

wing throughout, excepting only the neurulation. Ventral lobe of segment 9 ellipsoidally rounded off. Length of body 10–11; wing, ♂ 12–14, ♀ 14 mm.; setæ defective.

Hab. Greece (Stein, in Berlin Mus.); Albania (Sir S. Saunders), 2 ♂, 1 ♀ im. (in M^cLach. Mus.).

Part V. Read November 18th, 1886.

I FIND myself unable to decide, from dried specimens, whether *E. helveticus*, *venosus*, and *forcipula* are entitled to rank as species only or as races. It is possible, if specimens were grouped in accordance with their style of coloration, that *E. forcipula* might justly be held to bear the same kind of relationship towards *E. helveticus*, as the var. *quasitor* to *E. venosus*, and that the peculiar shortness of the first joint of the ♂ fore tarsus of *E. helveticus* may be found to be something less than a specific distinction. On the 3rd of June, 1885, I captured two ♂ imagines of *E. venosus* by the river at Eden Lacy in Cumberland, having the tarsal joint in question perceptibly shorter proportionally than that joint is in any other specimens caught elsewhere, or at other times in the same place, during that year. Specimens of *E. venosus* that have been relaxed and set out for the cabinet after they have become dry in the first instance are very apt to lose their markings and to be rendered unserviceable for study; and I have consequently found it difficult to institute comparisons between the unset specimens in my own collection, and a large proportion of those from other collections submitted to me for identification.

ECDYURUS HELVETICUS, sp. nov. Plate XXIV. 46 a (♂ fore tarsus).

‡ *Baëtis* ‡ *venosus*, Pict., Hist. Nat. Névropt. ii. Ephém. 167, pl. xx. [part.] (1843–5).

Subimago (living).—Wing-membrane either fumatose or dusky, tinged at the base of the fore costa and again beyond the middle with bright or sulphur-yellow, but elsewhere in the basal half of the same with dull greenish, approaching olive-green; fore wing marked with the usual dark stripes; terminal margin of the hind wing broadly bordered with dark grey. Eyes of ♂ dull yellowish green, traversed by a reddish-brown line, and displaying a movable black spot; those of ♀ dark and dull olivaceous. Fore femur of ♂ pitch-brown; tibia rather lighter; hinder femora dull greenish grey or olivaceous; tarsi black; setæ pitch-black; forceps black.

Imago (dried), ♂.—Notum light brownish or pitch-brown. Fore leg of ♂ uniformly piceous, with the first tarsal joint short for an *Ecdyurus*. Pterostigmatic space of the fore wing darkened. Abdomen nearly uniformly brownish above, with the following exceptions:—*in transmitted light* on each side of the base in segments 2–7 a small colourless translucent narrow space or spot, rounded below, extends nearly to the anterior dorsal trachea of the segment; and between the two dorsal tracheæ of the segment, the shallow, oval depression (covered in the nymph by the tracheal branchia) is rather paler than its borders.—(*Living*). Eyes sometimes intense bistre or pitch-brown above, sometimes rich rufo-fuscous, and traversed below by a dark or rusty line edged with light

greenish or yellowish; they also exhibit a movable black spot. Notum either testaceous or pitch-black. Dorsum of abdomen either dark bistre-brown or rufo-piceous, with the terminal borders of the segments opaque, having, however, their extreme edges sometimes pale, and with small translucent markings at the bases of some of the segments, similar to those already described in dried specimens. Venter sometimes uniformly dark warm-sepia, sometimes a rather yellower brown with paler joinings; segment 9 tinged with dull orange, and edged at the extreme base and at the sides with pitch-black; a pair of abbreviated divergent black lines is apparent at the base of the segment in segments 2-8, and the nerve-ganglia are visibly darkened in segments 4-7. Forceps-basis olive-black; the limbs black, each with a whitish spot inside at the base of the penultimate joint, and with the terminal joint white inside. Setæ pitch-black at the base, becoming distally light dusky grey with darker joinings. Fore legs pitch-black, with the femora lighter towards the base, and with the tarsal incisures whitish beneath. Hinder femora light olivaceous, tinged with bistre towards the knee; tibiæ light olivaceous, tinged with smoke-grey distally, [with change of light a yellowish tint predominates over the olive]; tarsi pitch-black, with the joinings pale beneath. Wings vitreous; the fore wing often tinted conspicuously towards the roots and in the marginal and sub-marginal areas with dull greenish yellow, or with yellowish green, and blackened or dark grey in the pterostigmatic region; neuration for the most part pitch-black, excepting that the stronger nervures in the disk are tinged with fuscous, and become near the roots olivaceous or flavo-piceous.

♀ (*dried*).—Very similar to *E. venosus* ♀. Length of body 10-13.5; wing, ♂ 12-13, ♀ 13-15; setæ, ♂ im. 25-35, subim. 15, ♀ im. 21, subim. 14 mm.

Hab. Alpine Switzerland, N. Italy and Savoy, chiefly at altitudes of over 2000 ft. Common in July and August at the following localities:—the head-waters of the Dranse de Biot near the Charbonnière at 4800 ft., and (in the same neighbourhood) both near the Châlets de Jouplane, Samoëns, at 5100 ft., and near Bonavaux, Champéry, at 5400 ft.; also in Val Furva near Bormio at 6300 ft., and in the neighbouring Mt. Adamello district. Streams and torrents ranging in temperature at the stated season from 50° to 62° F. seem to be the most suitable for the species, although it may sometimes be met with where the temperature of the water in the morning is as low as 46° F., or as high in the afternoon as 68° F. Mr. McLachlan captured several specimens of this species near Interlaken in the Habkern Thal, on the 21st of August; and I am disposed to identify with it a specimen captured by me in the Apennino Pistoiese, at 4200-5200 ft., in the Valle Sestajone.

ECDYURUS VENOSUS, Fabricius. *Adult*, Pl. XXIII. 46 (hind wing); Pl. XXIV. 46 (legs and genitalia). *Nymph*, Pl. LXII.

Ephemera venosa, Fabr., Syst. Ent. 304 (1775); *id.*, Sp. Ins. i. 384 (1782); *id.*, Mant. Ins. i. 243 (1787); Gmel., Linn. Syst. Nat. ed. 13, i. pars v. 2629 (1790); Ol., Encycl. Méth. vi. 418 (1791); Fabr., Ent. Syst. iii. pars i. 70 (1793); Lat., Hist. Nat. d. Crust. et Ins. xiii. 97 (1805).—*E. berolinensis*, Müll., Zool. Dan. Prodr. 143 note (1776)?—*E. fusco-grisea*, Retz., C. de G. Gen. et Sp. Ins. no. 183 (1783)?—*E. nervosa*, Vill., C. Linn. Ent. iii. 22 (1789).—*E. nigrimana*, Dufour, Mém. par divers sav., Instit. de France, viii. 580 footnote (1841)?—*E. rufa*, Ramb., Hist. Nat. d. Ins. Névropt. 269 (1842).

‡ *Baëtis dispar*, Curt., Lond. & Edinb. Phil. Mag. ser. 3 (1834) 120; *id.*, Brit. Ent. xi. 484 (1834); ! Steph., Ill. Brit. Ent. vi. 63 (1835).—*B. venosa*, *id.*, *op. cit.*, l. c.; Burm., Handb. d. Ent., Bd. ii. Abth. ii. 801 (1839); Walk., List of Neuropt. Ins. in Brit. Mus. part iii. 556 (1853); Pictet, Hist. Nat. d. Ins. Névropt. ii. Ephém. 167 [part.] (1843–5); Brauer, Neuropt. Austr. 26 (1857); Hag., Ent. Ann. (1863) 22; Karsch, Die Insectenwelt, v. 400–2 (1863).—*B. subfusca*, ! Steph., Ill. Brit. Ent. vi. 64 (1835); Pict., Hist. Nat. Névropt. ii. Ephém. 194 (1843–45); Walk., List &c. part iii. 561 (1853).—*B. purpurascens*, Pict., Hist. Nat. Névropt. ii. Ephém. 174, pl. xx. 4 (1843–5); Walk., List &c. part iii. 557 (1853); Brauer, Neuropt. Austr. 26 (1857); Ausser., Ann. d. Soc. Natur. Modena, An. iv. 135 (1869); [??] Mocsáry, Rev. d. Inhaltes der Természetrájze, Fuzetek ii. 124–5, or [German text] Naturh. Hefte ii. Bd. ii. u. iii. 181–2 (1878)?—*B. † longicauda*, ! Ronalds, Fly-fisher's Ent. ed. 5, pl. ix. (1856).—*B. † montana*, Hag., Ent. Ann. (1863) 26 [part.].—*B. Picteti*, Meyer-Dür, Mitth. schw. ent. Ges. i. 121 (1864).

Ecdyurus venosus, ! Etn., Trans. Ent. Soc. London (1868) 142 note [misspelt *Ecdyonurus*]; ! *id.*, Ent. Mo. Mag. xviii. 25 [nymph] (1881).—*E. quasitor*, ! *id.* MS., in the writing of Pl. XXIV. 46b [penis] (1883).

Heptagenia venosa, ! Etn., Ent. Mo. Mag. v. 90 (1868); *id.*, Trans. Ent. Soc. Lond. (1871) 151 [part] pl. vi. 24 [genitalia]; Hag., *op. cit.* (1873) 404–5; ! Meyer-Dür, Bull. Soc. Ent. Suisse, iv. 314 (1874); Rostock, Jahresb. d. Ver. f. Naturk. Zwickau, 1877, p. 92 (1878); Palmén, Paar. Ausf.-Gänge d. Geschl. Org. b. Insect. SS. 40, 44, 47–48, 51, 65–6, 69, 70, 74, 76–80 & 92, taf. iv. 57, 59, 68, & taf. v. 93 [anatom.] (1884).—*H. nigrimana*, Etn., Trans. Ent. Soc. London (1871) 144?—*H. † longicauda*, ! *id.*, *op. cit.* (1871) 152, pl. vi. 25 [genitalia].—*H. Picteti*, *id.*, *op. cit.* (1871) 153.—*H. purpurascens*, ! Meyer-Dür, Bull. Soc. Ent. Suisse, iv. 135 (1874).

Subimago (living).—Wing-membrane either very light ivory-black-grey, or very light fawn or Cologne-earth grey, with the borders of the cross veinlets narrowly darker. Before the moult, dark transverse stripes and bands appear in the wings, similar to those described under *Heptagenia sulphurea*. A greenish-yellow tint usually pervades the pterostigmatic space, and is sometimes diffused about the base of the fore wing. Fore femur piceous or olive-grey; hinder femora olivaceous; tibiæ grey or black-grey; tarsi black. Setæ pitch-black. (*Dried*.)—The wings vary in appearance according to the period at which the specimen is killed, as follows:—1st, wings uniformly light sepia-grey, with the cross-veinlets and most of the longitudinal nervures (*i. e.* all but the stronger nervures) rather a darker grey, and equal to each other in definition; 2nd, the cross-veinlets become bordered with grey, and hence the longitudinal neuration becomes less obvious to the naked eye; 3rd, the colouring-matter of the wing-membrane appears to become concentrated in the immediate neighbourhood of the cross-veinlets, so as to produce dark transverse bands, leaving the spaces where cross-veinlets are scarce paler than the other parts. The wings of some specimens might be described as of a dark colour with pale transverse stripes and bands, instead of *vice versâ*, light with dark markings.

Imago (dried).—Notum of ♂ pitch-brown, sometimes approaching pitch-black; that of ♀ lighter, sometimes brown-ochre or ferruginous brown. Fore leg of ♂ uniformly pitch-brown, excepting that sometimes the femur is lighter just at the base; 1st tarsal joint of normal length. Pterostigmatic space usually more or less obscured, sometimes clear. Terminal margins of the intermediate abdominal segments dark, excepting at the pleuræ; dorsal segments 2–8 marked, on both sides, either with a dark triangle, or

(through the obtuse angle and lower edge of the triangle being deficient in dark pigment) with a broad oblique dark stripe enclosing near the posterior angle of the segment a small pale space.—♂ (*living*). Eyes either intense sepia-brown, traversed below by a dark line edged with light yellowish or greenish grey; or pitch-brown traversed by a dark line. Frons piceous; epistoma olive-grey or black. Notum at first bistre-brown, changing to intense pitch-brown, or even to pitch-black; a stripe in advance of the wing-roots is either dull orange varied with light greenish yellow, or else subochraceous or Mars-yellow. Dorsum of abdomen either light raw-umber-brown, or greyish bistre-brown in the middle, and dull light yellowish or greenish at the sides of segments 2–6 [in the hinder segments more of the former tint], with the apical borders of the segments dark or piceous (excepting at the pleuræ), and marked on both sides of each segment with either a triangle or an oblique stripe of a reddish-brown or burnt-umber colour. When there are stripes, each stripe tapers forward from a rather broad base at the hind margin to the spiracle: the stripes in segments 7 and 8 are broader than in the anterior segments, and each subtends a dull light yellowish triangular spot in the hinder angle of the dorsum; this spot is almost effaced by the stripe in segment 9. The pleuræ throughout the abdomen and the sides of the dorsum of segment 10 in front of the insertions of the setæ are of a similar pale colour. Venter in segments 1–6 either light bistre-brown, olive-brown, or olive-grey, becoming posteriorly more and more of a light brownish ochre or dull orange; the impressed dots and dashes are not usually dark-coloured like those of *E. insignis*. Setæ and forceps-limbs piceous. Fore femur dark bistre-brown, paler at the base; tibia and tarsus in some lights pitch-black. Hinder femora either light brownish olive, light bistre, or fusco-luteous, but pitch-brown just at the knee; tibiæ in some positions lighter than the femora, or even testaceous; tarsi in some lights blackish grey some or greyish black, in others pitch-black or intense sepia-brown. Wings vitreous, sometimes colourless, but often tinged faintly with greenish or yellowish green in the basal half of the disk and in the greater portion of the marginal and submarginal areas of the fore wing, and usually blackened or obscured with intense sepia-brown in the pterostigmatic space. Neuration pitch-black, the basal extremities of the stronger nervures lighter in some positions; in living specimens the bullæ are pale.

♀ (*living*).—Very similar to the ♂ but lighter. Notum bistre or light pitch-brown; *when dried* brown-ochre or ferruginous brown. The dorsal tracheæ outside the abdominal stripes are dark. The pterostigmatic space of the fore wing is usually very slightly, if at all, discoloured, and is seldom so dark as it commonly is in the other sex; neuration often pitch-brown in small specimens. Head often dull orange, with the surroundings of the ocelli and a spot on the occipital margin pitch-brown, and with the epistoma olive-grey; eyes intense sepia-brown. Length of body, ♂ 10–15, ♀ 10–18; wing, ♂ 11–15, ♀ 11–18; setæ, ♂ im. 22–48, ♀ im. 14–25, subim. 12–17 mm.

