

**An analysis of the Scandinavian Species of  
Ephemerida described by older authors.**

By

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In preparing a monograph on the Swedish forms of the group of Ephemerida I have devoted very much attention to the synonymic of the species and, in the first place, I have tried to analyze the forms described by the older Swedish authors VON LINNÉ<sup>1</sup>, DE GEER<sup>2</sup> and ZETTERSTEDT<sup>3</sup>. Considering the great importance, which the identification of the species described by older authors has for the nomenclature of the forms, a fixation of the synonymy cannot fail to be also of great scientific interest.

Many of the species described by the authors mentioned have, both among older and later authors, been a subject for very diverging opinions, while, concerning others, the views have agreed very much. As long as, however, the May-flies of our country were only imperfectly examined, the interpretation of the forms lacked its necessary, solid foundation and could, in many cases, nothing but remain uncertain and doubtful, to which, of course, must also be added, as

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<sup>1</sup> C. VON LINNÉ, *Fauna Suecica*. Ed. II. Stockh. 1761 and *Systema Naturæ*. Ed. XII. Tom. I. Pars 2. Holmiæ 1767.

<sup>2</sup> CHARLES DE GEER, *Memoires pour servir à l'histoire des Insectes*. Tom. II. Pars 2. Stockh. 1771.

<sup>3</sup> J. W. ZETTERSTEDT, *Insecta Lapponica*. Lipsiæ 1840.

an explanatory moment, the shortness and incompleteness of the diagnoses, which, generally, only are based upon vague colour-characters and these are often taken from dried individuals too.

Many of our Swedish species are, of course, common to those of the neighbouring countries, and since there exists now, through ESB. PETERSEN'S work »Danmarks Fauna. 8. Guldsmede, Døgnfluer, Slørvinger etc. København 1910» a comparison, of recent date, of the Ephemera of the Danish fauna, a safer basis has been obtained also concerning the determination of the forms described by O. F. MÜLLER in *Zoologica Danicæ Prodrumus*. Havnæ 1776. The basis of the species of Ephemera described by J. C. FABRICIUS in *Entomologia Systematica*. Tom. II. Hafniæ 1793 and in his earlier works is, as is well known, in many cases, material collected in Denmark and even in Sweden, and, on account of this, I have also made most of his species a subject for a critical review. Within this setting I have at last also included the species, that are described by H. STRÖM in »Norske Insecters Beskrivelse med Anmærkninger. K. Danske Vidensk. Selskabs Skrifter. Ny Saml. Anden Deel. Kjøbenhavn 1783», and which are collected in Nordenfjeldske Norge.

Of the existing types, upon which the works above mentioned are based, I have had access to those of DE GEER, which are kept in the »Riksmuseum» in Stockholm and which have, for examination, been kindly committed to me by Prof. Dr. Y. SJÖSTEDT, Intendant of the collections, and to ZETTERSTEDT'S type-collection, which is kept in the Entom. Museum of the university of Lund, and which, like that of DE GEER, exclusively contains specimens, stuck on needles. Little or nothing of value seems to be left now of LINNÉ'S and FABRICIUS' types of this group. Whether O. F. MÜLLER has ever had a type-collection, is not known, as far as I am aware. About MÜLLER'S collection HAGEN<sup>1</sup> has the following statement: »Leider sind die sämtlichen Sammlungen und Schriften OTTO FRIEDRICH MÜLLER'S, nach denen ich auf das Eifrigste geforscht habe, ganz verschwunden, und wahrschein-

<sup>1</sup> H. A. HAGEN, Nachricht über die entomol. Sammlungen in Norwegen, Schweden und Dänemark. Stettin. Entom. Zeit. Jahrg. 5. 1844. p. 131.

lich bei den grossen Feuerbrünsten Kopenhagens oder dem Bombardement untergegangen».

Except the collections, just mentioned, I have had an opportunity — by the kind obligingness of Mr. O. GYLLING — of examining the late Rev. H. D. J. WALLENGREN's collection of Swedish Ephemerida, kept in the Museum of Malmö, upon which collection WALLENGREN's paper »Förteckning på de Ephemerider, som hittills blifvit funna på Skandinaviska halfön. Entom. Tidskr. Årg. 3. 1882. p. 173—178» is based, and I have thought it to be of interest to add the results of this examination too.

