islands themselves which compose each of the individual groups, and many of which are now separated from each other by wide oceanic channels of twenty, thirty, and even forty miles in breadth, were once united so as to form a comparatively extensive land; for if there is one thing more unmistakable than another, throughout every portion of these sub-African Groups, it may be expressed in a single word—*depauperation*. Taking this therefore as sufficiently proved, it seems to follow inevitably that (despite the uniformitarian opinions of the day) “catastrophes,” properly so called, must have had a significant place in the geological record; and if this be true, who shall venture to limit their magnitude?

My own opinion is (as indeed was sufficiently expressed in the Preliminary Remarks both of the ‘Coleoptera

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\* I say “the insect fauna,” because if a certain proportion are compelled to migrate (however gradually) in the manner in which I have suggested, others which (like the hunting races) prey upon them would of their own accord inevitably follow: and so, in the course of time, the *general tendency* would be in a uniform direction,—even whilst occasional storms and tornados, at rare intervals, might succeed in conveying elsewhere a few of the characteristic types.

'Atlantidum' and the 'Coleoptera Hesperidum') that the whole of these island clusters are but the scattered remains of a once (for the most part) continuous land—which, whatever were its northern bounds, had an undoubted north-easterly extension into what is usually termed the "Mediterranean province;" and it certainly appears to me that the particular region which is now represented by the Canarian archipelago received the first, and most complete, influx of Mediterranean types. Apart from every other motive stimulus, the ordinary breezes, which seem to have swept well-nigh uninterruptedly in the same direction formerly as now, would tend to keep up a slow, yet steady, migration towards the south-west, along that *quondam* tract; while occasional tornados from the east and south, such as are still experienced, might (on the principle suggested by Mr. Wallace) account for a slight sub-African element in the fauna, and likewise transmit a few genuine Atlantic types, as a repayment, to the north. Once fairly colonized, the gigantic subsendencies which could alone convert the major part of this vast continent into an ocean-bottom, may well be supposed to have accomplished what is further required,—the isolation of similar species upon areas which were respectively larger and smaller, and the greater or less depauperation of the areas themselves, suggesting innumerable methods for rapidly inaugurating distinctly modified races, and reducing the phenomena to what we now witness.

Although I cannot here enter into the minuter details of insect-dissemination, I will just call attention to the fact that there is a certain small assemblage of anomalous beetles attendant upon ants, which would seem, as Mr. Wallace has remarked, to have some *exceptional* methods of dispersion; for many of them, which possess neither wings nor eyes, and are partially even subterraneous in their habits, appear to have acquired a wider geographical range than is the case with numerous forms whose capability for locomotion is developed to the full. We must remember, however, that the ants (which tend them with the greatest care) are a restless and erratic tribe, and would themselves carry their mysterious guests into every fresh area which they might succeed in occupying. Moreover, in the Atlantic archipelagos, I believe that another, and more irregular, principle may unexpectedly have been

at work, within a comparatively recent date, to disseminate accidentally the myrmecophilous tribes,—I mean that of indirect human agency. Thus, to take an example, it was to me always an enigma how the anomalous *Cossyphodes Wollastoni*, which is both apterous and nearly blind, could by any possibility have acquired the range which I have myself ascertained it to possess,—namely, from Madeira to the extreme south of the Cape Verdes; for (in addition to Madeira proper, where it is far from uncommon around Funchal) I have captured it, always in company with the *Oecophthora pusilla*, in Teneriffe and Gomera at the Canaries, and in S. Iago and Brava of the Cape Verde group. In Brava it is indeed somewhat abundant; and the *Oecophthora* swarms to such an extent on that remote little island, as to have become a downright pest,—the shingly beds of some of the half-dried streams (as, for instance, that of the Ribeira do Sorno) being literally, as it were, alive with it. Now we ascertained, when in Brava, that since the period of its occupation, numerous Madeiran families had emigrated thither, and had taken along with them the same taste for floriculture which is so striking a feature in the more northern Group; and it was easy to recognize around the Quintas of the Povoacão a large number of ornamental plants which had, without doubt, been imported, from time to time, from the gardens of Funchal. Now every consignment, of even a few plants or shrubs, would probably be accompanied by the universal Madeiran ant, for garden-soil can hardly be collected, in the vicinity of Funchal, which is altogether free from it; and, along with the *Oecophthora*, we may be pretty sure that an occasional *Cossyphodes* must have found its compulsory way to Brava. Assuming, then, that the physical conditions were suitable for their development, both one and the other of the above-mentioned species would soon multiply, and more or less over-run the whole island.

I have thought it worth while to cite the above example because I believe that the transmission of roots, in boxes, from more northern latitudes, has been a most significant means of introducing species (perhaps hundreds of them) into most of the inhabited portions of these particular oceanic Groups; and that the ants'-nest forms should, *par excellence*, be amongst those which have

been conveyed, it will immediately strike every naturalist as probable. And since it is further certain that ants are emphatically a wandering race, and would themselves rapidly disseminate their small Coleopterous attendants, we have everything that is necessary in order to account for the *co-dispersion* of the two.\*

Having stated thus much on this particular subject, I will not at present add more, for my object was merely to call attention to the two suggestive papers of Mr. Murray and Mr. Wallace, rather than to discuss the general question itself. I will therefore proceed with the minutiae of this memoir, taking the several species *seriatim*, in the order which is indicated in my 'Coleoptera Atlantidum.'

#### Fam. CARABIDÆ.

p. 9 (genus PHEROPSOPHUS).

(Sp. 22) *Pheropsophus hispanicus*.

According to MM. Fairmaire and Coquerel (*Ann. de la Soc. Ent. de France*, 17; 1866), this noble Brachinid is in all probability a geographical variety of Dejean's *P. africanus*. "Il paraît difficile," they add, "de ne pas regarder cet insecte comme une simple variété géographique du *africanus*. Quand on compare les individus provenant d'Andalousie et ceux du Sénégal on trouve évidemment une grande différence; mais cette différence est bien peu de chose si l'on prend pour terme de comparaison les Brachines de Tanger. Il est du reste facile de comprendre qu'après la séparation de l'Espagne et de l'Afrique, la race de Brachines restée en Europe ne pouvant se retrouver par un croisement continual avec celle des régions tropicales, a dû diminuer de taille et finir par constituer un type inférieur au type primitif, comme on le voit pour les *Carabus rugosus* et *bæticus*, et comme nous le verrons plus loin pour un *Paussus*."

\* During our visit to S. Iago, of the Cape Verdes, I detected the nearly-blind *Cossyphodes Wollastoni* amongst vegetable detritus, at San Domingos, which had accumulated in the hollows of ancient trees, high up above the ground,—situations into which it must without doubt have been dragged by the *Æcophthora*, which positively swarmed.

p. 23 (genus EURYGNATHUS).

(Sp. 59) *Eurygnathus Latreillii*.

The slightly altered phasis of this insect which obtains on the Deserta Grande, constituting the "var.  $\beta$ " of my 'Insecta Maderensis,' has lately been described by the Baron Chaudoir (Rev. et Mag. Zool. 121; 1869) as a separate species, under the title of *E. parallelus*; but I am nevertheless persuaded that the small characters which distinguish it are completely worthless in a specific point of view, and cannot be supposed to indicate more than an unimportant insular variety. Indeed, I have already expressed this conviction in no less than three publications; and I may add that I twice submitted Desertan examples to the late Dr. Schaum, who affirmed in the strongest terms that they ought not on any account to be treated as more than a trifling modification, or race, of the Porto-Santan type. My belief is, that Chaudoir's conclusion is utterly untenable; whilst to cite the insect as simply from "Madeira" conveys an altogether false impression of its *habitat*, and fails to imply that the form in question may be (and probably is) a mere insular one. Although from the Madeiran archipelago, *Eurygnathus* has never yet, in point of fact, been detected in "Madeira" at all, it being peculiar (so far as hitherto observed) to Porto Santo and the Deserta Grande,—on the latter of which islands it assumes a slightly altered phasis (being, on the average, a little larger and more parallel, and with the sides of its prothorax somewhat broader and more recurved). And this leads me to remark how dangerous a practice it is, without some knowledge of the localities which they frequent, to describe every slightly differing form as necessarily a specific one; for I do not hesitate to assert that nearly *every* species which permeates these widely scattered archipelagos will be found (when closely inspected) to possess *some* little peculiar feature for each individual islet on which it occurs; and to treat, therefore, all these infinitesimal phases as *specific* is, to my mind, most unphilosophical; for that aboriginally distinct species should have been brought into existence for every oceanic rock which happens to have become detached from the central mass, is a thesis which few, I think, would endeavour to uphold, and one which seems to me to carry along with it its own immediate refutation.

p. 28 (genus CALATHUS).

(Sp. 78) *Calathus advena*.

It appears from the Baron Harold's recently published Catalogue, that the specific title of this insect must be changed,—Leconte (*Ann. Lyc.* iv. 217) having cited a *Pristodactyla advena* in 1846, and the genus *Pristodactyla* being now by universal consent united with *Calathus*. Indeed the author has himself made the alteration already, by proposing for it the unfortunately inappropriate name of *canariensis*; so that the synonymy of the species will stand as follows:—

*Calathus canariensis.*

*Calathus advena*, Woll. [*nec Lec.* 1846], *Ann. Nat. Hist.* 344 (1862); *Id.*, *Cat. Can. Col.* 32 (1864); *Id.*, *Col. Atl.* 29 (1865). *Calathus canariensis*, Har., *Col. Heft.* iii. (1868); *Id.*, *Cat. Col.* 361 (1868).

*Hab.*—Canarienses (*Can.*) ; in regione intermediâ El Monte dictâ à meipso semel captus.

p. 48 (genus STENOLOPHUS).

Whilst residing at S. Antonio da Serra (at an elevation of about 2,000 feet), during our late sojourn in Madeira, I met with seven or eight individuals of the European *S. exiguus*, by sifting fallen leaves in the little wood (near to the church) known as the “*Circa*;” and on our return to England I found that there were two examples of the same species in the collection of the late Mr. Bewicke, which (having been placed amongst his series of the *Bradyellus excultus*) had escaped our notice. Hence, although only now for the first time added to the fauna (though it is recorded by Mr. Crotch as having been taken in S. Miguel and Terceira, at the Azores), Mr. Bewicke claims the priority of capture. Judging from the examples before me, the Madeiran ones would seem to belong principally to the more pallid state (in which the prothorax and suture are appreciably rufescent, or diluted in hue) which has occasionally, in more northern latitudes, been regarded as a distinct species

under the name of *luridus*, and which, according to Mr. Crotch, is the one which obtains at the Azores: the two forms, however, as in Europe, fade off gradually into each other. The following diagnosis will suffice to inaugurate the species into our Atlantic catalogue.

*Stenolophus exiguus.*

S. oblongus, nitidus, nigro-piceus, prothorace obsolete dilutiore (*i. e.*, paululum magis rufescens); elytris leviter striatis; antennis ad basin, palpis pedibusque piceo-testaceis, tibiis versus apicem plus minus evidenter obscurioribus.

Long. corp. lin. circa  $1\frac{1}{2}$ .

*Acupalus exiguus*, Dej., Spec. iv. 456 (1829). *Stenolophus exiguus*, Daws., Geod. Brit. 161 (1854); Schaum, Nat. der Ins. Deutsch. i. 620 (1860).

Variat colore dilutiore,—plus minus fusco-piceus, prothorace clarius rufescente, elytris in limbo et suturâ sensim dilutioribus.

*Acupalus luridus*, Dej., loc. cit. 454 (1829). *Stenolophus luridus*, Daws., loc. cit. 160 (1854). *Stenolophus exiguus* var., Schaum, loc. cit. 620 (1860). *Stenolophus luridus*, Crotch, Proc. Zool. Soc. Lond. 369 (1868).

Hab.—Maderensis (*Mad.*); inter folia dejecta ad S. Ant. da Serra a meipso, necnon olim a Dom. Bewicke, parco deprehensus.

p. 52 (genus TRECHUS).

After species 156, add :—

*Trechus debilis*, n. sp.

T. angustulo-oblongus, nitidiusculus, subdepressus, rufo-piceus, capite necnon elytrorum suturâ (limboque versus apicem et humeros) obsolete dilutioribus; prothorace subquadrato, basi vix angustato; elytris oblongis, depressiusculis, profunde striatis; antennis pedibusque longiusculis, gracilisculis, testaceis, illis et interdum tibiis plus minus obscurioribus.

Long. corp. lin. circa  $1\frac{1}{2}$ .

*Hab.*—Maderensis (*Mad.*); in sylvaticis editioribus ad S. Ant. da Serra, tempore vernali A.D. 1870, sat copiose repertus.

*Obs.* Species *T. flavomarginato* affinis, sed nisi fallor certe distincta. Differt corpore angustiore, oblongiore, graciliore, ac paulo depresso, sensim minus nitido sed omnino dilutiore (magis rufescente), capite praeципue minus obscuro; prothorace paululum magis quadrato (*i. e.*, postice sensim minus angustato); elytris ad latera magis parallelis, subdepressioribus, ac multo profundius striatis, magis concoloribus (*i. e.*, in limbo minus evidenter testaceis); antennis pedibusque sub-longioribus et sub-gracilioribus.

Several examples of this *Trechus* were taken by myself during April and May of 1870, at S. Antonio da Serra, in the intermediate elevations of Madeira,—in company with the *T. fluvomarginatus*, which is so universal within the wooded districts of that island. There can be no doubt, I think, that the species is perfectly distinct from (although closely allied to) the latter,—being not only narrower, slenderer, and more oblong, but likewise perceptibly less shining, and altogether more diluted, or rufescent, in hue (the head being especially redder); its prothorax also is just appreciably squarer, or less narrowed behind; its elytra are straighter, or more parallel at the sides, a trifle flatter, and much more deeply striate, as well as more *concolorous* (there being less trace of a pallid margin); and its limbs are, if anything, somewhat longer and slenderer. It was far from uncommon throughout the S. Antonio da Serra region; the majority of my specimens having been captured by sifting dead leaves and refuse in, and near, the laurel woods.

(Sp. 160) *Trechus quadricollis*.

This species was founded, in 1854, upon a single example which was captured by myself in the autumn of 1847 at the Curral das Romeiras—on the mountains above Funchal; and I have already more than once expressed my conviction that further material was greatly needed, in order to determine as to whether or not it is a mere state, or local variety, of the *T. custos*. During the past winter

and spring I met with several individuals at "the Mount" (a region adjoining the Curral das Romeiras ravine) which I have no doubt whatsoever are conspecific with my original example, and which I now feel satisfied cannot be separated specifically from the *T. custos*. Indeed a sufficient series has convinced me that the *quadricollis* can scarcely be upheld as even a well-defined "variety," —the particular examples which accord with my original one being merely a trifle smaller and paler than the rest, and possibly a little more parallel in outline; so that I would desire to suppress the *quadricollis* as a mere unimportant phasis (if indeed a "phasis" at all) of the *custos*, and to cite, consequently, as an additional synonym, the *T. tetracoderus* of the Baron Harold's recent Catalogue (394, A.D. 1868), —a title which he imposed upon my supposed species in consequence of the name *quadricollis* having been preoccupied for a *Trechus*, by Putzeys, in 1847.

p. 59 (genus BEMBIDIUM).

(Sp. 182) *Bembidium concolor*.

It appears to be necessary to change the name of this insect, that of *concolor* having been pre-occupied by Kirby (*Fna. Bor. Am.* iv. 54) for a *Bembidium* during the previous year, 1837. And this perhaps is less to be regretted, since M. Brullé's "description," published in Webb and Berthelot's ponderous work in 1838, is so marvellously inaccurate that it simply amounts to no description at all. Having given a full diagnosis of it in 1864, and called attention to the exact points in which it is more especially peculiar, I need not insert a fresh one here, but will merely propose for it the title of *fortunatum* (the insect being a very characteristic one in the Canarian archipelago), citing its changed synonymy as follows:—

*Bembidium fortunatum*.

*Bembidium concolor*, Brullé [*nec Kby. 1837*], in Webb et Berth. (Col.) 58 (1838); Woll., Cat. Can. Col. 70 (1864); Id., Col. Atl. 61 (1865).

*Hab.*—Canarienses (in *Fuert.* solâ hactenus haud observatum); per margines aquarum, neenon ad rupes aquosas, hinc inde *vulgare*.

## Fam. DYTISCIDÆ.

p. 67 (genus COLYMBETES).

The Atlantic species of this group fall more properly under Eschcholtz's genus *Scutopterus*, which I have hitherto regarded as scarcely more than a subdivision of *Colymbetes* proper. As, however, it appears to be usually acknowledged, and the only exponents of it which have yet been brought to light are the *coriaceus* and *lanio* (the former of which is found in the south of Europe and the Canaries, whilst the latter is supposed to be peculiar to Madeira), and the *pustulatus* from Italy, it will be better perhaps to uphold it as generically distinct, and to cite the species consequently as *Scutopteri*. They seem to differ from the true *Colymbetes* in having the first four joints of their four anterior male feet powerfully dilated, the basal three being likewise studded beneath with minute cushions or *pulvilli*. Although I have not yet seen that particular sex of the species which I have enunciated below under the title of *imbricatus*, it nevertheless has so very much in common both with the *coriaceus* and *lanio* that I have little doubt it must be a true member of the same actual group. Of the three Atlantic *Scutopteri*, it will be desirable to place the *coriaceus* first, then the *imbricatus* (a diagnosis of which I subjoin below), and lastly the *lanio*.

*Scutopterus imbricatus*, n, sp.

S. oblongo-ovatus, elongatus, subopacus, nigro-piceus, capitis parte anticâ maculisque duabus frontalibus et prothoracis lateribus piceo-ferrugineis; capite prothoraceque rugose coriaceis, hoc antice angustato; elytris elongato-ovatis basi truncatis, paululum nitidioribus, grosse sub-imbricato-rugulosis et obsolete subtestaceo commixtis, singulis longitudinaliter triseriatim notatis; antennis palpisque rufo-ferrugineis, pedibus rufo-piceis.

Long. corp. lin. 10.

*Hab.*—Maderensis (*Mad.*); exemplar unicum, sc. fæmineum, olim misit clariss. Baronus de Paiva.

*Obs.* Species *S. lanioni* affinis, sed corpore magis ovato (antice, et in elytris et in prothorace, angustiore), elytris obscurioribus, minus nitidis, et rugose imbricato-

asperatis, pedibus (ciliisque in posterioribus) piceo-centratoribus. A *S. coriaceo* (Europæo et Canariensi) differt corpore minus obtuse oblongo (*i. e.*, antice angustiore) omnino minus nigro, capite distinctius maculato et pro thorace ad latera ferrugineo, neenon etiam in elytris obscure pallido-irroratis, prothorace paulo minus transverso, postice miuus sinuato (angulis basalibus rectioribus), scutello sensim minus triangulari, et elytrorum impressionibus (in seriebus tribus dispositis) magis rotundatis punctiformibus.

The single individual (a female) from which the above diagnosis has been drawn out was sent to me from Madeira, about two years ago, by the Baron Paiva; and it has since been placed aside, hoping that further material might perhaps enable me to speak with greater precision on the specific feature of the other sex, no less than on those of the present one. As no further examples however have been brought to light, and the distinctions of the solitary one now before me are too important to be ignored, I feel compelled to notice it in this memoir, and have proposed therefore the title of *imbricatus* for the species which it must be presumed to represent.

Judging, consequently, from the only type to which I have access, the *S. imbricatus*, while differing widely from them both, appears to be in many respects exactly intermediate between the *S. coriaceus* (of southern Europe and the Canaries) and the Madeiran *S. lanio*. From both of them it recedes (though especially from the former) in its less oblong, or obtuse, outline,—it being perceptibly narrower in front, and therefore altogether more elongate-ovate; whilst from the *lanio* it further differs in its elytra being not only much darker in hue, but also less shining, and sculptured after the singular fashion which obtains in the *S. coriaceus*, being closely roughened with coarse transverse *imbrications*. Its legs likewise are more piceous, with the long hairs which fringe the four hinder ones much darker, or less fulvescent.

Although agreeing in its sculpture with the *S. coriaceus*, the present *Scutopterus* (apart from its outline being more narrowed anteriorly) differs from that species in its colour being altogether less black, in its head being more brightly maculated, in its prothorax (instead of concolorous) being ferruginous at the sides (as in the *S. lanio*),

and \*in its elytra having an obscure *under-tint* of testaceous, though at the same time so densely mottled with black as to appear at first sight almost completely dark. Its prothorax likewise is a little less transverse, and not quite so undulated (or sinuate) along its basal edge, causing the hinder angles to be more decidedly right-angles; its scutellum is rounder, or less triangular; and the triple series of its elytral impressions are more punctiform or less linear and elongate.\*

p. 71 (genus *EUNECTES*).

After species 213, add:—

*Eunectes helvolus.*

*E. ovatus, angustulus, luteo-griseus, clypeo antice vix marginato; capite postice nigro, et maculâ frontali magnâ plus minus suffusâ antice bipartitâ ornato; prothorace vittâ transversâ abbreviatâ ornato, ad latera oblique rectissimo, angulis posticis acutiusculis; elytris punctis magnis sat profundis in triplici serie et ubique punctulis minoribus nigris notatis, singulis maculis duabus minutis sublateralibus et fasciâ transversâ tenui dentatâ posticâ (plus minus obsoletâ) nigris ornatis.*

Long corp. lin. 6.

*Eunectes helvolus*, Klug, Symb. Phys. 33:3. *Eunectes conicollis*, Woll., Ann. Nat. Hist. vii. 97 (1861). *Eunectes helvolus*, Id., Col. Hesp. 35 (1867).

*Hab.*—Maderenses (*Mad.*) ; in Salinis ad Paul do Mar a Dom. Moniz deprehensus.

A few examples of this *Eunectes* were captured by Senhor Moniz at Paul do Mar, in the west of Madeira, from amongst plants of *Ruppia rostellata*, Koch, in the briny water of a Saltern. It would appear, therefore, to be a saline species—a circumstance to which I called attention, at p. 36 of my ‘*Coleoptera Hesperidum*,’ whilst commenting on its *probable* habitat in the Cape

\* From the *pustulatus* of southern Europe, which appears to be regarded as a *Scutopterus*, it seems (judging from the published diagnosis) to differ even structurally,—the claws of the four anterior male feet in that species being described as of unequal dimensions. Moreover the *pustulatus* is said to have an ænescent tinge, with the sculpture of its elytra the same as that of its head and prothorax.

Verde archipelago. It doubtless possesses a wide African range; and I have already [Ann. Nat. Hist. vii. 99] expressed my belief that Aubé was mistaken in treating it as a variety of the almost cosmopolitan *E. sticticus*.

Fam. HELOPHORIDÆ.

p. 73 (genus OCHTHEBIUS).

Before species 221, and commencing the genus, add:—

*Ochthebius algicola*, n. sp.

*O. angustulus*, elongatulo-oblongus, submetallico-niger, nitidulus, (nisi oculo fortissime armato) calvus; capite postice foveis binis punctiformibus impresso, leviter et confuse ruguloso- sed prothorace distinctius punctatis, hoc coleopteris subangustiore, postice paulo angustato sed haud pellucide (ut in *Ochthebiis* plurimis) marginato, tenuiter canaliculato, antice et postice levissime transversim impresso (impressione posticâ lunulatâ); elytris oblongis, dense et rugose striato-punctatis (primâ facie quasi subasperato-crenulatis); antennis (clavâ obscuriore exceptâ), palpis pedibusque piceo-testaceis.

Long. corp. lin. vix. 1.

*Hab.*—Maderenses (*Mad.*); inter Confervas marinas in aquis omnino salinis ad “Gorgulho,” haud procul ab urbe Funchalensi, tempore vernali A.D. 1870, a me ipso detectus.

The habits of this most interesting *Ochthebius* appear to be precisely similar to those of the *Culobius Heeri*,—two examples of it having been captured by myself, during our late sojourn in Madeira, from amongst marine *Confervæ*, in pools of unadulterated sea-water left by the tide on the rocks (at the Gorgulho) to the westward of Funchal. Indeed at the time (never suspecting that any other species would possess the same very anomalous mode of life, and despite its wanting the long wiry legs and unsculptured surface of *Culobius*\*) I actually mistook

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\* In the recently published Catalogue of Gemminger and Harold, *Culobius* is cited as a synonym of *Ochthebius*, which can only be due to their total ignorance of its structural peculiarities,—the genus, although utterly distinct from them both, having in reality more in common with *Hydræna*.

it for that insect, and so merely secured these two individuals; though in all probability I might have easily obtained more, had it once occurred to me that it was distinct.

The *O. algicola* is narrower and more oblong (or parallel) than any of the *Ochthebiii* which have hitherto been detected in these Atlantic islands, and except under a very high magnifying power it is totally devoid of all traces of even the minutest pubescence. With the exception of its piceo-testaceous limbs, it is of a dark hue, being but very faintly submetallic; its prothorax (which is, if anything, a trifle narrower than the widest part of the elytra) is free from any portion of *pellucid* margin (so common in the *Ochthebiii*), and is very lightly impressed with an anterior and (curved) posterior transverse fovea; and its elytra are densely and coarsely striate-punctate, having almost the appearance at first sight of being subasperate and closely crenulated.

(Sp. 223) *Ochthebius subpictus.*

Madeira proper must be added to the habitat of this *Ochthebius*; for although the individuals taken by myself in Porto Santo were all that had until quite lately been observed, a specimen has more recently been communicated by the Baron Paiva which was captured in Madeira. Being, in Porto Santo, found in streams which are brackish, it is not improbable that it may occur likewise in water which is almost, or even entirely, saline: at any rate in the same bottle which contained it there are examples of the *Calobius Heeri*, which resides amongst marine *Confervæ* in the small pools of actual sea-water (along the rocky shores both of Madeira and Porto Santo); and I cannot but think it likely, therefore, that this single *Ochthebius subpictus* may perhaps have been captured in company with the *Calobii*.

Fam. HYDROPHILIDÆ.

p. 77 (genus *PHILHYDRUS*).

It is now more than a year since Dr. Sharp, who has studied the European *Philhydri* with considerable care, detected some examples of Thomson's *P. maritimus*

amongst the Canarian material which had been submitted to him by Mr. G. R. Crotch, and which was collected by the latter in the island of Gomera. Dr. Sharp having communicated this fact to me, I requested him to examine critically the very variable species (so abundant in many parts of the Madeiran and Canarian archipelagos) which I had hitherto referred, on the authority originally of Dr. Aubé, to the *melanocephalus* of Olivier; and the result is that he considered it as wrongly assigned to the latter, being identical, rather, with what he had little doubt is the *politus* of Küster (a species which occurs in Mediterranean latitudes, and which he had himself received from the south of Spain). This, therefore, apart from affording an absolute *addition* to the catalogue in the European *P. maritimus* (examples of which had certainly never before come beneath my notice), necessitates a change in the nomenclature of the *other* species—erroneously regarded by myself as Olivier's *melanocephalus*; and I would desire, therefore, to give the two following diagnoses—which will not only point out the difference between the species in question, but which will enable me also to correct the synonymy of the latter, and to call attention to its topographical range as hitherto ascertained.

*Philhydrus maritimus.*

*P. oblongo-ovalis*, parum convexus, subnitidus, luride fusco-testaceus sed in limbo sensim dilutior, ubique crebre et argute punctatus (punctis in elytris vix remotioribus); antennarum clava obscuriore; coleopteris seriebus tribus irregularibus punctorum majorum utrinque longitudinaliter notatis.

*Mas*: tarsorum unguiculis fere angulatim curvatis, ad basin dente valido instructis.

*Fæm.*: tarsorum unguiculis ad basin dente minore instructis.

Long. corp. lin. vix  $2\frac{1}{2}$ .

*Philhydrus maritimus*, Thoms., Skand. Col. ii. 96 (1860); Sharp, Ann. Nat. Hist. 14 (1870).

*Hab.*—Canariensis (*Gom.*); a DD. Crotch æstate A.D. 1864 parce deprehensus.

The pale lurid or brownish-testaceous colour, and comparatively coarsely punctured surface, of this European *Philhydrus* (the palpi of which seem to be immaculate) will readily distinguish it from the following species—which (although it varies occasionally into a somewhat testaceous hue) is always darker (at times, indeed, being nearly black), and much more lightly sculptured. As already stated, it was captured by the Messrs. Crotch during the summer of 1864 in Gomera.

*Philhydrus politus.*

P. oblongo-ovalis, convexus, nitidus, niger sed in limbo dilutior, ubique crebre et subtiliter punctulatus (punctis in elytris vix obsoletioribus et vix remotioribus); capite maculis duabus lateralibus ante oculos, antennis (clavâ exceptâ), palpis (articulo 2do ad basin interdum excepto) tarsisque rufo-testaceis; coleopteris seriebus tribus irregularibus punctorum majorum utrinque longitudinaliter notatis.

*Mas*: tarsorum unguiculis fere angulatim curvatis, ad basin dente valido instructis.

*Fem.*: tarsorum unguiculis ad basin dente minore instructis.

Long. corp. lin. circa 2 $\frac{3}{4}$ -3.

*Var.  $\beta$ .*—Subangustior, prothorace obsoletius punctato, palpis omnino testaceis (nec articulo 2do basi infuscato). [*Fuerteventura.*]

*Var.  $\gamma$ .*—Pallidior, sed palporum articulo 2do basi infuscato. [*Fuerteventura.*]

*Var.  $\delta$ .*—“*Var.  $\gamma$* ” similis, sed palpis omnino pallidis. [*Porto Santo.*]

*Var.  $\epsilon$ .*—“*Var.  $\delta$* ” similis, sed corpore nigrescentiore; aut “*var.  $\beta$* ” similis, sed prothorace distinctius punctato. [*Porto Santo.*].

*Hydrophilus melanocephalus*, Brullé [*nec Oliv. 1795*], in Webb et Berth. (Col.) 58 (1838). *Philhydrus politus*, Küst., Käf. Eur. 18·9 (1849). *Philhydrus atlanticus?* Blanch., in voy. au Pole Sud, Zool., iv. 51 (1853). *Philhydrus melanocephalus*, Woll. [*nec Oliv. 1795*], Ins. Mad. 98 (1854); Id., Cat. Mad. Col. 32 (1857); Id. Cat. Can. Col. 91 (1864); Id., Col. Atl. 77 (1865). *Philhydrus politus*, Sharp, Ann. Nat. Hist. 14 (1870).

*Hab.*—Maderenses (*Mad.*, *Pto Sto.*), et Canarienses (*Lanz.*, *Fuert.*, *Can.*, *Ten.*, *Gom.*) ; in aquis et aquosis, hinc inde vulgaris.

Although presenting many slight differences, both in colour and strength of punctuation, according to the locality in which it is found, this appears to be the universal *Philhydrus* in the Madeiran and Canarian archipelagos ; and I doubt not that it will be detected eventually in every one of the islands where there is sufficient water for its existence during the drier seasons. It swarms in the brackish streams of Porto Santo, in the Madeiran Group ; and it has also been captured by Senhor Moniz in the Salinas at Paul do Mar, in the west of Madeira proper. At the Canaries, I have myself met with it in Lanzarote, Fuerteventura, Grand Canary, Teneriffe, and Gomera,—in the first two and last of which it was found likewise by Mr. Gray, and in the last by the Messrs. Crotch.

Fam. CORYLOPHIDÆ.

p. 91 (genus *SACIUM*).

(Sp. 262) *Sacium pusillum*.

A late revision by Kraatz (Berl. Ent. Zeitsch. xiii. 283) of the European members of this genus, and of *Arthrolops*, has elicited the remark that, in his opinion, the Madeiran *Sacium* which I have hitherto referred to the *S. pusillum*, Gyll., of northern Europe, is in reality distinct ; and he has, consequently, proposed for it the specific title of *maderæ*. It is to Mr. Rye that I am indebted for drawing my attention to Kraatz's exact observations on the subject ; and it would appear that Gyllenhal's true *pusillum* (which has a less extended range than what is usually supposed, all the examples which had come under Kraatz's notice being from Finland) is larger and more finely punctured than the Madeiran species, as well as darker in colour, and with the hinder margin of its prothorax conspicuously bordered with brown. He then compares the Madeiran insect with the *obscurum*, Sahlb. (= *pusillum*, Redt., nec Gyll.)—a species found in central Europe—and adds that, while in the *obscurum* the third tarsal joint is only slightly shorter than the

second, it is in the Madeiran insect scarcely half as long: and, also, that whilst the second joint of the antennal club is, in the *obscurum*, much smaller than those which are contiguous to it [as in the typical *Anisotomidae*], the species from Madeira has that articulation distinctly larger than the preceding one.\* Hence, since it can be referred neither to the *pusillum* of Gyllenhal, nor yet to the *obscurum* of Sahlberg, and it clearly is *not* conspecific with either the *nanum* of Mulsant, nor the *brunneum* of Brisout (the two other species hitherto acknowledged as European), Dr. Kraatz regards it as distinct; and I may, therefore, cite its amended synonymy as follows:—

*Sacium maderæ.*

*Clypeaster pusillus*, Woll. [*nec* Gyll., 1810], *Ins. Mad.* 474 (1854); *Id.*, *Cat. Mad. Col.* 140 (1857). *Sacium pusillum*, *Id.*, *Col. Atl.* 91 (1865). *Sacium maderæ*, Kraatz, *Berl. Ent. Zeitsch.* xiii. (1869).

*Hab.*—Maderenses (*Mad.*, *Des.*) ; in graminosis intermediis, *passim*.

p. 91 (genus ARTHROLIPS).

(Sp. 264) *Arthrolips obscurus*.

From the synonyms of this species the *Cossyphus obscurus*, Sahlb., must be erased,—Sahlberg's insect, according to Kraatz, being (as above implied) a true *Sacium*, and not an *Arthrolips*. Hence, since the title of *obscurus* for this insect (*assuming it to be identical with the south-European one*) rests on a mere catalogue (that of Dejean's) it cannot be retained, and we are compelled to adopt (as, in point of fact, I did in my 'Ins. Mad.' and 'Cat. Mad. Col.') Comolli's name of *piceus* instead. And I will therefore cite the species afresh, thus:—

\* I called special attention to this fact at p. 90 of the 'Col. Atl.', where, judging from the sole material to which I had access (namely, the exponents from Madeira), I stated that the only genera in the *Corylophilidae* in which that particular structure (namely, the reduced proportions of the second joint of the antennal club) is *not* indicated were *Sacium* and *Arthrolips*.

*Arthrolips piceus.*

*Clypeaster obscurus*, Dej., Cat. 129 (1821). *Clypeaster piceus*, (Kunze), Comolli, De Nov. Col. 50 (1837). *Gryphinus piceus*, Redt., Fna. Austr. 574 (1849). *Arthrolips piceum*, Woll., Ins. Mad. 476 (1854); Id., Cat. Mad. Col. 142 (1857). *Arthrolips obscurus*, Duval, Gen. des Col. d'Eur. ii. 232 (1859); Woll., Col. Atl. 91 (1865).

*Hab.*—Maderenses (*Mad.*, *Des.*), et Canarienses (*Ten.*); in inferioribus intermediisque, hinc inde vulgaris.

## Fam. PTILIADÆ.

p. 96 (genus ACROTRICHIS).

After species 274 insert:—

*Acrotrichis brevicornis.*

*Acrotrichis brevicornis*, Mots., Bull. de Mosc. 174 (1868).

*Hab.*—Maderenses (*Mad.*); sub quisquiliis in intermediis degens.

Mixed-up with my examples of the *A. atomaria*, from the intermediate districts of Madeira, are a certain number which are said to differ slightly from the rest (but the “differences” in which are to my eye totally inappreciable), and which constitute the form for which Motschoulsky has recently proposed the name of *brevicornis*. During our late visit to the island we met with it both in the region of “the Mount” and in that of S. Antonio da Serra; but until the Monograph of Mr. Matthews makes its appearance I will not attempt to give a regular diagnosis of the “species,” or to do more than just allude to the fact of its acknowledgment both by him and by Motschoulsky. All indeed that the latter (who cites “Dalmatia” for its habitat, as well as Madeira) says concerning it is as follows:—“Forme entièrement de l’ *atomaria*, mais moitié plus petite, luisante à ponctuation très fine, pubescence sur les élytres assez forte, pattes testacées, antennes noirâtres, ne dépassant pas en longueur les angles post. du corselet.”

(Sp. 275) *Acrotrichis anthracina.*

This *Acrotrichis*, which was enunciated by Mr. Matthews in 1865 from the Canarian material of the Messrs. Crotch, is stated by the former to have since been captured by himself in England (namely, during the summer of 1867, in Sherwood Forest),—so that the species, like so many others in this family, is a European one. Speaking of his British examples, Mr. Matthews says (*Ent. Month. Mag.* v. 10; 1868) “The *anthracina* is a distinct and well-marked species ; it belongs to the first division of the genus, which comprises the *atomaria*, and others, whose thorax is much dilated at the base, with its posterior angles produced beyond the shoulders of the elytra ; but from all these it may easily be known by its small size, and short black antennæ ;” and as he then characterizes it afresh, it may be desirable perhaps to give his emended diagnosis,—stating the references up to the present date.

*Acrotrichis anthracina.*

A. ovata, maribus postice valde attenuata, valde convexa, nigra, nitida, pilis brevibus argenteis parce vestita, capite modico, antice elongato, oculis sat magnis, prominulis ; pronoto modico, valde convexo, postice dilatato, tuberculis sat magnis, ordinibus irregulariter sinuatis confertim dispositis, interstitiis nitidis, subtiliter reticulatis, ornato, lateribus rotundatis, late marginatis, angulis posterioribus valde productis, acutissimis ; elytris longioribus, maribus valde attenuatis, ordinibus sat remotis, sinuatis, modice asperatis, lateribus fere rectis, leviter marginatis, apicibus vix dilutioribus, vix rotundatis ; pedibus lâte flavis ; antennis brevioribus, piceo-nigris.

Long. corp. lin.  $\frac{1}{3}$ .

*Trichopteryx anthracina*, Matth., *Ent. Month. Mag.* ii. 35 (1865). *Acrotrichis anthracina*, Woll., Col. Atl. 98, et Append. 14 (1865). *Trichopteryx anthracina*, Matth., *Ent. Month. Mag.* v. 10 (1868).

*Hab.*—Canarienses (*Gom.*) ; à DD. Crotch parce deprehensa.

(Sp. 279) *Acrotrichis Montandonii*.

From the synonymy of this Madeiran *Acrotrichis* the first two lines must be erased, for Mr. Matthews (who originally identified it with the European *A. Montandonii*) now informs me that he is inclined to accept the opinion of Motschoulsky—who has recently cited (I will not say “described”) it, under the name of “*nigricornis*,” as distinct from that species. Until Mr. Matthews’ Monograph shall have made its appearance I will not presume to say what its exact differential characters may be, or how it is undoubtedly separable from the *A. Montandonii*; but, acting on the step taken by Motschoulsky (and subsequently endorsed by Mr. Matthews), I will merely call attention as follows to the change in the synonymy,—adding also that I find an example in my possession which was captured by myself on one of the other islands of the Madeiran archipelago, namely the Deserta Grande.

*Acrotrichis nigricornis*.

*Acrotrichis pumila*, Woll. [nec Erich.], Ins. Mad. 109 (1854); Id., Cat. Mad. Col. 35 (1857). *Acrotrichis insularis*, Id. [nec Mann.], Ann. Nat. Hist. viii. 109 (1861). *Acrotrichis Montandonii*, Id. [nec Allib.], Col. Atl. 99 (1865). *Acrotrichis nigricornis*, Mots., Bull. Mosc. 174 (1869) [sec. Matthews].

*Hab.*—Maderenses (*Mad.*, *Des.*) ; hinc inde in sub-inferioribus intermediisque, inter quisquiliis.

I should add, perhaps, that Motschoulsky’s “description” of it is as follows: “Taille, forme et couleurs de la *depressa*, Gillm., mais plus convexe, plus luisante, corselet large postérieurement, avec ses angles p. un peu aigus et saillants, antennes entièrement foncées même leurs premiers articles, pas plus longues que le corselet, élytres parallèles.”

(Sp. 280) *Acrotrichis Guerinii*.

This *Acrotrichis* was defined by myself in 1857, as the “*obscena*”—a title, however, which I was compelled subsequently to sink into a synonym on account of the species having been identified by Mr. Matthews with the

*Guerinii* of Allibert. But lately Mr. Matthews has altered his opinion (having met with the same exact form in England as the Madeiran one), and has come to the conclusion that it is, after all, distinct from the *Guerinii*; so that my original title of *obscœna* is again adopted by him. Hence I have no choice (in the face of so high an authority) but to suppress the name under which it is cited in the 'Col. Atl.' and revert (as below) to that under which I first enunciated it in my Madeiran Catalogue. Mr. Matthews' British example was captured by himself, during the summer of 1867, in Sherwood Forest; and in his published observations concerning it, he remarks (*Ent. Month. Mag.* v. 10; 1868) that it "belongs to a group of which the *Guerinii* may be considered as the type, and all of which have pale or rufescent elytra, and the thorax scarcely dilated at the base." And he subsequently observes "when I mounted the specimen I had taken at Sherwood, I was much struck by the appearance of its sculpture; this led to further examination, and I found that, though differing from the *Guerinii*, it coincided exactly in this respect with *obscœna*, and that both also differed from *Guerinii* in the comparative length of the elytra, and a few other points of minor importance. I therefore feel no doubt that *obscœna* is distinct from *Guerinii*, and that Mr. Wollaston's name must be restored to the species." Mr. Matthews having given an emended diagnosis of the *A. obscœna*, I may as well (as in the case of the *anthracina*) insert it as follows, adding at the same time its corrected synonymy:—

*Acrotrichis obscœna.*

A. oblonga, elongata, valde convexa, capite atque pronoto nigris, elytris nigro-castaneis, pilis brevibus flavescentibus parce vestita, capite magno, sat elongato prominulo, oculis vix prominentibus; pronoto modico, postice vix dilatato, tuberculis sat magnis, ordinibus interruptis dispositis, interstitiis nitidis, confertim reticulatis ornato, lateribus levissime marginatis, leviter rotundatis, angulis posterioribus acutis, vix productis; elytris brevioribus, quadratis, haud attenuatis, ordinibus transversis, interruptis, sat profunde asperatis, suturâ elevatâ, apicibus valde rotundatis; antennis brevioribus, nigropiceis; pedibus flavis.

Long. corp. lin. circa  $\frac{1}{3}$ .

*Acrotrichis obscœna*, Woll., Cat. Mad. Col. 35 (1857).  
*Acrotrichis Guerinii*, Id. [nec Allib., 1844], Col. Atl. 100 (1865). *Trichopteryx obscœna*, Matth., Ent. Month. Mag. v. 12 (1868).

*Hab.*—Maderenses (*Mad.*), et Canarienses (*Gom.*) ; præcipue sub stercore bovino et equino in locis inferioribus degens.

After species 281, add:—

*Acrotrichis ovatula*.

*Acrotrichis ovatula*, Mots., Bull. Mosc. 175 (1869).

*Hab.*—Maderenses (*Mad.*) ; inter quisquillas in ipsâ urbe Funchalensi à meipso sat copiose reperta.

Had I only Motschoulsky's short observation (which takes the place of a diagnosis) to judge from, I should have been utterly unable to form any idea whatsoever about this nevertheless well-marked little *Acrotrichis*; but since so high an authority as Mr. Matthews is satisfied that it must pertain to a minute species of which I captured many examples, amongst refuse, in a garden in Funchal, I am content to cite it accordingly. It is the smallest *Acrotrichis* proper which has hitherto been detected in any of these Atlantic islands, being but slightly larger than the *Nephanes Titan*; and my specimens were all of them taken by sifting rubbish in the garden of the Quinta dos Jasmineiros, on the western outskirts of Funchal. Motschoulsky's "description" of it is as follows:—"Forme et couleurs voisines de celles de la *depressa*, Gillm., iv. 3, mais un peu plus petite et plus convexe, élytres et antennes plus courtes, les premières plus rétrécies vers la base; ponctuation assez forte, pubescence éparsé, antennes obscures."

p. 101 (genus PTENIDIUM).

(Sp. 283) *Ptenidium lævigatum*.

This Canarian *Ptenidium* was originally identified by Mr. Matthews (apparently from Erichson's diagnosis) with the European *P. lævigatum* of Gillmeister; but Mr. Matthews now informs me that, having since received

continental types of the latter, he finds that the species from the Canaries is in reality distinct; and he has consequently proposed for it, in his Monograph of the family (which is already in the press), the name of *Bruckii*. Without therefore attempting to anticipate Mr. Matthews' diagnosis, I will just call attention to the fact—that the synonymy of the species will, consequently, have to be thus emended:—

*Ptenidium Bruckii.*

*Ptenidium lœvigatum*, Woll. [*nec* Gillm.], Cat. Can. Coll. 104 (1864); Id., Col. Atl. 101 (1865). (*Ptenidium Bruckii*, Matth., Mon. Trichopt.).

*Hab.*—Canarienses (*Can.*, *Ten.*, *Gom.*, *Palma*, *Hierro*); sub quisquiliis in inferioribus intermediisque, late sed parce diffusum.

(Sp. 284) *Ptenidium apicale*.

The Atlantic examples of this *Ptenidium* (so abundant throughout the Madeiran and Canarian archipelagos) differ a little from the ordinary ones of the *P. apicale*, of more northern latitudes; but Mr. Matthews until lately did not think that the points of discrepancy were of sufficient significance to indicate more than a very slight geographical variety of the common European species. Motschoulsky, however, in a recent paper on the *Ptiliadae*, having separated the Atlantic form under the name "*atomaroides*" (stating, moreover, that it occurs likewise in Georgia and Dalmatia), Mr. Matthews is inclined now to acknowledge it as distinct; and I have no choice, therefore, with such an authority before me, but to do so likewise. Motschoulsky gives no formal diagnosis of his *P. atomaroides*, but makes the following remark: "Forme et couleurs voisines de celles de l'*apicalis*, Gillm. viii. 2, mais toujours plus grand et plus large aux élytres, ce qui lui donne l'aspect trapu du *pusillum*; de chaque côté de la base du corselet on voit une impression transversale fovéiforme et sur le milieu des vestiges de deux points; élytres ponctuées par des points très-fins, disposés en stries et garnis chacun d'un poil assez long." Accepting therefore the *atomaroides* as distinct from the European *P. apicale* (which I must confess that I do with considerable reluctance), the synonymy of the species will require to be emended thus:—

*Ptenidium atomaroides.*

*Ptenidium apicale*, Woll. [nec Gillm., 1845], Ins. Mad. 110 (1845); Id., Cat. Mad. Col. 37 (1857); Id., Cat. Can. Col. 104 (1864); Id., Col. Atl. 101 (1865). *Ptenidium atomaroides*, Mots., Bull. Mosc. 191 (1869).

*Hab.*—Maderenses (*Mad.*, *Des.*), et Canarienses (*Fuert.*, *Can.*, *Ten.*, *Gom.*); inter quisqulias, vulgare.

p. 102 (genus *Ptinella*).

(Sp. 287) *Ptinella Proteus*.

Of this *Ptinella*, so abundant locally beneath the damp rotting bark of trees within the cultivated districts of Madeira, it appears necessary once more to alter the name under which it must be cited,—Mr. Matthews having received types from Dr. Heer which prove it to be conspecific with his *Trichopteryx testacea*. Its synonymy, therefore, so far as I am able to ascertain, would seem to be as follows; though whether the species is truly distinct, as I very much doubt, from the one which I have quoted on Mr. Matthews' authority (*vide* Col. Atl. 102) as the *P. aptera*, Guer., from the Canarian archipelago I will not undertake, at any rate until Mr. Matthews' Monograph has been published, to decide.

*Ptinella testacea.*

*Trichopteryx testacea*, (Chevr.), Heer, Fna. Col. Helv. 376 (1841). *Ptinella aptera*, Woll. [nec Guer.], Ann. Nat. Hist. viii. 101 (1861). *Trichopteryx ratisbonensis*, Id. [nec Gillm.], ibid. x. 341 (1862). *Trichopteryx Proteus*, Matth., in Zool. xx. 8262 (1862); Woll., Col. Atl. 103 et Append. 15 (1865).

*Hab.*—Maderenses (*Mad.*); sub cortice laxo humido, hinc inde in intermediis inferioribusque vulgaris.

## Fam. NITIDULIDÆ.

p. 110 (genus *MELIGETHES*).

(Sp. 311) *Meligethes echii*.

I think it very doubtful whether the few Canarian examples which were taken by the Messrs. Crotch in

Teneriffe, Gomera, and Hierro, and which I cited as rather aberrant individuals of the Madeiran *M. echii*, are more in reality than a somewhat large variety of the *M. seniculus* (= *tristis*, mihi, nec Sturm); at any rate the only specimen to which I now have access belongs manifestly to that species: and if this should prove to be the case, it will follow that the *M. echii* has been observed hitherto only in Madeira.

I may just state, however, that the typical *M. echii* (which occurs on the flowers and woolly foliage of the gigantic *E. candicans* of intermediate elevations, in the Madeiran archipelago) is certainly distinct from the (much smaller and darker-limbed) *M. seniculus*; so that the note at p. 111 of my 'Col. Atl.', which calls this point in question, requires to be qualified.

(Sp. 312) *Meligethes tristis*.

According to Mr. Rye this *Meligethes* is not the *tristis*, of Sturm, as I have hitherto imagined, but Erichson's *seniculus*—a species equally European in its range. Whether however it is attached to plants of the *Echium* group in the Atlantic islands, as it would appear to be in more northern countries, I am unable to say; though perhaps, on enquiry, this will be found to be the case. "The true *tristis*," Mr. Rye observes, "is more ovate and less depressed than the *seniculus*, as also broader, darker, and with less and lighter pubescence; its prothorax, too, is more contracted in front, its hinder tibiæ are wider, and the anterior ones are a trifle narrower." Mr. Crotch was evidently mistaken when, recording (*Proc. Zool. Soc. Lond.* 371; 1867) the *M. incanus* from the Azores (on the strength of a single individual taken in Fayal), he remarked that "the *M. tristis* of Mr. Wollaston's work must probably be referred to it [*i.e.*, to the *incanus*]." Whatsoever Mr. Crotch's insect may be, the Madeiran and Canarian one at all events is totally distinct from the European *M. incanus*—which is very like the *umbrosus*, but not so broad, most densely punctured, with its legs piceous, and its anterior tibiæ considerably dilated towards the apex—where there are three pretty conspicuous teeth externally. The corrected synonymy, therefore, of the species will stand thus:—

*Meligethes seniculus.*

*Meligethes seniculus*, Erich., Nat. der Ins. Deutsch. iii. 192 (1845). *Meligethes tristis*, Woll. [nec Sturm.], Ins. Mad. 124 (1854); Id., Cat. Mad. Col. 41 (1857); Id., Cat. Can. Col. 113 (1864); Id., Col. Atl. 111 (1865).

Hab.—Maderenses (*Mad.*, *Pto. Sto.*, *Des.*), et Canariensis (*Can.*, *Ten.*, *Gom.*, *Palma*, *Hierro*); ad flores vulgaris.

(Sp. 313) *Meligethes picipes.*

This *Meligethes* appears to be correctly identified with the European *M. picipes*, according to Mr. Rye—who however observes that the Madeiran examples are, on the average, a trifle larger than the ordinary British ones.

(Sp. 314) *Meligethes virescens.*

Mr. Rye informs me that this Canarian *Meligethes* (like the Madeiran *M. echii*) is quite unknown to him; and in all probability, therefore, it is not a European species.

(Sp. 315) *Meligethes varicollis.*

Concerning the Canarian form which I cited as a “var.  $\beta$ ” of this Madeiran *Meligethes* I have always had considerable doubt, though my desire not to multiply species unnecessarily induced me to register it as in all probability a geographical phasis of the latter. Yet a re-examination of the two, added to the decidedly-expressed opinion of Mr. Rye that they must be truly distinct, inclines me to correct what I feel now would almost certainly be regarded as a mistake by any Coleopterist who may have made this group his particular study; and in order therefore to point out the discrepancies between them, I think it will be desirable, whilst enunciating the Canarian species as a new one, to give also an emended diagnosis of the *M. varicollis*—its already described Madeiran ally.

*Meligethes varicollis.*

M. ovato-oblongus, convexus, aut æneo- aut cya-neo-viridis, grosse fulvo-cinereo pubescens, densissime

punctatus; prothorace latiusculo; antennis pedibusque ferrugineis; tibiis anticis latis, extus minute sed sub-inæqualiter serratis.

*Var. β.* [an sexualis distinctio?]—prothoracis lateribus, antennis pedibusque testaceis.

Long. corp. lin.  $1\frac{1}{4}$ .

*Meligethes varicollis*, Woll., Ins. Mad. 126 (1854); Id., Cat. Mad. Col. 41 (1857); (pars); Id., Col. Atl. 112 (1865).

*Hab.*—Maderenses (*Mad*); ad flores in sylvaticis intermediis, rarissimus.

An exceedingly rare *Meligethes*, being confined so far as I have hitherto observed to the intermediate sylvan districts of Madeira proper—where I have taken it, during the summer months, at the Ribeiro Frio and elsewhere.

#### *Meligethes Ryei*, n. sp.

M. ovato-oblongus, convexus, æneo-viridis, fulvo-cinereo pubescens, dense et profunde punctatus; antennis pedibusque ferrugineis; tibiis anticis latis, extus sat grosse sed inæqualiter serratis.

Long. corp. lin.  $1\frac{1}{4}$ .

*Meligethes varicollis*, (pars), Woll., Cat. Can. Col. 112 (1864); (pars); Id., Col. Atl. 112 (1865). *Meligethes erythropa*, Hart. [*nec Mshm.*], Geolog. v. Lanz. und Fuert. 140.

*Hab.*—Canarienses (*Lanz.*, *Fuert.*, *Ten.*); hinc inde ad flores, haud infrequens.

*Obs.*—Speciei praecedenti affinis, sed differt præcipue corpore profundius ac paulo minus dense punctato et pube sub-breviore sericato, prothorace (nisi fallor) semper concolori, ad latera sensim minus rotundato, quare angulis posticis paulo minus obtusis, antennis sublongioribus, necnon tibiis anticis extus (conspicue) grossius ac magis inæqualiter serratis.

*Species in honorem E. C. Rye, inter Entomologicos Britannicos longe lateque celebris, ob gratis amicissime oblatas dicata.*

As I have already stated elsewhere, this fine *Meligethes* is far from uncommon in the two eastern islands (Lanzarote and Fuerteventura) of the Canarian Group, but so far as I have observed hitherto it seems to be scarcer in the more western parts of the archipelago: nevertheless I have met with it sparingly in Teneriffe. Although with much the same brassy-green hue and pallid limbs as its Madeiran ally (the *M. varicollis*), it differs in being much more coarsely, and rather less closely, punctured than that insect, and clothed with a rather shorter sericeous pubescence; its prothorax (which is a trifle less rounded at the sides, and with consequently the hinder angles somewhat less obtuse) is apparently always concolorous (never being diluted in hue towards either external edge); its antennæ are appreciably shorter; and the outer edge of its anterior tibiae are more powerfully (though unequally) serrate.

## Fam. MONOTOMIDÆ.

p. 118 (genus MONOTOMA).

Motschoulsky has lately informed us (*vide Bull. Mosc.* 196; 1869) that he considers Lacordaire was mistaken in citing only three joints for the tarsi, and ten for the antennæ, in *Monotoma*, and in consequence placing it amongst the *Latridiidae*; for, in point of fact, the feet are tetramerous and the antennæ (as he asserts) composed of eleven articulations: and he argues therefore that, both in structure and habit, it belongs more properly to the *Colydiens* "a côté des Pyrenomèrides." Although I believe that Motschoulsky is incorrect as regards the antennæ, which seem to me to have but ten joints (the terminal one being completely lost, or swallowed-up, within the apex of the *one-articulated* club), he is evidently right about the tarsi; and the conclusion which he comes to about the affinities is exactly the same as I had myself arrived at twelve years before (*vide Cat. Mad. Col.* 67), though I did not so far deviate from the usually-received opinion as actually to place the genus amongst the *Colydiidae*. In my 'Canarian Catalogue' however, in 1864, I made the alteration, and during the following year adopted the same position in my 'Coleoptera Atlantidum'—though assigning it to a separate family, instead of to the Endophlœideous section of the *Colydiidae*.

## Fam. ENDOPHLŒIDÆ.

p. 120 (genus TARPHIUS).

After species 338, add:—

*Tarphius lutulentus*, n. sp.

*T.* subcylindrico-oblongus, subopacus, piceo-niger, setulis brevissimis fulvescentibus parce obsitus; prothorace subquadrato (ad latera paululum subæquilaterale rotundato), vix canaliculato; elytris concoloribus, rugose substriato-punctatis, fere simplicibus (*i. e.*, interstitiis alternis vix etiam obsolete interrupto-elevatis); antennis (breviusculis) pedibusque vel rufo-piceis, vel piceo-ferrugineis; tarsis (nisi fallor) in utroque sexu simplicibus, similibus.

Long. corp. lin. 1½-2.

*Tarphius inornatus* (*pars*), Woll., Cat. Mad. Col. 43 (1857).

*Hab.*—Maderenses (*Mad.*); castaneta pinetaque in montibus supra Funchal sita (præcipue inter 1700' et 2000' s. m.) colens,—vel sub ligno humi jacente vel sub cortice laxo emortuo, vulgaris.

*Obs.*—*T. inornato* (*et spinipedi*, olim.) plerumque paulo minor angustior, vix minus rugose sculpturatus, et setulis etiam sub-brevioribus (*sc. brevissimis*) obsitus, prothorace antice subangustiore, elytrorum interstutiis fere simplicibus (*i. e.*, minus evidenter subelevatis), antennis obsolete brevioribus, pedibus saepius paululum minus obscuratis, necnon præcipue (*ut mihi videtur*) tarsis in utroque sexu simplicibus, nec in maribus subtus spinosis.

When compiling my Madeiran Catalogue, in 1857, I felt it necessary to unite the *T. inornatus* and *spinipes* (both of which had been published in the ‘*Ins. Mad.*’),—further material having convinced me that the type on which I had established the latter was but a highly organized male, in reality, of the former, in which the front feet were quite as powerfully armed as the hinder ones; and every opportunity for observation has since satisfied me that I was correct, for the male tarsi of the *inornatus* are eminently variable as to the exact amount of their development,—occasional examples having only the posterior pair conspicuously spined, whilst in others (and indeed

in most) the spinule is *more or less* decidedly expressed in the anterior ones likewise. But whilst recording this fact, I distinctly expressed my belief that *perhaps* two species might nevertheless be concealed under the "*T. inornatus*" as *then limited*,—seeing that all the specimens, some thirty in number, which I had taken in the south of Madeira (where they occur, for the most part, beneath the bark and chippings of Spanish-chestnut trees and Firs on the mountains above Funchal) were not only a little smaller and narrower, but had their antennæ just perceptibly shorter, than those from the interior and north of the island; whilst at the same time the still more remarkable circumstance remained that *the whole of these southern individuals* (so far at least as the mere fact of their feet being *simple* enabled me to judge) *appeared to be females!*

Now it is this particular form (from the mountain-slopes in the south of the island), which appears to have its feet simple in both sexes, and which I admitted reluctantly into my emended diagnosis of the *inornatus* in 1857, that I have enunciated above under the title of *lutulentus*; and I will distinctly state that were it not for the apparent similarity of the male and female tarsi, I should scarcely perhaps have regarded it even now as more than a small and depauperated variety of that species. Yet the fact (if true) is so structurally important that I cannot but lay greater stress, in consequence, upon certain other minute characters which *per se* I might have looked upon as insignificant—even though they are sometimes so faintly appreciable that specimens are with difficulty separated from *female* ones of the *inornatus*. Indeed (apart from its feet) the *lutulentus* would seem mainly to differ from the *inornatus* in being on the average a little smaller and narrower (its length ranging from  $1\frac{1}{3}$  to 2 lines, whereas that of the latter ranges from 2 lines to  $2\frac{1}{3}$ ), a trifle less coarsely sculptured, and beset with, if possible, even shorter setæ still, in its prothorax being just appreciably (in proportion) less widened in front, in its alternate elytral interstices having a still less tendency to be obsoletely raised and interrupted (being, in point of fact, almost simple), and in its antennæ being if anything a little shorter, and its legs usually somewhat less darkened.

That the tarsal character however of the *lutulentus* is a real one appears more than probable from the fact that

I have lately examined 203 examples of it (taken during the last winter and spring in the chestnut-woods at "the Mount," above Funchal) without being able to discover a single individual which has even the slightest tendency to a spiniform development about the feet, and it is hardly likely that amongst such a mass of material both sexes should not be represented,—more particularly since in the case of the true *inornatus* (found in the more central and northern districts of the island) the males and females are numerically in about equal proportions. And indeed if we further take into account the individuals which I overhauled a few years ago, I must have seen, at the very lowest computation, 250 of them, and have yet been unable to detect any trace of the particular structure which is so conspicuous in the *inornatus*, and which we have been now considering.

(Sp. 348) *Tarphius Wolffii*.

The excessive difficulty attending the determination of some of the *Tarphii*, and (above all) the separating of the sexes in certain of the unarmed species, must be my excuse for feeling compelled to suppress the present one—which was founded in 1865 on two Madeiran examples which were taken by Dr. C. Wolff in the chestnut-plantations at "the Mount," above Funchal. Even now, however, I cannot but acknowledge the very great *prima facie* difference which exists between small and comparatively un-nodose specimens (such as those from which my diagnosis of the *T. Wolffii* was drawn out) and the much larger and more roughened ones which seem nevertheless to merge gradually into the others, and which represent the species which I described (from a unique individual, in 1854) under the title of *rugosus*. Yet remembering how greatly the sexes in many of the forms recede from each other, both in size and development of their elytral callosities, I have little doubt (after a careful inspection of fifty individuals which were taken at "the Mount" during the past winter and spring) that the smaller ones, in which the lumps are less elevated (though usually more rufescent), and which constitute my *T. Wolffii*, are merely the (unarmed) males of the larger and rougher ones; and I would therefore sink the *T. Wolffii* as a synonym of the previously-enunciated *T. rugosus*,—believing that all future observations will tend

equally to necessitate that step.\* I may just state, however, that without a sufficient series to judge from it is highly probable that collectors will hereafter be found, from time to time, who perhaps may feel inclined to reinstate the *T. Wolffii* as distinct; yet I nevertheless cannot see how any line of specific demarcation is to be drawn between any of the examples now before me,—even though some of them may have their prothorax a little more widened before the middle than others, and present at first sight a somewhat different aspect. The greater or less rufescence of the callosities however is in reality more apparent than real, and depends upon the amount of scales and setæ with which they happen to be clothed,—for even the most concolorous individuals when denuded of the latter will be seen to have their elytra obscurely maculated.

Apart from all other points of similarity, the comparatively *brown* hue and oblong-squarish, posteriorly truncated outline, and densely scaly surface of the whole of my fifty examples give a character to the *T. rugosus*, in all its phases, which when once seen it is impossible to mistake. The following, I may add, is the corrected synonymy of the species as now elucidated:—

(Sp. 354) *Tarphius rugosus*.

*Tarphius rugosus*, Woll., Ins. Mad. 144 (1854); Id., Cat. Mad. Col. 48 (1857); Id., Col. Atl. 124 (1865); *Tarphius Wolffii*, Id., Ibid. 123 et App. 21 (1865).

*Hab.*—Maderenses (*Mad.*); in castanetis longe supra urbem Funchalensem, præcipue inter 1700' et 2000' s. m., parce occurens. †

\* Considering how closely allied to the *T. truncatus* I regarded the *T. Wolffii*, when I had an opportunity (in 1865) of comparing the latter with my original types now in the British Museum, it may yet be open to inquiry whether the *truncatus* also should not be treated eventually as a variety, or state, of the *rugosus*.

† Before dismissing the Madeiran *Tarphii* I may just call attention to the fact that, during a two months' residence on the mountains above Funchal—in January, February, and March of 1870—we met with the *T. lutulentus* and *nodosus* in profusion, as well as, though less abundantly, the *rugosus* and *compactus*; and the same district produced a few examples of the very rare and interesting *T. angustulus*. A little later in the season a sojourn of two months at S. Antonio da Serra, on the mountains in the east of the island, afforded us the *T. echinatus*—a

p. 128 (genus PROSTHECA).

(Sp. 369) *Prostheca aspera*.

Hitherto this interesting little insect has been known only from the single example which was captured, about ten years ago, by the late Mr. Bewicke, at the Quinta da Palmeira, above Funchal; and I was glad, therefore, during our late sojourn in Madeira, to meet with a second. It was taken from beneath the loosened bark of a felled tree in the garden of the Quinta dos Jasminiéros, on the western outskirts of Funchal; so that I was probably mistaken in my conjecture (*vide Col. Atl.* 128) that the species would be found to be of *Euphorbia*-infesting habits.

Fam. CUCUJIDÆ.

p. 131 (genus LÆMOPHLÆUS).

After species 379, add :—

*Læmophlæus suffusus*, n. sp.

L. linearis, depressus, subopacus, sericeo-pubescent, ferrugineus sed in elytris (humeris exceptis) obscurioribus; capite prothoraceque grosse sed haud dense punctatis, illo vix canaliculato, fronte a clypeo (antice recte truncato) haud divisâ, oculis prominentibus, hoc longiusculo postice angustiore angulis posticis fere subrotundatis; coleopteris argute tenuiter striatis, striâ sublaterali costiformi; antennis brevibus, robustis, submoniliformibus.

Long. corp. lin. 1.

*Hab.*—Maderenses (*Mad.*); exemplar unicum olim cepit Dom. Bewicke.

*Obs.*—*Læmophlæus* colore subobscuro elytris (humeris exceptis) paulo obscurioribus necnon antennis brevibus robustis moniliformibus *S. axillari* affinis, sed paulo minor, sub-brevior, evidenter minus angustatus, magis depresso-

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species, although generally scarce, universal throughout that particular region; the *T. lauri* and *nodosus* in considerable numbers, the *compactus* and *inornatus*, both of them more sparingly, the minute *T. Loweii*, abundant (in company with the *Acalles Wollastoni*) amongst lichen on the trunks of various trees, the small, rounded *T. sylvicola*, by sifting fallen leaves and sticks at an elevation of about from 3000 to 4000 feet, the *T. rotundatus*, though not commonly, two examples of the rare and elegant *T. formosus*, and one of the equally scarce *T. angustulus*.

ac magis sericeo-pubescent, labro (ut mihi videtur) breviore, oculis magis prominentibus, capite prothorace quo argutius punctatis sed minus rugosis, hoc (fere ut in *L. clavicollis*) postice angustiore, neenon coleopteris magis regulariter argutiusque striatis et (nisi fallor) costâ unicâ, sc. sublaterali, utrinque solum instructis.

The single example from which the above diagnosis has been compiled was taken in Madeira by the late Mr. Bewicke, but whether near Funchal or in some more remote part of the island I have now no means of ascertaining. In its robust, abbreviated, submoniliform antennæ and rather dark ferruginous hue, the elytra with the exception of the shoulders being of a still obscurer tint, it resembles the *L. axillaris*; nevertheless it appears to be a trifle smaller, and relatively a little shorter and broader than that species, and it is likewise rather flatter and more thickly clothed with a coarser sericeous pubescence; its eyes also are more prominent, its upper lip appears to me (judging from the only type to which I have access) to be decidedly shorter, its head and prothorax (the latter of which is narrower behind, as in the *L. clavicollis*) are more distinctly punctured but less rugose, and its elytra are more uniformly and regularly (although delicately) striate, and seem to have only a single raised costa, namely a sublateral one, down each.

p. 135 (genus SILVANUS).

(Sp. 387) *Silvanus unidentatus*.

For this *Silvanus*, instead of “*unidentatus*, Oliv.,” read *bidentatus*, Fab. A more critical examination of it has convinced me that it should be referred to the latter of those species, rather than (as I had concluded) to the former. And I may add that the *S. bidentatus* differs from the *unidentatus* in being a little larger and more coarsely sculptured, in its limbs being proportionately a trifle longer and its eyes more developed, and in its prothorax (which is more evidently bisulcate down the disc) being a little more sinuate, or less straightened, at the sides, with the anterior angles a good deal more produced, and even the basal ones just appreciably more prominent—so as to occasion the prothorax to appear, relatively, a trifle less narrow behind. During our late sojourn in

Madeira we took the *S. bidentatus* in profusion, from beneath the dead bark of Spanish-chestnut trees, at "the Mount"—about 1700 feet above Funchal, the same locality in which the late Mr. Bewicke met with it (though more sparingly) a few years ago. The following entry into the catalogue will suffice to place on record the corrected synonymy of the species :—

*Silvanus bidentatus.*

*Dermestes bidentatus*, Fab., Ent. Syst. i. 233 (1792).  
*Silvanus unidentatus*, Woll. [nec Oliv. 1790], Cat. Mad. Col. 53 (1857); Id., Col. Atl. 135 (1865).

*Hab.*—Maderenses (*Mad.*) ; in castanetis editioribus longe supra Funchal, sub cortice laxe emortuo, vulgaris.

Fam. CRYPTOPHAGIDÆ.

p. 136 (genus CRYPTOPHAGUS).

(Sp. 390) *Cryptophagus saginatus*.

Until our recent sojourn in Madeira I had seen but two examples of this common European *Cryptophagus* (taken by the late Mr. Bewicke near Funchal) from any of these Atlantic islands; but whilst residing at S. Antonio da Serra, in the spring of 1870, we met with it abundantly, amongst decayed corn and refuse, in a granary adjoining the house in which we were living. In all probability, therefore, the species has become thoroughly established at Madeira,—having doubtless been introduced originally from some more northern country.

After this species (No. 390), add :—

*Cryptophagus pilosus.*

C. subovali-oblongus, leviter convexus, ferrugineus, pube longiusculâ depressâ dense vestitus, grosse punctatus; prothorace ad latera paululum subæqualiter rotundato, crenulato, angulis posticis argute determinatis sed paulo obtusis, dente anteriore retrorsum acuto, posteriore in medio sito.

Long. corp. lin. 1-1½.

*Cryptophagus pilosus*, Gyll., Ins. Suec. iv. 287 (1827); Sturm, Deutsch. Fna. xvi. 64, t. 313, f. A (1845); Erich., Nat. der Ins. Deutsch. iii. 352 (1846).

*Hab.*—Maderenses (*Mad.*); in granario quodam ad S. Ant. da Serra, tempore vernali 1870, sat copiose repertus.

A considerable number of examples of this European *Cryptophagus* were taken by my wife and myself at S. Antonio da Serra, during our late sojourn in Madeira,—amongst rotten corn and refuse, in company not only with the preceding species but also with the *C. aethiops* and *dentatus*. Like other insects of similar habits, it has doubtless become naturalized in the island from more northern latitudes.

### Fam. LATRIDIADÆ.

p. 148 (genus CORTICARIA).

Motschoulsky having, in his recent enumeration of such members of this genus as were known to him (*vide Bull. Mosc.* 1867), cited no less than four Madeiran *Corticaræ* which he assumed to be new, I have examined his short diagnosis with considerable care, and cannot feel justified in admitting more than *one* of them as indicating a genuine addition to the catalogue. Even that “*one*” indeed has so much the *primâ facie* aspect of the *C. fulva* (with which it is, for the most part, found in company) that I had until now overlooked it amongst supposed examples of that somewhat variable species; but I think nevertheless that it may be regarded as distinct, and I will therefore give a brief description of it (under Motschoulsky’s name of *ciliata*),—adding at the same time an emended one of what I believe to be the true *C. fulva*, in order to point out more exactly the characteristic features of the two. Of the three other Motschoulskian species I suspect that two (*attenuata* and *unicarinulata*) were founded upon small, accidental varieties, or states, of the *ciliata*, whilst the remaining one (*flavifrons*) may perhaps represent a mere immature individual of my previously-enunciated *C. inconspicua*—of the existence of which he does seem to have been aware. Until further evidence has been adduced I prefer to dispose thus of at any rate three out of the four supposed “species” of

Motschoulsky,—being unwilling to burden the Atlantic list with (to say the least) exceedingly doubtful additions in this rather obscure and insignificant group, and because his diagnoses appear to me fully to warrant the conclusions at which I have arrived.

If we except the *C. crenicollis*, which I admitted into the catalogue in 1854 on the evidence afforded by a single and somewhat unsatisfactory individual which was identified with that species about twenty years ago by Motschoulsky, and which (in the absence of the specimen itself for a re-examination) I cannot but suspect may perhaps prove to be but an accidental variety of the *C. fulva* (as now separated from the *ciliata*), the Madeiran *Corticariæ*, so far as I am acquainted with them, are remarkably well-defined, and (I will further add) may be cited in the following order:—

A. Prothorax ad latera crenulatus.—*pubescens*, Gyll.; *ciliata*, Mots.; *fulva*, Mann.; (?) *crenicollis*, Mann.; *maculosa*, Woll.; *fagi*, Woll.; *serrata*, Payk.; *inconspicua*, Woll.

B. Prothorax ad latera vel omnino vel fere simplex.—*transversalis*, Gyll.; *rotundicollis*, Woll.; *curta*, Woll.

p. 148. After species 422, add :—

*Corticaria ciliata*.

*C. ovali-oblonga*, convexa, subnitida, aut rufo-aut fusco-testacea (antennis pedibusque paulo dilutioribus), longe fulvo-pilosa; capite prothoraceque grosse punctatis, hoc transverso, ad latera rugose crenulato, pone discum foveâ mediâ rotundatâ sed haud profunda impresso; elytris paulo ventricosis, profunde sed subconfuse substriato-punctatis, intersticiis obsoletissime subconvexis.

Long. corp. lin.  $\frac{3}{4}$ -1.

*Corticaria fulva*, (pars), Woll. [nec Mann. 1844], Ins. Mad. 185 (1854); Id., Cat. Mad. Col. 65 (1857); Id., Col. Atl. 148 (1865). *Corticaria ciliata*, Mots., Bull. Mosc. 55 (1867). *Corticaria attenuata*,? Mots., Ibid. 67 (1867)—status minor? *Corticaria unicarinulata*,? Mots., Ibid. 76 (1867)—status minor?

*Hab.*—Maderenses (Mad.); domos in ipsâ urbe Funchalensi præcipue colens; forsitan ex alienis introducta.

*Obs.*—Species a sequenti (*i. e.*, nisi fallor, *C. fulva*, Mann.) parum distincta; differt corpore paulo convexiore et magis ovali (sc. sensim minus oblongo), necnon, praesertim in capite prothoraceque, grossius punctato, et pilis etiam sublongioribus obsito; prothorax magis transversus fovea media magis rotundata et paulo minus profunda impressus, elytra quoque sensim magis ventricosa.

Amongst the Madeiran specimens which I have hitherto, from time to time, assigned to the European *C. fulva* a certain number are more strongly punctured than the rest, and seem to differ also in a few other distinctive characters; and I have little doubt that they represent the particular form (perhaps a truly specific one) which Motschoulsky described, three years ago, under the title of *ciliata*. It is equally common, with what I believe to be the true *fulva*, in the houses of Fulchal,—the two species, which much resemble each other at first sight, being usually met with together; and both have doubtless been naturalized from some more northern country. The *C. ciliata* (if rightly understood, and identified, by me) may be known from the *fulva* in being a trifle more oval and convex (the prothorax being a little wider and more developed, and the elytra somewhat rounder and more ventricose), and clothed with perhaps even a still longer fulvescent pile, in its head and prothorax being much more coarsely punctured, and in the fovea with which the latter is impressed behind being appreciably shallower, as well as a trifle smaller and more rounded. Its colour, too, although often quite as pale as that of what I believe to be the *fulva*, is more frequently of a slightly darker tint—being generally *brownish* testaceous.

The *C. attenuata* and *unicarinulata*, of Motschoulsky, judging from their diagnoses, might well have been erected on accidentally small examples of this species; indeed I possess a specimen, undoubtedly conspecific with the rest, which answers almost exactly to his description of the former, and nearly as well with that of the latter; and until further evidence therefore shall prove the contrary, I must regard them both as referable to the *ciliata*.

(Sp. 423) *Corticaria fulva*.

*C. oblonga*, subnitida, rufo-testacea (antennis pedibusque paulo dilutioribus), longe fulvo-pilosa; capite pro-

thoraceque alutaceis et leviter punctatis, hoc subquadrato-cordato, ad latera rugose crenulato, pone discum foveâ mediâ magnâ profunda transverso-rotundatâ impresso ; elytris subrugulose substriato-punctatis.

Long. corp. lin.  $\frac{3}{4}$ -1.

*Latridius fulvus* (Chevr.), Villa, Cat. Col. Eur. 45 (1833). *Corticaria fulva*, Mann., in Germ. Zeitsch. v. 42 (1844); (*pars*), Woll., Ins. Mad. 185 (1854); Id., Cat. Mad. Col. 65 (1857); Id., Cat. Can. Col. 146 (1864); Id., Col. Atl. 148 (1865).

*Hab.*—Maderenses (*Mad.*) ; et Canariensis ? (Lanz., ? Ten. ?) ; præcipue in domibus, una cum specie præcedenti, degens.

As already stated, the present species (which I think is correctly identified with the ordinary European *C. fulva*) differs from the preceding one in being a little less convex and more strictly oblong (the elytra being rather more straightened, or less rounded at the sides), and in its sculpture being less coarse,—the head and prothorax (the latter of which is narrower and more cordate, and impressed with a somewhat larger, deeper, and a little more transverse fovea on its hinder disc) being more evidently *alutaceous*, and studded with comparatively shallow punctures. It is common, in company with the *C. ciliata*, in Madeira—where it may generally be found crawling on the inner walls of the houses ; and although I have no access at the present moment to my late Canarian types (which are now in the British Museum), I believe that the “*C. fulva*” recorded by me from Lanzarote and Teneriffe is referable to this species (*i. e.*, to what I regard as the true *C. fulva*), rather than to the *ciliata*.

(Sp. 427) *Corticaria inconspicua*.

Judging from the short diagnosis in the Bulletin de Moscou (p. 66, 1867), it seems highly probable to me that the *C. flavifrons* of Motschoulsky was founded upon an example (perhaps immature) of this insignificant little *Corticaria*—so like at first sight (though certainly distinct from) the common European *C. serrata* ; and therefore until further evidence has been adduced I prefer assigning it to the *C. inconspicua*, rather than running the risk

of multiplying "species" in a somewhat obscure group. The *C. inconspicua* is far from uncommon within the inhabited districts of Madeira,—occurring generally in houses and outhouses, and sometimes even under the bark of trees, irrespective of elevation. I originally met with it, in profusion, amongst bones and chippings of wood, in a small outhouse in Mr. Leacock's garden at the Quinta de São João, near Funchal; and during our late campaign we found it beneath the dead bark of Spanish-chestnut trees at "the Mount," as well as at S. Antonio da Serra.

After species 427, add:—

*Corticaria transversalis.*

*C. elongato-ovata*, nitidiuscula, piceo-brunnea (antennis, clavâ exceptâ, pedibusque piceo-testaceis), breviter cinereo-pubescent; capite profunde sed prothorace paulo levius ac confuse punctatis, hoc angustulo, subcordato-quadrato, versus angulos anticos obtuse rotundato, angulis ipsissimis posticis minute subrectis, ad latera integro (nec crenulato), pone medium late transversim impresso (impressione maximâ, sublunato-arcuatâ); elytris substriato-punctatis (fere quasi-subcrenulatis).