Hab. Generally distributed from Lapland and Finmark southwards. Common in Great Britain from June to September. Specimens of medium size are found in Switzerland and the adjoining districts at moderate altitudes, *e. g.*, at Gex and Berne (M^eLach.); also near Samoëns at 2200 ft., and near Bannio, Val Anzasca, at 3000 ft., and near Fontana, Val Bavona, not far from Bignasco, at about 2000 ft. Similar specimens have

been also taken in France at Autun, by M^cLachlan; some captured by him near St. Moritz (Grisons) on the 12th August, and in Val Bedretta, 17th August, are unusually large. In the Basses-Pyrénées it occurs near Laruns and Eaux Chaudes at about 1800–2000 ft. I am inclined now to consider *E. quæditor*, Etn., MS., to be only a local form of this species; but for fear of possible error I subjoin a description of the living insect.

Variation? [*quæditor*]. *Imago (living)*, ♂.—Eyes dark pitch-brown or intense sepia, traversed by a deep umber-brown line edged with light yellowish. Notum rufo-piceous; when dried light pitch-brown. Dorsum of abdomen rich reddish purple-brown, bordered with pitch-brown at the hind margins of the segments 2–9, between the ends of the oblique lateral stripes, which themselves are of a red-purple tint and cut off triangular spaces of a lighter red-purplish tint; pleuræ light yellow; spiracular spots black; segment 10 is of the pale ground-colour. Venter anteriorly light burnt-umber brown; segments 8 and 9 rubiginose with dark joinings. Setæ light sepia-brown with dark joinings, becoming pitch-black at the roots. Fore femur dark pitch-brown; tibia and tarsus pitch-black. Hinder femora greenish grey or light olivaceous, brownish at the tips, their tracheæ finely irrorated with black; tibiæ tinged with light yellow-ochre; tarsi black. Wings vitreous, tinged faintly with greenish in the marginal and submarginal areas before the middle, and also in the pterostigmatic space; neuration pitch-black, lighter at the wing-roots.

♀ (*living*).—Eyes dull olivaceous, mottled outside with pitch-brown or burnt-sienna, and traversed by a line of the same colour. Notum pitch-brown. The triangular lateral markings of the dorsal segments of the abdomen are dark burnt-carmine, and the lighter parts are more rosy than in the other sex. Setæ towards the roots deep warm sepia-brown, becoming distally light warm sepia-grey with dark joinings. Length of body 11; wing, ♂ 12–13, ♀ 15; setæ, ♂ im. 31–40, ♀ im. 25 mm.

Hab. The Apennino Pistoiese at the Limestone near Villa Margherita, San Marcello, at the end of July, at an altitude of 2160 ft. The males, after 6 P.M., were caught on the wing whilst flying in a very peculiar manner about the tops of alder trees (*Alnus*), about 20 ft. from the ground. Their movements resembled somewhat those of *Rhizotrogus* ♂ in quest of a female—whence the name *quæditor*. Earlier in the day specimens were obtained by beating.

ECDYURUS FORCIPULA, Kollar, MS. Plate XXIV. 46 c (penis).

‡ *Baëtis forcipula*, Kollar, MS., Pict., Hist. Nat. Névropt. ii. Ephém. 169–170 note (1843–5).

Heptagenia ‡ *alpicola*, ! Etn., Trans. Ent. Soc. London (1871) 148, pl. vi. 19 [penis dried; Carinthian specimens only].—*H. forcipula*, *id.*, *op. cit.* (1871) 152 [undescribed]; Meyer-Dür, Mitth. schw. ent. Ges. iv. 314 (1874); ! Rostock, Jahresb. d. Ver. f. Naturk. Zwickau, 1877, p. 91 (1878).

Ecdyurus italicus, ! Etn., MS., in the writing of Pl. XXIV. 6 of the present work (1883).—*E. Zelleri*, ! *id.* MS., p. 239 *supra* in bibliography of *Epeorus alpicola* (1885).

Subimago (living).—Wings uniformly black-grey, slightly tinged with greenish in the marginal area towards the base and at the tegulæ. Eyes olive-green above, and rather a light reddish brown by their lower orbits, with a red-brown line intervening between these two colours. Fore leg pitch-brown; hinder femora and tibiæ brownish olive with dull black tarsi. Setæ pitch-black.

Imago (dried), ♂.—Notum brownish ochre or reddish brown, sometimes darker behind. Fore leg in opaque view uniformly piceous; 1st tarsal joint of normal length. Pterostigmatic portion of the marginal area of the fore wing darkened more or less. Abdomen, *in opaque view*, usually marked at the sides with dark triangular spots, each occupying the lower half of the flank of the dorsum, but leaving the pleuræ pale; *in transmitted light* the spiracles become translucent, and a pale obovate space appears inside each of the dark triangles above the pleuræ. In diseased specimens, such as are infested with internal parasites, the dorsum is commonly of a uniformly dark colour, with opaque joinings, excepting that in segments 4–7 the extreme bases of the segments on each side may be narrowly translucent. (*Living.*)—Upper portion of the eyes either greenish bistre-brown, or olive-green; a burnt-umber-brown line, edged above with bright yellow separates this portion from a narrow greenish fuscous stripe along the lower orbit. Thorax pitch-brown above, darker behind. Abdomen red-purple-brown above, with the joinings of the segments opaque in the midst, and pale at the pleuræ, and sometimes with scarcely any indications of the usual dorso-lateral triangular markings; venter spotless, paler than the dorsum, and tinged in segment 9 with orange. Forceps black. Setæ dull black at the base, but sepia-grey with dark joinings nearer their extremities. Fore leg pitch-black, with the trochanter rufo-piceous. Hinder femora dull light olive-grey, slightly tinged at the edges and about the knee with rufo-piceous; tibiæ darker olive-grey; tarsi dull brownish black. Wings vitreous; marginal area of the fore wing tinged slightly for some distance from the roots with greenish yellow, and in the pterostigmatic region with light blackish grey; neuration piceous, pale at the roots; tegulæ bright yellowish.

♀ very similar. Length of body 9–12; wing 10–13; setæ ♂ im. 22–31, subim. 16, ♀ im. 21 mm.

Hab. Continental Europe from Saxony southwards to Central Italy. Common in Val Anzasca near Ponte Grande at 1350 ft., 19th July; also in the Apennino Pistoiese, both near San Marcello by the Limestone and its tributaries in the chestnut-wood below Gavanina at 2150–2750 ft., and also in the Valle Sestajone at 4230 ft. [2nd August, 11 A.M., water 50° F.]. Specimens captured by Prof. Zeller in Carinthia during June 1867 are in M^cLach. Mus., and being faded through damp and age, were until recently mistaken by me for a distinct species. I had (prior to inspecting specimens named by Rostock in Albarda Mus.) always supposed the species named *forcipula* by the Swiss entomologists to be identical with *Ecdyurus fluminum*—a view that might be contended for; but, adopting Herr Rostock's application of the name, I now give precedence to *forcipula* over *italicus*.

ECDYURUS BELLIERI, Hagen.

‡ *Baëtis Bellieri*, ! Hag., Ann. Soc. Ent. Fr. (1860) 746.

Heptagenia Bellieri, ! Etn., Trans. Ent. Soc. London (1871) 154.

Imago (dried), ♀.—Wings vitreous, with piceous neuration, and with the pterostigmatic region of the fore wing darkened. Fore legs piceous; hinder legs testaceous with fuscous tarsi. Setæ piceous. Ventral lobe of the 9th abdominal segment entire. Length of wing 14 mm.

Hab. Sicily. Somewhat similar in colour to *H. montana*, according to Hagen. The lacteous tint of the wing-membrane might be due to camphor. The type was examined by me in 1869; but I have no recollection of the insect.

ECDYURUS INSIGNIS, Etn. Plate XXIV. 46 *d* (penis).

Ephemera, ! Ronalds, Fly-fisher's Ent. ed. 1, pl. xi. 22 (1836).

Heptagenia insignis, ! Etn., Trans. Ent. Soc. London (1870) 7; ! *id.*, *op. cit.* (1871) 153, pl. vi. 26, 26*b* [detail]; Palmén, Paar. Ausf.-Gänge d. geschl.-Org. b. Insect. S. 74, 77, 78 [anatom.] (1884).

Subimago (*living*).—Wings light sepia-grey, the cross-veinlets narrowly edged with darker grey; longitudinal nervures subolivaceous or dark greenish grey in the greater portion of the wing, the wing-roots, and sometimes the adjoining parts of the said nervures, light olive-green or greenish yellow; cross-veinlets black. Setæ and hinder tarsi black.

Imago (*living*), ♂.—Eyes either dark olive-green intersected by an olive-brown line and exhibiting a large dark round movable spot, or else greenish black or black, their predominant colour changing with age or the time of day. Notum in front either very dark bottle-green or bistre-brown, posteriorly black varied with yellowish brown, or with brown-ochre or dull orange; tegulæ light greenish yellow. Abdomen whitish green, [the "green" approaching green oxide of chromium] modified in segments 8 and 9 with brown-ochre above, with yellow-ochre in segment 10, and marked with black in segments 1–8 above and beneath; the dorsal markings in each of these segments are an oblique streak descending from the hind margin to the pleuron, in close proximity to the anterior lateral angle of the dorsum on each side, tapering downwards and narrowly cuneiform, and these two streaks are connected together by a very narrow black edging along the interjacent portion of the terminal margin of the segment; in ♀ the tract of the dorsal vessel is likewise blackish: the ventral markings in segments 1–7 comprise, severally, a short acute longitudinal streak ♂ (or triangular spot ♀) from the base in the middle, a pair of short isolated lines parallel with the dorsal streaks of the same segment, commencing at a short distance from the median streak a little before its point, and divergent from each other backwards, a pair of dots placed transversely adjacent to the ganglionic tract, a little to the rear of the ends of the divergent lines, and, lastly, a fine line on each side closely skirting the pleuron, terminating some distance from the tip of the segment, and interrupted a little before the middle; in segments 8 and 9, the olive-green ground-colour is suffused more or less with reddish brown in ♂, and is varied in ♀ with pitch-brown. Setæ pitch-brown at the base, passing into intense sepia-brown and distally into warm sepia. Fore femur and tibia pitch-brown, the tarsus rather lighter in some positions; in immature specimens the femur is dark olive-brown approaching bistre, and is blackish at the knee; hinder femora light olive-green modified with bistre, the latter colour predominating at the knee and along the upper and lower edges; tibiæ paler than the femora; tarsi blackish or ivory-black. Wings vitreous; in the fore wing the longitudinal neuration and sometimes most of the cross-veinlets in the pterostigmatic space are dull olivaceous (excepting the bases of the nervures posterior to the subcosta, which are whitish), and the remaining cross-veinlets are black; a small blackish cloud is

also noticeable in the pterostigmatic region of that wing, situated at about $\frac{2}{5}$ of the distance from the bullæ towards the apex of the marginal area, between the costa and the radius: in the hind wing the neuration appears whitish in some lights, in others the cross-veinlets towards the extremity of the wing become greyish.

♀ (*living*).—Eyes brownish olive. Pronotum greenish olive; mesonotum light olive-brown; metanotum blackish, varied with light and brownish ochre. Abdomen light greenish olive, with a dark narrow median stripe along the back in segments 2–7, which is dilated anteriorly in every segment, in addition to the other blackish markings described in the ♂. Setæ intense sepia-brown at the base, becoming lighter with dark joinings distally. In other respects very similar to the ♂. Length of body 10–14; wing, ♂ 10–12, ♀ 12–15; setæ ♂ im. 32–34, subim. 14–20, ♀ im. 22–25, subim. 15 mm.

Hab. England, in rapid parts of rivers, such as the Dart, the Kennet, and the Eden; May to August; France, in the Garonne, close to St. Michel, Toulouse.

ECDYURUS FLUMINUM, Pictet. *Nymph*, Plate LXII. (part).

? *Ephemera speciosa*, Poda, Ins. Mus. Græc. 98 (1761); Schr., Enumer. Ins. Austr. indig. no. 604 (1781); Vill., C. Linn. Ent. iii. 22 (1789); Ol., Encycl. Méth. vi. 418 (1791); Lat., Hist. Nat. d. Crust. et Ins. xiii. 97 (1805).—*E.* † *bioculata*, Panzer, in Explic. Schæf. Ic. cexxix. [excl. var.] (1804).—† *E. angustipennis*, ! Ramb., Hist. Nat. des Ins. Névropt. 295 (1842); Walk., List of Neuropt. Ins. in Brit. Mus., part iii. 571 (1853) [nomen ineptum].

† *Baëtis fluminum*, Pict., Hist. Nat. Névropt. ii. Ephém. 164, pls. xvi.–xix. (1843–5); Imhoff, Insect. d. Schw. Bd. iv. [a pl. & fig., not numbered] (1845); Walk., List of Neuropt. Ins. in Brit. Mus. part iii. 556 (1853); Brauer, Neuropt. Austr. 26 (1857); Karsch, Die Insectenwelt, v. 400–402 (1863); Hag., Ann. Soc. Ent. Fr. (1864) 38; Meyer-Dür, Mitth. schw. ent. Ges. i. 221 (1864); Ausser., Ann. d. Soc. Natur. Modena, An. iv. 134 (1869).—*B. angustipennis*, Ed. Pict., Névropt. d'Espagne 23 (1865).—? *B. speciosus*, Etn., Trans. Ent. Soc. London (1871) 120 note; *id.*, *op. cit.* (1873) 402.

Heptagenia fluminum, Etn., Trans. Ent. Soc. London (1871) 146; Meyer-Dür, Mitth. schw. ent. Ges. iv. 315 (1874); Rostock, Jahresb. d. Ver. f. Naturk. Zwickau, 1877, p. 91 (1878); Palmén, Paar. Ausf. Gänge d. Geschl.-Org. b. Insect. SS. 40, 60, 63, 65, 74 and 77, taf. iii. 38, and taf. iv. 56 (1884) [anatom.].—*H. angustipennis*, ! Etn., Trans. Ent. Soc. London (1871) 152.

Subimago (dried).—Wings fawn-colour or light brownish grey, approaching vandyke and Cologne-earth; neuration for the most part pitch-black, but some of the thicker nervures are yellowish; cross-veinlets black, narrowly edged with grey, rather paler towards the costa. Setæ either light yellowish, or else dark sepia-brown with dark joinings; in living specimens they are blackish grey or dusky. Pictet's figure well represents the wings of the living insect; after death the dark bands and stripes across the fore wing disappear. These markings are as follows:—a transverse cloud in the basal portion of the disk, followed by a transverse abbreviated streak from the anal angle, and another a little further on from the costa in the neighbourhood of the bullæ, and lastly, between this and the tip of the fore wing, three narrow transverse streaks from the pterostigmatic region. (*Living*).—Eyes of ♀ greenish, surrounded with pitch-brown, and exhibiting a movable black dot. Wings fawn-colour or smoky grey with black, grey-margined cross-veinlets, rather paler towards the costa. Body more or less greenish ochraceous; the abdominal segments very narrowly darker at the tips; segments 1–8 striped obliquely

with black at the sides; the first and the last of the stripes are less distinct than the others. Fore femur intense olive-brown, darker towards the tip and at the edges; tibia blackish grey; tarsus black. Hinder legs light greenish or olive-grey, with black tarsi.