The results, to which I have come by this study, differ in many points from the current opinion, not only as regards more critical species, but in several cases also in such species, the determination of which has hitherto been rather unanimous. As a stating of the reasons, upon which I have based my opinion, may appropriatly be made in a separate paper, I now venture to present my results, in the hope, that, at least in some cases, a clearer light may be thrown upon the Scandinavian species of this group, described by the older authors.

## I. v. Linné.

1. *Ephemerula vulgata* (Fauna Suec. Ed. II. p. 376. N:o 1472. — Systema Naturæ. Ed. XII. p. 906. N:o 1) is the species so named by all later authors.

2. *Eph. marginata* (Syst. Nat. Ed. XII. p. 906. N:o 3). — This species seems, remarkably enough, not to have been known by LINNÉ as a Swedish one, as it is not mentioned in *Fauna Suec.* In *Systema Nat.* LINNÉ only says, concerning the spread of this species, as for the other species, »habitat in Europa», but, in this case, he relies on FABRICIUS, which he does not in the statement of the locality of all the other species. FABRICIUS, who in *Entomol. System.* Tom. II. p. 69 for his »*marginata*» quotes LINNÉ's species with the same name as synonymous, says about it »habitat in Sueciæ aquis», and as the description cannot be applied to any other species, occurring in Sweden, than *Leptophlebia marginata* auct., it must be regarded as the species in question. —

PICTET<sup>1</sup>, who identified LINNÉ's and FABRICIUS' species *marginata*, explained it as *Potamanthus marginatus*, which, however, as is clearly shown especially by the lengthened, narrow fore-wings »avec les nervures peu abondantes», the hind wings, relatively small, with »moins complète nervation» and by the illustrations, is a very separate form.

3. *Eph. vespertina* (Fauna Suec. p. 378. N:o 9. — System. Nat. Ed. XII. p. 906. N:o 4). — This has been a very mysterious and disputed species among later systematici. At first EATON<sup>2</sup> considered it as representing a typical *Leptophlebia*, but referred it later<sup>3</sup> hesitatingly to the genus *Blas-turus* and puts it, according to his latest interpretation<sup>4</sup>, with a note of interrogation as synonymous with his *Leptophlebia Meyeri*. As a *Cloëon* it was determined, according to EATON (1884), by OULIANINE<sup>5</sup>. WALLENGREN<sup>6</sup> thinks, that it »sannolikt» is subimago of *Habrophlebia fusca* (CURT.). It seems to me that the characters mentioned by LINNÉ — which characters must be supposed to be founded on dried material of subimago — »toto corpore et alis superioribus nigra, solæ alæ inferiores albæ», combined with the size mentioned (»est inter minores generis sui») and »cauda triseta» are not applicable to any other Swedish species known than to *Euphyurus albitarsis* BGTN. Cf. S. BENGTSSON, Beiträge zur Kenntn. d. paläarkt. Ephemeriden. Lunds Univ. Årsskr. N. F. Afd. 2. Bd. 5. 1909. p. 5. *Leptophlebia Meyeri* EAT., of which I have later had an opportunity of examining authentic specimens, is synonymous with this one. The species should thus take the name of *Euphyurus vespertinus* (LIN.).

4. *Eph. bioculata* (Fauna Suec. p. 376. N:o 1473. — Syst. Nat. p. 906—7. N:o 5). — Almost all authors have interpreted this species as *Baëtis bioculatus* auct. but, as I think, wrongly. The characters »alis albis reticulatis», »tubercula . . . lutea . . . pellucida», »abdomen . . . albo diaphanum»,

<sup>1</sup> F. J. PICTET, Hist. natur. d. Ins. Névropt. Famille des Ephémérines. Genève 1843. p. 208. Pl. XXV. Fig. 4 and 5.

<sup>2</sup> A. E. EATON, A Monogr. on the Ephemeridæ. Trans. Entom. Soc. London 1871. p. 88.

<sup>3</sup> A Revisional Monograph of recent Ephemeridæ or Mayflies. Trans. Linn. Soc. London 1884. p. 103.

<sup>4</sup> Entom. Monthl. Magaz. Vol. 37. London 1901. p. 253.

<sup>5</sup> Neuropt. and Orthopt. of the province of Moscou. 1867 (cited according to EATON.)

<sup>6</sup> H. D. J. WALLENGREN, Förteckning etc. p. 176.