Long. corp. lin.  $\frac{3}{4}$ .

*Latridius transversalis*, Schüppel, in litt.; Gyll., Ins. Suec. iv. 133 (1827). *Corticaria transversalis*, Mann., Mon. 51 (1844).

Hab.—Maderenses (*Mad.*); in montibus longe supra Funchal, in horto quodam (inter quisquilias), semel deprehensa.

A single example of the common European *C. transversalis* was taken by my wife (on the 6th of January, 1870) during our late sojourn in Madeira—namely, amongst vegetable refuse, in the garden of the Quinta do Prazer, at "the Mount," above Funchal; and it is not unlikely that the species may have become naturalized accidentally from more northern latitudes. If such be the case, however, there can be no doubt that it is extremely rare,—for, in spite of a subsequent residence of two months on the actual spot where it was captured, and the most careful collecting from day to day, we

failed to procure even a second. Apart from its dark-brown hue and elongate-ovate outline, it may at once be known from the other Madeiran *Corticariæ* hitherto brought to light by the broad transverse arcuated impression which stretches completely across the hinder region of its (rather narrowed) prothorax.

(Sp. 431) *Corticaria tenella*.

It would appear from the Baron Harold's recent Catalogue that a *Corticaria* was published by Leconte (Proc. Ac. Phil. 301) under the title of *tenella* in 1855; so that the little Canarian species which I described in 1864 will, in consequence, require a new name. I would therefore propose for it that of *delicatula* (which seems to be unappropriated in this genus), and will cite its corrected synonymy thus:—

*Corticaria delicatula*.

*Corticaria tenella*, Woll. [nec Lec. 1855], Cat. Can. Col. 150 (1864); Id., Col. Atl. 151 (1865).

*Hab.*—Canariensis (*Can.*, *Ten.*, *Gom.*, *Palma*, *Hierro*); *passim*.

p. 152 (genus *LATRIDIUS*).

It is somewhat remarkable that the British *L. nodifer* should have escaped all former observations in the Atlantic islands, for during our late sojourn at Madeira we met with it in profusion throughout the entire district of "the Mount" (from about 1600 to 1900 feet above Funchal), and likewise in scarcely less abundance at S. Antonio da Serra. It was obtained chiefly from amongst garden-refuse, and by sifting, in cultivated spots; and I think it far from unlikely therefore that the species has become accidentally naturalized from some more northern country. At any rate it is an interesting addition to the catalogue, and all the more so since it has been recorded by Mr. Crotch as having been taken likewise in S. Miguel and Fayal at the Azores. The following brief diagnosis will suffice to inaugurate the species into the Madeiran list.

*Latridius nodifer.*

L. elongato-ovatus, niger vel piceo-niger, valde inaequalis, subnitidus; prothorace subquadrato-cordato, in disco bicostato, neenon utrinque costa secunda flexuosa (in medio evanescente, fracta) instructo; elytris grosse striato-punctatis, interstitiis alternis plus minus interrude elevatis, interstitio 2do pone medium nodum magnum efficiente, 4to magis costiformi ac magis elevato, subflexuoso sed anto apicem subito terminato, 6to (humerali) recto abbreviato, ante medium evanescente; antennis gracilibus pedibusque picescentioribus.

Long. corp. lin. 1.

*Latridius nodifer*, Westw., Int. to Ent. i. 155, pl. 13, f. 23 (1839); Steph., Man. Brit. Col. 129 (1839); Crotch, Proc. Zool. Soc. Lond. 373 (1867).

*Hab.*—Maderenses (*Mad.*); inter quisquilias, praesertim in cultis intermediis, copiose occurrentes.

After species 437, add:—

*Latridius Watsoni*, n. sp.

L. elongato-filiformis, pallidus, subopacus; capite prothoraceque angustissimis, rufo-testaceis, dense punctato-rugosis, illo elongato-quadrato, antice recto sat prominulo, oculis minutis prominentibus, hoc obtriangulari-cordato; coleopteris parallo-ellipticis, dense et grosse striato-punctatis, interstitiis 2do et submarginali alte elevatis, costas duas integras utrinque efficientibus; antennis pedibusque gracilibus, testaceis.

Long. corp. lin.  $\frac{3}{4}$ .

*Hab.*—Maderenses (*Mad.*); in domo quodam mox supra urbem Funchalensem a Rev<sup>do</sup> Dom<sup>o</sup> Watson parce deprehensus, cuius in honorem nomen triviale proposui.

Four examples of this remarkable and most elegant little *Latridius* have lately been detected by the Rev. W. B. Watson, crawling on the inner walls of his house—the Quinta do Valle—above Funchal; and I have much pleasure in naming it after its captor, whose indefatigable researches in various branches of natural science, especially conchology, are well known both in the island and elsewhere. Its wholly testaceous hue and marvellously

narrowed outline (the elongate-quadrata head and subcordate prothorax being narrower than in any *Latridius* with which I am acquainted), in conjunction with its minute eyes and parallel-elliptic elytra—which are densely and coarsely striate-punctate, and have their second interstice, as well as the submarginal one, elevated into an unbroken costa extending from the base to the extreme apex,—give it a character which it is impossible to mistake. Its head and prothorax (the anterior portion of the former, containing the mouth-organs, being much developed and prominent) are greatly roughened, and almost scabrose, and its limbs are slender.

The *L. Watsoni*, like most of the *Latridii*, and other insects of similar habits, is manifestly not truly indigenous in Madeira; though it may very possibly have become naturalized in some of the houses of Funchal. Indeed it is far from unlikely that it was originally of even American origin, for there is an example of it in the collection of the British Museum labelled as having been received from Chili.

#### Fam. MYCETOPHAGIDÆ.

p. 156 (genus SYMBIOTES).

(Sp. 447) *Symbiotes pygmæus*.

According to Tournier (*Pet. Nour. Ent.* No. 3), who professes to have seen Heer's type, the *Symbiotes pygmæus* is identical with the “*Epuræa rubiginosa*” of that author; and of course, therefore, if this should prove to be the case, the latter specific title (having been published nine years before the other) would have the priority. However I cannot but feel that there must be some mistake either on the part of M. Tournier, or else perhaps in the accidental transposition of Prof. Heer's types,—for, in the first place, there is no species published by Dr. Heer under the actual title of *Epuræa rubiginosa*; Erichson's genus *Epuræa* was not even established until two years after the appearance of the ‘*Fauna Coleopterorum Helvetica*.’ There is a “*Nitidula rubiginosa*,” it is true, which I fully admit, from its position in the genus, must in all probability be an *Epuræa*; but it is well-nigh incredible, judging from the diagnosis, that it

can have anything whatever to do with the Mycetophagideous genus *Symbiotes*,—Dr. Heer being far too acute a Coleopterist ever to have permitted a totally dissimilar form like the latter to be introduced amongst his ordinary *Nitidulæ*, in the situation moreover which the following specific sequence will show:—*N. flexuosa*, F., 10-guttata, F., *rubiginosa*, Heer, *silacea*, Hbst., *obsoleta*, F. Moreover, apart from the description itself, the very size given for the *N. rubiginosa* (namely a line and a quarter) renders it quite inapplicable to the *Symbiotes pygmaeus*—which measures from seven-eighths to (at utmost) one line. Until therefore further evidence is adduced, I shall refuse to believe that Heer's insect and Hampe's are even congeneric,—so much more, therefore, conspecific.

### Fam. HISTERIDÆ.

p. 168 (genus SAPRINUS).

(Sp. 485) *Saprinus ignobilis*.

In the Appendix to the 'Coleoptera Hesperidum' I called attention to the fact that De Marseul, without stating the reason why, has changed (*L'Abeille*, i. 353; 1864) the title of my *Saprinus ignobilis* into "*S. Wollastonii*." I think it sufficient just to mention this; though until some explanation on his part be forthcoming I cannot believe that the alteration is valid, not knowing on what principle it has been made.

(Sp. 489) *Saprinus nitidulus*.

The name "*semistriatus*" for this common and widely-spread *Saprinus* (which has been cited, also, by Mr. Crotch from the Azores) seems to have the precedence over "*nitidulus*." Hence its synonymy must be thus corrected:—

*Saprinus semistriatus*.

*Hister semistriatus*, Hbst., Käf. iv. 306 (1791). *Hister nitidulus*, Fab., Syst. Eleu. i. 85 (1801). *Saprinus nitidulus*, Woll., Ins. Mad. 215 (1854); Id., Cat. Mad. Col. 75 (1857); Id., Cat. Can. Col. 169 (1864); Id., Col. Atl. 171 (1865).

*Hab.*—Maderenses (*Mad.*), et Canarienses (*Lanz.*, *Can.*, *Ten.*); in cadaveribus, hinc inde abundans.

## Fam. APHODIADÆ.

p. 179 (genus OXYOMUS).

The two species which, in my ‘*Coleoptera Atlantidum*’ and previous publications, I regarded as *Oxyomi* have been formed (along with many others), by the Baron Harold (Col. Heft. ii. 100-1867), into a distinct group—under the title of *Atænius*; and consequently, since the *O. Heinekeni* has moreover been identified by him with the *Scarabæus stercorator* of Fabricius, they must for the future be cited as follows :—

*Atænius stercorator.*

*Scarabæus stercorator*, Fab., Spec. Ins. i. 22 (1781); Oliv., Ent. i. 3-89, t. 17, f. 155 (1789). *Oxyomus Heinekeni*, Woll., Ins. Mad. 228 (1854). *Oxyomus Heinekeni*, Id., Cat. Mad. Col. 79 (1857); Id., Col. Atl. 179 (1865).

*Hab.*—Maderenses (*Mad.*); sub putridis in inferioribus occurrentes.

*Atænius brevicollis.*

*Oxyomus brevicollis*, Woll., Ins. Mad. 229 (1854); Id., Cat. Mad. Col. 79 (1857); Id., Cat. Can. Col. 191 (1864); Id., Col. Atl. 179 (1865).

*Hab.*—Maderenses (*Mad.*), et Canarienses (*Gom.*, *Palma*); passim.

## Fam. MELOLONTIDÆ.

It will be sufficient to state here that Blanchard, in his ‘*Cat. de la Coll. Ent. du Mus. d’ Hist. Nat. de Paris*,’ published in 1850, has described a member of the genus *Hoplia* (under the name of *H. Peronii*) which is said to have been brought [doubtless by M. Péron] from Teneriffe. I can do no more than allude to this fact, for I have had so many instances forced upon my notice of the almost incredible want of accuracy displayed by many French entomologists *as regards their professed habitats* that it is next to impossible not to suspect that perhaps

some error may have occurred in the citation as "Teneriffan" of the exponent of a group of which I have seen no single representative throughout the numerous islands of these scattered archipelagos. Is it possible that M. Péron may have touched at some Mediterranean country, or island, *en route*, and afterwards mixed-up unintentionally a portion of his *collectanea* from two distinct regions? Be this as it may, I will at any rate, without holding myself responsible for the accuracy of the supposed *habitat*, just cite the short diagnosis of M. Blanchard, in order to call attention to the fact that a *Hoplia* (although totally undetected during any of our recent campaigns) may possibly be found to exist in the Canarian Group.

*Hoplia Peronii.*

"*H. aulica* affinis, sed distincta, prothorace angustiore; elytris oblongioribus, læte viridi-squamosis, pedibus tenuioribus, tibiarumque dente primo minore."

Blanchard, *loc. cit.* 72 (1850).

*Hab.*—Canarienses? (*Ten.?*); mihi non obvia, sed a Dom. Blanchard citata.

Fam. CETONIADÆ.

The observations which I have just made with respect to the *Hoplia Peronii* might be repeated here, for it appears to be on precisely the same authority that M. Blanchard has admitted into his Catalogue a *Trichius* (under the title of *T. Fortunaturum*) which purports to have come from Teneriffe. It is of course possible that the genus may have a representative in the Canarian archipelago, but I have certainly no other evidence of its existence in *any* of the various islands of these widely-scattered Atlantic Groups; and it is at least remarkable that two such conspicuous forms as *Trichius* and *Hoplia* should have escaped our combined researches during so many campaigns, and that yet both of them should be supplied by a single naturalist who appears to have made a passing visit to Teneriffe. I must be excused therefore, under the circumstances, if a slight suspicion should involuntarily arise that there may *perhaps* have been some unintentional mistake in M. Péron's habitats;

though as it is of course impossible to ascertain this for certain, I will (as in the case of the *Hoplia* already referred to) cite the diagnosis of M. Blanchard, while at the same time recording my conviction that further evidence is greatly needed in order to establish the species as a truly Canarian one.

*Trichius Fortunatarum.*

“*T. affinis præcedentibus* [sc. *zonatus*, Germ., *abdominalis*, Sch., et *fasciatus*, Linn.] ; thorace depresso, fere quadrato, denudato ; elytris aureis, sutura faciisque tribus nigris, prima secundaque interruptis.

Du voyage de M. Péron.”

Blanchard, Liste des Cét. du Museum, 21 (1842) ; Id., Cat. Col. Ent. 47 (1850).

*Hab.*—Canarienses ? (*Ten.* ?) ; a Dom. Blanchard citatus, sed mihi ignotus. Species dubia, a *T. zonato*, Europæ meridionalis Algeriæque, teste cl. Harold, vix distincta.

Fam. BUPRESTIDÆ.

p. 186. (genus *ACMÆODERA*).

(Sp. 533) *Acmæodera ornata*.

It would seem that there is a Fabrician Buprestid (of which I was not aware) bearing the specific title “*ornata*,” which enters into this genus ; and the Baron Harold appears therefore to have proposed for my Fuerteventuran *Acmæodera* the name of *elegans* instead. Hence, the corrected synonymy will be as follows :—

*Acmæodera elegans.*

*Acmæodera ornata*, Woll. [*nec Fab.*], Cat. Can. Col. 207 (1864) ; Id., Col. Atl. 187 (1865). *Acmæodera elegans*, Harold, Col. Heft. v. 223 (1869) ; Id., Cat. Col. 1410 (1869).

*Hab.*—Canarienses (*Fuert.*) ; semel deprehensa.

## Fam. MALACHIADÆ.

p. 196 (genus ATTALUS).

(Sp. 573) *Attalus rugosus*.

As in the case of the following species, a rather wider range has been ascertained for the present *Attalus* than what was indicated in the 'Coleoptera Atlantidum.' Until recently it had been observed only on the low sea-cliffs to the westward of Funchal; but during our late sojourn in Madeira we met with it (in company with the *Pecteropus rostratus*), amongst flowers, on the Ponta de São Lourenço; and I also perceive that a single example of it has been mixed up with my series of the *Pecteropus rostratus* which I collected in Porto Santo about twenty years ago. Hence it would seem to have much the same range, and habit, as that insect; for we may expect that it will be found to occur (at an equally low elevation) on the Desertas likewise. Apart from minor differences, it may readily be known from the *P. maderensis*, to which in outline and general aspect it is much allied, and which is peculiar to the *higher* altitudes of the Madeiran Group, by its more densely roughened and less shining surface, as well as by its flatter head, and by its slenderer and less pallid limbs. The following brief entry will suffice to place on record its more extended range—as lately ascertained.

*Attalus rugosus.*

*Pecteropus rugosus*, Woll., Ins. Mad. 249 (1854); Id., Cat. Mad. Col. 86 (1857). *Attalus rugosus*, Id., Col. Atl. 202 (1865).

*Hab.*—Maderenses (*Mad.*, *Pto. Sto.*); ad flores in inferioribus, præsertim juxta mare, saepe cum *Pecteropus rugoso* degens.

p. 202 (genus PECTEROPUS).

(Sp. 574) *Pecteropus rostratus*.

In the 'Coleoptera Atlantidum' I stated that this insect has been observed only in Porto Santo, and on the two southern Desertas; but during our late visit to

Madeira we met with it, rather abundantly, on the 30th of March, on the Ponta de São Lourenço—the low rocky promontory which stretches out, in the direction of the Desertas, in the extreme east of that island. Hence there is every reason to suspect that it will be found on the northern Deserta likewise, and that the species is consequently *universal* (on the sea-cliffs of a low elevation) throughout the Madeiran Group. It is remarkable however that, so far as Madeira proper is concerned, the São Lourenço promontory would appear to be its peculiar *habitat*; a fact which affords another instance of the curious affinity which that singular tongue of land possesses, not merely with the Desertas (from which it is separated by a channel of only nine miles in breadth), but even (and in a still more remarkable manner) with the more remote island of Porto Santo. I have already mentioned elsewhere that the Desertan examples are, on the average, a trifle larger and more roughly sculptured than those from Porto Santo, with their prothorax just appreciably wider (or less laterally-compressed), and with their tibiae more or less obscurely darkened; and this state I regarded as a “var.  $\beta$ ,” treating the Porto-Santan ones as *typical*. The specimens from Madeira proper are, I find, almost similar to those from the Desertas; and, moreover, amongst my *original* series from Porto Santo (collected in 1848 and 1850) there are several, I now perceive, which belong to the same rugulose form cited by me as the “var.  $\beta$ ;” though I am not the less persuaded, on that account, that the two states (although perhaps not so strictly “insular” as I had suspected) are but very slightly altered races of a single rather variable type. Nevertheless, in order to define their points of difference more exactly, and to place on record the more extended range of the “var.  $\beta$ ,” I will cite the species afresh as follows:—

*Pecteropus rostratus.*

*status a* (*typicus*).—Plerumque subminor, ac sensim minus rugose sculpturatus, prothorace sub-angustiore, *i. e.*, magis lateraliter compresso, pedibus saepius omnino pallidis. [*ins. Portus Sanctus.*]]

*status  $\beta$*  (*aberrans floricola*).—Plerumque submajor, ac sensim magis rugosè sculpturatus, prothorace paulu-

lum minus angustato, i. e., sensim minus lateraliter compresso, tibiis saepius plus minus evidenter obscurioribus. [ins. Madera, Portus Sanctus, Deserta Grandis, et Deserta Australis.]

*Pecteropus rostratus*, Woll., Ins. Mad. 250, tab. iv. f. 9 (1854); Id., Cat. Mad. Col. 86 (1857); Id., Col. Atl. 202 (1865).

*Hab.*—Maderenses (*Mad.*, *Pto. Sto.*, *Des.*, *Bugio*); ad flores in apricis minus elevatis, tempore vernali, hinc inde vulgaris.

#### Fam. MELYRIDÆ.

p. 206 (genus DOLICHOSOMA).

In a revision of the members of this group (Berl. Ent. Zeit. 136-140; 1867) Kiesenwetter states that the *D. Hartungii*, of the Canarian archipelago, will fall under his subgenus *Dolichophron*; and that the Madeiran and Mediterranean “*Dasytes illustris*” (usually cited, also, as a *Dolichosoma*), will enter the subgenus to which he has applied the name of *Psilothrix*. This latter species I may add, occurs also on the Great Salvage,—an example having lately been detected by myself in a bottle of Coleoptera which had been obtained by the Baron Paiva from that remote island.

#### Fam. ANOBIADÆ.

p. 225 (genus ANOBIA).

(Sp. 641) *Anobium striatum*.

It would appear that this common, widely-diffused *Anobium* must be cited as the “*domesticum*, Fourer.,” that name having the priority over Olivier’s “*striatum*.<sup>3</sup> Hence its synonymy should be thus cited:—

#### *Anobium domesticum*.

*Anobium domesticum*, Fourer., Ent. Par. i. 26 (1785). *Anobium striatum*, Oliv., Ent. ii. 16:9 (1790); Woll., Ins. Mad. 278 (1854); Id., Cat. Mad. Col. 92 (1857); Id., Cat. Can. Col. 250 (1864); Id., Col. Atl. 227 (1865).

*Hab.*—Maderenses (*Mad.*, *Des.*), et Canarienses (*Ten.*, *Gom.*, *Palma*); late sed parce diffusum.

After species 644, add :—

*Anobium nitidulum*, n. sp.

*A. cylindricum*, rufo-ferrugineum, nitidulum, grosse griseo-pubescentes, et parce (sed in prothorace paulo densius) granulatum, aut forsitan asperato-punctulatum. *A. molli* similimum, sed paululum minor, clarus rufescens, nitidior, minus dense et minus rugosus granulatum, et pube sensim longiore ac robustiore vestitum.

Long. corp. lin.  $1\frac{1}{2}$ —2.

*Hab.*—Maderenses (*Mad.*) ; a Dom. Anderson haud longe ab urbe Funchalensi, sc. ad Sanctum Antonium, inter pinos, olim captum.

Several examples of an *Anobium*, which were taken in Madeira by the late Mr. F. A. Anderson (namely at S. Antonio, near Funchal), have long been placed aside by me, unexamined, as in all probability small individuals of the European *A. molle*—a species which occurs, also, though sparingly, both in the Madeiran and Canarian archipelagos. A more critical inspection, however, shows them to be truly distinct; and I may add that Mr. Rye is equally of opinion that they cannot be regarded as any state, or variety, of the *molle*. They appear to differ from the latter in being on the average a little smaller, and of a clearer or more rufo-castaneous hue, in their granules (or asperated punctules, if so regarded) being more distant and minute, and in their surface being more shining, and clothed with a coarser pubescence. Mr. Rye has called my attention to an *Anobium* described by Mulsant (*Opusc. Ent.* 13, *Cah.* 117; 1863), under the name of *consimile*, which might possibly prove to be the one which we are now considering; but since the author says nothing about the manifest difference of sculpture (as compared with the *A. molle*), and leaves equally unnoticed its more shining and more coarsely pubescent surface, it is scarcely possible to treat his insect as conspecific with the Madeiran one.

#### Fam. TOMICIDÆ.

p. 236 (genus *TOMICUS*).

(Sp. 665) *Tomicus nobilis*.

This fine Canarian wood-borer is said by Ferrari (*Berl. Ent. Zeitsch.* 254; 1868) to belong to the subgenus *Cyr-*

*totomicus*; and he is further of opinion that it may possibly be, in reality, but a large local form of the *C. duplicatus*, Sahlb. (= *rectangulus*, Eichh., *in litt.*).

p. 239 (genus APHANARTHROUM).

In my definition of this genus (*vide* Ins. Mad. 292; 1854) I stated, unreservedly, the funiculus to be 3-articulate; and it was not until seven years afterwards, when compiling a paper on the "Euphorbia-infesting Coleoptera of the Canary Islands," for the 'Trans. of the Ent. Soc. of London,' that a re-examination of several of the antennæ (carefully mounted in Canada Balsam) convinced me that in reality only *two* joints were distinctly appreciable,—although in one species (the Madeiran *A. euphorbiæ*, from which my original diagnosis was drawn out) I fancied that I could still trace a third, infinitesimal articulation between the second one and the club: and this led me to the conclusion that it would perhaps be safer to regard the funiculus of *Aphanarthrum* as only *bi-articulate*,—though, at the same time, adding the qualification "that in one species, at all events, there are indications, beneath a high microscopic power, of what may possibly be an additional joint at the base of the capitulum." And I then remarked that "when thus emended, the diagnosis will better accord with what is likely to be observed; whilst the fact of an extra joint being faintly indicated in one of the exponents will leave it an open question whether the funiculus may not in reality be triarticulate, even though but two joints are distinctly traceable in the various members of the group" [see Trans. Ent. Soc. Lond., 3rd ser., i. 165; 1861]. Under these circumstances it is satisfactory to notice that Ferrari, in a paper published in the 'Berliner Ent. Zeitsch.' in 1868, came to much the same conclusion,—remarking (p. 254) that the *A. Jubæ*, *canariense*, and *euphorbiæ* appeared to him to have a 2-jointed funiculus, while in the *luridus* the funiculus seemed to be *indistinctly triarticulate*.

Taking the above considerations into account, I cannot altogether endorse the suspicion of Leconte (Trans. Am. Ent. Soc. ii. 152) that the *Hylastes pumilus* of Mannerheim, from Alaska, which forms the type of Eichhoff's genus *Dolurgus* (Berl. Ent. Zeitsch. 147; 1868), should

be referred to *Aphanarthrum*; for although Leconte thinks that Eichhoff was mistaken in regarding the funiculus of *Dolurgus* as 4-jointed, believing it rather to be triarticulate, the fact at least remains that at any rate *three* joints must be *thoroughly* apparent (as indeed he plainly affirms),—whereas in *Aphanarthrum* (as already shown) it seems more probable that the funiculus is composed of only two articulations.

p. 244 (genus CRYPTURGUS).

(Sp. 686) *Crypturgus concolor*.

Ferrari thinks it possible (*vide* Berl. Ent. Zeitsch. 254; 1868) that this may prove to be but a geographical form of the European *C. pusillus*, Gyll.

#### Fam. HYLESINIDÆ.

p. 250 (genus HYLASTES).

(Sp. 703) *Hylastes trifolii*.

This European *Hylastes*, which is locally rather abundant in the intermediate elevations of Madeira (where it would seem to be attached principally to the *Genista scoraria*, or common Broom), has been shown to be conspecific with the *obscurus* of Marsham. Its corrected synonymy, therefore, will be as follows:—

#### *Hylastes obscurus*.

*Ips obscurus*, Mshm., Ent. Brit. 57 (1802). *Hylesinus trifolii*, Müll., Journ. du Mont Tonnere (1803). *Hylastes trifolii*, Woll., Ins. Mad. 304 (1854); Id., Cat. Mad. Col. 99 (1857); Id., Col. Atl. 251 (1865).

*Hab.*—Maderenses (*Mad.*); præcipue inter ramiculos emortuos *Genistæ scorariae*, L., hinc inde in intermediis.

#### Fam. CURCULIONIDÆ.

p. 252 (genus RHYNCOLUS).

(Sp. 706) *Rhyncolus crassirostris*.

In the Appendix to my ‘Coleoptera Hesperidum’ I called attention to the fact that the title of *crassirostris*

for this insect must be changed, that name having been pre-occupied by Perris (in the 'Ann. de la Soc. Linn. de Lyon,' sér. 2, iv. 147) for a *Rhyncolus* from the south of France; and, having therefore at the time proposed that of *pinipotens* instead, the synonymy of the species will stand as follows:—

*Rhyncolus pinipotens.*

*Rhyncolus crassirostris*, Woll. [nec Perris], Trans. Ent. Soc. Lond. v. 367, pl. 18, f. 3 (1861); Id., Cat. Can. Col. 270 (1864); Id., Col. Atl. 252 (1865). *Rhyncolus pinipotens*, Id., Col. Hesp. (Append.) 275 (1867).

*Hab.*—Canarienses (*Can.*) ; lignum antiquum *Pini canariensis* in montibus parce destruens.

p. 259 (genus CAULOTRUPIS).

After species 726, add:—

*Caulotrupis pyricollis*, n. sp.

*C. ellipticus*, nigro-aeneus (rarius aeneus), subnitidus; prothorace pyriformi-conico, fere impunctato (sc. punctulis levissimis parce irrorato); elytris obsolete et levissime subpunctulato-striatis, striis postice paulo distinctioribus, antice evanescentibus; antennis breviusculis, ferrugineis, pedibus rufo-piceis.

Long. corp. lin.  $1\frac{1}{2}$ -2.

*Hab.*—Maderenses (*Mad.*); sub cortice, truncis humi jacentibus, lignoque recenter secto, in castanetis longe supra urbem Funchalensem (præsertim inter 1600' et 2000' s. m.), vulgaris.

*Obs.*—Species *C. conicollis* affinis, sed nisi fallor distincta; differt corpore plus minus evidenter angustiore aut magis oblongo-elliptico (nec obpyriformi), neenon minus ænescenti minusque nitido, prothorace sublongiore, subamploire, minus argute conico, elytris postice minus striato-inæqualibus.

I cannot feel altogether certain that this *Caulotrupis* is more than an extreme variety, or race, of the *C. conicollis*, —for the *Caulotrupides* appear to be eminently liable to slight alterations, both in outline and sculpture, according to the exact locality in which they severally occur.

Nevertheless since the present one, which abounds throughout the region of "the Mount" (from about 1700 to 2000 feet above Funchal), has very decided characters to separate it from at any rate the typical *C. conicollis*, I think it better, in spite of a few rather doubtful examples which have elsewhere occurred (and which would seem in some respects to be intermediate between the two), to treat it as distinct. In that particular district it often swarms beneath chippings of wood, and under logs and planks, and never appears to be mixed-up with the true *conicollis*—which occurs more especially towards the eastern parts of the island, being tolerably common at S. Antonio da Serra and along the high sea-cliffs towards the Brazen Head; yet this very fact, I am aware, might tend to imply that it is but a modification, or race, peculiar to the mountain slopes above Funchal. Be this however as it may (for it seems next to impossible to decide for certain), the *C. pyricollis* may be said to differ from the *conicollis* in being a little narrower and more oblong (the elytra being less expanded in the middle, and therefore the whole outline less pear-shaped or broadly-elliptic), in its prothorax being a trifle wider and more developed (being perhaps somewhat less strictly conical), in its elytra being more *even* behind (where there is less appearance of the *inequalities* occasioned by the anteriorly-evanescent sulcate striæ), and in its entire surface being, on the average, a little darker, less shining, and less brassy. Still, considering the variations which the members of this genus are apt to undergo in the different districts in which they are found, I would desire to record at any rate my *doubt* as to whether the *C. pyriformis* is more in reality than an extreme modification of the *conicollis*.

p. 265 (genus NANOPHYES).

(Sp. 738) *Nanophyes longulus*.

It would appear, according to Brisout de Barneville (*L'Abeille*, vi.), that this Canarian *Nanophyes* is conspecific with the *N. Chevrieri*, Boh., from southern and south-western Europe, and perhaps also with the (previously-described) *N. nitidulus* of Gyllenhal. Possessing no type of these species, I cannot test the conclusion for myself; but assuming the identification to be correct, the emended synonymy will stand thus:—

*Nanophyes Chevrieri.*

*Nanophyes nitidulus?* (Hoffm.), Gyll., in Schön. iv, 785 (1838). *Nanophyes Chevrieri*, Boh., in Schön. viii. (pars 2) 193 (1845). *Nanophyes longulus*, Woll., Cat. Can. Col. 299 (1864); Id., Col. Atl. 265 (1865).

*Hab.*—Canarienses (*Can.*, *Ten.*) ; super folia plantarum in herbidis intermediis humidiusculis, rarer.

p. 270 (genus ACALLES).

While residing at S. Antonio da Serra, on the mountains in the east of Madeira, during March, April, and May of 1870, I had an opportunity of observing the habits of at any rate four of the numerous species of *Acalles* peculiar to the island,—three of which may be said to be universal throughout that particular district. The species to which I refer are the *terminalis*, *dispar*, *Wollastoni*, and *globulipennis*,—all of which occur amongst the lichen which clothes the trunks and boughs of the trees, which, from the general humidity of that cloudy region, attains an unusual amount of development. The apple trees, on account of the marvellously thick Cryptogamic envelope of their branches and dead twigs, were more particularly rich in the lichen-infesting forms; and in such situations (accompanied by the equally common *Tarphius Loweii*) the *Acalles Wollastoni* might be said almost to abound. The *A. globulipennis* and *terminalis* were less plentiful,—yet widely distributed, and by no means scarce; and at a still higher altitude (perhaps from about 3000 to 4000 feet above the sea) the *A. dispar*, when searched for in the proper situations, literally swarmed. This last was usually to be met with congregating in the larger kinds of lichen which are accustomed to hang in dense masses from the gnarled trunks of the old laurels; and towards the summit of the Pico Gordo the few trees which are still remaining, amongst the thickets of the *Vaccinium maderense*, were pretty sure, in every instance, when well shaken into a net, to yield a liberal supply.

p. 284 (genus TORNEUMA).

We are informed by Mr. G. R. Crotch (*Pet. Nouv. Ent.* No. 12) that Fairmaire's genus *Crypharis*, founded (*Ann.*

*de la Soc. Ent. de France*, 498) in 1868 for the reception of a small blind Curculionid from Algeria and Sicily, is identical with my Madeiran and Canarian *Torneuma*,—his type however (*C. planidorsis*) being specifically distinct from both of the Atlantic ones. I need scarcely add, if this be the case, that the title of *Torneuma*, having been proposed in 1860, has of course the priority.

p. 296 (genus *PROCAS*).

(Sp. 822) *Procas picipes*.

During our late sojourn in Madeira a single example of this rare European Curculionid was captured by my wife at "the Mount," about 1700 feet above Funchal,—making the third which has hitherto been recorded from the Madeiran Group. Of the other two, the first was found by the late Mr. F. A. Anderson, at a high elevation, on the edges of the Great Curral, and the second by Mr. Bewicke—in his garden at the Quinta da Palmeira.

p. 298 (genus *LIXUS*).

(Sp. 829) *Lixus rufitarsis*.

According to Desbrochers des Loges (*Pet. Nouv. Ent.* No. 10), the European and Madeiran *L. rufitarsis* of Schönherr's work is in all probability a phasis of the widely spread Fabrician *L. filiformis*. Still, as this requires corroboration, I shall not until further evidence has been adduced disturb the present synonymy.

p. 304 (genus *HYPERA*).

According to a late revision of the Hypérides by M. G. Capiomont (*Ann. de la Soc. Ent. de France*, vii. et viii.; 1867-68), the species of this group which I cited in the 'Coleoptera Atlantidum' enter more properly into the genus *Phytonomus*, as there separated (and distinguished) from *Hypera* proper; so that, for the future, they must be corrected accordingly.

(Sp. 839) *Hypera lunata*.

This *Phytonomus* is said by M. Capiomont to be not specifically separable from the widely-spread *P. fasciculatus*;

but I cannot help thinking (as indeed I have long ago expressed) that the form which obtains throughout the Mediterranean region and the Atlantic islands (extending even to Egypt and Abyssinia), and which is a little larger and differently marked, cannot be absolutely identified with the one which occurs in sub-northern Europe; and if therefore the latter be the true *fasciculatus* of Herbst, it follows that the other (which is undoubtedly Olivier's *dauci*, and which I subsequently described under the name *lunatus*) must be accepted as distinct.\* Under these circumstances, therefore, I will not at present amalgamate them; though the title under which the species has hitherto been acknowledged by me must be changed,—that of “*dauci*” (which until lately I was not aware had been actually published by Olivier) having of course the priority.

As mentioned in my ‘Coleoptera Atlantidum,’ the *P. lunatus* (*i. e. dauci*) is universal throughout the Madeiran and Canarian archipelagos — Gomera being the only island in the two Groups on which it does not happen, as yet, to have been observed; nevertheless Capiomont, in accordance with that strange want of precision as regards *habitat* which is so characteristic of the French entomologists, gives merely (for its Atlantic dissemination) “*L'île de Madère*,”—thus ignoring altogether its Canarian range; and that too whilst citing the *P. irroratus*, which is *only* Canarian, as found equally in “*Madeira!*” Assuming it therefore to be distinct from the typical *fasciculatus* of Herbst, the emended synonymy of this *Phytonomus* will be as follows:—

### *Phytonomus dauci.*

*Rhynchænus dauci*, Oliv., Ent. v. 127, t. 35, f. 542 (1793). *Phytonomus dauci*, Brullé, in W. et B. (Col.) 72 (1838). *Hypera lunata*, Woll., Ins. Mad. 398 (1854); Id., Cat. Mad. Col. 118 (1857); Id., Cat. Can. Col. 326 (1864); Id., Col. Atl. 304 (1865). *Phytonomus fasciculatus* (*pars*), Cap., loc. cit. 129 (1868).

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\* Even Capiomont himself remarks that “En général, les *fasciculatus* du nord de l'Europe sont plus foncés en couleur et plus petits que ceux du midi, et surtout que ceux du nord de l'Afrique et de l'Asie occidentale” (*loc. cit.* 131).

*Hab.*—Maderenses (*Mad.*, *Pto. Sto.*, *Des.*), et Canariensis (in *Gom.* sola haud observatus); sub lapidibus in aridis, præsertim calcarii inferioribus, late diffusus.

(Sp. 840) *Hypera irrorata.*

While recording it properly as Canarian, M. Capiomont (as just stated) misquotes this insect (*loc. cit.* 121) as likewise *Madeiran*, and even refers it (in general terms) to the ‘*Insecta Maderensia*;’ though, of course, had he taken the trouble to look into that volume he would have seen at once that it was *not* contained there. This however is but one instance out of many (alluded to, *passim*, in my Canarian Catalogue and elsewhere), in which the excessive inaccuracy of the French entomologists, as regards *habitats*, is well-nigh incredible. The fact is, that the *P. irroratus* has been observed hitherto only in Lanzarote and Fuerteventura—the two eastern islands of the Canarian archipelago.

After allowing it to be truly distinct, M. Capiomont then states that he believes, on re-consideration, that it is a variety of the *P. isabellinus*—a species which is found in Arabia, Egypt, and Algeria; but I suspect that in this conjecture he is wrong,—for I compared the Lanzarotan and Fuerteventuran insect very diligently with types of the *isabellinus*, and pointed out in my Canarian Catalogue (p. 327) the exact characters, one or two of them being structural ones, in which it seemed to me to differ from that species. Therefore, until further evidence has been adduced, I certainly shall *not* refer the *H. irroratus* to the *isabellinus*.

(Sp. 841) *Hypera murina.*

In my ‘*Ins. Mad.*’ and Madeiran Catalogue (published, respectively, in 1854 and 1857) I treated the common *P. murinus* and *variabilis*, however nearly related *inter se*, as specifically distinct; but in 1865, when compiling the ‘*Coleoptera Atlantidum*,’ I had so thoroughly satisfied myself (as I thought) that they merge imperceptibly into each other that I made up my mind to regard them as but phases of a single plastic form, and cited them accordingly. Yet M. Capiomont, in his late revision of the Hypérides, has expressed his conviction that, after

all, they are *not* conspecific; so that, on the strength of so high an authority, and so careful a monograph, I have practically no choice left but to accept the conclusion at which he has arrived, and to revert to my own opinion as originally expressed. Without discussing their distinctive features afresh, I may add that, since both forms (whether truly specific or not) do undoubtedly occur both in the Madeiran and Canarian archipelagos, their corrected synonymy may be thus tabulated, and the "*H. murina*" as defined in the 'Col. Atlant.' consequently cancelled.

*Phytonomus murinus.*

*Curculio murinus*, Fab., Ent. Syst. i., ii. 463 (1792).  
*Hypera murina*, Woll., Ins. Mad. 399 (1854); Id., Cat. Mad. Col. 118 (1857). *Hypera variabilis* (pars), Id., Cat. Can. Col. 328 (1864). *Hypera murina* (pars), Id., Col. Atl. 305 (1865). *Phytonomus murinus*, Cap., loc. cit. 199 (1868).

*Hab.*—Maderenses (in *Ilheo Chão* sola haud detectus), et Canarienses (ins. *omnes*); præcipue in cultis, hinc inde vulgaris.

*Phytonomus variabilis.*

*Curculio variabilis*, Hbst., Käf. vi. 263 (1795). *Hypera variabilis*, Woll., Ins. Mad. 400 (1854); Id., Cat. Mad. Col. 119 (1857); (pars), Id., Cat. Can. Col. 328 (1864). *Hypera murina* (pars), Id., Col. Atl. 305 (1865). *Phytonomus variabilis*, Cap., loc. cit. 205 (1868).

*Hab.*—Maderenses, et Canarienses; una cum specie præcedenti, nisi fallor, degens.

p. 309 (genus ATLANTIS).

(Sp. 858) *Atlantis noctivagans*.

My attention having been drawn by T. S. Leacock, Esq., during our late sojourn at Madeira, to the fact that an *Atlantis* has long been known in the vineyards, in most parts of the island, under the name of the "besta da vinha," from causing great injury to the vines—the young shoots of which it would often entirely destroy, I

took a considerable series of it from his vineyard at S. João, near Funchal, hoping that the examples thus obtained might enable me to clear up one or two doubtful points concerning some of the closely-allied forms which I had originally published as specifically distinct, but *two* of which I afterwards suppressed,—feeling it more probable that they were in reality but local races of the (evidently variable) *A. noctivagans*. Accordingly, having likewise captured a long array of individuals, barely differing at first sight from the others, at S. Antonio da Serra, I have been examining the two sets with unusual care,—being satisfied that if there is more than a single species concealed amongst the three forms which I admitted into my emended definition of the *A. noctivagans* in 1857, *two* at any rate would be likely to present themselves amongst my series from regions so dissimilar, and remote, as the vineyards around Funchal and the elevated mountain-district of S. Antonio da Serra. The result is that, despite the *primita facie* resemblance of the whole, I cannot but believe, as I did originally in 1854, that, after all, there must be *two species indicated* (one found in the higher altitudes, and the other in the lower), and that consequently I was mistaken when, in my subsequently-published (and re-adjusted) Madeiran Catalogue, I referred them both (contrary to my original conviction) to a single plastic type. Yet at the same time the extreme difficulty of ascertaining the true specific limits of these variable, scale-covered *Cyclomides* must be my excuse if even now I am in error, when endeavouring to re-instate at all events *one* of the two forms which, although treated in the ‘*Insecta Maderensis*’ as truly specific, I afterwards suppressed.

Since the true *A. noctivagans* (as enunciated by me in 1854) clearly attains its maximum in the laurel regions of a high altitude (being more particularly abundant from about 2000 to 5000 feet above the sea), I had always thought it extremely improbable that it could be absolutely conspecific with the particular form (so much resembling it) whose manifestly normal range is the vineyards and cultivated grounds of the lower districts; yet the differences were so slight between the two, and *both* forms were so inconstant, that it was difficult to arrive at a satisfactory solution of the problem. But, taking their habits again into consideration, I am inclined to believe now that the

one differential character which I have been able to detect (slight though it be) must suffice for their specific separation. Fortunately that character is a structural one, and I do not perceive that it is subject to any great amount of instability. It consists in the exact shape of the "heel," or projecting process which constitutes the inner apical angle of the two hinder tibiæ in the male sex,—a kind of compressed spur, which in the *A. noctivagans* terminates in an acute prominent angle, but in the allied form from the lower regions in a *comparatively* rounded or obtuse truncate plate. This latter species includes the *A. lauripotens* and *australis* of my 'Insecta Maderensis;' and it is usually, likewise, a trifle larger, on the average, and more densely and *softly* pubescent, than the genuine *A. noctivagans* of the higher altitudes, as well as perhaps a little more ferruginous or less brightly tessellated; and in order therefore to place on record the conclusion at which I have now (again) arrived, that the *lauripotens* (so destructive, and abundant, in the vineyards around Funchal) should be treated as distinct from its ally, I will cite it afresh, and correct its synonymy, as follows: \*—

*Atlantis lauripotens.*

*Atlantis lauripotens*, Woll., Ins. Mad. 369 (1854).  
*Atlantis australis*, Id., Ibid. 370 (1854). *Atlantis noctivagans* (pars), Id., Cat. Mad. Col. 114 (1857); (pars), Id., Col. Atl. 311 (1865).

*Hab.*—Maderenses (*Mad.*) ; in cultis inferioribus abundans: præsertim in vinetis ramulos vinearum destruit.

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\* Even though abundant, more particularly, in the *vineyards* of a low elevation, I do not think it necessary to adopt the name of *australis* for this species, in preference to that of *lauripotens*,—(1) because the original diagnosis of the latter (in the 'Ins. Mad.') agrees more accurately with the particular form which I wish now to define, and (2) because I have little doubt (since the vine is not truly indigenous to Madeira) that the *Atlantis* in question is in reality a laurel insect (perhaps common in the lower districts before the primeval forests were cleared away) which has simply *adapted* its mode of life to the altered circumstances of the island. Whether, however, this "adaptation" may in any way account for the slight structural peculiarity which it now presents, it would be idle even to speculate.

(Sp. 869) *Atlantis œnescens.*

This Madeiran *Atlantis*, which I had regarded hitherto as somewhat scarce, appears to be the common species throughout the mountain region of S. Antonio da Serra,—where, during March, April, and May of 1870 we met with it in profusion, by sifting fallen leaves and rubbish, particularly in sylvan spots. It ascends however to a very high altitude, being equally common towards the summit of the Pico Gordo and in the direction of the Poizo; and this indeed accords with the habitat of my original types, which were taken “on the lofty upland ridges between the Fonte das Moças and the Pico do Areeiro,—from about 4000 to 5000 feet above the sea. It is very nearly allied to the *A. ventrosa*—which is found likewise at a high elevation, though more frequently on the exposed mountain-slopes; but it may be known from that species by being, on the average, rather smaller, shorter, and more ovate (or ventricose), as well as just appreciably more shining and brassy, with its limbs perceptibly paler or more rufescent. Its antennæ moreover are, if anything, a trifle shorter,—the funiculus joints a little more abbreviated.

## p. 327 (genus SCOLIOCERUS).

It would appear that this genus is, after all, identical with *Cathormiocerus* of Erichson, though, in the absence of a type of the latter from which to form an opinion, I pointed out a few characters (in my diagnosis of it in 1854) which I thought might perhaps serve to separate it therefrom. Seidlitz, however, in his late revision of the *Otiorhynchides* (*vide Berl. Ent. Zeitsch.*, 1868), seems to have no doubt on the matter; and Mr. Rye (*Ent. Month. Mag.* 151; 1870) goes so far as to question whether “future entomologists will consider *Cathormiocerus* as in reality distinct from *Trachyphlaeus*.” Be this however as it may (and the members of the two groups are certainly, as regards their structure, barely distinguishable from each other), *Scoliocerus* it is clear must, at any rate, as a genus, be suppressed; and I would therefore desire for the future to cite the two Madeiran Curculionids which I have hitherto referred to it, as *Cathormioceri*. I may also add that the *C. curvipes* does not appear to be peculiar (like the *C. maderæ*) to that island, it having been observed during the last few years both in France and Algeria.

p. 328 (genus CÆNOPSIS).

(Sp. 914) *Cœnopsis Waltoni*.

Until our late visit to Madeira the admission of this European Curculionid into the island list was dependant upon a single example which was taken, a few years ago, by the late Mr. Bewicke, at "the Mount"—about 1700 feet above Funchal. But during our sojourn at the Mount, in January, February, and March of 1870, we met with it rather abundantly, in the grounds of the Quinta do Prazer,—not merely beneath logs and chippings of wood, but more particularly by sifting fallen leaves. I did not observe it, however, in any other district; and during an after residence at S. Antonio da Serra, although the *Trachyphlaeus scaber* (which so much resembles it) was tolerably common, there was no appearance of *Cœnopsis*.

#### Fam. BRUCHIDÆ.

p. 340 (genus *Bruchus*).

(Sp. 943) *Bruchus subellipticus*.

According to Kraatz (Berl. Ent. Zeitsch. 331; 1869), this *Bruchus* is the *irresectus* of Schönherr's 'Gen. et Spec. Cœr.' an insect recorded as Persian, and distinct from the *B. mimosæ*—with which, in that work, in habit and affinity, it is compared.\* I had always felt it probable indeed that the *B. subellipticus* would sooner or later be identified with some known form, for it had every appearance in Madeira of having been naturalized through the medium of commerce; nevertheless being unable to identify it, I was compelled to treat it as new. It has manifestly acquired a wide geographical range; and Mr. Crotch lately re-described it, under the name of *B. Breweri*, from the Azores. Its emended synonymy will stand thus:—

#### *Bruchus irresectus*.

*Bruchus irresectus*, Fhs., in Schön. Gen. et Spec. Cœr. v. 18 (1839). *Bruchus subellipticus*, Woll., Ins. Mad.

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\* Kraatz likewise considers the "*obtectus*, Schön." to be identical with the *B. irresectus*; but as the only *Bruchus* in Schönherr's work which bears that title is a North-American one described by Say, and is placed at the end of the genus amongst the forms which Schönherr had not inspected, I feel doubtful whether the Louisiana species can be referred safely to the *irresectus* and *subellipticus*.

420 (1854) ; Id., Cat. Mad. Col. 123 (1857) ; Id., Col. Atl. 341 (1865). *Bruchus Breweri*, Crotch, Proc. Zool. Soc. Lond. 379 (1867).

*Hab.*—Maderenses (*Mad.*) ; hinc inde in domibus et granariis.

#### Fam. CRYPTOCEPHALIDÆ.

p. 355 (genus CRYPTOCEPHALUS).

(Sp. 976) *Cryptocephalus crenatus*.

This Madeiran *Cryptocephalus* appears to be much attached to the various kinds of *Sedum* and *Sempervivum* ; and during our late sojourn at “the Mount” (about 1700 feet above Funchal) we met with it in profusion on the fleshy leaves of a shrubby species of one of those plants,—in company with the exceedingly rare *Ceuthorhynchus lineatotessellatus*, which is equally partial to the *Seda* and *Semperviva*.

#### Fam. CHRYSOMELIDÆ.

p. 361 (genus MNIOPHILOSOMA).

When defining this genus (*Ins. Mad.* 433) in 1854, I stated that the four anterior feet of the male sex have their basal joint considerably enlarged. A more careful inquiry has just convinced me that the articulation is almost as greatly developed in the hinder pair likewise ; so that I would desire to make a correction to that effect in my original diagnosis. Moreover, although I noticed the fact that the *M. laeve* has sometimes a perceptibly greenish tinge (like the individual figured in the ‘*Ins. Mad.*’) whilst at others it is entirely black, I omitted to mention that the examples in the latter predicament (which I may here cite as the “var.  $\beta$ . *obscurior*”) have their limbs not only less *clearly* rufo-testaceous, but also their antennal club and tarsi more or less conspicuously darkened.

#### Fam. HALTICIDÆ.

p. 364 (genus LONGITARSUS).

(Sp. 1007) *Longitarsus saltator*.

I find that this large *Longitarsus* is attached to a *Scrophularia* which is common throughout the inter-

mediate elevations of Madeira. During our residence at "the Mount," in January, February, and March of 1870, we met with it sparingly on that particular species of plant; and I subsequently captured it, under similar circumstances, though still more rarely, at S. Antonio da Serra.

Fam. COCCINELLIDÆ.

p. 377 (genus EPILACHNA).

Mr. G. R. Crotch, who is engaged just now in studying the *Coccinellidæ*, informs me that he believes my Canarian *Epilachna bella* and *4-plagiata* belong to the genus *Platynaspis*, and that the *10-plagiata* of the Madeiran and Canarian archipelagos is most likely referable to the genus *Pharus*,—being manifestly allied to the *P. setulosus* from Algeria.

p. 378 (genus COCCINELLA).

I may just mention that two examples of the common European *Coccinella mutabilis* (so general in the Madeiran Group), and one of the well-nigh cosmopolitan *C. 7-punctata*, have lately been detected by myself amongst some specimens (in spirits-of-wine) which had been obtained by the Baron Paiva from the Great Salvage; so that the very limited Coleopterous fauna of that small and remote island must be credited accordingly.

p. 382 (genus SCYMNUS).

After species 1054, add :—

*Scymnus epistemooides*.

*S. ellipticus*, niger aut subpiceo-niger, nitidulus, leviter punctulatus, parce cinereo-pubescent; prothorace breviter subconico, concolori; elytris subventricosis; labro, antennis, palpis pedibusque infuscate testaceis.

Long. corp. lin.  $\frac{3}{4}$ .

*Scymnus epistemooides*, Woll., Col. Hesp., Append., 276 (1867).

*Hab.*—Maderenses (*Pto. Sto.*) ; exemplar unicum olim collegit Dom. Bewicke.

*Obs.*—Species nigra, aptera, *S. limnichoides* propinquans; sed subminor (?), magis elliptica (*i. e.*, antice et postice subacutior), vix minus nitida, et conspicue levius minutiusque punctata, prothorace magis conico (antice sensim angustiore), etiam ad latera concolori, lineâ basali magis per basin ipsissiman sitâ, elytris paulo magis ventricosis (pone basin utrinque magis rotundatis).

In the Appendix to my ‘*Coleoptera Hesperidum*’ I stated that “the single example from which the above diagnosis has been compiled was taken in Porto Santo, several years ago, by the late Mr. Bewicke, and was inadvertently identified by myself with the *S. limnichoides*—to which in its size, general affinity, apterous body, and dark colour it closely approaches. The specimen having however, since the death of Mr. Bewicke, fallen into my possession, I am enabled to examine it with greater care, and I now perceive that it is unquestionably distinct from the *limnichoiles*—though belonging clearly to the same type. Whether it be a trifle smaller than that species I can, from the evidence afforded by a single individual, scarcely say; but it is considerably more elliptical in outline, or sharper before and behind (the prothorax being more conical, or attenuated in front, and the elytra more rounded outwards behind the shoulders); it is also much more lightly, and finely, punctulated; and its prothorax, which has the basal line placed even still nearer to the extreme edge, does *not* appear (at any rate in the example before me) to be diluted in hue towards the sides. Although there is no label appended to it, I have said that it was captured in Porto Santo because I distinctly recollect that it was communicated to me by Mr. Bewicke as found by himself in that island.”

#### Fam. OPATRIDÆ.

p. 414 (genus HADRUS).

Fairmaire (*Ann. de la Soc. Ent. de France*, 546; 1856) says that the *Opatrum carbonarium* of Schönherr is a member of this genus; but, as rightly observed by Lacordaire (*Gen. v. 274, note 1*), Schönherr has no *Opa-*

trum under that title in his published works. Accordingly the Baron Harold, in his recent Catalogue (p. 1939), makes the *Platynotus carbonarius* of Quensel (defined, in 1806, in Schönherr's 'Synonymia Insectorum,' i. 142, note *a*) identical with the common Madeiran *Hadrus cinerascens*; and if his conjecture be correct, of course the former name will have the priority over Dejean's one of *cinerascens*; but since the *habitat* given for the *P. carbonarius* is "in insula Java, ad Augeri," and it is likewise difficult, even *assuming* that a mistake had arisen as regards the country from which it was obtained, to decide as to which of the four nearly-allied *Hadrus* the title of *carbonarius* should belong, I prefer—until *both* of these points have been satisfactorily cleared up—to quote it still as the *H. cinerascens*.

#### Fam. ULOMIDÆ.

p. 418 (genus ADELINA).

According to the recent Catalogue of Gemminger and Harold (p. 1987), this genus is identical with *Sitophagus* of Mulsant (Col. Fr., Latig., 264; 1854); but I have not had any opportunity, myself, of comparing a type of the latter with my *Adelina farinaria*.

#### Fam. HELOPIDÆ.

p. 426 (genus HELOPS).

(Sp. 1175) *Helops arboricola*.

Of this large and apparently scarce Madeiran *Helops* I took a single example, beneath the loosened bark of an old Spanish-chestnut tree (during our sojourn at "the Mount"), about 1800 feet above Funchal. I think this locality worth placing upon record, because the only spots in which the species had hitherto been observed are the Vasco Gil ravine and the Rib. de Santa Luzia,—in both of which it was captured, under precisely similar circumstances as by myself at the Mount, by the late Mr. Bewicke.

(Sp. 1177) *Helops asper*.

Although I still believe that what I regarded in the 'Ins. Mad.' as the "state  $\beta$ " of this insect is truly conspecific with the "state  $\alpha$ " (for the two forms seem to merge gradually into each other), nevertheless as there is such a decided *primâ facie* difference between the two

that some naturalists might perhaps be induced to treat them as distinct, I will propose for the former (which occurs in the higher elevations, and is the more lightly sculptured of the two, with the hinder edge of its prothorax more arched-out, or sinuate) the varietal name of *obliteratus*, retaining (as formerly) the "state *a*" for the type.

(Sp. 1179) *Helops congener*.

It appears that the title of *congener* for this Canarian insect cannot be retained, a *Helops congener* having been described by Reiche (*vide Ann. de la Soc. Ent. de France*, 372) in 1861. Hence, the name of *conformis* having been proposed for it, in 1870, by Gemminger, the synonymy of the species will stand thus:—

*Helops conformis*.

*Helops congener*, Woll. [*nec Reiche, 1861*], Cat. Can. Col. 504 (1864); Id., Col. Atl. 429 (1865). *Helops conformis*, Gemm., Col. Heft. vi. (1870).

*Hab.*—Canariensis (*Can.*, *Ten.*, *Palma*, *Hierro*); hinc inde, præcipue in intermediis, congregans.

(Sp. 1187) *Helops subdepressus*.

Until our late visit to Madeira I had not myself ever captured this very distinct *Helops*,—three examples, which were found by Mr. Mason, and three more by Mr. Bewicke, being all that had come beneath my notice; but during our sojourn at S. Antonio da Serra, in March, April, and May of 1870, we met with it not only amongst lichen on the trunks of various trees, but more particularly under the loose outer fibre of the gigantic Heaths (*Erica arborea*, L.) for which the little wood known in that upland region as the "Circa" is so justly celebrated.

Fam. SCYDMÆNIDÆ.

p. 448 (genus *SCYDMÆNUS*).

(Sp. 1236) *Scydmænus castaneus*.

The late Dr. Schaum having apparently (*vide Mon. 21*) published a *Scydmænus* under the above title in 1841,

the name of *castanicolor* has been proposed for the present Canarian species by the Baron Harold; and the synonymy of it will consequently stand thus:—

*Seydmænus castanicolor.*

*Seydmænus castaneus*, Woll. [nec Schm. 1841], Col. Atl. 449 (1865). *Seydmænus castanicolor*, Har., Col. Heft. iii. 164 (1868).

*Hab.*—Canarienses (*Gom.*, *Hierro*) ; sub marcidis foliisque dejectis a DD. Crotch repertus.

p. 449. After the genus *SCYDMÆNUS*, add :—

Genus *CEPHENNİUM*.

Müller, Mon. d. Ameisenk. 12 (1822).

*Cephennium mycetæoides*, n. sp.

*C. elongatum*, obovato-ellipticum, nitidulum, omnino (palpis tarsisque testaceis exceptis) pallide rufo-ferrugineum et grosse fulvo-cinereo pubescens, parum dense sed minute (in elytris distinctior) punctulatum; prothorace magno, convexo, postice angustiore, ad latera oblique recto et anguste marginato: coleopteris ellipticis basi truncatis, utrinque ad basin ipsam mox intra humeros fovea magna latâ sed vix profundâ impressis; antennis pedibusque elongatis, robustis.

Long. corp. lin.  $\frac{3}{4}$ .

*Hab.*—Maderenses (*Mul.*); in montibus excelsis supra S. Ant. da Serra, inter folia *Vaccinii* dejecta, exemplar unicum inveni.

*Obs.*—Species valde distincta, *C. thoracico*, Europæo, multo major, elongatior, minus nitida, densius (tamen minute) punctulata, et omnino pallide rufo-ferruginea, prothorace elytrisque longioribus, illius angulis posticis rectioribus, horumque foveâ basali multo latiore ac magis humerali sed minus profunde et minus argute determinatâ, antennis pedibusque longioribus, robustioribus.

The single example from which the above diagnosis has been compiled is perhaps the most interesting of the various additions which we made to the fauna of Madeira during our late campaign in that island; and it having

been met with also at a great elevation on the mountains (namely by sifting fallen leaves near the summit of the Pico Gordo, far above the inhabited districts), I have little doubt that the species is a truly indigenous one, and in all probability peculiar to those wild upland regions. Judging from the type before me, it is considerably larger, and relatively more elongate, than the European *C. thoracicum*; and it is also less shining, much more densely (although minutely) punctulated, and its colour (instead of being dark) is altogether pale reddish-ferruginous; its prothorax and elytra are longer in proportion, and the former has its hinder angles more evidently right angles, whilst the latter have their basal fovea, although not so deep and well defined, both larger and wider, and placed nearer to either shoulder. Its limbs, too, are longer and more robust. Its colour and *prima facie* aspect are faintly suggestive of a narrow *Mycetaea*,—a circumstance which I have taken advantage of in selecting a specific name.

*Cephennium australe.*

*C. ellipticum*, nitidulum, parce sed grosse fulvo-cinereo pubescens, remote sed parum profunde punctatum; capite prothoraceque pallide rufo-ferrugineis, illo convexo, posse ad latera subrecto et anguste marginato; coleopteris piceis vel ferrugineo-piceis, ad basin ipsam fovea media rotundata utrinque impressis; antennis pedibusque testaceis.

Long. corp. lin.  $\frac{1}{2}$ - $\frac{2}{3}$ .

*Cephennium australe*, Woll., Col. Hesp., Append. 277 (1867).

*Hab.*.—Maderenses (*Mad.*); a meipso in castanetis editioribus longe supra Funchal (sc. 1800' s. m.) mense Decembri, A.D. 1865, parce deprehensum.

*Obs.*.—Species *C. thoracico*, Europæo, minor, angustior, minus polita, paulo densius punctata, necnon omnino pallidior—sc. capite prothoraceque pallide subrufescentibus, elytrisque plus minus picescentibus.

I captured three examples of this interesting little *Cephennium* on the 19th of December, 1865, while touching at Madeira, with Mr. Gray, on our outward route to the Cape Verdes. They were taken by sifting fallen leaves

and refuse, in the chestnut-woods at "the Mount"—about 1800 feet above Funchal; but their extremely minute size rendered them somewhat difficult to detect. They are smaller and narrower than the European *C. thoracicum*; also less highly polished, rather less remotely punctured, and considerably paler—their head and prothorax being pale rufo-ferruginous, and their elytra more or less piceous; whilst the limbs, which are slender, are brownish-testaceous.

Fam. PSELAPHIDÆ.

p. 452 (genus *PSELAPHUS*).

After species 1244, add:—

*Pselaphus minyops*, n. sp.

*P. gracilis*, rufo-castaneus, nitidissimus, parcissime fulvo-pubescent, impunctatus; capite prothoraceque angustissimis, ovalibus, oculis minutis; elytris triangularibus, brevibus, singulis lineis duabus integris (sc. suturali et discali) instructis; antennis, palpis pedibusque longissimis; palporum articulo ultimo longissimo, subflexuoso, gradatim facile clavato; antennarum articulo 1mo et ultimo robustis, illo elongato, hoc ovato, apicem versus oblique truncato.

Long. corp. lin. circa 1.

Hab.—Maderenses (*Mal.*) ; ad S. Ant. da Serra, in lauretis editioribus, a me ipso parcissime lectus.

Three examples of this very distinct and interesting *Pselaphus* were taken by myself, during May of 1870, by sifting fallen leaves and rubbish at S. Antonio da Serra, in the intermediate districts of Madeira. It is a little larger than the European *P. Heisii*, with the limbs considerably longer, with the head and prothorax (each of them) narrower and more elongate, and with the eyes very much smaller. Its elytra also are still more attenuated towards their base, the apical joint of its palpi is more flexuose and much less suddenly clavated, and the basal and terminal ones of its antennæ (the latter of which is more obliquely-truncate) are more developed.

In its extremely narrowed head and prothorax, as well as in the peculiar shape of the last joint of its maxillary palpi, the *P. minyops* is in reality more on the type of the Canarian *P. palpiger*; nevertheless it may imme-

dately be known from that insect by being not only rather larger and with more elongated limbs, but likewise by its eyes (although minute) being distinctly developed, by its elytra being less abbreviated, less plicate at the base, and with their discal line entire, by the second joint of its feet being rather less clavate, and by the first one of its antennæ being much longer.

Fam. STAPHYLINIDÆ.

p. 452 (genus FALAGRIA).

Before species 1245, add:—

*Falagria longipes*, n. sp.

*F. gracillima*, nitida, inæqualiter brunneo-picea, parce subtiliter fulvo-pubescent; capite prothoraceque parce vix punctulatis, illo quadrato-orbiculato, hoc elongato, hexagono-cordato, linea media profunda impresso, angulis ipsis posticis acute prominulis; elytris evidentius sed minute punctulatis, sensim magis testaceis sed in disco et versus utrumque latus obscurioribus; abdomine distinctius punctulato, versus basin testaceo-dilutiore; antennis, palpis pedibusque longissimis, infuscate testaceis, illis in medio obscurioribus sed ad apicem lâete rufo-testaceis, femoribus (ad basin, præcipue in posterioribus, exceptis) plus minus obscuratis.

Long. corp. lin.  $1\frac{1}{2}$ .

Hab.—Maderenses (*Mad.*); sub cortice laxo necnon inter quisquilias in horto quodam juxta urbem Funchalensem tria exemplaria deprehendi.

The larger size and much longer limbs of this fine *Falagria* would, even of themselves, at once separate it, even at first sight, from the common European *F. obscura* —which is so abundant in most of these Atlantic islands. It may however be further known from that species by the paler or more reddish-brown hue of its head and prothorax (the former of which is relatively rounder, whilst the latter, which has a much deeper dorsal groove extending along its entire length, is much longer and more rectangular behind, though with the posterior angles themselves acutely prominent), by the lighter portion of its elytra being clearer or more testaceous, by its abdomen being diluted behind, and by its femora (at any rate

except at their base) being picecent. Its antennæ, also, in addition to being longer, are rufo-testaceous at their base and apex, the intermediate joints being reddish-brown. It appears to be extremely scarce, the only three examples which I have yet seen having been captured by myself, during March of 1870, beneath the loosened bark of a felled tree, and amongst refuse, in Madeira,—namely in the garden of the Quinta dos Jasmeneiros, on the western outskirts of Funchal.

p. 455 (genus PHLÆOPORA).

(Sp. 1250) *Phlæopora corticina*.

When compiling my Canarian Catalogue (in 1864), I imagined that the present *Phlæopora* offered a few trifling characters sufficient to permit of its being treated as distinct from the common European *P. reptans*. It is the opinion, however, of Dr. Sharp that it ought not to be separated from that species; and, on further consideration, I agree with him in so thinking. Until our late visit to Madeira it had been observed only (so far as these Atlantic Groups are concerned) in the Canarian archipelago; but during the early spring of last year I met with two examples of it in the latter island also,—namely, beneath the bark of a felled Spanish-chestnut tree at “the Mount,” about 1700 feet above Funchal. Hence, its corrected *habitat* and *synonymy* will be as follows; and perhaps it may be desirable, also, to add an emended diagnosis.

*Phlæopora reptans*.

*P. linearis*, *angustula*, (abdomine nitidiusculo rugosiusque punctato excepto) subopaca, subtilissime punctulata, pube fulvescenti demissâ grossâ vestita; capite prothoraceque nigris, illo subconvexo, hoc (interdum paulo dilutiore) transverso-quâdrato, angulis posticis obtusis sed argute determinatis; elytris rufo-ferrugineis, versus basin et latera plus minus obscurioribus; abdomine nigro, ad apicem ferrugineo; antennis brevibus, incrassatis, fuso-, ad basin pedibusque rufo-testaceis.

Long. corp. lin.  $1\frac{1}{3}$ .

*Aleochara reptans*, Grav., Mon. 154 (1806). *Phlœopora reptans*, Kraatz, Nat. der Ins. Deutsch. ii. 337 (1858). *Phlœopora corticina*, Woll., Cat. Can. Col. 533 (1864); Id., Col. Atl. 455 (1865).

Hab.—Maderenses (*Mad.*), et Canarienses (*Ten.*, *Gom.*, *Palma*, *Hierro*); sub cortice in intermediis, rarer.

p. 458 (genus HOMALOTA).

Out of the 44 species of *Homalota* which have hitherto been detected in the Madeiran and Canarian archipelagos, 32 have been examined by Dr. Sharp—who it is well known has paid great attention to the members of that genus; and since many of his remarks possess considerable interest, as bearing on the affinities of certain forms, I purpose calling attention to them in my observations as given below. Out of this large number it is at least satisfactory to find that only one (namely my Madeiran *H. obliquepunctata*—which appears to be identical with the *pavens* of Erichson) requires *positively* to be cited under a fresh title; though at the same time it is extremely likely that one more name at any rate will have eventually to be changed,—my Canarian *H. subsericea* being *in all probability* conspecific (as indeed I originally suspected) with Mulsant's *H. sericea*; and also that the Teneriffan *H. aleocharoides* will have to be suppressed, as probably a mere phasis of the common *H. clientula*. It is true that the Madeiran *H. montivagans* has been identified by Dr. Sharp with Kraatz's *pulchra*; but in this case no disturbance will be necessary, of the Atlantic nomenclature, the former title having the priority. One endemic form, however, which I had regarded as a mere variety (namely the “*H. sanguinolenta*, var.  $\beta$ ” of my hitherto published volumes) has been raised, and I now believe quite correctly so, to the rank of a species; and I have great pleasure in dedicating it to Dr. Sharp, at whose suggestion the alteration has been made.

Amongst these forty-four Madeiran and Canarian Homalotas there are (in addition to the *montivagans*, *pavens*, and perhaps *sericea*) at any rate thirteen ordinary European species, all of which appear to have been rightly determined in my ‘Coleoptera Atlantidum.’ They are as follows: *clientula*, Erich.; *plumbea*, Waterh.; *luridipennis*, Mann.; *gregaria*, Erich.; *longula*, Heer; *fragilis*, Kr.;

*palustris*, Kiesw.; *analis*, Grav.; *nigra*, Kr.; *atramentaria*, Gyll.; *coriaria*, Kr.; *longicornis*, Grav., and *melunaria*, Sahlb. But of these thirteen there seems a possibility of the Madeiran "*H. longula*" proving to be specifically distinct from the Canarian form, which last differs in no respect from the European type.\*

(Sp. 1261) *Homalota sanguinolenta*.

A more careful examination, during the past winter, of a very extensive series of this *Homalota* has convinced me that the form which I have hitherto recorded as the "var.  $\beta$ " is in reality specifically distinct; and I am the further corroborated in this from the opinion of Dr. Sharp—who considers that there can be no question on the subject. It will perhaps therefore be desirable to give an emended diagnosis of the *type*, and afterwards (in order to point out the distinctions more accurately) a comparative one of its ally.

*Homalota sanguinolenta*.

*H. aptera*, subnitida, dense rugulosa-punctulata, plus minus infuscate rufo-testacea, fulvo-pilosa; capite abdomeque (nitido parcus punctulato, ultra medium sub-dilatato) obscurioribus, *i. e.* saepius piceis; prothorace lato, ad latera rotundato; elytris brevibus; antennis fusco-piceis, ad basin pedibusque testaceis.

Long. corp. lin.  $1\frac{1}{4}$ - $1\frac{1}{2}$ .

*Homalota sanguinolenta*, Woll., Ins. Mad. 547 (1854); Id., Cat. Mad. Col. 173 (1857); Id., Col. Atl. 459 (1865).

*Hab.*—Maderenses (*Mad.*); inter quisquilias in intermediis editioribusque sylvaticis, vulgatissima.

\* Although the present memoir pertains to the Madeiran and Canarian archipelagos only, I may perhaps just state that of the six species of *Homalota* which I recorded for the Cape Verde Group, five have lately been examined by Dr. Sharp—who remarks concerning them as follows: *H. coriaria*, "differs in no respect from the usual, more northern type;" *subputrescens*, "distinct from the Canarian *H. putrescens*, Woll., next to which it must be placed;" *clientula*, "this seems to be a little more strongly punctured than the ordinary European form, and might *perhaps* come nearer in reality to the *H. orbata*;" *glareosa*, "a very distinct species, to be placed next to *H. testudinea*;" and *carbunculus*, "a well-marked little species, of the *aterrima* group."

An abundant *Homalota* throughout the entire sylvan districts of Madeira,—occurring, normally, from about 2000 to 5000 feet above the sea. It appears to belong to the same group as the European *H. fungi*.

*Homalota Sharpiana*, n. sp.

*H. præcedenti similis*, sed plerumque paulo major et vix sublatior; capite (sensim latiore), prothorace elytrisque conspicue clarioribus, sc. læte rufo-testaceis aut testaceo-rufis: abdomine ut in *H. sanguinolenta* sed magis setoso et versus apicem lætius dilutiore; antennis subrobustioribus, ac paululum minus obscurioribus.

Long. corp. lin.  $1\frac{1}{2}$ - $1\frac{2}{3}$ .

*Homalota sanguinolenta*, var.  $\beta$ , Woll., Ins. Mad. 547 (1854); (*pars*), Id., Cat. Mad. Col. 173 (1857); (*pars*), Id., Col. Atl. 459 (1865).

*Hab.*—Maderenses (*Mad.*); in regionibus sylvaticis una cum specie precedente degens, sed in locis valde humidis præcipue abundat. Species in honorem cl. D. Sharp citata, *Staphylinorum* indefessi oculatissimi scrutatoris.

This is on the *average* a trifle larger, and perhaps broader, than the *H. sanguinolenta*, and its head (which is appreciably more developed), prothorax, and elytra are of a much paler and redder hue,—being clear rufo-testaceous; its abdomen is more diluted at the apex, and more densely studded with long setæ; and its antennæ are a little more robust, and not quite so dark. It is found in company with the *H. sanguinolenta*, but is usually the rarer of the two; nevertheless during the spring of 1870 I met with it in great abundance throughout the entire region of S. Antonio da Serra,—perhaps, on the whole, in somewhat wetter places than those which are generally most favourable to its ally. I have much pleasure in naming it after Dr. D. Sharp, whose indefatigable labours amongst the European *Staphylinidae* are well known, and to whom I have been much indebted for many valuable remarks on the affinities of some of the Atlantic species.

(Sp. 1262) *Homalota haligena*.

Although manifestly allied (as I have elsewhere stated) to the *H. sanguinolenta*, Dr. Sharp is of opinion that the

*haligena* is certainly distinct from that species,—differing in the punctuation of the elytra, as well as in the other characters which I have already pointed out.

(Sp. 1264) *Homalota montivagans*.

This species has been identified by Dr. Sharp with the *H. pulchra* of Kraatz (*Nat. der Ins. Deutsch.* ii. 321; 1858); but as my diagnosis was published a year before Kraatz's, the title "*montivagans*" will clearly have the priority. I may mention that during our late sojourn in Madeira I took it sparingly (by sifting fallen leaves and refuse) at S. Antonio da Serra, on the eastern mountains of that island.

(Sp. 1265) *Homalota vagepunctata*.

A Canarian *Homalota* regarded as "a remarkably distinct species" by Dr. Sharp, and apparently somewhat akin to a British one which has lately been enunciated by Mr. Rye (*Ent. Month. Mag.* vii. 6; 1870) under the name of *H. Sharpi*.

(Sp. 1268) *Homalota obliquepunctata*.

A *Homalota* (cited, also, lately, by Mr. Crotch, from the Azores) which Dr. Sharp identifies with the European *H. pavens*, of Erichson; and the corrected synonymy of which will, in consequence, stand as follows:—

*Homalota pavens*.

*Homalota pavens*, Erich., Käf. der Mark Brand. i. 689 (1839). *Homalota obliquepunctata*, Woll., Ins. Mad. 549 (1854); Id., Cat. Mad. Col. 174 (1857); Id., Col. Atl. 461 (1865); Crotch, Proc. Zool. Soc. Lond. 381 (1867).

*Hab.*—Maderenses (*Mad.*); in intermediis per margines aquarum, vel fluentium vel stagnantium, vulgaris.

(Sp. 1269) *Homalota amnicola*.

"A fine and distinct species, near to *H. pavens* and *insecta*."—Dr. Sharp.

(Sp. 1271) *Homalota gregaria.*

So far as the Madeiran Group is concerned, this European *Homalota* had been observed only in Porto Santo—where (as in certain of the Canarian islands) it swarms, beneath stones and shingle, along the edges of the brackish, half-dried streams; but during our late visit to Madeira I met with two examples of it (on the 30th of March, 1870) towards the extremity of the Ponta de São Lourenço,—thus introducing the species into the local list of Madeira proper, and affording another instance of the curious similarity which exists between the fauna of that low eastern promontory and that of Porto Santo. Dr. Sharp says, concerning this *Homalota*, “It is just possible that it is a distinct species from our *gregaria*; but even if so, it is found in England likewise,—for the ‘*H. gregaria*, var. *minor*’ of my paper must be referred to it.”

(Sp. 1273) *Homalota amnigena.*

According to Dr. Sharp this *Homalota* is allied to the *planifrons*, of Waterhouse.

(Sp. 1275) *Homalota longula.*

The Canarian specimens of this fragile little *Homalota* agree in every respect with the ordinary European ones; but those which I have hitherto captured in Madeira are just appreciably smaller and narrower, and likewise (unless indeed the whole of my examples be immature) paler, with their head perhaps a trifle narrower and less square; so that Dr. Sharp is of opinion that they may possibly prove to be the representatives of a species which is distinct from the other, however closely allied to it. Still, the differential characters are so slight that I will not at present venture to do more than indicate the Madeiran form as a geographical one; though I will propose for it in the following emended diagnosis a varietal name, in the event of future investigations rendering its isolation necessary.

*Homalota longula.*

*H. et synonymia ut in Cat. Can. Col. p. 539; sed adde;*  
*var.  $\beta$ , maderæ [an species distincta? ]—vix minor et*

angustior, neenon forsan pallidior, capite sensim angustiore minusque quadrato.

*Hab.*—Canarienses (*Lanz.*, *Ten.*, *Gom.*), sed “var.  $\beta$ ” Maderensibus (*Mul.*) pertinet; inter lapillos ad margines aquarum velocissime cursitans.

The species would appear to possess a wide Atlantic range, having been cited also by Mr. Crotch from the Azores.

(Sp. 1279) *Homalota subsericea*.

Judging from a single type of this *Homalota* which I sent to Dr. Sharp, he is inclined to suspect that the species is not distinguishable from the European *H. sericea*, Muls.: in all probability, therefore, the title “*subsericea*” will have eventually to give way.

(Sp. 1286) *Homalota aleocharoides*.

This will probably prove to be identical with the somewhat variable *H. clientula*. At any rate a single example which has been examined by Dr. Sharp was thought by him to be scarcely separable from that widely-spread species.

(Sp. 1289) *Homalota canariensis*.

“A very distinct species,” according to Dr. Sharp—who adds that “its place is in the *H. plana* group” of his arrangement.

(Sp. 1290) *Homalota insignis*.

“A distinct species, of the *merdaria* group,” according to Dr. Sharp—who likewise informs me that the nearly-allied *H. licta*, of the Canarian archipelago, appears to him (although closely resembling the Madeiran *insignis*) to be separable from it.

(Sp. 1296) *Homalota cacti*.

Concerning this Canarian *Homalota* Dr. Sharp says—“It is a species unknown to me, and one which should be placed near the *trinotata* of Kraatz.”

(Sp. 1297) *Homalota putrescens.*

According to Dr. Sharp, "pretty close to the *boletobia*, Thoms., but really distinct; the male characters are very curious."

(Sp. 1299) *Homalota Waterhousii.*

Dr. Sharp remarks of this Canarian *Homalota*, "a distinct species, its nearest ally known to me being my *subænea*." Fauvel indeed, from a cursory examination of one of my types, has stated that it is identical with the *aeneicollis* of Sharp. But in that conclusion I think that he was somewhat hasty; and I may mention that Mr. Rye is clearly of the same opinion,—adding "The *H. Waterhousii*, Woll., is undoubtedly very close to Sharp's *aeneicollis* (= *xanthoptera*,\* Kby.), but I am nevertheless convinced that it is a good species. It is more engine-turned in the punctuation of its elytra, and it is also narrower and more convex; its prothorax is rather less transverse; and the apical joint of its antennæ (in both sexes) is much shorter."

p. 473. After genus *Oxypoda*, insert the following:—

## Genus PLACUSA.

Erichson, Käf. der Mark Brand. i. 370 (1837).