Imago (living), ♂.—Eyes at first either intense sepia-brown, intersected below by a transverse sulphureous line; or else warm sepia, divided by a light greenish line; in moribund aged specimens they often become cæsius. (*Dried*) [*dark specimens*].—Notum rufo-piceous or dark reddish brown; a piceous or black stripe extends from the tegulæ to the fore coxa. Dorsum of abdomen broadly red-purple-brown along the middle, with the tract of the dorsal vessel and a considerable portion of the hinder part of each of the intermediate segments slightly darker; in segments 2–8 the sides of the dorsum are light yellowish ochre, intersected obliquely by reddish-purple stripes, extending in each segment from the pale stigmata or spiracles to the hind margin, and emitting a short streak from the spiracle along the main trachea to the nymphal tracheal scar of the preceding segment; hence the sides of the abdomen may be described as striped alternately with reddish purple and light yellowish ochre, the latter colour occupying the hinder angles of the dorsum, and a space on each side of the base above the dark stripes in each of the segments specified. The dark stripes referred to are gradually dilated posteriorly from in front, and their width varies somewhat with the individual; whence the light spaces above the stripes at the bases of the segments vary also in form, being in some specimens ovate or triangular spots, but in others very narrow streaks. The hinder segments are more largely occupied by the dark colouring; but the tenth is almost wholly reddish purple. Venter spotless, either light yellowish ochre in segments 1–6 and in the forceps-basis, but tinged with reddish purple in the remaining segments; or else tinged more or less with reddish purple throughout. Setæ whitish, tinged with sepia near the roots; the joinings piceous, and only for a short distance near the base alternately narrow and broader. Fore femur and tibia pitch-brown; tarsus very light bistre-brown. Hinder legs light yellowish-amber, with the ungues and part of the terminal joint of the tarsus intense sepia-brown, and with some brownish discoloration close to the knee. Wings vitreous, almost imperceptibly tinged with bistre-grey in the marginal and submarginal areas of the fore wing; the pterostigmatic space is as clear as the rest of the area; neuration in most lights pitch-black or black, with the costa, subcosta, and radius of the fore wing pitch- or bistre-brown; the great cross vein in most positions remains black. Pterostigmatic cross-veinlets branched and anastomosing.

Variation [light specimens (dried)], ♂.—Notum rich brown-ochre. Dorsum of abdomen to a large extent in segments 2–6 or 7 translucent pale bistre-brown, inclining to olive-brown, with the joinings also to a large extent slightly opaque. The sides of the dorsum are rather paler than the midst, but are not strongly contrasted in colour with it; the lateral stripes are black, and do not reach the hind margins of the segments in all specimens, but only in some. Hence the sides of the dorsum do not appear to be striped alternately with a light and a dark colour, but only display dark stripes on a light ground. Fore femur bistre-brown, darker towards the knee.

♀ (*dried*).—Rather similar to ♂, but the notum is lighter. Fore leg bistre-brown, dark at the tip of the femur: in many positions the tibia and tarsus appear as dark as the

femur. Hinder legs sometimes of a somewhat browner yellow amber-colour than in the other sex; the femora rather dark towards the tip; tarsi in small specimens pale, with dark joinings, but in large specimens usually intense sepia-brown or black; basis of subcosta and radius, and great cross vein of hind wing dark; but the nervures themselves light yellowish; ungues black. Setæ *during life* smoke-grey with rufescent joinings; *when dried* their prevailing colour is sometimes warm sepia-brown. The proportions of the tarsal joints, the less obtuse apex of the ventral lobe of the 9th abdominal segment, and the branched and anastomosing pterostigmatic cross-veinlets of the fore wing, serve to distinguish the ♀ of *H. angustipennis* from *Epeorus torrentium*. Length of body, ♂ 8-11, ♀ 9-12; wing, ♂ 9-12, ♀ 9-14; setæ, ♂ im. 19-23, subim. 13, ♀ im. 15-22, subim. 11-13 mm.

Hab. Continental Europe from Norway (Wallengren) to Spain (Ramb.). Common generally at rivers and lakes, from at least July to September, and doubtless earlier. Amongst other localities it occurs in Holland at Arnheim; in Switzerland in the environs of Geneva and Lac Lemman at Genthod, as well as at Basle and Berne; in Savoy at Annecy, Chambéry, Aix-les-Bains, and Evian (M^cLach.); in Northern France at Fontainebleau (*id.*); in Southern France at Toulouse and Tarascon [Ariège]; and at Madrid (Ramb.). At the Berne Museum in 1879 Albert Müller showed me the original drawings for Imhoff's plate (1845). The ♂ oculi are rightly represented in the artist's original drawing as warm sepia-brown, intersected horizontally by a 'gramineous' line. In the revised copy adopted as the original of the published figure the eyes were coloured 'gramineous' entirely. Pictet made them 'cyaneous'—a very light shade of ultramarine, or an intense ultra ash-blue. His specimens may have been moribund or flaccid with age, or he may have coloured them after the eyes of a subimago.

ECDYURUS VOLITANS, Etn.

Heptagenia volitans, ! Etn., Trans. Ent. Soc. London (1870) 7; ! *id.*, *op. cit.* (1871) 147, pl. vi. 20 (genitalia); Rostock, Jahresb. d. Ver. f. Naturk. Zwickau, 1877, p. 89 (1878); Parfitt, Rep. & Trans. Devon. Association, xi. 398 (1879); Palmén, Paar. Ausf.-Gänge d. Geschl.-Org. b. Insect. S. 52 [anatom.] (1884).—‡ *H. flavipennis*, var. ?, Etn., *supra* at pp. 273 & 274 (1885).

Imago (dried).—Notum of ♂ pitch-brown; that of ♀ light yellowish brown approaching brown-ochre, varied on the metanotum with pitch-brown. Fore leg of ♂ somewhat rufo-piceous in opaque view, with an indistinct darker median band on the femur followed at a short interval by almost imperceptible traces of a preapical band; the extreme tips of the femur and tibia, and the tarsal joinings, piceous or blackish; 1st tarsal joint of normal length. Fore leg of ♀ raw umber-brown, with the median and preapical dark bands well defined; tibia lighter than the femur; tarsus partially or wholly concolorous with the femur. Hinder legs light yellowish brown, with browner femoral bands; both bands are well defined in ♀, but the proximal band is obsolete in ♂; tarsi more or less sepia- or warm sepia-brown, with dark incisures. Setæ greyish white, with piceous joinings; in ♀ some of the alternate joinings near the base of the setæ are narrower than the others. Wings vitreous: neuration in ♂ piceous, varying with change of posture from pitch-black to pitch-brown, the cross-veinlets in some lights

retaining the darker tint, while the longitudinal nervures assume the lighter; neuration in ♀ lighter than in ♂, especially towards the wing-roots, varying with change of posture from light pitch- or light bistre-brown to raw umber-brown, the cross-veinlets, as in the other sex, retaining the darker tint in some stand-points; in the ♂ the great cross vein of the fore wing is dark from the radius almost to its junction with the costa, but in the ♀ it is piceous only from the radius to about half across the marginal area, and is in its dark part more strongly contrasted in colour with the neighbouring nervures than in the ♂. In the pterostigmatic region of the fore wing of both sexes the reticulation formed by the branching and anastomosis of the cross-veinlets varies considerably in extent with the individual, but in comparison with that of some of the other species of this genus is unusually open in texture. ♂ (*living*).—Eyes black-brown. Notum atro-fuscous. Dorsum of abdomen light bistre-brown, with the tips of the segments darker; venter dark olive-grey, usually spotless. Setæ light greenish grey, with darker joinings. Legs somewhat as in dried specimens; the tarsi and fore tibia fuscous; the bands of the hinder femora light reddish or carneous. Wings vitreous, with blackish neuration, and with a slight discoloration in the pterostigmatic region of the fore wing. Length of body 12–15; wing, ♂ 13–14, ♀ 14; setæ ♂ im. 25–28 mm.

Hab. England; near Reading, on the Thames above Pangbourne, and on the Holybrook above Coley Park, towards the end of May. Holland, near Arnheim in Gelderland (2 ♂ and 2 ♀ im., captured by Mr. Meddenbach van Rooy, in Albarda Mus.) at the end of May and beginning of June. Mr. Albarda has taken objection to the blunder committed by me, at p. 274 *supra*, in referring this species (albeit with hesitation) as a variation to *Heptagenia flavipennis*, and has lately forwarded to me for inspection the four Dutch specimens mentioned above. My error arose from imperfect recollection of the insect, which I had not seen since the time of its original description.

ECDYURUS ZEBRATA, Hagen.

‡ *Baëtis zebrata*, Hag., Ann. Soc. Ent. Fr. (1864) 38.

Heptagenia zebrata, Etn., Trans. Ent. Soc. London (1871) 155 [part.]; *vide* Hag. & Etn., *op. cit.* (1873) 406.

Subimago (dried).—Wings dark grey; longitudinal neuration yellowish; cross-veinlets edged with black.

Imago, ♂.—Eyes blue or green during life. Notum livid, clouded with brown. Abdomen yellow [jaune] with a broad median longitudinal black dorsal stripe, and oblique brown-black lateral stripes confluent with the bordering of the hind margins of the segments. Setæ white, annulated at the base, the middle, and the tip of each joint with black. Legs pale yellow, with the knee and tarsus brown, and a broad black median femoral band. Wings vitreous; the longitudinal nervures yellow; the cross-veinlets brown; hence the fore wing has a spotted appearance, especially along the anterior margin.

♀.—Similar, but larger than the ♂. The anterior margin of the fore wing is rather more spotted. Length of wing, ♂ 10, ♀ 12; setæ, ♂ im. 20, subim. 12, ♀ im. 15 mm.

Hab. Corsica (Hag.). [After Hagen.]

ECDYURUS FALLAX, Hagen.

‡ *Baëtis fallax*, ! Hag., Ann. Soc. Ent. Fr. (1864) 38.—‡ *B. sardoa*, ! Costa, Atti del. R. Accad. d. Sc. fisic. e matemat. di Napoli, ix. 34 (1882).

Heptagenia ‡ *zebrata*, ! Etn., Trans. Ent. Soc. London (1871) 155, pl. vi. 28 [detail (part.)], *vide* Hag. & Etn., *op. cit.* (1873) 406.

Imago (dried), ♂.—Notum raw umber-brown, varied posteriorly with darker. “Abdomen lighter than in *E. angustipennis*, brown ochreous, with the hinder borders of the dorsal segments black. Setæ dull yellowish, darker towards the roots.” [After Hagen.] Fore leg in opaque view dark raw umber-brown, with the tarsus, in some postures, the tibia, the knee narrowly, and a darker broad band about the middle of the femur pitch-brown. Hinder femora and tibiæ *in opaque view* very light raw-umber, in other positions yellower, and *in transmitted light* yellowish amber-colour, with a similar pitch-brown or blackish band about the middle of the former, and with the knee slightly brownish; tarsi brownish, either dark raw umber or sepia, according to posture. Wings vitreous, with pitch-brown neuration; the cross-veinlets in some postures appear much darker than the longitudinal nervures, but in other postures the colouring is uniform, although the cross-veinlets are strongly marked: in the only specimen examined by me the pterostigmatic cross-veinlets of the fore wing are almost without exception branchless, and somewhat evenly distributed. Length of wing 8–9 mm.

Hab. Corsica (Hag.); Gennargento, Sardinia (Costa). The specimen labelled *E. sardoa* in Costa’s handwriting, and kindly communicated to me by him, is a defective ♂ im., of which the abdomen is lacking. Judging from Hagen’s description of *fallax*, there need be little doubt as to the identity in species of the insects to which the above names were applied: I have therefore relied largely upon Costa’s specimen in this description.

ECDYURUS ANNULIFER, Walker.

‡ *Palingenia annulifera*, ! Walk., Trans. Ent. Soc. London, N.S. v. 199 (1860).

Heptagenia annulifera, ! Etn., *op. cit.* (1871) 148.

Imago (dried), ♀.—Thorax somewhat brown-ochreous above, darker in the middle than at the sides of the pro- and mesonotum. Abdomen testaceous, with a stripe down the middle of the back, the hinder borders of the segments, and with the usual broad oblique lateral stripes at the sides, black. Setæ light-brownish white, with the alternate joinings black. “Legs whitish, the femur banded with black” (*teste* Walker). Wings vitreous with pellucid nervures, but with the cross-veinlets and the portions of the longitudinal nervures in close proximity to them pitch-brown and narrowly edged with the same colour. Length of body ♀ 6; wing 8; setæ 10 mm., or more.

Hab. Hindostan.

** *Penis-lobes obovate.*

ECDYURUS AFFINIS, sp. nov. Plate XXIV. 46 e (penis).

Imago (dried), ♂.—Notum bright reddish brown or ferrugineo-piceous in part, sometimes approaching pitch-brown behind; the pleura are paler than in *E. lateralis*, and

hence the yellowish streak in front of the fore wing-roots is not conspicuous. Setæ whitish. Fore leg, in opaque view, piceous, excepting the tarsus and the basal half of the femur, which are lighter in colour. Wing-neuration in opaque view whitish, excepting, in the fore wing, the great cross vein and the roots of the subcosta and radius, which are slightly brownish in certain postures. (*Living.*)—Eyes intense burnt umber-brown above, black beneath, traversed by a chrome- or lemon-yellow line. Pronotum yellow-ochreous, with a piceous streak on each side; mesonotum bistre-brown; tegulæ yellowish ochre; metanotum either pitch- or jet-black; pleura rufo-piceous, with black streaks descending in front of the bases of the coxæ; sternum rufo-piceous. Abdomen either rufo-badius [a colour approaching Mars orange] or reddish umber-brown: the dorsal joinings and a short acute triangular streak from the base of each segment except the last two, coincident with the tract of the dorsal vessel, darker than the ground-colour; in segments 2–6 above the pleura on each side of the back is a large triangular or quadrilateral ochraceous spot tapering anteriorly, which contrasts to advantage with the contiguous portions of the dark joining; in segments 7 and 8 the corresponding pale spaces are much smaller and less distinct. Venter in some specimens pale lurid, with a continuous median series of obcordate blotches approaching Mars orange in colour. Setæ white, with the first three or four joinings rufescent. Fore femur either piceous or rufo-piceous in its distal half, and paler or lurid towards the base, with traces of a dark median band; tibia and all but the last joint (which is either rufo-piceous or darker than the other joints) of the tarsus either blackish grey or cervinous. Hinder legs lurid testaceous, with the median band and the tip of the femur, the base of the tibia, and the joinings and terminal joint of the tarsus rufescent piceous, and the spinule of the trochanter piceous or black; sometimes the tarsus is altogether reddish. Wings vitreous, neuration colourless. Length of body, ♂ 12–13·5, wing 10–11, setæ ♂ im. 15–16 mm.

Hab. The Netherlands. This species was first communicated to me by Mr. Albarda, who thought it might be identical with one of Hagen's Corsican species. I afterwards met with it near Arnheim; it is common in the neighbourhood of the railway-bridge at the end of July, and doubtless earlier before the seasonal rise of the Rhine.

ECDYURUS LATERALIS, Curtis.