»cauda duabus setis . . . corpore ipso duplo longioribus, albis» and »pedes nivei» indicate distinctly imago ♂. There is said nothing about the colour of the body in »*Fauna*» and, with the support of the description given in this place only, the species can surely be determined in this way. The matter stands differently, however, if the addition that is made in »*Systema*» p. 907 after the diagnosis is paid attention to: »alæ, ut totum corpus, pallide flavescentes». These characters are not at all applicable to the species mentioned, which has its wings quite vitreous, brownish black ground-colour and besides quite yellow (flava) turbinate eyes in ♂ imago. Unfortunately LINNÉ says nothing about the hind wings. All the characters given in the descriptions can be applied only to two Swedish species *Centroptilum diaphanum* (MÜLL.) (*luteolum* auct.) and *Cloëon bifidum* BGTN<sup>1</sup>, both of which have also the same size as *bioculatus*. Considering that the former is one of the most common May-flies in our country, with a very extensive and common spread, while *Cloëon bifidum* is far less common, it seems to me that there is every probability that *Centroptilum diaphanum* (MÜLL.) is the species LINNÉ has intended with his species *bioculata*.

5. *Eph. fuscata* (Fauna Suec. p. 376--7. N:o 1474. — Syst. Nat. p. 907. N:o 6). — This has been misinterpreted as identical with the preceding species. The characters »caput, thorax, abdominis primum et quatuor ultima segmenta fusca, gibberes oculares . . . flavi», and the other characters given in the description, with the exception of »caudæ setæ . . . abdomine breviores», are quite applicable to *Baëtis bioculatus* auct., imago ♂. The description is obviously founded on a specimen mutilated with regard to the caudal setæ, because there exists no imago ♂ of the fam. *Baëtidæ* with the caudal setæ »abdomine breviores». *Baëtis bioculatus* auct. should, therefore, be named *Baëtis fuscatus* (LIN.). The species is tolerably common in Sweden.

6. *Eph. culiciformis* (Fauna Suec. p. 377. N:o 1475. — System. Nat. p. 907. N:o 8) is a doubtful form. »Tubercula 2 supra oculos crassa magna» indicate ♂ and surely also a representative of the family *Baëtidæ*, as »setæ caudæ longi-

<sup>1</sup> S. BENGTSSON, Neue Ephemeriden aus Schweden. Entom. Tidskr. Årg. 33. 1912. p. 109.

tudine corporis» indicate subimago. The words »culice paulo major» suggest most probably, it seems to me, a *Cloëon simile* EAT. or *Baëtis Wallengreni* BGTN<sup>1</sup>, both in Sweden not rare and widely spread species.

7. *Eph. horaria* (Fauna Suec. p. 377. N:o 1476. — System. Nat. p. 907. N:o 9). — What LINNÉ intended with this species, has, no doubt, in my opinion, been *Cænis dimidiata* auct., but he has also, in his description, had before him some representative of the family *Baëtidæ*, which he has mistaken for the other species. His description in »*Fauna*» indicates this quite definitely, for as it stands, it cannot be applied to any known representative of Ephemera. In favour of the determination mentioned speak in the description the words »minima», »magnitudo muscæ domesticæ minoris», »alis albis, margine crassiore nigricantibus», »cauda . . . absque ullis parvis (h. e. setis, i. e. forceps) interiectis»<sup>2</sup>, »pedes albi, exceptis primis majoribus magis fuscis», »abdomen cinerascens, segmentorum marginibus albis», »vivunt tantum per noctem, moriuntur insequente hora matutina omnes», and »habitat ad lacus» — characters, which, combined, are applicable only to the genus *Cænis*. Inconsistent with these are »supra oculos tubera duo oculis majora», »habet quasi sex oculos . . . ante tubera positos», a character which belongs only to ♂ in the family *Baëtidæ*, as well as »cauda biseta». Whether the wings are only 2, is not expressly said, but the meaning seems to be this, as he only speaks about »alis margine nigricantibus». Of the Swedish species of *Cænis* LINNÉ's words are applicable only to the common and widely spread *C. dimidiata* STEPH., which, therefore, justly, as it seems to me, should take the name of *Cænis horaria* (LIN.).

8. *Eph. diptera* (Fauna Suec. p. 377. N:o 1477. — Syst. Nat. p. 907. N:o 11) is *Cloëon dipterum* auct., ♀ imago, as is generally supposed.

9. *Eph. nigra* (Fauna Suec. p. 377. N:o 1478. — Syst. Nat. p. 907. N:o 7) is doubtful. EATON identifies it with his *Baëtis niger*, but I have not found this species in our country

<sup>1</sup> Neue Ephemeren etc. p. 112.