Nine or ten examples of a small Staphylinid which I captured, during February of 1870, beneath the bark of a felled Spanish-chestnut tree, at "the Mount" (above Funchal), in Madeira, have been identified by Dr. Sharp with the British *Placusa infima*—which he informs me he has taken under precisely similar circumstances in England; and I will therefore record the species, briefly, as follows:—

*Placusa infima.*

P. depressiuscula, subopaca, densissime ruguloso-punctata, minute griseo-pubescent, nigra; elytris (præsertim

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\* Nec *merdaria*, Kraatz,—erroneously identified in Waterhouse's Catalogue with Kirby's *xanthoptera*.

postice) plus minus obscure fuscescentioribus; prothorace transverso, basi leviter bisinuato; antennis breviusculis, subrobustis, ad basin pedibusque saturate testaceis.

Long. corp. lin. circa 1.

*Placusa infima*, Erich., Gen. et Spec. Staph. 196 (1839); Redt., Fna. Austr. 823 (1849); Kraatz, Nat. der Ins. Deutsch. ii. 333 (1858).

*Hab.*—Maderenses (*Mal.*); sub cortice laxo in castanetis longe supra urbem Funchalensem a meipso parce deprehensa.

Whether the *P. infima* has been naturalized in Madeira, or whether it is truly indigenous, it is useless to speculate; suffice it to observe that it was found within the cultivated districts, at an elevation of about 1700 feet above the sea, and that I did not observe it (in spite of a two months' residence on the actual spot) except beneath the bark of a single Spanish-chestnut tree.

p. 473 (genus ALEOCHARA).

(Sp. 1310) *Aleochara mæsta*.

During our sojourn (in the spring of 1870) at S. Antonio da Serra, on the eastern mountains of Madeira, we met with one more example of this common European *Aleochara*—by sifting rubbish in an outhouse which adjoined our residence. The only Madeiran example which, until then, had come beneath my notice was captured by myself, in 1855, in the Ribeira de Sta. Luzia.

After species 1312, add:—

*Aleochara clavicornis*.

**A. nigra**, elytris, antennarum basi, palpis pedibusque fusco-testaceis, nitida, grosse sed vix dense fulvo-pubes-  
cens, parce et subasperate punctata; abdomine apicem versus dilutiore; antennis crassis et (basi exceptâ) piceis.

Long. corp. lin.  $1\frac{1}{2}$ .

*Aleochara clavicornis*, Redt., Fna. Austr. 822 (1849); Kraatz, Nat. der Ins. Deutsch. ii. 108 (1858); Woll., Col. Hesp., Append., 277 (1867).

*Hab.*—Maderenses (*Mad.*) ; juxta mare in urbe Funchalensi a me ipso mense Decembri 1865 semel capta.

In the Appendix to my ‘Coleoptera Hesperidum’ I stated that “I met with a single specimen of this little *Aleochara*, immediately behind the sea-beach, at Funchal—during the few days that we touched there, in December 1865, on our outward route to the Cape Verdes. Although occurring in central Europe, it appears to be found more particularly in Mediterranean latitudes; and I may add that I took several examples of it, some years ago, in the vicinity of Lisbon—a fact indeed which suggests the possibility of its having perhaps been introduced into Madeira (like, doubtless, many of the sterco-raceous *Staphylinidae*), along with cattle, from Portugal. The Madeiran individual was captured on the wing; and we may expect that the species will shortly become abundant in the island, if indeed this is not the case already. Although scarcely agreeing with the diagnosis given by Kraatz, particularly as regards its somewhat larger size, I am indebted to M. Fauvel for identifying it with Redtenbacher’s *A. clavicornis*.<sup>”</sup>

p. 476 (genus OLIGOTA).

(Sp. 1314) *Oligota castanea*.

According to M. Fauvel this Canarian *Oligota* is the *rufipennis* of Kraatz; but Dr. Sharp, who (in the absence of a type of the latter for comparison) is inclined likewise to suspect that such may perhaps prove to be the case, considers nevertheless that further evidence is desirable before the two can safely be regarded as conspecific.

(Sp. 1315) *Oligota inflata*.

From information which has been given me by Dr. Sharp, it would appear that the insect which I have hitherto regarded as the *O. inflata*, Mann., is not that species, but the *parva* of Kraatz. Indeed the Canarian examples seem to be distinct from both, and perhaps altogether undescribed; but the Madeiran ones do not differ, apparently, from the European *O. parva*; and I may also add that the *Oligota* from the Cape Verde archipelago which I described in 1867 under the title of “con-

*tempta*" is likewise referable to the *parva*—which would consequently seem to be very widely spread over these various Atlantic islands. In Madeira it is exceedingly common (amongst refuse, and under the bark of felled trees) throughout the cultivated districts—particularly in gardens around Funchal; and in order that it may not be confounded with the still more minute, and darker, *O. pusillima* (which occurs also in the Madeiran Group), I subjoin the diagnosis of it given in my 'Coleoptera Hesperidum,' along with its corrected synonymy and habitat.

*Oligota parva.*

*O. linearis*, subnitida, parce griseo-pubescent, fusco-nigra elytris plus minus fuscis, abdominis apice testaceo; capite prothoraceque minutissime punctulatis; elytris abdomineque densius rugosiusque subasperato-punctatis; antennis pedibusque saturate testaceis, illarum articulis 3 ulterioribus parum abrupte incrassatis.

Long. corp. lin.  $\frac{1}{2}$ -vix  $\frac{2}{3}$ .

*Oligota inflata*, Woll. [nec Mann.], Ins. Mad. 562 (1854); Id., Cat. Mad. Col. 184 (1857). *Oligota pygmaea*, Kraatz [nec Sol.], Berl. Ent. Zeitsch. 352 (1858). *Oligota parva*, Id., Ibid. 300 (1862). *Oligota inflata*, Woll., Cat. Can. Col. 555 (1864); Id., Col. Atl. 476 (1865). *Oligota contempta*, Id., Col. Hesp. 231 (1867).

Hab.—Maderenses (*Mad.*); inter quisquilias, necnon sub cortice laxo emortuo, præcipue in cultis abundans.

Amongst a large number of specimens of the *O. parva* (and a few of the *pusillima*), which I collected in Madeira during the spring of 1870, there is one which has been identified by Dr. Sharp with his European *O. ruficornis*, and which appears to agree perfectly with English examples (in my own collection) of that species. This therefore is an undoubted addition to the Atlantic catalogue, and consequently I will briefly record it as follows:—

*Oligota ruficornis.*

*O. linearis*, subnitida, parce griseo-pubescent, nigra; capite prothoraceque minutissime punctulatis; elytris abdomineque densius rugosiusque subasperato-punctatis;

antennis pedibusque saturate testaceis, illarum articulis 3 ulterioribus parum incrassatis, ultimo saepius plus minus infuscato.

Long. corp. lin.  $\frac{2}{3}$ .

*Oligota ruficornis*, Sharp, Ent. Month. Mag. vi. 232 (1870).

*Hab.*—Maderenses (*Mad.*); tempore vernali, A.D. 1870, a meipso capta.

This species is a little larger and relatively broader than the *O. parva*; it is also blacker (neither the elytra nor the apex of the abdomen being much, if at all, diluted in hue), and its antennæ are yellowish-testaceous, the apical joint only being usually a trifle infuscate. The only example which I have yet seen from any of these Atlantic islands was (as above stated) taken by myself, during the spring of 1870, in Madeira,—I believe near Funchal.\*

p. 477 (genus SOMATIUM).

(Sp. 1317) *Somatium anale*.

Until our late visit to Madeira, I had considered this insect as one of the rarest of the native Coleoptera; but during a residence at S. Antonio da Serra, in the spring of 1870, I met with it in tolerable abundance—not only by sifting dead leaves and rubbish in sylvan cultivated spots, but more especially by shaking piled-up masses of rotten sticks which were thickly overgrown with lichen. Dr. Sharp has called my attention to the fact that it is certainly congeneric with the section of broad-bodied Oligotas represented in Europe by the *O. xanthopyga*, *apicata*, and *flavicornis*,—which will probably combine, there-

\* In addition to the *O. parva*, *ruficornis*, *pusillima*, and the Canarian *castanea*, there is probably yet one more Atlantic *Oligota*, at least, which remains to be recorded; but as my material (at present available) is too scanty to render it desirable to erect a species in a group thus minute and obscure, I prefer putting it aside until more satisfactory examples shall have enabled me to pronounce upon it with precision. A single specimen however, which I took in Madeira during our late campaign, was singled out by Dr. Sharp as *probably* distinct (in its somewhat smaller head, longer elytra, &c.) from the remainder, and it seems likely also that three (rather imperfect) individuals which I captured formerly in Lanzarote of the Canarian archipelago are conspecific with it. These latter are what I assigned in my Canarian Catalogue to the *inflata*, Mann.; so that it is probable that a fifth species (perhaps as yet undescribed) remains to be recorded, and one which will be found to permeate both the Madeiran and Canarian Groups.

fore, with the *S. analis* into a tolerably well-defined group. Indeed M. Fauvel (*L'abeille*, vi. 150) actually identified it with Kraatz's *O. xanthopyga*; but as nearly every species which Fauvel has hitherto examined for me, from these various Atlantic islands, has been returned with a most unmistakeably false determination, I have no confidence whatever in his *dictum* as regards *Somatium*.

p. 478 (genus CONOSOMA).

(Sp. 1319) *Conosoma pubescens*.

Without assigning his reasons for the change, Mr. Crotch enters this common Tachyporid into his Azorean Catalogue as the “*sericeus*, Latr.”\* Strictly, no doubt, Paykull's title of *pubescens* (under which it has almost universally been acknowledged) cannot be retained, for there was already a “*Staphylinus pubescens*” published by De Geer in 1774; but as the latter falls now into a totally different genus (—being a true *Staphylinus*), and the present *Conosoma* is invariably recognized under the trivial name of *pubescens*, I hardly think that it is absolutely necessary to disturb the commonly-received nomenclature.

p. 482 (genus MYCETOPORUS).

(Sp. 1328) *Mycetoporus Johnsoni*.

During our late sojourn in Madeira I took several examples of a *Mycetoporus* throughout the elevated region of S. Antonio da Serra (chiefly by sifting fallen leaves and rubbish) which seem to differ a little from the ordinary ones of the *M. Johnsoni*, yet not sufficiently so, I think, to be treated safely as representing more than a slight variety, or state, of that species. I will however give a short diagnosis of it as a “var.  $\beta$ ,” assigning to it at the same time a varietal, or subspecific, name—in the event of further material rendering it desirable, at any future time, to cite it as distinct. It appears, on the average, to be a trifle larger and darker than what I have hitherto regarded as the *M. Johnsoni* type,—its antennæ

\* I cannot but think that this must be a misprint, and that *Lacordaire* (Faun. Ent. Paris, i. 519; 1835), not “*Latreille*,” was intended.

being appreciably less pale, and its elytra (instead of being concolorous with the prothorax) merging into almost a piceous-black. Its elytra too are perhaps just perceptibly more convex, and have their three longitudinal rows of punctures somewhat more developed. The following brief formula will suffice to place it upon record.

*Mycetoporus Johnsoni.*

Var.  $\beta$ , *lubrica* [an species vera?]—plerumque paulo major, elytris antennisque (præcipue illis) obscurioribus, punctorum seriebus tribus in elytris sensim distinctioribus (*i. e.* minus obsoletis).

Long. corp. lin. 1—vix  $1\frac{1}{3}$ .

*Hab.*—Maderenses (*Mal.*) ; sub folia dejecta neconon inter quisquilias supra S. Antonio da Serra, tempore vernali 1870, haud infrequens.

p. 485 (genus *HETEROTHOPS*).

(Sp. 1337) *Heterothops minutus*.

This widely-spread *Heterothops*, so nearly universal (particularly amongst the refuse around the base of corn-stacks, as well as in gardens and other cultivated grounds) throughout the Madeiran and Canarian archipelagos, would appear after all, according to Mr. Rye (who has studied the genus with particular care), to be inseparable from the common European *H. dissimilis*; and I would desire therefore to correct its synonymy accordingly. I may just add however that M. Fauvel, though with singular want of precision, identified it (*L'Abeille*, vi. 150) with Erichson's *H. prævius*—a species, nevertheless, from which it is totally distinct.\*

*Heterothops dissimilis.*

*Tachyporus dissimilis*, Grav., Col. Micropt. 125 (1802).  
*Heterothops dissimilis*, Kraatz, Nat. der Ins. Deutsch. ii.

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\* According to a very valuable paper by Mr. Rye in the 'Ent. Month. Mag.' (iv. 256), the *T. prævius*, apart from the fact of its elytra being perceptibly longer than its prothorax, "may be distinguished from the *dissimilis* (the most abundant and widely distributed in the genus) by its broader head and shorter and stouter antennæ, the joints whereof are sub-obconic, the apical ones being not longer than broad, and the basal ones pitchy-red, by its much more finely and closely punctured abdomen, and by its darker legs."

485 (1858). *Heterothops minutus*, Woll., Ann. Nat. Hist. vi. 53 (1860); Id., Cat. Can. Col. 562 (1864); Id., Col. Atl. 485 (1865).

*Hab.*—Maderenses (*Mad.*), et Canarienses (*ins. omnes*) ; inter quisquilias, necnon præcipue sub reccremento farris ad basin acervorum tritici sparso, hinc inde vulgaris.

p. 486 (genus QUEDIUS).

(Sp. 1339) *Quedius fulgidus*.

The only Atlantic specimens of this insect which I possess are three Canarian ones—from Teneriffe and Gomera; and Dr. Sharp, having a short time ago requested the loan of them for examination, remarks that they seem to divide themselves into two rather different forms,—one being larger with robust feet, and the usual darkened antennæ, and, as it seems to me, corresponding *sufficiently* (though by no means exactly) with the northern type, and the other being smaller, with lighter coloured limbs, slenderer posterior tarsi, and the intermediate antennal joints just appreciably more transverse. He then goes on to add—"Both differ a little from any of the European forms, and if Thomson's attempt at dividing *Q. fulgidus* into several species be sustained, these would have to be considered as two new species." I cannot believe, however, myself, that either one or the other is really distinct specifically from the European type,—though different *habitats* may perhaps have resulted in slightly altered races; nevertheless in the event of future naturalists thinking it desirable to detach them (which I do not in the least anticipate) from the more northern, ordinary state, I would cite the larger one under the varietal name of "*robusta*," and the smaller one under that of "*depauperata*." Of my three individuals, one (corresponding with the larger state) is from Gomera, and the other two (smaller, and with paler limbs) from that island and Teneriffe.

p. 487 (genus OCYPUS).

(Sp. 1342) *Ocypus olens*.

This common European *Ocypus*, which occurs in the whole seven islands of the Canarian archipelago (indeed

I have myself captured it in six of them), has been reported by Mr. Crotch from the Azores—where it appears also to be well-nigh universal; so that its total absence from the Madeiran Group is even still more remarkable. It seems to be cited in Dejean's Catalogue under the title of *Emus morosus*, with the *habitat* “Teneriffe;” and therefore the two following references may be added to its synonymy as given in the ‘Coleoptera Atlantidum.’

*Emus morosus*, Dej., Cat. édit. 3, 68 (1837). *Ocypus olens*, Crotch, Proc. Zool. Soc. Lond. 383 (1867).

(Sp. 1346) *Ocypus curtipennis.*

It appears from Harold's recent Catalogue that an *Ocypus* was published by Motschoulsky (*Bull. Mosc.* iii. 87) under the title of *curtipennis* in 1849, so that the present Canarian species will require a fresh name. And therefore as the Baron has himself proposed that of *canariensis*, I may cite the corrected synonymy as follows:—

*Ocypus canariensis.*

*Ocypus curtipennis*, Woll. [nec Mots. 1849]; Cat. Can. Col. 567 (1864); Id., Col. Atl. 488 (1865). *Ocypus canariensis*, Har., Cat. 581 (1868).

*Hab.*—Canariensis (*Can.*) ; in sylvaticis subsylvaticisque intermediis, minus frequens.

(Sp. 1348) *Ocypus atratus.*

It is far from impossible that M. Fauvel's identification of this Lanzarotan and Fuerteventuran *Ocypus*, with the common European *O. ater* (vide *L'Abeille*, vi. 151), may be correct; nevertheless since it certainly possesses a few minute distinctions of its own I will not absolutely suppress it as a species, seeing that it has already been established,—though I am quite willing to admit that its small differential characters (such as they are) may perhaps be merely indicative of a slight geographical variety, or race, of the ordinary northern type; and the more so, since an accurate re-comparison of its mandibles has led me to believe that I was mistaken in

regarding them as less dentate than those of the *O. ater*. So far as I can now detect, it would appear to recede from the latter in its elytra being a little more coarsely and remotely punctured, with the suture perceptibly less raised, and in its head being appreciably shorter (or more straightly and suddenly truncated behind the eyes—which are consequently *nearer* to the basal margin), with the large additional punctures on either side (posteriorly) shallower and less developed. Its prothorax also, if anything, is a trifle longer, just perceptibly narrower (or less downwardly-produced) towards the anterior angles, and with the posterior ones perhaps less completely rounded-off; and Mr. Rye has remarked (*Ent. Month. Mag.* iv. 236) that the basal joint of its middle and posterior tarsi is appreciably thicker and less elongate.

(Sp. 1350) *Ocypus punctatissimus*.

As mentioned in the Appendix to my 'Coleoptera Hesperidum,' M. Fauvel (*L'Abeille*, vi. 151) affirms this Lanzarotan and Fuerteventuran *Ocypus* to be identical with the common European *O. cupreus*. As already stated in no less than three separate volumes, I am far from certain that it may not be in reality a geographical variety of that species; nevertheless its few distinctive features are so constant, and pronounced, that I cannot but regard M. Fauvel's *dictum* as (to say the least) unnecessarily positive. Thus the Canarian specimens are not only a trifle narrower and darker (or less aeneous) than British ones now before me, but their head and prothorax are more closely and *very* much more finely punctured,—the former moreover being appreciably less developed, and the latter relatively narrower (or more laterally-compressed): the penultimate segment of their abdomen, also (at any rate in the male sex), is perhaps rather more sinuate along its upper hinder-edge. Kraatz, to whom I sent it for examination when compiling my Canarian Catalogue, returned it as "*Ocypus, cupreo affinis:*" yet the Baron Harold, despite my repeated assertions, and accepting doubtless the *dictum* of Fauvel, identifies it (*Cat. Col.* 582; 1868) with the *cupreus*.

Since it appears, however, that an *Ocypus* (said to be conspecific with the *O. ater*, Grav.) was published under

the title of “*punctatissimus*” in 1843, it is clear that the one from Lanzarote and Fuerteventura, if eventually upheld as distinct from the European *cupreus*, will require re-naming; and I would therefore cite its synonymy afresh, as follows:—

*Ocyphus fortunatarum.*

*Ocyphus punctatissimus*, Woll. [nec Duf., Bull. Soc. Pau, 1843], Cat. Can. Col. 568 (1864); Id., Col. Atl. 489 (1865).

*Hab.*—Canarienses (*Lanz.*, *Fuert.*); sub lapidibus, passim.

*Obs.*—Species *O. cupreo* affinis (sec D. Fauvel etiam æqualis), sed, nisi fallor, aut vere distincta aut varietas geographica. Differt corpore sub-angustiore, sub-obscuriore (minus æneo), necnon capite (sub-minore) prothoraceque (sub-angustiore, magis lateraliter compresso) densius ac multo minutius punctatis.

p. 490 (genus PHILONTHUS).

(Sp. 1358) *Philonthus scybalariae*.

It appears necessary to cite this common European *Philonthus* (which is so abundant throughout the Madeiran and Canarian archipelagos, and which is found also at the Azores, Cape Verdes, and even at Ascension) as the *longicornis*, Steph.,—that name having the precedence over Nordmann’s “*scybalariae*;” moreover Nordmann appears to have described the species under two different titles—*scybalariae* and *fuscicornis*. Hence the synonymy will be thus:—

*Philonthus longicornis.*

*Philonthus longicornis* (Kby.) Steph., Ill. Brit. Ent. v. 237 (1832). *Philonthus scybalariae* et *fuscicornis*, Nordm., Symb. 94 et 96 (1838). *Philonthus varians*, Woll. [nec Payk.], Ins. Mad. 583 (1854). *Philonthus scybalariae*, Id., Cat. Mad. Col. 189 (1857); Id., Cat. Can. Col. 571 (1864); Id., Col. Atl. 492 (1865).

*Hab.*—Maderenses (*Mad.*, *Pto. Sto.*), et Canariensis (*Lanz.*, *Ten.*, *Gom.*, *Palma*, *Hierro*); sub stercore quisquiliisque vulgaris.

(Sp. 1359) *Philonthus marcidus*.

It seems, according to Fauvel (*L'Abeille*, vi. 151), that this *Philonthus*, so universal throughout the Canarian archipelago (but which has not yet been observed in the Madeiras), is conspecific with the European *P. concinnus*, Grav.; so that its synonymy must be cited as follows:—

*Philonthus concinnus*.

*Staphylinus concinnus*, Grav., Col. Micropt. 21 (1802).  
*Staphylinus politus*, (?) Brullè [nec Grav.], in W. et B. (Col.) 60 (1838). *Philonthus marcidus*, Woll., Cat. Can. Col. 571 (1864); Id., Col. Atl. 492 (1865).

*Hab.*—Canarienses (ins. omnes); ab orâ maritima usque ad 9000' s. m. ascendens.

(Sp. 1360) *Philonthus proximus*.

Apparently identical, as first stated by Fauvel (*L'Abeille*, vi. 150), with the European *P. ventralis*, Grav.,—a species which is very widely, though sparingly, spread over these Atlantic archipelagos; having been taken by myself, and others, in the Madeiran, Canarian, and Cape Verde Groups. Its synonymy, therefore must be thus emended:—

*Philonthus ventralis*.

*Staphylinus ventralis*, Grav., Col. Micropt. 174 (1802).  
*Philonthus proximus*, Woll., Cat. Mad. Col. 189 (1857); Id., Cat. Can. Col. 573 (1864); Id., Col. Atl. 493 (1865).  
*Philonthus ventralis*, Id., Col. Hesp. 238 (1867).

*Hab.*—Maderenses (Mad., Pto. Sto.), et Canarienses (Ten., Gom.); in stercore bovino necnon sub quisquiliis, late sed parce diffusus.

(Sp. 1364) *Philonthus punctipennis*.

As mentioned in the Appendix to my ‘Coleoptera Hesperidum,’ this *Philonthus* is identical with the *turbidus* of Erichson,—a species of a very wide geographical range, having been taken not only in the Madeiran,

Canarian, and Cape Verde Groups, but reported also from Egypt, the Mauritius, Madagascar, and Assam. Its corrected synonymy must stand thus:—

*Philonthus turbidus.*

*Philonthus turbidus*, Erich., Gen. et Spec. Staph. 484 (1839). *Philonthus punctipennis*, Woll., Cat. Mad. Col. 192 (1857); Id., Cat. Can. Col. 575 (1864); Id., Col. Atl. 495 (1865). *Philonthus turbidus*, Id., Col. Hesp. 240 (1867).

*Hab.*—Maderenses (*Mad.*), et Canarienses (*Can.*, *Gom.*); sub quisculis in humi scululis, rarer.

(Sp. 1367) *Philonthus filiformis.*

I took a single example of this very rare little Madeiran *Philonthus* during our late sojourn at “the Mount”—about 1700 feet above Funchal. It is very closely allied to the *P. tenellus*, found in Teneriffe and Gomera; but, in addition to the distinctive characters (of smaller eyes, less deeply sculptured elytra, and more flattened, less coarsely punctured abdominal segments) which I pointed out at p. 577 of my Canarian Catalogue, it may be further known from that species by its head being a little squarer and more developed (being appreciably wider behind the eyes, and more straightly truncated at the base), by its elytra being less piceous and perhaps a trifle longer, and by its antennæ also being somewhat obscurer, and just perceptibly less abbreviate.

Whether the *Philonthus* which is admitted by Mr. Crotch into his Azorean list, on the strength of “a single specimen from a mountain-stream in Fayal,” and which in 1867 he cited (evidently by mistake) as the “*P. proximus*, Woll.” (*vide* Proc. Zool. Soc. 383), but subsequently corrected (*teste* Godman’s Azores, 91; 1870) into “*P. filiformis*,” be this Madeiran species, or its near Canarian ally, I have no means of ascertaining; but in all probability Mr. Crotch is right in his subsequent identification, and it will prove to be the Madeiran one.

p. 497 (genus LEPTACINUS).

(Sp. 1374) *Leptacinus linearis*.

In his Catalogue of Azorean Coleoptera, Mr. Crotch remarks that "Gravenhorst's name [*linearis*] for this species is inapplicable, it having been adopted erroneously from Olivier." On referring however to the 'Col. Mieropt.' I cannot perceive anything to indicate that the title was borrowed from Olivier at all; though since it is equally certain that there could not be two insects bearing the name "*Staphylinus linearis*" at the same time, and Olivier's (which pertains to our common European *Xantholinus*) had the priority by seven years, it follows as a matter of course that Gravenhorst's specific title must be forfeited, and that we have no choice but to accept the next one in succession,—*i. e.* Stephens' "*pusillus*." Hence, its synonymy should be thus corrected:—

*Leptacinus pusillus.*

*Staphylinus linearis*, Grav. [nec Oliv. 1795], Col. Mieropt. 43 (1802). *Gyrohypnus pusillus*, Steph., Ill. Brit. Ent. v. 264 (1832). *Leptacinus linearis*, Woll., Ann. Nat. Hist. vi. 101 (1860); Id., Cat. Can. Col. 580 (1864); Id., Col. Atl. 498 (1865). *Leptacinus pusillus*, Crotch, Proc. Zool. Soc. Lond. 383 (1867).

*Hab.*—Maderenses (*Mad.*), et Canarienses (*Lanz.*, *Ten.*); inter quisquilias et praeципue sub recreemento ad basin acervorum tritici sparso, hinc inde vulgaris.

p. 498 (genus OTHIUS).

(Sp. 1379) *Othius philonthoides*.

According to Fauvel (*L'Abeille*, vi. 151), this Canarian *Othius* is merely a small variety of my *O. brachypterus*—equally from the Canarian archipelago; but considering that Fauvel's only acquaintance with the two species rests upon a single example of each which I forwarded to him, and I have myself inspected at any rate a certain number of them, and pointed-out their exact differential characters, I must be pardoned if I fail to acknowledge the necessary indisputability of Fauvel's *dictum*. Although

by no means wishing to pronounce for certain that the *O. philonthoides* may not be a depauperated modification of the *brachypterus*, my own opinion is that, while belonging to undoubtedly the same geographical type, it is most decidedly distinct,—it being not only considerably smaller and with more abbreviated antennæ, but likewise less coarsely sculptured as regards both its elytra and abdomen, and with its head even *relatively* less developed.

p. 504 (genus SCOPÆUS).

(Sp. 1390) *Scopæus trossulus*.

This Canarian *Scopæus* is said by M. Fauvel (*L'Abeille*, vi. 152) to be conspecific with the Mediterranean *S. sericans*, of Mulsant and Rey; but as I possess no type of the latter, in order to judge for myself, I have no means of testing the accuracy of this identification. Assuming it, however, to be correct (which may, or may not, be the case), the corrected synonymy will stand thus:—

*Scopæus sericans.*

*Scopæus sericans*, Muls. et Rey, Ann. Soc. Linn. Lyon, 165 (1854). *Scopæus trossulus*, Woll., Cat. Can. Col. 585 (1864); Id., Col. Atl. 504 (1865).

*Hab.*—Canarienses (*Fuert.*, *Can.*, *Ten.*) ; inter lapis per margines aquarum, præcipue in inferioribus ac paululum elevatis, sese occultans.

p. 505 (genus LITHOCHARIS).

(Sp. 1395) *Lithocharis fuscula*.

I am indebted to Dr. Sharp for correcting an error into which I had fallen as regards this *Lithocharis*—which appears to be the European *apicalis*, Kraatz, and not the “*fuscula*.” The mistake was partly due to the insufficiency of the material from which I was compelled originally to form an opinion; but during our late visit to Madeira I met with it abundantly by sifting garden-refuse at the Quinta dos Jasmineiros, on the western outskirts of Funchal, and the more extensive series thus obtained renders the distinctive characters of the species at once

evident. Mixed-up however with the few examples of the *apicalis* (now before me) which were collected *many years ago* in Madeira (I think in the north of the island), are three which manifestly differ from the rest, and which accord precisely with an English type of the *L. ripicola*, Kr., which I have captured in south Devon. This latter species, consequently, is an addition to the Madeiran list, and an all the more interesting one perhaps through the fact of its having been cited by Mr. Crotch from S. Miguel in the Azores. In order to prevent, therefore, the two species [*ripicola* and *apicalis*], which at first sight much resemble each other, from being confounded *inter se*, I will subjoin diagnoses of them *both*, as follows:—

*Lithocharis ripicola.*

*L.* rufo-ferruginea, nitidiuscula, confertim subtiliter (capite rugosiore excepto) punctulata et pube griseâ demissâ parum dense vestita; capite magno, convexo, nigrescenti, rugose punctato, oculis parvis; prothorace rufulo, subquadrato postice angustiore, lineaâ mediâ longitudinali lăeviore; elytris longioribus; abdomine fusco, apice dilutiore; antennis pedibusque rufo-testaceis.

Long. corp. lin. vix 2.

*Lithocharis ripicola*, Kraatz, Nat. der Ins. Deutsch. ii. 715 (1858); Crotch, Proc. Zool. Soc. Lond. 384 (1867).

*Hab.*—Maderenses (*Mad.*); inter quisquilias humidas, minus frequens.

*Obs.*—*L. apicali* submajor, subrobustior, subnitidior, paulo minus dense pubescens, ac sensim rugosius (præser-tim in capite majore) punctulata; prothorace rufescentiore (minus obscuro), minus quadrato (*i. e.*, antice latiore), et in lineaâ mediâ lăeviore; elytris concoloribus (nec postice obscuratis), necnon antennis pedibusque paululum longioribus ac robustioribus.

*Lithocharis apicalis.*

*L.* fusco-ferruginea, subopaca, confertissime subtilis-simeque punctulata et pube grisea demissa dense vestita; capite convexo, nigrescenti, oculis parvis; prothorace

subquadrato; elytris longioribus, postice plus minus obsolete obscurioribus; abdomine fusco, apice dilutiore; antennis pedibusque subgracilibus, breviusculis, rufo-testaceis.

Long. corp. lin. circa 1 $\frac{3}{4}$ .

*Lithocharis fuscula*, Woll. [nec Mann.], Ins. Mad. 589 (1854); Id., Cat. Mad. Col. 193 (1857). *Lithocharis apicalis*, Kraatz, Nat. der Ins. Deutsch. ii. 715 (1858). *Lithocharis fuscula*, Woll., Col. Atl. 505 (1865). *Lithocharis apicalis*, Crotch, Proc. Zool. Soc. Lond. 384 (1867).

*Hab.*—Maderenses (*Mad.*) ; sub quisquiliis in cultis inferioribus præcipue degens; etiam in hortis ipsis Funchalensis interdum abundat.

*Obs.*—Species *L. fuscula*, Mann., paulo minor, gracilior, multo subtilius (densissime) punctulata et densius griseo-pubescentia, capite minore, nigrescentiore, elytris plus minus inæqualiter nebulosis (sc. postice, necnon interdum in regione scutellari, gradatim obscuratis), antennis pedibusque paulo brevioribus, gracilioribus, clarioribus.

*L. ripicola*, Kr., subminor, subgracilior, subopacior, paulo densius pubescens, ac sensim minutius (præsertim in capite quadratiore, minore) punctulata, prothorace paululum obscuriore et magis quadrato (*i. e.* postice minus evidenter angustato), elytris postice plus minus nebuloso-obscuratis, necnon antennis pedibusque vix sub-brevioribus.

(Sp. 1400) *Lithocharis tricolor*.

Mr. Crotch, in his list of Azorean Coleoptera, has mentioned (*Proc. Zool. Soc. Lond.* 384; 1867) that Marsham's name “*tricolor*” cannot be retained for this *Lithocharis*, seeing that there was already a *Staphylinus tricolor* published by Fabricius in 1787, and which applied moreover to a totally different insect—the well-known European *Xantholinus*. Hence there appears to be no title for this common species (that of “*melanocephalus*” pertaining to the cognate form with more abbreviated elytra) until we come to Kraatz's “*ruficollis*;” so that the corrected synonymy will have to stand thus:—

*Lithocharis ruficollis.*

*Staphylinus tricolor*, Mshm. [nec Fab. 1787], Ent. Brit. 516 (1802). *Lithocharis melanocephala*, Woll. [nec Fab.], Ins. Mad. 591 (1854); Id., Cat. Mad. Col. 194 (1857). *Lithocharis ruficollis*, Kraatz, Nat. der Ins. Deutsch. ii. 717 (1858). *Lithocharis melanocephala*, Woll., Cat. Can. Col. 588 (1864). *Lithocharis tricolor*, Id., Col. Atl. 507 (1865). *Lithocharis ruficollis*, Crotch, Proc. Zool. Lond. 384 (1867).

Hab.—Maderenses (in *Ilheo Chão solâ* haud observata), et Canarienses (ins. omnes); sub lapidibus quisquiliisque vulgaris.

p. 508 (genus *SUNIUS*).

(Sp. 1405) *Sunius angustatus*.

This common European *Sunius*, so widely spread over the Madeiran archipelago, but which has not yet been observed at the Canaries, is cited by Mr. Crotch, in his list of Azorean Coleoptera, under the title “*gracilis*, Payk.”—accompanied by the remark that “Paykull’s name *angustatus* having been pre-occupied, we should use the one he subsequently proposed for it.” The species, therefore, must be entered thus:—

*Sunius gracilis.*

*Staphylinus angustatus*, Payk. [nec Fourc. 1785], Mon. Staph. Suec. 36 (1789). *Staphylinus gracilis*, Id., Ibid. 38 (1789). *Sunius angustatus*, Woll., Ins. Mad. 593 (1854); Id., Cat. Mad. Col. 195 (1857); Id., Col. Atl. 509 (1865). *Sunius gracilis*, Crotch, Proc. Zool. Soc. Lond. 384 (1867).

Hab.—Maderenses (*Mad.*, *Pto. Sto.*, *Bugio*); hinc inde sub lapidibus necnon inter quisquilias, præcipue in intermediis.

p. 511 (genus *STENUS*).

(Sp. 1415) *Stenus fulvescens*.

According to the late Catalogue of Gemminger and Harold, a *Stenus* (from India) was published, by Mots-

choulsky (*Bull. Mosc.* iv. 515), under the name of *fulvescens*, in 1857—the very same year in which my own species was brought out bearing the same title; so that, manifestly, it is necessary that either one or the other of them should be re-named. Without stating his reasons for the selection, the Baron Harold has consequently proposed for the Madeiran species the title “*Wollastoni*;” and its corrected synonymy, therefore, will stand as follows:—

*Stenus Wollastoni.*

*Stenus Heeri*, var.  $\beta$ , Woll., Ins. Mad. 600 (1854).  
*Stenus fulvescens*, Id. [nec Mots. 1857], Cat. Mad. Col. 198 (1857); Id., Col. Atl. 513 (1865). *Stenus Wollastoni*, Har., Cat. 641 (1868).

*Hab.*—Maderenses (*Mad.*); in sylvaticis humidis editoribus, sub foliis quisquiliisque parce latens.

p. 514 (genus *BLEDIUS*).

(Sp. 1418) *Bledius januvianus*.

As stated in my ‘Coleoptera Hesperidum,’ this large *Bledius*, which I met with in Lanzarote of the Canarian archipelago (and subsequently, also, in S. Vicente of the Cape Verdes), has been identified by M. Fauvel with Erichson’s *B. vitulus*—a species recorded from Arabia. Not possessing a type of Erichson’s species from which to form an independent opinion, I have no means of testing M. Fauvel’s determination; but assuming it to be correct, the following change in the synonymy will have to be made:—

*Bledius vitulus.*

*Bledius vitulus*, Erich., Gen. et Spec. Staph. 761 (1839).  
*Bledius januvianus*, Woll., Cat. Can. Col. 593 (1864); Id., Col. Atl. 514 (1865). *Bledius vitulus*, Id., Col. Hesp. 253 et 280 (1867).

*Hab.*—Canarienses (*Lanz.*); ad margines lacus ejus salini “Januvio” dicti a me ipso parce deprehensus.

p. 518 (genus TROGOPHLÆUS).

(Sp. 1434) *Trogophlæus exilis*.

This little *Trogophlæus*, found both in the Madeiran and Canarian archipelagos, is said by Fauvel (*L'Abeille*, vi. 152) to be conspecific with the European *T. pusillus*, Grav.; and I think perhaps that this conclusion may be accepted as probable. Assuming, therefore, M. Fauvel's identification to be correct, the synonymy of the species must stand thus:—

*Trogophlæus pusillus*.

*Aleochara pusillus*, Grav., Col. Micropt. 78 (1802).  
*Trogophlæus pusillus*, Kr., Nat. der Ins. Deutsch. ii. 880 (1858). *Trogophlæus exilis*, Woll., Ann. Nat. Hist. vi. 105 (1860); Id., Col. Atl. 519 et Append. 75 (1865).

Hab.—Maderenses (*Mad.*), et Canarienses (*Ten.*, *Gom.*); hinc inde in humidis.

p. 522 (genus HOMALIUM).

(Sp. 1440) *Homalium sculpticolle*.

In the Appendix to my 'Coleoptera Hesperidum' I mentioned that this Canarian *Homalium* had been identified by M. Fauvel with the European *H. Allardii* of Fairmaire. There was clearly however some mistake in Fauvel's determination, for the *H. Allardii* is in reality more akin to the Madeiran and Canarian *H. ocellatum*, and has scarcely anything in common with the *sculpticolle*. The latter, as stated elsewhere, finds very much nearer allies in the common *H. riparium* and *fossulatum* of more northern latitudes. Hence, the note (above alluded to) in the Appendix of the 'Coleoptera Hesperidum' must be cancelled.

(Sp. 1441) *Homalium ocellatum*.

After what I have just mentioned under the preceding species, it will be seen that it is the *H. ocellatum* (not the *sculpticolle* as asserted by Fauvel) which so nearly resembles the European *H. Allardii*; nevertheless it would appear that even the *ocellatum* cannot be abso-

lutely referred to the latter; for Mr. Rye, alluding to the *double* mistake of Fauvel, and after a very careful inspection of my type of the *ocellatum* (now in the British Museum), adds that the *H. ocellatum*, when compared with the *Allardii*, "appears to be lighter, shorter, and broader, with bright yellow ocelli and clear testaceous legs, and with a more transverse thorax—of which the sides are more rounded and more contracted behind, and the hinder angles more prominent (the fovea there being deeper), with rather shorter and less parallel elytra, which are less strongly and scarcely rugosely punctured, and with the abdomen not so dull, but with evident scattered punctuation." And Mr. Rye then goes on to observe that "if, nevertheless, in spite of these discrepancies, Mr. Wollaston's insect is to be considered identical with the *H. Allardii*, it will not disturb any references,—for the *ocellatum* was described in the 'Insecta Maderensis' in 1854, and Fairmaire's species in the French 'Annales' for 1859." [Vide Ent. Month. Mag. iv. 236.]

(Sp. 1443) *Homalium clavicone.*

This very distinct Madeiran *Homalium*, although so greatly attached to the rotten wood of the decaying Euphorbias, does not appear to be (as I had supposed) peculiar to that singular race of plants; for during our residence at "the Mount" (about 1700 feet above Funchal), in the winter and spring of 1870, I took it in tolerable profusion out of the soft putrid stems of the fragrant *Cestrum vespertinum*, known as the "Béllas-nôites" by the Portuguese inhabitants of the island. Still, I believe it to be normally a *Euphorbia*-infesting species—for the "Béllas-nôites" is not indigenous in Madeira, and it is likewise reported by Mr. Crotch (*Proc. Zool. Soc. Lond.* 385; 1867) to have been met with abundantly "in *Euphorbia*-stems in Flores," the most western island of the Azorean archipelago.

After species 1444, add the following:—

*Homalium concinnum.*

*H. elongatum*, *subdepressum*, *nitidum*, (abdomine excepto) *minutissime vix pubescens*; capite (triangulari,

nigro) prothoraceque (omnino, sed præsertim in limbo, dilutiore) rugose punctatis; elytris inæqualiter piceo-testaceis, rugose punctatis (punctis obsolete longitudinaliter, quasi in strigis irregularibus, dispositis); abdomine multo subtilius punctulato, sed grossius pubescente; antennis (brevibus) pedibusque testaceis.

Long. corp. lin. circa 1½.

Variat colore plus minus obscuriore, corpore interdum omnino piceo-nigro.

*Staphylinus concinnus*, Mshm., Ent. Brit. 510 (1802). *Omalium concinnum*, Erich., Gen. et Spec. Staph. 886 (1839); Kraatz, Nat. der Ins. Deutsch. ii. 991 (1858).

Hab.—Maderenses (*Mad.*); in granariis ad S. Antonio da Serra parce lectum.

A few examples of this European *Homalium* were taken by my wife in a granary at S. Antonio da Serra, during our sojourn at Madeira in the spring of 1870, as also by sifting rubbish in an old outhouse adjoining it. I have little doubt therefore that the species (which was found in company with various *Cryptophagi*, *Latridii*, and other insects of like habits) has been introduced into the island from more northern latitudes. And this seems the more probable, since I have captured the *H. concinnum* under somewhat similar circumstances (namely amongst the refuse around the base of hay and corn-stacks) in England. It is very closely allied to the (equally European) *H. deplanatum*, but is, *inter alia*, a little brighter (being less appreciably pubescent) and more coarsely punctured, with its antennæ and elytra a trifle shorter,—the punctures of the latter having a tendency, moreover, to arrange themselves in irregular longitudinal strigæ.

p. 524 (genus *MEGARTHrus*).

(Sp. 1446) *Megarthrus longicornis*.

Although so universal throughout the Canarian Group, I had until lately considered this *Megarthrus* as somewhat scarce at Madeira. But during our late sojourn in that island we met with it abundantly at "the Mount" (from about 1700 to 1900 feet above Funchal), by sifting fallen leaves and rubbish, and likewise, though in less profusion, at S. Antonio da Serra. It would perhaps

have been more correct if, in the 'Coleoptera Atlantidum,' I had compared it with the European *M. denticollis*. Indeed Mr. Rye, who a short time ago had the kindness to give it a very careful examination, remarks "Not so near to the '*M. sinuaticollis*' as to the *denticollis*; but its long thin antennæ, very remote punctuation, and weak superficial male characters (as regards the legs) readily separate it from that species. There are certainly no European members of the genus in De Marseul's last Catalogue that will suit it."

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VIII. *On a new genus and species of Coleoptera belonging to the family Lucanidæ, from the Sandwich Islands.* By CHAS. O. WATERHOUSE.

[Read 20th March, 1871.]

AMONG some insects lately sent to the British Museum from Honolulu, Sandwich Islands, by Mr. Harper Pease, were two specimens of a small, dull-black coleopterous insect belonging to the family *Lucanidæ* which was new to the collection, and is apparently new to science.

The species is interesting not only from its somewhat peculiar form, but from the isolated locality from which it comes ; Honolulu being 2081 miles from the nearest continent, that is, from San Francisco in California. The insect is, however, evidently most closely allied to *Sclerostomus Bacchus*, which comes from Chili, distant from Honolulu 5902 miles.

Its short broad form, and much rounded elytra, together with the extreme brevity of the metasternum, and the absence of spines from all the tibiae, except the intermediate pair in the male, will at once separate it from all the *Lucanidæ* hitherto known.

I propose to call it *Apterocyclus*.

**APTEROCYCLUS, gen. nov.**

Mandibles in both sexes short, very slightly curved, furnished with a single tooth on the inner-side close to the base ; clypeus very wide, with the front margin very nearly straight ; mentum semicircular ; second and third joints of the antennæ subquadrate, of nearly equal size, the fourth to seventh joints gradually becoming shorter, the three apical joints spongy, and forming a slight club ; eyes in part divided by the canthus ; all the tibiae unarmed, except the intermediate pair in the male, which are furnished with a single minute submedial tooth ; metasternum extremely short.

*Apterocyclus Honoluluensis, sp. nov.*

*Brevis, subdepressus, ater ; capite lato, antice truncato ; mandibulis parvis, unidentatis, punctatis ; thorace capite*

*latiore, postice omnino rotundato; scutello parvo; elytris subrotundatis* ( $\delta$ ) *vel rotundatis* ( $\varphi$ ); *metasterno brevissimo, nitido; tibiis anticis posticisque inermis, intermediis unidenticulatis* ( $\delta$ ) *vel inermis* ( $\varphi$ ).

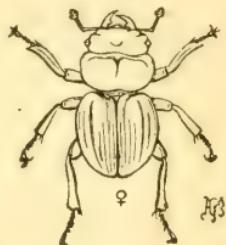
$\delta$ . Long. lin. 7; lat. elytrorum lin.  $3\frac{3}{4}$ .

$\varphi$ . Long. lin. 8; lat. elytrorum lin.  $4\frac{1}{6}$ .

Short, somewhat depressed, sooty-black; the head broad, slightly angular at the sides, above very minutely granular, sparingly and indistinctly punctured about the eyes, more distinctly punctured towards the front margin; canthus slender; clypeus wide, nearly straight in front, only very slightly produced in the centre in the male; there is a tendency to a reddish colour at the base of the mandibles, and on the canthus. The thorax is distinctly broader than the head, the front margin bisinuate; the sides are very little rounded, the whole of the posterior part of the thorax is semicircular; the upper surface is very minutely granular, sparingly and indistinctly punctured. Elytra in the male a trifle narrower than the thorax, narrowest at the base, gradually becoming broader to the apical two-thirds, the apex completely rounded; each elytron presents two indistinct longitudinal impressions; the suture near the base is rather less opaque than the other portions of the elytra, and is sparingly and minutely punctured; in the female the elytra are a little broader than the thorax, and much more rounded at the sides. The anterior tibiæ are elongate-triangular, unarmed; the intermediate tibiæ are sub-cylindrical, simple in the female, and furnished with a minute sub-medial tooth on the outside in the male, the apices on the outer-side in both sexes simple; the posterior tibiæ are sub-cylindrical, unarmed, bowed outwards in the female, nearly straight in the male. The metasternum is polished; extremely short, so that the bases of the intermediate and posterior pairs of legs are scarcely further apart than the posterior legs are from each other.

*Hab.*—Honolulu, Sandwich Islands.

Sent to the British Museum by Harper Pease, Esq., with the note “Mountains of Kanoï; only two found.”



**IX. An Examination of the arrangement of Macro-Lepidoptera introduced in England by Mr. Doubleday, and a suggestion as to its origin; with some strictures upon synonymous lists.** By W. ARNOLD LEWIS.

[Read 3rd April, 1871.]

THIS paper is concerned with the *Macro-Lepidoptera*. Its object is to investigate the order of the groups; or (more accurately) to examine what is found upon the order of the groups in the entomological publications now usually consulted. Incidentally to this inquiry, a few reflections will suggest themselves upon the essentials of scientific authorship; and some observations will be offered upon the degrees of respect to be conceded to writers on entomological science.

The *Macro-Lepidoptera* are, according to the arrangement as I believe in general use *in this country*, divided into ten groups; the names and order of the groups as usually recognized being as follows:—1st, *Diurni*; 2nd, *Nocturni*; 3rd, *Geometræ*; 4th, *Drepanulæ*; 5th, *Pseudo-Bombyces*; 6th, *Noctuæ*; 7th, *Deltoïdes*; 8th, *Arentiæ*; 9th, *Pyrales*; 10th, *Crambi*. I say this is the order usually adopted in this country, because, though I am not acquainted with any of the leading collections, yet all those which have come to the hammer of recent years (and many of them had the sanction of well-known names,) have been so arranged. Moreover, all the exchange lists printed for use by the active collectors adopt this order, as do the lists of captures, etc., in the entomological journals. We shall almost immediately have to trace, to some extent, the steps by which this arrangement came to be introduced: but it will be well to state concisely in what particulars it most conspicuously differs from its predecessors. It differs mainly in having no group *Sphinges*, and no group *Bombyces*, but in place of those having a group *Nocturni*, and a group *Pseudo-Bombyces* only. It differs also in the location of the groups *Geometræ* and *Noctuæ*, whose place in the order is wholly altered, and in the erection of a family into a separate group *Drepanula*. I hope to discuss presently these different points; but I wish at

once to suggest a question : *Is there anywhere in print a justification or explanation of this order of arrangement?* And as developments of this question, a few others : Has the group *Nocturni* ever had even characters assigned it ? Has the position of the *Geometræ* and the *Pseudo-Bombyces* been ever explained ? Is the arrangement of the *Noctuæ* consonant with the position of that group ? Have the names *Nocturni*, *Drepanulæ*, *Pseudo-Bombyces*, as applied to these insects, any sanction ? Upon these questions, and others which arise, I shall endeavour, in turn, to throw a little light.

It will, however, be best to observe here, that one aim I principally have in this paper, is to sift the history of the so-called group *Pseudo-Bombyces*; against which I charge that it is not a group at all; that if a group its position in the order is erroneous; that its name is wrong; and, that the group owes its creation to certain exigencies of a fortuitous kind. In particular, and finally, I charge as a grave offence to science, that no justification of the group, nor of its name or position, was ever offered by its authors, and that it has been introduced *sub silentio* in a mere labelling list.

It is necessary to prepare the ground for our inquiry into the present arrangement of the *Lepidoptera*, by noticing briefly the system in use before its introduction. This can be done shortly, because I am primarily concerned with the order of arrangement alone; the points at which authors have drawn the line between group and group not being especially important at this stage; and the internal classification of each having nothing to do, at present, with the matter.

The order of LINNÆUS is the basis of every system save the one I am to examine to-night; and, without any serious deviation, it was (so far as I am aware) followed by all the world until the year 1859, when this new order saw the light. The Linnæan divisions of the *Lepidoptera* are familiar to everyone, but it is necessary to notice them here once for all. His three primary sections, then, are *Papilio*, *Sphinæ*, and *Phalæna*: and his divisions of the section *Phalæna* (which correspond to our groups) are as follows: 1st, *Attacus*, and 2nd, *Bombyx*; 3rd, *Noctua*; 4th, *Geometra*; 5th, *Pyralis*. *Attacus* being now classed as a part of *Bombyx*, and not interfering with the order in any way, it is accu-

rate to state shortly, that the Linnaean order was *Bombyx*, *Noctua*, *Geometra*, *Pyralis*. I need not state what descriptions of species composed each Linnaean group; but it may be worth while to mention that the species of the so-called *Pseudo-Bombyces* known to Linnaeus, are described in the "Systema Naturæ" as *Bombyces*, and placed with the rest of that group between *Sphinx* and *Noctua*. The Linnaean order is completely intelligible; so intelligible indeed that, I believe, almost anyone would, without a book at all, of his own accord, arrange the *Lepidoptera* in this order. The largest species, the *Sphinges*, were put first; after them the largest moths that were left, *Attacus* and *Bombyx*, the smaller division coming second. Next all the remaining moths with stout bodies, *Noctua*; after these, the slender bodies in their order of size, viz., *Geometra* first, then *Pyralis*. As I have said, this order was the simplest imaginable. It is the most matter of course thing in the world to put the biggest moth at the head of your collection, and the little ones at the end. Linnaeus placed the largest group at the head of his arrangement, and the smaller groups in their order of size after it. I should be very sorry to be understood as placing the Linnaean arrangement on a low ground. It is, I think, a natural arrangement, to place the group containing the largest species first, and those containing the smallest species last, and, unless some close affinities are outraged, it is, I think, a natural arrangement to place all the groups, from the first to the last, in the order of size of the species. It is certainly the most striking of the objections to the new arrangement, that it takes you straight from the largest *Bombyces* into the *Geometræ*, from those slender insects back again into the large *Bombyces*, and then after another spell of stout-bodied moths, drops you finally into the small ones. The Linnaean groups with the Linnaean names, and in the Linnaean order, were adopted almost universally, down to the year 1840, a date from which their uniform accuracy seems, as we shall find, to have been occasionally canvassed. Fabricius followed the Linnaean order, and used the Linnaean groups; so did the famous authors of the Vienna Catalogue; and so have followed Hübner, Haworth, Ochsenheimer, Treitschke, Duponchel, Stephens, and, with special exceptions, Latreille; and so in recent times, Boisduval, Herrich-Schäffer, Westwood, Horsfield, Lederer, Staudinger, and even Doubleday.

All this array of authors of first-rate repute followed the order which, by the new arrangement of 1859, it was sought to re-model. The works of a few of the number must receive a brief consideration; but I will first and once for all present this view, which must occur to anyone who reflects much on the subject. The names of the Lepidopterists just mentioned at least equal in respectability any known in entomology. Those authors of different times and nationalities, with minds of different bents, as zealous for science as at least their successors, have proceeded to their conclusions by different and original methods; and their concurrence in one order of arrangement must be accepted as most notable. I will not enlarge on this view, because it is one which everybody can appreciate the moment it is presented, but I will merely recall here some facts showing its pertinence. It is a common-place to say that the classification of genera may depend on a great variety of details; all entomologists know that a genus may be defined by the characters of its larva, pupa, or imago, and by (1) the structure, or (2) the habits of either of the three. The differential characters in the perfect insect for instance, may be found in the palpi, in the neurulation of the wings, in the legs or in the antennæ, &c.; and a variety of systems have been devised for classifying insects from some one or more of these characters. Thus Linnaeus himself, after the wings, considered the antennæ of chief importance, and the order which he originated was arrived at from those characters; the Vienna Catalogue was founded entirely on the differences of the preparatory states, and that arrangement again is the same as that arrived at by Linnaeus. Fabricius used as the basis of his classification the characters of the mouth-parts; he also agrees in the Linnaean order. Latreille lastly with the "eclectic" system which he devised, also agreed in that order, though with a variation presently to be mentioned. Therefore, I repeat, the concurrence among these and the other first-rate writers is a very significant fact. There is no such thing in my mind as a suggestion, that these authors *may not* all have been wrong; but the fact of their concurrence would prompt anyone to examine narrowly a proposal of radical changes, and, one would have hoped, would stimulate the proposers of changes to submit their reasons for them to our judgment.

Denis and Schiffermiller, and some others of the authors named, supply some materials which it is as well to use up before leaving our consideration of their system. First, then, in the Vienna Catalogue the groups *Sphinx*, *Bombyx*, *Noctua*, and *Geometra* are regularly arranged in sub-divisions, which are very serviceable as illustrating the connection (in the view of the authors) of each group with its predecessor or successor in order. The affinity of *Bombyx* to *Sphinx* is illustrated in this way; *Bombyx* has for its first section *Sphingiformes*: while the same relation is illustrated in like manner, thus:—*Noctua* begins with *Bombyciformes* and concludes with *Semi-Geometræ*, the *Geometræ* again beginning with *Semi-Noctuæ*. This illustration of the affinity of each group to its predecessor, bears out very satisfactorily the correctness of the Linnaean order; and we shall find shortly that several later authors have seen the affinities in the same light.

It is necessary to examine with some particularity the arrangement of LATREILLE, not only because he is the greatest systematist who has revised the Linnaean arrangement, and was the first to propose any deviation from it; but also because he did sub-divide the *Bombyces*, and did in one of his works apply to one of his sub-divisions the name *Pseudo-Bombyces*. Latreille's "Genera Crustaceorum et Insectorum secundum ordinem naturalem in familias disposita," was concluded in 1809. The arrangement followed here he adhered to with variations in his other works. He divided all the *Lepidoptera* into *Diurna*, *Crepuscularia*, and *Nocturna*, which divisions exactly corresponded with the Linnaean divisions *Papilio*, *Sphinx*, *Phulæna*. His first family (corresponding to our group) of the *Nocturna* is *Bombycites*, including the present genera *Hepialus*, *Zenzena*, *Saturnia*, *Lasiocampa*, *Bombyx*, *Cerura*, *Laria*, *Limacodes*, *Psyche*. Of the *Bombycites*, however, he classes a number of genera under a sub-heading as " *Bombycites Legitimus*; les vraies Bombycites," namely, *Bombyx*, *Lasiocampa*, etc., and (what is important) *Cerura*, *Pygæra*, and *Clostera*. In order to show the bearing of this circumstance, I may mention here, that these very three genera, *Cerura*, *Pygæra*, and *Clostera* "vraies Bombycites" of Latreille, are (with others) now, by the new classification, separated from the group, and called in terms " *Pseudo-*" or "false" *Bombyces*. Latreille's first group of *Nocturna* being the *Bombycites*, his next is

*Noctuo-Bombycites*, including *Arctia* with its allies, *Lithosia* with its allies, and all the *Tineæ*; and his third group is *Noctuælitæ*. His fourth group following on the *Noctuælitæ* is *Phalænites*, being all the *Geometræ*. After the *Phalænites* come the *Pyralites*. Now this arrangement of Latreille's follows closely the Linnæan arrangement, except only in placing the *Tineæ* between *Bombyæ* and *Noctua*. The names and order of his groups, remark, are *Bombycites*, *Noctuo-Bombycites*, *Noctuælite*, *Phalænites*, *Pyralites*. This shows no deviation at all from the Linnæan arrangement; but it is the fact, that on examination we find the group *Noctuo-Bombycites* to include the *Tineæ*. In his "Considérations générales sur l'ordre naturel," etc. (published in 1810) Latreille observes almost identical divisions, and in the introductory portion (p. 81) he states that the *Lithosiæ* are the connecting link between *Bombyæ* and *Noctua*, and he places the *Tineæ* with the *Lithosiæ* on account of their affinity to them.

In his volume of Cuvier's "Familles naturelles du Règne Animal," (edition 1825), Latreille's first group of *Nocturna* is *Bombycites*. His second takes the name *Pseudo-Bombyces* (against which in a parenthesis the name "*Noctuo-Bombycites*" is printed, apparently as a synonym). Third come the *Tineites*; fourth again the *Noctuælites*; but fifth here, the *Tortrices* (including *Pyrales*); then sixth, the *Phalanites*; seventh, *Crambites*. The thing chiefly noticeable in these arrangements of Latreille is, so far as our inquiry is concerned, that throughout, his *order* of the groups we are discussing, is *Sphinæ*, *Bombyæ*, *Noctua*, *Geometra*. There is no suggestion that it was proper to bring *Geometra* next to *Bombyæ*; nor to separate the species of *Bombyæ* by placing *Geometra* between them; nor to place *Geometra* before *Noctua*; nor indeed to deviate at all, so far as these groups are concerned, from the Linnæan order. We do find, however, that Latreille used the greatest freedom in altering the position of the groups where that appeared desirable, and moved about at his pleasure the *Pyralides*, *Tortrices*, and *Tineæ*.

We must now turn to the group *Pseudo-Bombyces*, first used by Latreille in his last work, the 'Règne Animal.' His *Pseudo-Bombyces* include *Cossus* and *Zenzena*, *Dicranura*, *Platypteryx*, *Notodontæ*, *Orgyia*, *Limacodes*, *Callimorpha*, *Arctia*, *Chelonia*, or in fact by far the

greater number of species in the original *Bombyces*. It is important not to overlook this fact, that here we have *Dicranura* and *Notodonta*, which are included in the *Pseudo-Bombyces* of the new arrangement, also included in a group of Latreille bearing the same name. This is, I think, the nearest approach to a justification of the new arrangement which has appeared in print, and it is, therefore, important to allow it its full influence. How slender a justification it in truth proves we shall very shortly find.

The new group *Pseudo-Bombyces* takes away twenty-seven species, and separates them from all the other *Bombyces*. They are placed so far away from all the other *Bombyces*, that we are bound to believe the authors of the arrangement discover in those species a complete difference of structure, or other striking dissimilarity, from the remainder of the Bombyciform genera. That should be, of course, the sole rationale of the creation of the group.

Now, that being the case, what justification or support does the new division of the *Bombyces* receive from the fact, that Latreille had before effected a subdivision of the group? Latreille's group, *Pseudo-Bombyces*, so far from isolating at a distance from the *Bombyces* only twenty-seven species, itself includes the bulk of the *Bombyces*; and, what is most important, groups together, as allied with the separated genera, many others from which the new arrangement takes them away. Latreille does call *Dicranura* and *Notodonta* *Pseudo-Bombyces*; but he also calls *Pseudo-Bombyces* the genera *Cossus*, *Arctia*, *Orgyia*, and many more, considering all these to bear to the true *Bombyces* the same relation as is borne by *Dicranura* and *Notodonta*, and presenting them in close relationship with *Dicranura* and *Notodonta* in the same subdivision. Latreille's arrangement of the species in fact strengthens the case against the new group *Pseudo-Bombyces*; and though he called some genera by that name, they were not placed as the new group is placed, nor are they, as a group, distinguished by the same characters. But, in truth, Latreille, in his last work, divided the *Bombyces* on a very simple plan, which is found stated at p. 472 of his vol. of the "Règne Animal." His group *Bombycites* is confined to those species "dont les ailes inférieures n'ont point de frein," and that is the distinction by which he was guided.

There remains his placing of the *Pyrales* (in this last work) next after the *Noctuae* and before the *Geometræ*. This is clearly a step in the direction of the new arrangement, and it remains as some testimony in its favour; but Latreille considered *Pyralis* as a division of *Tortrix*; and *Crambus*, which he admitted to be separate, he placed after *Geometra* (as in the Linnæan order), away from *Pyralis* altogether: so the new arrangement *Noctua*, the *Deltoides*, *Pyralis*, *Crambus*, *Tortrix*, obtains very small countenance from Latreille.

I now leave this author, whose various classifications, the work of a vigorous and intrepid systematist, all strongly favour the coherency of the Bombyciform genera; and the order of arrangement, *Sphinx*, *Bombyx*, *Noctua*, *Geometra*.

Hübner's arrangement also affords a contrast in the classification of the *Bombyces*, to the new one now in vogue. One of his three sections is termed “*Veræ*” (or “the true”); and this section includes *Clostera* and *Diloba*, two genera of the new “*Pseudo-*” *Bombyces*. The remainder of the species of this so-called group Hübner classes under the name *Sphingoides*, and places at the head of the *Bombyces* following the *Sphinges*. Now, anything in the same class of natural objects more dissimilar than *Sphinx* and *Geometra* I have never read of. Hübner considered *Notodontæ* as allied to *Sphinx*: the promoters of the new arrangement appear to consider it allied to *Geometra*. Hübner, also like the authors of the Vienna Catalogue, illustrates the affinities between the groups by using appropriate names; thus, besides the *Bombyces* commencing with the *Sphingoides*, he makes the *Noctuae* commence with *Bombycoides*, and end with *Semi-Geometræ*, etc.

There are but two other writers before 1840, whose works it is necessary to notice (one of them an Englishman), Dr. Horsfield and M. Guenée. A very few words will express all that need here be said about both.

Dr. Horsfield plans out the *Macro-Lepidoptera*, following the Linnæan order without the smallest deviation. His *Bombycidæ* include, of course, *Pygæra*, *Cerura*, *Notodontæ*. He has no group *Pseudo-Bombyces*. The fifth and last section of his *Noctuidæ* is *Semi-Geometræ*

(as in the Vienna Catalogue and Hübner's "Verzeichniss"). The first of his sections of *Phalænidæ* is also *Semi-Noctuæ*. His order is *Bombycidæ*, *Noctuidæ*, *Phalænidæ*, *Pyralidæ*.

M. Guenée, in 1837, contributed to the Annals of the Entom. Soc. of France, the first of a series of papers on the classification of the Noctuælides; and as everyone would expect, he makes the group, if I may use the expression, "face towards" the *Bombyces* at the beginning, and towards the *Geometræ* at the end. He places first the tribe *Bombycoïdi* to illustrate the affinity to *Bombyx*, and last the tribe *Noctuo-Phalænidæ* to illustrate the affinity to *Geometra* (or *Phalæna*), both names being the names of Dr. Boisduval—an arrangement which in 1841, indeed, when he contributed a revision of his classifications, M. Guenée confirmed and re-published.

Thus up to the year 1840, at all events, we have found no trace of a disposition to alter the place of the *Bombyces*, *Noctuæ*, or *Geometræ*. On the contrary, all the writers have preserved the three groups in their original order, and we have found German, English, and French authors fortifying this arrangement, and supplying in their nomenclature additional illustrations of its propriety. Two authors also, as if to secure by anticipation the recognition of certain species as *Bombyces*, have named those *Bombyces* "verr" and "legitime," which it is now sought to call "Pseudo—" *Bombyces*.

We shall still find (starting from the year 1840) that no matter where the divisions were made, the order observed was, for some time, substantially the same.

One of the best known methodical lists is Boisduval's "Genera et Index Methodicus Europæorum Lepidopterorum." The second edition of this work was published in 1840. His arrangement is very simple, and his division of the Lepidoptera into *Rhopalocera* and *Heterocera* is known everywhere. Boisduval separates the three first groups of the *Heterocera* into tribes, and it is in his arrangement that we first miss the use of the appellations *Sphinx* and *Bombyx* as the names of groups, a feature which distinguishes also the new arrangement. To the families constituting these groups he gives, it seems, no collective name, merely heading the division "Larvæ

progressoriæ" (see p. 39). This is the only important change introduced by Boisduval's Index. In all other respects it closely follows the Linnaean arrangement. The *Micro-Lepidoptera* were the subject of a continuation of the "Index" undertaken by M. Guenée. The noticeable feature of that arrangement is the insertion of the *Pyrales* and *Crambi*, after *Tortrix* and before *Tinea*, an arrangement which has now, it seems, no apologists.

In the year 1840, appeared Mr. Newman's "Familiar Introduction to the History of Insects; being a new edition of the grammar of Entomology," one book of which is devoted entirely to an exposition of the author's views upon classification (Classif. Lepidop. pp. 209-215). His order is—including remark, Butterflies and Moths all in one:—1st, "Hawk-moths or *Sphingites*," including all the *Sphingina*, except the genus *Trochilium* of Stainton, the small clearwings: 2nd, "Skippers, or *Hesperides*;" 3rd, "Butterflies;" 4th, "Loopers, slender-bodies, or *Geometrites*;" 5th, "Half-loopers, or *Phytometrites*," *Plusia*, *Acontia*, *Erastria*, *Phytometra*, and the rest; 6th, "Full-bodied moths, or *Noctuites*;" 7th, "Millers, or *Arctiites*," *Acronycta*, *Spilosoma*, *Arctia*, *Hypercompa*, *Lithosia*, *Hypogymna*, *Laria*, *Orgyia*; 8th, "Eggars, or *Bombycites*," *Eriogaster*, *Odonestis*, *Gastropacha*, *Lasiocampa*; 9th, "Emperor-moths, or *Phalænites*," *Saturnia carpini* alone; 10th, "Prominents, or *Notodontides*," *Endromis*, (!) *Cerura*, *Stauropus*, *Platypteryx*, *Ciliæ*, *Notodontæ*, *Pygara*, *Clostera*; 11th, "Wood-eaters, or *Xyleutes*," *Hepialus*, *Xyleutes*, *Zenzena*; 12th, "Clearwings, or *Ægeriites*," *Ægeria*; 13th, "Burnet-moths, or *Glaucopites*," *Zygæna*, *Ino*; 14th, "Pearl-moths, or *Pyralites*;" 15th, "Veener-moths, or *Crambites*."

In the preface (p. ix) Mr. Newman gives his own view of his own arrangement. "The Fourth Book, entitled Classification of Insects, may be charged with being too original; it may be said that the author should have given the views and arrangements of others in preference to his own. He would ask, whose system was he to select? That his own is the most simple, and the most readily understood, no one will deny;" and he adds (two pages later) "it would be false modesty for the author to pretend blindness to the fact, that the humble efforts of his pen and pencil have been unusually successful," &c. It

rather takes away one's breath to be told this strange looking arrangement is "the most simple," but as it is not accompanied by a word of reason, we may suppose Mr. Newman really thought it was. It is unfortunate that this particular "effort" was not so successful as to prevent its being abandoned by its author; for it seems to be the case that, neither he nor any other entomologist ever followed the scheme.

One remarks in this arrangement that, though the *Sphinges* are cut up and separated widely, the *Bombyces*, *Noctuae*, and *Geometræ* are all kept together, and, while the arrangement is chiefly noticeable for its eccentric treatment of the *Sphinges*, it is in other respects nearly the Linnæan arrangement read backwards. In particular, Mr. Newman, like Denis and Schiffermiller, Hübner, and Horsfield, connects *Noctua* with *Geometra* by means of *Plusia* and its allies; and like Hübner, he places *Notodonta* as far away from *Geometra* as it could well be. No one, so far, has connected *Geometra* with *Noctua* by means of *Notodonta*, the great feat of the new arrangement.

Also in 1840, was published Professor Westwood's "Introduction to the Modern Classification of Insects," a work (if I may be allowed to say so) characterized by wide learning and very close study. The author professes his inability to offer a satisfactory classification of the *Lepidoptera* in main tribes or groups, but, using only large family divisions, he adopts exactly the Linnæan order, following Latreille and Stephens in making *Lithosia* the connecting link between *Bombyx* and *Noctua*.

Mr. Westwood's book supplies numerous expressions of opinion, and various reasons, in favour of the Linnæan arrangement, of which I will reproduce a few in his own words. He speaks of "the transition from the *Noctuidæ* to the *Geometridæ*, so beautifully effected by *Catocala*, *Plusia*, and other half-loopers, as their larvae are termed, and *Ophiusa*, *Erastria*, &c." (Westw. Introd. ii. p. 363.) Again (p. 370), "there appears to be but little relation in the imago state (between *Ægeria* and *Zenzena*), either in respect of their habits or structure, so that it may be questioned how far the relation is more than one of analogy; at all events, I hesitate as to the propriety of placing the *Ægeriæ* in the same natural group with *Hepialus* and *Cossus*." I need hardly remind Lepidopterists that one

of the features of the new arrangement is to place *next together* those two genera in the group called *Nocturni*. Again (p. 385), "I find it impossible to draw a line between the types which form Stephens' two families, *Notodontidae* and *Aretiidae*. The structure of the mouth will not assist in the inquiry, because *Pygæra*, *Cerura*, &c., amongst the *Notodontidae* have the maxillæ, and even the maxillary palpi, developed as strongly as in *Spilosoma* and *Aretia*, whilst there is as great a variation in the transformations of the genera of either group as there is between the respective species of the two groups; hence I have followed Latreille in keeping them under one family." Those genera which Mr. Westwood felt constrained to include in one family are now, by the new arrangement, separated by hundreds of species, including the whole group of *Geometræ*. And again (p. 363), "It seems unquestionable that *Sphinx* (or the hawk-moths), *Bombyx* (or the feather-horned full bodies), &c., are, as Linnaeus considered them, amongst the primary types." Neither *Sphinx* nor *Bombyx* is, in the new arrangement, acknowledged as a type at all.

But to proceed. Not long after Mr. Westwood's book was written, came Mr. Doubleday's first "Synonymic List," proposing the first instalment of the great changes which were at hand. The first pages (1-8) were published in October, 1847, and they went as far as the genus *Tæniocampa* (in the *Noctuæ*), proceeding in the Linnaean order through *Rhopalocera* (so called in the List), *Sphinges* (so called), and *Bombyces* (so called). In the following month (November, 1847) some more pages (9-16) came out, carrying the list through the remainder of the *Noctuæ* well on into the *Geometræ*. Thus Mr. Doubleday, like all who preceded him, adopted the old order, leaving no doubt that (1) *Sphinx*, (2) *Bombyx*, (3) *Noctua*, (4) *Geometra*, was then, according to his view, the correct arrangement. In August, 1849, there was a complete re-issue of pp. 9-16, apparently for the express purpose of taking in the *Pyrales* between the *Noctuæ* and *Geometræ*. This order, at all events, was observed on pp. 13, 14, and 15 of the re-issue; and, accordingly, Mr. Doubleday's first list, when concluded at the close of 1849, showed the following order: *Rhopalocera*, *Sphinges*, *Bombyces*, *Noctuæ*, *Pyrales*, *Geometræ*. At this time, therefore, the change was not very great or

startling, for Latreille had before (as we have seen) tried the *Pyrules* in different positions without leaving them very satisfactorily placed. But this alteration in the Linnaean order by Doubleday was, nevertheless, openly dissented from by Mr. Stephens, and it did not obtain, I believe, the adhesion of entomologists.

Next, in 1852, was published the first vol. of M. Guenée's "Noctuélites," and on p. 2 of that work, we find his ideas on classification. He says, "The *Noctuæ* can be placed indifferently after *Bombyx* or after *Geometra*. They unite with the former by the *Noctuo-Bombycides* and *Bombycoides*, and with the latter by the *Anthophilides*, *Erastrides*, and *Phalænoïdes*. If this last disposition were adopted, it would be necessary to attach *GEOMETRA* to *BOMBYX* by the genera *AMPHIDASYS*, *NYSSIA*, &c., and to the *NOCTUÆ* by the families just mentioned" (namely *ANTHOPHILIDES*, *ERASTRIDES*, *PHALÆNOÏDES*). This, I think, is a most important passage; and then follows this sentence: "But up to this time, all the authors have placed the *Noctuæ* immediately after *Bombyx*, and when I reflect that the bouleversemement of that order adopted for such a long time, would have nearly as many inconveniences as advantages, I feel little disposed to make an innovation." Now here we have a candid suggestion by M. Guenée, of a plan for placing the *Geometræ* between *BOMBYX* and *NOCTUA*; and he says that if this be done, the *Noctuæ* must begin with *Erastria* and *Anthophila*, which would require a complete re-arrangement of the group. Not a word, remark, is here said by the author of the new system about dividing the *Bombyces*, and placing the *Geometræ* between the sections. The whole passage tends directly to this, that if effect is to be given to the affinity of *Bombyx* and *Geometra*, it must be by placing *Geometra* next to *Bombyx*, and then securing the transition from *Geometra* to *Noctua*, by a re-arrangement of the latter group. Too much weight can hardly be given to this opinion.

M. Guenée, therefore, having decided in 1852 not to disturb the arrangement, described the "Noctuélites" in the old order, that is, beginning with the *Bombyciformes*, and having the Geometriform families at the end. When his work had proceeded as far as the *Geometræ*, M. Guenéo (in the 'Généralités,' vol. 9, p. x) returned to the subject. He says, "you can attach the *Phalænites* to nearly all the other divisions of the *Nocturna*. Thus, the *Noctuæ* give

us as a transition, the *Erastrides*, *Catocalides*, *Brephos*, and all the family of the *Thermesides*; the *Pyrales* present to us a crowd of species with large and slender wings, which the old authors have confounded with the *Geometræ*; the *Deltoides* approach them still more; lastly the *Bombyces* include, in nearly all their principal sections, families which border upon them"—naming with others, *Euchelia*, *Platypteryx*, *Saturnia*, *Lithosia*. Thus M. Guenée in 1857.

The first volume of Stainton's Manual was completed in the same year; and the order there observed is, everyone knows, the Linnaean order. A writer in the "Natural History Review," attacked Mr. Stainton on the subject of his arrangement, and in particular for departing, forsooth, from that introduced in Mr. Doubleday's list of synonyms. The "Substitute," in a later article (Substitute, 1856-1857; p. 14, Art. "Change of names") took occasion to correct the first-named writer, and inform him that a list without descriptions or characters was "no authority at all for quotation," a dictum in which I venture to express my strong concurrence.

In the year 1858-59, Mr. Doubleday was getting ready a new catalogue, and the authors of the then shortly forthcoming "Accented List" were favoured, we were told, with a sight of it. They straightway copied the new list out of hand, and the first knowledge entomologists in general had of the mercies in store for them, was obtained on the appearance of the "Accented List." The "Intelligencer" of that date published some comments on the new arrangement, and, in particular, protested against the *Geometræ* "being placed sandwich-like in the midst of the *Bombyces*." (Intel. vol. v. p. 169, Art. "Practicability.") The arrangement of the new list was, however, almost universally followed, notwithstanding the discouraging fact that there was no descriptive work which followed that order, and the actual nomenclature differed, in numerous cases, from all the existing English descriptive works in use. This great change was completely unsupported by any statement of the reasons supposed to render it advisable. The cause of the silence was not that the reasons were obvious, or that the changes explained themselves. How many owners of large collections would, if sitting down to-day to arrange them "out of their heads," hit upon

the arrangement of Mr. Doubleday? I suppose it is quite certain that not one would place the species in anything approaching to that order. Ever since the publication of this second List\* of Mr. Doubleday, we in England have been subjected to the discomfort of having to acknowledge two rival systems, the advocates of either of which take the smallest recognition of the other. The rights and wrongs of the matter have never been fought out in consequence; a thing, perhaps, not difficult to account for, when we consider that the one party have never shown, or professed to show, any reasons for their scheme. Meanwhile, in 1866, Mr. Doubleday's list saw another edition. In 1867, Mr. Stainton published another book on Butterflies and Moths, and a considerable portion of it is concerned with classification. It takes no notice whatever of the new order, and reproduces that of the Manual. At the same time, Mr. Newman brings out his descriptive work, the "Natural History of British Moths," in which he follows Mr. Doubleday. Lastly, in 1870, Dr. Knaggs prints a new list on the side of Mr. Stainton; and Dr. Staudinger only this year has brought to the side of the Linnæan order another edition of his elaborate Catalogue, which has indeed reached our hands in England only within the last few days.

The alteration in the position of the *Geometræ*, suggested by M. Guenée as an alternative scheme of arrangement, had not, until the year 1859, attracted much attention; but the primary idea of Mr. Doubleday's List was, it seems to have been considered, the carrying out of that idea. At the same time, other and startling variations in our arrangement were introduced; the *Sphinges* and *Bombyces* were then rolled into one group; and a family of *Bombyces*, the *Notodontidæ*, being detached and separated by the whole group of *Geometræ* from the main body, was erected into a group by itself; the family *Platypterygidae* was erected into a principal group, and inserted next after the *Geometræ*, and before the detached *Notodontidæ*. The revolution was signalized, as in the Year One of the French Republic, by things being named anew.

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\* It would be invidious to push comment on this head much further; but, if any course more than another be calculated to invite hostile criticism of this publication, the rhapsodieal eulogy of it by its authors' friends is certainly that one.

The Butterflies were no longer *Rhopalocera*, but were named *Diurni*; the heterogeneous collection of *Sphinges* and part of the *Bombyces* was named, with a pugnacious disregard of tradition, *Nocturni* (the name *Nocturna* being already well-known as designating, in Latreille's arrangement, all the moths outside the *Sphingidae*). The family *Platypterygidae*, not increased or reduced by a single species, was now termed *Drepanulæ*; and, greatest defiance of all, the separated *Notodontidæ*, being all the species included in that family by Stainton, and all save one originally so named by Stephens, were termed *Pseudo-Bombyces*.

The names introduced by the revolutionists are all, I venture to think, unfounded and unsustainable.