‡ *Baëtis lateralis*, Curt., Lond. & Edinb. Philos. Mag. ser. 3 (1834) 121; ! Steph., Ill. Brit. Ent. vi. 65 (1835); Pict., Hist. Nat. Névropt. ii. Ephém. 175, pl. xxi. 2–6 (1843–5); Walk., List of Neuropt. Ins. in Brit. Mus. part iii. 557 (1853); Hag., Ent. Ann. (1863) 28.—*B.* ‡ *obscura*, Pict., Hist. Nat. Névropt. ii. Ephém. 182, pl. xxiii. 1 (1843–5); Walk., List &c., part iii. 557 (1853); Hag., Ent. Ann. (1863) 28 [nec ! Steph. 1835].

‡ *Cloë brunnea*, Ramb., Hist. Nat. d. Ins. Névropt. 298 (1842); Walk., List of Neuropt. Ins. in Brit. Mus. part iii. 557 [as var. ? of *C.* ‡ *halterata*] (1853); Rosenhauer, Thier. Andalus. 366 (1856); Ed. Pict., Synop. Névropt. d'Espag. 26 (1865).

Heptagenia lateralis, ! Etn., Trans. Ent. Soc. London (1871) 155, pl. vi. 27 [detail]; Meyer-Dür, Bull. Soc. Ent. Suisse, iv. 313 (1874).—*H. obscura*, *id.*, loc. cit. (1874); Rostock, Jahresb. d. Ver. f. Naturk. Zwickau, 1877, p. 91 (1878).

Subimago (dried).—Wings uniformly tinted either with brownish [vandyke] grey, or

(in some of the ♂ Scotch examples) with blackish grey: the brown-grey tint matches with that of the wings of *Cloëon simile*, subimago, and the black-grey with that of the fore wings of *Ephemerella ignita*, subimago.

Imago (dried), ♂.—Notum dark pitch-brown. Setæ light bistre-brown, sometimes with the joinings opaque. Fore leg pitch-brown, lighter or bistre-brown towards the base of the femur. Hinder legs light bistre-brown, with the knee and the tarsus pitch-brown or blackish. (*Living.*)—Eyes very intense burnt umber-brown. Notum jet-black; a greenish-yellow or sulphur-coloured streak usually prolonged forwards from the fore wing-roots strongly contrasts in colour with the dark pleura. Dorsum of abdomen bistre-brown, modified with burnt-umber; segments 2–6 are lighter than the remainder, and have each of them the whole of the terminal margin narrowly bordered with pitch-brown or a darker colour, a fuscous spot posteriorly on both sides, which disappears in drying, and a pale space or cloud above the spiracular line on each side in the midst; the remaining segments likewise are paler near the same line. Venter sepia-brown, tinged in the anterior segments with greenish; the penultimate segment, tinged with orange near the insertions of the forceps-limbs, has on each side a piceous lanceolate wart resembling a spine. Forceps black, greyish inside distally. Setæ sepia-brown. Wings vitreous, with pitch-brown neuration. Fore femur fuscous at the base, and pitch-brown towards the tip; tibia and tarsus pitch-black. Hinder legs subfuscous; the femur has a small subrufescent cloud nearly in the middle towards its upper edge, and the tarsus is black-grey.

♀.—Very similar to the ♂. (*Living.*)—Abdomen more uniformly opaque than in the other sex, and marked on each side, in most of the segments, either with a dark triangular spot or an oblique dark stripe from the terminal border. Venter fuscous, with greenish-grey joinings; the terminal ganglionic mass of the nervous tract is sometimes tinged faintly with warm sepia-brown. Length of body 5–9; wing, ♂ 6–10, ♀ 7–10; setæ, ♂ im. 19, subim. 10, ♀ im. 15, subim. 8 mm.

Hab. Locally common in the west and north of Great Britain, extending to Dorset in the south. It chiefly inhabits trout-streams and the shores of lakes in hilly and mountainous districts; and the fly appears from May to August. Nowhere have I found it more abundant than it was along the shore of Ullswater, in Westmoreland, under Kailpot Crag, on 1st July. On the Continent it has an extensive range:—Styria (Brauer); Carinthia (Zeller in M^cLach. Mus.); Switzerland (Pictet and Meyer-Dür); Savoy, at the Lac de Montriond (3440 ft.); the stream below Freycinet-la-Tour (Haute-Loire) in the direction of Les Estables, in company with *Odontocerum* (3770 ft.); Spain (Rambur). Small specimens of *Rhithrogena semicolorata*, ♀ im., are liable to be mistaken for this species, should their femoral spots happen to be indistinct; but they are distinguishable from it by their having simple, instead of branched and anastomosing cross-veinlets in the pterostigmatic space of the fore wing, by the absence of the bright-yellowish streak in front of the fore wing-roots, and by the ventral lobe of the 9th abdominal segment being emarginate instead of seemingly subacute, or at least entire.

EPHEMERIDÆ OF UNCERTAIN GENERA.

The generic names here attributed to species placed in this category, when not of very recent origin, are used in a lax and unrestricted sense, such as was accorded to them by Pictet (1843-5) or by myself in the year 1871.

AMERICAN SPECIES OF UNCERTAIN GENERA.

POTAMANTHUS VOGLERI, Weyenbergh.

Cloë (?) *Vogleri*, Weyenbergh, Tijdschr. v. Ent. xxvi. 1882-3, p. 171, pl. x. 5 (1883) [wings].

Imago (*living*), ♂.—Thorax jet-black; abdomen black; setæ 3, greyish, with black joinings; legs somewhat pearl-grey, but darker. Wings vitreous, with black neuration, excepting that the fore wings from the costa to the radius are dark-tinted. [In the figure the proximal half of the marginal area is colourless.] Hind wing very small, traversed by a single longitudinal median nervure, which does not extend quite to the margin.

♀.—Abdomen of lighter colour than that of the male. Length of body 3.5, setæ 14-15 mm.

Hab. At Paseo Sobremonte, Cordova, Argentine Republic, flying in the sunshine at about 8 A.M., on the 20th of April.

From the figure of the fore wing and items detailed in the original description, it is evident that this species represents a genus of the Fifth Section, or *Leptophlebia*-type. What is stated of the hind wing should, perhaps, be received with caution, because, from inspection of the figures, it appears that Prof. Weyenbergh was not accustomed to flatten out the wings he delineated.

POTAMANTHUS SIEWERTII, Weyenbergh.

Cloë *Siewertii*, Weyenbergh, Tijdschr. Ent. xxvi. 1882-3, p. 170 (1883).

Imago (*living*).—Upper portion of oculi dark red; thorax sepia-brown; abdomen dark grey, darker at the joinings; setæ 3, pearl-grey, with darker joinings. Femora [sprieten] blackish; the remainder of the legs [pooten] light grey. Wings dull, spotless. Hind wings very small. Length of body 3, setæ 9 mm.

Hab. Cordova, Argentine Republic; sparingly in November.

POTAMANTHUS (?) INANIS, Pictet.

Potamanthus (?) *inanis*, Pict., Hist. Nat. Névropt. ii. Ephém. 232, pl. xxiv. 4 (1842-5); Walk., List of Neuropt. Ins. in Brit. Mus. 547 (1853); Etn., Trans. Ent. Soc. London (1871) 91 [nec *E. inanis*, Gmel. 1790].

Imago (*dried*), ♂.—Thorax polished bright brown. Abdomen whitish for the most part, but with the tip brown, and with a large brown dot on each side of every whitish segment. Setæ greyish, dotted with black. Legs brown. Wings vitreous, slightly greyish, rather darker along the costa, and tinged faintly with yellowish at the base;

neuration brown; cross-veinlets sparse. Hind wings seemingly absent. Length of body 5, wing 6, setæ 6 mm.

Hab. Brazil (Vienna Mus.). [After Pictet.] Pictet did not know exactly to which of his genera this species should rightly be referred. His figure attributes to the mesothoracic wings a shape which would lead one to suspect that the absence of hind wings in his two specimens was due to *Psocidæ* or other cabinet pests. Otherwise, his statement that cross-veinlets exist only in the anterior portion of the mesothoracic wing would render it probable that the species might be related in some degree to one of the genera illustrated in Plate XV. of the present volume,—supposing him to have used a lens of low power in his examination of the specimens, and their setæ to have exceeded his estimate in length.

THRAULUS (?) VITRIPENNIS, Blanchard.

Ephemeræ (*Cloë*) *vitripennis*, Blanch., Gay, Hist. fisic. y politic. de Chile, vi. 107, Atl. Névropt. ii. 3 (1851).

Cloëon vitripenne, Etn., Trans. Ent. Soc. London (1871) 107.

Imago.—Body of a light brownish olive; head flavo-rufous above. Mesothoracic wings vitreous. Legs light testaceous; femora banded with fuscous in the middle and at the tips. Setæ whitish, annulated with brown. Hind wings absent.

Hab. Chili. [After Blanchard.] Probably a *Thraulus*, of which the hind wings had been destroyed by *Psocidæ*.

SIPHLURUS QUEBECENSIS, Provancher.

‡ *Baëtis* ‡ *canadensis*, Provancher, Natural. Canad. viii. 267 (1876); id. Fn. Ent. d. Canad. ii. fasc. i. 83 (1877).

Siphylurus quebecensis, Hag. MS., *op. cit.* ii. fasc. i. [corrections] 82² (1877).

Brune; le vertex et le disque du prothorax ferrugineux. Abdomen avec la base des segments testacée, surtout sur les côtés. Pattes pâles, cuisses brunes, jointures des articles des tarsi noires. Ailes hyalines, le bord costale brun à l'extrémité et quelque peu ferrugineux à la base; nervures transversales brunes. Soies très longues, pâles, à jointures brunes. ♂ Sous-parfait: ailes un peu obscures, couleur du corps plus sombre. Long. .40 pouce; soies 1.20. [After Provancher.]

HEPTAGENIA QUEBECENSIS, Provancher.

‡ *Cloë quebecensis*, Provancher, Natural. Canad. viii. 267 (1876); *id.*, Fn. Ent. d. Canad. ii. fasc. i. 84 (1877).

Heptagenia quebecensis, Hag. MS., *op. cit.* ii. fasc. i. [corrections] 82² (1877).

Brun varié de roussâtre. Thorax poli, d'un brun roussâtre, les côtés avec les sutures jaunâtres. Ailes. . . parfaitement hyalines, les nervures transversales interrompues, peu apparentes. Pattes brun pâle, les jointures des articles des tarsi antérieurs noires. Abdomen brun, blanchâtre sous le ventre et à la base des segments sur les côtés. Soies caudales. . . blanchâtres, à jointures brunes. Long. .40 pouce, soies .65.

Hab. Quebec, common. [After Provancher.]

HEPTAGENIA ‡ PUDICA, Hagen.

Heptagenia ‡ *pudica* [♀ subim.], ! Hag., Ann. Rep. U.S. Geol. & Geograph. Survey of the Terr. 1873, part iii. Zool. 581 (1875); [nec ‡ *Ephemera pudica*, ! Hag. (1861) = *Ecdyurus vicarius*].

Subimago (*dried*), ♀.—The two specimens supposed in 1875 to be identical with the species described in 1861 as *E. pudica* differ from this last specimen, but agree with each other in the following particulars:—In the tarsus, joint 1 is the longest, joints 2–4 diminish successively in length, and joint 5 is as long as (if not longer than) joint 1; unguis unlike each other in form. Wings talcose, grey-tinted in the disk, and slightly yellowish along the costa; longitudinal neuration at first flavescent, and banded with greyish black, but becoming in a large extent darker before the moult; cross-veinlets pitch-black, mostly bordered faintly with grey, this colour also spreading along the longitudinal nervures in the vicinage of their junctions with the former: near the anal angle of the fore wing many of the cross-veinlets are at first pale and unbordered, but after a time they become dark like the others. The wing-neuration is comparable to that represented in Pl. XXIII. fig. 41, the cross-veinlets being rather evenly distributed in the disk; the marginal area of the fore wing contains 9–11 cross-veinlets before the bulla, 1 or 2 at the bulla, and about 20 rarely forked beyond it. Notum lutescent. Abdomen striped obliquely at the sides with black, and marked at the bases of most of the ventral segments with two fine divergent black lines. The ventral lobe of segment 9 appears to be obtuse behind, with a slight sinus in the middle closely flanked on either side by a small acute tooth. The specimens were ticketed 82 and 83; and the left hind leg of 82 was atrophied. Length of wing 20 mm.

Hab. Foot-hills, Colorado (W. L. Carpenter) in August. (Mus. Comp. Zool. Cambridge, Mass.) This species may be related generically to *Epeorus*.

HEPTAGENIA BASALIS, Walker.

‡ *Baëtis basalis*, ! Walk., List of Neuropt. Ins. in Brit. Mus. part iii. 565 (1853); Hag., Smithson. Miscell. Coll. (1861) Synop. Neuropt. N. Am. 50; [nec *B. basalis*, Steph., Cat.].

Heptagenia basalis, ! Etn., Trans. Ent. Soc. London (1871) 139, pl. vi. 15, 15 *a* [detail].

Imago (*dried*), ♂.—Notum piceous. Abdomen pitch-brown, pale at the joinings. Setæ very light reddish [Roman] sepia-grey, with pitch-brown joinings. Legs absent. Wings vitreous, with pitch-black neuration: the fore wing towards the inner margin, and the hind wing at the base, tinged with dark vandyke-grey; the cross-veinlets in the disk of the fore wing near the base of the wing, and between the costa and the pobrachial (7) nervure, are narrowly edged with pitch-brown, or, in parts, with pitch-black; their edging in two places coalesces into pitch-black spots, situated one at the bulla of the subcosta, and the other about midway between that and the extremity of the marginal area. Length of body 13, wing 14, setæ 25 mm.

Hab. Lake Winnipeg (Brit. Mus.).

HEPTAGENIA PULCHELLA, Walsh.

‡ *Palingenia pulchella*, Walsh, Proc. Acad. Nat. Sc. Philad. (1862) 375; Hag., Proc. Ent. Soc. Philad. ii. 177 (1863); Walsh, *op. cit.* ii. 203 (1863).

Heptagenia pulchella, Walsh, *op. cit.* ii. 204 (1863); Etn., Trans. Ent. Soc. London (1871) 141.

Subimago.—Wings subopaque, clouded with fuscous; cross-veinlets fuscous, bordered with fuscous; hind wings paler than the fore wings, and tipped with fuscous.

Imago (living), ♂.—Fore tarsus $1\frac{1}{4}$ to $1\frac{1}{2}$ as long as the tibia; joints 1–3 of the tarsus subequal to each other. Eyes pearly whitish, changing to blackish. Notum ferrugineo-piceous, with the meso- and metathoracic scutella whitish. Abdomen, in segments 2–7, and the base of segment 8, whitish hyaline, with the extreme terminal edges of the segments dark, and usually with a large fuscous dot at each of the spiracles; the remainder of the dorsum ferrugineo-piceous. Venter whitish. Setæ whitish, with fuscous joinings alternately narrow and broad in the basal half. Fore leg pale yellowish; the femur with a median and a terminal band, the tip of the tibia, and the joinings and tip of the tarsus fuscous: hinder legs whitish, marked palely in correspondence, wanting sometimes the median femoral band. Wings hyaline, clouded with pale brown in the pterostigmatic space of the fore wing: neuration for the most part fuscous, but the “costal veins” [? subcosta and radius] in their basal $\frac{2}{3}$ are yellowish, and in the hind wing the “post-costal veins” [? those posterior to the pabrachial (7)] and cross-veinlets are hyaline.