<sup>2</sup> These are, as regards gen. *Cænis*, characteristically small and undeveloped and escape easily one's attention.

or otherwise seen a Swedish specimen. LINNÉ's description obviously refers to subimago.

10. *Eph. mutica* (Fauna Suec. p. 377. N:o 1479). — In System. Nat. Ed. 12 LINNÉ corrected the wrong character »cauda mutica» in 10 Edit. of *System. Nat.* and in *Fauna Suec.* to »cauda biseta» and changed, in connection with this, the name of the species to *striata* (Syst. Nat. Ed. 12. p. 907. N:o 10). Imagines of ♂ and ♀ are described. EATON has, hesitatingly, interpreted the species as *Baëtis pumilus* BURM., with which already PICTET<sup>1</sup> considered it »voisine». Though nothing is mentioned in the description about the hind wings, it seems to me impossible to refer the species to any other genus than *Baëtis*. Owing to the fact that both sexes are described, the determination of the species is rather easy. It seems to me that of the characters mentioned »femina corpore opaco subrufescente» and »alæ hyalinæ . . . vasis minime reticulatis» decidedly speak in favour of the interpretation of this species as synonymous with *Baëtis pumilus* BURM., for in ♀ of this very species the nervures are characteristically colourless and, therefore, less prominent and the body, especially abdomen, above reddish brown. The words »capitis tubera oculis minora» are applicable only to ♀ and to its two large upper ocelli, not to the turbinate eyes of the male, which, as far as I know, in the family *Baëtidæ*, are always larger than the lower eyes. The species in question should consequently, no doubt, take LINNÉ's name and certainly the oldest one and be named *Baëtis muticus*, with application, also in a case like this, of the rule of priority. The species occurs in Sweden, spread from Skåne to Lappland.

## II. De Geer.

1. *Ephémère commune* (Mem. d. Ins. Tom. 2. Part 2. p. 621—646. N:o 1). — It is *Ephemera vulgata* LIN., as also the type specimens show.

<sup>1</sup> l. c. pag. 270.

2. *Ephémère noire à ailes blanches* (l. c. pag. 646—650. N:o 2). — DE GEER himself considered this species as representing the same as LINNÉ's *Ephemera vespertina* (Fauna Suec. Ed. 2. N:o 1480) and it has also been interpreted so by most of the following systematici. Just as this one it has, therefore, been a subject for very different opinions. Cf. above under LINNÉ's *Eph. vespertina*. It is particularly remarkable that PICTET<sup>1</sup> considered DE GEER's species as representing »une toute autre species» than *Eph. vespertina* LIN. and identified it with his *Potamanthus Geerii*, which, however, as both the description and the figures show, obviously is another, although proximal species, which does not occur in Sweden. Contrary to *Eph. vespertina* LIN., of which only a short description is to be found, referring to the subimago-stage, DE GEER has, for his species, given a detailed description of both the larva-, subimago- and imago-stages, by which the identification has been essentially facilitated. In my »Beiträge», above mentioned, I was able to give the description of a form, which obviously, in all its stages of development, came very close to the species described by DE GEER. A form of larva, suggestive of the larva reproduced and described by DE GEER and especially distinguished by its curious tracheal branchiæ, had not, since his time, been found again. I, therefore, referred DE GEER's species, without any hesitation, to the same genus *Euphyurus* established in this paper, but dared not identify my species with his. Continued examinations, based upon a more extensive material, have more and more strengthened my opinion, that DE GEER's species must be the same as my *Euphyurus albitarsis* and also, as DE GEER supposed, synonymous with *Ephemera vespertina* LINNÉ. Except this species, there is no one of the Swedish Ephemerida, that can be identified with it. DE GEER's description and figures contain, in reality, nothing, which is inconsistent with this interpretation, presuming that, as seems to be indisputable, DE GEER has founded his description, concerning the colour, both of larva, subimago and imago, like LINNÉ and probably most of the older authors, on conserved, dried material. The only point of difference, which, perhaps, deserves emphasizing, is that

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<sup>1</sup> l. c. pag. 211.



in the larva »les anneaux du ventre» are said to be »separés les uns des autres par des bandes transversales noirâtres, et tout le long du dos ils ont une suite de taches de la même couleur» (l. c. pag. 647), whereas I have found these markings of the larva pale yellow (both in living specimens and specimens in spirit). From the above said it also follows, that *Leptophlebia Meyeri* EAT. is synonymous with the species in question. The types of this species, which I have received for examination, have not given any guidance for the determination of the species. The fact is that all 3 specimens — all imago ♂ — proved to be spurious types, because none of the specimens agreed with DE GEER's description and figures of this species. They are obviously not the animals, on which his description is based, but belong to quite another species and to the same as DE GEER's N:o 4.