They term the Butterflies *Diurni*; and no doubt would say in justification, that in doing so they merely revived the name given by Latreille. Latreille's name was a completely good name according to Latreille's system; for that system established three leading groups designated according to their time of flight. Latreille's Butterflies were *Diurna*, but his *Sphinges* were also *Crepuscularia*, and all the other Lepidopterous insects he termed *Nocturna*. The division by times of flight has long been abandoned, for many reasons; the most simple being that the names conveyed a wholly erroneous notion of the actual habits of the species, since a crowd of insects besides the *Diurna* are known to fly by day. In the face of this history of the name, it was surely an error to revive it; the name *Rhopalocera* for the butterflies had been fully accepted by entomologists, and the change was altogether gratuitous.

But what of the name *Nocturni* for *Sphinges* and *Bombyces* together,—even putting aside for the present, the absurd union of these groups, which has been discountenanced even by the followers of the new arrangement? This name *Nocturni* is also, we have seen, completely understood by entomologists as designating one of Latreille's three great divisions, the distinction between *Nocturna* and *Nocturni* not being, I suppose, a matter of which any nomenclator would make very much. The use of those divisions is not continued at the present day, but the name has its history in entomology, as indicating a different group of insects from that to which it

is now sought to apply it. There is surely no justification for it here, and indeed the more it is examined, the more uncalled for it seems to be.

First, the name would appear to suggest a fictitious antithesis, or contrast with the *Diurni* immediately preceding.

Secondly, this name could not be accepted unless the group comprised all night-flying species, and the *Lepidoptera* has again to be classed according to their time of flight.

Thirdly, the pretended group comprises very few of the true night-flying species at all; and does include a large number of species which fly only in the sunshine, *e. g.*, *Macroglossa*, *Sesia*, *Procris*, *Zygæna*.

Fourthly, the pretended group includes the *Sphinges*, which, if they are to be classed according to their time of flight at all, must be called by the earlier name *Crepuscularia*.

Next, *Drepanulæ*. Since when has it become allowable to supplant the received name of a family by a new one? It is notorious that this cannot be done in the case of a species or genus. The so-called "*Drepanulæ*" (termed *Drepanulidæ*, without authority given, by Dr. Knaggs) are, species for species, the *Platyptericæ* of Hübner, the *Platypteridæ* of Stephens' Illustrations, the *Platypterygidæ* of Stainton's Manual; the name, without any alteration of the constituent parts of the family, is sought to be altered to *Drepanulæ*, on the erection of the family into a petty group. Without wishing to impute a shabby motive, I protest I can find no reason for this alteration, except that before hinted at, viz., the passion for a new coinage and new nomenclature for everything, which has in every age, been the weakness of innovators.

Now, *Pseudo-Bombyces*. This name is very flagrant. First, because it is an old name used by more than one author to express different assortments of species, neither of them the same as that to which it is now applied; secondly, because the genera forming this supposed group have a prior name completely recognised; thirdly, because of the illogical relation of the name to the other names in the same scheme of classification.

The name “*Pseudo-Bombyces*” was, it appears, first used by Haworth, who in his “*Lepidoptera Britannica*,” thus designates a variety of *Noctuae* having pectinate antennæ. The species classed together by Haworth under this name are mostly now included in our genus *Agrotis*. Next, Latreille in the “*Règne Animal*” uses the same name, as we have found, for one of his sections of the *Nocturna*, there grouping under that name the *Arctiidæ*, *Notodontidæ*, and *Lithosidæ*. Thus the name *Pseudo-Bombyces* has already a historic meaning. If Haworth’s name passed for nothing, Latreille’s classification at least was the work of a great systematist; and surely the name which he gave to a certain group of genera cannot be now applied with propriety to another. If such a practice were generally allowed, endless confusion would be caused. Timid writers would take care to get favour for new arrangements by using old names; and we should soon have the *Pseudo-Bombyces* of Haworth, of Latreille, of Guenée, and of this, that, and the other writer, all meaning different things. A confusion of this kind is very easily guarded against. A general law, that no group distinguished by characters different from those of the original group, shall bear the name of the original group, meets the difficulty—and, perhaps, only expresses what has been the practice of accurate authors.

Stephens, in his “*Illustrations*,” unites all the so-called *Pseudo-Bombyces* into one family, which he names *Notodontidæ*; and Stainton, in his Manual, describes them species for species, under the same name. On this ground the name *Pseudo-Bombyces* cannot, I assume, be upheld.

But the reason which at once disestablishes the name *Pseudo-Bombyces* for this so-called group is founded on its own illogical position. The authors Haworth and Latreille each recognized a group *Bombyces*, and therefore for them to call another group *Pseudo-Bombyces* was not improper or ridiculous. To ignore the existence of the *Bombyces* as a natural group, and yet to exalt into a natural group genera, whose common characteristic is a certain definite unlikeness to the *Bombyces*, is a performance in all respects worthy of a writer who, without giving any reasons, interferes with the work of other men. The blunder is of the same character as would be a proposal to tax, according to its wheat produce, a

country in which cereals did not grow; or to express in dry measure the standard height for our recruits!

One point on the subject we have just left, it may, perhaps, be desirable very shortly to notice, as it might be considered I had overlooked it. It may be urged that the names *Platypterygidae* and *Notodontidae* terminating in *-idae*, are the names of families and not groups, and that therefore when a group was to be expressed, it was necessary a name with a different termination should be used. The reasoning put forward must be either that—

(1.) The name of a group has a fixed termination other than *-idae*; or, that—

(2.) The termination *-idae* is exclusively used to indicate some other distinction.

And neither of these contentions is true. Mr. Stainton, for instance, in the Manual, uses a uniform termination for the names of the groups, viz., *-ina*; “*Sphingina*,” “*Bombycina*,” and the rest; but there is no sort of uniformity among the authors. Linnaeus uses the nominative singular, “*Phalaena*;” and the same for the genera, our groups; “*Attacus*,” “*Noctua*,” “*Tortrix*.” Latreille’s three groups end in “*-a*,” the neuter plural; but his primary sections have any termination at hap-hazard, thus: “*Aposura*,” “*Tortrices*,” “*Deltoides*,” “*Tineites*.” The list now in vogue, following the new arrangement uses, as did Hübner in his “*Verzeichniss*,” the simple form “*Noctuae*,” “*Pyralides*,” “*Crambi*”—a practice actually objectionable, because those plurals also indicate (in modern usage) the species of the genera *Noctua*, *Pyralis*, *Crambus*. There is certainly no sanction for a contention that the names of groups must be of uniform termination.

Neither is it true that the termination *-idae* is exclusively used to indicate the name of any other division. Families in the modern books usually have that termination *e. g.* again, those of Stainton in his Manual. But Guenée uses the same termination for his two leading sections of the *Noctuélites*, *Trifidae* and *Quadrijidae*; and without looking further afield, Dr. Horsfield, as well as Mr. Stephens (see the Introduction to his “*Systematic Catalogue*”), have used the termination *-idae* to indicate the very thing we are upon, the name of a group.

Besides (to return) it would seem that if the authors of the new names felt a difficulty of this kind, they should, according to their own plan have named their groups "Platypteryges" and "Notodontæ," and there was no sort of necessity to invent new titles.

With reference to the species constituting the new group *Pseudo-Bombyces*, we have already seen that some were before considered so closely akin to certain *Bombyces*, that they were placed in the same family with them. On the other hand, the species now collected were by Latreille considered so dissimilar among themselves, that he placed them three of his families apart, the species of the genus *Notodontæ* being classed with the *Noctuæ*, in Gen. Crust. &c., vol. iv.

The new grouping places twenty-seven Bombyciform moths a long distance away from their allies, between these and the main body, being the whole of the very distinct group *Geometræ*. That arrangement could only be supported by showing that the *Geometræ* naturally connect the *Bombyces* with the *Pseudo-Bombyces*; but there is not the slightest reason for saying that the last-mentioned, or, if you please, "aberrant" *Bombyces* are connected with the other *Bombyces* through, or by means of the *Geometræ*. No author who has written with reasons has ever suggested, remark, the possibility of such an arrangement. The relationship of the "aberrant" to the "true" *Bombyces* (I use these terms strictly under protest) is direct; some families of the latter pass gradually into the separated family *Notodontidæ*, so plainly, that one learned author refused, as we have seen, to consider the *Notodontidæ* anything but a part of the *Arctiidæ* (Westw. Introd. ii. p. 385); and Latreille also classes them in one family. The *Notodontidæ* may, nevertheless, present such differences from the typical *Bombyæ*, that they should not be classed in the same group. But their position even then should be next to *Bombyæ*.

On leaving the so-called *Nocturni*, we leave several families of moths characterised by their strong and thick wings, robust bodies, and antennæ pectinate in the males; whose wings in repose meet roof-like over the abdomen, whose larva has sixteen legs, and walks without looping.

We are next taken through the *Geometræ*, and there find numerous families of moths whose wings are thin and weak, whose bodies are slender, whose antennæ are simple or filiform in the males, whose wings in repose are extended, or put up vertically, whose larva has ten legs, and cannot walk without looping. We are then again brought back to an isolated set of twenty-seven moths agreeing with the families from which we first started, having strong and thick wings, robust bodies, pectinate antennæ, wings in repose meeting roof-like, whose larva has sixteen legs.

The reasons for this startling arrangement, if I am at liberty to guess them, centre in this, that between the *Geometræ* and the twenty-seven *Bombyces*, a connection can be made by means of *Platypteryx*. In other words, we are taken from the *Bombyces* by a leap into the *Geometræ*, in order to be shown by what easy stages we can be brought from the *Geometræ* back to the *Bombyces* again! The fact that *Platypteryx* joins *Geometra* and *Bombyx* is thus made the most of; but, even so, the new order has, as it were, a rough edge, because the junction of the true *Bombyces* (or *Nocturni*) with *Geometra* is not effected by closely related species.

Now, let me endeavour to account for this extraordinary group *Pseudo-Bombyces*. No one has vouchsafed a line of explanation, and it is not my fault if I am all abroad.

The arrangement of the *Noctuar*, in the different books, had been conceived with a view to the position of the group between the *Bombyces* at the one end, and the *Geometræ* at the other. The species least akin to the *Geometræ* had been put furthest away from the *Geometræ*; the species least akin to the *Bombyces* furthest away from the *Bombyces*. In the year 1852, M. Guenée—who in 1841, as we have seen, followed the same arrangement—described or catalogued the *Noctuar* in this, the old order, beginning with the species akin to *Bombyx*. M. Guenée's work has taken its place as the chief work upon the *Noctuar*; and the author of it would not, it may be expected, be inclined, shortly after the book's completion, to favour a new arrangement, which would render it less an authority.

The affinity between the *Geometræ* and the *Bombyces* seems in, or just before 1859, to have struck M. Guenée as of greater importance than he had before considered

it; and in that year (as it is well understood, at his suggestion) Mr. Doubleday's second List introduced the new arrangement. Let us bear in mind the important consideration that, in Mr. Doubleday's List, the order of arrangement of the *Noctuæ* was not changed. That remained the same as when the group followed next after the *Bombyces*, and the *Geometræ* came at the end. *Bombyciformes* is still the first section (including the families *Noctuo-Bombycidæ* and *Bombycoïdæ*) ; and at the end come the various *Quadrifidæ* with their half-looping larvæ (including the species acknowledged as *Noctuo-Phalaenidi* by M. Guenée himself in 1841).

It appears to me that this fact controlled the rest of the arrangement. The order of the *Noctuæ* begs the question of the group's position ; and it was, therefore, necessary to start the *Noctuæ* from something Bombyciform. The new arrangement was introduced to give effect to the affinity between the *Geometræ* and the *Bombyces*, and this was carried out by placing the two groups in *juxta-position*. Now, if the *Geometræ* had only been brought up and placed next to the *Bombyces*, the *Noctuæ* making way for them, would have had *to follow* the *Geometræ*. The complete re-arrangement of the *Noctuæ* would then have become necessary in view of their changed location. But there were weighty reasons against proposing a re-arrangement of the *Noctuæ*. Not only had this group been long described in the books, in the order which it would be necessary to abandon ; but M. Guenée himself had, within a very few years, completed an exhaustive work, whose order of arrangement would also have become obsolete. M. Guenée would of course be disposed to see advantage in a plan, which, while giving full play to the affinity between *Geometra* and *Bombyx*, at the same time preserved and vindicated his own previous arrangement of the *Noctuæ*. And here I think we find the reason of the existing order.

It was necessary in the first place to join the *Geometræ* to the *Bombyces*, in order to exhibit what in the new view was the natural relationship between these groups. But, to preserve the union of the *Noctuæ* with the *Bombyces* was equally necessary, if the existing arrangement of the former was to be upheld. These two objects were accomplished in the only way possible ; and the steps by which they were accomplished were the natural ones for that purpose.

The only way in which it was possible to join on to the *Bombyces*, both *Geometræ* and *Noctuæ*, was to divide the first-named group, and fasten the *Geometræ* to one part, the *Noctuæ* to the other. M. Guenée had even more recently been engaged upon the *Geometræ*, and no rearrangement of this group was likely to be proposed by him. On the arrangement of the *Bombyces*, however, he was unfettered, having published no views upon the order of that group.

This measure of dividing the *Bombyces* once determined on, all the details were, it seems to me, matters of necessity. The *Platypterygidae* have affinities both with the *Bombyces* and *Geometræ*; and that family, therefore, would not occupy an unnatural position, if made a connecting link between the two groups. This happy invention of the *Platypterygidae*, was the only thing wanted. Every one knows to which family of *Bombyces* the *Platypterygidae* have always been considered akin. Their larva was described by Linnæus himself, as “*Vinulae affinis*” (*Syst. Nat.* vol. 2; p. 860); and Prof. Westwood succinctly expresses the relationship of the groups, when he says (*Westw. Intr.* ii. p. 362), “*Platypteryx* agrees with *Geometra* in the habit of the imago, but in its transformations it is much nearer to *Cerura*, amongst the *Bombycidæ*.” Therefore the *Notodontidae* (the family including *Cerura*) came naturally to be the separated section. Thus we have our new order worked out.

Although this arrangement secures its objects, I venture to think that it effects them in an empirical fashion; and also fails in effecting what an arrangement of the *Lepidoptera* should secure.

In the front of my objection, I of course place this starting of the *Noctuæ* from a few *Bombyces*, in order to preserve the order of the former group. But that has been sufficiently discussed. The erection of the family *Platypterygidae* into a group, I confess appears to me a strong step. No author has yet described the *Platypterygidae* as a separate group, not even Mr. Newman, who has faithfully followed the new order. He joins this family to the *Pseudo-Bombyces*, and calls both together “*Cuspidates*,” a name he however explains is not a very good one (*Brit. Moths*, p. 204). The erection of the insect *Arentia flexula* into a separate group is also a very strong proceeding, and I much question whether both

that group “*Aventie*,” and its neighbour *Deltoides*, were not both constituted primary groups, in order to keep the two essential ones *Drepanula* and *Pseudo-Bombyces* in countenance.

The new order shirks the affinity between *Geometra* and the *Deltoides*, and *Geometra* and *Pyralis*, of which M. Guenée spoke so strongly (in his *Généralités*, vol. 9); as well, of course, as shirking the necessity for rearrangement of the *Noctuæ*; for, at present, the order of that group leads one (according to M. Guenée’s own expressions) to expect more *Geometra* to come at the end!

The union of *Sphinx* and *Bombyx* in one group I will not discuss. I say with all humility, that the proposition is, in my view, the result of an extreme disregard for the opinion of entomologists, no one of whom has been found to say a good word for the arrangement. The “group” *Nocturni* is properly stigmatised by Mr. Newman as “heterogeneous, and far too comprehensive” (*Brit. Moths*, pref. vi.).

It stands to reason, that the arrangement of families, made with a view to their proximity to certain other families, must require alteration when these last are no longer in proximity, and their place is taken by species totally different. But the feat to be accomplished by the apostles of the new arrangement was this, that though this reform was to be made, and the relations of the neighbouring families altered, yet no change was to be made in their order of arrangement. It was done, and the result is the group *Pseudo-Bombyces*—a creation in which, from its wonderful audacity, men are almost fain to see some merit.

Observe one way in which (if it was necessary to strain a point) the affinity of *Geometra* and *Bombyx* might be exemplified. At the end of *Bombyx*, place *Platypteryx*; then begin *Geometra*, taking the group as at present arranged, backwards; end *Geometra* with *Metrocampa*; then begin *Noctua* with *Erastria* and *Plusia*, etc.; there you have *Geometra* next to *Bombyx*,—the affinity victorious, and no outrage on common sense, such as an eruption of *Bombyces*, eight hundred species out place. Or again, place *Geometra* before *Bombyx*, end *Geometra* with *Amphidusys*, &c. (termed “*Bombyciformes*” by Hübner); then take the *Bombyces*, and go on from them to the *Noctue*; either by the *Bombycoïdæ*, or by *Gonoptera* as Latreille suggested.

But of course it does not rest with me, or any follower of the Linnaean order, to show M. Guenée how he may gratify his taste for tactical movements. M. Guenée had, before the new arrangement came out, done his best to condemn it by anticipation; for he had stated in the language I have quoted, that to place *Geometra* next to *Bombyæ* would require a re-arrangement of the *Noctuae*, though he has since fathered the proposition to carry out the innovation, and yet leave the *Noctuae* as they were.

So much for the new arrangement. It was introduced in a List intended to catalogue synonyms, and the promulgation of it seems to have been considered a minor object, even by its authors. In England alone does it appear to have taken root. No writer on the Continent follows the plan; and the Americans do not so much as recognise its existence. In Dr. Packard's "Guide to the Study of Insects," one of the best entomological books ever written, the order of the *Lepidoptera* given is that of Linnaeus, and the work contains numerous passages in support of that arrangement (see pp. 283-284, 293, 302, 318, &c.). In the preface (p. iv.) we read that this succession of the families of the *Lepidoptera* is "that now generally agreed upon by entomologists." It seems that lists without reasons are not accounted anything by the great nation beyond the Atlantic.

One word before we come to the "Lists," upon the principle on which changes in names are to be made. It is continually being discovered that, after an insect has been called by one name for, say, fifty years, it really ought to be called something else, because that name was "earlier." I leave out of the question the *doubt* which attends so many of these earlier names, arising from variable characters, imperfect condition of a specimen, from mis-coloration of a figure, or lack of descriptive acumen in the author,—all matters affecting the fidelity of a reference. But, supposing a prior name to be discovered clearly meant for the insect which has always been misnamed; is it always desirable to discard the wrong name? It is a maxim of law, which might with advantage govern scientific nomenclature, that *Communis error facit jus*; and, when the entomological world is startled by receiving orders to call all the old insects by new names, I think a craving for some good rule of this kind must be experienced by many. It

will always, to the majority, appear unreasonable, to require all people, nations, and languages, to give up a name on which the world is agreed, for some other no one living has before heard of. We have been only lately a good deal startled by receiving orders to call our Butterflies by names which are very new to us, and if our authors had shown a reasonable deference to the maxim *Communis error facit jus*, we might have been spared some disagreeables. The mode, however, of introducing changes in names—wholly unsatisfactory as it is—has effectually prevented any rule of this kind being even proposed, as we shall, I think, presently find.

In last years Transactions, appear some learned papers by Mr. Crotch, on the genera of *Coleoptera*,\* showing how much confusion there has been in them; and the President in his address this year, suggests that it may be necessary to take some concerted action with a view to settlement. The concerted action will, I think I may prophesy, take this form, that all that is will be declared right, and the forgotten, if accurate, distinctions will be remitted to the oblivion from which they were dragged. It is too much to be told, as Mr. Dunning remarked was its effect, when the paper was read here, that “all the names by which we have been calling our beetles are wrong,” and, when the information comes thus in a lump, the change is resisted. In principle, there is no difference between that case and the case of our Butterflies; everyone has agreed to call *Linea Linea*, and it is too much because some one else once called it by a different name, to ask the whole scientific world to abandon that and call the species *Thaumas*.

The mode, however, of introducing changes of names (in the English synonymic lists at least) is very unsatisfactory, and tells the reader nothing; and it is by no means surprising, that the changes themselves are therefore so unacceptable. One reason why they are so, is because they are unexplained. It is no explanation at all to scratch out the old name and write in the new one. At that rate, any one could make a very startling and real-looking list with a Latin dictionary and a list of abbreviations. Nor is it any explanation to write in the new name, leaving the old name underneath. That only shows what the erasure shows just as well—which name it is that is superseded.

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\* Trans. Ent. Soc. Lond. for 1870, pp. 41, 213.

To demonstrate that the practice followed furnishes no explanation is very easy. Either of two very substantial reasons at the least, very widely different in kind, may be the ground of a change in name. The first is, that the new name is found to have been published earlier than the old. The second is, that the old one is found to refer to another species. Now, no indication at all is given, by the English lists, which of *these* two reasons has caused the change of name. It may well be a very nice question (in the latter case) to what species the old name does refer, and unless a reference, at the very least, is given, each reader must do all the author's work again. The effect of the present fashion here is often to pass off, as the work of one of the old entomologists, the wholly inaccurate deduction of the modern editor.

In the case of a change of name, when the old name has been discovered to refer to a different insect, there may be circumstances of especial interest which make the author's omission to give references or extracts particularly unfortunate. Thus, where a name *Tantalus* is found, some fine day, supplanted in our lists by a new one (say) *Ixion*, the name *Tantalus* referring to another insect, it may well be that the true *Tantalus* has at some time or other occurred in England, that being, indeed, the most probable cause of the confusion. Here you have an interesting point raised directly, involving, perhaps, some curious question of geographical distribution. Such a discovery is impeded by the practice of the English list-makers to withhold reasons and references.

It is out of the question that all our entomologists should be equally well acquainted with the works of foreign authors, or should enjoy equal opportunities for deliberate study. If, indeed, they were so circumstanced, it is not for the interest of science that each should pursue his investigations for himself; but the acknowledged fact is, that access to foreign works, or old English works, is the privilege of a very few. Therefore, the giving of mere references to works that cannot be consulted is not a sufficient help to the reader; *extracts* and a *commentary* are both necessary.

Last year, a new "Cabinet List" appeared "printed on one side only," with the name of Dr. Knaggs as

editor. This list follows the "Manual," with many emendations of nomenclature, and a few suggestions for alteration of the order. Perhaps it may be considered that it did not lie with Dr. Knaggs, reproducing another man's work, to justify it; but at all events, the new things in the "Cabinet List" demanded some explanation.

The *Nolidæ* are included by Stainton (in the Manual) among the *Pyralidina*. Doubleday puts them with the *Nocturni*; Dr. Knaggs gives up the *Nolidæ*, and "recommends" their insertion amongst the *Bombyces* (Cabinet List, pp. 3, 11). He is careful not to state any reason at all, for the conveyance of this family across the dead bodies of seven hundred species, and the unlearned entomologist is left to think himself very stupid that he does not see it all quite clearly. Now, if the "Manual" order is so good, that it is proper to produce it anew after a lapse of twelve years, what obvious and crying error was made in the classification of *Nolidæ*, that Mr. Stainton's readers must blush to observe his arrangement any longer? The *Nolidæ* are by Westwood (Introd. to Mod. Class. vol. ii. p. 401) also classed with the *Pyrales*, but said to be allied to the *Tortrices*, and reasons for the opinion are given, drawn from the wings of the imago, and the cocoon. They are also classed with the *Pyrales* by Haworth, by Stephens, and by Curtis, the last-named of whom also notices their affinity to *Tortrix*. But Doubleday's List places the *Nolidæ* in the *Nocturni*, and Dr. Staudinger's also (in the family *Lithosidæ*). No reasons are given, and Dr. Knaggs politely "advises" that this should be their position.

It is of importance to recollect that Dr. Knaggs' List is published as a *labelling* list; and of the new practice of "advising" and "recommending" changes in a publication of this class, I shall have a few words to say before the conclusion of this paper.

Dr. Knaggs' List gives some other pieces of advice. It "recommends" that *Aventia* be placed in the *Noctuæ* after *Toxocampa*, and that the *Pterophori* come after *Nomophila* in the *Pyrales*! As to *Aventia*, I suppose anyone may express an opinion without its doing much harm, as the genus has long been treated as an outcast. The new arrangement makes it, as we have seen, a group by itself (placed between the *Deltoides* and *Pyralis*) an enterprising course at all events; Staudinger (another list writer)

places it in the *Noctue* already, and in the same position which Dr. Knaggs "recommends." Stainton had placed it in the *Geometræ*, following Hübner, Stephens, and others who had also done so. Here is a change in which surely the list-writers might spare us a few sentences in a foot-note.

But Dr. Knaggs also "advises" us to place the *Pterophori* among the *Pyrales*; and if a change of this sort is to be brought about thus in a labelling list, it is a waste of time ever to write a book.

In Dr. Knaggs' List, a rule to be observed in the construction of synonymous Lists is laid down, and a reason for it is given. The rule (expressed\* by the way, in eccentric English) is that where the two sexes of a species have been named simultaneously, the name given to the female should be preferred. I am not concerned now with the reason; it is a great thing to have some reason advanced. But as to the author's confidence in his own rule, it is instructive to examine his treatment of a few well-known cases.

Linnaeus "named simultaneously" the two sexes of the Meadow-brown Butterfly, terming the male *Janira*, and the female *Jurtina*; and Haworth actually did term the Butterfly *Jurtina* alone, which according to Dr. Knaggs was the only right name. Dr. Staudinger also suggests that *Jurtina* may be the better name, because it is given before *Janira*, in order. Dr. Knaggs, however, writes the species down *Janira*, in defiance of his own regulation. There are several other instances. *Sibylla* is, it is now admitted, the male name for our White Admiral Butterfly, and *Camilla* the female, both names being given by Linnaeus; *Camilla* for a long time was the name in use in England, Haworth, Stephens, and Curtis (the two latter with emphasis) stating that *Camilla* is the name of our insect. Dr. Knaggs has *Sibylla* in his list. *Trochilium Cynipiformis* appears to be in a similar case, the female name being *Estriformis*, Rottemburg. And to take one other instance, exceedingly easy to be veri-

\* The following is Dr. Knaggs' "Note."—"Should the sexes of a species have been named simultaneously, that of the female is adopted, for the reason, that, while the ♂ is alone utterly incapable of perpetuating its species, the unimpregnated ♀♀ of several insects have the power of reproducing their like, and may therefore be considered to be of the higher organism." [I am responsible for all *italics*.]

fied; our own Haworth "named simultaneously" the two sexes of *Miana arcuosa*, the name *arcuosa* being given to the male. No one terms the species anything else than *arcuosa*, and Dr. Knaggs does not suggest that, according to his canon, the name *minima* (given to the female) must be accepted instead.

The reason he does not is, perhaps, the same which would control the action of any adventurous writer. A principle can be stated, and supported as a principle, without encountering any vigorous opposition. Entomologists at large do not know enough to see its effect, and choose not to quarrel with a learned writer till he makes an overt attack. Dr. Knaggs avoids encountering the displeasure of the collectors, but he does so at the cost of acknowledging that *Communis error facit jus*.

But do not the English entomologists demand *better work* than this? Theory and practice are not on speaking terms in Dr. Knaggs' list. Let us hope a list of labels will never again assume to introduce changes, or lay down a law.

Mr. Newman's "Natural History of British Moths" is a work extensively used by collectors of the unscientific class. The sort of practical joke, by which the later English writers carry off—I speak without offence—their autocratic manner, is played more than once in this book. The joke is almost *de rigueur* with authors on Lepidopterology. It consists in an assumption on the part of the writer, that he is addressing children, and a continual reference to his readers' youthfulness and inexperience. No one writes on the *Lepidoptera* for grown people! It is a very remarkable thing that the books now are always published for "the young collector." This is very pleasant for the authors, because they are saved a great deal of trouble. You do not give the reasons for things to children; they are satisfied without; and in a book written ostensibly for children, no one looks for anything very thorough or deep. It would be a pity, however, that an author should carry even this joke too far, because it might unjustly be imputed that he bid for the approval of the unscientific. I am beginning to fear that we shall not have any more English books that are not addressed to the school-room; and I have no expectation but that the title-page of the forthcoming work

by Dr. Knaggs will state, that it is "The Synonymy of the Lepidoptera of Great Britain and Ireland; expurgated for the young collector."

Mr. Newman's "Natural History," I venture to suggest, contains several passages, which are exceedingly objectionable to an independent mind. The passage which I mention is only quoted here, because it is necessary to take some instance in order to illustrate the views, which I respectfully urge in this paper. I take one instance and only one.

After describing the *Leucaniae* and *Nonagriæ* and their allies, in whose names and order some changes are introduced, Mr. Newman prints an "observation" as follows: "In concluding the family of *Leucanidae*, it seems desirable to allude to the changes which it has been deemed right to make in the names:"—This commencement gave me great pleasure; it is very desirable indeed, I think, not only to allude to, but also to discuss and explain all changes, whether in names or in arrangement. The passage continues: "But I believe I may state, that where I have departed from the names and arrangement of Mr. Doubleday's List, it has been with the entire approval of that lepidopterist" (Newm. Brit. Moths, p. 276). And so, it is enough, is it, to say that? An author is to chop and change the arrangement of the *Macro-Lepidoptera*, without a scratch of the pen for reason, and unblushingly present to us the results of the operation, stamped with someone else's "entire approval!" After carefully spreading the cloth, this is the stale crust Mr. Newman flings us to stay our starving capacities! What entomologists want is, not that changes should come to them "approved of" by this or that leading man, but that each author who proposes an alteration in classification or nomenclature for their adoption, should first state all his reasons, and then leave the "approval" to them. Haworth himself, whose follower Mr. Newman claims to be, tried to carry things through by other men's "approbation," and had to abandon summarily the very plan which he presented with such a flourish. I refer to Haworth's plan of uniform terminations for the names of all the *Lepidoptera*, which had, as he boasted, "the full and individual approbation of all the members of the Aurelian Society" (Haw. Lep. Brit.; pref. xix.; and pp. 139, 588).

Lists are, I suppose, divided into synonymic lists and labelling lists. Restricted to their proper objects, synonymic lists are very useful things ; and while entomologists continue to label their collections, printed labelling lists will always play a useful, if a humble, part in the world of science.

A list is a list all the world over, and cannot be a treatise. To make a list answer the purpose of a treatise is at all events a very slovenly proceeding. But there are some functions which a list cannot perform. I am concerned only with one. A bare list cannot state reasons for results ; it can only catalogue the results themselves. Now, was it ever designed in the institution of synonymic lists, that they should be an authority upon classification, or the medium for introducing important changes in arrangement ? Classification is the highest incident of scientific study, which requires, if anything requires it, a full statement of reasons *pro* and *con.*, research, deliberation, careful discrimination between published conclusions. An opinion on a system of arrangement, formed without such preparation, would be absolutely worthless in a scientific point of view, by whomsoever it might be expressed. A list such as Mr. Doubleday's makes no pretence of affording any guide for the formation of a judgment, even on the propriety of the names ; and as to *them*, rests entirely for its acceptability on the reputation of its author. But can it be tolerated, that a bare array of names, shaken into a certain order, shall be accepted as any authority that that order is natural or proper ? Surely no list has or can have such authority, and there would be a stultification of science if it had. When we desire authorities upon System, we go to books, written by entomologists, who have given reasons for their plan. It has not been thought beneath the attention of the men most reverenced in science, to devote a studious lifetime to the perfecting of systems of classification. The works of those men remain, and will remain, the great authorities, though stacks of "synonymic lists" may leave our printing-offices year by year.

A mere list is not of any value even as corroborating or adopting an *existing* arrangement. An arrangement of insects depends for its acceptability on its own merits, and is no better if a hundred synonymic lists, without

reasons, are published following the same order. But what respect is such a list to receive, when it seeks to change and subvert an arrangement previously adopted? How completely absurd it is to accept as any authority a list, which, as if by its author's *ipse dixi*, supersedes the work of an entomologist who has given his reasons! Worse ignominy awaits us in the spectacle of our system re-organised by labelling lists! If the label writer keeps his place, people will buy his labels in the course of business, and his publisher's account may be expected to show a moderately satisfactory return. But if the label writer assumes too much, and pretends to be a systematist, we shall probably choose to deal somewhere else. When we buy a labelling list, it is generally with the confidence that if we do not secure a learned, we at least have a useful commodity. But if a label writer takes to tinkering the lists on his own account, not only is his new labour thrown away, but his own proper work is rendered untrustworthy. I have no hesitation in saying, that I regard the introduction of changes in arrangement in a list intended for labelling as an affront to science; and, if such a course is not considered to fix a stigma on the scientific reputation of an author, it is only because the ignorant and unreflecting collectors are so numerous that they constitute the majority and direct opinion.

I gladly dismiss this subject (on which, as will have been gathered, I hold a strong view) by suggesting a consideration which I think should weigh with any author, having pretensions to be a man of science. To publish changes in a labelling list for the first time, is to obtain a sanction for new views by *adventitious* means—a thing to be deprecated by all. I leave these gentlemen and their followers to the scourge of M. Guenée's trenchant sarcasm where, speaking of improper changes, he says they "tendent à se vulgariser chez nous par les nombreux entomologistes-amateurs qui ne possèdent, pour toute bibliothèque, qu'un catalogue qu'ils suivent aveuglément" (Lépidopt., vol. 9, p. xxxiii.).

An entomological book ought to fulfil the conditions required of all good books, according to its kind. If an entomological book seek to introduce alterations, an entomological book like any other book, ought to support those alterations by facts and reasoning. If it be sup-

posed (and I am reduced to believing that it is supposed), that entomology is a subject by itself, in which it is easy to be a great man, it is necessary to say that such a creed is a mistake. It may be the case that a writer of pre-eminent position, who has earned universal respect on a special subject, is allowed to transgress the ordinary rules, and his opinions alone carry weight without the reasons for them being stated. But there is certainly no living entomologist who stands in this position towards his fellow-students, and I am strongly inclined to believe that of all the sciences, this very one of ours is the one among whose votaries there is the greatest evenness of knowledge, and capacity for judgment, *ceteris paribus*, the men being matched in other respects. I have long entertained the opinion, that entomology is a science in which any student can obtain considerable proficiency, and that authors who treat of it ought to unbend to their readers, because their readers are often as clever as themselves. To publish conclusions without reasons, is not only not to unbend, but is a highly self-sufficient action ; and in any other walk of literature would augur an exaggerated self-esteem and considerable disregard of other persons' judgment.

A good scientific book, then, I humbly contend, should state all the reasons for every opinion advanced, or scheme propounded, and should quote and discuss previous authorities bearing on the subject in hand. In fact, the book should *submit everything,—reasons, authorities, conclusions—to the judgment of the reader.*

First of all, is it an author's duty to absolve himself from the suspicion of chicanery. I candidly confess, the very first idea which crosses my mind when I take up a list or catalogue whose contents are not supported by reasons (published either in the book or elsewhere), is ; to what extent is the writer of this a quack ?

Mr. Doubleday and Dr. Knaggs treat me no better than does the dealer, at whose shop I may purchase tomorrow a little book professing to contain "Gardner's Arrangement." I have procured a copy of this publication, and I can assure the Society that it alters the order of the species, chops and changes the genera, and in all things enacts to the life the part of a thorough-bred "list." It is supported by no reasons of any sort, of course, but it is no worse in this than are the others.

Respect for the quarter of its origin does not prevent my deriding it as fanciful, and stigmatising its changes of the order as unmeaning; but am I quite sure it has not as good authority as the Cabinet List, "printed on one side only"? I do not follow the order of arrangement given in this dealer's list, because he shows me no reason why I should do so. What reason, pray, is offered me for following Mr. Doubleday's?

Surely I need not press further the imperative urgency there is for entomological writers to absolve their work from all appearance of chicanery. Next, it is (as I have already urged) an entomological writer's duty to furnish his readers with the materials for forming an independent judgment. For upon this, in great measure, depends whether or not his performance is worth our study. The English lists, as now published, afford no materials at all for estimating the writers' trustworthiness, and it is impossible, without doing the author's work over again for ourselves, to determine whether or not we shall avail ourselves of his labours. Indeed, a list of species, such as the English list-makers offer, is an absurd composition in every view—a list of names merely, with abbreviations of the nomenclators' names appended. No quotations, no references even, are supplied, much less foot-notes explaining the causes of this or that alteration in name or position.

An aim which I had in this paper was, that by asking the attention of scientific men to the method of introducing changes in arrangement, I might draw from them some expressions of disapproval of the existing fashion, such as may, perhaps, have the effect of establishing a better practice. The promulgation of important changes, by mere lists as barren as those I have slightly noticed, seems likely to become the rule, unless the opinion of entomologists is very decidedly expressed. The bewilderment continually felt (outside the publishing coterie) as to the reasons for the frequent changes is just now very general. Any understanding now arrived at would be most opportune, and have a good effect in removing feelings even of annoyance, which I think are not confined to a few. It is high time something were done.

I challenge any Lepidopterist to say, that he can look with complacency upon the development of entomological science in England for the last twelve years, in

which his fellow-students have been so unreasonably led, and have so unreasonably followed. The present condition of entomological literature in England is, so far as concerns the *Lepidoptera*, utterly unequal to the needs and below the capacities of the students of that Order.

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X. Descriptions of some new exotic species of Lucanidæ.  
By J. O. WESTWOOD, M.A., F.L.S., &c.

[Read 1st May, 1871.]

By the kindness of Dr. Howitt of Melbourne, and Major F. J. Parry, I am enabled to offer to the Entomological Society, descriptions and figures of a number of new species of this interesting family, by way of further supplement to the different articles which have appeared, from time to time, in the Society's Transactions, upon these insects.

The great additions which have been made, to our knowledge of this group during the last twenty years, have rendered necessary the breaking up of the old genera *Lucanus* and *Dorcus* into minor groups, or subgenera, and the most interesting species to be described in this communication is sufficiently distinct from previously separated groups, as to render necessary the proposal of another, with the name:—

RHÆTULUS (Parry, MS.).

Corpus oblongum, subdepressum. Caput et pronotum sub lente granulata subopaca; elytra parum nitida punctatissima. Labrum porrectum transversum, in medio marginis antici paullo angulato-productum; mandibulæ magnæ, curvatæ, contortæ; antennæ longæ, clava 3-articulata. Pedes longi, tibiæ 4 posticæ in medio 1-calcaratæ. Prothorax lateribus crenatis haud spinosis.

Species unica, RHÆTULUS CRENATUS, mas.

(Plate VIII. fig. 4.)

Piceo-niger, elytris magis castaneo-nigris; mandibulis capite duplo longioribus, valde curvatis, et in medio elevatis, apicibus depresso-fortiter bifidis, margine antico vel supero basin versus dento parvo conico erecto, et in medio denticulis numerosis obtusis, armato; pedibus antennisque nigris, tibiis anticus denticulis circiter 14 instructis.

Long. corp. lin. 15; mandib. lin.  $6\frac{1}{2}$ .

Hab.—In Insula Formosa. In Mus. Parry.

This insect, to which Major Parry has given the name above employed, is most nearly allied to *Rhaetus Westwoodii*, from which it is sufficiently (subgenerically) distinct, by the smaller size of the head (which in that insect is as large as the prothorax), by the upper surface of the head and prothorax being entirely covered with minute granulations, rendering them subopaque (instead of being polished); by the elytra also being covered with minute punctures, scarcely visible, except under a lens, but giving them a less brilliant appearance than they have in *Rhaetus*; in the anterior tibiae being denticulated throughout their outer edge, in the two posterior tibiae being armed with a small tooth on the middle of the outer edge (as well as the two middle tibiae), one of which, indeed, exhibits trace of a second rudimental tooth; in the regular crenation of the sides of the prothorax, destitute of the two teeth on each side visible in *Rhaetus*; in the disc of the head wanting the two elevated spaces between the eyes, which leave the centre depressed in *Rhaetus*, and lastly, in the smaller size of the insect.

The head is transverse, with a small raised tubercle in front of each eye; the anterior lateral angles being oblique, punctate, and slightly emarginate. The labrum is porrected, transverse, the lateral anterior angles acute, and the middle of the fore-margin moderately produced into an angle. It is similarly granulose with the remainder of the upper-side of the head. The antennæ have the seventh joint produced into an acute spine, the sixth being also larger than the fifth. The maxillæ are elongate, the outer lobe long, and strongly setose. The mentum is broad at the base, the sides very oblique, and the middle of the anterior margin very slightly emarginate; it is not only granulate, but marked with large round shallow punctures. The labium is bi-partite, moderately setose, and the labial palpi have the basal joint elongated. The prothorax is transversely quadrate, with the anterior and posterior lateral angles oblique, the lateral margins finely crenated, the disc convex, and marked close to the middle of the anterior margin with a small polished space. The sides and hinder margin are distinctly elevated into a slender margin; the suture of the elytra is polished, and the sides and apex of the elytra are margined. The anterior

tibiæ are armed throughout the whole length of the outer edge with about fourteen teeth, those next the base gradually diminishing in size, the larger ones being wider apart, with minute crenations between them. The middle tibiæ are armed with one spine in the middle of the outer edge, behind which is to be perceived the very minute rudiment of the second spine. The two hind tibiæ have only a single spine on the same situation. The under-surface of the body is moderately glossy and black, the prosternum is grooved down its centre between the anterior coxæ, and the mesosternum is quite simple.

In Major Parry's collection is preserved a female specimen brought from Formosa by Mr. Swinhoe, which may possibly be the other sex of *Rhaetus crenatus*, but which it would be rash, without further information, to describe as such at present. It is eleven lines long, black and polished, the head small and rugose, the sides of the head in front of the eyes very oblique, forming a large canthus extending over two-thirds of the length of those organs. The labrum is small, rugose, as well as the mandibles, which are armed with a small tooth in the middle, and when shut close at rest, forming a triangle, advanced in front of the head scarcely more than half its length ; the prothorax and elytra are minutely punctured, the punctures at the sides and along the hind margin of the prothorax more strongly and thickly disposed. The sides of the prothorax are margined and crenated ; one tooth, opposite the humeral angle of the elytra, being slightly more prominent than the rest. The anterior tibiæ are crenated with about ten stronger teeth on the outer margin ; the middle tibiæ are armed with a central spine in the middle of their outer edge, which is delicately crenated, and they have a very minute rudimental spine in front of the large middle one. The two hind tibiæ are armed only with a single central spine.

#### Note on *Rhaetus Westwoodii*.

The precise habitat of the original specimen of *Rhaetus Westwoodii* was unknown, but Major Parry has recently obtained a second individual from the Himalayas. Hence he is induced to consider it probable, that the Himalayan

female *Dorcus derelictus*,\* may be the opposite sex of *Rhaetus*, whilst at the same time he entertains the opinion that *Dorcus rufus*, Westw., is the female of the insect described below, under the name of *Dorcus ratiocinatus*. I have entered into the consideration of this opinion, in the observations upon *D. rufus*, given in a subsequent page.

In his original description of *D. derelictus*, Major Parry was so struck with the "utterly anomalous slender anterior and unarmed posterior tibiae," and other characters, as to doubt whether the specimen were really a female, or a male with short ill-developed mandibles, and whether the insect ought not to be removed to the genus *Eurytrachelus*; whilst in his memoir, in 1870, he considered it nearer to *Cladognathus* and *Odontolabis*. The specimen having been dissected by Mr. C. Waterhouse, has proved to be a female, as confirmed by a subsequent examination of the mouth-organs, which I have been enabled to make by the kindness of Major Parry, and which are noticed in my observations on the sexual relations of *D. rufus*.

#### DORCUS RATIOCINATUS, n. s.

(Plate VIII. fig. 2, male.)

Niger, prothorace et elytris parum castaneo-tinetis, capite opaco pone oculos subangulato, mandibulis capitis longitudine, falcatis dente medio suberecto armatis, prothorace transverso quadrato, lateribus subparallelis, angulis posticis lateralibus truncatis, denticulo parvo utrinque instructis, pronoto et elytris subnitidis et sublaevibus.

Long. corp. lin. 11; mand. fere lin. 2.

Hab.—Himalaya. In Mus. Parry.

This small species is of a narrow oblong form, the thorax being scarcely broader either than the head or

\* *Dorcus derelictus*, Parry.

Proc. Ent. Soc. Lond. 1862, p. 112; Trans. Ent. Soc. 3rd, s. v. 2, pp. 50, 90; 1870, p. 92, pl. xi. f. 3.

D. elongatus niger nitidus, capite inter oculos bituberculato; mandibulis obsolete unidentatis; elytris levissimis subparallelis; tibiis posterioribus extus subcurvatis, inermibus, intermediis unidentatis.

Long. corp. (mand. incl.) unc. 1, lin. 5.

Hab.—Ind., or Himalayas. Coll. Parry.

elytra, it is subconvex; the head is broad, nearly flat above, and subopaque, being seen, with a strong lens, to be entirely covered with very minute granules, placed closely together; the sides behind the eyes are slightly angulate, the canthus extends half the length of the eyes; the anterior lateral angles in front of the canthus being obliquely truncate, and slightly emarginate; the labrum is short and transverse, with the fore-margin straight, and fringed with short fulvous hairs; the mandibles are about the length of the head, sickle-shaped, and acute at the tips; the basal portion is concave, the outer angle (in front of the eyes) being dilated, in the middle they are armed with a strong nearly erect spine. The maxillæ are moderately long, the lobes clothed with long hairs, the inner lobe being simple; the mentum has the lateral anterior angles rounded, and the fore-margin nearly straight. The prothorax is transverse, with a slender raised margin all round its circumference; it has the sides nearly parallel, terminating behind in a small tooth, behind which the lateral angles are obliquely truncate, the anterior margin is rounded towards the head; the disc is convex and polished, with the outer angles finely punctured. The elytra are oblong, convex and polished, and, seen under a lens, covered with very minute punctures.

The anterior tibiæ are armed with seven small teeth on the outer edge, and the four hind tibiæ have a small spine in the middle of each.

Major Parry is inclined to believe that this insect is the male of *D. rufus*, next described.

#### DORCUS RUDIS.

(Plate VIII. fig. 3.)

♀. Totus niger, rude punctatus; elytris costatis interstitiis punctatissimis, capitis angulis anticis lateralibus obliquis, oculis septo dimidiatim incisis; prothoracis angulis posticis oblique emarginatis; elytris angulo humerali prominenti notatis.

Long. corp. (cum mandibulis) lin. 10.

Hab.—India vel Insulis Indicis? In Mus. D. Parry.

*Dorcus (Prosopocoilus?) rufus*, Westw., Trans. Ent. Soc., ser. 3, vol. ii. p. 35 (1864).

*Cladognathus rufus*, Parry, loc. cit., p. 35.

*Dorcus rufus*, Parry, Trans. Ent. Soc. 1870, p. 112.

The original female type of this species is here more carefully re-figured, in order to afford comparison with the male *Dorcus ratiocinatus* (Plate VIII. fig. 2) which Major Parry is inclined to regard as its genuine male. The precise habitat of this female specimen is, unfortunately, not known, and it is from analogy only that Major Parry has been led to the supposition of its being the female of the Himalayan insect. Should Major Parry's suggestion that *Dorcus derelictus* is the female of *Rhaetus Westwoodii* prove to be correct, we shall, I think, be scarcely warranted in adopting his view as to the sexual relationship of the two former insects, since the great difference between the two females far outweighs the close affinity existing between the two males.

Thus, although the structure of the mouth organs, especially the hooked inner lobe of the maxillæ, mentum, and labium, with its palpi, are quite alike in the two females; the mandibles of *D. derelictus* are straighter, and curved, with two teeth on the inner edge; the head is bicornute, and but slightly punctured, the prothorax being almost impunctate, with the lateral margins regularly rounded; the elytra also impunctate, except at the sides; the fore tibiæ very slender, and with about seven very small denticulations on the outer margin, the middle tibiæ with a single spine in the middle, and the hind tibiæ unarmed in the middle; differing in all these respects from *D. rufus*, the male of which will, no doubt, prove to be a very distinct creature from the genuine male of *Dorcus derelictus*.

#### DORCUS SUTURALIS, n. sp.

(Plate VIII. fig. 5.)

Obscure niger, elytris subopacis, regione scutellari et suturali glabrata, capite transverso, labro brevissimo, transverso, antice emarginato; mandibulis capite duplo longioribus, falcatis; dente crasso submedio antice parum porrecto armatis, mento lato, cicatricoso.

Long. corp. lin. 16½; mandibul. lin. 5.

Hab.—Pungi, Himalaya. In Mus. Parry.

The head is transverse, with the sides, including the lateral canthus of the eyes, nearly parallel; the hinder angles behind the eyes rounded; the canthus extends backwards half the length of the eyes, in front of each of which is a lateral depression. The labrum is very short, transverse, broad, with the fore-margin moderately emarginate. The mentum is broad, with the lateral anterior angles rounded, the disc marked with shallow cicatricose punctures. The mandibles are sickle-shaped, twice the length of the head, with a large, nearly central, tooth arising on the upper edge, and slightly porrected. The prothorax is transverse, with the front rather wider than the head, having the anterior angles slightly dilated and rounded, and the hind ones oblique; the disc is entirely even, without sulci or impressions, the whole, like the head, being opaque, and, when seen with a strong lens, entirely covered with exceedingly minute granulations. The elytra are oblong, slightly wider in the middle, where they are equal in breadth to the middle of the prothorax; they also are opaque, except along the sides of the suture and about the scutellum, where they (as well as the scutellum itself) are polished; the humeral angles are elevated. The disc is destitute of costæ or sulci. The fore legs have the tibiae rather narrow, and armed with about eight teeth on the outer margin. The four hind tibiae are also rather slender, with a spine on the middle of each on the outer edge.

DORCUS GLABRIPENNIS, n. sp.

(Plate VIII. fig. 6.)

Niger, subopacus, clytris glabris, capite prothorace minori, ante oculos parum dilatato, labro brevi, transverso, margine antico recto, mandibulis capitidis longitudine, dente forte conico medio, denticulisque duobus inter hunc et apicem armatis, prothoracis lateribus antice rotundato-dilatatis, angulis posticis obliquis; clytris prothorace angustioribus, costis nonnullis, valde indistinctis, notatis; Mas.

Long. corp. lin. 15; mand. lin.  $3\frac{1}{2}$ .

*Hab.*—In India orientali, Kasyah Hills. In Mus. Parry.

This insect is about equal in size to the preceding, but the mandibles are shorter, and the polished elytra, marked with several very indistinct costæ, distinguish it from that species. The head is transverse, narrower than the

prothorax, with a slight obtuse angle on each side behind the eyes; the canthus extends about half through the eyes, and is but slightly dilated in front of them. The labrum is short, transverse, with the fore-margin nearly straight, the anterior lateral angles prominent and acute. The mandibles are about the length of the head, they are falcate, acute at the tips, with a large triangular flattened tooth in the middle of the inner edge, beyond which, or rather arising on the anterior edge of the tooth itself, is a very minute tooth, and there is another equally minute and erect on the upper edge near the tip, and so placed that it is not visible when seen vertically. The mentum is very broad, with the anterior lateral angles rounded, the fore margin nearly straight, and the disc (like the remainder of the head, except the jugulum) covered with very minute granulations when seen with a lens, and marked with large shallow cicatricose punctures. The upper surface of the head is almost flat and even, with a very slight trace of a depression in the middle near the prothorax. The prothorax is wider than the head, but very slightly convex on the disc, the centre of which exhibits a very faint longitudinal depression; the anterior half of the lateral margin is dilated and rounded, and the hinder angles are oblique; the whole of the lateral and posterior sides have a slender, but distinct, margin; the upper surface is very delicately granulated like the head. The elytra are narrower than the prothorax, moderately convex, polished, but when seen with a lens they are delicately punctured; the humeral angles are prominent, and the disc of each is marked with several very indistinct raised longitudinal lines, scarcely visible beyond the middle. The anterior tibiæ are moderately slender, finely crenulated on the outer edge with six marginal teeth; the four hind legs are moderately slender, with a spur in the middle of the outer edge of each of the four posterior tibiae; the prosternum is rather wide, with a groove between the base of the fore-legs; the metasternum and abdomen are polished, and delicately punctured.

NIGIDIUS PARRYI, Bates.

(Plate VIII. fig. 1, male.)

“ Oblongus, niger, nitidus; capite quam thorax paulo angustiore, lateribus ante oculos rotundato-dilatato haud

angulato, fronte depressa sparsim minus grosse punctata; mandibulis maris porrectis, apice recurvatis, supra rugoso-punctatis, absque dente erecto, intus obtuso dentatis; thorace angulis anticis obtusis, margine laterali antice incrassato, medio valde emarginato, angulis posticis late rotundatis, supra lœvi, nitido, sulco dorsali abbreviato rugoso, plaga parva utrinque laterali punctata; elytris late punctato-sulcatis."

Long. mand. excl.  $11\frac{1}{2}$  lin.; mand.  $1\frac{1}{2}$  lin. Mas.

*Nigidius Parryi*, Bates, in Proc. Zool. Soc. 1866, p. 347.

*Hab.*—In Insula Formosa. In Mus. Parry.

"A more elongated insect than the other two continental Asiatic species (*N. cornutus* and *N. obesus*), and differing from all the allied species in wanting the erect tooth, or horn-shaped dorsal apophysis of the mandibles. The sides of the head are rounded before the eyes, and not produced into a point; the thorax has the lateral margin excavated in the middle. The sulci of the elytra are wide and deep, and have a chain of foveæ, but are destitute of the lines of fine punctures seen in *N. levicollis*; the interstices are narrow, polished, and impunctate."

In addition to the above character given by Mr. Bates, it is to be noticed that the clypeus is produced in front into an obtuse point, the disc of the head is furnished with a central impression, deepest behind. The eyes are completely divided by the canthus; the maxillæ have the inner lobe armed with a strong horny tooth, which leads me to suppose that the specimen described by Mr. Bates and the one here figured, are females. The mentum is very deeply emarginate in front, and widely punctured; the anterior margin of the pronotum is narrowly depressed, strongly punctate, behind which the disc is raised on each side, with a sharp small central raised tubercle. The striae of the elytra, near the suture, are slightly curved, and not parallel therewith; the anterior tibiæ have seven or eight teeth on the outer margin, and the four hind tibiæ have a rather strong central spine, preceded, in the middle pair by three, and in the hind pair by two, more minute spines.

*LISSOTES FURCICORNIS*, n. sp.

(Plate IX. fig. 3.)

Niger, punctatissimus; elytris magis cicatricosis; prothorace maris transverso quadrato, lateribus rectis; capite latissimo ad angulos anticos tuberculo elevato instructo; mandibulis maris magnis, furcatis, furcis æqualibus, interna sub-porrecta subconica, apicali conica erecta; prothoracis dorso leviter canaliculato; clytris dimidiatim costatis.

Long. corp. ♂ lin.  $6\frac{1}{2}$ - $7\frac{1}{2}$ ; mand. lin. 1: ♀ lin. 7.

Hab.—In Alpibus Victoriae Australasiæ. D. Howitt, ♂ ♀. In Mus. Oxoniæ.

This species is well distinguished by the transversely quadrate prothorax, and furcate mandibles of the male, the two branches of the furcation being of nearly equal size. The head of the male is transverse, regularly sloped from the crown to the front; the sides rather square, the anterior angles truncate, with each end of the truncature rounded; the lateral angle behind the eye is also rounded, in front of each eye is an elevated obtuse tubercle; the disc of the head is strongly punctured; the labrum is very shortly and slightly trilobed and setose; the mandibles of the male are about the length of the head, strong and much curved, they have a minute angular internal projection at the base, and they are deeply cleft in the middle, into two large nearly equal sized obtuse teeth, of which the inner is horizontal, and exhibits traces of one or two notches below the apex; the outer or upper tooth is somewhat vertically elevated. The mentum is transverse, with the anterior lateral angles rounded off; it is strongly punctured, with the anterior margin setose, and conceals the maxillæ and labium; the former have the terminal lobes moderately setose, the inner one being rather longer than the outer, and produced into a straight point in the male, but in the female (fig. 3e) it forms a strong acute hook. The labium is somewhat vase shaped, strongly setose in front, and the labial palpi have the basal joint slender and slightly curved, the second joint short, and the third somewhat clavate and curved. (In figure 3c, the labium and palpi are represented as detached from the inner surface of the mentum, in front of which they are placed separately, to show their relative size and form.) The prothorax in the male is much shorter than wide, being slightly wider than the head, with the lateral

margins nearly straight and parallel, with a slender lateral slightly crenulated edge. The disc is not so rudely punctured as the head, the punctures placed irregularly, so as to leave various small polished spaces; the disc has a slight central impression, widest across the centre, and a smaller one on each side; the hinder angles are rounded, and the middle of the hind margin straight. The scutellum is very small and triangular. The elytra are narrower than the prothorax in the male, with the sides nearly parallel; they are rugosely and irregularly punctured, and cicatricose, with the suture a little elevated; they have two ill-defined costæ on the disc, extending from the base to beyond the middle; the apex of the elytra is regularly rounded. The legs are rather slender; the anterior tibiae with seven or eight small teeth on the outer edge, and the four posterior tibiae with a small central spine on the outer edge.

The female is smaller than the male, and elongate ovate, with the head small, and destitute of the tubercles of the male; the mandibles small and curved, with a central tooth on the inner edge. The prothorax has the lateral margins rounded, somewhat narrowed towards the head, and crenulated with a slight central depression, and a small smooth space on each side. The elytra are more ovate, quite as broad as the prothorax, the whole upper surface is more thickly punctured than in the male; the legs are slender, the outer edge of the fore tibiae with only five teeth. The mentum in this sex is wider in front than behind, and strongly punctured.

I am indebted to Dr. Howitt for both sexes of this species, obtained by him from the Alps of Victoria, about sixty miles north-east from Melbourne, the female being very rare: and have adopted the manuscript name proposed by him for the species. I also purchased a specimen of the male from Mr. Du Boulay's collection, but was unable to ascertain whether he had collected it himself, at Swan River, or had obtained it from some other collector in Australia.

*LISSOTES LATIDENS*, n. sp.

(Plate IX. fig. 4.)

Mas. Niger, punctatissimus, capitis angulis anticis oblique subtruncatis, canthi oculorum angulo postico rotundato, mandibulis fere capitis longitudine, curvatis,

apice obtuso, intus basin versus dente maximo quadrato armatis; prothoracis lateribus subrotundatis.

Long. corp. fere lin. 7; mand. fere lin. 1.

*Hab.*—In Insula Maria et littora versus Tasmaniæ. D. Howitt. In Mus. Oxoniæ.

The singularly robust tooth near the base of the inner edge of the mandibles, the oblique anterior angles of the head, and the rounded lateral margins of the prothorax, distinguish the males of this species.

The whole surface is strongly and closely punctured, the punctures of the elytra being more elongated and occasionally confluent; the head is narrower than the prothorax, with a slightly prominent tubercle on each side at the base; the anterior angles of the head are obliquely rounded off, the posterior portion of this lateral margin being thin, and forming the canthus of the eye. The labrum is small, and very slightly produced; the mandibles are about as long as the head, strongly curved and sickle-shaped, the tip obtuse, and the inner edge furnished with a large, nearly square and flattened tooth, emarginate on its inner edge, as though it were formed of two obtuse teeth which had become confluent; beneath, this broad tooth is convex, and finely punctured. The mentum is transverse, with the anterior angles rounded and the surface punctured; the prothorax is transverse, wider than the head, and as wide in the middle as the widest part of the elytra (which are represented in figure 4 as rather too wide across the middle); the disc of the prothorax has a slight longitudinal central depressed line, and there is a small rounded impression between the middle and the lateral margin; the posterior part of the lateral margins of the prothorax are rounded off, but the hinder angle itself, on each side, is very slightly produced opposite the humeral angles of the elytra. The scutellum is minute, and on each side of the suture of the elytra is an impressed longitudinal line, formed by a series of confluent punctures, of which also there are several others on each elytron, which do not extend beyond two-thirds of their length. The legs are moderately slender, the anterior tibiæ with five or six obtuse teeth on the outer margin, and the four posterior tibiæ with a small spine in the middle of their outer edge.

Dr. Howitt kindly sent me a specimen of the male of this species, of which sex he had seen five specimens; the individual forwarded to me not being much more than half the size of one of his examples. They are from Maria island, and the east coast of Tasmania.

The female is unknown.

LISSOTES LAUNCESTONI, n. sp.

(Plate IX. fig. 1.)

Gracilis, subdepressus, niger punctatissimus, mandibulis maris curvatis, apice subporrectis, intus ultra medium dente subovato composito, armatis; prothorace transverso caput versus paullo angustiori.

Long. corp. lin. 6; mand. lin. 1.

Hab.—Launceston, Tasmania; mense Martis. D. Howitt. In Mus. Oxoniæ.

I am indebted to Dr. Howitt for a specimen of the male of this species, which, as he remarks, is "much like *L. obtusatus*, but narrower in form, with the mandibles more long and slender. I have never seen a specimen of this form from the south of Tasmania; the female is equally elongate with the males." It differs, moreover, in its depressed elytra, and in the much more strongly punctured upper surface of the body, especially of the prothorax.

The head is narrower than the prothorax, with the front part semicircularly sloping down to the labrum, which is minute and conical, with a small slightly raised tubercle on each side, near the base of the mandibles; the lateral margins of the head, in front of the eyes, are obliquely truncate and thin, the hind part forming an obtuse canthus of each eye. The mandibles are about the same length as the head, each with a small triangular tooth near the base of the inner margin, the apex porrected and obtuse, with a somewhat oval tooth, or dilatation, on the inner edge of the mandible, beyond the middle, on which are the obtuse rudiments of tubercles.

The prothorax is transversely subquadrate, the lateral margins slightly inclining towards the head, the centre of the disc being slightly impressed with a longitudinal

channel; the elytra are of equal width with the prothorax, and are more thickly produced than the other parts of the body; they have the lateral margins nearly parallel, the disc marked with several very faint longitudinal carinae, and the sutural portion is flattened.

The legs are moderately slender, the anterior tibiae with a few small irregular teeth, and the four hind ones with a small spine in the middle of their outer edge.

This species is destitute of wings.

*LISSOTES FORCIPULA*, n. sp.

(Plate IX. fig. 2.)

Piceo-niger, brevis, punctatus, subconvexus, labro conico porrecto, mandibulis maris falcatis; apicibus parum cochleatis, sub bi-vel tridentatis, lateribus capitis ante oculos obliquis et attenuatis, lateribus prothoracis obliquis, fere rectis et tenuiter marginatis et crenulatis, angulis posticis rotundatis, disco vix longitudinaliter in medio impresso; elytris brevibus subovatis et subconvexis punctatissimis; tibiis anticus dentibus 5 extus armatis.

Long. corp. ♂ (cum mandibulis) lin. 6 ( $\frac{1}{2}$  unc.); long. elytror. lin. 3.

*Hab.*—Tasmania. Mus. Oxon. (♀), et Parry (♂).

This species is nearly allied to *L. crenatus*, but differs from it in the narrower and much less convex form of the male, which has a much smaller head and smaller mandibles; it has also the upper surface of the body (especially of the head and prothorax) much more strongly and closely punctured; the labrum, conically produced, is also smaller, and the mandibles are less strongly toothed at the apex. It is distinguished from the male of *L. obtusatus*, and its allies, both by its shorter form and differently constructed mandibles. The head is transverse; the anterior portion forming a large semicircular depressed space, extending from the outer angles of the base of the mandibles nearly to the hind margin of the head; the front of this space is nearly smooth, but the hind part is covered with widely dispersed circular punctures; the lateral margins of the head in front of the eyes are oblique and thin, rounded off to the front incision

of the eyes; the labrum is conical, and advanced as far as inner produced base of the mandibles, which are sickle-shaped, dilated at the apex into a somewhat spoon-shaped extremity, the right mandible terminating in two obtuse unequal teeth, whilst the left mandible is obliquely truncate at the tip, with two or three slight incisions, forming a broad obtuse compound tooth. The prothorax in the male is transverse, convex, smooth, with moderately large round punctures, which are almost obsolete towards the anterior margin; the lateral margins are slightly crenated and oblique, but nearly straight; the anterior angle not acute, and the posterior angles rounded off. The elytra are short, subovate, convex, covered with small oval punctures, with two or three very slightly marked longitudinal carinae on each, one towards the suture being the most distinct.

The anterior tibiae are 5-dentate on the outer edge, the two teeth at the apex being the largest.

LISSOTES FORCIPULA, fem. ?

(Plate IX. fig. 6a, b.)

In the Hopeian Collection is preserved a small female specimen of a Lucanideous species, which Major Parry is inclined to regard as the female of the above described *L. forcipula*. Until, however, we are able to obtain more decisive evidence of its identity, it will be advisable simply to record its existence. It is rather more than five lines long; black, glossy, and thickly punctured. The head is small, nearly flat in the middle of the anterior portion, with a small round tubercle on each side, near the base of the mandibles; the punctures of the head are larger and more distinct than those of the prothorax; the labrum is transverse, with the middle of the front margin porrected into a conical point; the prothorax is much wider than the head, with the lateral margins narrowly curved towards the head, and finely crenulated; the posterior margin rounded, with the posterior lateral angles rounded off. The elytra are much shorter than those of *L. obtusatus*, fem.; they are subovate, widest across the middle, each shoulder forming a sharp angle. The disc is covered with small oblong punctures, and the apical half finely rugulose; the punctures on the disc

form two or three almost indistinct longitudinal striae, in consequence of their being more or less confluent; the anterior tibiae have five teeth on their outer edge, of which the second is by far the strongest.

Plate IX. fig. 6a, represents the head and prothorax of this female insect; and fig. 6b, the anterior tibia.

There is no locality attached to the specimen, but I believe I received it from Tasmania.

*LISSOTES SUBCRENATUS*, n. sp. (♀).

(Plate IX. fig. 5a, b.)

Piceo-niger nitidus punctatissimus, labro transverso, antice vix bisinuato, lateribus capitidis ante oculos oblique truncatis, lateribus prothoracis subrotundatis, angulo postico lateralili parum prominulo.

Long. corp. lin.  $4\frac{1}{2}$  (9 mill.).

*Hab.*—Tasmania. In Mus. Parry.

I am only acquainted with a single female of this insect, which differs so much from the females of the other known species of the genus, that I am reluctantly compelled to describe it as distinct, in the absence of its male.

It is considerably smaller than the *L. crenatus*, female; the head and pronotum are much more numerously and closely punctured, the disc of the head is flat, and gradually slanting; the sides, between the eyes and the outside of the base of the mandibles, are obliquely truncate and depressed, so as to leave a slight longitudinal carina on either side running backwards from the mandibles; the anterior canthus of the eyes is rounded off. The labrum is transverse, with the lateral angles rounded off, and the fore-margin very slightly bisinuate, the central portion formed by this bisinuation not more prominent than the side portions. The mandibles are small, curved, dilated inwards at the base, the apex of each forming a strong conical tooth, below which is a second smaller tooth, unequal both in size and position, in the two mandibles; the prothorax is transverse and convex, the anterior lateral angles slightly rounded; the disc with a slight central longitudinal channel; the sides are regularly curved and subserrate, the widest part being

beyond the middle, the posterior lateral angles are slightly prominent. The elytra are subovate, convex, setose, covered with oval punctures, considerably smaller than those of the pronotum, with two or three very slightly marked slender costæ on each. The anterior tibiae are very broad, and bidentate at the tips, with two smaller teeth on the middle of the outer edge.

LISSOTES HOWITTANUS, Westw.\*

(Plate IX. fig. 7a, b, c, d.)

Dr. Howitt having been so kind as to send me specimens of both sexes, of this very remarkable species, from the alps of Victoria, I am enabled to supply the omissions in my original description, by giving the characters of the female, and illustrating the parts of the mouth of both sexes.

The female is as large as the male, being one inch and two lines long; glossy black; the head is much smaller than that of the male, and much narrower than the prothorax, it is strongly swollen on each side behind the eyes, the upper and under portions of which are entirely separated by the canthus (as in the male); the front of the head slopes down gradually, forming a large semi-

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\* *Dorcus Howittanus*, Westw., Trans. Ent. Soc. Lond., 3rd ser., vol. 1, pl. 21, fig. 1. *Lissotes* (Sect. II.) *Howittanus*, Parry, Trans. Ent. Soc., 3rd ser., vol. 2, pp. 90, 97. *Lissapterus Howittanus* (Deyrolle) Parry, Trans. Ent. Soc., 1870, p. 114.

The genus *Lissapterus* of Deyrolle, to which this insect is assigned by Major Parry in his last Catalogue of the family, must be unpublished, since I am unable to find any such, either in his Memoir in the 'Ann. de la Soc. Ent. France,' for 1864; or in the 'Ann. Soc. Ent. Belge,' for 1865, vol. ix. From the name, it may be inferred that, the apterous condition of *D. Howittanus* had induced its generic separation, but, both sexes of *L. obtusatus*, and as we have seen above, the male of *L. Launcestoni* (which cannot be separated from the other Australian species) are destitute of wings. A more important character, namely the unarmed condition of the inner lobe of the maxillæ of both sexes of *D. Howittanus*, as well as the singular encircled head of the male, might suffice for the establishment of a separate generic group, but they seem outweighed by the identity in the general characteristics of the species. The inner lobe of the maxilla is also destitute of a hook in *L. crenatus* (see Trans. Ent. Soc., n. s., vol. 3, pl. xii. f. 3b).

circular depression, with a tubercle on each side near the base of the mandibles. The latter are short, subtriangular, with two teeth on the inner edge.

Plate IX. fig. 7a, represents the head of the male (reduced in size in comparison with fig. 7c, which represents the head of the female). The broad tooth on the inner edge of each of the mandibles of the males, is more conspicuous in some individuals than in others; thus, in my figure of the male above referred to, it is scarcely perceptible.

The maxillæ in both sexes are simple, those of the female being destitute of the strong hook at the extremity of the inner lobe. Fig. 7b, represents the maxilla of the male; and 7d, that of the female.

The prothorax of the female is transverse, with the lateral margins rounded, the anterior portion being as wide as the hinder; the disc is covered with punctures, those of the centre being smaller than the rest, without any of the smooth spaces or the rude punctures seen in parts of the prothorax of the male. The elytra are much more punctate than the male, the punctures extending to the extremity, and there is a broad, flat, smooth stria on each elytron adjoining the suture, as well as two on the disc of each, separated by punctures, which gradually disappear beyond their middle; the legs resemble those of the male, the anterior tibiae of the male being armed on the outer edge with several (three or four) minute teeth, which are not represented in the figure published in Trans. Ent. Soc. 3rd ser., vol. I. pl. xxi. f. 1. The anterior tibiae of the female exactly resemble those of the male.

In several of his memoirs on this family (especially in the Transactions of the Entomological Society for 1864 and 1870), Major Parry has suggested that the unique insect in the British Museum from Moreton Bay, which I described under the name of *Dorcus Pelorides* (Trans. Ent. Soc. 3rd ser. vol. I. pl. xxi. fig. 2) may be the female of *L. Howittanus*. This supposition is now disproved by the discovery of the true female by Dr. Howitt. The chief distinctions between these two females may be thus contrasted.

*D. Howittanus.*

Body subconvex; with parallel sides: upper surface of body strongly punctured.

Lateral anterior angles of the head with a sharply defined oblique ridge extending towards the middle of the crown.

Canthus of the eye moderate, entire.

Hind angles of the head moderate.

Prothorax with a depressed space on each side towards the anterior lateral angles.

Elytra costated, costæ flattened, the intervening spaces strongly punctured.

*D. Pelorides.*

Body subdepressed, of a more elongate ovate form: upper surface of body very glossy and slightly punctured.

Lateral anterior angles of the head with a raised round tubercle near the base of the antennæ.

Canthus of the eye forming a rounded, flat, exserted lobe.

Hind angles of the head strongly produced.

Prothorax with an impressed puncture towards the posterior lateral angles.

Elytra not costated, nor strongly punctured.

Note on *Lissotes cancroides*.

(*Lucanus cancroides*, Fabr.)

The original type specimen of this species, described by Fabricius and figured by Olivier, is now preserved in the British Museum, and does not exactly agree with any specimens of the genus since received from Australia. It is a male measuring seven lines in length, not including the mandibles, which are one line long; the head has the crown gradually sloping to the anterior edge, not retuse, as it is in the specimens which have been named *curvicornis*; the anterior lateral angles are oblique, slightly emarginate, their posterior part forming an obtuse canthus, extending a short distance into the front of the eyes; the head behind the eyes is wider than the middle, and produced into an obtuse tubercle, and there is a raised tubercle on each side behind the outer base of the mandibles, which agree with those of the specimens, which I have termed *sub-tuberculatus* (Trans. Ent. Soc., n. s. 3, p. 215, pl. xii. f. 2). The prothorax is transversely quadrate; the anterior margin bisinuate, with a small simple (not bipartite) raised

tubercls in the middle, close to the fore-margin; the anterior lateral angles are slightly produced in front, and rounded, and the sides are slightly emarginate at about one third of their length from the front angles; the posterior angles are obtuse, the junction of the lateral and hind-margin being indicated by a minute angular projection; the disc of the prothorax is nearly smooth and impunctate, with a central, rather strong longitudinal sulcus, which is deeply punctured; the prothorax is narrower than in *D. obtusatus*, with the sides much less strongly punctured than in *D. subtuberculatus*; the elytra are more elongate and narrower than in the specimens usually named *L. cancrioides* and *obtusatus*, and much less strongly setose at the sides, they are also not so strongly or so thickly punctured as in the allied species. The anterior tibiae are armed with ten teeth on the outer edge, those nearest the femora being very much diminished in size.

The description of this species given by me in the Entomological Magazine (vol. V. p. 267), was taken from the original individual, at that time in the possession of the Linnean Society; but in the coarse wood-cut several minute details were omitted, such as the frontal tubercle of the prothorax (which appears in my original drawing), the peculiar form of the canthus of the eyes, and posterior angles of the prothorax, &c.

M. Boisduval has given a description, in the voyage of the "Astrolabe" (p. 234), of an insect said to be from New Guinea, in the collection of M. Dupont, under the name of *L. cancrioides*, which "différe un peu de l'individu figuré par Olivier." He describes the prothorax as marked with two impressed foveæ, and the elytra as pubescent, covered with punctures "avec quelques côtés très peu marquées. It is probably distinct from Olivier's insect.

In the British Museum a female belonging to this genus, from Melbourne, is labelled as the female of *L. cancrioides*, but I believe that identification is simply conjectural; the head is strongly punctured, the angle of the canthus in front of the eyes strongly defined, the crown gradually sloping to the anterior margin, the prothorax destitute of a frontal tubercle, the surface punctured all over, but more delicately on each side of the

central sulcus; the posterior lateral angles are obtuse, and slightly emarginate. It is  $7\frac{1}{4}$  lines long, including the mandibles.

From the preceding observations it would appear, that these Tasmanian species may be thus distinguished, so far as the males are concerned.

- A. Those with the posterior lateral angles of the prothorax oblique, with a prominent angle opposite the shoulders of the elytra.
  - a. Those with the fore-margin of the prothorax anteriorly produced in the middle.
    - \* Prothorax with a small central frontal polished tubercle. 1. *L. cancroides*.
    - \* \* Prothorax with two small tubercles conjoined in middle of front margin of prothorax. 2. *L. subtuberculatus*.
  - b. Those with the fore-margin of the prothorax straight; front of head strongly retuse. 3. *L. curvicornis*, Latr.
- B. Those with the posterior lateral margins of the prothorax rounded.
  - 4. *L. Launcestoni*.
  - 5. *L. obtusatus*.
  - 6. (?) *L. obtusatus*, var. *dimidio minor*, mandibulis multo minoribus, dente apicali cum dente lato medio coalito.  
Mount Wellington, March, 1866. Dr. Howitt.

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### *Explanation of Plates.*

#### PLATE VIII.

- Fig. 1. *Nigidius Parryi* (slightly magnified); 1a, maxilla; 1b, mentum; 1c, antenna.
2. *Dorcus ratiocinatus*, ♂ (nat. size); 2a, maxilla; 2b, mentum, and one of the labial palpi; 2c, terminal joints of antenna.
3. *Dorcus rudis*, ♀ (rather magnified); 3a, head, seen from above; 3b, maxilla; 3c, mentum; 3d, labrum and labial palpi.

Fig. 4. *Rhaetus crenatus*, ♂ (nat. size); 4a, underside of the head with basal portion of one of the mandibles, showing the jugulum, mentum, labial hairs, and terminal joint of the labial palpi, and end of one extremity of the second joint of the other maxillary palpus; 4b, one of the eyes, seen laterally, showing the canthus extended into its upper part; 4c, right mandible, seen laterally from within; 4d, maxilla with its palpus; 4e, mentum, seen within, showing the labium and labial palpi; 4f, one of the antennæ (mis-lettered 4c, in middle of the right side of the plate).

5. *Dorcus suturalis*.
6. *Dorcus glabripennis*.

#### PLATE IX.

- Fig. 1. *Lissotes Launcestoni*, ♂; 1a, head slightly magnified.
2. *Lissotes forcipula*, ♂; 2a, head much magnified.
3. *Lissotes furcicornis*, ♂; 3a, head magnified; 3b, maxilla; 3c, mentum, with the labrum and palpi detached from within the mentum, and represented in front of the latter; 3d, head and prothorax of ♀; 3e, maxilla of ditto; 3f, mentum of ditto.
4. *Lissotes latridens*, ♂; 4a, head much magnified.
5. *Lissotes subcrenatus*, ♀, head and prothorax; 5b, anterior tibiæ.
6. *Lissotes forcipula*, ♀? (see pp. 367, 368).
7. *Lissotes Howittanus* (see p. 372).

XI. Descriptions of a new genus, and of two new species  
of Longicorn Coleoptera. By H. W. BATES,  
F.Z.S., &c.

[Read 1st May, 1871.]

Genus BOLBOTRITUS, nov. gen.

(Sub.-fam. *Cerambycinae veræ.*)

*Mas.* Corpus cylindricum, robustum. Caput crassum pone oculos haud constrictum. Antennæ breves, humeros elytrorum paulo superantes; articulo tertio maxime ampliato, ovato, crasso, paulo compresso; 4to lato in apice articulo tertii inclusio; articulis 5-7 brevibus ovatis; 8-11 linearibus lateribus sulcatis, ultimo longiori acuminato. Thorax transversim quadratus, inermis. Elytra parallelogrammica apice rotundata. Pedes breves robusti; tibiae compressæ; tarsi breves, articulo 3io lobis brevibus, angustis, 4to cæteris conjunctis paululum breviori crasso. Prosternum arcuatum, mesosternum simplex; acetabula antica extus longe angulata. Abdomen postice vix angustatum, segmentis singulis convexis, ultimo latissimo et brevissimo.

*Bolbotritus Bainesi*, n. sp.

Fusco-castaneus, capite et thorace obscurioribus, cerebrime punctulatis et rugulosis; antennis articulis basali obscuriori rugoso, tertio punctulato, cæteris nitidis; elytris subtiliter coriaceis nitidis, leviter bicostatis; pectore et abdome punctulatis.

Long. 2 unc.

*Hab.*—Ad ripas fluminis Mungwe in terris Matabiliorum, Africæ Australis, in lat.  $20^{\circ}$ ,  $45'$ ; A viatore insigne Thom. Baines capto.