♀.—Vertex whitish, varied with luteous or ferrugineous; notum whitish, varied with luteous; sternum and pleura whitish. Dorsum and venter egg-yellow when full of eggs; the dorsum marked in joints 1–6 as in ♂, and slightly tinged sometimes in segments 7–9 with ferrugineous. The pterostigmatic cloud is lighter than in ♂; and the neuration of the hind wing is mostly hyaline. Length of body 5–8; setæ, ♂ im. 17–21, subim. 10–13, ♀ im. 15–16, subim. 8–13 mm.

Hab. Rock Island, Ill., and Maryland. In the fore wing the great cross-vein is very strong, and the cross-veinlets, especially in the front of the wing, are coarser than the longitudinal neuration. [After Walsh.]

HEPTAGENIA TERMINATA, Walsh.

‡ *Palingenia terminata*, Walsh, Proc. Acad. Nat. Sc. Philad. (1862) 376; Hag., Proc. Ent. Soc. Philad. ii. 177 (1863); Walsh, *op. cit.* p. 203 (1863).

Heptagenia terminata [sp.? or *H. pulchella*, var.?], Etn., Trans. Ent. Soc. London (1871) 141 note [after Hag.].

‡ *Baëtis* ‡ *interpunctata*, Provancher, Natural. Canad. viii. 266 (1876); *id.*, Fn. Ent. d. Canad. ii. fasc. i. 83 (1877) [corrected at *op. cit.* p. 82² (Hag. MS.)].

Perhaps only a variation of *H. pulchella*. The ♂ *imago* has segments 2–7 of the abdomen pale yellowish, without dots at the spiracles; the hinder legs pale yellowish, usually wanting the median femoral band. In the fore wing the cross-veinlets are scarcely coarser than the longitudinal nervures (whence the wing seems paler than in *H. pulchella*) and the “second costal vein” [? subcosta or ? radius] is generally thickened and clouded for the length of 0.5 mm. at the bulla, which is rarely so in *H. pulchella*.

Length of body 6·5–8·5; setæ, ♂ im. 19–22, subim. 12–13, ♀ im. 18–22, subim. 15–18 mm.

Hab. Rock Island, Ill. [After Walsh.]

HEPTAGENIA SIMPLEX, Walsh.

Heptagenia simplex, Walsh, Proc. Ent. Soc. Philad. ii. 204 (1863); Etn., Trans. Ent. Soc. London (1871) 141.

Subimago.—Wings and neuration yellowish.

Imago (living), ♂.—Fore tarsus $\frac{3}{4}$ as long as the tibia: joints 1–3 of the tarsus subequal to each other; joint 4 a little shorter. Eyes bright greenish yellow. Notum flesh-colour. Abdomen in segments 2–7 hyaline; segments 8–10 whitish; forceps white; setæ white, tinged with dusky at the extreme tip. Femora yellow or yellowish; tibiæ and tarsi white, with the extremities of the tarsi, the tip of the fore tibia, and sometimes the joinings of the fore tarsus fuscous. Wings hyaline; neuration colourless, excepting in the distal $\frac{1}{2}$ or $\frac{2}{3}$ of the fore wing, where it is fuscous, and sometimes the cross-veinlets of the marginal area of the same wing are also fuscous; in the pterostigmatic region the cross-veinlets are coarse.

♀.—Fore tarsus $\frac{1}{2}$ as long as the tibia; joint 1 as long as joint 2. Abdomen egg-yellow. Setæ scarcely tinged with dusky at the tip. Only the extremities of the tarsi are a little tinged with fuscous. Wing-neuration colourless, excepting that a few cross-veinlets towards the extremity of the costa are dusky, and that the costa, subcosta, cubitus, and radius are tinged with yellowish. Length of body, ♂ 6–8, ♀ 7–8·5; setæ, ♂ im. 14–18·5, subim. 10·5, ♀ im. 14–16, subim. 10–15; expanse of wings, ♂ 16–20·5, ♀ 19–25·5 mm.

Hab. Rock Island, Ill., June. [After Walsh.]

HEPTAGENIA CRUENTATA, Walsh.

Heptagenia cruentata, Walsh, Proc. Ent. Soc. Philad. ii. 205 (1863); Etn., Trans. Ent. Soc. London (1871) 140.

Subimago.—Wings and their neuration dull opaque yellowish. Setæ tinged with dusky; their joinings fuscous, less distinct than in the imago.

Imago (living), ♂.—Yellowish. Fore tarsus as long as the tibia; the first joint much shorter than the second. In the hinder tarsi joint 1 is slightly shorter than joint 2. Eyes pale bluish grey, intersected by a black line. Notum and dorsum sanguineous. Setæ whitish, with fuscous joinings, which towards the base are alternately broad and narrow. Forceps pale, fuscous towards the tips. In every leg the distal half of the femur, the basal $\frac{1}{3}$ and the terminal $\frac{1}{3}$ of the tibia are pale sanguineous, that portion of the femur presenting at each extremity a narrow dark sanguineous annulus, and the tarsus has dusky joinings and ungues. Wings hyaline, tinged uniformly with yellowish along the costa; neuration close to the wing-roots hyaline, but elsewhere fuscous, excepting the costa, which is tinged with yellow in its basal $\frac{2}{3}$: the bulla of the “2nd costal vein” [? subcosta] for about 0·5 mm. is thickened and obfuscated.

♀.—Fore tarsus shorter than the tibia; joint 1 shorter than joint 2, and slightly so in

the hinder tarsi. Occasionally paler than ♂, and sometimes with the venter sanguineous. The hyaline portion of the wing-nervures is more extensive than in ♂, especially in the hind wings. Length of body 7-9; setæ, ♂ im. 25-27, subim. 12-14, ♀ im. 17-20 mm.

Hab. Rock Island, Ill. [After Walsh.]

HEPTAGENIA MACULIPENNIS, Walsh.

Heptagenia maculipennis, Walsh, Proc. Ent. Soc. Philad. ii. 206 (1863); ! Etn., Trans. Ent. Soc. London (1871) 139.

Subimago.—Wings tinged with dusky; cross-veinlets slightly bordered with dusky. Setæ tinged with dusky towards the tips.

Imago, ♂.—Fore tarsus longer than the tibia, with the first joint about $\frac{1}{3}$ as long as the second; in the hinder tarsi the first joint is as long as the second. The peculiarity of the cross-veinlets of the fore wing, described below, is noteworthy. Notum ferrugineous. Dorsum of abdomen pale yellowish to the basal $\frac{1}{3}$ of segment 7, and then piceous up to the extreme base of segment 10; the remainder pale yellowish. Setæ and forceps whitish. Femora yellowish, usually with a short fine fuscous vitta beneath at the tip; tibiæ and tarsi whitish, the tip of the fore tibia and the ungues fuscous. Wings hyaline: in the fore wing most of the longitudinal nervures are fine and dusky, and most of the cross-veinlets black; but the neuration of the axillar region, like that of the whole of the hind wing, is colourless: in the fore wing the black cross-veinlets are comparatively coarse, and some of them are bordered with coal-black, several of those in the marginal and submarginal areas being immersed in small rounded blots of that colour. The cross-veinlets of the marginal area are unevenly spaced; 3 stand close together in a group at the bulla apart from the others in that area; and again, in the pterostigmatic portion of the same, midway between the bulla and the apex, is another similar group of 4 or 5 cross-veinlets, bordered with black like those of the former group: in all, the area contains, from the great cross-vein up to the bulla, 4-6 heavily bordered cross-veinlets, and beyond the bulla about 13, of which last only the 4 or 5 above mentioned are bordered. In the next two areas, 2-3 cross-veinlets are likewise grouped together in rear of the bulla apart from the others of those areas.

♀.—Paler than the male; dorsal segments 8-10 opaque whitish, tinged more or less with ferrugineous. The bordering of the cross-veinlets is rather lighter than in ♂. Fore tarsus longer than the tibia; joint 1 about $\frac{2}{3}$ as long as joint 2. Length of body 4.5-6; setæ, ♂ im. 12-15, subim. 7.5, ♀ im. 9-12, subim. 8 mm.

Hab. Rock Island, Ill. (Walsh); United States (M^cLach. Mus.). [Chiefly after Walsh.]

ECDYURUS GUTTATUS, Pictet.

† *Baëtis guttata*, Pict., Hist. Nat. Névropt. ii. Ephém. 187, pl. xxiv. 3 (1843-45); Walk., List of Neuropt. in Brit. Mus. part iii. 559 (1853).

Ephemera (Baëtis) guttata, Blanchard, Gay, Hist. fisic. y politic. de Chile, vi. 106, Atl. Névropt. ii. 2 (1851).

Heptagenia guttata, Etn., Trans. Ent. Soc. London (1871) 156.

Imago (dried), ♀.—Head and thorax fuscous, varied with small spots of yellow and

brown. Abdomen yellow [fuscous in the figure cited], with the apical borders and oblique lateral stripes of the segments black, and with two longitudinal dorsal and ventral series of black dashes or streaks besides. Setæ yellow, with black annulations that are narrow and broad alternately. Legs ochreous; a spot on the femur and the extremities of both femur and tibia piceous. Wings vitreous, with black neuration, and with a brownish tint in the costal region, where the cross-veinlets are coarser than elsewhere, and irregular. Length of body, ♀ 12; wing about 14; setæ 18 mm.

Hab. Valdivia, Chili (Blanchard).

EUROPEAN SPECIES OF UNCERTAIN GENUS.

BAËTIS FUSCUS, Schneider.

Cloë fusca, Schn., Stett. ent. Zeit. vi. 340 (1845).

Baëtis ? fuscus, Etn., Trans. Ent. Soc. London (1871) 120.

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 lin.

Hab. Messina, April. [After Schneider.]

HEPTAGENIA IRIDANA, Kolenati.

Baëtis iridana, Kolen., Wien. ent. Monatschr. iv. 383.

Heptagenia iridana, Etn., Trans. Ent. Soc. London (1871) 148.

Imago.—“Corpore rufo-brunneo, segmentis abdominis 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 lin.

Hab. Altwater, in August and September, at an altitude of 4000 feet. The type is in the Royal Polytechnic, Brunn.

BAËTIS VITREATUS, Zetterstedt.

Ephemer vitrea, Zett., Ins. Lap. col. 1045 (1840).

Baëtis vitreatus, Wallengren.

“Nigra, nitida, pedibus sordide luteis, alis hyalinis, nervis valde tenuibus albidis crebre reticulatis, setis caudalibus pallidis, articulatione fusca. Mas: abdominis medio forcipeque sordide alba. Fem.: abdomine toto nigro.” Long. corp. fere 4; al. exp. 8 lin.

Hab. Western Finmark by standing water near Bozzekop, August 7th. Setæ 2, dirty white, with fuscous joinings. (Zetterstedt.)

HEPTAGENIA MONTANA, Pictet.

‡ *Baëtis montana*, Pict., Hist. Nat. Névropt. ii. Ephém. 172, pl. xx. 3 (1843–45); Walk., List of Neuropt. Ins. in Brit. Mus. part iii. 557 (1853); Brauer, Neuropt. Austr. 26 (1857); Ausser., Ann. d. Soc. Natur. Modena, Ann. iv. 434 (1869).

Heptagenia montana, Etn., Trans. Ent. Soc. London (1871) 154; Meyer-Dür, Bull. Soc. Ent. Suisse, v. 313 (1874).

Imago (living), ♂.—Head black; eyes blue. Pronotum reddish, with a median black spot; meso- and metanotum black, the sides of the thorax lighter. Abdomen greyish brown [in the figure light yellowish olive, with the joinings of the segments and oblique stripes at the sides dark]. Setæ fuscous. Fore legs black; hinder legs fulvous. Wings vitreous, with a slight brownish tint in the pterostigmatic region of the fore wing; neuration fine and black. Length of body 13, wing 13, setæ 30 mm.

Hab. Alpine Savoy, *e.g.* at a small stream descending from the Brevent above Chamounix. [After Pictet.]

HEPTAGENIA GEMMATA, Scopoli.

Ephemera gemmata, Scop., Ent. Carn. 264, pl. xxxviii. 683 [wretched fig.] (1763); Müll., Zool. Dan. Prodr. 143 (1776); Vill., C. Linn. Ent. iii. 22 (1789); Ol., Encycl. Méth. vi. 421 (1791); Etn., Trans. Ent. Soc. London (1871) 156 note; Hag., *op. cit.* (1873) 406.

Imago (dried), ♀.—Corpus rufum. Incisuræ abdominis marginibus flavicantibus. Long: 17 mm.

Hab. Circa aquæductum Fodinarum Idrensium. [After Scopoli.] According to Dr. Hagen (1873) this species is related to *Ecdyurus venosus*.

SPECIES, SOME OF WHICH HAVE BEEN PUBLISHED ELSEWHERE DURING THE PROGRESS OF THIS WORK, AND OTHERS NOW FIRST PUBLISHED.

The following species ought to follow *Campsurus dorsalis*, p. 42 :—

CAMPSURUS WAPPÆI, Weyenbergh.

‡ *Ephemera Wappæi*, Weyenb., Tijdsch. v. Ent. xxvi. 1882–3, p. 159, pl. x. I (1883) [wings].

Adult.—Head light yellowish brown; eyes small, black. Pronotum somewhat darker than the head; mesonotum (*during life*) yellow, changing (*when dried*) to yellow-brown; metanotum often somewhat darker. Abdomen above greyish yellow, becoming gradually darker and sometimes approaching black posteriorly; venter yellowish grey throughout; the two appendices very pale, the “palpen” darker. Legs yellow or greyish yellow. Wings transparent, but rather dull; fore wings along the costal border brownish grey through the colouring of the subcosta and radius.

In the ♀ the abdomen posteriorly is rather darker above than it is in the ♂. Length of body 13 or under, wing 18, setæ ♂ 40–43 mm.

Hab. Cordova, Argentine Republic. [After Weyenbergh; condensed translation.]

CAMPSURUS HOLMBERGII, Weyenbergh.

‡ *Ephemera Holmbergii*, Weyenb., Tijdsch. v. Ent. xxvi. 1882–3, p. 160 (1883).