This singular species belongs, without doubt, to section A of Lacordaire's Group *Cerambycides vrais*, and to division I. of the same section; the lower lobe of the eyes not advancing beyond the antenniferous tubercles. The extreme shortness of the antennæ makes it an exception to the general character of the group, but it is clear that

their form is only an exaggeration, or an extreme development, of the well-known structure, common in the males of the group, in which the third to fifth joints are more or less swollen. In *Bolbotritus* the bulbous enlargement of the third joint is enormous, encasing in its apex the enlarged third joint, and even to some extent, also the fifth, which appears only as a prominent tubercle at the end of the bulb ; and this excessive enlargement appears to have been obtained at the expense of the remaining joints of the antennæ, which are extraordinarily shortened. The insect is interesting, as an illustration of the tendency so wonderfully displayed by the Longicornia to extreme developments of any variable feature, in species otherwise closely allied. This tendency is carried sometimes to such a length, that the affinities of the modified forms are no longer recognizable, and hence the unusual difficulties often complained of as attendant on their classification.

*Mallaspis præcellens*, n. sp.

*M. Beltii* affinis, multo angustior et gracilior. Læte ænea, nitida; capite aurato valde elongato grosse haud profunde subrugoso-punctato, supra late sulcato; antennis corpore vix brevioribus, articulis basalibus auratis, 6-7 violaceis, reliquis nigris, omnino linearibus, punctatis, 3-4 paulo latioribus subplanatis, 6-7 breviter sparsim denticulatis; thorace quam in *M. Beltii* multo angustiori, spina mediana valida, antice et postice æqualiter angustato, suprâ discrete passim punctato; scutello lâte aureo-sericeo; elytris elongatis postice paulo angustatis, supra basin ad paulo convexis creberrime subtiliter ruguloso-punctatis, basi multo lævioribus nitidis; pedibus elongatis, æneo-auratis, tarsis violaceis; femoribus anticis grosse granulatis; corpore subtus cupreo-æneo splendido.

Long. 1 unc. 8 lin.; lat. pone humeros 6 lin. ♂.

*Hab.*—Chiriquí, near Panamá.

Two specimens in the British Museum, and one in my own collection. The species is very distinct from all hitherto known. The rich intense metallic hues of its antennæ and legs, at once distinguish it from all others having linear antennal joints.

XII. Descriptions of three new species of Cicindelidæ.  
By H. W. BATES, F.Z.S., &c.

[Read 3rd July, 1871.]

*Oxygongia albitænia*, n. sp.

Caput et thorax breves, angusti; elytris duplo latioribus maxime elongatis, apice utrinque in dente acuta prolongatis. Supra obscure ænea, thorace lateribus læte cupreis, elytris olivaceo-viridibus nitidis; labro nigro, utrinque macula pallide testacea, transverso, angulis oblique truncatis, medio obtuse producto; antennis nigris; palpis gracilibus, pallidis, articulis apicalibus nigris; capite thoraceque omnino subtiliter strigosis, hoc postice profunde transversim sulcato antice supra sulco vix impresso, linea longitudinali modice impressa, disco vix convexo, lateribus paululum rotundatis; elytris passim equaliter discrete punctulatis, supra inæqualibus, apice depresso-explanatis; juxta marginem vitta alba ab humeris usque prope apicem extensa, marginem haud attingenti, juxta humeros angustata, apud medium breviter dilatata; corpore subtus aureo-cupreo splendido; pedibus nigro-æneis, femoribus viridibus, coxis et femoribus albo pilosis. ♂ segmento sexto ventrali medio profunde emarginato.

Long. 7 lin. ♂.

Evidently allied to *Oxygongia Schœnherri* (Mannerh.), from which it differs in the broad white lateral stripe (instead of three spots) of the elytra, and, according to the description, in the form of the thorax. The apex of the elytra is not truncate, neither is the spine sutural, but the whole apex is prolonged into a broad and sharp tooth.

Hab.—New Granada.

*Oxygongia cyanopis*, n. sp.

Viridi-cyanea splendida, thorace brevi cylindrico; elytris triplo latioribus, valde elongatis, apice (♀) explanatis sinuatim truncatis, spina suturali modice elongata; labro transverso, angulis rotundatis medio dente elevato armato, nigro, macula utrinque testaceo; palpis testaceis, maxill. articulis 2 ultimis, labial. 1 nigris; antennis nigris; capite thoraceque supra subtiliter strigosis: hoc lateribus paul-

lulum rotundatis, sulco basali supra profundo, apicali vix impresso, linea dorsali modice impressa, disco utrinque vix convexo; elytris inæqualibus, passim discrete punctulatis, utrinque maculis duabus rotundatis lateralibus albis, una mox pone medium, altera intra angulum externum apicis, ambabus a marginem paulo distantibus; corpore subtus læte viridi-æneo, pectore pedibusque nigris; coxis et femoribus sparsim albopilosis.

Long. 6½ lin. ♀.

Hab.—New Granada.

Apparently allied to *O. prodiga*, Erichs., which differs in having three white spots on each clytron, and in the sides being cupreous. In *O. cyanopis*, there is no trace of cupreous, the clytra being of a fine dark blue, with a greenish tinge in certain lights, and a trace of violet on the sides about the middle; the sides and flanks of the thorax, like nearly the whole of the under-surface, are brilliant brassy-green. The description by Erichson is so brief and incomplete, that there is no means of knowing whether his insect really belongs to the genus, and the species would have to be set aside as indeterminable, if we had not an indirect redescription by Chaudoir, in his comparison of *O. Vuillefroyi* (Rev. Mag. Zool., Jan. 1869).

The genus *Oxygonia*, comprising a small number of species of very great rarity in collections, has generally been ill-understood by authors. According to most authorities, its affinities are with *Iresia* and *Euprosopus*; but Chaudoir, correcting his previous views, placed it rightly, in his "Catalogue of Cicindelidæ" (Brussels, 1865), in the immediate neighbourhood of *Odontocheila* and *Thopentica*, an arrangement which was unnecessarily perverted afterwards in Harold and Gemminger's "Catalogus." The genus, in fact, is very closely allied to *Phyllodroma*, *Odontocheila*, and allies; agreeing with them in the simple palpi, grooved tarsi, and slender form of body, and differing from *Iresia* and *Euprosopus* in the absence of frontal grooves, separating the middle of the forehead from the inner orbits of the eyes. Its peculiarities are the spined apices of the femora, and the nearly smooth punctulate surface of the elytra. Although the definite structural differences are but slight, the genus forms a most natural group, as manifested by numerous minor characters, such as the fine striation of the thorax, the tooth-like projections at the apex of the

elytra, the style of coloration and markings, and the large size of its elytra and "after-body," compared with the head and thorax. Six species are now known, viz., five from the Andes (near the Equator), and one of much smaller size from South Brazil. Although nothing is recorded of their habits, I have no doubt they resemble those of the *Odontocheile*, and that they live in the shades of the virgin forest, flying about low bushes, especially on the humid margins of rivulets and mountain torrents.

*Cicindela Crespignyi*, n. sp.

Quoad labrum sectionem *Culochroa* pertinens, *C. lachrymans* (Schaum.) et *C. flavovittata* (Chaud.) affinis; forma *C. Vasseletii* (Chevr.) simillima. Viridi-aenea, infra nitida, supra capite et thorace obscurioribus; elytris olivaceis postice late viridi-sericeis, aurantiaco maculatis; capite subopaco, subtiliter ruguloso, prope oculos strigoso; labro albo, medio producto (♀ magis ♂ minus) tridentato, dente mediana magna; palpis omnino aeneis; antennis articulo 1 cupreo 2-4 viridi-aeneis; thorace cylindrico subtiliter ruguloso, subopaco: sulco posteriori profunde, anteriori leviter, impresso; elytris elongato-ovatis utroque sexu apice obtuse rotundatis, angulo suturali spinoso, supra punctis opacis grossis haud profundis passim sparsis, fascia obliqua abbreviata pone medium vittaque postica trianguliformi co adnexa, aurantiacis; corpore subtus lateribus griseo piloso.

Long. 6 lin. ♂ ♀ exempla plurima.

*Hab.*—Interior of Northern Borneo; taken by Lieut. de Crespigny.

The markings of the elytra are unlike those of any other described species; the ground-colour is opaque, greenish or olivaceous, with a changing light-greenish silky gloss, especially on the hinder half, where a deeper and bluer tint surrounds the orange-coloured markings; these latter form on each elytron a hammer-shaped figure, consisting of a broad oblique spot or fascia across the disc behind the middle, touching neither the suture nor the lateral margin, and a longitudinal stripe proceeding from the middle of the hind-margin of the fascia and extending very near to the apex, where it is much dilated; in some examples it is detached from the fascia.



XIII. *Descriptions of new genera, and of some recently discovered species of Australian Phytophaga.*  
By J. S. BALY, F.L.S.

[Read 5th June, 1871.]

*List of Species.*

1. <i>Duboulaia</i> (n. g.) <i>fulvipennis</i> .	12. <i>Ditropidus fulvus</i> .
2. <i>Carpophagus excavatus</i> .	13. " <i>dimidiatus</i> .
3. <i>Elaphodus albo-hirsutus</i> .	14. " <i>biplagiatus</i> .
4. <i>Ditropidus carbonarius</i> .	15. <i>Lachnabothra Hopei</i> .
5. " <i>hirticollis</i> .	16. " <i>Breweri</i> .
6. " <i>Duboulai</i> .	17. " <i>integra</i> .
7. " <i>strigosus</i> .	18. " <i>Wilsoni</i> .
8. " <i>rufo-cupreus</i> .	19. " <i>Waterhousei</i> .
9. " <i>Odewahnii</i> .	20. " <i>Saundersii</i> .
10. " <i>fasciatus</i> .	21. " <i>distincta</i> .
11. " <i>tarsatus</i> .	22. " <i>Duboulai</i> .

Fam. SAGRIDÆ.

Genus DUBOULAIA, n. g.

*Corpus* subelongatum, modice convexum, non metallicum, pube griseo adpresso dense vestitum; *caput* exertum, modice elongatum; *oculis* integris, granulosis, vix prominulis; *palpis maxillaribus* articulo ultimo ovato, apice obtuso; *mento* transverso; *ligula* apice bifida; *antennæ* corporis dimidio fere æqualibus, filiformibus. *Thorax* subcordiformis, latitudine non longior, angulis anticus indistinctis; *elytra* oblonga, convexa, glabra, irregulariter punctata; *pedes* robusti; *femoribus* posticis incrassatis, subtus spina compressa trigonata armatis; *unguiculis* simplicibus; *prosternum* coxis æquialtum, postice non prolongatum; *pygidium* elytris non obtectum.

This genus must take an intermediate place between *Megamerus* and *Prionesthis*, with the former it agrees in the form of the thorax, and in the emarginate *ligula*, but differs in the shorter head and antennæ, less prominent eyes, and in the form of the apical joints of the maxillary palpi; from the latter, although agreeing in the form of the maxillary palpi, it differs greatly, both in the form of the thorax, and also in having the hinder thighs armed beneath.

*Duboulaia flavipennis.*

Subelongata, modice convexa, piceo-nigra, griseo-sericea, antennis, clypeo antice, labroque fusco-fulvis; tibiis tarsisque obscure piceis; thorace crebre punctato, dense albo sericeo; elytris tenuiter punctatis, obscure fulvis, sutura anguste picea.

Long. 8½ lin.

*Hab.*—Champion Bay, Western Australia; collected by Mr. Duboulay.

Antennæ half the length of the body, fusco-fulvous; front impressed with a longitudinal groove, which extends downwards as far as the apex of the clypeus; surface on either side distinctly punctured, clothed with adpressed white hairs; clypeus large, pentagonal, thickly punctured; its lower edge, together with the labrum obscure fulvous; thorax as broad as long, sides rounded and dilated in front, constricted behind the middle; above moderately convex, somewhat flattened on the disc, closely covered with small, but deep and well-defined punctures; surface clothed with adpressed whitish hairs; elytra much broader than the thorax, oblong, glabrous, shining fulvous, the suture narrowly edged with piceous; whole surface faintly wrinkled, rather closely but finely punctured; hinder thighs thickened, armed beneath with a large, flat, triangular tooth.

## Genus CARPOPHAGUS, McLeay.

*Carpophagus excavatus.*

Anguste oblongus, piceo-niger, pube adpresso griseo dense vestitus; thorace nigro, irregulariter excavato et foveolato, interspatiis glabris, nitidis; elytris oblongis, postice paulo attenuatis, piceis, nitidis, profunde excavato-foveolatis; foviis magnis, substriatim dispositis, griseo-hirsutis, interspatiis glabris, nitidis, rugulosis.

Long. 10 lin.

*Hab.*—Champion Bay, Western Australia; collected by Mr. Duboulay.

Thorax longer than broad, subconic; sides more quickly converging near their apex; above subcylindrical, irregularly excavated, densely clothed with adpressed hairs; interspaces between the excavations smooth, gla-

brous, shining black; on the centre of the disc these interspaces are small, detached, and wart-like, but on the sides of the thorax they are much larger and irregularly confluent; elytra oblong, much broader at the base than the thorax, slightly narrowed towards their apex; surface covered with large, irregular, deeply excavated foveæ, whose surfaces are thickly clothed with short adpressed griseous pubescence; these foveæ, which are arranged in about ten longitudinal rows on each elytron, cover nearly the whole disc, the spaces between the foveæ being shining glabrous, coarsely wrinkled, and obscure rufo-piceous; pygidium rufo-piceous.

The specimen from which I have made the above description is (judging from the shorter antennæ and from the very slight enlargement of the hinder femora) a ♀; the ♂ probably differs in colour from the ♀, in the same way as in *C. Banksiae*; in that species, the ♂ is obscure fulvous, whilst the ♀ is lead-coloured.

### Fam. CRYPTOCEPHALIDÆ.

Genus ELAPHODES, Suffr.

*Elaphodes albo-hirsutus.*

Anguste oblongus, obscure cupreus, pube albido adpresso vestitus, antennarum dimidio basali, labro pedibusque (femoribus anterioribus dorso, posticisque totis exceptis) fulvis, tarsis antennarumque dimidio apicali piceis; thorace subremote punctato; elytris tenuissime granulosis, minute transversim rugulosis, tenuiter et subremoto punctatis, punctis ad latera seriatim dispositis.

Long. 1½ lin.

Hab.—Western Australia, Champion Bay.

Head thickly clothed with long white hairs; front impressed with a longitudinal groove; mouth fulvous, apex of jaws black; antennæ rather longer than the head and thorax, the six outer joints moderately dilated, black; thorax twice as broad as long at the base, sides nearly parallel behind the middle, rounded and converging in front; apex of the basal lobe entire, its surface very slightly reflexed; scutellum broadly oblong-ovate; elytra not broader than the thorax, rather more than twice its length, their sides parallel; the humeral callus moderately prominent.

## Genus DITROPIDUS, Erichs.

*Ditropidus carbonarius.*

Subquadratus, postice paullo attenuatus, niger, nitidus, antennarum basi, labro mandibulisque (his apice exceptis) fulvis, femoribus anticis, tibiis apice, tarsisque obscure piceis; thorace tenuiter punctato; elytris tenuissime punctato-striatis, interstitiis planis, impunctatis, striis duabus ad latum subsulcatis, interstitiis lateralibus leviter convexis.

Long. 2 lin.

*Hab.*—Western Australia.

Head finely but distantly punctured, nearly glabrous, only a few small white adpressed hairs being visible here and there on the surface; eyes distant, face impressed with a faint longitudinal line; antennæ slightly longer than the head and thorax, five outer joints moderately dilated, black, the remaining joints fulvous; thorax twice as broad at the base as long, sides rounded and converging from base to apex; surface finely but not very closely punctured, the puncturing more crowded on the sides; basal lobe distinctly notched, obsoletely reflexed; elytra broader at the base than the thorax, twice its length, sides slightly narrowed from the shoulders backwards; surface very finely punctate-striate, the interspaces flat, impunctate; two outer striæ subsulcate, their interspaces slightly convex.

*Ditropidus hirticollis.*

Subquadratus, postice paullo attenuatus, convexus, niger, pube adpresso albido vestitus, antennarum basi labroque rufo-piceis; abdomine corporeaque supra (antennis apice exceptis) cupreus; thorace minute punctato, albo-hirsuto; elytris distincte striato-punctatis, glabris, interstitiis planis, apicem versus leviter convexiusculis, ad latera convexis, subcostatis.

Long.  $1\frac{1}{4}$  lin.

*Hab.*—Western Australia.

Upper half of head closely clothed with adpressed white hairs; lower half of face glabrous; five upper joints of antennæ moderately dilated; five basal joints

obscure rufo-piceous; labrum rufous; thorax twice as broad at the base as long; sides rounded and converging from base to apex; surface finely and subremotely punctured, covered with adpressed white hairs; basal lobe slightly reflexed, its apex very feebly notched; scutellum oblong, its apex acute; elytra slightly broader at the base than the thorax, regularly punctate-striate; interspaces plane, smooth, slightly convex towards the apex of the elytra, those near the outer border raised and subcostate for their whole length; lower surface of abdomen and pygidium closely clothed with adpressed white pubescence, finely rugose-punctate; pygidium as broad at its base as long; on its medial line is seen a faint longitudinal ridge.

*Ditropidus Duboulai.*

Oblongus, convexus, niger, nitidus, capite thoraceque cupreo-aeneis, mandibulis apice, antennarum articulis sex basalibus subtus, femoribus anticis subtus, tibiis anticis apice, labroque obscure rufo-fulvis, thorace crebre sed tenuissime strigoso-punctato, basi linea brevi transversa impresso; elytris obscure viridi-aeneis, subfortiter striato-punctatis, interstitiis leviter convexis, transversim rugulosis.

Long. 1 lin.

Hab.—Champion Bay.

Head remotely and very finely punctured, clothed with long griseous hairs; six lower joints of antennæ obscure rufous, stained above with black, the remaining joints entirely black; apex of jaws also rufous; thorax slightly broader than the elytra; sides rounded, nearly straight and parallel at the base, obliquely converging from the middle to the apex; basal lobe slightly reflexed, separated from the disc by a slight but well-defined transverse groove; disc very finely punctured, somewhat closely covered with faintly impressed, longitudinal striæ; elytra half as long again as the thorax, distinctly punctate-striate, interspaces on the inner disc obsoletely, those on the outer disc distinctly convex, transversely rugulose.

*Ditropidus strigosus.*

Breviter oblongus, obscure cupreus, pube adpresso albido dense vestitus, femoribus tibiisque fulvis, piceo

tinctis, tarsis piceis; supra nitido-cupreus, antennis extrosum nigris, his basi labroque fulvis; thorace pubespresso albido vestito, disco remote, lateribus subremote-punctato; elytris glabris, sat fortiter punctato-striatis, interspatiis fere planis ad apicem ut ad latera convexis, dense transversim rugulosis.

Long.  $\frac{1}{4}$  lin.

*Hab.*—Champion Bay; collected by Mr. Duboulay.

Head clothed with adpressed white hairs; surface finely but distantly punctured; labrum and lower half of antennæ fulvous, outer half of the latter black; eyes large, reniform; thorax as broad at the base as the elytra; sides obliquely converging and slightly rounded from base to apex; upper-surface clothed with adpressed white hairs; disc remotely, sides rather more closely, impressed with moderately deep punctures; basal lobe slightly reflexed; scutellum semi-ovate, rounded at the apex, its surface shining, impunctate; elytra about one-half longer than broad, nearly parallel; surface rather densely punctate-striate, interspaces nearly plane on the anterior half of the inner disc, moderately convex towards the apex of the latter, and also on the outer disc, their whole surface closely covered with fine transverse rugosities; legs fulvous, stained with piceous; tarsi pitchy-black.

### *Ditropidus rufocupreus.*

Subquadratus, convexus, postice paulo attenuatus, pallide rufo-piceus, supra rufo-cupreus, antennis extrosum nigris, thorace distincte punctato; elytris striato-punctatis, interstitiis planis, ad latera pone medium convexis.

Long.  $1\frac{1}{4}$ - $1\frac{3}{4}$  lin.

*Hab.*—Western Australia, Champion Bay.

Head clothed with adpressed whitish hairs, surface distinctly punctured, impressed on the upper half of the face with a longitudinal groove; jaws black; antennæ equal to the head and thorax in length, slender, five upper joints only slightly dilated, four upper joints blackish-piceous; thorax twice as broad at the base as long, sides rounded and converging from base to apex; surface impressed with numerous distinct but shallow punctures;

basal lobe distinctly notched, its surface on the same plane as the disc of the thorax; scutellum regularly ovate, its apex acute; elytra slightly but distinctly broader at their base than the thorax, twice the length of the latter; surface regularly punctate-striate, interspaces plane, very minutely and distantly punctured, those on the hinder half of the outer disc convex, subcostate; on the upper half of the inner disc are a few very faint irregular rugæ; pygidium finely rugose-punctate, clothed with adpressed white hairs.

*Ditropidus Odewahnii.*

Oblongus, cupreus, nitidus, antennis extrorsum nigris, his basi, labro pedibusque picco-fulvis; thorace subremote punctato, lateribus substrigoso; elytris distincte punctato-striatis, interspatiis impunctatis, fere planis, apicem versus et ad latera leviter convexusculis.

Long.  $\frac{1}{2}$ - $\frac{3}{4}$  lin.

*Hab.*—South Australia.

Head remotely punctured, sparingly clothed with adpressed griseous hairs, face impressed with a longitudinal groove; eyes large, slightly notched; six lower joints of antennæ fulvous, the five outer black; thorax as broad at the base as the elytra, sides rounded and converging from base to apex; upper surface remotely punctured, the punctures oblong, rather more crowded on the sides; surface between the punctures smooth and impunctate on the disc, obsoletely strigose on the sides; elytra nearly parallel, scarcely narrowed posteriorly, regularly punctate-striate, punctures large but not very deeply impressed, oblong; interspaces smooth and shining, impunctate, faintly wrinkled when seen under a strong lens; on the disc nearly plane, on the inner disc near the apex, and on the outer disc, slightly convex.

*Ditropidus tarsatus.*

Subquadratus, postice angustatus, ♀ magis oblongus, sordide fulvus, subopacus, antennis extrorsum, thoracis margine basali, scutello, tarsisque nigro-piceis; elytris sulcato-striatis, striis fortiter punctatis; puncto humerali, sutura postice, margine apicali, maculisque tribus ante apicem transversim positis, pallide piceis; abdomine fusco.

Long. 1-1 $\frac{3}{4}$  lin.

*Hab.*—Western Australia, Champion Bay.

Head closely covered with adpressed fulvous hairs; front impressed with a longitudinal groove; outer half of antennæ pitchy-black; thorax as wide as, or slightly wider at its base, than the elytra, sides regularly rounded and converging from base to apex; disc closely punctured, strigose-punctate on the sides; in the middle, extending from the extreme apex of the basal lobe half-way across the disc is a faint longitudinal ridge, on either side of which, just in front of the basal margin, is a broad but shallow and ill-defined transverse excavation; basal margin narrowly edged with black; elytra subnitidous, scarcely equal in width to the base of the thorax, narrowed from base to apex; disc below the basal margin broadly but faintly depressed; each elytron with eleven rows of sulcate striæ, the first short; each stria impressed with a regular row of large round punctures, more or less stained with fuscous; interspaces slightly raised, obsoletely convex on the inner disc, subcostate near the outer margin, distinctly punctured, here and there faintly wrinkled; a spot on the humeral callus, and three large ill-defined patches placed transversely across the disc nearly half-way between its centre and the apex, obscure fuscous; of these patches the middle one is common and transverse, the two others oblong, and placed one on either side on the outer disc, and attached to the outer border of the elytron; the hinder half of the suture, the apical border of the elytra, and sometimes the hinder half of the lateral border, are narrowly edged with fuscous; knees stained with piceous, tarsi pitchy-black.

### *Ditropidus fulvus.*

Oblongus, fulvus, subnitidus, thorace sat crebre punctato, substrigoso, lateribus rugoso-punctatis, margine basali anguste nigro-marginato; elytris punctato-striatis, punctis magnis, rotundatis, leviter impressis; interspatiis obsolete convexiusculis, ad apicem magis elevatis, ad latera subcostatis.

Long. 1 lin.

*Hab.*—Western Australia.

Head deeply punctured, glabrous; antennæ fulvous, the inner angles of the five upper joints alone being stained with piceous; thorax as broad at its base as the elytra; sides obliquely converging and slightly rounded from base to apex, surface coarsely punctured, substrigose, rugose-punctate on the sides; basal lobe slightly reflexed; basal margin narrowly edged with piceous; scutellum pale, brownish-fulvous; elytra broadly oblong, scarcely narrowed posteriorly; surface of each elytron with eleven rows of large round shallow punctures, the first row short; interspaces smooth, nearly flat on the inner disc, convex towards the apex, more strongly raised and almost costate near the outer margin.

This species strongly resembles *Cryptocephalus minutus* and its allies, in habit and coloration.

### *Ditropidus dimidiatus.*

Subquadratus, rufus, nitidus, antennis extrorsum, pedibus intermediis, tarsisque anticis rufo-piceis, scutello, elytris, metasterno, abdomine, pedibusque posticis nigris.

Long.  $1\frac{1}{2}$  lin.

Hab.—Northern Australia, Brisbane?

Head closely punctured, rugose-punctate between the eyes, the latter distant, reniform, front impressed with a faint longitudinal groove; thorax as broad at its base as the elytra, sides rounded and converging from base to apex; upper surface distinctly and somewhat closely punctured; elytra slightly longer than broad, slightly narrowed posteriorly; surface strongly punctate-striate, interspaces flat, impunctate, three outer interspaces thickened, subcostate.

### *Ditropidus biplagiatus.*

Subquadrato-ovatus, postice paullo angustatus, niger, nitidus, antennis extrorsum piceis, basi labroque rufo-testaceis, thorace rufo, tenuiter nigro marginato; elytris tenuiter punctato-striatis, utrinque plaga magna rufa, discum fere amplectente, ornatis; femoribus obscure rufo-piceis aut nigris.

Long.  $1\frac{1}{4}$  lin.

*Hab.*—Moreton Bay; North-West Australia.

Head broad, flat, impressed with moderately large but shallow punctures; clypeus and lower portion of face slightly wrinkled; middle of face with a shallow longitudinal groove; four or five outer joints of antennæ piceous; eyes distant, uniform; thorax nearly as broad at the base as the elytra, sides obliquely narrowed from base to apex, slightly rounded near the apex; disc smooth, rather closely covered with shallow punctures; elytra about a third longer than broad, slightly narrowed posteriorly, each elytron with eleven rows of moderately impressed oblong punctures, the first short; interspaces distantly and minutely punctured, plane on the anterior portion of the middle disc, faintly raised on the front half of the inner disc, slightly convex on the hinder half, those on the outer disc near the outer margin raised and convex for their whole length: on each elytron is a large subtrigonate rufous patch occupying the middle of the disc.

*Ditropidus fasciatus.*

Breviter oblongus, obscure æneo-niger, nitidus, albo-sericeus, antennis basi fulvis, dorso piceis, articulis quinque ultimis modice dilatatis, nigris; thorace elytrisque obscure cupreis, illo subfortiter punctato, albo-sericeo; his glabris, tenuiter punctato-striatis, interstitiis planis, iis ad latera leviter convexus; utrisque fascia lata obliqua, fulva, a humero fere ad suturam extensa ornatis.

Long.  $1\frac{1}{2}$ - $1\frac{3}{4}$  lin.

*Hab.*—Champion Bay.

Head somewhat closely punctured, vertex cupreous, labrum and six basal joints of antennæ obscure fulvous, the latter stained above with piceous; thorax twice as broad as long, sides rounded and converging from base to apex, slightly sinuate just before the hinder angle, the latter somewhat compressed, and produced slightly backwards; basal lobe feebly notched, obsoletely reflexed; surface on either side the basal lobe and extending to the hinder angles distinctly depressed (this depression causes the disc of the thorax to appear unusually convex);

surface distinctly punctured, the puncturing rather distant on the disc, closer on the sides; scutellum obovate, its apex obtuse; elytra not broader at their base than the thorax, twice its length, finely but distinctly punctate-striate; interspaces plane; on the outer margin the two outer striae are sulcate, and their interspaces convex.

Genus LACHNABOTHRA, Saunders.

Trans. Ent. Soc. Lond., vol. iv. p. 294.

The genus *Lachnabothra* was formed by Mr. W. W. Saunders in 1847, on a single female example in the cabinet of the Rev. F. W. Hope; this insect being figured and described by him as *Lachnabothra Hopei*; the Suffrian, who subsequently (in 1859) monographed Australian Cryptocephalidæ, sank *Lachnabothra*, and placed Mr. Saunders' species in the fourth section of Erichson's genus *Cadmus*; both authors appear to have known the ♀ only, but more than twenty years previously a ♂ specimen belonging to the genus, was described and figured by Dr. Klug (Ent. Mon. p. 159, tab. vi. fig. 9, 1824) under the name of *Chlamys* (?) *braceata*; Klug, who was unacquainted with the locality of his insect, pointed out its affinity to the Cryptocephalidæ, thus indicating its true position. For some years after the publication of Mr. Saunders' and Dr. Suffrian's works, the species were very rare in cabinets, but latterly, owing to the exertions of Messrs. Waterhouse, Wilson, and Odewahn, in South Australia, and of various other collectors in the Western, and other parts of the continent, many specimens of both sexes of species belonging to the genus have become known to us. I myself, possess no less than eight distinct forms (the descriptions of which I have given below), in my own collection.

The characters of the males, as distinguished from the females, are as follows:—

*Antennæ* much longer than the body; the ultimate joint compressed, generally broader than the penultimate.

*Thorax* more or less gibbose, the gibbosity divided into two distinct protuberances.

*Hinder thighs thickened; basal joint of anterior tarsus usually dilated.*

The other characters are as in the ♀; both sexes may be known from the species of the genus *Cadmus*, by the sculpture and dense metallic pubescence of the thorax; the sculpture of the elytra is also peculiar and constant in all the species known to me.

I have not been able satisfactorily to identify Dr. Klug's insect with any of the species described below; it is, however, very closely allied to *L. Waterhousei*, and may possibly prove to be the same insect.

*Lachnabothra Hopei*, Saunders.

Trans. Ent. Soc. vol. iv. p. 295, pl. xv. fig. 5.

*Cadmus Hopii*, Suffrian, Lin. Ent., vol. xiii. p. 85.

Subquadrato-oblonga, pallide rufo-picea, pilis pallide aureis vestita, thorace dense aureo-sericeo; elytris rugosis, apice elevato-vittatis, disco interno tuberculis oblongis nonnullis, disco externo cretis irregularibus, inter se confluentibus et rete laxum formantibus, instructis; pedibus antennisque obscure fulvis.

*Mas.* Thoracis disco bituberculato; antennarum articulo ultimo dimidio apicali nigro, penultimo distinete latiori, obtuseiformi, apice ipso angulato; tarsorum anticorum articulo primo paullo dilatato, oblongo, basi attenuato, apice truncato.

Long. 2-2½ lin.

*Hab.*—South Australia, Melbourne, Adelaide.

Head clothed with adpressed golden hairs; face impressed with a longitudinal groove, which extends from the vertex to the apex of the clypeus; surface of face deeply punctured; clypeus transverse, triangular, sides of the triangle slightly convex, anterior border slightly concave; hinder surface punctured, clothed with adpressed hairs, anterior portion smooth, impunctate, glabrous; labrum often stained with piceous; jaws piceous; thorax as broad at its base as the thorax; sides diverging at the base, thence obliquely converging to the apex in the ♂, regularly rounded in the ♀, the apex itself quickly

rounded; upper surface convex, covered with numerous shallow pits or excavations, anterior half of disc closely punctured, subrugose, hinder half finely and subremotely punctate; whole surface densely clothed with silky golden hairs, which radiate from the excavated pits; on either side the centre of the disc, in the ♂, is a broad obtuse protuberance; scutellum densely clothed with adpressed golden hairs; elytra sparingly clothed with golden hairs, rugose-punctate, hinder third with seven or eight raised, broad, longitudinal ridges; inner disc with five oblong, longitudinally placed tubercles, which are scattered over the anterior two-thirds of its surface; outer disc coarsely rugose; on its surface are several irregularly raised reticulations, which enclose large, ill-defined, irregular spaces; these ridges are less defined in the ♀ than in the other sex; abdomen and legs clothed with pale golden hairs.

*Lachnabothra Breweri.*

Subquadrato-oblonga, rufo-picea, clypeo nigro-piceo, pube adpressa aurea vestita, thorace dense aureo-sericeo; elytris rugosis, disco interno tuberculis elongatis, iis prope apicem incrassatis, instructo, disco externi apice elevato-vittato, antice irregulariter elevato-reticulato.

*Mas.* Thoracis disco leviter gibboso, indistincte bituberculato, antennarum articulo ultimo (basi excepta) nigro, penultimo latiori, a basi apicem versus dilatato, apice angulato, acuto; femoribus posticis sat valde incrassatis; tarsorum anticorum articulo basali modice dilatato.

Long. 2-2½ lin.

*Hab.*—Albany, King George's Sound; Swan River.

Thorax as wide at the base as the elytra, sides rounded and slightly diverging at the extreme base, thence rounded and obliquely converging to the apex; disc excavated here and there into shallow pits (about fourteen in number); surface densely clothed with golden sericeous hairs, which radiate from the centres of the shallow excavations; centre of the disc in the ♂ slightly gibbose, the gibbosity transverse, elevated on either side into a small illdefined tubercle; elytra coarsely rugose-punctate,

inner disc with a number of elongated and oblong tuberosities, several of these placed near the apex are greatly thickened and enlarged ; basal half of outer disc covered with irregular raised reticulations, the apical half elevatittate ; running down the middle of each elytron, and separating the inner from the outer disc, is a very irregular raised line, which here and there sends off short spurs on either side.

This species is closely allied to *L. Hopei*, and is possibly a local form of that species ; both sexes may be known by the much stouter and broader apical tuberosities of the inner disc ; the ♂ also has the hinder thighs more strongly thickened.

*Lachnabothra integra*, Suffr., MS.

Oblongo - quadrata, rufo-picea, pilis adpressis pallide aureis vestita, antennis, tibiis tarsisque obscure fulvis, femoribus posterioribus intus nigro-piceo maculatis ; thorace dense pallido aureo-sericeo ; elytris rugosis, disco interno tuberculis oblongis, disco exteriori lineis elevatis longitudinalibus, instructis.

Mas. Thorace dorso leviter gibboso, gibbo medio longitudinaliter sulcato ; antennarum articulo ultimo (basi excepta) nigro, penultimo vix latiori, compresso, a basi apicem versus leviter ampliato, apice ipso angulato ; femoribus posticis modice incrassatis, tarsorum panticorum articulo basali leviter dilatato, oblongo, apice truncato.

Long. 2-2 $\frac{3}{4}$  lin.

Hab.—South Australia, Adelaide, Gawlertown.

Thorax similar in form to that of *L. Hopei*, disc in the ♂ slightly gibbose, the gibbosity divided by a distinct longitudinal groove ; pubescence clothing the surface pale golden sericeous ; basal margin narrowly edged with black ; elytra rugose-punctate, inner disc with seven or eight oblong longitudinal protuberances, placed irregularly on the surface from base to apex ; at the base near the scutellum is also a longitudinal ridge, which extends backwards for rather more than a fourth of the elytron ; outer disc coarsely rugose ; on its surface are two somewhat irregular longitudinal ridges, the first commencing a short distance within, the second immediately without

the humeral callus ; the first of these terminates at the commencement of the last fifth of the elytron, the second is slightly longer, and approaches somewhat nearer to the apex ; in addition, on the hinder third, are four or five coarse longitudinal ridges. .

The form of the thorax will separate the ♂ of the insect before us from the same sex of any of the hitherto known species.

*Lachnabothra Wilsoni*, Suffr., MS.

Subquadrato-oblonga, nigro-picea, pilis argenteo-aureis adpressis vestita, tibiis basi antennisque obscure fulvis ; thorace dense argenteo-aureo sericeo ; elytris profunde rugoso-punctatis ; prope marginem lateralem irregulariter verrucosis, castaneis, tuberculis plurimis oblongis magnis, nigro-piceis, nitidis, instructis.

*Mas.* Thoracis disco utrinque tubculo nitido instructo ; antennarum articulo ultimo penultimo paullo latiori, dimidio apicali nigro ; femoribus modice incrassatis ; tarsorum anticorum articulo basali paullo ampliato, oblongo-ovato, apice truncato.

Long. 2-2½ lin.

*Hab.*—South Australia, Gawlertown, Mr. Odewahn ; Adelaide, Messrs. Wilson and Waterhouse.

Thorax as broad at its base as the elytra, sides rounded at the base, thence converging to the apex in the ♂, lateral margin slightly sinuate just before the middle ; in the opposite sex the sides are rounded and diverging at the base, slightly flattened from thence to beyond the middle, then rounded and converging to the apex ; disc irregularly pitted, but less distinctly so than in *L. Hopei*, densely clothed with pale metallic sericeous hairs, which radiate as usual from the centres of the various depressions ; disc in the ♂ elevated on either side of its middle into a distinct gibbosity, the apex of which is crowned with a shining tubercle ; immediately behind each gibbosity is an ill-defined transverse excavation, which runs inwards nearly to the medial line of the thorax, leaving the latter only in the form of a narrow longitudinal ridge ; elytra castaneous, coarsely and deeply rugose-punctate, irregularly verrucose near the lateral margin, covered with large shining, oblong, nigro-piceous tuberosities ; those on the anterior portion of the outer disc irregular.

This is one of the best defined species of the genus, it may be at once known by the peculiar sculpturing of the elytra.

*Lachnabothra Waterhousei.*

Subquadrato-oblonga, pallide picea, aureo-sericea; antennis tarsisque fulvis; thorace hic illic excavato, dense aureo-sericeo; elytris nigro-piceis, rude rugoso-punctatis, basi et apice elevato-vittatis, disco interno tuberculis oblongis magnis instructo, disco externo laxe elevato-reticulato; vittis tuberculisque rufo-piceis.

*Mas.* Thoracis disco utrinque in gibbum validum subconicum elevato; antennarum articulo ultimo apice nigro, penultimo latiori, apice obtuse angulato; femoribus posticis modice incrassatis; tarsorum anticorum articulo basali non dilatato, secundo æquilato.

Long. 2 lin.

*Hab.*—South Australia, Adelaide.

Thorax as wide at the base as the elytra, sides rounded and diverging at the extreme base, nearly straight and parallel in the middle, thence rounded and converging to the apex; surface excavated into a number of shallow pits, densely clothed with adpressed golden hairs, which radiate from the centres of the pits; in the ♂ (the only sex known to me) the disc is strongly elevated on either side into a large subconical protuberance; elytra sparingly clothed with adpressed hairs, very coarsely rugose-punctate, the base with three short, but strongly raised longitudinal ridges, which extend backwards rather more than one-third the length of the elytron; they are placed, one near the suture commencing with a thickened base, at the apex of the scutellum, another half-way between the suture and the humeral callus, and a third a short distance within the latter; in the interspace between the first and second ridge, is seen a small tubercle, and between the second and third is a slightly raised, ill-defined, longitudinal line; on the hinder two-thirds of the inner disc are placed seven or eight large oblong tuberosities; outer disc very irregularly and coarsely elevate-reticulate, its hinder portion covered with raised longitudinal vittæ; one of these, the second from the suture, is continued upwards along the disc as far as the apex of the humeral callus; hinder thighs moderately thickened.

This species, of which I have seen three specimens (all males), varies like most of the others, in coloration; usually it is dark piceous, the raised markings on the elytra being pale rufo-piceous, the legs and abdomen, and the upper part of the head are also more or less rufous, and stained with dark piceous; the antennæ (the apical joints excepted) and tarsi are pale fulvous, the basal joint of the latter being sometimes stained with fuscous.

*L. Waterhousei* may be known by the undilated basal joint of the anterior tarsus, by the strongly raised tuberosities of the thorax, and by the moderately dilated hinder thighs; these characters taken together, will at once separate it from its congeners.

### *Lachnabothra Saundersi.*

Subquadrato-oblonga, rufo-picea, thorace basi elytris distincte latiori, dense aureo-sericeo, elytris pube aureo minus dense vestitis; rugosis, disco interiori tuberculis oblongis nonnullis (circa 7) instructo, disco exteriori rude rugoso, elevato-reticulato, ad apicem elevato-vittato.

Mas. Thoracis disco leviter bituberculato; antennarum articulo apicali (basi excepta) nigro, penultimo distincte latiori, apice oblique truncato; femoribus valde incrassatis; tarsorum anticorum articulo basali late ampliato, semi-ovato, lateribus inæqualibus.

Long.  $2\frac{1}{4}$  lin.

Hab.—Australia.

Thorax distinctly broader at the base than the elytra, sides slightly diverging at the base, thence rounded and converging to the apex, hinder angles armed with a small obtuse tooth, lateral margin near the base irregularly crenulate; surface finely rugose-punctate; on either side the medial line in the ♂ is a large but slightly elevated gibbosity, the apex of which is crowned by a small shining tubercle; elytra rugose-punctate, whole surface clothed with adpressed golden hairs; inner disc with a number of large oblong tubercles, placed irregularly from base to apex of the elytron; outer disc coarsely rugose, the interspaces thickened and forming small irregular reticulations and rugosities over the whole surface; on the apical third are four or five ill-defined (owing to the general rugosity of the surface) raised longitudinal vittæ.

*Lachnabothra distincta.*

Subquadrata, oblonga, rufo-picea, supra nigro-picea, aureo-sericea, antennis fulvis; thorace basi elytris paullo latiori, dense aureo-sericeo; disco hic illic leviter excavato; elytris rugosis, disco interiori tuberculis nonnullis, disco exteriori vittis elevatis, iis ante medium irregulariter flexuosis, instructis.

*Mas.* Thoracis disco utrinque in gibbum validum elevato; antennarum articulo ultimo, a basi apicem versus paullo dilatato, penultimo paullo latiori, apice rotundato, dimidio apicali nigro; femoribus posticis sat valde incrassatis; tarsorum anticum articulo basali sat late dilatato, semi-ovato, lateribus inæqualibus.

Long.  $2\frac{1}{2}$  lin.

*Hab.*—North-West Australia.

Thorax very slightly broader at the base than the elytra; sides rounded at the base, thence obliquely rounded and converging to the apex; hinder half of lateral border finely crenulate; surface rugose-punctate, excavated here and there into shallow pits; clothed with adpressed golden hairs, which radiate from the centres of the shallow excavations; in the ♂ (the only sex known to me) the middle of the disc is raised on either side into a strong subconical protuberance, divided from its fellow in the medial line, by a longitudinal depression; elytra rugose, also clothed with adpressed golden hairs; inner disc with six or seven oblong tubercles, placed irregularly from base to apex; outer disc coarsely rugose, subverrucose near the outer border; commencing a short distance within the humeral callus, is an elevated ridge, which, irregularly flexuous about the middle of its course, runs backwards for four-fifths the length of the elytron; immediately external to the humeral callus, and connected at its base to the callus itself, is a second, much shorter than the first; on the hinder fifth of the outer disc, are placed five or six round longitudinal vittæ.

This male insect may easily be separated from the same sex of *L. Saundersi* (the ♀ of which is also unknown to me) by its more strongly raised thorax, as well as by the less dilated basal joint of the anterior tarsus.

*Lachnabothra Duboulai.*

Subquadrato-oblonga, pieea, aut rufo-picea, pubo pale  
lide argenteo-aureis vestita; antennis, tibiis tarsis quo  
fulvis; thorace dense pallide aureo-sericeo; elytris rugosis;  
pilis argenteo-aureis vestitis, tuberculis elongatis et ob-  
longis disco interno positis, vitta elevata irregulari  
hic illuc rannulum emittente, a callo humerale fere ad  
apicem extensa instructis, disco exteriori apice elevato-  
vittato, antice rude et irregulariter elevato-reticulato.

*Mas.* Thoracis disco utrinque leviter gibboso, gibbis  
subconicis; antennarum articulo ultimo non dilatato,  
penultimo aequilato; femoribus posticis sat valde incras-  
satis; tarsorum anticorum articulo basali sat dilatato,  
semi-ovato.

Long.  $2\frac{1}{4}$ - $2\frac{1}{2}$  lin.

*Hab.*—Western Australia; collected by Mr. Duboulay.

Thorax as wide at the base as the thorax, sides rounded  
and slightly diverging at the base, thence obliquely con-  
verging and slightly rounded to the apex in the ♂, more  
regularly rounded in the other sex; surface closely  
rugose, densely clothed with pale metallic adpressed  
hairs; on either side the disc in the ♂ is a large, broad,  
but slightly raised obtuse protuberance; elytra coarsely  
rugose, rather densely clothed, when freshly disclosed,  
with adpressed hairs; inner disc with a number of  
strongly raised longitudinal tuberosities, compressed and  
linear at the base, thicker and oblong towards the apex;  
on the middle portion of the surface of each elytron,  
separating the inner from the outer disc, is an irregular  
raised longitudinal line; outer disc very coarsely elevate-  
reticulate in front, elevate-vittate on its hinder portion  
towards the apex; these vittæ and protuberances are  
usually stained with black, but are more rarely concolorous  
with the disc of the elytron; thighs stained with  
black, strongly dilated.

The species before us, collected in some abundance  
by Mr. Duboulay, most closely resembles (especially  
when slightly rubbed) *L. Wilsoni*; both sexes may be  
separated from that species by the different sculpture of  
the elytra; the ♂ may be also known by the slender  
apical joint of the antennæ, as well as by the much less  
strongly elevated gibbosities of the thorax.

## Fam. CHRYSOMELIDÆ.

## Genus STRUMATOPHYMA, n. g.

*Corpus* postice attenuatum, apterum; *caput* exsertum, breve; *antennæ* filiformes, corpore dimidio longiores; *oculis* prominulis, elongatis; *palpis* maxillaribus articulo ultimo penultimo æquilato, apice truncato; *thoræ* transversus dorso præsertim ad latera, excavatus; *elytra* oblonga, postice attenuata, suturâ intime convexa, dorso tuberculata, tuberculis seriatim dispositis; *pedes* simplices; *unguiculis* inernibus, basi leviter incrassatis; *acetabula* antica incompleta.

Type *Chalcolampra verrucosa*, Clark.

*Chalcolampra undulatipennis*, Clark, from Western Australia, also belongs to this genus.

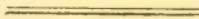
*Strumatophyma* is separated from *Chalcolampra* by the apterous body, soldered elytra, and simple claws.

## Genus SPHÆROLINA, n. g.

*Corpus* rotundato-ovatum, semiglobosum; *caput* exsertum, breve; *antennæ* brevibus, capite cum thorace vix æqualibus, articulis quinque ultimis compressis, distincts dilatatis, clavam elongatam formantibus; *oculis* elongatis, subprominulis; *palpis* maxillaribus articulo ultimo penultimo vix æquilato, breviter ovato, apice truncato; *thoræ* transversus; *elytra* thorace multo latiora apice late rotundata, tumida inordinatim punctata; *pedes* simplices; *unguiculis* muticis; *acetabula* antica incompleta.

Type *Lina Rajah*, Guérin; India.

The short antennæ distinguish the present genus from *Chrysomela*; it also differs in the form of the thorax: from *Lina* it may be known by the shorter form, and by the swollen elytra. *Lina Templetoni*, Baly, must also be placed in this genus.



XIV. Descriptions of five new species, and a new genus, of Diurnal Lepidoptera, from Shanghai. By A. G. BUTLER, F.L.S., &c.

[Read 5th June, 1871.]

THE species here described were recently sent home by Mr. W. B. Pryer. They are very interesting; one of them being a representative of an exclusively New World group of butterflies, and another very similar to a common British *Argynnис*; in the same Collection is a curious little *Terias*, which I believe to be the *T. mandarinus* of De L'Orza; it may, however be new, since I have not recently had an opportunity of consulting his description.

Fam. NYMPHALIDÆ.

Sub.-fam. SATYRINÆ, Bates.

PALÆONYMPHA, gen. n.

*Affinissimum Euptychiae* (Sect. *Neonympha*) differt alis dense pilosis; anticis striga lata, opaca, masculina, obliqua; angulo antico cellulæ discoidalis haud porrecto; palpis articulo ultimo longiore.

Nearly allied to *Euptychia*, which it much resembles in markings, but with the oblique male streak (not present in any known *Euptychia*, but represented in *E. vesta* by a scalloped embossed line); the anterior angle of the discoidal cell obliquely cut off, and therefore not projecting as in *Euptychia*; the palpi with the last joint longer, the wings clothed above with long hairs; it differs from *Paramecera* (Mexico), with which it agrees in the last-mentioned character, and in the oblique male streak, in the different form of the front-wing cell, the shape and marking of the wings, and the length of the palpi.

Typical species PALÆONYMPHA OPALINA.

*Palaeonympha opalina*, sp. n.

Alæ supra fuscæ, anticæ ocello uno apicali albo-pupillato lineisque duabus marginalibus, nigris; posticæ ocellis quatuor nigris; primo apicali indistincto, secundo parvo inconspicuo, tertio magno, distincto, bipupillato,

quarto anali parvo, inconspicuo; alæ subtus cinereæ, striis duabus mediis æquidistantibus, nebula maculari ocellos ferente lineisque duabus submarginalibus, olivaceis; linea marginali tenuissima, nigra; anticæ ocellis tribus primo apicali nigro, argenteo-bipupillato, flavo late cincto, aliis ovalibus geminatis argenteis; posticæ stria externa apud costam profunde sinuata; ocellis quinque, primo, quarto et quinto nigris argenteo-pupillatis flavo-cinctis, aliis ovalibus argenteis geminatis olivaceo-cinctis.

Exp. alar. unc. 2, lin. 2.

I have called it *opalina*, because of the silvery-opaline spots on the under-surface; these occur on a great many of the species *Euptychia*: the species is most like *E. Antonoë* of Cramer, but is much smaller.

#### Genus LETHE, Hübner.

♀ *Letha satyrina*, sp. n.

Alæ ovali-triangulares, supra olivaceo-fuscæ; margine albido, a stria submarginali fusca intersecto; ciliis fuscis; anticæ apice late dilutiore, ocellis duobus inconspicuis fuscis albo-pupillatis; posticæ ocellis quinque, secundo indistincto maximo, primo, quarto et quinto magnis, omnibus (secundo excepto) nigris flavo-albido cinctis albo-pupillatis. Alæ subtus fere velut supra; anticæ stria postcellulari obliqua albida; ocellis supernis, nigris distinctis; posticæ ocellis sex, primo et quinto maximis, ultimo geminato, omnibus nigris albo-pupillatis flavo-cinctis, fusco circumcinctis, lilacino zonatis; striis duabus mediis irregularibus lilacino-fuscosis.

Exp. alar. unc. 2, lin. 6.

Most nearly allied to *L. Verma*, and resembling the species of *Satyrus*, in the shape of the wings and distribution of the ocelli.

#### Genus YPHTHIMA, Hübner.

*Yphthima Zodia*, sp. n.

Alæ supra fuscæ, anticæ ocello mediocri nigro bipupillato, flavo-cincto; posticæ ocellis tribus subanalis, tertio ad angulum ani minimo, nigris albo-pupillatis, flavo-cinctis; alæ subtus cinereo-albidae, fusco reticulatae;

anticæ striis duabus mediis male conspicuis, externa cum stria submarginali simili continua, fuscis; ocello superno majori; posticæ fascia lata olivacea, undulata; ocellis sex minutis, duobus subapicalibus, duobus discali-analibus, duobus analibus contiguis, nigris, albo-pupillatis, flavo-cinctis.

Exp. alar. unc. 1, lin. 7.

Allied to *Y. Lisandra* and *Y. Argus*, but differing from all the known species, in the broad central fuscous band on the under-surface of the hind-wings.

### Sub-fam. NYMPHALINÆ.

#### Genus NEPTIS.

*Neptis Pryeri*, sp. n.

Alæ supra nigrae, ciliis albis; anticæ vitta discoidali quinque maculari, serie macularum decem bisinuata discali et altera, a fascia media nigra intersecta, sex maculari, submarginali, apicem haud attingente, albis; posticæ fascia media a venis interrupta; stria sex-maculari discali transversa, albis; corpus cinereum; alæ subtus albican-tibus; anticæ maculis costali-discalibus, plagiisque disco-cellulari, apicali et marginali, brunneis; posticæ basi nigro-maculata; plaga costali cellulum partim cingente, fascia media ad costam attingente, venis discalibus et area marginali (lunulos subseptem gerente) brunneis; corpus albidum.

Exp. alar. unc. 2, lin. 5.

Not nearly allied to any species that I have seen.

#### Genus ARGYNNIS, Fabricius.

*Argynnis vorax*, sp. n.

Affinis *A. Adippe*, differt alis anticis costa multo longiore, margine externo magis arcuato, posticis margine interno longiore, omnibus supra maculis submarginalibus fulvis angustioribus; subtus characteribus discoideis minus conspicuis; anticæ maculis discalibus majoribus; posticæ pallidiores, area basali viridiore; maculis argenteis vix nigro marginatis; serie ocellorum minus angulata; lunulis submarginalibus viridibus.

Exp. alar. unc. 3, lin. 2.

Nearly allied to *A. Adippe*, but more like *A. Paphia* in form.



XV. *On some black species of Cantharis with red heads and filiform antennæ.* By CHAS. O. WATERHOUSE.

[Read 3rd July, 1871.]

HAVING lately required a name for a species of black *Cantharis*, belonging to the group with the head red, and with filiform antennæ, I have gathered together all the specimens at my disposal, with a view of identifying them. I find among them five species, and as only one of these has been at all properly described, I have ventured to write out descriptions of them all. I have yet one or two which cannot well be placed with these five, but as the species are so close, I thought it better not to describe from single specimens.

*Cantharis nepalensis*, Hope.

*Lytta Nepalensis*, Hope, Gray's Zool. Miscel. p. 32.

*Ater; capite rufo, antennis filiformibus, tibiis anticis non hirsutis; elytris apices versus latioribus.*

Long.  $6\frac{1}{2}$ - $11\frac{3}{4}$  lin.

Closely allied to *C. ruficeps* of Illiger, but is to be distinguished from it by the deeper red colouring, and strong punctuation of the head, and by the elytra being distinctly broader towards the apex.

The head is dull dark red, not very thickly, but somewhat strongly, punctured ; the clypeus is almost entirely black, as are also the labrum and other parts of the mouth. The antennæ are filiform, very slightly pubescent ; the first joint short, the second very short, the third the longest, the fourth to seventh equal, the eighth to tenth rather shorter, the eleventh a little longer than the seventh. The thorax is subquadrate (contracted in front), thickly and distinctly punctured, less closely and rather more strongly on the disc ; the fore-part is slightly impressed on each side, there is a faint longitudinal line on the disc, and a deep fovea in the centre of the posterior margin. The elytra somewhat broader towards the apex, where they diverge, each rounded at the apex, the whole

surface distinctly punctured. The underside of the insect is entirely black, clothed with long black pubescence; legs simple; the anterior tibiæ not dilated, nor clothed with long hair.

*Hab.*—Nepal (Hardwicke). Brit. Mus.

*C. hirtipes*, sp. n.

Very closely allied to *C. nepalensis*, but larger and more cylindrical. The antennæ are similar. The head is dull, dark red, with long black hairs at the back, very thickly and strongly punctured, with the exception of an ovate spot at the base of each antennæ, which is smooth, impressed in the middle, and only sparingly punctured. Thorax very thickly and strongly punctured, rounded in front, clothed at the sides with long black hairs. Elytra elongate, distinctly punctured, not broader towards the apex, where they diverge, and somewhat acuminate, the extreme apex of each rounded. Underside entirely black, with moderately long pubescence; the legs simple, the four posterior tibiæ thickly clothed with somewhat long black pubescence.

Long.  $12\frac{1}{2}$ - $13\frac{1}{4}$  lin.

*Hab.*—Allahabad (Bowring). Brit. Mus.

*C. tibialis*, sp. n.

*Ater; capite rufo-testaceo; antennis filiformibus; tibiis anticis apicem versus latoribus [extus dense hirsutis ( $\delta$ )]; elytrorum sutura marginibusque tenuissime albo-pubescentibus.*

Long.  $7-11\frac{1}{2}$  lin.

This species most closely resembles *C. ruficeps* of Illiger, but is distinguished from it by the narrow margin of white pubescence to the elytra, and by the somewhat broad and hairy anterior tibiæ in the male.

$\delta$ . The head is reddish-yellow, and (with the exception of a smooth raised spot at the base of each antenna (perhaps only a male character), somewhat sparingly and not very strongly punctured; the anterior margin of the clypeus is fuscous, as are also the labrum and other parts of the mouth. The antennæ are filiform, the third to

sixth joints each notched for the reception of the following joints: the basal two joints with longish black pubescence, the second joint is a little shorter than the first, and more slender; the third is about equal to the fourth and fifth joints together; the fourth, fifth, and sixth joints are short, of nearly equal length; the seventh to the eleventh gradually increasing. The thorax is subquadrate (abruptly contracted in front), thickly, evenly, distinctly, but not very strongly, punctured; the forepart is slightly impressed on each side, and there is a large deep fovea in the centre of the posterior margin. The elytra are scarcely broader at the apex than at the base, each elytron rounded at the apex, where they diverge; the apex and lateral margins fringed with white pubescence, the suture also very slightly so.

The mesothoracic epimera, the sides of the metathorax, and the margins of the abdominal segments, are also more or less clothed with whitish pubescence. The anterior tibiae are thickly set on the outside with long black hair, the innerside of the anterior femora and tibiae are clothed with yellowish pubescence.

♀. Antennæ with the third to sixth joints less strongly notched; the anterior tibiae destitute of long black hair; the forehead without any well-defined smooth spot at the base of the antennæ.

*Hab.*—China. Brit. Mus.

### *C. assamensis*, sp. n.

It is with some hesitation that I venture to give the insect which I have received with the above manuscript name, the place of a species. It differs, however, from *C. tibialis* in having the head distinctly more thickly punctured, and the mesothoracic epimera are black (♂).

Long.  $11\frac{1}{4}$  lin.

*Hab.*—“Assam.” Brit. Mus.

Two specimens (♀) from the Island Formosa, from Mr. Bowring's collection, most closely resemble the above, but appear to have the elytra relatively longer; the head more arched behind, somewhat closely punctured in front, but sparingly on the crown. The antennæ are as in the ♀ of *C. tibialis*. The underside is almost entirely black. The legs are simple, the anterior tibiae not hirsute.

*C. ruficeps*, Illiger.

♀. *Lytta ruficeps*, Ill. (Wiedmann, Archiv. I. pt. 3, p. 140, 1800).

♂. *Lytta plumicornis*, Castelnau? (Hist. Nat. des Insectes, II. p. 274, 1840).

*"Atra unicolor, capite solo toto rufo, antennis totis nigris, elytris obtuse acuminatis."*

♀. Totally black, except the head which is reddish-yellow; the clypeus is yellowish, with a transverse black band, the labrum has a notch in the front margin which is yellowish, the other parts of the mouth are more or less fuscous. The head is polished, sparingly but distinctly punctured. The thorax is subquadrate, slightly broader in front than behind, abruptly contracted and rounded in front, the fore-part is slightly impressed on each side, the whole surface is thickly and distinctly punctured, the disc has a lightly impressed longitudinal line, which runs into a deep fovea at the posterior margin. The elytra are parallel, not narrower at the base than at the apex, where they diverge, and are each rounded. The antennæ are four-fifths the length of the elytra, filiform, the second joint two-thirds the length of the first, the third a little longer than the first, the fourth two-thirds the length of the third; the remaining joints gradually increasing in length, and tapering. Legs simple. Tarsi beneath, spongy, fuscous. The metasternum and abdomen clothed with short grey-black pubescence.

The ♂ is rather more slender than the ♀; the antennæ are longer (very nearly as long as the elytra), the second to eighth joints furnished with long hair on the lower (or inner) side; the anterior tibiæ are furnished with long black hairs; the innerside of the femora and tibiæ clothed with golden pubescence.

Long.  $6\frac{1}{2}$ - $10\frac{1}{2}$  lin.

Hab.—Java, Borneo, Sumatra. Brit. Mus.

Good specimens of this insect appear in some lights to have a reddish-brown pubescence, but a slight alteration of the position makes it appear greyish.

The male agrees with Castelnau's description of *Lytta plumicornis* from China, and in the national collection there is a specimen labelled 'North China' which I cannot satisfactorily separate from the Javanese specimens.

XVI. *Aperçu statistique sur les Névroptères Odonates.*  
 Par le Baron E. DE SELYS-LONGCHAMPS, Mem.  
 Hon. Soc. Ent. Lond.

[Lu 3me Juillet, 1871.]

Au moment où je viens de publier une nouvelle partie du Synopsis des Odonates, celui de la sous-famille des Cordulines, je crois qu'il y a un certain intérêt à jeter un coup d'œil statistique sur les genres et les espèces connus jusqu'ici.

Pour arriver au chiffre total j'ai récapitulé:—

1,—les espèces décrites dans mes différents synopsis et leurs suppléments.

2,—les espèces à ajouter aux mêmes groupes: les unes sont décrites dans différentes publications; les autres sont inédites, mais je possède leur signalement.

3,—les espèces des groupes que je n'ai pas encore publiés. Ce sont les sous-familles des Libellulines et des Æschnines, et parmi les Agrionines les deux grands genres *Agrion*, F., et *Telebasis*, De Selys.

Pour ces groupes dont je n'ai pas terminé l'étude, on comprend que les chiffres résultant du classement actuel de ma collection ne sont pas tout à fait absous. C'est pour ce motif que je ne détaille les sous-genres des deux grands genres *Agrion* et *Telebasis*.

La partie embarrassante est celle de la sous-famille des Libellulines. En 1868 M. F. Brauer de Vienne a publié son 'Verzeichniss der bis jetzt bekannten Neuropteren im Sinne Linné's', suivi de son 'Zweiter Abschnitt', dans lequel les genres de Libellulines, au nombre de 40 (ou 41 avec *Zygonyx*) sont caractérisés, et les noms des espèces qui y appartiennent cités au nombre de 361.

Pour compléter mon Aperçu, en ce qui concerne les Libellulines, le mieux m'a semblé être de ne rien changer à l'ordre adopté par M. Brauer, qui a rendu un grand service à la science en publiant ce travail. Je prends sa classification et ses chiffres tels qu'il les donne, en faisant observer bien entendu, que je me réserve d'examiner plus tard sa classification et ses groupes. J'ajoute que le nombre des espèces qu'il cite est de 361, tandis que je crois en connaître environ 100 de plus, parmi lesquelles le genre *Neophlebia* que j'ai décrit et figuré dans le voyage de M. Pollen.

Dans le résumé par sous-genres, que je donne plus bas, j'arrive aux résultats suivants.

LIBELLULINES . .	461	espèces, en 41 sous-genres.
CORDULINES . .	83	„ „ 11 „
GOMPHINES . .	172	„ „ 39 „
ÆSCHNINES . .	108	„ „ 9 „
CALOPTERYGINES	160	„ „ 31 „
AGRIONINES . .	373	„ „ 59 „
	—	—
	1357	190
	—	—

Et nous sommes évidemment bien éloignés de connaître tous les Odonates, excepté pour les espèces d'Europe, qui sont au nombre de 100, et qui ne me semblent guère susceptibles de recevoir une augmentation importante.

Dans les Synopsis et ailleurs j'ai décrit environ 600 espèces. Il y en a donc encore plus de 700 que je n'ai pas étudiées en détail, mais parmi elles se trouvent beaucoup d'espèces dont de bonnes descriptions ont été publiées par MM. Rambur, Uhler, et Brauer, et par mes honorables collègues et amis MM. Hagen et McLachlan.

#### Famille I. LIBELLULIDÆ.

##### Sous-fam. I. LIBELLULINA.

Genres et sous-genres.	Espèces.	Genres et sous-genres.	Espèces.
1. <i>Zyxomma</i> , Ramb.....	1	24. <i>Nannothemis</i> , Brauer.....	6
2. <i>Tholymis</i> , Hag.....	3	25. <i>Tetrathemis</i> , Brauer.....	1
3. <i>Pantala</i> , Hag.....	2	26. <i>Uracis</i> , Ramb.....	8
4. <i>Tramea</i> , Hag.....	30	27. <i>Lyriothemis</i> , Brauer.....	1
5. <i>Rhyothemis</i> , Hag.....	19	28. <i>Agrionoptera</i> , Brauer.....	4
6. <i>Diastatops</i> , Ramb.....	4	29. <i>Orthemis</i> , Hag.....	8
7. <i>Palpopleura</i> , Ramb.....	11	30. <i>Libellula</i> , L., Brauer .....	27
8. <i>Neurothemis</i> , Brauer. ( <i>Polyneura</i> , R.).....	10	31. <i>Libella</i> , Brauer.....	31
9. <i>Celithemis</i> , Hag.....	1	32. <i>Onychothemis</i> , Brauer.....	1
10. <i>Perithemis</i> , Hag.....	6	33. <i>Diplacina</i> , Brauer.....	2
11. <i>Leucorhinia</i> , Brittg.....	12	34. <i>Dythemis</i> , Hag.....	32
12. <i>Diplax</i> , Charp.....	52	35. <i>Macrothemis</i> , Hag.....	4
13. <i>Mesothemis</i> , Hag.....	9	36. <i>Trithemis</i> , Brauer.....	19
14. <i>Pachydiplax</i> , Brauer.....	1	37. <i>Brachythemis</i> , Brauer.....	1
15. <i>Erythrodiplax</i> , Brauer.....	10	38. <i>Crocothemis</i> , Brauer.....	4
16. <i>Erythemis</i> , Hag.....	11	39. <i>Macrodiplex</i> , Brauer.....	2
17. <i>Lepthemis</i> , Hag.....	11	40. <i>Urothemis</i> , Brauer.....	3
18. <i>Acisoma</i> , Ramb.....	2	41. <i>Zygonyx</i> , De Selys.....	2
19. <i>Microthemis</i> , Brauer.....	1		
20. <i>Brachydiplax</i> , Brauer.....	4		
21. <i>Nannodiplax</i> , Brauer.....	2		
22. <i>Nannophya</i> , Ramb.....	2		
23. <i>Nannodythemis</i> , Brauer.....	1		
		Selon M. Brauer ...	361
		En plus selon moi ...	100
			461

## Sous-fam. 2. CORDULINA.

## GENRES.

## SOUS-GENRES.

Légion 1. *Cordulia*.

1. <i>Cordulia</i> , Leach.....	{ 1. <i>Hemicordulia</i> , De Selys..... 2. <i>Cordulia</i> , Leach..... 3. <i>Epitheca</i> , Charp., De Selys 21 4. <i>Oxygastra</i> , De Selys..... 2 5. <i>Gomphomacromia</i> , Brauer... 4	8
2. <i>Cordulephya</i> , De Selys .....		1

Légion 2. *Macromia*.

3. <i>Idionyx</i> , De Selys.....	7. <i>Idionyx</i> , De Selys.....	1
4. <i>Aeschnosoma</i> (Bates), De Selys 8	<i>Aeschnosoma</i> (Bates), De Selys 3	
5. <i>Macromia</i> , Ramb. ....	{ 9. <i>Epophtalmia</i> , Burm., Bra. 7 10. <i>Macromia</i> , Ramb. ....	14
6. <i>Synthemis</i> , De Selys .....		6

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## Famille II. AESCHNIDÆ.

## Sous-fam. I. GOMPHINA.

Légion 1. *Gomphus*.

1. <i>Gomphus</i> , Leach.....	{ 1. <i>Onychogomphus</i> , De Selys... 19 2. <i>Ceratogomphus</i> , De Selys.... 1 3. <i>Erpetogomphus</i> , De Selys.... 8 4. <i>Ophiogomphus</i> , De Selys.... 4 5. <i>Heterogomphus</i> , De Selys.... 2 6. <i>Epigomphus</i> , Hag..... 2 7. <i>Microgomphus</i> , De Selys .... 1 8. <i>Macrogomphus</i> , De Selys.... 4 9. <i>Cyclogomphus</i> , De Selys.... 3 10. <i>Phyllogomphus</i> , De Selys.... 1 11. <i>Platygomphus</i> , De Selys .... 1 12. <i>Gomphus</i> , Leach, De Selys.. 40 13. <i>Austrogomphus</i> , De Selys.... 3 14. <i>Hemigomphus</i> , De Selys.... 3 15. <i>Neogomphus</i> , De Selys.... 3 16. <i>Agriogomphus</i> , De Selys .... 1	

Légion 2. *Lindenia*.

2. <i>Progomphus</i> , De Selys .....	17. <i>Progomphus</i> , De Selys..... 7	
3. <i>Gomphoides</i> , De Selys.....	{ 18. <i>Gomphoides</i> , De Selys..... 7 19. <i>Cyclophylla</i> , De Selys ..... 9	
		6
4. <i>Zonophora</i> , De Selys .....	{ 21. <i>Diaphlebia</i> , De Selys..... 2 22. <i>Zonophora</i> , De Selys..... 3	
5. <i>Hagenius</i> , De Selys .....		
	{ 23. <i>Hagenius</i> , De Selys..... 2	
	{ 24. <i>Sieboldius</i> , De Selys..... 1	

## GENRES.

## SOUS-GENRES.

5. <i>Diastatomma</i> , Burm., De S....	25.	<i>Diastatomma</i> , B., De Selys	2
	26.	<i>Gomphidia</i> , De Selys.....	1
7. <i>Lindenia</i> , De Haan, De S....	27.	<i>Ictinus</i> , Ramb.....	11
	28.	<i>Cacus</i> , De Selys.....	1
	29.	<i>Lindenia</i> , De Haan, De Selys	1

Légion 3. *Chlorogomphus*.

8. <i>Chlorogomphus</i> , De Selys .....	30.	<i>Chlorogomphus</i> , De Selys....	2
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Légion 4. *Cordulegaster*.

9. <i>Cordulegaster</i> , Leach.....	31.	<i>Thecaphora</i> , Ch., De Selys	1
	32.	<i>Cordulegaster</i> , Leach.....	12
10. <i>Petalia</i> , Hag.....	33.	<i>Petalia</i> , Hag.....	1
	34.	<i>Phyllopetalia</i> , De Selys.....	2
	35.	<i>Hypopetalia</i> , McLach.....	1

Légion 5. *Petalura*.

11. <i>Petalura</i> , Leach .....	36.	<i>Petalura</i> , Leach.....	1
	37.	<i>Uropetala</i> , De Selys.....	1
	38.	<i>Tachopteryx</i> , Uhler.....	1

12. <i>Phenes</i> , R. .....	39.	<i>Phenes</i> , Ramb.....	1
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Sous-fam. 2. *ÆSCHNINA*.

1. <i>Anax</i> , Leach .....	1.	<i>Anax</i> , Leach.....	17
	2.	<i>Cyrtosoma</i> , Charp., De Selys	3
2. <i>Æschna</i> , F. .....	3.	<i>Gomphæschna</i> , De Selys.....	1
	4.	<i>Brachytron</i> , Evans .....	1
	5.	<i>Æschna</i> , F., De Selys.....	50
3. <i>Staurophlebia</i> , Brauer.....	6.	<i>Staurophlebia</i> , Brauer.....	4
	7.	<i>Neuræschna</i> , De Selys.....	5
4. <i>Gynacantha</i> , Ramb.....	8.	<i>Amphæschna</i> . De Selys.....	5
	9.	<i>Gynacantha</i> , Ramb.....	22

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Pour le moment je m'abstiens de réunir les sous-genres par catégories de grands genres d'une manière définitive ; les quatre coupes que je propose sont provisoires.

Je réserve le nom de *Cyrtosoma* pour les espèces d'*Anax* du groupe de l'*ephippigerus*, Burm. (*mediterraneus*, De Selys).

Le sous-genre *Gomphæschna* est créé pour recevoir la *Gynacantha quadrisida* de Rambur, dont les caractères sont mentionnés dans sa description de l'espèce.

Le sous-genre *Amphæschna* comprend, entre autres, l'*Æschna ampla*, Ramb., l'*Æschna Irene*, Fonscolombe, et la *Gynacantha idæ*, Brauer. Il se distingue de *Gynacantha* par l'espace basilaire réticulée, et de *Neuræschna* parce que la nervure sous-costale s'arrête au nodus.

### Famille III. AGRIONIDÆ.

#### Sous-fam. 1. CALOPTERYGINA.

##### Légion 1. *Calopteryx*.

###### GENRES.

###### SOUS-GENRES.

1. <i>Calopteryx</i> , Leach .....	{	1. <i>Sylphis</i> , Hag. ....	2
		2. <i>Calopteryx</i> , Leach .....	13
		3. <i>Matrona</i> , De Selys.....	1
2. <i>Echo</i> , De Selys .....	{	4. <i>Cleis</i> , De Selys .....	1
		5. <i>Sapho</i> , De Selys .....	4
		6. <i>Mnais</i> , De Selys.....	5
		7. <i>Echo</i> , De Selys .....	1
		8. <i>Psolodesmus</i> , McLach. ....	1
		9. <i>Phaon</i> , De Selys.....	1
		10. <i>Neurobasis</i> , De Selys.....	3
		11. <i>Vestalis</i> , De Selys .....	4
3. <i>Phaon</i> , De Selys.....	{	12. <i>Lais</i> , Hag. ....	9
		13. <i>Heterina</i> , Hag. ....	30

##### Légion 2. *Euphæa*.

6. <i>Caliphæa</i> , Hag. ....	14.	<i>Caliphæa</i> , Hag. ....	1
7. <i>Euphæa</i> , De Selys.....	15.	<i>Anisopleura</i> , De Selys.....	1
	16.	<i>Epallage</i> , Charp. ....	2
	17.	<i>Euphæa</i> , De Selys .....	16
	18.	<i>Dysphæa</i> , De Selys.....	3
8. <i>Dicterias</i> , De Selys .....	19.	<i>Dicterias</i> , De Selys.....	1
	20.	<i>Heliocharis</i> , De Selys.....	3
9. <i>Anisoneura</i> , De Selys .....	21.	<i>Anisoneura</i> , De Selys.....	1

##### Légion 3. *Amphipteryx*.

10. <i>Amphipteryx</i> , De Selys.....	{	22. <i>Tetraneura</i> , De Selys.....	1
		23. <i>Amphipteryx</i> , De Selys .....	1
		24. <i>Diphlebia</i> , De S. ( <i>Dineura</i> , (De Selys, olim) .....	1

##### Légion 4. *Libellago*.

11. <i>Libellago</i> , De Selys.....	{	25. <i>Rhinocypha</i> , Ramb.....	21
		26. <i>Libellago</i> , De Selys. ....	5
12. <i>Micromerus</i> , Ramb.....	27.	<i>Micromerus</i> , Ramb. ....	9

Légion 5. *Thore.*

GENRES.	SOUS-GENRES.	
13. <i>Thore</i> , Hag.....	{ 28. <i>Cora</i> , De Selys .....	5
	29. <i>Euthore</i> , De Selys .....	4
	30. <i>Thore</i> , Hag.....	8
	31. <i>Chalcopteryx</i> , De Selys .....	2
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## Sous-fam. 2. AGRIONINA.

Légion 1. *Pseudostigma.*

1. <i>Megaloprepus</i> , Ramb. ....	{ 1. <i>Megaloprepus</i> , Ramb. ....	1
	2. <i>Microstigma</i> , Ramb. ....	3
2. <i>Mecistogaster</i> , Ramb.....	{ 3. <i>Pseudostigma</i> , De Selys....	2
	4. <i>Mecistogaster</i> , Ramb.....	7

Légion 2. *Lestes.*

3. <i>Lestes</i> , Leach .....	{ 5. <i>Megalestes</i> , De Selys .....	1
	6. <i>Hypolestes</i> , De Selys .....	1
	7. <i>Archilestes</i> , De Selys.....	2
	8. <i>Melanolestes</i> , De Selys .....	1
	9. <i>Lestes</i> , Leach .....	53
	10. <i>Sympycna</i> , Charp.....	1
	11. <i>Platylestes</i> , De Selys.....	1

Légion 3. *Podagrion.*

4. <i>Paraphlebia</i> , De Selys .....	12. <i>Paraphlebia</i> , De Selys .....	1
5. <i>Philogenia</i> , De Selys .....	13. <i>Philogenia</i> , De Selys.....	5
6. <i>Podagrion</i> , De Selys .....	14. <i>Podagrion</i> , De Selys .....	6
7. <i>Heteragrion</i> , De Selys .....	15. <i>Heteragrion</i> , De Selys .....	14
8. <i>Perilestes</i> , De Selys .....	16. <i>Perilestes</i> , Hag. ....	1
9. <i>Synlestes</i> , De Selys .....	17. <i>Synlestes</i> , De Selys .....	1
10. <i>Chlorolestes</i> , De Selys .....	18. <i>Chlorolestes</i> , De Selys .....	5
11. <i>Allolestes</i> , De Selys.....	19. <i>Allolestes</i> , De Selys .....	1
12. <i>Argiolestes</i> , De Selys .....	20. <i>Argiolestes</i> , De Selys .....	3
13. <i>Podopteryx</i> , De Selys.....	21. <i>Podopteryx</i> , De Selys.....	1
14. <i>Podolestes</i> , De Selys .....	22. <i>Podolestes</i> , De Selys .....	1
15. <i>Amphilestes</i> , De Selys .....	23. <i>Amphilestes</i> , De Selys.....	1

Légion 4. *Platycnemis.*

16. <i>Hemiphlebia</i> , De Selys .....	24. <i>Hemiphlebia</i> , De Selys .....	1
17. <i>Amphicnemis</i> , De Selys.....	{ 25. <i>Pericnemis</i> , Hag. ....	1
	26. <i>Amphicnemis</i> , De Selys.....	1
18. <i>Hypocnemis</i> , Hag. ....	27. <i>Hypocnemis</i> , Hag. ....	1
	{ 28. <i>Trichocnemis</i> , De Selys.....	6
	29. <i>Calicnemis</i> , De Selys.....	1
19. <i>Platycnemis</i> , Charp.....	{ 30. <i>Metacnemis</i> , Hag. ....	2
	31. <i>Platycnemis</i> , Charp. ....	5
	32. <i>Psolocnemis</i> , De Selys .....	7
	33. <i>Allocnemis</i> , De Selys.....	1

## GENRES.

## SOUS-GENRES.

20. <i>Chlorocnemis</i> , De Selys.....	34. <i>Chlorocnemis</i> , De Selys.....	2
21. <i>Argiocnemis</i> , De Selys .....	35. <i>Argiocnemis</i> , De Selys .....	4

Légion 5. *Agrion.*

22. <i>Argia</i> , R., De Selys .....	36. <i>Hyponeura</i> , De Selys.....	2
	37. <i>Argia</i> , R., De Selys.....	48
	38. <i>Onychargia</i> , De Selys .....	1
	39. <i>Pyrrhosoma</i> , Charp.....	
	40. <i>Erythromma</i> , Charp.....	
23. <i>Agrion</i> , Fabr. ....	41. <i>Agrion</i> , Fabr.....	71
	42. <i>Nehalennia</i> , De Selys .....	
	43. <i>Ischnura</i> , Charp. ....	
	44. <i>Anomalagrion</i> , De Selys..	
24. <i>Telebasis</i> , De Selys .....,	45. <i>Brachybasis</i> , De Selys .....	
	46. <i>Telebasis</i> , De Selys.....	
	47. <i>Leptobasis</i> , De Selys .....	63
	48. <i>Megalobasis</i> , De Selys....	

Légion 6. *Protoneura.*

25. <i>Platysticta</i> , De Selys.....	49. <i>Palemnema</i> , De Selys.....	3
	50. <i>Platysticta</i> , De Selys.....	6
26. <i>Alloneura</i> , De Selys .....	51. <i>Peristicta</i> , Hag.....	1
	52. <i>Disparoneura</i> , De Selys.....	4
	53. <i>Alloneura</i> , De Selys.....	14
	54. <i>Brachyneura</i> , De Selys.....	1
	55. <i>Nososticta</i> , Hag.....	1
27. <i>Protoneura</i> , De Selys.....	56. <i>Idioneura</i> , De Selys .....	1
	57. <i>Neoneura</i> , De Selys .....	5
	58. <i>Protoneura</i> , De Selys.....	6
	59. <i>Microneura</i> , De Selys.....	1

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Je propose le nom de *Podopteryx* pour une grande espèce de l'Île Aru, prise par M. Wallace, déposée au British Museum. Ce genre est très extraordinaire parce qu'il possède une troisième nervure antecubitale (qui, il est vrai, n'existe qu'entre les nervures costale et sous-costale), ce qui rappelle en diminutif le genre *Amphipteryx*, qui est une Caloptérygine. Pour le reste des caractères de la réticulation, des antennes, et des appendices analis du male, le *Podopteryx* est très voisin des *Argiolestes*, qui appartiennent à la légion des *Podagrion*. L'espèce, qui je nomme *P. roseo-notata*, est très singulière par les taches d'un rose carmin qui existent au prothorax et sur le devant du thorax, coloration dont je

ne connaît pas d'autre exemple parmi les Odonates. Elle se rapproche beaucoup des *Podolestes* par la lèvre inférieure dont les deux pointes sont distantes, mais elle en diffère génériquement par l'espace post-costale de plusieurs rangs de cellules, analogue à celui des *Argiolestes*.

L'espace basilaire est traversé aux quatre ailes par une nervure, ce qui est jusqu'à présent une exception unique dans la sous-famille des *Agrionina*.

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XVII. *On the forms of Zygaena Trifolii, with some remarks on the question of specific difference, as opposed to local or phytophagous variation, in that genus.* By T. H. BRIGGS, B.A.

[Read 6th November, 1871.]

In the 'Zoologist' for 1861, Mr. Newman observes, touching another *Zygaena*, that "it is a dangerous thing to write about our British *Zygaenæ*, if anyone incline to take up the genus, I heartily wish him well through it." And yet I am about to ask aid from Lepidopterists generally, in working out some curious facts connected with this, confessedly, difficult genus—difficult, because of the similarity of the perfect insects themselves, more so by the similarity and variation of their respective larvæ, and yet even more so by the great confusion of their synonymy; the difficulties are crowned by the fact of an unusual and extraordinary affinity existing between the different so-called species, and the frequent occurrence of intermediate forms or hybrids—as yet, I cannot say which—that are found amongst them. My theory and proposition is, that two permanent forms of a *Zygaena* now existing in England, and confused under the special name *Trifolii*, have an equal right with *Lonicerae* to the title of Species.

In the 'Entomologists Annual' for 1862, some remarks by Prof. Zeller in the 'Isis' for 1840, are translated by Mr. Stainton, in which we find the following words,—"Since that Nature, in the formation of species of *Zygaena* (productive or reproductive) is not yet at an end, appears to me conclusive, from the constant copulation of specimens of different species *without constraint, and when in a condition of perfect liberty.*"

Undoubtedly true as the fact is upon which Zeller bases this theory, it is somewhat difficult to follow his reasoning.

Once admit that a *form* has become a species, and Nature is at an end, so far as relates to the *formation* of that species; the progress of Nature, then (if any) is only to widen the separation. The sexual union of forms might be of common occurrence, but the fact is, the examples on record are not what we consider *forms*, but *well-defined species*, as subsequently mentioned by Boisduval. Such a union would be strongly suggestive of

the common origin of those *Zygænae* at no remote date, and that a union of this nature was the result of a habit acquired as a form, not yet being lost in the species; hence the species being, so to speak, new species, it would be inferential to suppose forms, not yet species, existing, yet to become species. If we examine the result of such a union, would it not bear strongly upon the title of any "form" to the rank of "species"? If the eggs resulting were fertile, and produced moths like either parent, it would go far to prove the parents only "forms" of each other, not yet sufficiently separated to attain to the rank of species. If the eggs were fertile and produced hybrids, it would show that each parent was a species of itself, since they produced offspring *unlike* themselves, though probably closely allied, and their common origin of no very remote date. But if the eggs were sterile, would it not show that the line of demarcation was already established between those allied species, though the difference might be so slight, as to baffle our efforts to define it? I can find no instance on record, however, of even hybrids being *bred* from these unions, although we constantly *catch* specimens that if they are not hybrids, what are they? In his Monograph of the genus published in 1829, M. Boisduval observes, "Je dois dire ici qu'il m'est arrivé quelquefois de trouver des espèces différentes accouplées ensemble, ainsi j'ai trouvé plusieurs fois la *Filipendulæ* accouplée avec la *Peucedani*, et la *Trifolii* avec l'*Hippocrepidis*; j'ai fait pondre les femelles pour obtenir des hybrides, mais jamais je n'ai été assez heureux pour voir éclore les œufs résultant de ces mariages adultérins, quoique les œufs des *Zygænes* éclosent très facilement; il est possible, cependant, que quelques uns éclosent dans la nature." So far as our present knowledge goes, therefore, the genus seems to consist *certainly* of a number of closely allied species, many of which species *probably* have different forms, some of which forms *may be* on the journey towards future species—the great difficulty yet remains, how to distinguish a local or Phytophagie 'form' from a 'species,' it being impossible to apply the above test of an accidental natural union between two supposed species, although when that does occur, one can test species or forms by the result. We must therefore, in most cases, separate 'form' from 'species' by other means. In the 'Entomologists Annual' for 1861, Stainton, referring to the allied genus *Procris*, says, "attention has been called

to the various forms which *Procris Statices* assumes in different localities, but still we do not feel at liberty to state that any new species of that genus have been added to our lists, further series of specimens from various localities are necessary; it may be, that in an insect so local and so gregarious as a *Procris*, each little tribe or colony will be found to differ more or less from other tribes or colonies of the same species."

These remarks apply with equal force to the *Zygænæ* but since we do allow more than one 5-spotted native species, it follows that whether or no Zeller's theory is the true one, a certain amount of constant variation among these little tribes, will suffice to elevate it into a presumptive species. If such a constant variation were confined to one little tribe or colony, and not found elsewhere, I presume such a colony would be considered a local form of the nearest allied species, but if it can be shown, as I intend to endeavour to do, in the present paper, that an exactly similar constant variation occurs in numerous colonies in various parts of England, and that such constant variation is not confined to the imago, but is also found in the respective larvae, such colonies or tribes surely have acquired an *equal* right with *Lonicerae* to appear in our lists as 'species.'

The chief points by which we can differentiate these insects, are—

- (1.) The size and disposition of the red spots on the fore-wings.
- (2.) The black border to the hind-wings.
- (3.) The antennæ.
- (4.) The time of appearance of the perfect insect.
- (5.) The larva.
- (6.) The food-plant.
- (7.) The habitat.

The first two of these points are in some species most variable, in others tolerably constant; the antennæ aid the determination considerably, when the one sex in one species is compared with the *same sex* in another, but I have too often seen in collections a series of males marked "*Trifolii*," and the females with their slenderer

antennæ labelled "*Lonicerae*"!! I attach great importance to all the remaining points. Touching the larva, the usual description of "yellowish" or "greenish," "with four rows of black spots," is exactly equivalent to describing the imago as "green, with red spots," or a *Smerinthus* caterpillar as "green, with stripes on his side, and a horn on his tail." I have found these spots on the larvæ vary in the different forms or species in size and shape, although the following remark will apply to the caterpillars equally with the imagines, viz., that the general type only can be described—*uberrant examples will be found in which all the characteristics of some other type are fully developed*, but such aberrancy seems confined to the then stage of the insect's existence; for instance, that if in a number of *Lonicerae* caterpillars we find one quite unlike the rest, and *exactly* resembling a *Trifolii* caterpillar, such caterpillar will not be a *Trifolii* caterpillar accidentally in company with *Lonicerae*, but will be a *Lonicerae* caterpillar that from some unknown cause has assumed the markings of *Trifolii*, and the moth produced from such caterpillar will be a typical *Lonicerae*. Conversely, often when catching *Trifolii*, say we imagine we have come across a solitary example of *Lonicerae*. In most cases, such supposed *Lonicerae* is only *Trifolii* imago having assumed the characteristics of *Lonicerae*, and, in all probability, produced from a typical *Trifolii* caterpillar. I have several times personally met with examples of this singular fact, which, if further substantiated, will go far to explain what many authors have remarked, the occasional turning up of one species in the locality of another. In short, that *mimicry is common throughout the genus*.

I now proceed to differentiate my two supposed species—comparing them with *Filipendulae* and *Lonicerae*.

### (1.) *Zygæna Filipendulæ.*

**Imago.** Too well known for description. Antennæ mediate in thickness between *Lonicerae* and the two forms of *Trifolii*, those of the ♂ much thicker than those of the ♀; a very narrow black border to hind-wings in both sexes.

**Larva.** Full description set out in the appendix to this paper.

*Obs.* The caterpillar varies much in different individuals, as subsequently mentioned, but apparently *within a given range of variation*: in some thousands I have minutely examined, I have never seen the spots in the shape of those of *Loniceræ* as described.

(2.) *Zygæna Loniceræ.*

*Imago.* Nearly if not quite of the same size as *Z. Filipendulae*. Central red spots of fore-wings nearly always disunited (this seems a constant character in *this* species, while in *Trifolii* it is its most variable); hind-wings paler and more pinky-red than in any other English five-spotted species. The antennæ are much slenderer than those of the other species, and considerably longer than in *Trifolii* (either form), those of the ♂ being, as usual, much thicker than those of the ♀; this character cannot fail to distinguish it at once from either form of *Trifolii*, *care being taken to compare the same sex*; the difference in the thickness of the antennæ between a ♂ *Loniceræ* and a ♂ of either form of *Trifolii* is very striking, but that between a ♂ *Loniceræ* and a ♀ *Trifolii* very small. Neglect of this common precaution has aided the present confusion.

Black border to hind-wings not very broad, broader in the ♂ than in the ♀; in typical specimens *much sinuate* on the inner margin.

*Larva.* Fully described in the appendix as *Zygæna*, No. 2. The leading characteristics which differentiate it from other species are—the long hairs, greener ground colour, more conspicuous orange spot, and different shape of the black spots as set out in the description.

Time of appearance of perfect insect same as *Filipendulae*.

*Locality.* Hill sides; common; often in parks where fern grows. *Never to my knowledge in marshy places.*

(3.) *Zygæna* ——.

(Hereinafter called ‘the late *Trifolii*.’)

*Imago.* Expans. alar. 1' 2" to 1' 5". Antennæ much thicker and shorter than in *Filipendulae* or *Loniceræ*, those of the ♂ being *much* thicker than those of the ♀.

In typical specimens the fore-wings are of a very brilliant green, with the red spots large, and generally with the central pair more or less united, especially in the ♂. In the male all the spots often coalesce and form one band, but this *rarely* occurs in the ♀. Hind-wings bright deep red, with a *broad* black border, slightly sinuate on the inner margin; the border is broader in the ♂ than in the ♀.

Larva fully described in the appendix to this paper as *Zygæna*, No. 1 (*Trifolii*).

The insect is found in *marshy places*; the caterpillar feeds on the large sort of Trefoil that grows among the rushes, often attaining the height of a foot, or more. The insect is exceedingly local, generally being confined to one little spot only.

Time of appearance of perfect insect varies from the second week in June to the second week in July, according to the season, *but always about one month later than the next described species*; it appears at the same time as *Filipendulæ*.

I have never yet found this insect in company with *Z. Filipendulæ*; it is apparently rarer than the next species. In most collections I have found the males of this species classed as curious varieties of *Trifolii*, or as *Loniceræ* with the spots confluent; the females I have found nearly always classed as typical *Loniceræ*.

It is distinguished from *Trifolii* usually so-called (the next species), by its size, its larva, its locality, its food plant, and especially by its time of appearance.

#### (4.) *Zygæna Trifolii.*

(The small form, hereinafter called 'the early *Trifolii*.'

This is the insect usually known as *Trifolii*; expans. alar. 1' 2" to 1' 3". Antennæ almost as thick as in the last species. Head much more densely clothed with hairs. In typical specimens the fore-wings are of a darker green than in any other species, with the central spots small and disunited, but in some colonies the confluent spots are of common occurrence. Hind-wings dark red, in some specimens *quite crimson*, with a much broader black border than in any other British species; with a tendency to no sinuation on the inner margin, but to a uniform breadth throughout.

Larva. I cannot say that I have yet *bred* the insect, but I subsequently adduce the evidence of others on the subject.

This insect is found in *dry-places*,\* and is widely distributed, especially on the sea-coast.

Time of appearance of imago, from second week in May to second week in June, always about one month earlier than the last species.

I have nearly always found this insect in company with *Z. Filipendulæ*.

The knowledge of the existence of these two forms of *Trifolii*, as *forms*, is no novelty either to our English or Continental authors, and varieties of them, not the types, were described as *species* by the late Mr. Stephens; the confusion in the synonymy almost baffles elucidation, and is by no means the least intricate problem in the genus.

Fabricius in his ‘*Entomologia Systematica* (1793) gives only *one* 5-spotted species, viz. :—

LOTI.

*Sphinx Loti*, W. V.

*Sphinx Lonicerae*, Esper.

And he observes concerning it—

“Habitat in Loto corniculato, nimis affinis *Z. Filipendulæ*.” As Fabricius only knew *one* 5-spotted species, the expression *nimis affinis* cannot be read in the same way as if he had our present knowledge; the most aberrant five-spot, *to us*, would probably have been *nimis affinis* to Fabricius. *So, in fact, it is impossible to say which insect the Loti, Fab. was;* the probability is in favour of the *Lonicerae* of the present day.

Haworth, following Fabricius, gives only *Zygæna Loti*, also adding “habitat in Loto corniculato;” evidently supposing his *Loti* to be the *Loti* of Fabricius; but the following remark occurs in a note to Humphreys and Westwood’s “*British Moths, and their transformations.*”

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\* I do not say that the early *Trifolii* is exclusively confined to dry places; as *Filipendulæ* is often found in marshes, this species ought also, but I have never found it in marshes.—T. H. B.

"Mr. Stephens refers the *Z. Loti*, of Haworth, to the preceding species (*Loti*, H. & W., *Loniceræ*, Hüb.), but having received, however, from Mr. Haworth specimens of his *L. Loti*, I am enabled to state that they are identical with the *Trifolii* of Stephens."

Hübner figures—

On p. 2, fig. 7, *Loniceræ*, ♀; pl. 5-32, *Loti*, ♀, a six-spotted species; pl. 17-79, *Trifolii*, ♀; pl. 82, *Loti*, ♂, a small 5-spotted species, apparently *Trifolii* of the present day; pl. 29-133, *Orobi*, *Trifolii* with central spots disunited; pl. 134 and 135, *Trifolii*, males of *Trifolii* with central spots more or less confluent; pl. 35-160, *Loniceræ*, ♂.

His figure of the caterpillar of *Loniceræ*, together with those of the moths, are very good representations of the *Loniceræ* of the present day. His caterpillar of *Loti* is unlike any I have ever seen, perhaps it is the larva of the 6-spotted species.

Boisduval, in 1829, published a most elaborate and valuable monograph of the genus, and in his section of the genus with "cinq taches plus ou moins arrondies," the following species are included.

A. Ailes un peu transparentes.

*Corsica*, *Meliloti*, *Exulans*, *Cynaræ*, *Achilleæ*, *Janthina*, *Concinna*.

B. Ailes d'un bleu foncé.

*Loniceræ*, *Trifolii*.

I need only mention two insects in the first section, *Achilleæ* with the fifth spot *securiform* (because *Loti*, Fab., is given as a synonym) and *Meliloti*, the origin of further confusion.

MELILOTI, *Z. Meliloti*, Ochs.

*Sphinx Loti* (mas.), Hübner.

*Meliloti*, Esper.

This insect has the wings most decidedly semi-transparent, nearly as much so as *Z. Minos*, and has not yet occurred here.

In the sub-section "Ailes d'un bleu foncé," the two species are thus differentiated:—

TRIFOLII (no synonym of *Loti* or *Loniceræ* attached).  
*Trifolii*, Ochs., Esper., Hüb., Borkh.

M. Boisduval says of the caterpillar, "on rémarque en outre sous le ventre un petit point noir sur chaque anneau," a character I have never seen in the larva of the late *Trifolii*, but under the name *Trifolii*, so far as I can comprehend, M. Boisduval comprised all the forms or varieties of *Trifolii*.\*

RONICERÆ thus stands. *L. Loniceræ*, Ochs., Esper., Hüb.

*Z. Loti*, Fab. (*Loti*, Fab., as I have before mentioned, Boisduval also gives as a synonym of *Achilleæ*).

M. Boisduval's remarks, "Elle est de la taille de la filipendulæ avec laquelle elle a été quelques fois confondue. La variété à taches réunies en une seule bande irregulière est assez rare;" and of the caterpillar, "On rémarque sur chaque anneau un point jaune placé entre les deux bandes;" and also its "apple-green" colour, sufficiently serve to identify the insect with the *Loniceræ* of our present lists.

From this time the Continental authors seem only to have allowed these two species, but our English authors did not accept this view.

Stephens, in his illustrations, gives three 5-spotted species, viz.:—*Meliloti*, Ochs.; *Trifolii*, Esper.; and *Loti*, Fab.

In describing *Meliloti*, he agrees with Boisduval's description of the continental *Meliloti*, and his own insects in the British Museum do not agree with his description as regards the semi-transparency of the wings. Stephens' specimens of *Meliloti* in the British Museum are small, not typical specimens of the late *Trifolii* of the present paper.

Of *Trifolii*, Mr. Stephens observes, "alar. expans. 11"-1' 2"-1' 3". Found abundantly in many parts of the

\* M. Boisduval observes, however, that *Trifolii* appears some time before *Filipendulæ*, whereas the late *Trifolii* appears at the same time.—T. H. B.

country, at the *end of May and beginning of June*. It has generally been considered the *Loti* of Fabr., but that insect is considerably larger and is subsequently noticed. Caterpillar dusky yellow, with four rows of black spots, two on the back, and two on each side; feeds on trefoil." I have examined these specimens in the British Museum, and they are the small *early Trifolii* of the present paper.

Of *Loti*, Mr. Stephens says, " Considerably larger than the foregoing, which it greatly resembles. Caterpillar pale green, with a row of black spots on the back, and one on each side; the latter in the females with a bright yellow streak beneath." These specimens in the British Museum are small specimens of the *Loniceræ* of the present day.

Mr. Stephens' three species will therefore be as follows—

*Meliloti*, Ste. = Small specimens of the *late Trifolii*.

*Trifolii*, Ste. = *Early Trifolii*.

*Loti*, Ste. = *Loniceræ*.

Stephens' opinion is followed by Prof. Westwood in his " *Brit. Moths, and their transformations*," where the three species are thus set out:—

#### A. LOTI.

*Loti*, Fab., Don., Steph., Wood, Duncan, not *Sphinx Loti* of Hübner and Esper.

*Loniceræ*, Esper.

#### A. TRIFOLII.

*Trifolii*, Esper, Stephens, Wood.

*Z. Loti*, Haw.

*S. Loniceræ*, (?) Esper.

#### A. MELILOTI.

*Meliloti*, Esper, Och., Steph., Wood.

*Sphinx Loti*, Hübner.

The observations attached to ' *Loti*,' or *Loniceræ* as it is now called, " here again varieties occur, in which the spots are more or less confluent;" and " Mr. Curtis states, that it is common in *marshy* places, at the beginning of May, and the beginning and end of June," must be attributed to some other species.

Mr. Humphreys expresses an opinion in Westwood and Humphreys' "British Moths, and their transformations," that all the five spots "constitute but one species;" and adds, "I have not figured the larva of *A. Loti*, as I cannot but suspect that there has been some mistake respecting it; for while the species in its perfect state is so very similar to *A. Filipendulae*, the caterpillar is represented as totally different, not only in colour, but also in shape, being what is termed onisciform."

Hübner, from whom Mr. Humphreys copied, represents *A. Filipendulae* larva as stretched out feeding, *A. Loti* larva as in repose; and it is only in repose that these larvae assume an onisciform appearance, so that portion of the difficulty is soon explained; as to the colour, Mr. Humphreys has erroneously considered his *loti* and Hübner's as identical. Hübner's *loti*, ♀, as before stated, being a 6-spotted species, and his *loti*, ♂, is given in the very work that Mr. Humphreys introduces this observation into as a synonym of *A. Meliloti*!!

In a note to the first edition of the same work, Mr. Bree observes, "The two species (*Filipendulae* and *Loti*) occur in this neighbourhood (near Coventry), but in different localities, *Loti* being found in heathy bogs, *Filipendulae* in low meadows and grassy woods. Occasionally I have met with specimens of each in the locality of the other, but this was not usual, which tended to convince me, amongst other circumstances, that they were distinct species. . . . I have often seen the cater-

NOTE. In the National Collection in the British Museum, only 'Trifolii' and 'Lonicerae' are recognized.

*Trifolii* comprises :—

- (1.) *Trifolii*, Esper.
- (2.) *Meliloti*, Ste., late *Trifolii*; specimens with spots not confluent.
- (3.) A fine series of typical specimens of the marsh, or late *Trifolii* of this paper, queried as *Trifolii*.
- (4.) Three abnormal varieties of the late *Trifolii* (?).
- (5.) The early *Trifolii* of this paper, but not typical specimens.
- (6.) Typical specimens of the early *Trifolii*, labelled 'Orobi,' Hüb.

*Lonicerae* comprises :—

- (1.) *Lonicerae*, Esper.
- (2.) *Lonicerae*, Hübner; both typical *Lonicerae*.
- (3.) *Loti*, Ste.; small specimens of *Lonicerae*.

In no one specimen of *Lonicerae* in the Brit. Mus. are the central red spots of the fore-wing confluent.

T. H. B.

pillars of each, and though I have never compared them side by side, yet I can safely say there is no very obvious difference between them." The *Loti* here mentioned as inhabiting heathy bogs was probably not *Loti*, Humphrey & West. (*Loniceræ*), which, so far as my experience goes, does not inhabit marshes, but the large late *Trifolii* of the present paper.

Now if, in all these works, *all the scientific names were omitted*, I think any one carefully reading the facts recorded, would come to the conclusion that, at least, *three* species or forms were included in the descriptions, even when only professing to describe two. All the authors (since Hübner) recognise by "*Trifolii*" a small *Zygæna* occurring in May and June, with a broad black border to the hind-wings. If, then, dismissing *Trifolii* from our minds, we compare the descriptions of *Loti* or *Loniceræ*, by which name authors seem to have meant, pretty unanimously, a larger insect than *Trifolii* occurring later in the year, we find decided contradictory evidence.

Described as "habitat in *Loto corniculato*," true of *Loniceræ*, but not of the marsh insect, Boisduval's description of the caterpillar being quite at variance with that of the marsh, or late *Trifolii*, the confluence of the spots as "assez rare," and "of common occurrence," described as "found in marshy places," where *Loniceræ* does not occur, all which to my mind points to the conclusion, that *Loti* or *Loniceræ* often included, beside itself, a *large species of 5-spotted Zygæna inhabiting marshy places*; but that often this large species, if small or not typical specimens, got included with *Trifolii* the early species.

The publication of Mr. Stainton's Manual, produced a change. Mr. Stainton following the continental authors, only allows two species, *Trifolii* and *Loniceræ*, for the first time so-called in this country; the points of difference Mr. Stainton relies on, are, in *Trifolii*, the central pair of red spots large and generally united; in *Loniceræ*, small and never united, and the thicker antennæ, and broader black border to the hind-wings in *Trifolii*. This opinion was nearly universally accepted; a *Zygæna* always approximated to one or the other, and was classed accordingly; but I have found out two points from inspection of a great many cabinets; first—the type of the small

early male *Trifolii* with the broadest black band of any, but the central red spots *small and seldom united*, was regarded as an *aberrant variety*—while the female of the *marsh form* with antennæ just as slender as a ♂ *Loniceræ*, and an equally narrow black border, has been nearly invariably classed as *Loniceræ* (I am only speaking of ordinary collectors). Very shortly after the publication of the part of Stainton's Manual, comprising the *Zygænæ*, Mr. Newman expressed his dissatisfaction. Speaking of the insects and the authors, he says (*Intelligencer*, vol. 1, p. 180) that he cannot understand *them*, the *them* being equally applicable to either or both, the insects or the authors.

In Doubleday's list (2nd edition) *Loniceræ* and *Trifolii* are the only two 5-spotted species, and their synonymy is extremely scanty, *Trifolii* being given as *Trifolii*, Esper, and *Loti*, Haw., and *Lonicera* as *Loniceræ*, Esper (Fabricius, Hübner, Stephens, or Westwood not being mentioned). In his recent list, Staudinger follows the same arrangement, but he apparently separates the types of the early *Trifolii* under one of the following varieties.

B. Var. *Orobi*, mac. mediis separatis.

C. Var. *Syracusia*, minor, al. ant. maculis parvis disjunctis, post. margine lato nigro.

On June 16th, 1864, I found *Z. Trifolii* in abundance in some rough dry fields, abounding in *Lotus corniculatus*, bordering on Barnwell Wold, Northamptonshire; the insects were very much worn, of a very small form, in fact, types of the "early" *Trifolii*; *Filipendulæ*, which also occurs there, was just coming out. The *Trifolii* were so worn, I could catch but few worth keeping.

On the 27th of the same month, in the same year, I found the large late *Trifolii* just coming out in a marshy spot in Tilgate Forest. I also got many pupæ. The insects were so much larger, and so different in appearance from the Barnwell Wold specimens, and the fact of the *same* species being so much later in a much more southern and less exposed locality, and the thickness of the antennæ in each, and the generally confluent central spots in the Tilgate insect, precluding the possibility of referring either to *Lonicera*, I was at once struck with the impression that they were *not* one and the same species (I had never taken *Trifolii* before this year). *Filipendulæ* does not occur here.

In the summer of 1866, I heard that *Trifolii* occurred in Stowe Wood near Oxford, and I found a marshy place exactly similar to the spot in Tilgate Forest; here, on the 17th May, with the aid of M. Dembski, I found a few *very young* larvæ of a species of *Zygaena*, feeding on the large species of *Trifolium* I have before mentioned, amongst the rushes; when they were larger I described them (see Appendix, No. 1).

I then wrote at once to Mr. Whall at Thurnring, close to Barnwell Wold, begging if it were possible, for some larvæ of the small early *Trifolii* found there. One caterpillar of a *Zygaena* was all that could be found; *Mr. Whall stating that the caterpillars were nearly all spun up (Obs.—The Stowe Wood larvæ were quite young)*. This caterpillar was quite different in its markings from the Stowe Wood larvæ, as will be seen by comparing its description (Appendix, No. 3). *As *Filipendulae* also occurs here, it is just possible that it might have been a variety of that insect*, but it agreed with Mr. Hellins' description of *Trifolii* (Ent. Mo. Mag. iii. p. 118) *in the peculiar shape of the dorsal black spots*; Mr. Hellins especially mentions the  $\times$ -like dorsal black spots. I have spoken of the dorsal line, i. e., the ground-colour, as consisting of a row of transverse lozenge-shaped spots, this is the same peculiarity differently expressed. I determined to write to Mr. Hellins as soon as convenient, asking if his *Trifolii* came from a dry or moist locality—I anticipated the answer, dry. This caterpillar unfortunately died.

Before this larva died, I wrote to J. H. Wood, Esq., of Tarrington, in Herefordshire, who had informed me that *Trifolii* and *Lonicerae* both occurred in that neighbourhood. He wrote me at once, stating that he was unsuccessful in finding me any *Trifolii* larvæ, but sent six *Lonicerae* larvæ feeding on *Lotus corniculatus*; these are the larvæ described in the appendix to this paper as *Zygæna*, No. 2. I then wrote to Folkestone for larvæ of *Filipendulae*, which duly arrived; thus at the same time I had four distinct varieties of *Zygæna* larvæ, *Filipendulae*, *Lonicerae*, and the late marsh *Trifolii*, all of which I bred, and the supposed early *Trifolii* which died, but whose peculiar characteristics, so different from the late *Trifolii*, is corroborated by Mr. Hellins, as before mentioned. I took all the larvæ to Professor Westwood, who himself enlarged, and closely corrected the appended descriptions.

On the 13th of June this same year (1866), I went to the marshy place in Tilgate Forest, before mentioned, in search for larvæ, hoping, of course, to find them identical in their markings with the Stowe Wood caterpillar. I found some *Zygæna* larvæ there in tolerable abundance, feeding on the same plants as in Stowe Wood Marsh; *their markings, to the minutest particular, were identical with the Stowe Wood caterpillars*, the same slight range of variation, and no more. These larvæ afterwards, in the first week in July, produced the late *Trifolii* I had found there in 1864, *and at the same time* the Stowe Marsh caterpillars began to come out, and produced the late *Trifolii*, exactly identical with those of Tilgate Forest. Here, then, were two colonies, one in Northamptonshire, one in Sussex, traced from larva to imago, and exactly agreeing in every point, including time of appearance. On the 3rd of July, while these insects from Tilgate and Stowe Wood were just beginning to come out, I visited Barnwell Wold, a locality intermediate in geographical position, and, as I expected, the early *Trifolii* was over; I caught five only, *very worn*; I was told *it had been abundant*.

I had been also informed of another locality near Oxford, where *Trifolii* occurred, *viz.*, *the dry slopes of Shotover Hill*; in 1867, M. Dembski sent me two *Zygæna* larvæ found there: these larvæ had all the characteristics of the Barnwell Wold caterpillar, to wit, the tendency to the confluence of the dorsal spots, and the tendency to the  $\times$ -like shape, which I have *never* seen in the late *Trifolii*; to breed one of these was the only link I now wanted, and at a consultation held with Professor Westwood, it was determined to put one into whiskey and water, and breed the other; the weakest looking was accordingly consigned to the bottle, and two days afterwards the other on which I rested my hopes, produced an abundant crop of Ichneumons.

In 1870, on June 17th, the late *Trifolii* was not out in Tilgate Forest; on June 18th, I found the early *Trifolii* at Folkestone over, I caught a few worn specimens only. I had written a few days previously to Mr. Hellins, asking him the nature of the locality of the caterpillars described by him in 'Ent. Mo. Mag. iii. p. 118,' and also sending him some larvæ, of the late *Trifolii*, from Stowe Wood, Mr. Hellins kindly answered my letter at once, and said,

"I have compared the larva you sent me with Mr. Buckler's figures, and find it more nearly resembles *Filipendulae* than *Trifolii*, both species appear to vary much in the larva state. . . . I imagine the *Trifolii* spoken of by me (Ent. Mo. Mag. iii., p. 118) were the ordinary seaside fellows, feeding on Birds-foot Trefoil. . . . I see Mr. Buckler's figures decidedly gave the long hairs you now mention to *Lonicerae*."

The caterpillar of the early *Trifolii* seems very hard to find, possibly from the fact that where the insect occurs, its food plant is always in such abundance; the food plant of the marsh, or late *Trifolii* is often limited in its range, and the larva consequently easily found; all my endeavours to get caterpillars of the early *Trifolii* were fruitless. Dr. Wood, however, sent me from Tarrington five larvæ of, as he considered, *Lonicerae*, stating that they came from a different locality from the former *Lonicerae*, about eight miles distant from it; they were found on a dry bank. These larvæ I considered to be the early *Trifolii*, but they possessed the "conspicuous yellow spot" so many authors have observed in *Lonicerae* (the long hairs, the greenish ground colour, and the little tail to the posterior lateral spot, observed both by Mr. Buckler and myself were all absent); the lateral row of spots were nearly confluent, dorsal spots as large as in *Filipendulae*, dorsal line narrow in all; the minute black spot below the second lateral spot present in one individual, and in another individual there was a strong tendency to the x-like spots, but the spots were only nearly confluent; they nearly approximated to some of the varieties of *Z. Filipendulae*, except in the much clearer and paler ground colour. In short, they united certain characteristics of the caterpillar of the early *Trifolii* with that of *Lonicerae*; the characteristics of the larva of the late *Trifolii* were altogether absent. I only bred one, a ♂, which, on June 20, produced an undoubted *Z. Lonicerae*, as evidenced by the structure of the antennæ, but there was a slight tendency to a confluence of the red spots of the fore-wing—a character of the marsh *Trifolii*. I purpose to investigate this colony further, as the result is eminently unsatisfactory. Mr. Buckler has published descriptions of two varieties of *Lonicerae* larvæ (Ent. Mo. Mag. iv. 253), but both comprise the salient points of difference, that *Lonicerae* ought to possess; particular mention is made in

the first, of the greenish ground colour, and the orange spot, but no mention of the "little tail;" but in a drawing Mr. Buckler has kindly sent me of a segment of one of the variety found feeding on *Lathyrus pratensis*, this little tail is accurately delineated. Mr. Buckler has kindly given me all the information in his power, and has sent me diagrams of the 6th segment in *Trifolii*, *Lonicerae*, and *Filipendulae*; this diagram of *Trifolii* differs from my marsh *Trifolii* altogether, having the lateral spots united below, and the tendency to the  $\times$ -shaped dorsal spots.

Now then, to sum up. Of the 5-spotted species in the imagos, we have *Lonicerae* distinguished by its slender antennæ; a *Zygæna* equally as large as *Lonicerae*, appearing about the same time, found in marshes; and a *Zygæna* found in dry places, appearing a month before the marsh one, and usually known as *Trifolii*.

I have found no intermediate time of appearance, in the four colonies I have especially observed; in Huntingdonshire, Oxfordshire, Sussex, and Kent, the early *Trifolii* in the most northern and most southern locality, has appeared simultaneously; and also the late *Trifolii* in the two intermediate localities, the early *Trifolii* always about one month before the other, and this invariably the case in the course of eight years' observation of the colonies. Is not this fact alone opposed to the supposition of their being simply "forms" of each other?

As regards the caterpillars, the salient points of difference in *Lonicerae* have been observed by Boisduval, and seem to be the same now as the "point jaune" is distinctly observed by Mr. Buckler and myself.

Of the two *Trifolii*—one has the spots very small, and never\* any tendency to the  $\times$ -like spots, and never has the lateral spots united; the other has the spots invariably larger, lateral spots nearly united, and a *more or less* tendency to confluence in the dorsal spots, and the assumption of the  $\times$ -like form. I have not seen any intermediate form of caterpillar in *Trifolii*, there is a gap, but *Filipendulae* larva has a range of variation extending

\* During the period 1864-1871, I have examined some hundreds.—  
T. H. B.

nearly over both these forms of *Trifolii*, and *Filipendulæ* larva seems to be a connecting link between the two *Trifolii*. But throughout all the caterpillars of *Filipendulæ*, *Lonicerae*, the early and the late *Trifolii*, the differences relied on as determinant, exist in a rudimentary form in the rest. The conspicuous orange spot in *Lonicerae*, is more faintly to be traced in the rest; the 'little tail' in the same insect, often appears in *Filipendulæ* and in the early *Trifolii*, as a "minute black spot below the second of the two lateral spots," and the  $\times$ -like spots themselves are only the smaller spots magnified and developed into a certain shape. All the caterpillars may be described as yellowish-green or greenish-yellow, with two dorsal rows of black spots, larger or smaller, pointed or rounded, confluent or separate, and a lateral row on each side more or less confluent, and a more or less apparent dusky line above the feet.

I have not said anything about the cocoons, as they are all similar; a *Lonicerae*, however, bred in 1866, spun a cocoon which presented a reticulate appearance. The one I bred this year did the same, others that spun up, however, did not, so I suspect this coincidence was accidental.

Now, if we find this constancy of variation and development and time of appearance, although there are no primary distinctive differences ranging through these four forms, are we to regard them as species or forms or what? Do other forms, perhaps intermediate, exist? Will not a further examination of the general type of other colonies show? I do not anticipate much trouble about the mimics and the hybrids, they are exceptions, and only troublesome so far as regards the particular specimen in question. A colony cannot be a colony of hybrids, or a colony of mimics; either they are forms or species, and surely this is capable of elucidation. One word as to the hybrids and mimics; a hybrid usually (if it be a hybrid) shows signs of degeneration, which might occur throughout a brood; mimicry would be peculiar to the individual.

This year on the 16th June at Folkestone, *Filipendulæ* larvæ swarmed in the warren, but no moths could I find; on Castle Hill the moths were out, but they were very small, and with a tendency to the obliteration of the sixth spot; antennæ shorter than usual; one specimen, a ♂,

is of the size, contour, and has the broad black border to the hind-wings, of the early *Trifolii* found at Folkestone (which was out). Surely these were Hybrids?

I possess a *bred* late *Trifolii* (♂) that has assumed the more slender antennæ of *Lonicerae*; also a *bred Lonicerae* (♂) that has much shorter antennæ than usual, approaching to *Trifolii*. These two bred specimens are hard to distinguish when placed together.

I also possess a remarkably large female *Zygæna* with *five* spots on the upper surface of the fore-wings, and *six* beneath; I caught it by itself, so cannot decide if it is a *Filipendulae* mimicing the late *Trifolii*, or *vice versa*; it has none of the appearances of a hybrid.

This season has been a bad one for *Trifolii*, but I shall hope next year to be able to elucidate some further facts connected with the history of these troublesome little creatures.

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## APPENDIX.

### Larvæ of the genus ZYGÆNA.

Generic characteristics. Legs sixteen; head *very small*; larva short and fat, and sluggish; when in repose assumes an onisciform appearance, but not so when stretched out feeding.

#### Larva of *Z. Filipendulae* (full fed).

Body with whitish hairs scattered over it, but with a few black hairs on the back; hairs short, head and fore-legs black; head with transverse upper lip, and the membrane at the base of the antennæ white; ground colour greenish-yellow, arranged in a dorsal line, and two lines on each side; dorsal line with a brighter yellow spot in the fold formed by the hind-margin of

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NOTE. I observed the food plant of the late *Trifolii* last year, in a marshy place on Wimbledon Common, but could find no larva. This season I have received information of the capture of a few very large *Trifolii* in July, just in one spot only in the marsh, where I saw the food plant.

each segment, the dorsal line becomes much narrower in the anterior segments. On each side of the dorsal line a row of large black spots, two on each segment, of which the anterior is the larger, with the inner posterior angle emarginate, and rounded on the side next the head ; the posterior spot is narrow, and curved on the inner margin. In the segments immediately following the head, the anterior margin is narrowly blackish, often only partially margined with black, with the dorsal spots confluent, the anterior being greatly reduced in size ; below which row of spots, a pale lateral line, with a bright yellow spot in the fold formed by the hind margin of each segment ; below which line another row of black spots, two on each segment, of which the posterior spot on each segment is nearly spherical, and the anterior larger, and curved backwards, so as to terminate below the spherical spot, but sometimes uniting with it in the posterior segments ; it (the anterior spot) also bears the black spiracles ; the lower portion of this curved spot in which the spiracles are placed is often separated from the rest, as in *Zygæna*, No. 1 (*Trifolii*) ; a minute black spot is often placed below the posterior of these two spots, but this minute spot is as often obsolete. Then follows another pale lateral line ; and between this line and the feet is a curved blackish mark on each segment, bearing a pale transverse lunule in its lower portion ; a slight dusky line at the base of the feet ; pro-legs and underside pale, with an interrupted dusky line (occasionally almost obsolete) down the middle of the belly.

Feeds on Trefoil, &c. Described June, 1866, from larvæ taken at Folkestone.

The larva has a great range of variation ; its *limit* towards the *confluence* of the black spots is complete confluency ; the angles become developed, and assume the  $\times$ -like appearance of the early *Trifolii*, but the ground-colour *always* more dusky, but the usual type is as described.

The *limit* the other way towards the *obliteration* of the black spots is seldom beyond that in the above description, the *limit* is attained before the range of variation of the marsh species begins. In some thousands, I have never seen one with the spots so small, and *consequently* the dorsal line so broad as in the late *Trifolii* ; and I have before remarked, that I have never seen the spots in the shape of those of *Lonicerae*, as described.

Larva of *Zygæna*, No. 1 (late *Trifolii*).

Body with short white hairs scattered over it, with very few black hairs mixed with the white on the back. Head and fore-legs black; head with transverse upper-lip and membrane at base of antennæ, white; ground-colour pale yellowish, arranged in five lines, one dorsal and two lateral on each side; dorsal line *broad*, yellower in the fold formed by the hind margin of each segment; on each side of the dorsal line, a row of black spots, two on each segment, of which the anterior spot is the larger, somewhat semicircular, with the flat side turned towards the anus, but coming to a point on the back; posterior spot narrow, curved on the anterior margin, approaching in shape to a lunule; in the segment immediately following the head, the dorsal spots are confluent, the anterior being greatly reduced in size, the anterior margin of this segment is *partially* margined with blackish, leaving the middle portion of the yellowish ground-colour, below which row of spots, a *broad* pale yellowish line with a yellow spot in the fold, formed by the hind margin of each segment, but this spot is *not* very conspicuous, below which line another row of black spots on each side, two on each segment, of which the anterior is larger and curved backwards, and bears the black spiracles, but *very often* the lower portion of this spot which bears the black spiracles, is separated from the rest, and sometimes dwindles down to a mere dot. No minute black spot below the smaller of the two lateral spots, as is often the case in *Filipendulae*; below which row of spots is the lower lateral line, and below this line and the feet is a row of dusky spots bearing a pale transverse lunule in the lower portion of each, but which lunule is sometimes absent, or nearly so; a dusky, very narrow streak at the base of the feet; pro-legs and underside yellowish, with a dusky interrupted line down the middle of the belly. Feeds on the large Trefoil found in marshes (and on that plant only).

Described June, 1866, from larvæ found in marshy ground in Stowe Wood; confirmed by others found in Tilgate Forest in a similar locality, and since confirmed by examination from year to year.

Take a *Filipendulae* larva, give it a much clearer and cleaner ground-colour, diminish its spots *below the limit*

*of smaller spots in Filipendulae*, so as to make all the *lines* broader, and you will have a specimen of this caterpillar.

As the variation in *Filipendulae* tends towards *confluence*, the variation here is towards *obliteration*; but the caterpillar is *very* constant, its range of variation very small, as the limit towards *magnitude* of the spots in this species is attained before the limit of *Filipendulae* towards *obliteration* commences; it follows, as a matter of course, that I have never seen *any tendency* towards the  $\times$ -like dorsal markings, or ever seen the lateral spots united.\*

#### Larva of *Zygæna*, No. 2 (*Lonicerae*).

Body with *long* white hairs scattered over it, with some black hairs mixed with the white on the back, hairs much longer and more dense than in the other species; head and fore-legs black, head with transverse upper-lip, membrane at base of antennæ, and articulations of lower organs of the mouth, white; ground-colour arranged in five lines, one dorsal and two lateral on either side; very pale yellowish tinged with green, sometimes quite green; dorsal line slightly yellowish in the fold formed by the hind margin of each segment, and rather narrow, not being nearly as broad as in the last species (the late *Trifolii*); on each side of the dorsal line a row of large black spots, two on each segment which almost meet, and in some cases are confluent; the anterior is slightly the larger, but there is very little difference in size, both being somewhat pear-shaped; the anterior with the larger portion below, the posterior with the larger portion above, leaving a small pale angulate space in the middle of the back of each segment; below which row of spots a narrow pale line with a *very conspicuous bright yellow spot* in the fold formed by the hind margin of each segment, below which line another row of black spots on each side, two on each segment, *united* in their lower extremities,

\* *Filipendulae* is widely distributed, and its larva feeds on many plants; the larva is very variable. *Zygæna* (No. 1) is very local, and its larva feeds, so far as I know, on one plant only; its larva is very constant. Are these facts coincidental or explanatory? I forgot to observe, as a further proof of distinctness between this species and the early *Trifolii*, that some larva I tried to feed on Birds'-foot Trefoil, wasted away, and died.—T. H. B.

in which is placed the black spiracles, *the posterior spot emitting a small transverse spot towards the pro-legs* (the 'little tail' of Mr. Buckler); below which the lower narrow lateral line, below which a row of dusky patches of a lunate form, sometimes bearing a small transverse lunule; another dusky patch on the base of the feet; pro-legs and underside pale, but often irregularly suffused with dusky markings, the upper part of the anterior segment is narrowly margined with blackish.

Described in June, 1866, from some larvæ sent me from Tarrington. Found on Tarrington Common, feeding on Birds'-foot Trefoil.

This larva seems to have a certain range of variation, as is evidenced by the two varieties described by Mr. Buckler. The latter of which varieties *agrees exactly with the above description* (see Ent. Mo. Mag. iv. 253); it will be observed that this variety that agrees so exactly well with my description, *was found feeding on the same food-plant, Lotus corniculatus*. The question naturally suggests itself, does the variation in the larva depend on the food plant. It is *odd* that the caterpillar of the late *Trifolii* always found on the same plant should be so constant.

As to the *very different* larvæ, resembling the early *Trifolii* before mentioned, as I only bred one moth (*rest died in pupa*), it is useless to attempt an opinion; *the moth may be a mimic.*

### No. 3. Larva of a *Zygæna*, supposed to be the ordinary *Trifolii*.

Body with short white hairs scattered over it, with a *very few* black hairs on the back; head and pro-legs black; head with transverse upper-lip, and membrane at base of antennæ, white; ground-colour pale yellowish, arranged in five lines, one dorsal and two lateral on either side; on each side of the dorsal line, a row of large black spots, two on each segment, confluent or nearly so, but each coming to a point on the back, *which makes the dorsal line look like a row of transverse lozenge-shaped spots on the middle of the back of each segment*, preceded and followed by semi-lozenge-shaped spots, which unite (or

nearly so) with those of the following and preceding segments ; the anterior spot terminates lower down the side than the other ; in the three segments immediately following the head, the dorsal line is so narrow and dusky as to be hardly perceptible ; below which row of black spots, a pale yellowish line on each side with a bright yellow spot in the fold formed by the hind margin of each segment, below which line a row of black spots on each side, two on each segment confluent, or nearly so in their lower extremities, when confluent, making together a spot of a horse-shoe shape, in which the spiracles are placed, below which, and in the succeeding pale line, are two black dots on each segment ; one on the anterior, one on the posterior fold, the anterior dot being placed rather lower than the other, the space between this line and the feet is nearly filled up with blackish and dusky markings, some segments being more suffused than others ; pro-legs and underside pale, with a row of dusky dots down the middle of the belly.

Described June, 1866, from a larva sent from Barnwell Wold, which died ; *supposed to be the Trifolii found there*, subsequently compared with two larvae from Shotover Hill, which agreed with this description, except in the less confluence of the spots.

This larva seems as variable as *Filipendulae*, but with a brighter and generally paler ground-colour.

*Obs.* M. Boisduval's "petit point noir," Mr. Hellin's "x-like black spots," and Mr. Buckler's "figures with the lateral spots united," all agree more or less with the above description, and are in total opposition to the description of the caterpillar of the late *Trifolii*.

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XVIII. *Remarks concerning the identification of Myrmeleon formicaleo, formicarium, and formicalynx of Linné.* By ROBERT McLACHLAN, F.L.S., Sec. Ent. Soc.

[Read 20th November, 1871.]

I HAVE just received from Pastor Wallengren a most valuable contribution to European Neuropterylogy, in the form of the first part of his "Skandinaviens Neuroptera" (Kongl. Sv. Vet.-Ak. Handlingar, 1871), comprising the *Planipennia*. Naturally the Scandinavian fauna is almost identical with that of Britain; but Sweden possesses an Ant-lion, which is amongst the things hoped for by us. The name this Ant-lion should bear opens up an interesting and involved question. The family *Myrmeleonidae* is tolerably rich in species in Southern Europe; but as we approach the more central or northern portions of the Continent, it may be said to have but two representatives, and it is concerning these two that the following notes are written. One of those has the wings spotted with black or fuscous, the spots being less evident in faded individuals, or in those recently developed: this has been known under the name of *formicarius* by almost all European entomologists, *out of Sweden*, and is very abundant in warm sandy spots in most parts of central Europe, also occurring pretty generally in the south. The other has perfectly immaculate wings (excepting a whitish pterostigma): this, by modern Neuropterists, is generally known, *out of Sweden*, by the name of *formicalynx* (it is the *innotatus* of Rambur, according to the type, and the *neutrum* of Fischer v. Waldheim), and has a more decided northern range, extending far into Siberia, yet also occurring in Spain and southern Italy. I make no mention of other characters, because the presence or absence of spots on the wings is enough for my present purpose.

It is evident that, sooner or later, Linné confounded those two distinct species as forms, or local varieties, of one.\*

In the first edition of the 'Fauna Suecica' (1746), he says, of an Ant-lion (without trivial name) "*alæ obsolete nebulosæ*."

\* Cf. Villers, Linn. Ent. iii., pp. 59-60.

In the tenth edition of the 'Systema Naturæ' (1758), we find an insect named *Hemerobius formicaleo*, still with the word "nebulosis" applied to the wings.

In the second edition of the 'Fauna' (1761), there is again a *Hemerobius formicaleo*, but there is here no mention of the nebulous or spotted wings; these members are simply said to be "hyaline, venis fuscis reticulatae."

Finally, in the twelfth edition of the 'Systema' (1767), the name is changed to *Myrmecleon formicarium*, and there is a very significant modification of the description, the words now being "alæ nostratis absque maculis fuscis," making it evident that the Swedish insect had immaculate wings, whereas he had seen individuals from other quarters with spotted wings, or, at any rate, was made acquainted with such by the works of contemporary authors.

The modern Swedish entomologists\* affirm that one species only of *Myrmecleon* occurs in their country, that with the immaculate wings, hence the *formicarium* of the twelfth edition of the 'Systema,' and the *formicaleo* of the second edition of the 'Fauna.'

Linné cites the works of Réaumur, Vallisnieri, Roesel, Sulzer, Schäffer ('Elementa'), Poda, and Geoffroy, and all these authors describe or figure the spotted-winged species, excepting Schäffer, who distinctly figures that with immaculate wings.†

How then did he come to describe the insect, as with markings on the wings in his earlier works;? and this question is more especially directed to the first edition of the 'Fauna.' I hazard a conjecture. It is well known that the perfect insects of *Myrmecleon* are rarely seen at large in a state of nature, they being nocturnal in their habits, concealing themselves adroitly during the day. On the other hand the larvae, or rather the pit-falls made by them, force themselves upon our attention. Hence I consider it very probable that Linné, at the time of pub-

\* Wallengren remarks, that he formerly (Ofy. Vet.-Ak. Forhand., 1863) erroneously diagnosed the Swedish insect as with spotted wings, and that Thomson made the same mistake.

† In his private, interleaved, copy of the twelfth edition of the 'Systema' (in the possession of the Linnean Society), Linné (in MS.) refers the *immaculatum* of De Geer, as a synonym of *formicarium*; and Wallengren likewise includes the name among the synonymy given by him. But De Geer's insect is stated to be from Pennsylvania; it is a recognisable, and common, North American species (cf. Hagen, North American Synopsis. p. 231). Gmelin makes the name a synonym of *formicalynx*, and adds 'America' as a habitat for that species.

lication of his earlier works, knew of the existence of an Ant-lion in Sweden from the larvæ only, considering those to produce the insect made familiar to him by the works of his contemporaries in other parts of Europe. But, later, the Swedish species became known to him, and he then amended his descriptions accordingly, emphasising his last by the word "*nostratis*."

There yet remains to be considered the species intended by the name *formicalynæ*. Linné, in the tenth edition of the 'Systema,' simply characterises this by the words, "*alis immaculatis, hyalinis, antennis clavatis. Habitat in Africa.*" In the twelfth edition, the word "*clavatis*" is altered, by an evident slip of the pen, to "*setuccis*." No mention of the species is made in either edition of the 'Fauna.' Notwithstanding its African habitat, he refers to another figure in Roesel (tab. xxi. fig. 2), which decidedly represents (from Germany) the Swedish species described by him as *formicarium*.

The Linnean collection, in the possession of the Linnean Society of London, adds to the difficulty. The only Ant-lion in that collection bearing a label in Linne's hand-writing is the plain-winged Swedish insect (there are several specimens of it, all with the characteristic Linnean pins, but only one bearing a label), and that label is "*formicalynæ*!" I absolutely refuse, considering the African habitat given for *formicalynæ*, and the evidence of Swedish entomologists, to acknowledge this specimen as typical. Before the collection was placed in its present quarters, it was so maltreated by additions, destructions, and misplacement of labels, as to render it a matter of regret that it now exists at all.\* Any evidence it now furnishes is only trustworthy when confirmed by the descriptions. It is true that the few words of diagnosis given for *formicalynæ* will apply to this insect so far as they go; but the African habitat of *formicalynæ*, and the fact that the label-bearing insect is the known Swedish species well described by Linné as *formicarium*, render it certain that this label has been wrongly placed, after the destruction of the specimen that originally bore it, which was probably one of the many African species with immaculate hyaline wings, now indeterminable.

\* Cf. Staudinger, 'Catalog der Lepidopteren des Europäischen Faunengebiets,' vorwort, pp. xvi-xvii., 1871.

If, therefore, our system of nomenclature be limited to the twelfth edition of the 'Systema,' as is the custom with many naturalists, the familiar spotted-winged Ant-lion, usually known as *formicarius*, is in the position of being nameless; but as this species was evidently that intended by the diagnosis in the tenth edition, with the name *formicaleo*, we may very justly retain both names, and the species and their synonymy will now stand as follows:—

1. FORMICALEO, Linné, Syst. Nat. ed. x.; Poda.

*Formicarius* (Vallisnieri; Réaumur, Geoffroy; Roesel, tab. xvii.-xx.; Sulzer\*), Fabricius; Olivier; Panzer; Latreille; Stephens; Rambur; Westwood; Burmeister; Brauer; Hagen; McLachlan, olim.; etc. (nec Linné, Syst. Nat. ed. xii.).

2. FORMICARIUS (UM.), Linné, Syst. Nat. ed. xii. (Schäffer, 'Elementa' et 'Icones'; † Roesel, tab. xxi. fig. 2); Dahlbom; J. B. Fischer; Wallengren.

*Formicaleo*, Linné, Faun. Suec. ed. ii. (nec Syst. Nat., ed. x.); O. F. Müller.

*Formicalynæ*, Burmeister; Hagen; Brauer; McLachlan, olim (nec Linné).

*Innotatus*, Rambur; Costa.

*Neutrum*, Fischer v. Waldheim.

[3. FORMICALYNX, Linné, Syst. Nat. ed. x., et ed. xii. (*Species Africana, indeterminata*).]

I have already stated that no species of Ant-lion has been detected in the British Isles: † and I do not believe that such insects exist here. But if my views in this respect should ultimately prove to be erroneous, it may be that, instead of the spotted-winged species (*formicaleo*), its plainer congener (*formicarius*), of Swedish notoriety, will assert its claim to a place in our lists.

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\* Those authors whose names are included within the brackets, apply no trivial names to their insects.

The figures in Vallisnieri's 'Opera' (1733) are of extreme coarseness, and, in some of them, intentional caricatures of the human face, or figure are introduced, a practice not confined to him only among the earlier authors. The figures of the magnified larvæ are good.

† Hagen (Stettiner ent. Zeit., 1866, p. 439) refers the figure in Schäffer's 'Elementa' to No. 2, and those in the 'Icones' to No. 1. In both works the species represented is No. 2 (*formicarius*).

‡ The spotted-winged species has been erroneously recorded as British, by Barbut.

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PROCEEDINGS  
OF THE  
ENTOMOLOGICAL SOCIETY OF LONDON  
FOR THE YEAR  
1871.

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6 February, 1871.

A. R. WALLACE, Esq., F.Z.S., President, in the chair.

The President nominated Prof. Westwood and Messrs. J. W. Dunning and H. T. Stainton as Vice-Presidents.

*Donations to the Library.*

The following donations were announced, and thanks voted to the donors:—‘Remarks on Synonyms of European Spiders,’ No. 1; ‘*Araneæ nonnullæ Novæ Hollandiæ descriptæ*,’ presented by the Author, T. Thorell. ‘*Lepidoptera Exotica*,’ Part vii.; by E. W. Janson. ‘The Gall Midge of the Ash’ (*Cecidomyia Botularia*, Winnerz); by the Author, Albert Müller. ‘*Silk Supply Journal*,’ No. 9; by the Silk Supply Association. ‘*Proceedings of the Royal Society*,’ No. 124; by the Society. ‘*The Zoologist*’ for February; by the Editor. ‘*The Entomologist’s Monthly Magazine*’ for February; by the Editors.

*Election of Member.*

Pastor J. H. Kawall, of Pussen, Kurland, was ballotted for, and elected a Corresponding Member.

*Exhibitions, &c.*

Mr. Bond exhibited several species of Lepidoptera taken in Perthshire, last season, by Mr. Eedle, *viz.* *Pachmobia alpina*, being the third known British example; a fine variety of *Larentia caesiata*; a very dark form of *Thera juniperata*, being its ordinary condition in that district, and remarkable also for the time of its appearance, which was nearly two months

earlier than in England; *Gelechia boreella*; and finally *Hyponomeuta evonymella*, *L.* (*padi*, *Zeller*), the larva of which Mr. Eedle had observed to cover the trees of bird-cherry with its webs to a remarkable extent,—a piece of web exhibited was a yard long.

Mr. Bond also exhibited an example of *Vanessa Atalanta*, bred by Mr. Jackson, which still retained the larval head.

Prof. Westwood said that this form of monstrosity was very rare. He could call to mind only four recorded instances: (1) *Nymphalis populi*, (2) *Gastropacha quercifolia* and (3) *Dytiscus marginalis* in the British Museum, and (4) a *Syrphus* in the Oxford Museum.

Mr. Bond laid before the Meeting some beautifully executed photographs of the eggs of bird parasites, taken from microscopic slides, prepared by Mr. Norman, of 178, City Road.

Mr. Müller exhibited several galls, collected by Mr. Trovey Blackmore in Morocco, as follows:—

*Firstly.* On the cork tree (*Quercus suber*), a monothalamous, terminal, bullet gall, standing on a peduncle of an inch in length, emanating from a thin twig: colour dark gray, with irregular fuscous veins; surface rough, greatest diameter 15 mill. Undoubtedly the home of a true *Cynips*. Mr. Blackmore informs me that he “cut it from a cork tree, near Cape Spartel: many others were on the same tree.”

*Secondly.* On an undetermined species of oak (*Quercus* — ?); on the under side of a leaf, and attached to the lateral ribs. *A.*—Monothalamous, pea-shaped, flattened galls: ground colour mahogany-brown, irregularly sprinkled all over with small darker spots, some of which are reddish and ocellate, with a pale dot in the centre; surface more or less polished and shining (four specimens); size variable; greatest diameter of the largest specimen 15 mill.; of the smallest 6 mill. These galls show great affinity to those of *Cynips agama*, *Hartig*. *B.*—Deeply wrinkled, flat, brownish spangles seated right across the lateral ribs; greatest diameter 5 mill. If not a very immature stage of the gall *A*, these spangles may belong to a *Neuroterus*. Mr. Blackmore observes of *A* and *B* that “he remembers obtaining them all from one oak tree in the Gibel-el-Kebir, a small mountain near Tangier, either in March or April.”

The Rev. H. S. Gorham exhibited a beetle new to the British list, concerning which he made the following remarks:—

“*Oxytelus fulvipes*, Erichs. Käfer der Mark B. 590: Genera et species Staph. 787; Kraatz Naturg. der Ins. Deuts. ii. 852. Of the indigenous species most allied to *O. rugosus*, *Fab.*, from which it differs as follows:—The head, thorax and elytra are much less closely punctured, especially the former, which also lacks the depression of the clypeus, conspicuous in *rugosus*; this part also being shining instead of opaque. The thorax is proportionally shorter and more narrowed towards the base; the lateral

margins obsoletely crenulate. The legs and first four joints of the antennæ are testaceous; these joints, however, in my specimens are spotted with pitchy. The third joint is shorter than the second; whereas the reverse is the case in rugosus. In the male characters beneath, this species presents considerable differences,—the fifth segment being simple (in rugosus the margin bears a conspicuous tubercle), and the seventh has the margin simply bisinuate. One male and three female specimens, found by myself, near a wet spot in a wood, near Needwood, Staffordshire, January, 1870. It is found also in Germany, Austria and France."

Prof. Westwood exhibited drawings of a species of *Coccus*, infesting *Cypripedium niveum*, from Siam. These *Cocci* were situated on the under side of the leaves in groups of four or five, or more. The body of the scale was very small, apparently composed of waxy exudation; on the surface were six raised radiating white lines, corresponding to the legs of the insect, and each of these raised lines was produced into a spine-like process extending beyond the margins of the scale; beneath there was an oval receptacle, which contained the pupa or perfect insect, but always of the male sex. On the under side the mid-rib of the same leaves were differently formed, and not stellate scales, which probably were those of the female. Some of the first-described scales were altered in form, the raised lines being obliterated, and the surface swollen: these he considered to be infested with parasites. He proposed to name the insect *Coccus stellifer*.

Mr. Stainton remarked that at a recent Meeting of the Scientific Committee of the Royal Horticultural Society there were exhibited samples of lemons, from Palermo, infested with a *Coccus* distinct from that which ordinarily affects the orange. The rind immediately around the scales never acquired the yellow colour, so that the lemons appeared to be sprinkled with green spots. The presence of these *Cocci* was of considerable importance, inasmuch as it rendered the fruit useless for preserving purposes.

Prof. Westwood further exhibited a minute species of *Corixa*, destructive to the ova of fishes in India, received from Mr. H. S. Thomas, respecting which that gentleman made the following remarks:—

"Its habitat is fresh water in the rivers of Canara, though, I dare say, it may also be found in other rivers of the Madras Presidency. I observed it myself in a still hollow in a rock, where the water was quite clear, and only two or three inches in depth. The insects kept tossing the ova up from the bottom, and following them closely up to the surface, whence they gradually subsided to the bottom by their own weight, the insects apparently adhering to the eggs all the time; but the moment they were at the bottom they were vigorously tossed up again. I daresay it attacks other spawn also; but the ova I saw it engaged with were those of the 'Masheer barbas mosal,' commonly called 'Masheer,' the most valuable fish in the Indian rivers."

Mr. Thomas sent also an extract from the report of Pisciculture in South Canara, detailing experiments made by an intelligent observer to test the destructive habits of the insect. In one instance a hollow was watched, in which were many freshly deposited ova, but no Corixæ. The next morning the latter were there in large numbers, and nothing left but the empty egg-shells. In another experiment the ova were placed in a finely woven basket, and the Corixæ immediately came in quantities and endeavoured to penetrate from the outside. This insect, which is deposited in the British Museum in accordance with Mr. Thomas's request, Prof. Westwood characterized as under:—

"*CORIXA OVIVORA*, sp. n. Minuta, supra griseo-fusca, infra (cum pedibus) pallide lutea; capite lutescente; hemelytris griseo-fuscis, apicibus paullo pallidioribus, margine antico lineis nonnullis punctoque apicem versus nigris, notato; femoribus intermediis longis, tibiisque gracillimis; metasterno profunde bisinuato, angulis posticis lateralibus elongatis. Long. corp. lin. 1½; exp. hemelytr. lin. 2½. Habitat in fluviis India orientalis copiose, ova piscium devorans" (*Dom. H. S. Thomas*).

*Paper read.*

"Description of a new genus, and of six new species of Pierinæ," by Mr. A. G. Butler.

The new species were described as *Ixias venatus*, from the White Nile; *Kricogonia fantasia*, from Nicaragua; *Callidryas formax*, from Chili; *C. Jaresia*, from Pará; *Euchloe limonea*, from Mexico; and *Larinopoda* (n. g.) *lycænoides*, from West Africa,—this latter form seemed, in some respects, intermediate between the *Eronia* group of Pierinæ and the genus *Deloneura* among the Lycænidæ, according to Mr. Butler.

20 February, 1871.

A. R. WALLACE, Esq., President, in the chair.

*Exhibitions, &c.*

Mr. Bond exhibited a hybrid between a male *Bombyx Pernyi* and a female *B. Yamamai*, bred by Dr. Wallace. In colour it more resembled that of its male, in shape that of its female, parent. He also exhibited a crippled example of *Bombyx Mori*, likewise bred by Dr. Wallace, still retaining the larval head.

Mr. M'Lachlan called attention to what was, in all probability, the first record of a similar arrest of development, *viz.* a paper in 'Der Naturforscher' for 1781, by O. F. Müller, intituled, "Entdeckung eines

Schmetterlings mit einem Raupenkopfe," and which related to a female example of *Hypogymna dispar*.

Mr. F. Smith mentioned that Prof. Owen had narrated to him how the hieroglyphic inscriptions on the ancient monuments in Egypt are obliterated by being filled in with mud composed of fine sand used by a common Egyptian wasp, *Rhynchium brunneum*, in forming its nests. And in connection with this subject he exhibited an example of the same wasp, which had been found by Dr. Birch when unrolling a mummy, there being every reason to believe that the insect had remained in the position in which it was found, ever since the last rites were paid to the ancient Egyptian.

Mr. Smith further mentioned that he had recently discovered a passage in 'Pepys's Diary,' which was, probably, the earliest record of the use of observatory bee-hives. The passage runs thus:—"May 5, 1665. After dinner to Mr. Evelyn's; he being abroad we walked in his garden, and a lovely and noble ground he hath: and among other rarities, a hive of bees which, being lived in glass, you may see the bees making their honey and combs mighty pleasantly."

#### *Papers read.*

Mr. Müller read a paper on the "Dispersal of Non-migratory Insects by Atmospheric Agencies," in which he had collected together many records in support of his opinion that various atmospheric phenomena played a considerable part in the wide dispersal of insects, and explained many points connected with their present geographical distribution.

In the discussion which followed, the President said he was quite of opinion that currents of air were the chief agencies in the peopling of oceanic islands with the smaller forms of animal life; though, no doubt, floating timber had the same effect, but in a lesser degree.

Mr. Bates and Mr. Pascoe asked how it was that the Coleopterous fauna of the opposite sides of high mountains, and mountain-chains, presented such marked differences, if their insect-inhabitants were liable to be carried over the summits by atmospheric agencies? And Mr. F. Smith, Mr. Pascoe, and Mr. M'Lachlan remarked on the extreme difficulty of naturalising insects in localities which apparently present no important climatic differences from those in which the species experimented upon are abundant.

Mr. Müller, agreeing with the suggestion thrown out by several members, explained this by the hypothesis, that though many individuals are dispersed in the manner he indicated, yet, owing to causes difficult to comprehend, the strangers are unable to cope with the pre-existing denizens of the locality, and thus only very few are able to maintain their position, and most of these die out before they are able to give birth to new varieties or incipient species.

Mr. Bates said that this explanation quite accorded with his own views on the subject.

Mr. Smith enquired the exact meaning attached to the terms "migratory" and "non-migratory," as applied to insects, in connection with Mr. Müller's paper.

Mr. Stainton suggested that in the one case the insects might be considered free agents, whereas, in the other, compulsion was necessary to force them from their customary habitats. But it was remarked that the terms were ill chosen, inasmuch as migration, in the sense in which the term is applied to birds, does not exist with insects, much of the so-called migration of these being dependent upon the supply of food being insufficient to satisfy the wants of vast hordes of a particular species; this, in some cases, as in the locusts, being the normal condition, rendering them habitual wanderers, whereas, in others, it was of only occasional occurrence.

Mr. H. Jenner-Fust communicated a supplement to his paper "On the Distribution of Lepidoptera in Great Britain and Ireland."

*New Part of 'Transactions.'*

Part 5 of the 'Transactions' for 1870 was on the table.

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6 March, 1871.

A. R. WALLACE, Esq., President, in the chair.

*Donations to the Library.*

The following donations were announced, and thanks voted to the donors:—'Proceedings of the Royal Society,' No. 125; presented by the Society. 'Bullettino della Società Entomologica Italiana,' anno secondo, trim. iv.; by the Society. 'The Journal of the Linnean Society,' Zoology, No. 50; by the Society. 'The Journal of the Quekett Microscopical Club,' No. 13; by the Club. 'The Canadian Entomologist,' vol. ii., Nos. 10 and 11; by the Editor. 'Species of the genus Buprestis of Linneus, described previous to 1830;' by the Author, Edward Saunders, Esq., F.L.S. 'Considérations sur la classification et la distribution géographique de la famille des Cicindélites,' par A. Preudhomme de Borre; by the Author. 'Synopsis Coleopterorum Europæ et confinum,' anno 1868, descriptorum, Auctore G. R. Crotch, M.A.; by the Author. 'The Spangle of the Mango leaf,' by Albert Müller; by the Author. 'The Zoologist' for March; by the Editor. 'The Entomologist's Monthly Magazine' for March; by the Editors.

*Election of Members.*

The following gentlemen were ballotted for, and elected:—Baron E. de Selys-Longchamps, as Honorary Member; the Rev. T. A. Preston, M.A. (formerly a Subscriber), as Ordinary Member; and G. C. Champion, Esq., as Annual Subscriber.

*Exhibitions, &c.*

Mr. Jenner Weir exhibited a small collection of butterflies, taken by Mr. Poole, in Madagascar.

Mr. F. Smith exhibited portions of two small branches of ash, from which the bark had been neatly removed all round. He had received them from the Rev. J. Hellins, of Exeter, accompanied by a note, in which Mr. Hellins stated that, one day last summer, he had observed a hornet busily engaged in removing the bark from these branches. Mr. Smith could not believe that the hornet was providing building-materials for its nest, as he had invariably found this to be composed of friable paper, apparently formed from dead or decayed wood. Upon referring to Réaumur's 'Memoires,' he found that that keen observer had recorded a precisely similar circumstance, and he, Mr. Smith, was inclined to think the insect was endeavouring to extract the sap, from the inner wood, as food.

Mr. Smith further called the attention of the Meeting to a letter from the Marquis Spinola, published in the 'Revue Zoologique' for 1844 (p. 240), in which the writer maintained his belief in the luminosity of Fulgora, stating that M. Kaifer, who accompanied Prince Eugène de Carignan on his voyage, had observed, at Santos, in Brazil, a very large Fulgora emitting a brilliant light. On the strength of this and other statements, especially that of Baron Ransomet respecting a Chinese species, Mr. Smith was quite of the opinion that Fulgora is luminous, at any rate occasionally, notwithstanding all that had been said and written to the contrary.

Mr. Dunning exhibited a parasite, which he had recently taken from a peacock. This was evidently the *Pediculus pavonis* of Linné and the older authors; but, by all recent writers on these insects, it was termed *Goniodes falcicornis* of Nitzsch; and Nitzsch, in Germar's 'Zeitschrift,' actually gave Linné's name as a synonym, for what reason he knew not.

Mr. Lewis exhibited examples of antennal malformation in Lepidoptera, comprising (1) a specimen of *Melitaea Cinxia*, in which the apical half of one antenna was aborted; (2) *Cymatophora diluta*, with one antenna congenitally wanting; and (3) *Scopelosoma satellitia* in the same condition, and, in this specimen, the corresponding eye was enveloped in a cuticle. He also exhibited *Melitaea Cinxia*, with malformed hind wings.

Mr. Butler exhibited examples of *Cœnonymphia Satyrion* from the opposite sides of the Gemmi. These individuals showed marked variation,

and he thought it probable they represented the ordinary condition of the species on either side of that mountain-pass.

Mr. Albert Müller communicated the following notes on a Cecidomyia, causing galls upon *Campanula rotundifolia* :—

" Mr. James W. H. Traill, of Old Aberdeen, has sent to me several specimens of *Campanula rotundifolia*, Linné, gathered by him in August last on exposed braes, two or three miles to the north of that city, which specimens are infested by the larvæ of a Cecidomyia. They occur both in the seed-vessels and in green, small, globular, monothalamous axillary galls, developed from buds. On some shoots almost every bud is appropriated by the gall, and one specimen presents a terminal cluster of them. Mr. Traill has suggested to me that the galls are, probably, abortive flower-buds, and I am inclined to concur in his opinion, owing to the presence of the larvæ in the seed capsules as well. One of the latter disclosed an immense number of unripe seeds, each one tenanted by the very young oval larva, the smallest quite white; older ones 1 millim. in length, flattened, the centre of the body longitudinally purple-red, the remaining parts almost transparent. At this stage the larvæ looked very pretty in the seeds, of which they had consumed the contents, presenting the appearance of living rubies, cased in flat capsules of transparent horn. Adult larvæ—taken singly from the galls, and in number from the seed capsules—were 3 millim. in length, 14-jointed, elongated, reddish, with darker intestine; their first segment very slender, beak-like. In the full grown state they were lively; but in the earlier stages they appeared rather sluggish. I regret that mildew killed the whole brood; but I hope, with Mr. Traill's kind assistance, to rear the perfect insect this season. In the meantime I propose for it the name of *C. Campanulæ*, as its peculiar mode of life warrants my considering it a new species, distinct from all those whose economy is known to me."

#### *Papers read, &c.*

Dr. Sharp communicated "Notes on some British species of *Oxypoda*." After remarking upon the extreme state of confusion that existed respecting the species of this genus, Dr. Sharp proceeded to critical notes upon most of the previously recorded British species, and described four as probably new to science, viz. *O. petita*, hitherto confused with *O. cunicularia*, *Er.*, generally distributed in England and Scotland; *O. edinensis*, from near Edinburgh; *O. verecunda*, from near London and in the fens; and *O. tarda*, from salt-marshes near Dumfries.

Mr. Lowne (who was present as a visitor) read, "Observations on immature sexuality and alternate generation in insects." The author thought that species originated occasionally from the maturity of the sexual organs before the acquirement of the adult characters. He had been

induced to believe that such is the case, from the early period at which the sexual organs first make their appearance in the embryo and larva, from the fact that some larvae have been taken *in copulâ*, and from an analogous phenomenon which had been observed among the Echinodermata. In the course of the paper he had occasion to enter largely into details of correlation of development between the cutaneous and sexual organs in insects. He stated his belief that such correlations often gave rise to secondary sexual characters. The paper concluded with a comparison between acquired and direct larval forms. The author thought the larva and pupa of insects were probably all acquired, and not direct, stages of development.

With reference to Mr. Lowne's remarks on the early development of the sexual organs in insects, and with a view of disproving a not uncommon idea that the sex is determined by the supply of food (or its quality) furnished to the larva, Mr. Briggs detailed some experiments he had made. A number of larvae of *Liparis dispar* were separated into two divisions, about sixty in each. One lot were fed upon hawthorn, the other upon elm. In the elm-fed larvae the imagoes produced were about equal as to sex, but there were only two perfect females; the males of the ordinary size. In those fed upon whitethorn, the sexes were again about equal in number, but the males were much smaller and paler, whereas the females were much finer, and scarcely any of them imperfect. Again, with a view of determining whether any truth exists in the statements of old authors that larvae differ in colour according to sex, Mr. Briggs experimented upon two forms of the larva of *Trichiura crataegi*; one form being ringed, somewhat like the larva of *Bombyx rubi*; the other mottled. These forms were figured by Hüibner as of different sexes; but the first-named seemed to be dying out, and was described by none of the more recent writers. From a batch of eggs, Mr. Briggs obtained about thirty larvae of each form: firstly, a male imago, produced from a larva of the ringed form, was paired with a female of the mottled form; secondly, these conditions were reversed; thirdly and fourthly, each form was paired with its like. From these four experiments in no one instance was the ringed form of larva obtained; and it did not reappear after breeding in to the third generation.

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20 March, 1871.

A. R. WALLACE, Esq., President, in the chair.

*Election of Members.*

Prof. P. M. Duncan, M.D., F.R.S., &c., and Ernest S. Charlton, Esq., were ballotted for, and elected Members of the Society.

*Exhibitions, &c.*

Mr. Dunning read the following letter received from the Rev. L. Jenyns, of Belmont, Bath:—

"I see in the Proceedings of the Entomological Society (Part v. 1870, p. xxxiv.) notice of a communication, made at the Meeting of the 7th of November, respecting large swarms of flies, referred to *Chlorops lineata*, which had appeared in September in a room in the Provost's Lodge at King's College, Cambridge. It may be worth drawing the attention of the Society to the circumstance of the same phenomenon having occurred, probably in the same room, in 1831, thirty-nine years ago, where it was witnessed by myself, the late Provost, Dr. Thackeray, having invited me to come in and see it. Of that phenomenon I published a full account at the time in Loudon's 'Magazine of Natural History' (vol. v. p. 302), and it was afterwards reprinted in my 'Observations in Natural History' (p. 275), published in 1846.

"In reference to the occurrence of this fly in King's College Lodge in September last, Prof. Westwood 'thought it was with a view to hibernation.' This in itself seems not improbable; but the remarkable thing is, in this case, that the same house, if not the same room, should have been selected by this species of insect for the above purpose over a period of nearly forty years, during which time there must have been a succession of many generations. On the occasion of the swarms in 1831, it was about the 17th of September, so far as could be remembered, that these insects first showed themselves; and it was thought that they had entered the room very early in the morning, by a window looking due north, which had been open during part of the night, having been first observed between 8 and 9 A. M. For further particulars I would refer those who are interested in the matter to my original notice of the phænomenon."

Mr. Müller made some observations on the varieties of *Cœnonympha Satyrium*, from the Geanni, exhibited by Mr. Butler at the last Meeting. He had compared the specimens with those taken by himself in other parts of Switzerland, and with the descriptions given by Swiss authors, and found the species showed a considerable general tendency to variation.

Mr. Verrall exhibited a dipterous insect, *Pipiza noctiluca*, taken by himself at Rannoch, to the head of which was adhering a foreign substance, apparently a fungoid growth. Several members dissented from this explanation of the nature of the substance in question, and thought it was probably the pollen-mass of an orchid.

Mr. Müller exhibited a gall on a species of *Carex*, concerning which he read the following notes:—

"The present Lord Walsingham kindly sent to me, in the middle of September last, a growing plant of an undetermined species of *Carex*,

collected near Thetford, in Norfolk, pointing out to me at the same time some curious galls on its leaves. They may be described as oblong, of the size of a grain of wheat, and as attached longitudinally to the blades of the Carex, sometimes in groups. When fresh they were of a paler green than the plant itself; in their present dry state they are coffee-brown, and remind one vividly, by size and colour, of the brown cocoons of certain Nemat. But this resemblance is only superficial: they form part and parcel of the plant, and derive, in their fresh state, their sap direct from its tissues. They are monothalamous. I potted the plant immediately on arrival, but notwithstanding my constant attention I have failed to rear the maker of these excrescences, so I record my observations so far, in the hope that other naturalists will be luckier than myself."

*Papers read, &c.*

Mr. C. O. Waterhouse communicated a paper "On a new genus and species of Lucanidae (*Apteroecylus honoluluensis*) from the Sandwich Islands."