Adult.—Vertex of head very dark between the black eyes. Thorax and abdomen very largely overspread above by dark grey markings approaching sepia-brown, the remaining

surface being of a dirty yellow colour. The dark markings comprise, on the thorax,—an almost circular stripe on the neck; two very large subquadrate spots and the commencement of a longitudinal median line on the pronotum; two longitudinal stripes on the mesonotum united by a transverse band before the metanotum; and two somewhat confluent and more or less raised [knobbelachtig] black spots upon the hind border of the metanotum preceded by four similar black dots somewhat coalescing into a more or less curved line:—the markings on the abdomen comprise,—two small oblong spots on the dorsum of the first segment situated one on each side of the middle line and somewhat near the lateral border; in the next segment the corresponding marks are widened, and in the fourth and fifth segments the spots begin to be blended into one; in the following segments the corresponding spots become gradually larger, so that towards the extremity of the body the whole of the dorsum is occupied by the grey-black colour, excepting the lateral borders of the segments and the whole of the terminal segment, which remain of a yellowish colour. Venter uniformly pale yellow. On each side of the mesothorax a fine oblique dark line extends backwards and downwards from the transverse band of colouring mentioned above, and sometimes unites with a very similar line running downwards in the opposite direction upon the side of the metathorax so as to form a single arcuate line. Setæ shorter than in *C. Wappæi*. Length of body 12 mm.

Hab. Buenos Ayres; scarce. [After Weyenbergh; abstract of translation.]

CAMPSURUS NAPPÏI, Weyenbergh.

Palingenia Nappii, Weyenb., Tijdsch. v. Ent. xxvi. 1882-3, p. 162, pl. x. 2 (1883) [wings].

Adult.—Eyes brown-black. Underside of body yellowish. Pronotum greyish yellow, with a darker longitudinal double median stripe, and with an extremely narrow, dark, nearly brown edging to its hind margin; the remainder of the notum grey-brown, with three darker longitudinal stripes; the sides of the thorax lighter. Abdomen anteriorly greyish above, with a darker transverse band in the hinder part of every segment; posteriorly these bands become successively broader, until in the seventh to the ninth segments almost the whole surface of the dorsum is occupied by the darker colour; the tenth segment, however, remains yellow. Setæ transparent white. Legs [pooten en sprieten] greyish, in some degree tinged with brownish. Wings transparent; fore wing darker along the costal margin, owing to the colouring of the subcosta and radius, and sometimes slightly lactescent in the remainder of the disk, as is usual in subimagines. Length of body 13, wing about 12, setæ ♂ about 33 millim.

Hab. Santiago d. E., Argentine Republic; January. [After Weyenbergh; abstract translation.] Judging from the figures of the wings, I am disposed to rank this species in *Campsurus*, as well as the two preceding, pending further observations. The wings illustrated by Prof. Weyenbergh in the cited publication appear to have been drawn *in situ*, without being flattened out; and this should be borne in mind when reference is made to the plate.

These Species should follow Ephemerella ignita, p. 127.

EPHEMERELLA NOTATA, sp. nov. Plate LXV. 9 (genitalia).

Subimago (living).—Wings whitish grey, paler in proximity to the roots in some lights; neuration in a large measure concolorous with the membrane or whitish, but in the fore wing the great cross-vein, the greater portion of the subcosta and radius, and in certain lights the remaining longitudinal nervures, are light greenish yellow approaching yellow-lake. Setæ dark vandyke- or reddish-grey with reddish joinings. Hinder legs light olive-grey with greyer tarsi: fore leg of ♂ rather darker.

Imago, ♂ (living).—Upper division of eyes light yellowish red (the “yellowish” approaching Mars-yellow, the “red” medium burnt-sienna); lower division brownish olive with a movable dark spot. Pronotum bistre-brown; meso- and metanotum raw-umber-brown; pleura much lighter in colour. Abdomen above translucent bistre-grey in segments 1–7, with the joinings more or less opaque; segments 8 and 9 raw-umber-brown; segment 10 much lighter than these: venter in segments 1–7 light greenish or ashy grey, marked with black lines and dots as in ♀ (see below); segments 8–10 somewhat brown-ochreous, paler along the middle and in segment 9 at the tip; forceps light greenish grey. Setæ light warm-sepia grey with reddish joinings. Fore legs dark bistre-grey; hinder legs rather greener or yellower, and lighter, with the tarsal joinings grey, and brownish unguis. Wings vitreous, with an evanescent yellowish stain in the pterostigmatic region; longitudinal neuration dull greenish grey; cross-veinlets more distinct than in *E. ignita*, and those in the pterostigmatic region less regularly forked or connected together than the corresponding veinlets of that species.

♀ (*living*).—Eyes light olive-green, with a movable round black spot; vertex of head light yellow; orbits of eyes and of the ocelli black, but the interspace between these last, and two unequal dots on each side of the frontal carina, light brown-ochreous. Pronotum lighter than the mesonotum, and traversed in rear of the outer ocelli by two longitudinal black stripes that are slightly divergent and dilated posteriorly. Meso- and metanotum light brownish-ochre, approaching Mars-yellow; the mesopleura in advance of the wing-roots light yellow. Abdomen in segments 1–7 yellower than in ♂, the prevailing tint approaching dull yellow-ochre; the remaining segments rather browner ochre than these; venter rather lighter than the dorsum: the abdominal markings comprise a fine, slightly irregular, transverse brownish line, close to the dorsal joining, at the base of the segment in segments 2–8 or 9, and some blackish marks in segments 1–8, viz. :—in segment 1 a streak at the side ascending the dorsal joining, a small spot above and an isolated longitudinal line below the pleural projection, and a dot nearly in the middle on each side of the ganglionic tract; in segments 2–7 a short isolated longitudinal linear streak met by a shorter erect or ascending streak and followed in certain instances by a small dot at the scar of the nymphal tracheal branchia, above the pleuron on each side, and a longer isolated linear longitudinal streak immediately below the pleuron; also in the same segments a pair of slender clavate streaks, half as long as the segment, divergent posteriorly, produced from the base of each segment; and

lastly, a pair of dots placed one on each side of the ganglionic tract nearly in the middle of each of these segments: in segment 8 the corresponding markings are ill defined. The pleura of segments 8 and 9 are acute behind. Femora yellowish instead of greenish, their colour approaching dull yellowish ochre. Eggs light yellowish. Length of body 8-9; wing 9-11; setæ, ♂ im. 15 & 14, subim. 7, ♀ im. 12 & 12.5, subim. 7 mm.

Hab. N. of England and S. of Scotland. Locally common by shallow and swift parts of the river Eden in Cumberland during June, near the villages of Langwathby and Salkeld. Its occurrence in Scotland is vouched for by a single subimago in Mr. King's collection. The ♂ imago, while in the net, can be distinguished from *E. ignita* by the yellowish tint of the pterostigmatic portion of the fore wing.

EPHEMERELLA HISPANICA, sp. nov.

Subimago (dried), ♀.—Wings light blackish grey, with opaque neuration. Abdomen discoloured, but opaque: the terminal margins of dorsal segments 3-8 or 9 black in the middle for some distance transversely, and then pale towards the sides; the dorsum is flanked on each side by a single series of longitudinal black stripes placed at the bases of the pale pleura; these stripes are visible ventrally, and together with a median longitudinal black line, cause the venter (the joinings of which are pale) to appear trilineate. Setæ dark grey, with black joinings. Sutures of the mesonotum black; on each side of this segment, a little above the spiracle and in front of the tegulæ, is a small rounded black spot. Femur olive-grey; hinder tibiæ, in some lights, browner than the femora; tarsi and fore tibiæ in opaque view blackish.

Imago (dried), ♂.—Notum bright raw-umber-brown: the rounded black spots in front of the tegulæ are each subjacent to a black longitudinal line along the margin of the mesonotum: the thoracic pleura are raw-umber varied with dull light ochre, and their sutures in the neighbourhood of the hinder coxæ are black or pitch-black. Femora in opaque view light yellowish umber or corneous, becoming translucent in transmitted light; fore tibia dark pitch-brown, excepting just at the knee, which is concolorous with the femur; fore tarsus bistre-grey; hinder tibiæ almost concolorous with the femora, each with a blackish-grey stain externally just below the knee; hinder tarsi bistre-brown. Wings vitreous; neuration in some postures colourless, but in other postures the edge of the fore costa in its basal half appears blackish, and some of the stronger of the longitudinal nervures assume an olive-grey or brownish-amber tint, the bulla of the subcosta and the great cross-vein of the fore wing remaining colourless. Length of wing, ♂ im. and ♀ subim. 9 mm.

Hab. Spain; San Ildefonso, Segovia; captured in July by Messrs. Ed. Pictet and Meyer-Dür in the year 1859 (2 examples). By the courtesy of Mr. H. Albarda and Prof. E. Frey-Gessner, I have lately examined all that remains of the Spanish *Ephemeredæ* collected by the deceased Swiss entomologists above mentioned. A single ♀ subimago of this species is in Mr. Albarda's collection, and part of a ♂ imago in Ed. Pictet's Mus.; but the ravages of *Anthrenus* preclude full description of the insect from these materials.

From the same locality, in the same collection as the above species, are specimens of

Ephemerella ignita, and a fragmentary subimago of perhaps an undescribed species of this genus, all captured by the same entomologists in July 1859.

This should follow Ameletus exquisitus, p. 213.

AMELETUS INOPINATUS, sp. nov. Plate LXV. 13 (genitalia).

Imago (dried), ♀.—Head and body pitch-brown, inclining to burnt-umber or rufo-piceous in the hinder abdominal segments; venter nearly concolorous with the dorsum. Legs *in opaque view* light pitch-brown; *in transmitted light* rich brown-amber or translucent raw-umber-brown. Wings vitreous, brilliantly iridescent, tinted uniformly and very faintly indeed with rusty brown or ferruginous; neuration *in opaque view* ferruginous or rufo-piceous, *in transmitted light* ferruginous-amber; cross-veinlets *in opaque view* delicate, except in the pterostigmatic region of the fore wing, and there many or some of those in the marginal area divide and anastomose so as to form an irregular and rather open reticulation. Counted at the subcosta the number of cross-veinlets in the marginal area of the fore wing is 13 before the bulla, and 27–29 beyond it. Length of wing 10 mm.

Hab. Europe: the Schwarzwald and Vosges. Described from a single ♀ specimen, of which the setæ were lost, captured by M^eLachlan at the end of July 1885 at the Feldbergsee (4000–5000 ft.), and a single ♂ im. taken by him in 1883 at the Lac de Retourn^{er}, both in M^eLach. Mus. The ♂ setæ are light brown with opaque joinings.

THE GEOGRAPHICAL DISTRIBUTION OF THE GENERA OF RECENT EPHEMERIDÆ.

A brief summary of the geographical range of the genera and the number of known species by which they are represented may here be given advantageously.

Palingenia: Subgenus (typical). Eastern N. Temperate region, in large rivers, 2 sp.—Subgenus *Ana-*

genesia: Indo-Malay region and Irkutsk, 6 sp.—Subgenus —, Brazil, 1 sp.

Oligoneuria: Europe, middle and south, with Egypt, 1 sp.; Brazil, 1 sp.

Elassoneuria: Natal, 1 sp.

Spaniophlebia: tropical S. America, 2 sp.

Lachlania: Central America and Cuba, 2 sp.

Homæoneuria: Central America, 1 sp.

Euthyplocia: Tropical America, 2 sp.

Campsurus: America, from Texas to Brazil, 8 sp.

Jolia: Europe, S. of France; N. America, Niagara 2; (?) sp. (?) 2 sp.

Polymitarctys: Middle Europe to N. Africa, 2 sp.; Indo-Malay region, 1 sp.; N. America, 1 or (?) 2 sp.

Hexagenia: America N. and S., 6 sp.; E. Siberia, 1 sp. (undescribed); Hindostan, 1 sp. (undescribed).

Ephemerella: Northern temperate regions, 10 sp.; Hindostan, Ceylon, 3 sp.; China, 1 sp.; Japan, 2 sp.; New Zealand, 1 sp. (undescribed).

Pentagenia: Illinois and Texas, 2 sp.

Potamanthus: Europe, middle and south, 2 sp.; N. America, Virginia, 1 sp. (undescribed).

Rhoënanthus: Dutch East Indies, 1 sp.

Atalophlebia: Australia, 6 sp.; New Zealand, 3 sp.; Chili, 1 sp.; Ceylon, 4 sp.; Cape of Good Hope, 1 sp.; Japan (undescribed).

- Leptophlebia* : Europe, 5 sp. (one of them ranging into Turkestan); temperate N. America, 6 sp. and others undescribed; Chili, 1 sp. (undescribed).
- Blasturus* : temperate N. America, 1 sp.; Scandinavia, perhaps 1 sp.
- Choroterpes* : continental Europe, 1 sp.; Arizona, 1 sp. (undescribed).
- Thraulus* : southern Europe, 1 sp.; Indo-Malayan region, 2 sp.; tropical America, 4 sp. and others undescribed. Probably well represented in hot climates.
- Adenophlebia* : Cape Colony, 1 sp.
- Hagenulus* : Cuba, 1 or 2 sp.
- Habrophlebia* : temperate and southern Europe, 6 sp.; New Hampshire (undescribed).
- Calliarcys* : southern Europe, 1 sp.
- Ephemerella* : Europe, 3 sp.; N. America, 6 sp.; Japan, 1 sp.; China, 1 sp. (undescribed). Several nameless genera related to this are found in N. America.
- Teloganodes* : Ceylon, 2 sp.
- Tricorythus* : Egypt, 1 sp.; Malay Archipelago (undescribed); Cape Colony, 1 sp.; perhaps south of France, 1 sp.
- Leptohyphes* : Argentine Republic, 1 sp.
- Cænis* : Europe, 8 or 9 sp.; Egypt, 1 sp. (undescribed); Morocco, 1 sp. (undescribed); Lake Nyassa, 2 sp.; Cape Colony, 1 sp. (undescribed); Ceylon, 1 sp.; N. America, 2 sp. and several others undescribed.
- Prosopistoma* : middle and southern Europe, 1 sp.; Madagascar, 1 sp. (Fly undescribed.)
- Baëtis* : Europe, 14 sp., one of them ranging to Madeira and the Canaries, another to Canada, also one undescribed; Greenland, 1 sp. (?); Egypt, 1 sp. (undescribed); N. America, 6 sp. and upwards; central and S. America, 2 sp. or perhaps 3; Indo-Malay region, 3 or more sp.; Australia (undescribed). A kindred genus is known by the nymph from Peru.
- Centroptilum* : Europe, 8 sp., one of them ranging into Canada; N. America, Arizona, 1 sp. (undescribed); Cuba, 1 sp.
- Cloëon* : Europe, 5 sp., one of them ranging eastward to Armenia and Japan, and southwestwards to Madeira and Teneriffe; Indo-Malay region, 4 sp. (one undescribed); China, 1 sp., perhaps a European; Australia, 1 sp. (undescribed); Cape Colony, 1 sp. (undescribed); N. America, 3 sp.; Argentine Republic, perhaps 1 sp.; Chili, 1 sp. (undescribed).
- Callibaëtis* : throughout America; N. America, 3 or 4 sp. and 1 undescribed (one of the former ranging southwards to Central America); Cuba and Central America, 3 or 4 sp. (one undescribed); S. America, 2 sp.; Australia, 1 sp. (undescribed).
- Coloburiscus* : Australia, 1 sp.; New Zealand, 1 sp.; N. America, 1 sp. (undescribed).
- Chirotonetes* : Europe, 1 sp.; N. America, 4 sp.
- Metamonius* : Chili, 1 sp.
- Ameletus* : Europe, 1 sp.; N. America, 3 sp.
- Dipteromimus* : Japan, 1 sp.
- Siphylurus* : Europe, upwards of 4 sp.; N. America, 6 sp. (the genus is probably represented by many other species); E. Amurland, 1 sp.; Japan, 1 sp. (undescribed); New Zealand, perhaps 1 sp.
- Oniscigaster* : New Zealand, 1 sp.
- Batisca* : N. America, 1 sp.
- Gen. —. A remarkable nymph from Chili [Pl. LIII.] is worthy of mention here.
- Ametropus* : Europe, 1 sp., perhaps ranging to the Caucasus and Armenia.
- Atopopus* : Borneo, 1 sp.
- Thalerosphyrus* : Java and the Philippines, 2 sp.
- Epeorus* : Europe, 4 sp.; Armenia, 1 sp. (undescribed); Himalaya, 1 sp. (provisionally included); N. America (undescribed).