Mr. Wollaston communicated a memoir "On additions to the Atlantic Coleoptera." In this paper he recorded the additions to the combined fauna of the Madeiras, Salvages and Canaries, noticed since the publication of his 'Coleoptera Atlantidum' in 1865. The new species were thirty-three in number, but he had expunged two species from the list, leaving the total number at 1480, as against 1449 in 1865: sixteen of the additions he described as probably new to Science. The total number of species were distributed thus:—Madeiras 694, Salvages 27, Canaries 1013. Mr. Wollaston proceeded further to notice certain changes in nomenclature that had become necessary; and alluded to the discoveries of Mr. Godman in the Azores, which, according to the list published by Mr. Crotch, seemed to affiliate this group with the more southern Atlantic archipelagos. The introductory portion of the paper terminated with an examination of the origin of the beetle-fauna of these islands, according to the theories of Mr. Murray, as enunciated in his treatise 'On the geographical relations of the chief Coleopterous Fauna,' and of Mr. Wallace, as explained in his recent presidential Address. From observations made *in situ*, establishing a remarkably homogeneity of character in the fauna of the several groups, up to a certain nucleus, and then diminishing towards the south, Mr. Wollaston adhered to his original idea of a former land-connection between the groups, afterwards broken by some gigantic catastrophe: and in this respect he favoured the views of Mr. Murray more than those of Mr. Wallace, who contended that the insect-population had been chiefly influenced by atmospheric phenomena, such as storms and hurricanes. He remarked, in support of his opinion, that storms were of very rare occurrence in that part of the Atlantic, the wind blowing as a moderate breeze almost

uninterruptedly from the north-east, with an occasional storm from the south; and he was willing to admit that these storms might possibly account for the slight African element in the fauna; but the large number of Mediterranean types could not, in his opinion, have originated from atmospheric causes. Floating timber, and human agency, especially the introduction of plants from Europe, and from one island into another, no doubt played a not inconsiderable part both in the character of the fauna as a whole and in its details.

A lengthened discussion followed the reading of this paper, in which the President, Mr. Bates and Mr. Murray, who was present as a visitor, took part.

Mr. Bates considered that Mr. Wollaston had adduced no new facts calculated to convert those who do not believe that the present community of species in these islands is to be explained by former land-connection, *inter se*, and with south-western Europe. Mr. Wollaston had not endeavoured to meet the objection to his theory, raised by Sir C. Lyell in his 'Principles of Geology,' *viz.*, that the Atlantic Islands, and especially the Azores, are separated from the continent of Europe by a sea of from 10,000 to 15,000 feet in depth. It was pretty generally acknowledged that all great geological changes were extremely slow in their operation, and this being the case, a land-depression of that magnitude must have occupied a length of time that could only be measured by geological epochs; in fact, would throw back the operation to a period probably prior to the origin of the now existing insect fauna of the islands. It was not in accordance with the present state of Science to call to our aid the idea of "great catastrophes," or if that course be adopted, we should be prepared with facts in support of the theory.

Mr. Murray agreed with Mr. Bates with regard to his remarks on "great catastrophes," and thought Mr. Wollaston in that respect had chosen a wrong position; but he did not agree with him in his estimate of the length of time necessary for the operation of great geological changes. Fossil shells, &c., from Solenhofen were referrible to recent genera, and Prof. Heer had identified the fossil plants of the miocene of Madeira with genera now existing there. Furthermore, it was known that *Cardium edule* was found in a fossil state in the Aralo-Caspian region and in the Sahara, and he thought the elevation demonstrated by this fact was not opposed to the idea of a corresponding depression in the Atlantic. The great objection to his mind, to the theory of population by atmospheric means, was the remarkable homogeneity of form in the fauna of the various groups. If the fauna were derived from atmospheric agencies there would not be this community of form. As a proof of this he would cite Keeling Island, which has an insect fauna of nineteen species, belonging to almost as many orders.

Mr. Bates could not consider the argument of the existence of *Cardium edule* in the Aralo-Caspian basin as of much weight, it not proving the operation of great elevation within a comparatively recent period, the district in question being still eighty-three feet below the sea-level.

The President said it was impossible with him to overcome the geological difficulty in the way of a supposed former land-connection; for though he could readily believe in great elevation or depression, either continuous or alternate, yet it was a generally received opinion that the great depths between these islands and the continent of Europe had existed since the secondary period. The example of Keeling Island, as noticed by Mr. Murray, was of little importance, because, being a coral island, it was of very recent date, and, as there was little variety of vegetation, it was impossible for the insects to show great increase; but, let the island become more elevated, and its flora more varied, then its few involuntary insect immigrants would each become the nucleus of a group of generic forms. Mr. Murray had not explained the greatest objection to Mr. Wollaston's theory, the wonderful absence in the Atlantic Islands of indigenous mammals and reptiles, which, if the islands be the remnants of a once-existing continent, ought certainly to be represented; neither did he account for the absence of the apterous groups of bulky European heteromeroous beetles, such as *Pimelia*, &c., an absence the more remarkable in the face of the fact that genera, and even species, of other families, become apterous in the islands, though they are winged in Europe.

In connection with the absence of mammals, Mr. Bates alluded to the almost total want of coprophagous beetles, a group very numerous in species in those parts of Europe that approach nearest to the Atlantic islands.

3 April, 1871.

A. R. WALLACE, Esq., President, in the chair.

*Donations to the Library.*

The following donations were announced, and thanks voted to the donors:—‘Proceedings of the Royal Society,’ No. 126; presented by the Society. ‘The Zoologist’ for April; by the Editor. ‘The Entomologist’s Monthly Magazine’ for April; by the Editors. ‘Report of the Fruit-growers’ Association of Ontario for the year 1870;’ by the Association. ‘Exotic Butterflies,’ part 78; by W. W. Saunders, Esq. ‘Lepidoptera Exotica,’ part viii.; by Mr. Janson. ‘Die Alpenkafer und die Eiszeit,’ by P. V. Gredler; by Mr. Müller.

*Exhibitions, &c.*

Mr. F. Smith exhibited examples of gynandromorphism in Aculeate Hymenoptera, and read the following notes:—

“1. In 1836 I took *Anthophora acervorum*, in the month of April, at Barnes, Surrey. In this example the male characters are very conspicuous, and are all situated on the left side, most conspicuously so in the head, thorax and legs. This specimen is figured in the ‘Zoologist,’ vol. iii., and also in my book on British Bees.

“2. A second example of *Anthophora acervorum* is in the collection of the late Mr. Walcott, of Bristol: but the sexual peculiarities of structure are much less apparent than in that exhibited.

“3. *Andrena thoracica*. In this specimen the male characters are on the right side, and are observable in the antennæ, head and legs.

“4. *Nomada baecata*. In this specimen the male characters are found to be on the left side; the head is about equally divided sexually; the antennæ having in the male sex the front side white, and also a white line at the inner margin of the eye, and the face covered with silvery hair; the male mandible is longer and pointed at the tip; in the female it is blunt. The thorax is coloured as in the female. The abdomen exhibits a strange peculiarity; the apical segment above is blunt, as in all the females of the genus, whilst beneath it is acute; there are the usual six segments above, beneath there are seven. Taken at Weybridge in 1845.

“5. *Apis mellifica*. A monstrosity, partly male, partly worker. Antennæ worker on both sides; eyes worker; left anterior leg male; the right intermediate leg and also the posterior one male; the abdomen has the silky gloss of a male, and is in form partly so, being more blunt at the apex: the male organ of generation is partly protruded. This specimen was sent to me by Mr. Woodbury, of Exeter.”

Mr. W. A. Lewis called attention to the ravages reputed to be occasioned to books by *Lepisma saccharina*, with reference to Mr. Quaritch’s statement made before the Society at the Meeting held on the 3rd of January, 1870. Although it was acknowledged that *Lepisma* damaged books by eating the paste of the bindings, thus causing them to fall to pieces, yet it had been considered impossible for it to bore holes in the books, as stated by Mr. Quaritch, such ravages being considered due to *Anobium*. However, upon referring to Dr. Packard’s ‘Guide to the Study of Insects,’ Mr. Lewis found that the author (p. 623) endorsed the opinion that *Lepisma* is a borer.

Mr. Horne alluded to the damage done to silk garments in India by *Lepisma*; the insect evidently attacking the silks on account of

the stiffening matters in them, but, nevertheless, making holes in the fabric.

The Secretary exhibited a number of beautiful coloured figures of Chinese Lepidoptera, executed by Mr. E. Holdsworth, of Shanghai.

*Papers read, &c.*

Mr. W. A. Lewis read a paper on the order of the groups of the Macro-Lepidoptera. He criticised and condemned the arrangement introduced by Mr. Doubleday's List of 1859, and accompanied the statement of his views with a variety of comments on the modern works dealing with his subject, particularly Dr. Knaggs' 'Cabinet List of Lepidoptera' and Mr. Newman's 'Natural History of British Moths.'

The paper first stated the order of arrangement by different authors from Linnaeus to the present day, the conclusion arrived at being that the Linnean order was followed almost without deviation by every author down to the year 1859; also that the Linnean names of the different groups were adopted very generally until the same date. Mr. Lewis remarked that since 1859 we in England had been subjected to the discomfort of having two rival systems of arrangement, the followers of neither of which take the smallest recognition of the other. He noticed severally the groups of Doubleday's List, and stated, successively, reasons against the acceptance of the names Diurni, Nocturni, Drepanulae and Pseudo-Bombyees; contending, in effect, that, in the case of the two first-named groups, the new names were, from their history, inapplicable: and as to the others, that both divisions had prior names. He also objected to the name "Pseudo-Bombyees," on the further ground that the scheme of classification of which that group forms part does not acknowledge a group "Bombyees," and therefore a group "Pseudo-Bombyees," in the same scheme, is a solecism.

Mr. Lewis expressed his belief that the existence of the group Pseudo-Bombyees was entirely owing to the necessity, in M. Guenée's view, of maintaining the order of the Noctua which he, and other authors, had observed. To do this it was necessary to place them in the old position next after some Bombyciform genera, as the group had been arranged to "face towards" Bombyx. Mr. Lewis contended that the course followed was empirical, and was, besides, a failure, because the order of the Noctua still led one to expect the Geometrae at the end of the group. He contended, also, that the division of Bombyx had become a necessity when M. Guenée determined to place Geometra next to Bombyx without re-arranging Noctua, and that the part of Bombyx separated was then never in doubt, since Platypteryx (as everyone had remarked since Linnaeus) would easily join the Geometrae and Cerurie. He showed that M. Guenée had (in 1852) admitted that in order to give effect to the

affinity of Geometra to Bombyx, it would be necessary to re-arrange Noctua, and in his plan, then proposed, made no suggestion that it would be necessary to divide Bombyx. Mr. Lewis also gave a variety of reasons against the new order.

He also mentioned that some of the species now grouped as "Pseudo"-Bombyces had, by Latreille, been denominated "Bombycites Legitimæ," and some by Hübner "Bombyces veræ"; that the twenty-seven species now separated from the Bombyces by the whole of the Geometræ were, by Westwood and other writers, considered so closely akin to the "true" Bombyces that they were included *in the family Arctiidæ*; and that the Linnean order, from which the order of 1859 showed so great a departure, had received illustrations of its propriety in the nomenclature adopted by Denis and Schiffermiller, by Hübner, Horsfield, Boisduval, and many others, *rīz.* Noctuo-Bombycidæ, &c., Semi-Geometræ, &c., Semi-Noctuales, &c. Mr. Lewis then expressed his opinion that, considering the concord among first-rate entomologists in favour of the Linnean order, the introduction of the new arrangement "*sub silentio* in a mere labelling list" was "an affront to Science."

Considering recent publications, Mr. Lewis showed that Dr. Knaggs (in his 'Cabinet List of Lepidoptera') had failed to observe, in a number of instances, his own canon requiring preference of the female name when two names are simultaneously given to the two sexes of a species, instancing, besides others, the names "Janira," "Arcuosa," which should have been "Jurtina," *Linn.*, "Minima," *Haw.* He also complained that this publication, like Mr. Doubleday's Lists, assumed, though published with an object altogether different, to introduce changes in arrangement. With reference to Dr. Knaggs' proposal to place Pterophorus after Pyralis, he remarked that "if such a change was to be so brought about it was a waste of time ever to write a book." Remarking on a passage in Mr. Newman's 'Natural History of British Moths,' as to Mr. Doubleday having "approved" certain changes, Mr. Lewis declared that what entomologists want is not that changes should come to them "stamped with the approval of this or that leading man, but that an author, who proposes any change in nomenclature or arrangement, would first state all his reasons, and then leave the approval to *them*."

Mr. Lewis strenuously protested against any changes in arrangement being introduced in a mere list of synonyms, and quoted M. Guenée as satirizing the practice. As to changes in names, he suggested that the legal maxim "Communis error facit jus" might with advantage be applied in cases of long-forgotten specific names, as he felt assured it would, in effect, be, in the case of the misapplied generic names detailed by Mr. Crotch in the Ent. Soc. Trans. for 1870; and he also condemned the insufficiency of the information given by all the English lists, showing that

none of the lists stated the reason for a change of name, or whether the discarded name was supplanted by a prior one, or found to refer to a different species.

With reference to Mr. Lewis's criticisms on recent changes in the arrangement of British Lepidoptera, Mr. Briggs remarked that Mr. Newman, in his 'Natural History of British Moths,' had united *Tapinostola Bondii* and *Miana areuosa* into a genus termed *Chortodes*, giving no reason for this change excepting Mr. Doubleday's "approval." Mr. Briggs had examined the palpi of these two species, and found they were very dissimilar; he considered, therefore, that this union of the two into a special genus was unnatural.

*New Part of 'Transactions.'*

Part i. of the 'Transactions for 1871' was on the table.

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8 May, 1871.

Prof. WESTWOOD, M.A., F.L.S., Vice-President, in the Chair.

*Additions to the Library.*

The following donations were announced, and thanks voted to the donors:—'Proceedings of the Royal Society,' No. 127; presented by the Society. 'Verhandlungen der k. k. zoologisch-botanischen Gesellschaft in Wien,' t. xx.; by the Society. 'Berliner Entomologische Zeitschrift,' 1870, Heft 3 & 4, and Beiheft 1871, Heft 1 & 4; by the Society. 'Bullettino della Società Entomologica Italiana,' t. i. fasc. 2; by the Society. 'Third Annual Report on the Noxious, Beneficial and other Insects of the State of Missouri, made to the State Board of Agriculture, pursuant to an Appropriation for this purpose from the Legislature of the State,' by Charles V. Riley, State Entomologist; by the Author. 'The Journal of the Quekett Microscopical Club,' No. 14; by the Club. 'Recherches Physico-chimiques sur les Articulés Aquatiques,' par Félix Plateau, 1<sup>e</sup> Partie; by the Author. 'Catalogue of Zygopinae, a subfamily of Curculionidae, found by Mr. Wallace in the Eastern Archipelago,' by Francis P. Pascoe, F.L.S., &c., late Pres. Ent. Soc.; by the Author. 'Petites Nouvelles Entomologiques,' Nos. 28 & 29; by the Editor. 'The Zoologist' for May; by the Editor. 'The Entomologist's Monthly Magazine' for May; by the Editors.

By purchase:—'Catalog der Lepidopteren des Europäischen Faunengebiets,' I. Macro-lepidoptera bearbeitet von Dr. O. Staudinger; II. Micro-lepidoptera bearbeitet von Dr. M. Wocke. 'Skandinavicens Coleoptera synoptisk bearbetade af C. G. Thomson,' tom. x.

*Exhibitions, &c.*

Mr. Higgins exhibited collections of exotic insects from Natal and Borneo. In the former were magnificent examples of several of the larger South-African Bombyces, bred from the larvæ; and he also exhibited a series of figures of these larvæ, executed by what was described to him as a "chromo-photographic process," the figures having evidently been obtained by means of photography, and presenting their natural colours.

Mr. Meek exhibited the example of *Nyssia lapponia* (male) of Boisduval, recorded in the 'Entomologist's Monthly Magazine,' vol. vii. p. 282, as having been recently taken by Mr. Warrington at Rannoch, Perthshire, new to the British Fauna.

Prof. Westwood exhibited a collection of varieties of British Lepidoptera, obtained by Mr. Briggs from an old collection formed in the time of Haworth. Among them were singular forms of *Lycæna dispar*, *Leucophasia sinapis*, *Lithosia helveola*, &c.

The Rev. R. P. Murray exhibited a series of Lepidoptera captured in Switzerland, including an example of *Lycæna Euridice* (said by Staudinger to be a form of *Hippothoe*), in which the spots of the under side formed long streaks.

Mr. Bicknell (on behalf of Mr. Cowan, who was present as a visitor) exhibited an extraordinary specimen of *Gonepteryx rhamni*, captured by Mr. Cowan at Beckenham, in March, 1870. This example was a male of the ordinary form, but the costal margin of each anterior wing was broadly, but unequally, suffused with bright rose-colour or scarlet, and the right posterior wing was marked in a like manner.

Mr. M'Lachlan suggested that possibly the wings of the insect had come in contact with some substance during hibernation, which had chemically altered the coloration.

Mr. Janson said he had noticed that yellow insects killed by cyanide of potassium became red.

Mr. Cowan said the individual exhibited had been killed by chloroform, and moreover it was in precisely the same condition when captured.

Mr. Bicknell also exhibited varieties of other British Lepidoptera.

Mr. Stainton exhibited beautifully-executed coloured figures of the mines of various Micro-Lepidoptera, collected at Santa Marta, by Baron Von Nolcken, who had proceeded upon an entomological expedition to New Granada.

Mr. Champion exhibited *Seydmænus rufus*, Müll. & Kunze, a beetle new to the British list, recently captured by him in Richmond Park, as recorded in the 'Entomologist's Monthly Magazine,' vol. vii. p. 273.

Mr. M'Lachlan exhibited a tusk of an Indian elephant, placed in his hands by Dr. Slater, accompanied by the following explanatory note,

extracted from the Report of a recent meeting of the Zoological Society:—

“Mr. Selater exhibited a pair of tusks of a female Indian elephant (*Elephas indicus*), which presented the appearance of having been corroded or eaten away in the basal portion, immediately adjacent to the end projecting from the gums. Just below this, on the outer side of each tusk, was deposited a mass of egg-like bodies arranged in regular series, apparently of some dipterous insect, and somewhat resembling those of the common blow-fly (*Musca vomitoria*). These tusks had been submitted to Mr. Bartlett for examination by Mr. G. S. Roden, of the 1st Royals, lately stationed in India, who had communicated to Mr. Selater the following note on the subject:—‘The tusks which I left with Mr. Bartlett belonged to a female elephant, which I shot last June at a place called Muddry, at the foot of the Manantowady Mountains in Malabar. Directly after shooting her I lifted up her lips to see the size of the tusks, and then noticed the deposit of eggs on them. I had them carefully cut out. On cleaning the tusks afterwards I noticed that they had been eaten away at the ends, and also near where the white eggs were. *There were no maggots* in the grooves at the end of the tusks; they were merely filled up with some dark dry clay, just the same as what you now see the eggs now surrounded by. The tusks have been slightly polished over, but I took great care that the eggs should not be touched.’ Mr. Selater remarked that a previous notice of the same phenomenon had appeared in a letter addressed to the ‘Field’ newspaper on the 12th of March last, signed by a well-known Indian sportsman, under the pseudonym of ‘Smoothbore’:—‘Has any zoologist or microscopist ever noticed how the tusks of female elephants are attacked and eaten away by some parasite? and is it not most singular that this has never been observed in the tusks of the male?’ Mr. Selater added that he had been informed by Prof. Flower that there was an exactly similar pair of tusks in the Museum of the Royal College of Surgeons, but that he had hitherto sought in vain for any information as to the name of this extraordinary parasite that was able to digest ivory.”

The eggs in question were each about 1<sup>1</sup>/<sub>2</sub> in length, hence of enormous bulk as compared with those of *Musca vomitoria*.

Mr. M'Lachlan was of opinion that the decay of the tusk was not directly traceable to the larvæ produced from these eggs, and therefore there was no evidence that the insect “digested” ivory. He thought rather that the parasite took advantage of an already diseased condition, and possibly fed upon the morbid secretions thereby generated. Prof. Westwood thought that possibly the habit was not a normal one, and that the parasites had simply been attracted by the disease, in the same way that flies frequent festering wounds. Dr. Selater desired information as to what creature

was likely to have produced the eggs, but no Member present had before heard of a similar instance.

Mr. W. A. Lewis exhibited an earthenware jar, of Chinese manufacture, about the shape of an ordinary tobacco-jar, and which was being used as such by a friend some time resident in China, from whom he obtained it. His friend narrated that the same description of jar was used by the inhabitants of Pekin for the purpose of confining what was termed the "great fighting beetle." According to him the Chinese used this beetle for sporting purposes. Each was placed in a separate jar and allowed no nutriment other than water absorbed by the very thick porous bottom of the jar. Under this treatment they became very ferocious, and were then pitted one against the other.

Prof. Westwood reminded the meeting that the Chinese had long been known to employ Mantidæ in a similar manner.

Mr. Lewis, Mr. M'Lachlan and other Members brought before the notice of the meeting, paragraphs that had been going the round of the newspapers, concerning a phœnomenon observed apparently on two recent occasions at Bath; it appearing that after violent storms the ground was covered with some creatures, variously described as Annelides and Insects, which had baffled the knowledge possessed by the "scientific men" of that city.

Prof. Westwood thought the creatures were probably Branchipus stagnalis, a large fresh-water entomostracon.

Mr. Müller communicated the following note on a gall found on *Pteris aquilina* :—

"In March, 1869, Mr. Rothney placed in my hands a chip-box containing a dessicated excrescence of about the size of a very large pea, and some Cynipideous insects, as well as two specimens of a Callimome. Mr. Rothney informed me at the same time that he had found this excrescence on the common bracken (*Pteris aquilina*) at Shirley. The excrescence was bleached to a straw-colour, but its condition prevented my being able to form a correct opinion as to the plant from which it was taken; and besides I then knew of no gall on any fern. On dissecting the gall I found it composed of an accumulation of small larval cells, some of them still containing dead specimens of the maker. The insects being in a very bad condition, I did not think it worth my while to examine them, so I carded them with the excrescence and put them aside.

"Having lately had occasion to peruse Professor Schenck's work on the Cynipidæ of Nassau, I found (at p. 127) the following observation:—  
 'No. 69. There is in the collection of Herr von Heyden a gall on the bracken (*Pteris aquilina*), similar to that of *Diastrophus rubi*; a swelling on the upper side of the stem, curved, resembling an episcopal staff, 1—2" long, full of roundish pierced cells, pale yellowish; a similar straight one in

the same collection has also been taken from that fern. A specimen agreeing with the above curved one is in my collection, but I do not well recollect on what plant I have found it. The galls on the fern belong probably to *Diastrophus rubi*, with the gall of which they quite agree.<sup>1</sup> After reading this passage, I at once examined Mr. Rothmey's Cynipidae carefully, and although they are in a very bad condition I have not the slightest doubt that they are *Diastrophus rubi* of Hartig and Schenck. It now only remains, to complete this observation, to breed *D. rubi* from fresh undoubted fronds of the bracken. Probably the tips of unexpanded fronds are chosen by the insect for the deposition of its eggs; hence the subsequent curved shape of the gall, as described by Professor Schenck."

*Papers read, &c.*

Mr. W. F. Kirby communicated the following notes on the synonymy of certain European Lepidoptera:—

"Pap. (Meditaea) *Cinxia*, var. B, *Gouffroy* -- Pap. *Athalia*, *Rott.* This insect is referred by Godart to *Phœbe*, *Esp.*, and by Werneburg to *Athalia*, *Esp.* Werneburg's identification is probably correct: but if Godart is right, *Phœbe*, *Esp.*, must take the name of *Athalia*, *Rott.*, and *Athalia*, *Esp.*, the name of *Leucippe*, *Schneid.*

"Pap. *Podalirius*, *Linn.* Werneburg is wrong in restoring Poda's name of *Simon* to this species. Even if we take the tenth edition of Linnaeus' 'Systema Naturæ' (1758) as our starting point, instead of the twelfth (1767), still *Podalirius* is named in the tenth edition, and though not described, because at first regarded by Linnaeus as a variety of Pap. *Protesilaus*, is sufficiently characterized by the references which he quotes.

"*Sesia*. In the tenth edition of the 'Systema Naturæ' Linnaeus describes the broad-bordered species as *bombyliformis*, and the narrow-bordered as *fuciformis*, besides *Sphinx Tityus*, which he afterwards considered to be identical with the former. In 'Fauna Suecica,' ed. 2, he describes the narrow-bordered as *fuciformis*: but in *Syst. Nat.*, ed. 12, he describes the broad-bordered under that name, placing *bombyliformis* as a *var.* of *Sph. Porellus*. Under these circumstances the only way of avoiding further confusion seems to be to revert to the tenth edition of the 'Systema,' as is done on the Continent, and to apply the name *bombyliformis* to the broad-bordered, and *fuciformis* to the narrow-bordered species."

Prof. Westwood read "Descriptions of some new Species of Exotic Lucanidæ."

Mr. H. W. Bates read a description of a new genus and species of Longicorn Coleoptera, collected in Matabili Land, Southern Africa, by the

well-known traveller Mr. T. Baines. He exhibited the insect, which he proposed to call *Bolbotritus Bainesi*. It belonged to Lacordaire's group '*Cerambycides vrais*,' and was remarkable for the large and bulbous third antennal joint, the succeeding joints being much shortened. From the same locality he also exhibited examples of *Onthophagus rangifer*, which, instead of being bright coppery as in the Zambesi individuals, were bright green, though presenting no structural differences.

Mr. Bates also read a description of a new species of *Mallaspis* from Chiriqui, near Panama, allied to *M. Beltii*: this he named *M. præcellens*.

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5 June, 1871.

J. W. DUNNING, Esq., M.A., F.L.S., Vice-President, in the Chair.

*Donations to the Library.*

The following donations were announced, and thanks voted to the donors:—'Proceedings of the Royal Society,' No. 128; presented by the Society. 'Proceedings of the Scientific Meetings of the Zoological Society of London,' 1870, Parts 1—3; by the Society. 'Annales de la Société Entomologique de Belgique,' tome xiii.; by the Society. 'Mémoires de la Société de Physique et d'Histoire Naturelle de Genève,' tomes iii. & iv., & tome xx., 2<sup>e</sup> Partie; by the Society. 'Synopsis des Cordulines,' par M. Edm. de Selys Longchamps; by the Author. 'The Zoologist' for June; by the Editor. 'The Entomologist's Monthly Magazine' for June; by the Editors. 'The Canadian Entomologist,' No. 12; by the Editor. 'The Silk Supply Journal,' No. 10; by the Silk Supply Association.

*Exhibitions, &c.*

The Secretary read the following letter (dated May 9th), received from the Rev. L. Jenyns, of Bath, concerning the newspaper reports, alluded to at the last Meeting, as to the supposed showers of insects, or other organisms, occurring at that city:—

"Seeing in the 'Athenæum' that mention was made at the last Meeting of the Entomological Society of a 'so-called storm of insects' that had fallen lately at Bath on two occasions, with reference to the inaccuracy of newspaper reports in scientific matters, I venture to send, for the information of the Members of the Society, a statement of so much as I know respecting the phenomenon in question. I did not witness it, indeed I was not in Bath at the time; but a person who keeps a small inn near the Midland Railway-station, where the phenomenon was observed, on my requesting to see them, showed me some of the organisms still alive, which he had kept in a tumbler of water since the time of their falling. This was several days

after the occurrence of the storm, and, having already parted with a great many specimens, he would not allow me to take one away with me for closer examination at home. But I saw enough to satisfy me as to their nature, if not to identify the exact species. They were not, as may be supposed, true insects, nor were they Entomostraca, as Professor Westwood thought they might perhaps have been, but forms of Infusoria, more especially of the genus Vibrio, large numbers of which were present, some swimming freely in the water, but the greater part congregated in spherical masses about the size of a small marble, each mass being surrounded by a semitransparent filmy sort of skin or envelope, through which the minute worms might be readily discerned with a pocket lens, tangled together and in a nearly quiescent state. I believe them to have been the *Vibrio undula* of Müller ('Animalecula Infusoria,' p. 46, tab. vi. figs. 4—6, 1785), or some very closely-allied species; and his figure gives an exact representation of the appearance of the congregated masses of worms as presented in this instance, this habit being characteristic of the species. He speaks of the masses being sometimes collected round the branchlets of a *conferva* (as given in one of his figures). The surrounding skin, which I have alluded to above, I suspect to have been nothing more than a pellicle of scum, &c., deposited from stagnant water, perhaps rendered thick by evaporation. I was told there had been a sudden squall of wind before there came on a heavy rain, and my idea is that these organisms must have been lifted up by the force of the wind, acting in a gyratory manner, from some shallow pool in the neighbourhood, reduced perhaps to little more than a large puddle, in the centre of which, from the drying up of the water around, the organisms had collected. A boy at the station first noticed them (*i.e.* the above spherical masses) falling on his coat, &c., as the rain came on, and shortly after, as the rain fell more heavily, the platform, so much as was not under shelter,—so I was told,—was covered with them. A few had been observed during a storm some days previous to the fall of of which the above is an account."

Mr. Butler exhibited species of Lepidoptera, upon which experiments had been made by Mr. Meldola, with regard to testing the effects of dyes. The insects were *Pieris brassicæ* and *napi*, *Gonepteryx rhamni*, *Vanessa urticæ*, *Pyrameis Atalanta* and *Aretia caja*. The most striking effects were observable in *P. napi* dyed black, and *A. caja* dyed metallic-green and magenta. The dyes used were aniline. Mr. Meldola dissolved the dyes in spirits of wine and laid them on with a camel-hair pencil. Not being satisfied with Mr. Meldola's experiments, Mr. Butler resolved upon performing others on his own account; but being then ignorant of the system pursued, he dissolved his dyes in hot water, and discovered that the specimens would not take them. He then made a solution of soda, into which he dipped *G. rhamni*, and found that the yellow pigment immediately united with the

soda, and was discharged into the solution, which it visibly coloured, and he saw no reason why, if a sufficient number of individuals were experimented upon, the colour should not be collected and utilised. *Colias Edusa* and *Hyale*, *Danais Chrysippus* and *Vanessa urticæ* were deprived of their natural colours in the same manner. Mr. Butler had experimented upon *G. rhamni* (dyed blue), *C. Edusa* and *Hyale*, *Papilio Demoleus*, *Lycæna Corydon*, *Danais Chrysippus*, *Argynnus Adippe* and *Aglaja*, *Vanessa urticæ*, *Epinephela Janira*, *Arctia caja* and *villica*. The most successful results were obtained with *Danais Chrysippus*, deprived of its natural colours and dyed blue, which colour only entered certain scales, whereas magenta, being a faster dye, entered all: and *V. urticæ*, dyed blue in one case, and magenta in another; the latter resembled a typical South-African *Junonia*, the former a melanitic variety of the same species. The peculiarity in these specimens consisted in certain parts of the wings not taking the dye, leading to the conclusion that the scales are more perfectly closed in these parts.

Mr. Meldola (who was present as a visitor) remarked that he had also made experiments with alkalines; the yellow of *G. rhamni* being removed by soda, and precipitated by the addition of an acid. He possessed an example of *Vanessa Io* altered to deep mahogany-colour by exposure to the fumes of ammonia.

Mr. Bicknell exhibited a number of examples of *Gonepteryx rhamni*, upon which he had experimented with cyanide of potassium, as suggested at the last meeting. The yellow was changed to orange-red in the parts exposed to the cyanide.

Mr. F. Smith stated that he had seen a number of wasps that had been killed by cyanide of potassium, and which, in consequence, were changed to vermillion.

The hope was expressed that these interesting experiments would not be taken advantage of by unscrupulous persons, in consequence of the prevailing disposition to pay high prices for varieties of common Lepidoptera.

Mr. W. C. Boyd exhibited an example of *Rumia cratægata*, taken at Stoke Newington, the apical portion of one anterior wing of which was suffused with brown, the insect being in that condition when caught.

Mr. Müller exhibited the bell-shaped nest of the spider *Aglena brunnea*. Also fresh specimens of the cabbage-galls formed by an undescribed species of four-legged Acari belonging to the genus *Phytoptus*, upon birch; these galls were unusually common this season.

Mr. F. Smith exhibited three rare British Hymenopterous insects sent to him by Mr. J. C. Dale, of Glanville's Wootton, in which neighbourhood they had been captured. They were *Myrmecomorphus rufescens* (a remarkable species of Proctotrupidae), *Ichneumon glaucopterus* and *Osmia pilicornis*.

Mr. Holdsworth, of Shanghai, communicated the following notes on the

method pursued in China in rearing the silk-producing *Bombyx Pernyi*, extracted from a Shanghai newspaper:—

“*Bombyx Pernyi* feeds exclusively on oak leaves, producing a reddish gray cocoon, from which is spun a fine glossy thread; breeds and forms cocoons twice a year, and, unlike *Bombyx mori*, its chrysalis, after the second production, remains in the cocoon till the following spring. Two kinds of oaks are used for its food: one with narrow serrated leaves and conical acorns, the other with broad and long leaves with short round acorns. The latter kind is preferred on account of supplying a larger amount of food. The trunks of the oak trees are cut, as will be explained in the notes, for two reasons: first, to keep the branches within easy reach; secondly, to obtain a better adapted quality of leaves at the requisite time of the season. The alternate use of the bushes is necessary to keep up the successive production of cocoons without damaging the bushes, which would suffer if deprived of leaves twice in the same season, and also to allow sufficient time for them to grow. The dissimilarity of treatment between the first and second production is simply caused by the difference of time of the season in which they take place. At the first production the newly hatched worms, if transferred at once on the bushes in the open air, would be liable to total destruction by a too great fall of temperature; while no such danger is incurred late in summer, when the second production is progressing. It can easily be seen that *Bombyx Pernyi* could be raised altogether within doors; but by so doing it would entail more labour in keeping it supplied with food, besides requiring the continual cutting of fresh branches. This would not only cause a great waste of leaves, but limit the supply.

*“Notes on the Practical System followed in the Province of Shang-tung  
for the cultivation of *Bombyx Pernyi*.*

“Five or six years (according to their growth) after the oaks have been planted, each trunk is cut off close to the roots about November, and in the following year, the new branches springing out round the foot, the truncated trees will form into low bushes. The first year after the oaks have been cut, the second yearly production of cocoons can only be raised on them, and they are afterwards used alternately with others for the consecutive cultivation of the first and second yearly productions. In explanation of the above, let us suppose we have one hundred oak trees. These must be divided into two sections; each section to be cut separately at the interval of one year. Thus, out of one hundred trees, fifty, cut in November 1870, will serve for raising the second yearly production of cocoons in August, 1871, and the first yearly production in May, 1872; while the other fifty trees, cut in November, 1871, will serve for the secend yearly production in August, 1872, and the first yearly production in May, 1873. Once this

system is established, it is followed up by recutting every year that section of the bushes which has already served for two successive productions of cocoons within two years. When the second production of one section takes place in the spring, the recutting is effected in July, directly after the cocoons are gathered; and when it occurs in August the recutting is done in November. In this way both sections are used alternately every year for each production of cocoons, allowing also ample time for the requisite growth of the bushes.

"The cocoons retained for obtaining seed must be kept during the winter at a uniform cold temperature, taking care not to expose them to any heat above 60° Fahr.

"On arrival of the spring, whenever the oaks begin to bud, the cocoons intended for preparation of seed are strung together with thread, in long rows, and suspended in rooms. Care must be taken, in order to facilitate the issue of moths, that the point of suspension of each cocoon must be the same that served to attach it to the leaf-stalk while in course of formation. If the temperature at this time is not sufficiently high for the development of the chrysalis, it must be gradually raised artificially until the moths begin to issue from the cocoons. When the moths are out it is necessary to wait till they have well distended their wings before placing them in the coupling-baskets. Coupling-baskets are lined on the inside with paper pasted all round the sides and bottom, with the exception of the cover, to allow ventilation. The same number of male and female moths are to be placed in the baskets, with sufficient room for free movement. The moths generally issue from the cocoons between 6 and 7 p. m., and their coupling, which takes place directly afterwards, lasts about twenty-two hours. The male moths are then detached from the females and thrown away. The female moths are placed in other baskets like the first, inside of which, on the paper, they will soon deposit their seed. The baskets must be kept closed to prevent their escaping.

"The baskets containing seed are kept in rooms sufficiently warm (about 70° Fahr., the temperature of the season in fine weather), and after twelve days the seed will be hatched. When the young worms are all out, oak-branches with tender leaves are cut and stuck in earthen pots or wooden boxes, filled with well-moistened sand or mud to preserve the freshness of the leaves. The baskets containing the newly-hatched worms are then placed close to the branches, on which the worms will instinctively ascend in search of food; more fresh branches are added in the same manner, as food must always be abundantly supplied. When the worms have passed the second *muta* (Italian term for each successive period of feeding and sleeping of silkworms), a fine day is chosen to transfer the worms to the bushes. This is done by holding the branches, on which the worms are, close to the bushes, paying attention to distribute them well, so as to avoid

placing too many on some bushes and too few on others. A certain number of bushes are always to be kept in reserve, in case that it should be found necessary to remove to them worms which have consumed all the leaves where first placed. This operation is done by cutting the branches bearing the worms and transferring them as already indicated. In case it is not convenient to do so, then each worm must be seized with the thumb and fore finger by the posterior end, and suddenly pulled off at the same time; otherwise, such is their power of adhesion, they would be torn to death sooner than relinquish their hold. All kinds of birds must be kept away, to prevent the destruction of the worms.

"*Bombyx Pernyi* undergoes five *muta* of the following periods:—

1st	<i>muta</i>	from	4	to	5	days.
2nd	"	"	7	"	8	"
3rd	"	"	9	"	10	"
4th	"	"	10	"	11	"
5th	"	"	12	"	13	"

having in average, from the hatching to the beginning of formation of cocoon, a period of forty-five days. The worms, after undergoing the fifth *muta*, will form the cocoons in about three days; but as a general rule they are not gathered till after the fifth day, in order to give time for the perfect formation of cocoons by such worms as are somewhat later than others.

"The cocoons reserved for obtaining seed for the second yearly production are spread out to dry for three or four days, and are then strung together, as mentioned for the first production. The moths will issue from the cocoons after twelve or fifteen days from the gathering of cocoons. The coupling-baskets used this time are not provided with paper, on account of the high temperature of the season (August). The females when separated from the male moths, instead of being replaced in baskets, are fastened with a thread by one of their larger wings, and tied (leaving a few inches scope) on bunches of fresh-cut branches with leaves, which are suspended by their cut ends: on these branches the female moths will deposit their seed. The rooms where the branches are kept suspended must be cool and well ventilated. When the worms are hatched the branches are straightway carried to the bushes, upon which the worms are transferred at once, to proceed through their successive stages till the formation of the cocoons."

#### *Papers read.*

Mr. W. F. Kirby communicated the following "Synonymic Notes on Lepidoptera":—

#### 1. SPHINGIDÆ.

"Under this title I propose from time to time to publish such corrections of synonymy as may occur to me in the course of my studies, supplementary to the three most recent Catalogues of the Order Lepidoptera—my

own of the Rhopalocera; Mr. Walker's British Museum Catalogue of the Heterocera; and Staudinger and Wocke's Catalogue of European Lepidoptera.

*Perigonia* (*Sphinx*) *lusca*, *Fabr. Gen. Ins.* p. 272 (1777).

*Calliomma* (*Sphinx*) *Parce*, *Fabr. Syst. Ent.* p. 543 (1775). *S. Licastus*, *Cram. t. 381*, A. B. (1782).

*C.* (*Sphinx*) *Pluto*, *Cram. t. 216*, E. The *Pluto* of the Mus. Lesk. is *Pluto* of Fabricius, not of Cramer.

*Chœrocampa* *Eson*, *Walk.* The synonymy is as follows:—*Thyelia*, *rel* *Theylia*, *Linn.*; *Boerhaviae*, *Fabr. Syst. Ent.* p. 542; *Eson*, *Cram.* Walker quotes also *Sphinx* *Pluto*, *Fabr.* (nec *Cram.*), but erroneously. I should be inclined also to doubt the identity of *Thyelia*, *Linn.*, but have not Clerck's figure to refer to. In this case Fabricius' name would have the priority over Cramer's.

*Chœrocampa* *Clotho*, *Drury.* *Sphinx* *Clotho*, *Fabr. Syst. Ent.* p. 540 (nec *Mant.* and *Syst. Ent.*) is synonymous with *Philampelus* *Labruscæ*.

*C.* (*Sphinx*) *Oldenlandiæ*, *Fabr. Syst. Ent.* p. 542. *Chœrocampa* *argentata*, *Steph.*

*C.* (*Sphinx*) *Lycetus*, *Cram. t. 61*, D.

*Pergesa* (*Sphinx*) *Pluto*, *Fabr.* (nec *Cram.*) *Gen. Ins.* p. 274 (1777); *Zschach*, *Mus. Lesk.* p. 95, t. 3, f. 184. *Sphinx* *Thorates*, *Hüb.*

*Deilephila* (*Sphinx*) *lineata*, *Fabr. Syst. Ent.* p. 541 (1775). *Sphinx* *Daucus*, *Cram. t. 125*, D (1779). Confounded by Fabricius in his subsequent works with *D. livornica*; but his original description is perfectly clear, as remarked by Westwood in his 'British Moths.'

*Philampelus* (*Sphinx*) *Labruscæ*, *Linn.* See above.

*Darapsa* (*Sphinx*) *Gnoma*, *Fabr. Syst. Ent.* p. 546 (1775). *Sphinx* *Butus*, *Cram. t. 152* (1775).

*Zonilia* (*Sphinx*) *Didyma*, *Fabr. Syst. Ent.* p. 543 (1775). *Sphinx* *Peneus*, *Cram. t. 88*, D (1779). *Sphinx* *Peneus*, *Fabr. Mant. Ins. ii.* p. 93, must be a different species.

*Zonilia* (*Sphinx*) *Hespera*, *Fabr. Syst. Ent.* p. 546 (1775). *Sphinx* *Morpheus*, *Cram. t. 149* D (1779).

*Macrosila* (*Sphinx*) *rustica*, *Fabr. Syst. Ent.* p. 540.

*Sphinx* *cingulata*, *Fabr. Syst. Ent.* p. 545. *Sesia* *cingulata*, *Zschach*, *Mus. Lesk.* p. 96, t. 3, n. 193; *Gmel.* p. 2386, is one of the *Ægeriidæ*.

*S. jasminearum*, *Gray*, *Griff. An. Kingd. Ins.* 83, f. 1 (Walker, xxxi. *Suppl.* p. 36).

*S. sordida*, *Harr.* It has been suggested that this species is identical with *S. pœcila*, *Steph.* (Harris, Correspondence, p. 157).

*Anceryx* (*Sphinx*) *plebeja*, *Fabr. Gen. Ins.* p. 273.

*Smerinthus* *geminata*, *Harr.* The synonyms quoted by Walker (*jamaicensis*, *Dru.*, and *cerisii*, *Kirb.*) appear to me to belong to two distinct species.

S. Timesius, *Stoll*, t. 40, f. 1 (1790). *Sphinx modesta*, *Fabr.* (nec *Harr.*) *Ent. Syst.* iii. 1, p. 356 (1793).

*Acherontia* (*Sphinx*) *Lachesis*, *Fabr. Ent. Syst. Suppl.* p. 434 (1798). *Morta*, *Hüb.* *Lethe*, *Westw.* *Satanas*, *Boisd.*

*Macroglossa*?? *fimbriata*, *Walker*, viii. p. 261. *Sesia fimbriata*, *Gmel.*, is one of the *Ægeriidæ*. See Zschach's description and figure, *Mus. Lesk.*, p. 96, t. 3, f. 192.

*Sphinx Abadonna*, *Fabr. Ent. Syst. Suppl.* p. 435, is not noticed by *Walker*."

Mr. Baly communicated "Descriptions of new Genera and of some recently-discovered Species of Australian Phytophaga." The new genera he named *Duboulaia* (intermediate between *Megamerus* and *Prionesthis*), *Strumatophyma* and *Spærolina*. In all twenty-two new species were described, eleven of which pertained to *Ditropidus*, eight to *Lachnabothra*, and the others to *Carpophagus* and *Elaphodus*.

Mr. Butler read "Descriptions of five new Species and a new Genus of Diurnal Lepidoptera from Shanghai." These insects had all been collected by Mr. W. B. Pryer. The new genus was termed *Palaeonympha*; allied to *Neonympha*. The other species belonged to the genera *Lethe*, *Yphthima*, *Neptis* and *Argynnis*.

#### *New Part of 'Transactions.'*

Part 2 of the 'Transactions' for 1871 was on the table.

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3 July, 1871.

A. R. WALLACE, Esq., F.Z.S., President, in the chair.

#### *Additions to the Library.*

The following donations were announced, and thanks voted to the donors:—'The Journal of the Linnean Society,' No. 51; presented by the Society. 'Bulletin de la Société Impériale des Naturalistes de Moscou,' 1870, No. 2; by the Society. 'Mittheilungen der schweizerischen entomologischen Gesellschaft,' vol. iii. Nos. 6 and 7; by the Society. 'Horae Societatis Entomologicæ Rossicæ,' t. vii. No. 4, t. viii. No. 1; by the Society. 'The Canadian Entomologist,' vol. iii. No. 1; by the Editor. 'Beiträge zur Kenntniß der Käfer (Coleoptera) in den russischen Ostseeprovinzen Kurland, Livland und Estland,' von J. H. Kawall; by the Author. 'Fauna Perthensis; or, Contribution towards a Knowledge of the Animals inhabiting Perthshire,' Part I., Lepidoptera, by F. Buchanan White, M.D.; by the Author. 'L'Abeille,' tome vii. livr. 10 & 11; by the Editor. 'The

Zoologist' for July; by the Editor. 'The Entomologist's Monthly Magazine' for July; by the Editors. 'Exotic Butterflies,' Part 79; by W. W. Saunders, Esq. 'Lepidoptera Exotica,' Part ix.; by E. W. Janson, Esq. 'Catalogue of British Coleoptera,' by David Sharp, M.B., &c.; by E. W. Janson, Esq.\* 'Monographie des Caloptérygines;' 'Note sur quelques Névroptères nouveaux de Port Denison (Australia);' 'Additions et Corrections au Catalogue-raisonné des Orthoptères de Belgique;' 'Note sur une excursion dans l'Entre-Sambre-et-Meuse;' 'Notice sur une nouvelle espèce de Némoptère;' 'Note sur quelques Odonates nouveaux du Mexique;' 'Odonates des Iles Seychelles;' 'Nouvelle Revision des Odonates de l'Algérie;' 'Seconde Additions au Synopsis des Gomphines;' 'Seconde Additions au Synopsis des Caloptérygines;' by the Author, M. le Baron Edm. de Selys-Longchamps. 'Stettiner entomologische Zeitung,' 1871, Nos. 4—9; by the Entomological Society of Stettin. Twelve Memoirs on Arachnida; by the Author, the Rev. O. P. Cambridge, M.A.

By purchase:—'Bericht über die wissenschaftlichen Leistungen im Gebiete der Entomologie während der Jahr 1867 und 1868,' von F. Brauer & Dr. A. Gerstaecker; Zweite Halfte.

#### *Exhibitions, &c.*

Prof. Westwood exhibited the minute-book of proceedings of an Entomological Society existing in London in 1780. The members appeared to have consisted of Messrs. Drury, Honey, Swift, Francillon, Jones and Bentley. The meetings were held weekly, but, in consequence of some internal dissensions, the Society seemed to have collapsed in about a year. The "business" done chiefly embraced notes on the appearance of various species, and the objects of the members' studies were divided into three classes, "flies" (butterflies), "moths" and "insects."

Mr. S. Stevens exhibited a collection of Coleoptera formed by him during a recent tour in Ireland. The most interesting species was *Chlaenius holosericeus*, of which he had captured several examples at Killaloe, near Lough Derg.

Mr. Champion exhibited *Emus hirtus*, recently captured by him in cow-dung in the New Forest; being the only instance of its occurrence since the late Mr. Alfred Haward found a specimen many years since. He also exhibited two new British species of Hemiptera, *viz.*, *Corizus Abutilon*, Rossi, and *Drymus latus*, described by Messrs. Douglas and Scott in the 'Entomologist's Monthly Magazine' for June and July, 1871.

Mr. Blackmore exhibited a collection of insects of all orders from Tangiers, including some from Fez. There appeared to be many new species of Coleoptera, which Mr. Blackmore announced his intention of describing at a future meeting. Locusts, (*Acridium peregrinum*), were

exceedingly abundant at Tangiers, and the pedestrian was often ankle-deep in the dead and dying on the shore. The natives destroyed them with wisps of straw, and did not dig trenches to stop their ravages. Mr. M'Lachlan having remarked that the Chinese held, or did hold, an opinion that locusts were developed from the eggs of craw-fish, Mr. Blackmore said that the Spanish word 'langosta' was used both for a locust and lobster.

Mr. Druee exhibited several rare species of exotic Rhopalocera, the most interesting being *Euryades Reevi*, *Westwood*, *Heliconia Hermogenes*, *Hewitson*, *Heliconia*, n. s., *Eresia*, n. s. (2), *Catagramma*, n. s. (2), *Agrias Amydon*, *Hew.*, *Paphia Panarista*, *Hew.*, *Paphia nobilis*, *Bates*, *Siderone Mars*, *Hew.*, &c.

Mr. Stanton exhibited (on behalf of its captor, the Rev. R. P. Murray) an example of *Botys fuscalis*, from the Isle of Man, to the head of which still adhered a portion of the puparium. The antennæ and haustellum were free, but the case of the latter projected perpendicularly from the under side of the head, simulating the rostrum of a *Panorpa*. The insect must have been nearly blind, yet it was flying briskly at the time of capture.

Mr. Müller exhibited a vine-leaf from Basle, attacked by *Phytoptus vitis*, which causes fur-like spots on the leaves, known as *Erineum vitis*.

Mr. Riley, State Entomologist for Missouri (present as a visitor), exhibited a large collection of North American insects, illustrating, in many cases, their transformations. Among them was a coleopterous larva, which Dr. Leconte (who was present) stated to be that of *Pyrochroa flabellata*.

Mr. Dunning read the following extract from the 'Times' of 27th June:—"Under the pressure of necessity a Salt Lake City blacksmith has invented a machine to kill grasshoppers. It can be manufactured for seventy-five dollars. It consists of a frame drawn by two horses, having an apron extending forward close to the ground to scrape up the locusts, with a hood above it, forming a box open in front. At the rear of the machine is a pair of rollers geared together, the upper one driven by the carrying wheels, of which it forms the axle. Whatever may find its way into the front of the machine is obliged to pass between the rollers at the back, which, being capable of being forced close together, are described as completely demoralizing the 'ironclads.'"

Mr. Dunning also read a letter he had received from the Rev. W. H. Wayne, of Much Wenlock, stating that both this year and last his ripe strawberries were infested by a small Myriopod, which entered into the interior; there were often six or eight in one strawberry, and they were often eaten without detection. Mr. Wayne also stated that his young carrots were injured by what he seemed to consider the same creature, but, from examples he sent, the depredators in this case were evidently the larvæ of a Dipterous insect, *Psila rosæ*. The larvæ first showed their

presence by a slightly crumpled appearance of the leaf, which commenced to droop. On taking up the carrot no root-fibres are observed, the slender portion being dry and brittle, and in the centre is found the larva. He observed that all his neighbours' gardens were infested in a similar manner. Mr. Druce said that the carrots in his brother's garden at Kingston were destroyed by the same larvæ.

*Papers read, &c.*

Mr. H. W. Bates read descriptions of three new species of Cicindelidæ. Two of these pertained to the genus *Oxygonia* of Mannerheim, and he described them as *O. albitænia* and *O. cyanopis*, from New Granada. The third was *Cicindela Crespignyi*, from Borneo. Mr. Bates entered into an examination of the affinities of *Oxygonia*, and agreed with the position near *Odontocheila* assigned to it by Baron Chaudoir in his recent Catalogue.

Mr. C. O. Waterhouse communicated a paper "On the black Species of *Cantharis* with red heads and filiform antennæ."

Prof. Westwood read descriptions of new species of exotic Papilionidæ. Having used the term 'sub-species,' Prof. Westwood explained that a sub-species he considered as a modified form of a species as originally created. Mr. Jenner Weir objected to the use of the term 'created' in scientific communications.

Baron De Selys-Longchamps communicated a paper under the title "Aperçu statistique sur les Névroptères Odonates." In this memoir he enumerated the number of known species of dragon-flies under their respective genera and subgenera. He estimated the total number at about 1350.

Mr. S. S. Saunders read a paper intituled "Strepsiperidum, pro ordine Strepsipterorum Kirbii olim, mihi tamen potius Coleopterorum Familia Rhiphiphoridibus propinquia, Monographia."

Mr. Saunders divided the groups into four subfamilies, according to the several Hymenopterous tribes with which they are associated; namely (1), the true Stylopidæ, found with the Mellifera of Latreille; (2) the Myrmecolacidæ, with the Formicidæ; (3) the Xenidæ, with the social wasps; and (4) the Pseudoxenidæ, with the solitary wasps and Fossores; these latter tribes coinciding more or less in their habits and economy, and requiring about *eight or nine months* (from one year to the next) to attain maturity; involving a corresponding detention for their Strepsipterous dependents; whereas the true Xenidæ, consorting with the social Vespidae, must be reared from their primary hexapod condition in from *thirty to forty days*. such being the term within which the larvæ of the social Vespidae attain the imago state; the females of the latter *hibernating* with those of *Xenos*, which produce their larval brood the *ensuing year*; whereas the Pseudoxenidæ, after their long-protracted larval condition as aforesaid, must

produce their young the *self-same year* in which they themselves complete their transformations, in order that their brood may obtain access to the future larva-cells of their *non-hibernating* foster parents.

The genera recorded were eight in number, comprising 22 species, as follows:—*Halictophagus* 1; *Stylops* 5; *Hylechthrus* 3; *Elenchus* 3; *Myrmecolax* 1; *Xenos* 3; *Pseudoxenos* 3; and *Paraxenos* 3. Of these 16 were European (whereof 7 British), and 6 extra-European.

Mr. Saunders also exhibited a series of specimens, including two new species, *viz.* *Pseudoxenos Coreyricus* ♂, from *Epipone spinipes*, *L.*; and *Paraxenos Erberi* ♂, from a variety of the *Larra peregrina* of Smith (now pertaining to the genus *Bembeinus* of Costa); one of the former, together with some others, being retained *in situ*, when in the act of emerging from the pupa-cases in the bodies of their foster-parents.

The vexed question of the affinity of this class of insects with the Coleoptera was adverted to in a preamble.

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6 November, 1871.

Prof. J. O. WESTWOOD, M.A., F.L.S., &c., Vice-President, in the chair.

#### *Additions to the Library.*

The following donations were announced, and thanks voted to the donors:—‘Second and Third Annual Reports of the Trustees of the Peabody Academy of Science;’ presented by the Academy. ‘Record of American Entomology for the Year 1869;’ ‘On Insects inhabiting Salt Water;’ ‘Catalogue of the Phalaenidae of California;’ ‘Bristle-tails and Spring-tails;’ ‘List of Insects collected at Pebas, Ecuador, and presented by Prof. James Orton;’ ‘The Early Stages of Ichneumon Parasites;’ ‘Morphology and Ancestry of the King Crabs;’ ‘The Ancestry of Insects;’ ‘On the Embryology of *Limulus Polyphemus*;’ ‘The Caudal Styles of Insects’ Sense-organs, *i. e.* Abdominal Antennae;’ ‘Abdominal Sense-organs in a Fly;’ ‘A Remarkable Myriaped;’ presented by the Author, Dr. A. S. Packard, jun. ‘Proceedings and Communications of the Essex Institute,’ vol. vi. part ii. : ‘Bulletin of the Essex Institute,’ vol. iv. ; by the Institute. ‘Proceedings of the Boston Society of Natural History,’ vol. xiii. Nos. 15—23 : by the Society. ‘Annals of the Lyceum of Natural History of New York,’ vol. ix. Nos. 21—26; by the Lyceum. ‘The American Naturalist,’ vol. iv. Nos. 3—12; vol. v. No. 1; by the Editors. ‘Monograph of the North-American Astacidae,’ by Dr. Hermann A. Hagen; by the Museum of

Comparative Zoology at Harvard College, in Cambridge, Massachusetts. 'Bulletins de l'Académie Royale des Sciences, des Lettres et des Beaux-Arts de Belgique,' xxix. and xxx.; by the Society. 'The Transactions of the Linnean Society,' vol. xxvii. part 3; 'The Journal of the Linnean Society—Zoology,' Nos. 52 and 53; 'Proceedings of the Linnean Society,' Session 1870—1871; by the Society. 'Proceedings of the Royal Society,' No. 129; by the Society. 'Proceedings of the Scientific Meetings of the Zoological Society of London for the Year 1871,' part i.; by the Society. 'The Transactions of the Entomological Society of New South Wales,' vol. ii. part 2; by the Society. 'The Journal of the Quckett Microscopical Club,' No. 15; by the Club. 'Bullettino della Società Entomologica Italiana,' vol. iii. part 3; by the Society. 'Horæ Societatis Entomologice Rossicæ,' tome viii. No. 2; by the Society. 'The Silk Supply Journal,' Nos. 11, 12; by the Association. 'The Canadian Entomologist,' Nos. 2—6; by the Editor. 'Catalogus Buprestidarum Synonymicus et Systematicus'; by the Author, Edward Saunders, Esq. 'L'Abeille,' 1870, livr. 12; 1871, livr. 1—3; by the Editor. 'Remarks on Synonyms of European Spiders,' No. 2; by the Author, T. Thorell. 'Qu'est-ce que l'aile d'un Insecte?' by the Author, Félix Plateau. 'Exotic Butterflies,' part 80; by W. Wilson Saunders, Esq. 'Lepidoptera Exotica,' part 10; by E. W. Janson, Esq. 'Rhododendron Excrescences'; 'Batoneus Populi, a Mite injurious to the Aspen in Scotland'; by the Author, A. Müller, Esq. 'The Zoologist' for August—November; by the Editor. 'The Entomologist's Monthly Magazine' for August—November; by the Editors. 'Annual Report and Transactions of the Adelaide Philosophical Society for the year ending 30th September, 1870:' by the Society.

The following books had been added by purchase:—'A Synonymic Catalogue of Diurnal Lepidoptera,' by W. F. Kirby. 'Bericht über die wissenschaftlichen Leistungen im Gebiete der Entomologie während des Jahres 1869,' von Friedrich Brauer.

#### *Exhibitions, &c.*

Mr. R. L. Davis exhibited an extensive series of beautifully preserved larvæ of Lepidoptera and other insects, and a few spiders. Among them were specimens illustrating the complete natural history of *Cossus ligniperda*, and of some other common species.

Mr. Bond exhibited examples of *Zygæna exulans*, a recent addition to the British Fauna, captured at Braemar by Dr. F. Buchanan White. Also a specimen of *Catoeala fraxini*, captured in the Regent's Park on the 12th of September last; and he remarked that the insect had occurred in that locality for three successive years. Furthermore he exhibited a very singular variety of *Chœrocampa elpenor* from Ipswich, in which the central portion of each fore wing was perfectly hyaline and free from scales, the

insect being in perfect condition, and presenting no indication of the peculiarity having been induced by artificial means.

Mr. Howard Vaughan exhibited examples of the *Triphaena* from Forres, captured by Mr. G. Norman, which Mr. Newman had named *T. curtisi*. Mr. Vaughan, however, considered it to be only a dark form of *T. orbona*. Mr. W. A. Lewis made some observations on the synonymy of this form, pointing out that it had been figured by Curtis as *T. consequa*, *Hübner*, and, further, that it was given by Stephens as *T. subsequa*, *W. V.*

Mr. Vaughan also exhibited a nearly black variety of *Arge Galathea*, captured in Kent by Mr. Farn.

Mr. E. W. Janson exhibited two new, or recently detected, species of Coleoptera, captured by the Rev. A. Matthews, as follows:—

“ *THROSCUS CARINIFRONS*, de Bonvouloir, Essai Monographique sur la Famille des Throscides, p. 20, tab. i. fig. 5 (1859).

“ At first sight resembling *T. dermestoides*, *L.*, but at once distinguished from it by the ocular depression extending *right across* the eyes; more nearly allied to *T. elateroides*, *Heer* (*T. gracilis*? *Woll.*), but readily separated therefrom by its superior size, the prominence of the lateral frontal longitudinal ridges, which extend to the anterior margin of the prothorax, the sinuated sides and prominent posterior angles of the prothorax, especially in the males, and the somewhat finer punctuation of the interstices of the elytra.

“ Three specimens taken by the Rev. A. Matthews, in company with *T. dermestoides*, by sweeping in a plantation near Chiselhurst, in July, 1869, and shortly after placed in my hands for identification.

“ *CRYPHALUS PICEÆ*, Ratzeburg, Forst-Inseeten, i. p. 163 (1837).

“ Allied to *C. abietis*, *Ratzeb.*, but larger, less convex, the elevations on the anterior part of the prothorax larger and arranged in five or six tolerably regular rows, the striæ of the clytra distinct, and the interstices, especially towards the apex, with sparse erect yellow bristles.

“ One specimen taken by the Rev. A. Matthews, many years since, in the vicinity of Weston, Oxon.”

Mr. F. Smith exhibited a large *Noctua*, apparently an *Aplecta*, captured by Mr. J. Gwyn Jeffreys, on the Atlantic, about 220 miles from Nova Scotia, on the outward voyage. (This has since been identified as the pale form of *Aplecta occulta*).

Mr. M'Lachlan exhibited the remarkable wingless Californian *Bittacus*, recently described and figured by him in the ‘Entomologist’s Monthly Magazine,’ vol. viii. pp. 100—102, as *Bittacus apterus*.

Mr. Albert Müller exhibited a gigantic Californian oak-gall, given to him by Mr. C. V. Riley, of St. Louis, Missouri. Also the impregnated and unimpregnated eggs of *Libellula flaveola*, *Linne*, the former being whitish in

colour and deposited singly, the latter excluded by a captured female in a gelatinous yellowish mass.

Prof. Westwood exhibited numerous examples of the true *Formica herculeana*, Linné, an ant not hitherto considered as British, and stated the circumstances under which they were found, as follows:—It appeared that, very recently, a labouring man had brought to a colleague of his, at Oxford, several birds which he said he had shot in Wytham Wood, on the Earl of Abingdon's estate, and these were purchased for the insignificant sum of two shillings. One of these birds was a great black woodpecker (*Picus martius*), which had been considered a very doubtful British species. Upon dissection the proventriculus of this bird was found to be crammed with the ant in question, the specimens being in perfect condition, with the wings entire, and none had passed into the gizzard. Taking all these facts into consideration with the freshness of the bird itself, Prof. Westwood could come to no other conclusion than that the man's account of how he became possessed of the bird was true, and hence that the ant was a British species.

Mr. Müller stated that he had frequently found this ant in Switzerland, in winter, in pine-stumps a foot or two in height; and Mr. Smith made some remarks on Nylander's account of its habits.

Mr. Jenner Weir utterly disbelieved in *Picus martius* having ever occurred in Britain in a wild state, an opinion shared by several of the Members present.

Prof. Westwood further exhibited two males of *Papilio Crino* from Ceylon. In one of these the first and second branches of the median vein were coated with brown hairs, a peculiarity which was the rule in some species of *Papilio*, but which had not been hitherto observed in *P. Crino*. The other example had these veins naked, as is usual in the species. He was not able to ascertain if both specimens were from exactly the same locality.

The Secretary of the Haggerston Entomological Society invited the Members to attend their annual exhibition of insects on the 23rd and 24th of November.

#### *Papers read, &c.*

Baron Chaudoir communicated the following notes on the specific value of *Eurygnathus parallelus*, *Chaudoir*:—

“In the Transactions of the Entomological Society of London, 1871, p. 215, Mr. T. Vernon Wollaston contests the right of the insect I described under the name of *Eurygnathus parallelus* (Guérin's Rev. et Mag. de Zool. 1869, p. 121) to constitute a species distinct from *Latreillei*. As he states my opinion to be ‘most unphilosophical,’ I feel myself compelled to say a few words on the subject. No one acquainted with both forms could doubt that the differences between *parallelus* and *Latreillei*, and which have been remarked and pointed out by the English author as well as by myself, are

far more important and striking than those which, according to Mr. Wollaston, distinguish his *Pogonus salsipotens* from *chaleeus*, *Masoreus arenicola* from *Wetterhalii*, *Pterostichus haligena* from *longulus*; and if we admit with him, and those who follow these new theories, that a long isolation has led to a modification in the form of an insect, we ought certainly to expect much less similarity between those individuals which live in temperate Europe and those living in the almost tropical climate of the Canaries, than between such as inhabit islands so near together as Porto Santo and Deserta Grande. How much greater still ought to be the difference among individuals of *Pristonychus complanatus* from Europe, from Chili, from the Cape, and from Australia; of *Plochionus pallens* from France, California and Java; of *Loricera pilicornis* from Europe and America, &c.?; but, nevertheless, specimens from countries so distant are nearly identical, while individuals from the same locality show very often much greater differences. I do not mean to deny that atmospheric circumstances might influence the size or coloration of certain species, as we see in several species of *Carabus*, *Nebria*, &c.; but we never find among specimens of diverse stations such striking and constant differences of form as those which occur between *Eurygnathus parallelus* and *Latreillei*. Why attempt to force nature rather than admit that there can be in that group of islands two species of *Eurygnathus*, just as there are twenty-three species of *Calathus*, fourteen of *Trechus*, seven of *Olisthopus*, five of *Zergus*, and three of *Broseus*?

"Mr. Wollaston leans on the authority of our lamented friend, the late Dr. Schaum, and I am happy to find such homage to his memory; but Dr. Schaum might have been in error in this case, as he was in that of *Aptinus cordicollis*, which he believed for a long time to be identical with *pyrenaeus*, until, having acquired it from Sturm's collection, he convinced himself of the contrary; and I must say that he was always ready to acknowledge his errors. In general, he lived in a period of reaction, and was afraid of multiplying species, in order not to fall into the excesses of so many entomologists who established species on the most trifling and even imaginary characters."

Mr. T. H. Briggs read a paper "On the Forms of *Zygæna trifolii*, with some remarks on the question of Specific Difference as opposed to Local or Phytophagous Variation in that Genus."

20 November, 1871.

A. R. WALLACE, Esq., F.Z.S., President, in the chair.

*Additions to the Library.*

The following donations were announced, and thanks voted to the donors:—*Mémoires de la Société de Physique et d'Histoire Naturelle de*

Genève,' tome xxi. 1re partie, and 'Table des Mémoires contenus dans les tomes i. à xx, ;' presented by the Society. 'Nouveaux Mémoires de la Société Impériale des Naturalistes de Moscou,' tome xiii., livr. 3 ; 'Bulletin de la Société Impériale des Naturalistes de Moscou, 1870,' Nos. 3 and 4; by the Society. 'Additions to the Australian Curculionidæ,' part 1; 'Descriptions of New Genera and Species of Longicornes, including three new Subfamilies ;' 'Notes on Coleoptera, with Descriptions of New Genera and Species,' part i. ; by the author, F.P. Pascoe, Esq.

By purchase ;— Loew, 'Systematische Beschreibung der bekannten europäischen zweiflügeligen Insecten,' band ii.

#### *Election of Members.*

The following gentlemen were balloted for and elected :—C. V. Riley, Esq., State Entomologist for Missouri, as Foreign Member; Lieut. Barzillai Lowsley, R.E., of George Town, Demerara, and F. Raine, Esq., of South Road, Durham, as Ordinary Members; and W. H. Miskin, Esq., of the Supreme Court, Brisbane, Queensland, as an Annual Subscriber.

#### *Exhibitions, &c.*

Mr. Dunning said that since the last meeting of the Society he had been informed that, at the precise time when the example of the great black woodpecker (*Picus martius*), referred to by Prof. Westwood in connection with *Formica herculeana*, was said to have been shot near Oxford, several specimens were exposed for sale in Leadenhall Market, and these were presumably of Norwegian origin.

Mr. E. Sheppard could not reconcile the occurrence of a gigantic species of ant, not hitherto known as British, in the crop of a bird the origin of which was open to doubt, with the idea that this bird had actually been shot under the circumstances already alleged.

Prof. Westwood said that Mr. C. Robertson, of Oxford, assured him that he had repeatedly seen the bird in the woods at Clovelly, and Mr. Jackson, of New College, had observed it in East Devon.

Mr. F. Smith was informed that thirty instances of its occurrence in Britain had been recorded, and that in one case an example had been shot by the grandfather of the present Lord Derby.

Mr. Bond asserted that there existed no authentic British example; all the reported occurrences had been traced and found to be erroneous, save that of Lord Derby, and much doubt existed concerning this.

Mr. M'Lachlan suggested that the matter might be set at rest by visiting the locality in which the bird was said to have been shot, and finding the ant.

The discussion ended by Prof. Westwood promising to furnish further evidence on a future occasion.

Mr. Bond exhibited a series of small pale examples of *Lasioecampa trifolii*. He had made a similar exhibition a year or two since, and Mr. Mitford, their discoverer, furnished the following information, tending to prove that they formed, at any rate, a distinct local form. The locality is Romney Marsh, Kent, and the larvae were first found by Mr. Mitford in May, 1866, feeding in the tufts of a very wiry grass growing in the shingle above high water mark; they were again found and bred in May, 1867: in August, 1868, two dead moths, exactly similar, were observed in the same locality: and in August, 1871, eighteen examples were bred. While hunting for these larvae, Mr. Mitford's son found smaller caterpillars, which produced *Lithosia caniola*, thus showing an entirely new locality for this species.

Mr. Bond further exhibited two remarkable varieties of *Clisiocampa castrensis*. One of them, a female, had the left-hand wings shaped like those of the male, though the insect otherwise showed no tendency to be gynandromorphous; the other, also a female, had the right-hand under wing marked and banded as in the upper wing.

Mr. Stainton exhibited, on behalf of Mr. D'Orville, a singular variety of *Agrotis comes*, of Hübner, according to Staudinger's recent Catalogue, equivalent to the *Triphæna orbona* of authors.

Mr. M'Lachlan exhibited a striking case of mimetic resemblance between two common North American Libellulidæ, not very closely allied. These were *Libellula pulchella*, of Drury, and *Plathemis trimaculata*, of De Geer. In *L. pulchella* the sexes were nearly similar with respect to markings; in *P. trimaculata* they were dissimilar, and the female bore a remarkable resemblance to either sex of *L. pulchella*, both in the ornamentation of the wings and in the thoracic markings.

Mr. Bates said he had never observed any similar instance, and was inclined to consider this case as one in which the markings had repeated themselves, rather than as indicating actual mimicry.

Prof. Westwood suggested that observations should be made as to whether the female was liable to the attacks of fishes when depositing her ova, and instanced the case of *Ephemera*, in which the fish eagerly devoured the female insect when full of eggs, but rejected the male as affording no nutriment. A discussion ensued as to the liability of dragon-flies to the attacks of birds. Mr. F. Smith had seen swallows engaged in the pursuit of small Agrionidæ, and Mr. Briggs had witnessed, in the streets of London, a combat between a sparrow and a large dragon-fly, probably an *Aeschna*, and in this case the insect overcame the attacks of the aggressor. It was suggested whether this latter case might not have been an exemplification of the natural pugnacity of the sparrow, rather than an indication that the bird attacked the insect with a view to food. Mr. Jenner Weir incidentally mentioned that he had himself witnessed the fact of an *Agrion* descending into the water to deposit its eggs. The President thought the larger species

(the *Libellula*) might be strong enough to defend itself from some unknown enemies, whereas the smaller one (the *Plathemis*) was more at their mercy : but he thought the matter should be referred to American entomologists to observe the habits of the two species in question, and report thereon.

Mr. F. Smith exhibited the cocoons of the American *Tiphia tarda*, of Say, given to him by Mr. Riley ; these were double, there being an outer flimsy covering and an inner hard case, from which the imago escaped by making a small hole at one end. He was inclined to believe that the larvæ of *Tiphia* fed upon those of *Aphodius*, for he had observed the larvæ of the British species in galleries under dried-up cow-dung, but never actually in the act of devouring the *Aphodius* larvæ. Prof. Westwood suggested that examination should be made of the inner hard cocoon in order to decide whether it be made of silk or formed from an exudation of the larva.

Mr. Müller called attention to an apparently unrecorded instance of an insect destructive to green peas. He had last summer observed the outside of pea-pods showing large whitish blotches, and had found that these were produced by the attacks of the larvæ of a Thrips, fifty or sixty larvæ often being engaged upon one pod, and retreating into the adhering calyx when alarmed.

Mr. M'Lachlan read observations upon the synonymy of two common species of European ant-lions, usually known as *Myrmeleon formicarius* and *formicalynx*, showing the discrepancies in the Linnean descriptions in the various editions of the 'Fauna Sueica' and 'Systema Naturæ,' and proving that Linné more or less confused the two species. The Swedish entomologists affirmed that the species known as *formicalynx* by modern authors (described by Linné as an African insect) was the only ant-lion occurring in Sweden, and that it was the true *formicarius* of Linné, whereas the spotted-winged species, usually known by that name, was not an inhabitant of their country.

The Secretary announced that Mr. Miskin, of Brisbane, elected that evening, wished to enter into correspondence with entomologists for the purpose of exchanging Lepidoptera and Coleoptera.

*New Part of 'Transactions,' and of the 'Catalogue of British Insects.'*

Part iii. of the 'Transactions' for 1871 (published in August) was on the table, as was also a further instalment of the proposed general Catalogue of British Insects, comprising the Aculeate Hymenoptera, compiled by Mr. F. Smith.

4 December, 1871.

A. R. WALLACE, Esq., F.Z.S., President, in the chair.

*Additions to the Library.*

The following donations were announced, and thanks voted to the donors:—‘Annales de la Société Entomologique de France,’ 4<sup>e</sup> Série, tome x. and Supplement; presented by the Society. ‘Bullettino della Società Entomologica Italiana,’ anno iii., trim. 1 & 2; by the Society. ‘Mittheilungen der Schweizerischen Entomologischen Gesellschaft,’ vol. iii. No. 8; by the Society. ‘L’Abeille,’ tome vii., livr. 4, 5, 6 & 7; tome viii., livr. 8, 9; by the Editor. ‘The Canadian Entomologist,’ vol. iii., Nos. 7 & 8; by the Editor. ‘Additamenta et Ementationes ad Catalogum methodicum et synonymicum Hemipterorum Italiæ indigenarum,’ auctore Antonio Garbiglietti, M.D.; by the Author. ‘Description de deux Doreadion nouveaux et observations sur quelques autres espèces du même genre,’ par M. A. Chevrolat; by the Author. ‘Beitrag zur Parthenogenesis der Arthropoden,’ von C. T. E. v. Siebold; by the Author. ‘The Zoologist’ for December; by the Editor. ‘The Entomologist’s Monthly Magazine’ for December; by the Editors.

By purchase:—‘A History of the Spiders of Great Britain and Ireland,’ by John Blackwall, F.L.S. Parts I. and II.

*Exhibitions, &c.*

Mr. S. Stevens exhibited, on behalf of Mr. Shearwood, an extraordinarily dark variety of *Argynnis Aglaia*, captured near Teignmouth.

Mr. Bond exhibited, on behalf of Mr. Doubleday, varieties or malformations of British Lepidoptera, as follows:—(1) *Melitaea Artemis*, with the antennæ scarcely more than half the usual length; (2) *Pieris rapae*, female, with only a faint trace of the second spot on the upper wing; (3) *Anchocela lunosa*, male, taken at sugar, the right-hand upper wing much broader than the other, and differently formed; (4) *Cheimatobia brunneata*, naturally with only three wings, and varying in colour and markings.

Mr. E. W. Janson exhibited a collection of insects, principally Coleoptera, from the diamond-fields of South Africa.

Mr. Higgins exhibited examples of *Tetracha crucigera* of McLeay, sent to him from Sydney, being, as he believed, the first seen in Europe.

Prof. Westwood exhibited a series of drawings and specimens, with the view of identifying *Papilio Thersander* of Fabricius, and of proving that the

figures thereof published by Donovan in the 'Naturalists' Repository,' although stated to have been copied from Mr. Jones's 'Icones,' were drawn by Donovan from a torn and mutilated copy of Jones's figure, and completed from Charaxes Fabius.

Mr. Albert Müller read the following notes:—

"In reference to the question whether Libellulidæ are liable to be persecuted by birds, I wish to point out that they have very powerful enemies to contend with in the Falconidæ, as Natterer has stated that a species belonging to this tribe, namely Hypotriorchis ruficollaris, *Gray*, was met by him late in the evening, after sunset, flying over the tops of figeira (?) trees, near Sapitiba (Brazil), apparently to catch insects, and that the stomach of a female contained Libellulidæ (Verhandl. K. K. Zool. Bot. G. in Wien. 1863, p. 632). It will be recollect that at the last Meeting Mr. M'Lachlan exhibited an instance of mimicry between two species of American Libellulidæ, so it may be worth while to inquire if these suffer similar persecution by birds of prey. At any rate, I throw out the suggestion."

Mr. Horne remarked that during his residence in India he had never seen Libellulidæ attacked by birds.

#### *Papers read, &c.*

Major Parry communicated the following:—

"*Lissapterus Howittanus*, H. Deyrolle, Trans. Ent. Soc. 1870, p. 98.—On perusing Prof. Westwood's recent paper in the 'Transactions' of the Society, containing descriptions and notices of several new and interesting species of Lucanoid Coleoptera, my attention has been called to a note the author has appended to his notice of an insect originally described by himself under the name of *Lissotes Howittanus*, a most remarkable and interesting form, pertaining to the family of the Doreidæ. This insect has been subsequently characterised, by M. Henri Deyrolle (*loc. cit.*), as the type of a new genus, and published as such in my Catalogue of the Lucanoid Coleoptera (*vide* Trans. Ent. Soc. 1870). In the note alluded to in Prof. Westwood's publication (Trans. Ent. Soc. 1871, p. 369) I find the following statement made by the author with reference to the species in question:—'*Lissapterus Howittanus* (Deyrolle), Parry, Trans. Ent. Soc. 1870, p. 114.—The genus *Lissapterus* of Deyrolle, to which this insect is assigned by Major Parry, must be unpublished, since I am unable to find it either in his Memoir in the *Annales de la Soc. Ent. France* for 1864, or in his Memoir in the *Ann. Soc. Ent. Belg.* for 1864, vol. ix.' Had my friend Prof. Westwood turned to page 98 of the publication he quotes, the information he was anxious to obtain would have been found,

viz. M. Henri Deyrolle's characters *in extenso* of the genus *Lissapterus*, and these characters, I think, fully entitle the species to be raised to generic rank. I may also state that, although Prof. Westwood infers that the apterous condition of the insect had induced the generic separation, M. Henri Deyrolle does not even allude to this particular character in his definition of the genus."

Mr. W. F. Kirby communicated a continuation of his "Synonymic Notes on Lepidoptera," as under:—

"In the present paper I have brought together various detached notes on synonymy, which will perhaps be more useful in the present form than scattered.

"*Gmelin's Lepidoptera*.—The Lepidoptera Heterocera described by Gmelin and Zschach are so briefly characterised that their identification will be a work of time and trouble, and in many cases will be impossible. Six species are, however, figured, and four of these I was able satisfactorily to determine at the British Museum this year, with the kind help of Mr. Butler.

*Sphinx immaculata*, *Gmel.* i. 5, p. 2386: *Sphinx*, No. 283, *Zschach*, p. 95, t. 3, f. 283 = *Chœrocampa capensis*, *L.*

*Sphinx Pluto*, *Gmel.* l. c.; *Zschach*, l. c. No. 284 = *Pergesa Pluto*, *Fabr.* (*vide supra*), and may be regarded as the typical figure.

*Sphinx octopunctata*, *Gmel.* l. c.; *Zschach*, l. c. No. 286 = *Chœrocampa Boerhaviæ*, *F.* (= *Sph. Thyelia*, *L.*?)

*Phalæna Cypria*, *Gmel.* l. c., p. 2403: *Bombyx*, No. 210, t. 3, p. 210, *Zschach*, = and supersedes *Hyperchiria incisa*, *Walk.*

I may here remark that *Hyperchiria varia*, *Walk.* = *Bombyx Io*, *Fabr.* nec *Cram.* Cramer's *Attacus Io* will therefore require another name; and I propose to call it *Hyperchiria Vala*."

"*Sphinges of Fabricius*.—Mr. Walker has left several Fabrician Sphinges undetermined. *Sphinx asiliformis*, *F.*, appears to me to be a species of *Thyreus*; *S. Medea*, *F.* = *Basiothia Idicus*, *Dru.*, according to Prof. Westwood: and *S. Clio*, *F.*, seems to be synonymous with the same insect. *S. minus*, *F.*, is apparently synonymous with *C. Boerhaviæ*. It must be noted that Fabricius, in his 'Mantissa,' wrongly placed his *Pergesa Pluto* (= *Thorates*, *Hüb.*), as synonymous with *C. Boerhaviæ*, reversing the diagnoses, and consequently, in his Ent. Syst., we find *C. Boerhaviæ* described with the diagnosis of *P. Pluto* prefixed.

"*Chœrocampa Nessus*, *Dru.* This species is figured by Cramer, t. 226 D, under the same name, but oddly enough, without any reference to Drury, or to his having himself previously figured a species of *Thyreus* as *Sphinx Nessus*. Fabricius named Drury's species *Sphinx Equestris* (Ent. Syst.

iii. 1, p. 365, n. 29); but the name being applied to Drury's species, which was published before Cramer's, of course falls.

"*Papilio hyalinus*, *Gmel.* p. 2259 (cf. *Tr. Ent. Soc.* 1869, p. 356). Since the publication of my *Cat. Diurn. Lep.* I have determined this species to be identical with *Pierella Dracontis*, *Hübn.*, which it will supersede, though Gmelin's name is not very appropriate.

"*Papilio Acidalia*, *Weber*. This species is synonymous with *Neptis aceris*, *Lep.*

"*Morpho Crameri*, *Kirb. Cat.* p. 121, n. 8 (= *Telemachus*, *Cr. nee Linn.*) According to Butler this species = *M. Iphicles*, *Feld.*; but it also = *M. Ulysses*, *Meerb. Afb. zeldz. Gew.* t. 14, 20, which is the oldest name.

"*Athyma Kresna*, *Moore* = *Limenitis Jadera*, *D'Orb. Dict. d'Hist. Nat., Atl. Zool.* ii. *Lep.* 4, f. 3 (1849).

"*Limenitis Camilla*, *L.* In 1764 Linnaeus described the sexes of our English 'White Admiral,' calling the male *Prorsa* and the female *Camilla*. But as he had previously described another species under the name *Prorsa*, he properly changed the name of his second species into *Sibilla* in 1767. This therefore establishes the name of our species to be correctly *Camilla*, *L.*

"The first author who described the other species was Drury, who figured it under the name of *Papilio Sibilla*, *var.*; but it would be better to reject this name altogether, as not = *Sibilla*, *L.* Scopoli's name *rivalaris*, which is usually quoted among the synonyms of this species, properly belongs, according to Werneburg, to *Neptis Lucilla*, *W. V.*, and is therefore inadmissible. *Lucilla*, *Esp.*, is likewise inadmissible; and we must therefore adopt *Drusilla*, *Bergstr.*, as the correct name of *Camilla*, *W. V.*.

"*Attacus Paphia*, *L.* In 1758 Linnaeus gave a diagnosis of this species, which will apply to several large Bombyees, quoting a figure of Petiver's (which is considered to represent *Antheraea Dione*, *Fabr.*) and (with doubt) a bad figure by Catesby of *Telea Polyphemus*, *Cr.* But in 1764 he carefully describes *T. Polyphemus* under the name of *Paphia*; and as he describes no allied species, and referred in 1758 to Queen Ulrica's Museum as containing specimens of his *Paphia*, I think we can hardly hesitate to regard Cramer's *Polyphemus* as identical with it. Cramer figures *Antheraea Mylitta*, *Dru.*, as *Paphia*, *L.*; but there can be no doubt that this is an error, although some of the figures quoted by Linnaeus in his later works very possibly represent that species."

"*The date of Cramer's Works*.—Cramer's 'Papillons Exotiques' was published in parts at intervals. The exact dates are now lost. The address prefixed to vol. i. bears date Dec. 2, 1774; and vols. i. and ii. are

dated 1779, vols. iii. and iv. 1782, and the supplementary vol., by Stoll, 1791. Hagen states that parts 1—7 (plates 1—76) were published in 1775, and part 8 (plates 77—96, completing vol. i.) in 1776. Mr. Butler, I believe, possesses a memorandum that plates 1—36 were published in 1775, and plates 37—48 in 1776. In the part commencing with plate 133, Sulzer's 'Abgek. Gesch. d. Insecten' is quoted as having been published in the year 1776. If plates 133 and following had not been published later than 1776 it is probable that Cramer would have noticed the book either as 'just published,' or 'published this year.' Fabricius, in his 'Genera Insectorum,' published at the beginning of 1777, quotes only the first four parts, or plates 1—48. But as Fabricius in 1781 was only acquainted with 216 plates, there is good reason to suppose that he did not receive the separate parts of Cramer's work as they were published. In the late Mr. Haliday's entomological library, now in the possession of the Royal Irish Academy, is a complete set of Goeze's 'Entomologische Beytrage,' including even vol. iii. part 4 (Leipzig, 1783, pp. xx. 178), unknown to Hagen. The prefaces are mostly dated 'before Michaelmas, 17—,' and contain notices of the parts of Cramer which have appeared up to the time of publication. Unfortunately this information is only useful after 1779, when the two first volumes of Cramer (plates 1—192) were already completed. Between Michaelmas, 1779 and 1780, plates 193—276 appeared; between Michaelmas, 1780 and 1781, plates 277—336 were published: and the work is known to have been completed in the following year. A considerable part of vols. iii. and iv. (certainly all after plate 252, and perhaps several earlier plates) were edited by Stoll after the death of Cramer. As regards Stoll's Supplement, the title-page bears the date 1791; but I have seen a copy in the original covers, upon which part 1 (plates 1—8) was dated 1787, and the four subsequent parts 1790, although it is more likely that a part would have been issued annually; but of this I have no evidence."

"Papilio Hyale, L.—I have already (Tr. Ent. Soc. 1870, p. 141) questioned the correct identification of this insect, and I now feel sure that the insect intended by Linnaeus is the female of *Papilio Croesus*, *Fouger.* = *Colias Edusa*, *auct.* The Linnean description is as follows (Fn. Suec. p. 272):—'Pap. Hyale alis integerim rotundatis flavis; posticis macula fulva; subtus puncto sesquialtero argenteo. . . . Simillimus Pakenoni, sed aëe magis flavae. Aëe primores flavae, apice nigrae, nigroline fascia quasi lutea in duas partes dissecta. Secundarie supra in medio puncto s. macula ferruginea, cui subtus opposita. Puncta duo argentea approximata, annulo ferrugineo cincta; altero puncto valle parvo. Antennæ et margo ciliaris alarum rubra ut in sequente (P. Pakeno).' In favour of the species intended being the modern *Hyale*, it may be contended, (1) that the ground colour is called *flavis*; (2) that the Linnean type agrees with this species.

I can only reply to the second point from hearsay; but I believe I am correct in asserting that the Linnean types of *Colias* are very doubtful. (Compare Prof. Westwood's remarks in his 'British Butterflies.') *C. Palæno* is by far the commonest species in Sweden, and there has never been any doubt about this species, except that some of the older authors who were unacquainted with it gave *Hyale*, *auct.*, under this name. Both *C. Edusa* and *C. Hyale*, *auct.*, are of doubtful occurrence in Sweden; and it is very unlikely that Linnæus was acquainted with either of the high northern species, *C. Nastes* and *C. Hecla*. *C. Electra* was subsequently described by Johanssen and Linnæus as 'fulvus,' which has helped to obscure the other descriptions. The Linnean description states that *Hyale* is 'magis flavis' than *Palæno*. This will not apply to *Hyale*, *auct.*; which if anything is *less* yellow. Then the fascia dividing the dark hind margin is called 'lutea,' which indicates a decided difference in that tint from the ground colour. This cannot apply to *Hyale*, *auct.*, but applies very well to *Croceus*, female. All the other points in the description would apply equally well to both species. Eight references are quoted by Linnæus in his different works for his *Hyale*. I have consulted six of these, and all refer to *C. Croceus*, and every figure quoted represents the female. In one or two cases (*e.g.* by Scopoli and Geoffroy) *Hyale*, *auct.*, is casually noticed as a *var.* or as the other sex; but the two species were never properly separated till Denis and Schiffermiller, in the 'Wiener Verzeichniss' (1775), gave *Hyale*, *auct.*, as *Palæno*, *L.* (certainly an error) and *Croceus* as *Hyale*, *L.*; another reason why the name *Hyale* should be applied, as it was by nearly all the old authors, to the latter species. The only name which I can find for *Hyale* (except *Palæno*, which is inapplicable) is *Sareptensis*, applied by Staudinger, in his 'Catalog' (1871), p. 5, to a variety. It is a very inappropriate name for an insect of so extensive a range; but unless all the misnomers in Entomology are to be rejected, I do not think we can avoid adopting it."

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1 January, 1872.

A. R. WALLACE, Esq., F.Z.S., President, in the chair.

#### *Additions to the Library.*

The following donations were announced, and thanks voted to the donors:—'Proceedings of the Royal Society,' No. 130; 'Catalogue of Scientific Papers,' vol. v.; presented by the Society. 'The Journal of the Linnean Society,' Zoology, No. 54; 'Proceedings of the Linnean Society of London,' Session 1871-72; by the Society. 'Coleopterologische Hefte,'

No. VII.; by the Editor, Herr E. v. Harold. 'L'Abeille,' 1871, livr. 10, 11; by the Editor, M. S. A. de Marseul. 'The Zoologist' for January; by the Editor. 'The Entomologist's Monthly Magazine' for January; by the Editors. 'Exotic Butterflies,' Part 81; by W. W. Saunders, Esq. 'The Entomologist's Annual for 1872;' by H. T. Stainton, Esq. 'Contributions pour servir à l'Histoire Naturelle des Ephémérides,' No. 3; by the Author, Dr. Emile Joly.

*Papers read, &c.*

The Secretary read a communication from Mr. Gould respecting the question of the liability of Odonata to the attacks of birds, of which the following is an extract:—"I believe that the larger dragon-flies are very liable to the attacks of birds, and have no doubt that the hobby and kestrel occasionally feed upon them. With regard to the small blue-bodied species (Agrionidae) frequenting the sedgy banks of the Thaunes, I have seen smaller birds—sparrows, &c.—capture and eat them before my eyes, after having carefully nipped off the wings, which are not swallowed. This must take place to a considerable extent, as I have observed the tow-path strewn with the rejected wings."

Mr. Müller called attention to a pamphlet just presented to the Society, viz. 'Contributions pour servir à l'Histoire Naturelle des Ephémérides,' by Dr. Emile Joly, in which the author asserted his belief that the so-called Crustaceous genus *Prosopistoma* is founded upon the immature condition of species of *Ephemeridae*.

Mr. M'Lachlan said that he had been made aware by Mr. Crotch of an inaccuracy in his paper on certain Linnean species of *Myrmecleon* (Tr. Ent. Soc. 1871, pp. 441—444). The inaccuracy referred to consisted in his having ascribed to Linné the words "*ala obsoleta nubulosa*" in the description of the ant-lion in the first edition of the 'Fauna Suecica,' whereas Linné there says nothing whatever about the perfect insect, the description referring entirely to the larva and habits. Mr. M'Lachlan explained that he had been led into this error through having neglected to notice that the words were MS. additions by Linné in his own interleaved copy of the 'Fauna' in the possession of the Linnean Society. The error did not alter the bearings of the case.

Mr. F. Smith communicated a long letter from Mr. J. T. Moggridge, dated from Mentone, November 7th, relating to the habits of certain species of ants belonging to the genus *Aphenogaster*. Mr. Moggridge had observed that two species of this genus (*A. stractor* and *A. capitata*) frequenting the sandstone slopes of that neighbourhood were, in the winter months, in the habit of carrying into their nests the seeds of certain late-fruiting plants, especially of *Polygonum vulgare*. The nests of *A. capitata* extend a long way into the rock; with the aid of a chisel and hammer these excavations

had been traced to their limits, and in one case the channels ended in a spherical chamber, filled with the seeds of a grass which he had seen the ants in the act of transporting. Outside the channels there was generally a heap of the husks of the various seeds, and sometimes one of those heaps would fill a quart measure. These husks had had their farinaceous contents extracted through a hole on one side. He purposely strewed near the nests large quantities of millet and hemp-seeds. After the lapse of a fortnight many of these seeds, previously conveyed into the nests, had been brought out again, they having evidently commenced to germinate, and he then found that the radicle was gnawed off from each seed, so as to prevent further growth, and, this being effected, the seeds were carried back again. The cotyledons of germinated seeds were removed from the nests. The oily seeds of hemp appeared to be greatly in request. He had not found any true Myrmecophilous beetles in the nests, but a specimen of a *Choleva* was observed, and *Aleochara nitida* swarmed about the entrance of the galleries. There were, however, numerous immature examples of a *Lepisma*, and a Coleopterous larva, to which the ants paid great attention, an agitated group of workers seizing one of them when placed near them, removing it to a place where there was loose friable earth, into which it immediately began to burrow. The only recent account of the storing of grain by ants that Mr. Moggridge had been able to find was in the '*Encyclopædia Popolare*,' Torino, 1845, in which the explanation given was that the ants used the seeds for building materials. He promised to make further observations on these grain-storing species, and to communicate the results to the Society.

Prof. Westwood called attention to a paper on the same subject by the Rev. F. W. Hope, published in vol. i. of the '*Transactions*' of the Society (pp. 211—213), 1839.

Mr. Butler read a paper "On certain Species of Pericopides in the Collection of W. Wilson Saunders, Esq."

*New Part of 'Transactions.'*

Part iv. of the '*Transactions*' for 1871 (published in December) was on the table.

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## ANNUAL MEETING,

22 January, 1872.

A. R. WALLACE, Esq., F.L.S., President, in the chair.

An Abstract of the Treasurer's Accounts for 1871 was read by Mr. Dunning, one of the Auditors, and showed a balance in favour of the Society of £133 13s. 8d.

The Secretary read the following :—

*Report of the Council for 1871.*

In accordance with the Bye-Laws, the Council presents the following Report.

The vacancy in the list of Honorary Members, occasioned by the death of the lamented Lacordaire in 1870, has been filled by the election of the Baron De Selys-Longchamps, of whom Lacordaire was long a fellow-townsman.

One composition in lieu of Annual Subscriptions has been received and invested.

The 'Transactions' and 'Proceedings' for 1871 form a volume which the Council believes will bear favourable comparison with that for any preceding year. There is an absence of coloured plates, but this is owing to causes beyond the control of the Council.

The receipts from the sale of our publications show a slight diminution. This the Council believes to be mainly, if not entirely, due to the late lamentable struggle between two leading continental powers, and in its next Report it looks forward to this item as then presenting a more favourable aspect.

In November there was published a second part of the Catalogue of British Insects, comprising the Aculeate Hymenoptera, compiled by Mr. F. Smith. From the Abstract of Income and Expenditure, given below, it will be seen that the expense of printing this part has been defrayed without any special donation devoted to this purpose. But the Council feels it to be very desirable that the parts of the Catalogue should appear in more rapid succession, and at intervals equal to the ability of the various compilers to furnish their MSS. An attempt to effect this is now being made by an application for extraneous aid.

The Income and Expenditure for the year may be briefly stated as follows:—

RECEIPTS.	£	PAYMENTS.	£
Contributions of Members ..	200	Investment .....	15
Sale of Publications .....	72	'Transactions' & 'Proceedings'	179
Interest on Consols .....	4	Library .....	12
Donations .....	20	Rent and Office Expenses....	54
	<hr/> <u>£296</u>	Tea at Meetings .....	14
		One part of Catalogue .....	24
		<hr/> <u>£298</u>	

The expenditure has therefore slightly exceeded the receipts, thus almost annihilating the small balance exhibited in the statement of accounts for 1870. And it will be seen that even this result has only been obtained from the item of donations, though, with the exception of a sum liberally subscribed by Mr. W. Wilson Saunders, this item is made up from contributions received from the Rev. A. E. Eaton and Mr. W. Arnold Lewis, towards the expenses of publishing their memoirs; the thanks of the Society are also due to Mr. Butler for the plate illustrating one of his papers.

A consideration of this financial statement can but prove to the Members that the endeavours of the Council to extend the usefulness of the Society are powerless without their aid, and that aid it confidently asks and expects. An addition of twenty new Members to our number would relieve the Council of much of the anxiety it continually experiences in its endeavours to maintain for the Society the position it has attained, and would also enable it to be more liberal in adding to the Library.

22 January, 1872.

The following gentlemen were elected Members of Council for 1872:—Messrs. H. W. Bates, Butler, Grut, Higgins, M'Lachlan, Marshall, Müller, E. Saunders, Stainton, F. Smith, S. Stevens, A. R. Wallace, and Westwood.

The following officers for 1872 were subsequently elected:—President, Prof. J. O. Westwood. Treasurer, Mr. S. Stevens. Secretaries, Messrs. M'Lachlan and Grut. Librarian, Mr. E. W. Janson.

## THE PRESIDENT'S ADDRESS.

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GENTLEMEN,

When I had the honour of addressing you a year ago, it was my duty to record the heavy loss we had sustained by the death of two of our members, both Entomologists of the first rank, and one of them of European reputation. I am now happy to be enabled to inform you that, during the year 1871, our Society has suffered no losses by death, either among its home or foreign members, neither have we to regret the loss to our science of any Entomologist of especial eminence. Yet the obituary portion of my address will by no means be a blank, since we have lost in the past year four entomological authors of some note, while two others died in the latter part of 1870, but were not noticed in my last address.

Rudolf Felder, Doctor of Laws, only son of Dr. Felder, Mayor of Vienna, died on the 29th of March, 1871, at the early age of twenty-eight years. He devoted most of his leisure to the study of his father's extensive collection of Lepidoptera, and to the publication, in conjunction with his father, of a variety of valuable descriptive and classificational papers. Their greatest joint work is that on the Lepidoptera of the 'Novara' Voyage, which contains descriptions of nearly a thousand butterflies, the largest portion of which are illustrated by figures, which are well drawn, beautifully engraved, and admirably coloured. The descriptions, which are all in Latin, are understood to be by Rudolf Felder, who seems to have had a talent for discerning specific differences as well as those more important structural characters on which natural genera are founded, and the power to express them in terse and well-chosen language. By publishing so large a number of excellent coloured

figures of new butterflies and moths, the two Felders have conferred a benefit upon Entomology which will not soon be forgotten; and, in the early death of the younger, we have lost one of our most earnest and most enlightened students of the fascinating but difficult order of Lepidoptera.

Victor von Motschulsky died at Simferopol on June 5th, 1871. He was a colonel on the staff of the Russian army, and made very extensive journeys in an official capacity to the remotest parts of the vast Russian Empire, as well as to other countries. His first important work, published more than twenty years ago in the Transactions of the Imperial Academy of Sciences of St. Petersburg, was on the Coleoptera of Siberia, describing hosts of new species of Geodephaga, with exact localities. He afterwards published a large work entitled '*Die Käfer Russlands.*' His '*Etudes Entomologiques*' formed a miscellaneous record of his travels and adventures in the Caucasus, Central and North America, and other countries, and contained descriptions of great numbers of new species. He also described and catalogued the Coleoptera collected by various travellers in the Amur and in Central Asia, and published several memoirs on the Coleoptera of California. Of late years he wrote chiefly in the well-known Moscow '*Bulletin*,' monographing various groups of Coleoptera and describing large numbers of new genera and species. I am informed by Mr. Bates (to whom I am indebted for most of the foregoing information) that Motschulsky has a reputation for carelessness and inaccuracy, for recklessness in introducing new classifications, and for ignoring the works of his predecessors. His genera and other new groups are often unintelligible; and it is therefore not improbable that his great labours as an author have been on the whole of more injury than benefit to the science to which he devoted himself. Although almost exclusively a Coleopterist, he also described many Lepidoptera.

Professor J. T. C. Ratzeburg died at Berlin on the 24th of October last, in his seventy-first year. He occupied himself especially with the metamorphoses and the ravages of insects injurious to forests, and his great work '*Die Forstinsekten*' is a lasting proof of his industry and keen powers of observation. He also published a popular edition of this work, as well as the portion relating to the parasitic Hymenoptera (which play so important a part in checking the ravages of forest insects), in a

separate form. He was also a constant contributor to German entomological periodicals. He was one of the few Entomologists who devote themselves, almost exclusively, to a study of the habits and economy of known insects rather than to the description of new ones; and will always be remembered by the Coleopterist for his elaborate researches into the Natural History of the Xylophagous beetles.

On the 18th of December last, Von Heinemann of Brunswick died suddenly. His work on German and Swiss Lepidoptera is well known, and he was engaged in correcting the proofs of the concluding portion at the time of his decease.

Dr. J. P. Rambur died at Geneva on the 10th of August, 1870, aged 69. When a young man he explored the Entomology of Corsica and Andalusia, and in 1812 commenced publishing an expensive Entomological Fauna of the latter country, but the issue was soon discontinued. In the same year appeared his chief work, the volume on Neuroptera, in the '*Nouvelles Suites à Buffon*.' He tells us in his preface to this work that the Lepidoptera were his favourite study, while the Neuroptera were, of all insects, the least attractive to him; yet the task so inauspiciously undertaken was executed in a manner which proves him to have been a true Entomologist. He paid great attention to structural details, and especially to secondary sexual characters, which have since been found so valuable in the classification of other orders of insects. He laid the foundations of the modern classification of the Neuroptera, and, in so doing, made a real advance in the study of Entomology. He was one of the founders of the Entomological Society of France.

Dr. Emerie von Frivaldszky of Pesth, a Hungarian Entomologist and traveller, died during the year 1870, aged 72. He was more especially known by his investigations of the Entomological fauna of the Balkan Mountains, and of Asia Minor. He published several memoirs on the results of his expeditions, but many of these are in the Magyar language, and remain as sealed books to most Entomologists. Latterly he industriously investigated the cave-beetles of his native country.

The Entomological literature of the year possesses many features of interest, and I propose to notice a few of the more remarkable works I have met with; after which I shall beg to

offer you some more detailed observations on two special subjects which are suggested by them.

Giving the precedence to our own "Transactions," I am happy to say that the yearly volume just completed contains papers of great originality and value, so as fully to maintain its reputation as a standard scientific work. The first and most important paper is the careful and elaborate monograph of the *Ephemeridæ*, by the Rev. A. E. Eaton; beautifully illustrated by six plates, crowded with details of the structure of the various species. All the known species of the family, 178 in number, are fully described, and immense research has been bestowed upon the literature and synonymy.

Three papers, by Messrs. Hewitson and Butler, describe new species of butterflies, while Professor Westwood, Messrs. Bates, Baly, Sharp, Wollaston, and C. O. Waterhouse, describe new Coleoptera. Mr. Albert Müller discusses the dispersal of non-migratory insects by atmospheric agencies, and adduces evidence to show that this is constantly going on, and is one of the regular means by which the existing geographical distribution of insects has been brought about.

Our honorary member, the Baron de Selys-Longchamps, has given us, in a short paper, a summary of the group of dragon-flies as at present known; from which it appears that there are 190 genera and 1357 species, including some in our collections which are not yet described.

Mr. B. T. Lowne has contributed a curious and suggestive paper on "Immature Sexuality and Alternate Generation in Insects," in which he discusses the phenomena of apterous females and largely developed horns and other appendages in the males, as directly due to sex. He doubts the action of sexual selection in producing the horns and other ornaments of beetles, and maintains that the apterous and larval forms of the existing higher insects are all acquired, and not due to descent from ancestral larval forms.

Mr. W. Arnold Lewis has given us a very important critical paper on the arrangement of Lepidoptera, and on the use and abuse of synonymous lists and other catalogues. Not only do his criticisms appear to me to be, for the most part, sound and of great value, but he has treated one of the driest and most uninviting of subjects with so much skill and such command of

language, as to make it not only intelligible and interesting, but even amusing. His views on nomenclature have caused some discussion, and they have an important bearing on a subject I shall refer to presently. The remaining papers are—"On the forms of *Zygæna Trifolii*," by Mr. Briggs, in which the question of species and variety is discussed; and one by Mr. McLachlan on the identification of three species of *Myrmecleon* described by Linnaeus.

The Proceedings of the Zoological Society of London, published during the past year, contain few Entomological papers. Part iii. of the volume for 1870 (which appeared in 1871) contains a list of a collection of North Indian butterflies by Mr. Butler, a note on abnormal neurulation in an *Aeræa* by the same author, and two papers on spiders by Mr. O. Pickard Cambridge. The two parts already published for 1871 contain another paper on spiders by the last-named gentleman, and four papers on butterflies by Mr. Butler, as well as one by Mr. W. S. Atkinson on the same group. The Journal of the Linnean Society contains several Entomological papers :—on new forms of *Asecalaphidae* and on the classification of the *Asecalaphidæ*, by Mr. McLachlan; Contributions to a Knowledge of *Curculionidæ*, pt. ii., by Mr. Pascoe; a Note on Mr. Murray's Coleopterous Faunæ, by Mr. Trimen; a Catalogue of Aculeate Hymenoptera and Ichneumonidæ of India and the Eastern Islands, by Mr. F. Smith, with some introductory observations by myself; Observations on a Light-giving Coleopterous Larva, by Dr. Hermann Burmeister; and Sir John Lubbock's paper on the Origin of Insects. The 'Annals and Magazine of Natural History' contains no less than ten papers on insects in the last year's volumes, of which the following is a list :—On Insects inhabiting Salt Water, by Dr. Packard; Descriptions of new Butterflies, and of a new *Paphia*, by Mr. O. Salvin; List of Coleoptera from Old Calabar, by Mr. A. Murray; New Species of Lepidoptera, by Mr. Butler; Life in the Wyandotte Cave, in which several cave-insects are described, by Professor Cope; Catalogue of Zygopinæ, Additions to Australian Curculionidæ, New Genera and Species of Longicorns, and Notes on Coleoptera, by Mr. Pascoe; Spiders of Montreal, Upper Canada, by Mr. John Blackwall; and Coleoptera of St. Helena, by Mr. T. Vernon Wollaston. The 'Zoologist' contains Notes on Chalcididæ, by Mr. Francis Walker. The 'Entomologists'

'Monthly Magazine' has contained, during the past year, the usual quantity of valuable and interesting matter on every branch and aspect of British Entomology, and has also contained a number of papers of wider interest, treating of classification, or describing new species of insects. Among the contributors of this class are Messrs. Stainton, Butler, Ward, and Scudder, on Lepidoptera; Messrs. Sharp, Bates, Waterhouse, and Reed, on Coleoptera; and Mr. M'Lachlan, on Neuroptera and Trichoptera.

Mr. Hewitson's beautiful illustrations of butterflies have regularly appeared throughout the last two years, and fully maintain their high reputation for delicacy of execution and superb colouring. Long may he live to continue them! till they form a monument of his patient skill and enthusiastic love of nature, unequalled by the work of a single individual in any age or country. Our stores of Lepidoptera have, however, been of late so rapidly increasing that no pencil can keep pace with the supply, and we have all to thank Mr. Butler for helping on the good and useful work of accurately delineating the new and puzzling forms that crowd upon us. In his '*Lepidoptera Exotica*' he has boldly essayed a new style of art in this country, that of illustrating species by colour-printing. Ten quarterly parts have now appeared, in which a large number of new butterflies and moths are, always accurately and often beautifully, delineated. As specimens of art these will not, of course, compete with the best hand-work, but as representations of Nature they are all that can be desired; and some of the last issued plates are so beautiful, and so well represent the texture of the lepidopterous wing, that they may be preferred by some to the superior brilliancy of hand-colouring. It must be remembered that the expense of such a publication (where the demand for copies is limited) is very great, and in such a case there can be little or no advantage over the old method in point of cost; but the experience in this mode of work now being gained, will, it is to be hoped, lead to its being applied to publications where a large number of copies are required, and where the saving of expense will be a real boon to many a working naturalist. Before dismissing Mr. Butler's meritorious work, I would, however, protest, both on the score of utility and of harmonious effect, against the introduction of brilliant flowers among the figures of butterflies. This has been tried in one plate, which I trust will be the last of its kind.

As an example of the importance Entomology may assume in a new and partially cultivated country, I may call your attention to a Report on the Noxious and Beneficial Insects of the State of Missouri, made to the Missouri Board of Agriculture by the State Entomologist, Mr. Charles V. Riley, a gentleman of English birth and education, who, you will recollect, attended one of our meetings during the past year. In this Report, containing the matter of a fair-sized volume, we have popular and lively, yet accurate descriptions of a large number of noxious insects, with full accounts of their transformations and general economy, and of the various methods of guarding against their ravages. The vine in America seems especially liable to attack, the ravages of an *Aphis*, three Coleoptera and seven Lepidoptera being here described, while this is only a third of the series of articles (not yet concluded) on insects injurious to the vine. This superabundance of enemies is due, no doubt, to the fact that numerous species of grape, and of several allied genera of plants, are indigenous to the United States, and there are thus a host of insects ready to seize upon the more luxuriant and juicy cultivated vines. In the latter part of the Report, under the heading 'Innoxious Insects,' we have a most excellent account of two common American butterflies, the *Danais Archippus*, Fabr., and the *Limenitis disippus*, Godt., in which the subject of mimicry, as illustrated by these two species, is very clearly treated. Mr. Riley's own experiments on the *Archippus* butterfly adds something to our knowledge of this interesting subject. He found that neither turkeys, chickens, toads, nor snakes, would touch the brilliantly-coloured larva, and he observed that these larvae have a pungent and nauseous odour, especially perceptible when a few are confined in a box. In the imago state the odour is even stronger. The larva is not wholly free from enemies, for though hymenopterous parasites have never been observed to attack it yet it is often killed by the dipterous *Tachina*. The caterpillar of the *Limenitis*, on the other hand, is attacked by, at least, three parasites, two hymenopterous and one dipterous. Other facts of importance are, that the larvae of the *Limenitis disippus* are protected by their colours, closely resembling the various willow-leaves on which they feed, while the pupae resemble birds' dung, more especially for the first few hours after their transformation; and that Mr. Otto Lugger, a gentleman employed on the U. S. Lake

Survey, once saw a bird dart after an *Archippus* butterfly, seize it, and immediately drop it, uneaten. Mr. Lugger picked up the butterfly, and was much puzzled at the time to account for this singular action of the bird.

A characteristic feature of the past year is the number of valuable catalogues, lists, and monographs that have appeared. Our own Society has issued, as a second instalment of the 'Catalogue of British Insects,' a Catalogue of the Aculeate Hymenoptera, by Mr. Frederick Smith. Mr. Edward Saunders has given us a compact and useful catalogue of all the described species of the extensive and beautiful family of Buprestidæ, and has furnished it with an excellent index.

The Vicomte de Bonvouloir has published the first part of his long-expected Monograph of the Eucnemidæ, in which he has given careful descriptions of the species in this difficult family, accompanied by exquisitely-engraved figures of nearly half of them. A few years ago Lacordaire enumerated only 70 described species : the present Monograph contains 450.

Dr. Thorell, one of the Professors of Zoology in the University of Upsala, is publishing an elaborate critical work on European spiders. The book is written in English, and the first part, which appeared in 1870, contains some observations on Zoological nomenclature, to which subject the author has devoted much attention. He refers to the old British Association rules with general approval, but differs from them on some important points. He holds the law of priority as absolute, under a few definite restrictions. 1. There must be definition or description, and publication. A recognizable figure of a species he considers sufficient, but of a genus there must be a description pointing out the generic characters. He says, "A new genus that has been distinguished merely by referring to some particular species of an older genus as its type, without in any way indicating which of the characteristics of the species is to be considered as the mark of the new genus, no one can indeed be looked upon as bounden to acknowledge." He adds, "Nevertheless it appears to me advisable to do so, especially if the species referred to deviate in any generally known manner from the typical species of the old genus, and always if the new genus has been once received and acknowledged." 2. As to how far back the application of the law of

priority should extend, he has some very important observations. The binomial system of nomenclature was, he says, fully and distinctly propounded by Linnaeus in the 'Philosophia Botanica,' published in 1751, and there can be no reason whatever why authors who adopted and systematically applied it should be set aside, because Linnaeus himself did not apply it to the whole animal and vegetable kingdoms till 1758. An example occurs in Dr. Thorell's group, Clerck having in 1757 applied it with perfect consistency in his 'Aranea Suecici.' His law therefore is enunciated as follows:—"that in determining the priority of a specific name notice should be taken only of those works in which the Linnaean binomial nomenclature is exclusively and consistently employed." This rule has the great advantage of being independent of date; it goes to the root of the matter and would have some very important results in the determination of synonymy, and I cannot but regret that it was not adopted in the amended British Association rules, instead of the illogical compromise of the 12th Ed. of the 'Systema Naturæ,' with exception as regards two authors, Artedi and Scopoli. An important complement of this simple rule is, that all writings published subsequently to that epoch in which that nomenclature has not at all or not consistently been employed, count for nothing. The same date, our author thinks, should apply to generic as to specific names, both being characteristic of the binomial nomenclature, and it being impossible, if we go back earlier, to determine what are to be considered as truly generic names."

3. Dr. Thorell would not prohibit the employment of the same generic name in Zoology and Botany, such a restriction being unnecessary, and leading to wholesale alteration and consequent confusion.

4. He is a strict purist, and alters the termination of every name he considers to be not classically constructed. He admits that there is often difference of opinion on these points, but does not seem to consider that the consequent confusion and instability of nomenclature is as great an evil as classical inaccuracy.

Our author agrees with most zoologists in rejecting the plan used by botanists, of giving as authority for a species the man who placed it in the last new genus, remarking that he is "unable to discover what advantages that custom can offer." He

well observes that it conceals the epoch when a species was first made known, and it also prevents us from going direct to the work where we shall find the species first described.

The body of Dr. Thorell's work is devoted to a thorough examination of the literature and classification of European spiders, with especial reference to two important Monographs, the authors of which were each unacquainted with the other's works. These are, Westring's '*Aranei Suecicæ*,' and Blackwall's '*British Spiders*,' which, although largely treating of the same insects differ widely in their nomenclature. Both works were published about the same time, and they exhibit a remarkable coincidence in the number of species inhabiting the two countries, Sweden having 308, Great Britain and Ireland 304. A considerable number of southern forms occur with us which are wanting in Sweden, the latter country of course possessing a corresponding proportion of northern and continental forms which we have not. The portion of the work already published is devoted to a critical examination of the genera, both as regards synonymy, classification and structural characters; the species will, I suppose, be afterwards treated in a similar manner.

Of a less extensive scope is Dr. Hagen's '*Monograph of the fresh water Astacidæ of North America*,' which, besides going into interesting anatomical details, brings out a curious fact in geographical distribution, analogous to what occurs in some groups of insects. These crawfishes consist of two well-marked genera, *Cambarus* and *Astacus*. *Cambarus* contains 32 species, and is entirely confined to North America, east of the Rocky Mountains. *Astacus*, on the other hand, is confined to the Pacific coast of America, but also extends into Europe and Asia.

Another work, which may be considered a new one, is Staudinger and Wocke's new edition of their Catalogue of European Lepidoptera, which is now extended to include all the species of the Europæo-Asiatic Fauna. The limits defined are nearly, but not quite, the same as those of Dr. Selater's Palaearctic region. They extend from Iceland to the mouth of the Amur river, going only as far south as 45° or 50° latitude in the east, while in the west of Asia there is an extension as far as 30° in South Persia. The south-east of Persia, towards Afghanistan, is said to show a transition towards the Indian Fauna. Syria and Palestine are wholly European, while Arabia and Egypt should probably be

excluded. All the rest of North Africa, Madeira and the Canaries are considered as forming part of Europe, while the Cape de Verdes are African. The polar regions are said to be wholly European as far as South Labrador and Canada, where North American forms begin to prevail. A very good feature in this catalogue is the separation of accidental variations from true local varieties or races. The former are called "aberrations," the latter only "varieties." Those forms which some naturalists class as varieties, while others consider them to be good species, are termed "Darwinian species." Of all these kinds of varieties a brief Latin diagnosis is given. The number of species in this extended catalogue is 6062; and in the index each genus, species, synonym, and variety, is entered, and severally distinguished by differences of type.

In the preface Dr. Staudinger gives his views as to rules of nomenclature at some length, and it will be of interest to compare them with those of Dr. Thorell, and with our own. His rules are as follows:—

1. Species should be designated by a double Latin name, as first adopted by Linnaeus in the 10th edition of the 'Systema Naturæ.'

On the question of taking the 12th edition, instead of the 10th, as the starting-point for specific names, he epigrammatically remarks: "This way of acting is illogical, and endangers the stability of specific nomenclature; it is illogical because it does not begin at the beginning; it is dangerous because it starts with an exception, and a denial of justice."

2. The names of species should be in Latin or latinized.

Staudinger objects to such names as *Amphionycha knownothing*, and claims the right to latinise them, retaining the original name for purposes of reference. At this one ground of alteration, however, he takes his stand, and will admit of no other whatever. He says, that if specific names are altered on philological grounds, they may be equally altered for errors in botany, geography, &c., and all stability will be at an end. As an extreme case he cites the following corrections of a supposed erroneous name. *Agrotis nyctymera*, Boisd., was altered by Herrich-Schäffer into *Nyctemera*, by Duponchel into *Nyctymera*, by Guenée into *Nyctimera*, by Zeller into *Nychthemera*, and by Speyer into *Nyclimena*. He would consider every specific name, once given

and duly latinized in termination, as a *proper name*, write it with a *capital letter*, and treat it as *unalterable*. His collaborateur Wocke, however, does not agree with him, and therefore he does not fully carry out his views in this catalogue.

3. The first describer of a species should have his name attached to it, even though it be removed to another genus.

He protests, like Dr. Thorell, against the practice of botanists and of many American zoologists in this respect.

4. Museum and catalogue names, without any recognizable descriptions, are void.

5. Every species should absolutely preserve the name under which it has been first described, in accordance with the Linnaean nomenclature.

6. The same specific name may be employed in genera sufficiently remote from each other.

7. A description founded on two or more species can only in exceptional cases be applied to either of them.

8. Species described from the larvæ or pupæ only can not be retained should the perfect insect differ much from known species.

Gemminger and Harold, whose great Catalogue of Coleoptera has been suspended owing to the Franco-Prussian war, but will it is hoped shortly be resumed, carry out the law of priority with great rigour; adopting the oldest name, however bad the description may be, and although the identification is only possible by reference to the type specimen. But they do not admit the validity of any descriptions in fugitive papers or price catalogues. They are purists in orthography, taking exactly the opposite view to the German Lepidopterist cataloguers, and unmercifully alter all names which they conceive to exhibit unclassical construction or erroneous orthography.

One of the most important, if not the most important, of the entomological works of the year 1871 is, undoubtedly, Mr. W. F. Kirby's 'Synonymic Catalogue of Diurnal Lepidoptera,' a volume of 690 pages on the general plan of Gemminger and Harold's 'Catalogue of Coleoptera.' It is issued as a complete work, containing all, or very nearly all, the species and varieties of butterflies described down to the date of publication, with very full synonymy accompanied by dates, and with a column of localities. There is no enumeration of the species either in the

genera or families, and this is an omission; but an estimate by counting a number of pages taken at random gives between nine and ten thousand as the number of species and varieties; and the full and excellent index has about twelve thousand separate references, and appears to contain every generic and specific name, and almost every synonym and variety mentioned in the volume. That such a laborious work, and one of such great use to entomologists, should have been undertaken by so young a man as Mr. Kirby, and successfully completed in so short a time and under the disadvantage of residence in Dublin, where no extensive collections or complete entomological libraries exist, excites our admiration and respect, and proves the author to be not unworthy of the honoured name he bears.

In so extensive a work errors are unavoidable, and the fact that they are discovered and pointed out can hardly be said to detract materially from its merits or its value, if the author does all in his power to circulate among his readers lists of such errata. Every one will then have it in his power to make the needful corrections, each in its proper place, and the work may thus be soon rendered perfect as a book of reference. Leaving such inevitable errors to be discovered by those who use the work, I propose to make a few remarks on some more general topics suggested by this catalogue and by the other works of the like nature to which I have referred.

I would first note the omission of any statement in the preface of what systematic arrangement has been followed. It appears to differ in many points from all previous arrangements, and Mr. Kirby thus lays himself open to the very just criticism of Mr. Lewis, that a catalogue is not the right place to introduce a new classification, still less to introduce it without note or comment, reason or explanation.

The most novel, and, as many will think, the worst feature of the book, is the entire revision of the generic nomenclature (not of the synonymy merely, as stated in the preface), in accordance with a series of rules selected from those issued by the British Association and published in their Report for 1865. This revision has the effect of abolishing scores of old and familiar names, and replacing them by others altogether new to the majority of Lepidopterists. This is done, either because the name is supposed to be preoccupied in some other branch of

Natural History, or because an earlier generic name than that in common use has been discovered. Now although these are valid reasons for altering a name in some cases, they are not always so, and I think we should refuse to accept the decisions of any author who is not governed by the limitations which the British Association Rules place on the alteration of names. It is even questionable whether the author of a catalogue is not going beyond his province in making any corrections or alterations of names in use, for any reason whatever. It may be said that he should simply record the facts, adopt the nomenclature in use, whenever there is uniformity among living authors, and point out if he likes in foot-notes his belief that such a name should be altered for certain reasons. He should consider himself an adviser in such matters, not a judge. I will take one example, almost the first that struck me on turning over the pages of Mr. Kirby's Catalogue, in order to show the mischief of such alterations, and how little they help to promote stability of nomenclature. We find, at p. 303, the old genus *Erycina* of Fabricius, which for sixty years has stood without a synonym, and which is familiar to every one acquainted with South-American butterflies or with the illustrations of Hewitson, Saunders, and Felder, entirely abolished in favour of a much later name, *Ancyluris*, because the original name is said to be preoccupied. Yet, according to the British Association Rules, the name *Erycina* must stand; Rule 10, which applies to this case being as follows: "A name should be changed which has before been proposed for some other genus in zoology or botany, or for some other species in the same genus, *when still retained for such genus or species.*" The last clause of this rule saves our old and admired friend *Erycina* from the indignity of an *alias*, for although that name was given to a genus of Mollusca by Lamarek in 1805, it has long been abolished as an unintelligible "*omnium gatherum;*" and the species distributed in various Limæan and other genera. Mr. Kirby, however, prints the rule in his preface, omitting the last clause, and by doing so has been led to make alterations which those rules in their entirety do not justify, and which therefore cannot stand.\* But by far the most

\* Even should it be necessary to alter a name on account of preoccupation, the change made should be as small as possible, and should be effected by altering a single letter or the termination—not by the introduction of a totally new name, such as is usually given by Mr. Kirby. Thus if *Paphia*, *Fabr.*, which has been in

important and most numerous alterations are caused by adopting the names of an author who has long been purposely ignored as an authority for genera, both by English and Continental Lepidopterists; I of course allude to Hübner. Such old names as *Chionobas*, *Agraulis*, *Eresia*, *Godartia*, *Adolias*, *Polyommatus*, *Leptalis*, *Terias*, *Callidryas*, *Thestias*, and *Anthocharis*, with many more, are changed for others which most of us have never heard of, and which are generally to be found in no other work than Hübner's obsolete and useless catalogue. Yet this wholesale change does not seem to be warranted by the Rules of the British Association, which indeed Mr. Kirby in his work altogether ignores. Rule 12 says: "A name which has never been clearly defined in some published work should be changed for the earliest name by which the object shall have been so defined." And in the explanatory remarks it is said, "Definition properly implies a distinct exposition of essential characters, and *in all cases we conceive this to be indispensable.*" Now this rule merely embodied the feeling and the practice of naturalists, and it had been acted on for nearly thirty years before it had been formally enunciated, in this very case of Hübner, whose work had been systematically set aside as an authority by most European entomologists because it was felt that his so-called genera were mere guesses founded on *facies* alone,—happy guesses no doubt sometimes,—but as frequently wrong as right, and wholly without such *definition* as was held, even in his own day, to be required to constitute a new genus. Boisduval expressly states this, at p. 153 of his 'Species Général des Lépidoptères,' and his non-recognition of Hübner's genera has been followed in almost all the great systematic works which have since been published. If we take Hübner's first four genera, and the characters he gives for them, we shall be able to judge of the reasons for this course.

They are as follows :

- |                 |                          |
|-----------------|--------------------------|
| Hymenitis . . . | Upper wings half-banded. |
| Ithomia . . .   | Upper wings one-banded.  |

---

uninterrupted and exclusive use for sixty-four years, is really preoccupied, it would be much better to alter it to *Paphiæ*, and still quote Fabricius as the authority, than change it to so totally dissimilar a name as *Anaea* of Hubner. A more recent example is *Idiomorphus*, which might have been similarly modified and retained instead of being changed to *Bicyclus*, *Kirby*. No law requires this total change, while every consideration of convenience, no less than of justice, is better satisfied by a slight modification.

Oleria . . . Upper wings twice banded.

Thyridia . . . Both wings banded.

Such a mode of defining genera, although it has the merit of being simple and symmetrical, is undoubtedly superficial; and it can only be by the purest accident that a group so characterised can correspond in extent to any real genus. It is therefore not surprising that two of these four Hübnerian groups of species do not constitute modern genera; yet, because one of the rejected names, Oleria, has been applied by Mr. Bates to an allied genus characterised by him, Mr. Kirby thinks it necessary to give it a new name, because it does not correspond to the Oleria of Hübner, again breaking the British Association law. In Mr. Kirby's own work, we find Hübner's condemnation in almost every page, in the utter want of agreement between his groups and modern genera. The modern restricted genus *Heliconius*, for instance, contains species belonging to seven Hübnerian genera; *Pieris* comprises five, and *Thecla* twelve of these hap-hazard groups; while, in other cases, the species comprising Hübner's groups are divided among several quite unrelated modern genera.

Now here, it seems to me, the case is very strong against the practice of those who, like Mr. Kirby, advocate the adoption of Hübner's generic names. It is not that those who hold opposite views seek to annul or over-ride the law of priority by any self-created law, or by individual opinion; but it is a case in which there has been hitherto almost a universal agreement, fully supported by the tenor of the British Association Rules, that the names sought to be reinstated rank as mere catalogue names for want of proper definition, and should, therefore, never be quoted. The idea of justice to the first namer or describer of a species is sometimes appealed to; but the law of priority is founded on no such expressed idea, but rather on the universal practice of mankind, which always upholds stability of nomenclature, and requires cogent reasons of convenience or beauty to sanction an alteration. Intelligible language is wholly founded on stability of nomenclature, and we should soon cease to be able to understand each other's speech, if the practice of altering all names we thought we could improve upon, became general. It was because this practice of reckless alteration of names had become so prevalent among naturalists, that it was found necessary to declare that

names once given and published were thenceforth unchangeable. It is rather unfortunate that the laws which govern the formation of languages in general were not more consulted, for it would then have been seen that the proper rule to adopt would have been unchangeability of names in use, rather than priority of date, which latter rule ought only to have been brought in, to decide on the claims of two or more names in use, not to revive obsolete names never in use or long ago rejected. Yet even as a matter of justice, it may be maintained that we should recognise the careful and elaborate definitions of a Doubleday or Westwood, rather than the childish guesses of a Hübner; and should quote the former as the authority for the genus, even should they, out of courtesy, have adopted the names of the latter. I think too, that until they can agree among themselves to a new set of rules, English Naturalists should feel themselves bound to follow the rules adopted and confirmed by their national scientific Association, and strongly oppose any alterations of nomenclature not sanctioned by those rules. We are all agreed that change and instability of nomenclature are great evils. We should insist, therefore, that whenever one of these rules can be so interpreted as to avoid change, it should be done; and whenever there is any doubt as to the interpretation, the benefit of the doubt should be given to all names which have been in general use for a number of years. If this view is adopted, the proper course to be taken is to reinstate every name which of late years has been made to give place to one of Hübner's, and further, to treat the 'Verzeichniss bekannter Schmetterlinge' as a mere catalogue which can never be quoted as an authority for genera. There is one other class of alterations made by Mr. Kirby for which I can find no rule, and which seems to me to have no advantages. Whenever the genus from which a family name has been formed is abolished for any cause, he at once gives a new name to the family. Thus, having abolished *Eurygona*, *Bois.*, in favour of *Euselasia*, *Habn.*, he changes Mr. Bates' sub-family *Eurygoninae* into *Euselasiinae*, and, for the same reason, our old friends the *Erycinidae* are rebaptised *Lemoniidae*. It will be remembered that for some years the genus *Nymphalis* was expunged from our catalogues, but no inconvenience or confusion was caused during that epoch by retaining the old family name of *Nymphalidae*.

Looking at the varied opinions expressed and acted upon by

the several authors I have quoted, it becomes evident that we shall never obtain complete uniformity and permanence of nomenclature, as long as each writer of a monograph or compiler of a catalogue thinks himself at liberty to use it as a medium for expressing his own views on the subject. To enact laws is of little use if we have no judges to interpret them. I have long been of opinion that we require a tribunal to decide authoritatively what changes of nomenclature shall be allowed; and though I have often been told this is impracticable, I cannot yet see the impracticability. As an example of what I mean, I would propose that the Natural-History Societies of each of the great nations of Europe and America should appoint one or more well-qualified naturalists to form a Judicial Committee of Nomenclature, all these societies, of course, agreeing to abide by the decisions of such committee. It might meet once a year, or even less frequently (as much business might be done by means of a Secretary), when any one could lay before it cases of non-accordant or erroneous nomenclature, with reasons and authorities for proposed changes. Its decisions, once given, would be adopted in the publications of all the societies, and this would soon lead to their universal adoption. Authors working at monographs or catalogues would naturally submit to it all proposed alterations of existing nomenclature, and would hardly run the risk of injuring the sale of their books by acting in opposition to the judgments given. All cases in which an important principle was involved should be decided only after submitting it to every member of the committee. The decisions of the committee need not be absolutely final, because new evidence might turn up, or the application of a rule might involve consequences not foreseen; but the confusion caused by the reversal of a decision would be carefully considered, and such reversals should not be made, except by a larger absolute majority of the committee than that which gave the previous decision. Such a committee would, of course, lay down certain principles and rules for its own guidance, calculated to secure a uniform and permanent scientific nomenclature of natural objects; and with the great facilities for communications that now exist, I cannot believe that there would be any great difficulty in its practical working; still less can I believe that its decisions would not be respected, and that it would not help us to obtain, much earlier than we otherwise should do, a uniform and permanent nomenclature.

The interesting problem of what is the true ancestry of Insects, and which line was taken in their progress of development, is one which has of late been much discussed. Sir John Lubbock, following Brauer, indicates Campodea, a curious larval form, allied to Thysanura and Collembola, as the nearest existing representative to the ancestral type of the Insecta. The mouth of these insects is neither truly suctorial nor mandibulate, and thus affords a starting point for special modification in both directions. The larvae and pupæ of the higher insects are certainly not mere lower stages in the progressive development of the imago, as was once supposed, but are highly specialized forms, which, during a long series of ages, have diverged so as to become adapted to widely different modes of life. They are not likely, therefore, to represent ancestral types, which must rather be looked for in certain exceptional developmental forms, such as the hexapod larvae of Meloë for example. Dr. Packard endeavoured, nearly two years ago, to carry the solution of the problem one step further back. He believes that the Insecta and Crustacea have been independently evolved from some low annulate animals; the Insecta passing through a rudimentary form to which he gives the name Leptus, analogous to the well-known Nauplius form of Crustacea. The Myriapods he believes to have descended from a Leptiform animal, something like the young of Pauropus;—the Hexapods from one more resembling the young of Stylops and Meloë, and certain low Orthopterous and Neuropterous larvae. Dr. Anton Dohrn is now engaged in a systematic study of this subject, taking, as his basis, the maxim that the development of the individual is a short and incomplete statement of the development of the race; and working out the embryology of as many types as possible, so as to discover how far their earliest stages agree or disagree. He has hitherto principally occupied himself with the Crustacea, but seems inclined to revive the old idea of the possibility of finding homologies between the Annulose and Vertebrate types. The Russian anatomist Kowalewsky holds somewhat similar views, but they seem to be founded on the supposed histological identity of certain internal organs and tissues, rather than on any accurately determined homologies in the great structural features of each sub-kingdom.

Amid all the discussions to which this subject has given rise, it

is to me surprising that one of the most ingenious and remarkable theories ever put forth on a question of Natural History has not been so much as once alluded to. More than six years ago, Mr. Herbert Spencer published, in his 'Principles of Biology,' a view of the nature and origin of the Annulose type of animals, which goes to the very root of the whole question; and, if this view is a sound one, it must so materially affect the interpretation of all embryological and anatomical facts bearing on this great subject, that those who work in ignorance of it can hardly hope to arrive at true results. I propose, therefore, to lay before you a brief sketch of Mr. Spencer's theory, with the hope of calling attention to it, and inducing some of you to take up what seems to me to be a most promising line of research; and, although the question is one on which I feel quite incompetent to form a sound judgment, I shall call your attention to the light which it seems to throw on some of the most curious anomalies of insect structure.

The theory itself may be enunciated in very few words. It is, that insects, as well as all the Annulosa, are not primarily single individuals, but that each one is a compound, representing as many individuals as there are true segments in the body, these individuals having become severally differentiated and specialized to perform certain definite functions for the good of the whole compound animal.

Mr. Spencer first calls attention to the fact, that among the undoubtedly compound animals (which are almost all found in the sub-kingdoms, Cœlenterata and Molluscoida) the several individuals are rarely combined in such a manner as to necessitate any physiological division of labour among them. The associated individuals of a Hydrozoon or an Ascidian are each free to spread their tentacles, to draw in currents of water, and to select their food, without in any way interfering with each other, because the compound animal is either branched or approximately hemispherical, and thus there is no necessity for any of the combined individuals to become especially modified with regard to the rest. But should a compound animal have its component individuals arranged in a linear series, there would most probably arise a marked difference of conditions between the two situated at the extremities and those between them. If they remained united, some modification must have occurred to adapt each to its condition. But if, further, the series should be fixed at one end,

the other being free, a new differentiation must arise; for the two ends being very differently situated, the intermediate ones will also differ accordingly as they are nearer one end or the other. Here there is a cause for the differentiation of united individuals that does not exist in any branched or other symmetrical arrangement than a linear one. Some of the Salpidae show such a rudimentary linear aggregation, but their mouths and vents being lateral the individuals are so similarly situated that no differentiation need occur. A little consideration will show us that this is one of those cases in which perfectly transitional forms are not to be expected. A permanent union of individuals in a linear series, such as to necessitate differentiation of function among them, could only be effected by a series of co-ordinated gradations, each of which would have so great an advantage over its predecessor as to necessitate its extinction in the struggle for existence. We cannot expect to find the union without the differentiation, or the differentiation without the complete union; and it will, therefore, be impossible to prove that such was the origin of any group of animals, except by showing that numerous traces of separate individualities occur in their organization, and cannot be explained by any of the known laws of development or growth in animals not so compounded.

In the structure of the lower Annelids we do find strong indications of such an ancestral fusion of distinct individuals. These animals are composed of segments, not merely superficial, but exhibiting throughout a wonderful identity of form and structure. Each segment has its branchiae, its enlargement of the alimentary canal, its contractile dilatation of the great blood-vessel, its ganglia, its branches from the nervous and vascular trunks, its organs of reproduction, its locomotive appendages, and, sometimes, even its pair of eyes. Thus every segment is a physiological whole, having all the organs essential to life and multiplication. Again, just as other compound animals increase by gemmation or fission, so do these. The embryo leaves the egg a globular ciliated gemmule; elongation and segmentation then take place, always in the hinder part, so as to elongate the compound animal without interfering with the more specialized anterior segment. In the Nemertidae, and some Planaria, spontaneous fission occurs, each part becoming a perfect animal, and in the *Taenia* this is the usual mode of reproduction. The account given

by Professor Owen in his ‘Comparative Anatomy of Invertebrates’ is very suggestive of Mr. Spencer’s view. He says—“On the first appearance of the embryo annelid it usually consists of a single segment, which is chiefly occupied by a large mass of unmetamorphosed germ-cells. And these are not used up, as in higher animals, in developing the tissues and organs of an undivided or individual whole, but, after a comparatively slight growth and change of the primary segment, proceed in the typical orders to form a second segment of somewhat simpler structure, and then repeat such formations in a linear series, perhaps more than a hundred times. So that we may have a seeming individual annelid, consisting of many hundred segments, in which a single segment would give all the characteristic organization of such individual, except some slight additions or modifications, characterising the first and last of the series.” He also tells us that spontaneous fission has now been observed to take place in almost every order of Annulata; and, in many, artificial fission produces two distinct individuals. In some cases the compound animal consists of very few segments, three only in the genus *Chætogaster*, the fourth always separating as a zooid, and forming a new animal. In the higher Articulata, the process of gemmation goes on to a considerable extent in the egg, and even afterwards in some cases, but more or less irregularly. Thus the larva of *Julus* is hatched with eight segments, and at the first moult it acquires six new ones, which are added between the last and the penultimate.

The gradual fusion of the once distinct individuals into a complete unity, is shown in a very interesting manner as we advance from the lower to the higher forms. In the Annelida, Dr. Carpenter tells us, the spiracles of each segment are separate, and do not communicate internally with those of other segments. In the Myriapoda they partially communicate, while in the Insecta they communicate perfectly by a system of anastomosing vessels. The same thing is indicated by the various positions of the chief spiracles. In *Smynthurus* among the Poduridæ there are only two, opening under the side of the head immediately beneath the antennæ. In Solpugidæ (Arachnida) they are situated between the anterior feet; in some spiders they open near the end of the abdomen, in others at its base. The position of the mouth and eyes at the anterior extremity of the body, and the

vent at the posterior, are obviously what would arise as soon as any specialization of function in the series of zooids occurred. It is not, therefore, surprising that we never find these change their position. But for the respiratory and generative organs there is no such necessity for fixity of position, and as *they* existed originally in every segment, we can well conceive how, as articulate forms become more and more modified, it would sometimes be useful to the compound animal for these organs to become abortive or developed in different parts of the body. We have seen that this is to some extent the case with the former organs, but it occurs to a much greater extent with the latter.

The most generalized form is to be seen in the intestinal worms, each segment of which possesses a complete hermaphrodite reproductive apparatus; so that, in this respect, no less than in their capacity for spontaneous fission, these creatures are really what we should expect the early type of compound animals to be. This, however, is a rare case, but even in the much higher leeches there are testes in no less than nine of the segments, and Dr. Williams discovered a direct passage from the spermatheca to the ovaries, which seems to indicate internal self-fertilization. It is, however, in the lower Arthropoda that we find the most curious diversities in the position of these organs. In the Glomeridae the genital openings in both sexes are situated in the third segment, just behind the insertion of the second pair of limbs. In the Polydesmidae the female organs are in the third segment, while those of the male are in the seventh segment. In Julus the same organs are situated in the fourth and seventh segments respectively. The Chilopoda, on the other hand, have them near the end of the body, as in most insects. In the Acarina the ovaries open on the middle of the abdomen or on the under side of the thorax, either between or behind the last pair of legs. In spiders the seminal orifice is at the base of the abdomen, but the palpi are the intromittent organs; these are spoon-shaped, and are besides armed with horny processes, hooks, and other appendages, and must be looked upon as true generative organs. In the Astacidae the sexual organs of the male are at the base of the first pair of abdominal legs, those of the female at the base of the third pair. Among the true winged-insects there is one remarkable case of abnormal position of these organs, in the

dragon-flies, which have the seminal vessels in the ninth, while the complex male sexual organs are situated in the second, abdominal segment. It is interesting to note that this curious anomaly occurs in an order which is considered to be of the greatest antiquity and most generalized type among the true insects.

There are many other facts of a similar character to those I have now touched upon, and they all become clearly intelligible on the theory of Mr. Spencer, that the Annulosa are really compound animals, or, as he expresses it, "aggregates of the third order;" while the other great groups of highly organized animals—Mollusca and Vertebrata—are typically simple animals, or "aggregates of the second order," (the cells of which their structures are built up being "aggregates of the first order"). Nothing of a similar character is to be found among the two latter groups. No molluscous or vertebrate animal can be divided transversely so that the separate segments shall be in any degree alike, and contain repetitions of any important organs. The distinct separation of parts in the vertebral column has been acquired, for it is less visible in the lower types than in the higher (the reverse of what obtains among insects), and in the lowest of all is quite absent; while in none is there any corresponding multiplicity or displacement of respiratory, circulatory, or generative organs. The vertebral column corresponds rather to the segmented shell of the Chiton, and has no more relation than it to the essential plan of the more important vital organs. Neither does any mollusk or vertebrate undergo spontaneous fission, nor that complete and progressive segmentation in the process of development which is characteristic of all Annulosa; nor do they ever exhibit the phenomena of parthenogenesis or alternation of generations, the essential feature of both which is, that numerous individuals are produced from a single fertilized ovum, by a process analogous to (or perhaps identical with) ordinary gemmation, and both which phenomena sometimes occur even among the higher insects.

In concluding this short sketch of a remarkable theory, I would observe, that if it is a true one it at once invests the objects of our study with a new and exceptional interest; because they are the most highly developed portion of a group of animals which will, in that case, differ fundamentally in their plan of structure from all other highly organized forms of life. In the study of the habits, instincts, and whole economy of insects, we shall have to

keep ever in view the conception of a number of individualities fused into one, yet perhaps retaining some separateness of mental action, a conception which may throw light on many an obscure problem, and which will perhaps materially influence our ideas as to the nature of life itself. We must remember also, that if the insect is really a compound animal, then the only true homology that can exist between it and a vertebrate, or a mollusk, will be one between a single segment and an entire animal, and the search after any other will be so much lost time. Especially must the acceptance of this theory have an important bearing on all embryological and genetical studies; and if the facts and arguments adduced by its learned and philosophical author do make out even a *prima facie* case in its favour, it must deserve the careful and unbiassed consideration of all who endeavour to solve the problem of the origin of insects.

I have now, Gentlemen, only to express my satisfaction that, at the expiration of my term of office, I leave the Society in at least as flourishing a condition as that in which I found it; for, although I feel that none of its success is due to my individual exertions, yet some of the responsibility of misfortune might have fallen upon me. The Entomological and all similar Societies may be compared to such a compound animal as Mr. Spence's insect, and its success will depend upon its component members being sufficiently numerous and sufficiently differentiated in character to perform energetically all the functions which maintain its life, and at the same time sufficiently combined and integrated to work harmoniously together for the good of the organism. The officers with whom I have had the pleasure of being associated during the past year, make, I venture to suggest, a near approach to this high ideal; and although I have been but an inefficient head to a body which is, so to speak, engaged in a constant struggle to maintain a healthy and useful existence, yet your kind consideration has always made it a pleasure for me to fulfil, to the best of my ability, the duties of the honourable office to which you elected me.

Mr. Dunning proposed, and Mr. Weir seconded, a vote of thanks to Mr. Wallace for his Address, and for his services as President during the past year. Mr. Wallace returned thanks.

Mr. Dunning proposed, and Mr. Stainton seconded, a vote of thanks to the other officers for 1871. Mr. Stevens returned thanks.

*Abstract of the Treasurer's Accounts for 1871.*

Receipts.	£ s. d.	Payments.	£ s. d.
By Balance in hand, Jan. 1, 1871	6 3 8	To Rent, Librarian, and Office }	54 7 0
,, Arrears of Subscriptions ..	24 3 0	Expenses .....	
,, Subscriptions for 1871 ....	143 17 0	,, Printing .....	174 7 9
,, Admission Fees .....	6 6 0	,, Plates, engraving & printing	29 5 0
,, Composition .....	15 15 0	,, Books, purchased & binding	12 5 6
,, Tea Subscriptions .....	10 2 0	,, Tea, 13 Meetings .....	13 13 0
,, Interest on £148 0s. 5d. (Consols .....) )	4 8 8	,, Consols purchased (£16 17s. 8d.) } 15 15 0	
,, Sale of Publications .....	71 19 7	Balance in Treasurer's hands .....	3 1 8
,, Donations .....	20 0 0		
	<hr/> £302 14 11		<hr/> £302 14 11

*Liabilities and Assets of the Society.*

Liabilities.	£ s. d.	Assets.	£ s. d.
To Loan of Mr. Dunning ....	45 0 0	By Arrears of Subscriptions:—	
		Good.....(say)	24 3 0
		Doubtful £56 14s. 0d.	
		,, £164 18s. 1d. Consols (cost)	151 9 0
		,, Cash Balance in hand ....	3 1 8
	<hr/> £45 0 0		<hr/> 178 13 8
		Less Liabilities .....	45 0 0
			<hr/> £133 13 8

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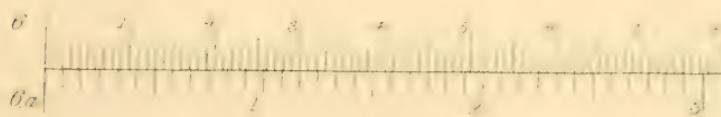
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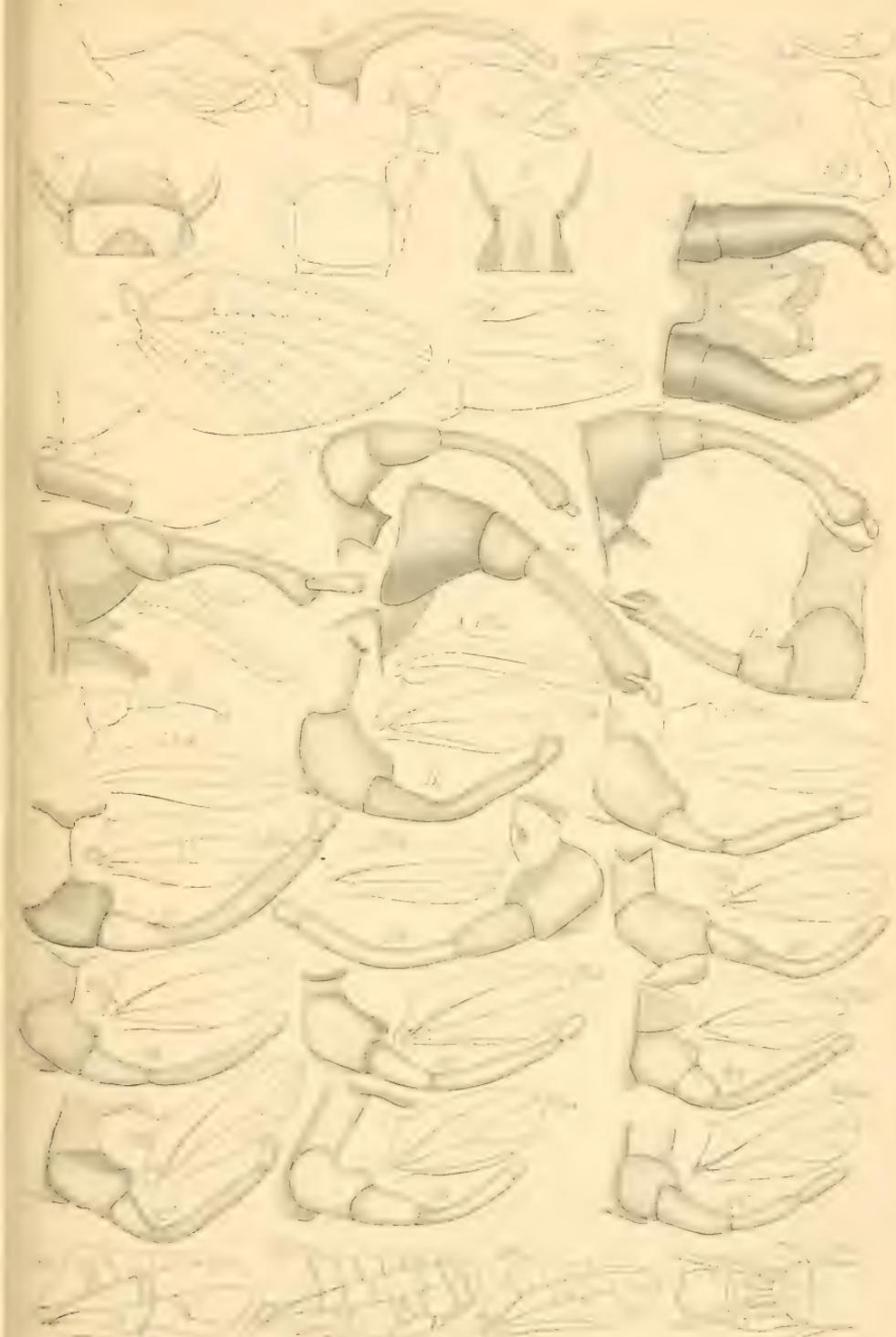




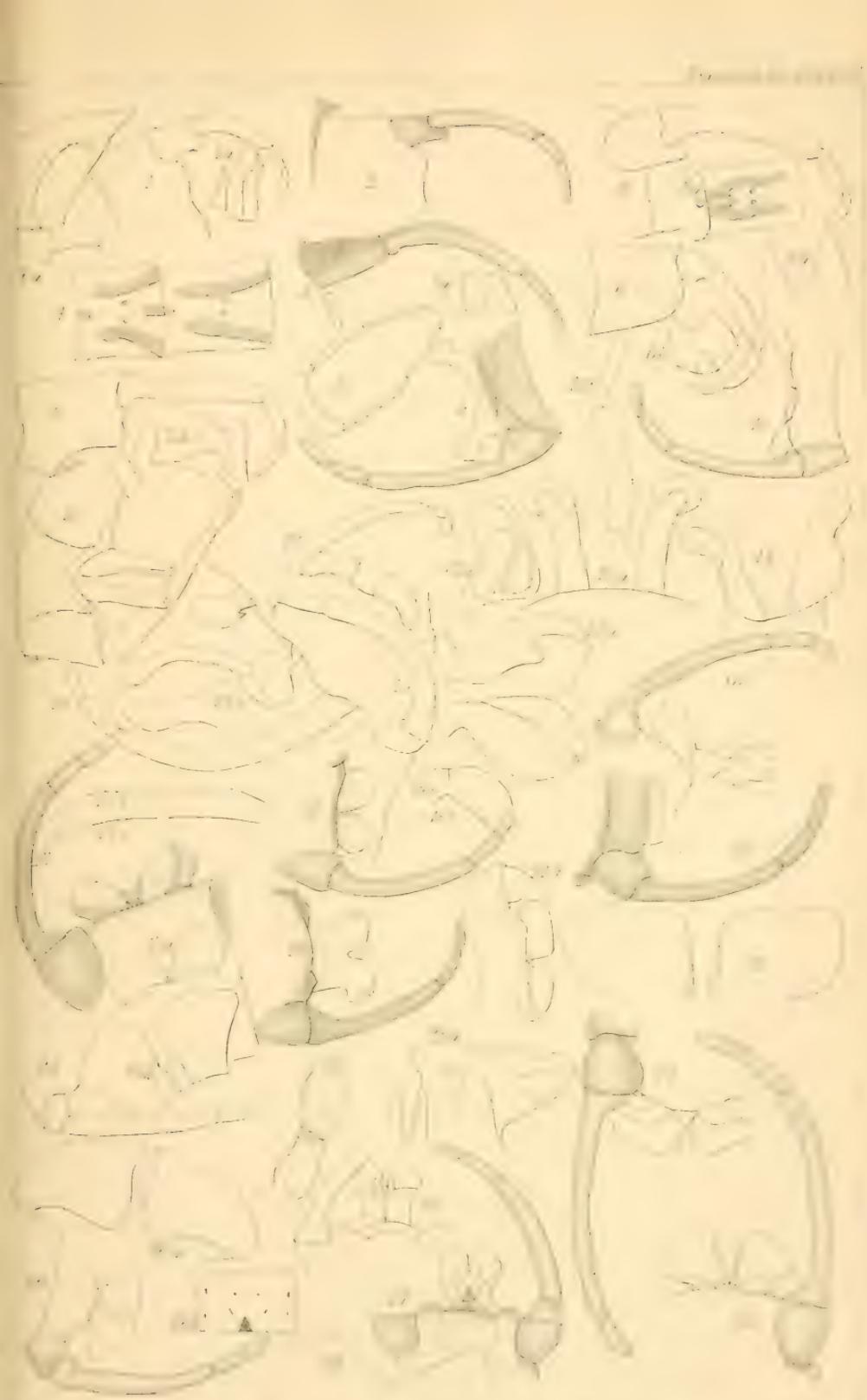




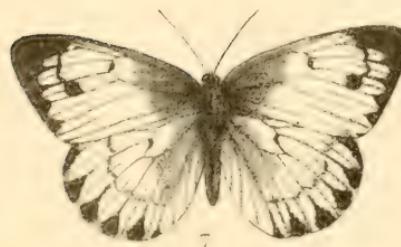
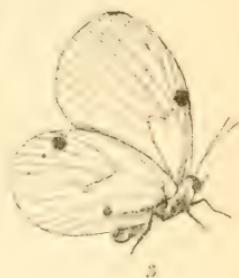
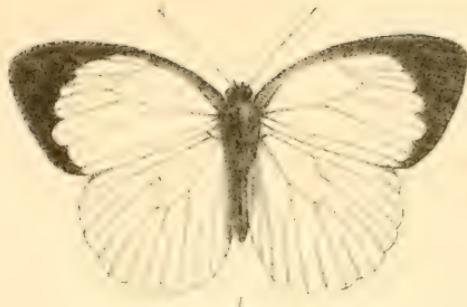








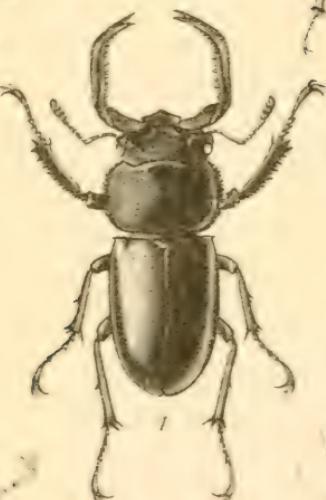




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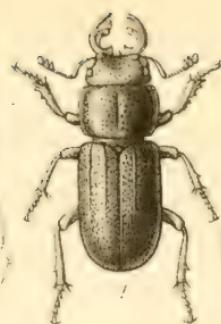


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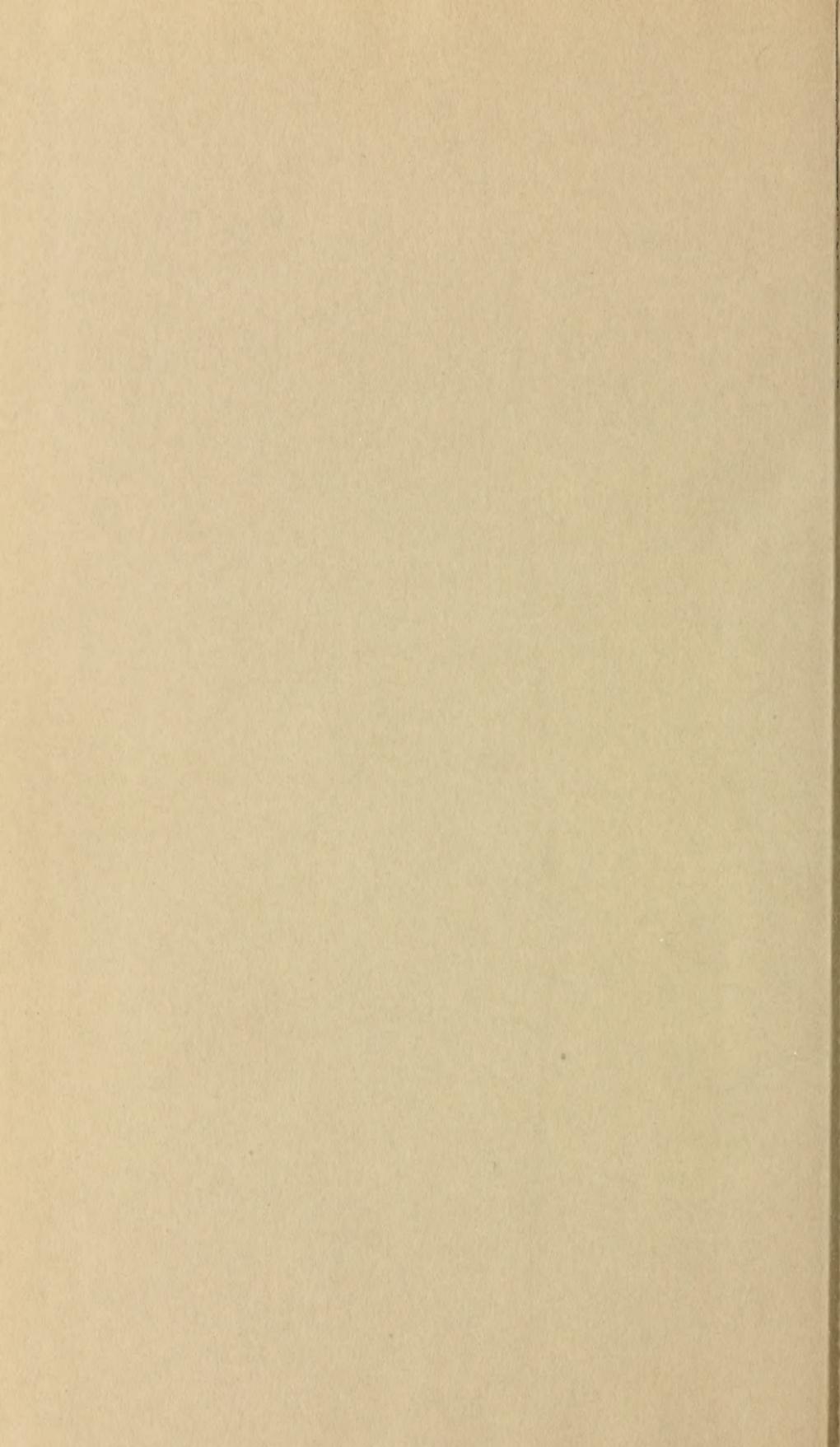
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