Bleptus: Japan, 1 sp.

Iron: Western N. America, 2 sp.; Central America (undescribed).

Cinygma: Western N. America, 4 sp.

Rhithrogena: Europe, 7 sp. and upwards; N. America, 5 sp.

Pægniodes: China, 1 sp.; Tibet, 1 sp. (undescribed).

Heptagenia: Europe, 4 sp., two of them ranging to E. Amurland, and one undescribed from Segovia; N. America, 2 sp., and probably many undescribed.

Compsoeuria: Malay region, 1 sp.

A kindred genus in N. America (undescribed) may here be enumerated.

Ecdyurus: N. America, 4 sp.; Europe, 12 sp.; the Caucasus, Mesopotamia, Himalaya, and Siberia (undescribed).

The *Ecdyurus* type of genera is represented in Cape Colony. An undescribed ♀ specimen of a species taken by Mr. R. Trimén at Paarl, and now in M^cLach. Mus., has a superficial likeness to species of *Heptagenia*, but differs therefrom in the proportions of its legs. Some small undescribed species, not referable to *Compsoeuria*, and of undetermined genus, natives of the Malay region, are represented in a Leyden Collection.

In this volume 55 genera and 270 species of recent *Ephemeridæ* are characterized, in addition to 11 nameless nymphs, and 19 species named by other authors, which cannot now be classified exactly. Amongst them, 5 genera and 68 species were new to science, and 13 of the older species had to be renamed.

A Conspectus of the Classification adopted in this volume prefaces at pp. 21–22 the systematic description of the *Ephemeridæ*. I now bring it to a close with an analysis of the Groups, &c., therein set forth. The tabulated characters apply solely to adult insects, and are selected from fuller particulars given at the pages that are indicated, to which reference should be made.

ANALYSIS OF THE GROUPS, SERIES, SECTIONS, AND GENERA.

Family EPHEMERIDÆ (p. 2).

- 1 **Group I.** (p. 22). At the roots of the mesothoracic wing the Anal (8) nervure meets the Pobrachial (7) nervure; and, when axillar nervures are developed, the 1st Axillar (9) meets the Anal nervure. Hinder tarsi usually 4-jointed; when a fifth joint is traceable, it is only very short, and is intimately blended with the tibia 2
- **Group II.** (p. 77). At the roots of the mesothoracic wing [except in Series 1 and 3] the Anal (3)⁸ nervure communicates only indirectly with the Pobrachial (7) nervure, through an obsolete channel of circulation, discernible in the wing-membrane. Legs all functional [except, perhaps, in *Prosopistoma*]. Hinder tarsi usually 4-jointed; a very short fifth joint is sometimes intimately blended with the tibia 3

- **Group III.** (p. 199). At the roots of the mesothoracic wing the Anal (8) nervure is separate from the Pobrachial (7) nervure, but a channel of circulation is traceable between them in the wing-membrane; the 1st Axillar, detached from its own group of nervures, either meets or approaches the Anal (8) nervure. Hinder tarsi distinctly 5-jointed 4
- 2** **SERIES 1 OF GROUP I.** (p. 22). Legs of ♀ short and feeble, when not atrophied and functionless. Hind leg of ♀ longer than the fore leg. Eyes of ♂ evenly contoured 5
- **SERIES 2 OF GROUP I.** (p. 47). Legs of ♀ all functional. Fore leg of ♀ at least as long as the hind leg, and usually rather longer. Eyes of ♂ evenly contoured 6
- 3** **SERIES 1 OF GROUP II.** (p. 77). At the roots of the fore wing the Anal (8) nervure approaches or meets the Pobrachial (7) and is met by the 1st Axillar (9¹) which distally describes a bold curve. Forceps-basis of ♂ and lobe of the 9th ventral segment of ♀ developed. Eyes of ♂ evenly contoured 7
- **SERIES 2 OF GROUP II.** (p. 81). At the roots of the fore wing the Anal (8) nervure is quite separate from the Pobrachial (7): the 1st Axillar (9¹) usually describes a simple curve which is strongly arched distally; but sometimes close to the wing-roots, from certain points of view, it appears to be continued forwards along the crease in the wing-membrane so as to curve abruptly towards the Anal (8) nervure, and then it may be termed ogee*-curved. Forceps-basis of ♂ and lobe of the 9th ventral segment of ♀ developed. Eyes of ♂ ascalaphoid 8
- **SERIES 3 OF GROUP II.** (p. 136). At the roots of the mesothoracic wing the Anal (8) and Pobrachial (7) nervures lie close alongside of each other, or in mutual contact, apart from the Axillar (9) nervures. Præbrachial (6) nervure forked. Eyes of ♂ evenly contoured and far asunder 9
- **SERIES 4 OF GROUP II.** (p. 153). At the roots of the mesothoracic wing the Anal (8) nervure is quite separate both from the Pobrachial (7) and the 1st Axillar (9¹) nervure. The 1st Axillar nervure is gently curved, and the Præbrachial (6) nervure is essentially simple. Forceps-basis of ♂ and lobe of the 9th ventral segment of ♀ undeveloped. Eyes of ♂ divided into two unequal segments; the upper segment is large and turbinate, the lower small and oval 10
- 4** **SERIES 1 OF GROUP III.** (p. 199). The Anal-Axillar interspace [in *Bætisca* the 2nd Axillar space] of the fore wing includes the anal angle and the outer half of the inner margin. The Anal (8) nervure [in *Bætisca* the 2nd Axillar (9²)] is less curved than the 1st Axillar (9¹) [in *Bætisca* the 3rd Axillar (9³)], and its numerous branchlets meet the outer half of the inner margin 11
- **SERIES 2 OF GROUP III.** (p. 229). Adult unknown 12

* Ogee or ogive, an architectural term, signifies the sinuate curve shown in vertical section of the side of a vase or cup that is rounded at the base and everted at the rim.

- SERIES 3 OF GROUP III. (p. 230). The Anal-Axillar interspace of the fore wing includes the anal angle and part of the terminal margin, and it contains a variable number of longitudinal intercalar nervures [usually four] which are commonly disposed in two couples of unequal length: of these the couple next to the 1st Axillar (9¹) nervure is the longest 13
- 5 Section 1 (p. 22). Subcosta of the fore wing, when developed, retired somewhat in a fold of the membrane under the Radius (3). PALINGENIA Type 14
- Section 2 (p. 26). Subcosta of the fore wing displayed (except in the dried ♀ *Campsurus*) POLYMITARCYS Type. 19
- 6 Section 3 (p. 48). In the fore wing the Anal (8) and essentially simple 2nd Axillar (9²) nervures bound a semi-sagittate space. [Compare Section 4, *infra*.] Forceps-basis of ♂ developed; basal joints of the limbs shorter than the next joints: lobe of the 9th ventral segment of ♀ undeveloped.
EPEMERA Type. 21
- 7 Section 4 (p. 78). In the fore wing the Anal (8) and forked 2nd Axillar (9²) nervures bound a semi-sagittate space. Basal joint of ♂ forceps-limb the longest of all. [Compare section 3 *supra*.] POTAMANTHUS Type. 22
- 8 Section 5 (p. 82). In the fore wing the Anal (8) and simple 2nd Axillar (9²) nervures bound a trilateral somewhat leg-of-mutton-shaped space. The 1st Axillar (9¹) at its proximal extremity, where it meets the transverse crease in the wing-membrane, is nearer to the 2nd Axillar than to the Anal nervure. [In *Hagenulus* the 1st Axillar meets the 2nd Axillar nervure.]
LEPTOPHLEBIA Type. 23
- Section 6 (p. 122). In the fore wing the Anal (8) and simple 2nd Axillar (9²) nervures bound a curved trilateral space, truncate at its narrow end. The Anal (8) and 1st Axillar (9¹) nervures converge, and at the base of the wing lie close together, or in mutual contact, apart from the 2nd Axillar and from the Pobrachial (7) nervure EPHEMERELLA Type. 31
- 9 Section 7 (p. 137). In the mesothoracic wing the Anal (8) and 2nd Axillar (9²) nervures bound a curved trilateral space, truncate, or abrupt at its narrow end. Hind wings absent CÆNIS Type. 32
- Section 8 (p. 149). Wing-neuration imperfectly elucidated. Hind wings developed PROSOPISTOMA Type. 34
- 10 Section 9 (p. 153). In the mesothoracic wing the Anal (8) and 2nd Axillar nervures bound a trilateral, somewhat leg-of-mutton-shaped space, abrupt at its narrow end. Hind tarsus $\frac{1}{2}$ to $\frac{3}{4}$ the length of the tibia, 4-jointed, with the proximal joint long BAËTIS Type. 35
- 11 Section 10 (p. 200). In the fore wing the Anal (8) nervure terminates close by the anal angle; the 1st Axillar (9¹) nervure terminates in or before the middle of the inner margin. Pronotum well developed SIPHLURUS Type. 37
- Section 11 (p. 226). In the fore wing the Anal (8) and the 1st Axillar

- (9¹) nervures run almost parallel with one another to the terminal margin; and between these nervures and the anal angle, the 2nd Axillar (9²) intervenes.
- Pronotum of minimum proportions BÆTISCA Type. 42
- 12 Section 12 (p. 229). Adult unknown
- 13 Section 13 (p. 230). Hinder tarsi as long as the tibiæ, or longer. In the fore wing the 1st Axillar (9¹) is almost parallel with, and is near the 2nd Axillar (9²) nervure, and it approaches the anal angle ATOPOPIUS Type. 43
- Section 14 (p. 233). Hinder tarsi shorter than the tibiæ. In the fore wing the 1st Axillar (9¹) nervure seldom approaches the anal angle so nearly as in Section 13 ECDYURUS Type. 45

Palingenia Type.

- 14 Axillar nervures well developed in the fore wing; wing-neuration plentiful; wing-membrane translucent but dull 15
- Axillar nervures obsolescent or wanting in the fore wing; wing-neuration scanty 16
- 15 Præbrachial (6) nervure of the fore wing forked beyond the middle; two conspicuous couples of longitudinal nervures proceed to the terminal margin [(p. 23).
Subgen. *Palingenia*
- Præbrachial nervure of the fore wing forked before the middle; three conspicuous couples of longitudinal nervures proceed to the terminal margin [(p. 25).
Subgen. *Anagenesia*
- 16 Wing-membrane dull or satin-like 17
- Wing-membrane "shot" with blue or purple 18
- 17 Fore wing apparently 5-nerved, with the 5th nervure forked *Oligoneuria* (p. 29).
- Fore wing apparently 3-nerved, with the 2nd and 3rd nervures forked. *Elassoneuria* (p. 32).
- 18 Fore wing apparently 5-nerved, with the 4th and 5th nervures forked. *Spaniophlebia* (p. 33).
- Fore wing apparently 4-nerved, with 1st, 3rd, and 4th nervures forked *Lachlania* (p. 34).
- Fore wing apparently 4-nerved, with every nervure simple *Homæoneuria* (p. 35).

Polymitarcys Type.

- 19 The Anal-Axillar interspace of the fore wing contains numerous sinuate or ogee-curved branchlets of the Anal (8) nervure which run transversely to the inner margin. Setæ 3 *Euthyplocia* (p. 36).
- The aforesaid interspace contains two longitudinal intercalary nervures or branches of the Anal (8) nervure, and very few cross-veinlets. Setæ 2 *Campsurus* (p. 38).

- A nameless insect differs from *Campsurus* in having an abundance of cross-veinlets Plate VI. 8 bis.
- The aforesaid interspace contains 4 or 5 longitudinal intercalar nervures, and an abundance of cross-veinlets 20
- 20 Setæ ♂ 2 *Jolia* [?] (p. 42).
- Setæ ♂ 2, ♀ 3 *Polymitarcys* (p. 43).

Ephemera Type.

- 21 Median caudal seta very short and rudimentary in both sexes. Pronotum of ♀ longer than broad; fore tarsus of ♀ subequal in length to the tibia *Hexagenia* (p. 48).
- Median seta subequal to the others in both sexes. Pronotum of ♀ somewhat transverse; fore tarsus of ♀ about $\frac{3}{4}$ as long as the tibia *Ephemera* (p. 58).
- Median seta very short and rudimentary in the ♂, but long and little shorter than the others in the ♀. Pronotum of ♀ transverse; fore tarsus of ♀ scarcely $\frac{2}{3}$ as long as the tibia *Pentagenia* (p. 75).

Potamanthus Type.

- 22 Median caudal seta long in both sexes *Potamanthus* (p. 78).
- Median seta aborted in both sexes *Rhoënanthus* (p. 81).

Leptophlebia Type.

- 23 Tarsal claws all narrow and uncinatè 24
- Of every tarsus one claw is broad and obtuse, the other claw narrow and uncinatè 25
- 24 Hind wing more or less obtusely subovate *Atalophlebia* (p. 83).
- Hind wing oblong, oblique; its marginal area abbreviated and relatively very broad *Adenophlebia* (p. 111).
- 25 Hind wing obtusely ovate or oval; its marginal area narrow throughout and far extended 26
- Hind wing strongly angulated in front; its marginal area broad and usually abbreviated 27
- 26 Median caudal seta equal to the others *Leptophlebia* (p. 91).
- Median seta much shorter than the others. *Blasturus* (p. 100).
- 27 At the roots of the fore wing the 1st Axillar (9¹) meets the 2nd Axillar nervure *Hagenulus* (p. 113).
- At the roots of the fore wing the 1st Axillar is separate from the 2nd Axillar nervure 28
- 28 In the Anal-Axillar interspace of the fore wing

- if there are more than two intercalar nervures, that which is next to the Anal (8) nervure is long. Lobe of the 9th ventral segment of ♀ obtuse 29
- If there are more than two intercalar nervures in the said interspace, that which is next to the Anal (8) nervure is short or rudimentary. Lobe of the 9th ventral segment of ♀ bifid and acutely excised 30
- 29 Basal joint of the ♂ forceps-limb very short; 2nd joint by far the longest *Choroterpes* (p. 104).
- Basal joint of the ♂ forceps-limb by far the longest *Thraulius* (p. 106).
- 30 Basal joint of the ♂ forceps-limb nearly as long as the remainder of the limb *Habrophlebia* (p. 114).
- Basal joint of the ♂ forceps-limb longer by far than the remainder *Calliarcys* (p. 121).

Ephemerella Type.

- 31 Median caudal seta long. Hind wing well proportioned, and with copious neuration: subcosta arched and long. Basal joint of the ♂ forceps-limb shorter by far than the 2nd joint *Ephemerella* (p. 124).
- Median seta aborted. Hind wing minute and with scanty neuration: subcosta straight and abbreviated. Basal joint of the ♂ forceps-limb rather longer than the 2nd joint *Teloganodes* (p. 134).

Cænis Type.

- 32 Cross-veinlets of the wing pluriserial 33
- Cross-veinlets uniserial. Median caudal seta long *Cænis* (p. 141).
- 33 Median seta long *Tricorythus* (p. 138).
- Median seta aborted *Leptohypthes* (p. 140).

Prosopistoma Type.

- 34 Median caudal seta developed *Prosopistoma* (p. 149).

Baëtis Type.

- 35 Hind wings small or minute 36
- Hind wings absent *Cloëon* (p. 179).
- 36 Hind wing oblique, elongate, narrow, and binerved, with usually a slender costal projection *Centroptilum* (p. 174).

- Hind wing oblique, usually rather broad and obtusely ovate, bi- or tri-nerved, with usually a small and acute costal projection *Baëtis* (p. 156).
- Hind wing oblique, usually rather broad and oblong, tri-nerved, with several cross-veinlets in at least the marginal area, and with a large and very obtuse costal protuberance *Callibaëtis* (p. 191).

Siphylurus Type.

- 37 Hind tarsus shorter than the tibia 38
- .. Hind tarsus longer than the tibia 41
- 38 Proximal joint of the hind tarsus distinctly shorter than the next joint 39
- Proximal joint of the hind tarsus hardly perceptibly shorter than the next joint. Of every tarsus one claw is blunt and the other hooked *Ameletus* (p. 210).
- Proximal joint of the hind tarsus longer than the next joint. Tarsal claws all narrow and hooked. Hind wings minute *Dipteromimus* (p. 213).
- 39 Of every tarsus one claw is blunt and the other hooked ~~Coloburiscus~~
Coloburus (p. 201).
- Claws of the hinder tarsi, and usually of the fore tarsus also, all narrow and hooked 40
- 40 Axillar region of the hind wing ample, containing numerous long branchlets of the 2nd Axillar nervure. Claws of the ♂ fore tarsus peculiar in form *Chirotonetes* (p. 203).
- Axillar region of the hind wing small and narrow; 2nd Axillar nervure of the same almost branchless *Metamonius* (p. 208).
- 41 Proximal joint of the hind tarsus longer than the next joint. Tarsal claws all narrow and hooked *Siphylurus* (p. 214).
- Proximal joint of the hind tarsus likewise longer than the next joint. Of every tarsus one claw is blunt and the other hooked *Oniscigaster* (p. 223).

Bætisca Type.

- 42 Hind tarsus longer than the tibia; its proximal joint longer than the next joint. Of every tarsus one claw is blunt and the other hooked *Bætisca* (p. 226).

Atopopus Type.

- 43 Axillar region of the hind wing ample and with

- copious neuration. Hind tarsus probably rather longer than the tibia. Median caudal seta long *Ametropus* (p. 231).
 Axillar region of the hind wing small, narrow, and with sparse neuration. Median caudal seta aborted 44
44 Hind tarsus of ♂ twice the length of the tibia *Atopopus* (p. 232).
 Hind tarsus of ♂ equal in length to the tibia *Thalerosphyrus* (p. 232).

Ecdyurus Type.

- 45** First joint of the hind tarsus longer than the second; the second joint longer than the third 46
 First joint of the hind tarsus equal to the second joint 48
 First joint of the hind tarsus shorter than the second joint 50
46 First joint of the fore tarsus rather longer than the second joint. Hind wings unusually small *Bleptus* (p. 243).
 First joint of the fore tarsus equal to the second joint. Hind wings well developed *Epeorus* (p. 237).
 First joint of the fore tarsus shorter than the second joint. Hind wings well developed 47
47 Penis-lobes (when dried) narrow and shrunk to peg-like projections. Femora sometimes without markings, sometimes faintly banded *Cinygma* (p. 247).
 Penis-lobes (when dried) stout, dilated at their extremities. Cross-veinlets scarce in the fore wings. Femora banded *Compsoneuria* (p. 275).
 Penis-lobes stout, usually transversely and broadly dilated at their extremities, but sometimes obovate. Cross-veinlets abundant in the fore wings. Femora often banded, but sometimes without markings *Ecdyurus* [part] (p. 276).
48 Second joint of the hind tarsus equal to the third joint. Femora usually marked with a dark median spot, but banded in one species and without markings in another *Iron* (p. 244).
 Second joint of the hind tarsus longer than the third joint 49
49 Penis-lobes (when dried) narrow and shrunk to peg-like projections. Femora usually marked with a dark median spot or streak, but sometimes without markings *Rhithrogena* (p. 250).
 Penis-lobes stout and broadly dilated at their extremities, or obovate. Femora often banded, but sometimes without markings *Ecdyurus* [part] (p. 276).

| | | |
|----|--|-----------------------------------|
| 50 | Second joint of the hind tarsus equal to the third joint | 51 |
| .. | Second joint of the hind tarsus longer than the third joint | 52 |
| 51 | Penis-lobes somewhat explanate and oblong, subtruncate at their divergent extremities. Femora usually without markings, but sometimes faintly banded . . . | <i>Heptagenia</i> [part] (p.265). |
| .. | Penis-lobes broad and short. Femora banded . . . | <i>Heptagenia</i> [part] (p.267). |
| .. | Penis-lobes narrow and subcylindrical at their bases, with suddenly enlarged patulous tips. Femora without markings | <i>Pægnoides</i> (p. 261). |
| 52 | Femora usually without markings, &c. [See 51 above.] | <i>Heptagenia</i> [part] (p.265). |
| .. | Femora usually marked with a dark median spot or streak, &c. [See 49 above.] | <i>Rhithrogena</i> [part](p.250). |

ANALYTICAL INDEX TO THE DESCRIPTIONS AND ILLUSTRATIONS OF NYMPHS OF
Ephemeridæ CONTAINED IN THIS VOLUME.

| | | |
|----|--|---|
| 1. | Palpi of maxilla II biarticulate | 2 |
| .. | triarticulate | 7 |
| .. | pluriarticulate, flagellate, each consisting of a long, stout basal joint and a slender, multiarticulate flagellum. Seven pairs of abdominal tracheal branchiæ: the foremost different in shape from the others. A nameless S. American nymph p. 229, Pl. LIII. | |
| 2. | Basal joint of the palpus of maxilla II shorter than the other joint. Palpus of maxilla I also biarticulate | 3 |
| .. | Basal joint of the palpus of maxilla II subequal in length to the other joint. Palpus of maxilla I triarticulate. Median lobe of tongue excised. Seven pairs of abdominal tracheal branchiæ; the foremost branchiæ rudimentary, minute and fringeless; the other branchiæ ciliate or fimbriate. Habits fossorial | 6 |
| .. | Basal joint of the palpus of maxilla II longer than the other joint, which is peculiarly pouched. Palpus of maxilla I likewise biarticulate. Seven pairs of abdominal tracheal branchiæ. Lobes of the labium more or less distant from one another. Type of <i>Ecdyurus</i> . See Tabulation at p. 235, Pls. LIV.-LXII. | |
| 3. | Laminæ of at least the hinder pairs of the abdominal tracheal branchiæ jugate, narrow, conduplicate lengthwise and fringed. Habits fossorial | 4 |
| .. | Laminæ of the abdominal tracheal branchiæ all single, broad, somewhat plane, fringeless, and each provided at its base with a fascicle of fibrils. Habits predaceous | 5 |
| 4. | Six pairs of abdominal tracheal branchiæ all of uniform make. Median lobe of tongue acute. Mandibles strong and short <i>Palingenia</i> , pp. 23 & 25, Pl. XXV. | |
| .. | Seven pairs of abdominal tracheal branchiæ; the foremost, unlike the others, is rudimentary, minute, single and spatulate. Median lobe of tongue obtuse. Crown of mandible prolonged into a slender tusk in advance of the head <i>Polymitarcsys</i> , p. 44, Pl. XXVIII. | |

5. Seven uniform pairs of abdominal tracheal branchiæ, the foremost ventral: laminæ small, coriaceous, subrotund. Median lobe of tongue acute. Maxillæ II coherent, enclosing and intimately adherent to the labium. At maturity the space between the wings and the peak of the mesonotum is spanned over by membrane sheathing the base of the dorsum.
Oligoneuria, p. 29, Pl. XXVI.
- .. Seven uniform latero-dorsal pairs of abdominal tracheal branchiæ; the laminæ well developed, foliaceous, and somewhat obovate. Labium and terminal margins of the fore wings free. Median lobe of tongue obtuse. Caudal setæ natatorial *Jolia*, p. 42, Pl. XXVII.
6. Frons armed anteriorly with a single obtuse median protuberance. Tusks of mandibles convergent when closed together *Hexagenia*, p. 48, Pls. XXIX. & LXIII. (part).
- .. Frons armed anteriorly with two acutely conical projections. Tusks of mandibles overlapping at the points when closed together *Ephemera*, p. 58, Pl. XXX.
7. Palpus of maxilla I quadriarticulate*. Maxillæ II concrete with the labium, which is undivided. General form testudinate, broadly ovate, flattened beneath and highly convex dorsally. Caudal setæ plumose, very short, retractile with the last segment. Tracheal branchiæ concealed by a large notal shield in which the anterior wings are immersed at maturity.
Prosopistoma, p. 149, Pl. XLIII.
- .. Palpus of maxilla I triarticulate 8
- .. " " apparently † biarticulate [but if triarticulate,—Mandibles short. Lacinia of maxilla I curved externally from the point to the insertion of the palpus, which is longer than it. Seven pairs of abdominal tracheal branchiæ. Lobes of the labium narrow &c.,—cf. §18 below]. Tracheal branchiæ all foliaceous and double, with unequal divisions.
Callibætis, p. 191, Pl. XLVIII.
8. Mandibles short 9
- .. " prolonged beyond the head into slender incurved tusks. Six uniform pairs of abdominal tracheal branchiæ: the laminæ jugate, narrowly lanceolate, conduplicate lengthwise and fringed. Median lobe of tongue excised. Frons unarmed anteriorly.
Euthyplocia, p. 37, Pl. XXIX. (part).
9. Lacinia of maxilla I truncate for some distance outwards from the point; consequently, between the point and the insertion of the palpus, the exterior contour of the lacinia is angular: a conspicuous dense patch of suberect hair occupies some part or the whole of the truncated edge: palpus longer than the lacinia 10
- .. Lacinia of maxilla I curved or irregularly rounded off from the point to the insertion of the palpus 14
10. Six pairs of abdominal tracheal branchiæ, all of uniform make; each branchia consisting of two jugate, elongate-oval, plumose or pinnately parted laminæ, with crowded subulate segments
Potamanthus, p. 78, Pl. XXXI.
- .. Seven pairs of abdominal tracheal branchiæ 11
11. Tracheal branchiæ uniform 12
- .. Foremost tracheal branchiæ quite different in form from the other pairs 13
12. Tracheal branchiæ bipartite, with subulate or linear-lanceolate divisions.
Leptophlebia, p. 92, Pl. XXXII.

* The basis or place of insertion of the palpus might in many instances be easily mistaken for a joint (*e. g.* in *Siphururus*, Pl. L).

† The number of joints could not be positively ascertained from the specimens examined. Even the figure published is suggestive of there being possibly a very short third joint at the tip of the palpus; but no joining was traceable thereabouts in the actual object.—A. E. E.

- .. Tracheal branchiæ bifid, with filiformly dissected divisions . . . *Habrophlebia*, p. 115, Pl. XXXVI.
13. Foremost tracheal branchiæ bifid, with linear-lanceolate divisions: the others consist of jugate, obliquely subovate, tail-pointed, fringeless, foliaceous laminae. *Blasturus*, p. 100, Pl. XXXIII.
- .. Foremost tracheal branchiæ single, linear-lanceolate; the others composed each of two jugate, unequal, cuspidate, foliaceous laminae, oblique at the base, of which laminae the smaller is obliquely ovate, and the larger obliquely subcordate-ovate, with unequal auricles: the cusps are discontinuous with the blades of the laminae *Choroerpes*, p. 105, Pl. XXXIV.
- .. Foremost tracheal branchiæ bipartite, with filiform divisions: the others composed each of two jugate, oblong-ovate, fimbriate, foliaceous laminae *Thraulus*, p. 107, Pl. XXXV.
14. Four or five pairs of abdominal tracheal branchiæ. Palpus of maxilla I shorter than the lacinia 15
- .. Six pairs of abdominal tracheal branchiæ. Palpus of maxilla I longer than the lacinia 16
- .. Seven pairs of abdominal tracheal branchiæ. Palpus of maxilla I equal in length to, or longer than, the lacinia 18
15. Pronotum well developed. Palpi of maxillæ II simply pointed. Hinder tracheal branchiæ each composed of a lamina, concave on the underside, sheltering a partly adherent forked appendage beset with membranous lamellæ. At maturity triangular membranes extend from the terminal margins of the fore wings to the peak of the mesonotum. Type of *Ephemerella*.
See Tabulation, p. 123, Pls. XXXVII.-XL. & LXIV. (part).
- .. Pronotum reduced to a minimum. Palpi of maxillæ II forcipate. Tracheal branchiæ at maturity concealed by a large mesonotal shield, in which the fore wings are immersed.
Betisca, p. 226, Pl. LII.
16. Foremost tracheal branchiæ rudimentary, subulate; the second pair elytroidal, sheltering the hinder pairs, the laminae of which are fimbriate 17
- .. Abdominal tracheal laminae imbricate, all lamellar and pergamentose: the foremost is triangular-obovate in form; each of the other laminae is somewhat oval, with a large rounded foliated, eroded and lacinate lobe produced from its interior margin. Abdominal pleura oniscoidally dilated *Oniscigaster*, p. 224, Pl. LI.
17. Laminae of the hinder pairs of tracheal branchiæ each furnished on the underside with a filamentously dissected appendage *Tricorythus* (?), p. 138, Pl. XLI.
- .. Hinder tracheal branchiæ unprovided with any appendage *Cænis*, p. 141, Pl. XLII.
18. Lobes of the labium broad and obtuse. Pleura of the intermediate abdominal segments more or less narrowly dilated oniscoidally 19
- .. Lobes of the labium narrow and acute or falcate. Pleura of the intermediate abdominal segments hardly at all produced.—Type of *Baëtis* . . . See Tabulation, p. 155, Pls. XLV.-XLVIII.
19. Abdominal tracheal branchiæ all single and obovate. Palpus of maxilla I subequal in length to the subquadrate lacinia, the crown of which is singularly beset with suberect pectinate spinules.
Chirotonetes (?), p. 204, Pl. XLIX.
- .. Abdominal tracheal branchiæ of the first two pairs, each formed of two foliaceous laminae connate at the base: the laminae of the other pairs are single. Palpus of maxilla I longer than the lacinia, which is longer than broad *Siphurur*, p. 215, Pl. L.