3. *Ephémère à ceinture blanche* (l. c. pag. 650—652. N:o 3). — This species was later named *Ephemerella cincta* by A. J. RETZIUS<sup>1</sup>. If it could be said about the preceding species, that it has been a subject for very different opinions, it is just the contrary with regard to the species in question. Since PICTET<sup>2</sup> interpreted it as a *Potamanthus* (*Leptophlebia* WESTW.) it reappears uncritically by all later authors under the name of *Leptophlebia cincta*. It seems curious to me that such a determination could have been accepted. The individual, on which the description is founded, has obviously been a male, as DE GEER also expressly says. The characters, which have struck DE GEER as the most »remarquables», seem in the first place to have been the eyes, which he describes and reproduces (Pl. 17. Fig. 18) as distinct, typical »yeux en turban». Concerning the hind wings he says: »les ailes inférieures sont si petites, qu'il faut les chercher pour les voir», and that also the presence of small intercalary veinlets on the fore wings have not escaped his attention, ought probably to be regarded as clear from fig. 18, which shows us such veinlets well indicated — all characters, which very definitely show, that the species cannot belong to the genus *Leptophlebia*, but must be arranged in the family *Baëtidae*. Also the genus is not doubtful, because the figures show us the

<sup>1</sup> A. J. RETZIUS, C. DE GEER's Genera et Species Insect. Lipsiæ 1783. p. 57. 182.

<sup>2</sup> l. c. pag. 219.

same small ovale—oblong hind wings, rounded in the point, which are characteristic of the genus *Baëtis* LEACH. With this agrees also the statement concerning its size »cette éphémère est des plus petites». The reason why it has been interpreted as a *Leptophlebia* has obviously been the mentioning of »les trois longs filets de la queue», which also are reproduced. The presence of these is the only one of the characters given, which does not seem to be consistent with the interpretation just mentioned. DE GEER has, however, also (p. 652) the observation »il arrive quelquefois qu'on trouve de ces Ephémères qui n'ont que deux filets au derriere», but he considers that »celles-la sont mutilées, elles ont perdu le filet du milieu par quelque accident». In this opinion he is notwithstanding mistaken, probably on account of a confusion with some other rather similar form. For an imago of Ephemerida furnished, at the same time, with 3 caudal setæ, turbinate eyes, and such small hind wings, should be a monster, which does not exist in nature or else is not known at least.

The correctness of this interpretation of mine has been fully verified through the examination of the received type, imago ♂ — the only individual that, according to DE GEER's words in the text (»cette petite Ephémère, qui étoit un mâle»), seems to have been in his hand at the description. For this individual agrees entirely with his description, with the exception of the caudal setæ, which are 2 and which apparently have never been more, and is proved to be a *Baëtis*. As far as it is possible to determine the specimen, the species seems to be *B. incurvus* BGTN<sup>1</sup>.

4. *Ephémère grise en dessous* (l. c. pag. 652—656. N:o 4). — This species is not EATON's and other modern systematici's *Heptagenia* (*Ecdyurus*) *venosa*, but *Ecdyurus volitans* EATON. DE GEER describes all the stages of development, for which reason it is much more noticeable, that EATON, who also knew the *venosus*-larva, which differs through differently formed tracheal branchiæ etc., could identify this species with DE GEER's. The larva too, as it is described and reproduced by DE GEER (l. c. Pl. 18. Fig. 1—3) agrees entirely with the larva of *Ecd. volitans*, which is the only species

<sup>1</sup> S. BENGTSSON, Neue Ephemeriden etc. p. 115.

occurring in Sweden, to which the description can be applied. The examination of the type specimen received, which consisted of imago ♂ and which agrees entirely with DE GEER's description, has further strengthened the correctness of such an interpretation. The species in question was named *Ephem. fusco-grisea* already by RETZIUS<sup>1</sup> and ought, therefore, to take the name of *Ecdyurus fusco-griseus* (RETZ.). Cf. below under FABRICIUS N:o 7, *Ephemera venosa*.

5. *Ephémère à deux ailes & à bande brune* (l. c. pag. 656—660. N:o 5) is *Cloëon dipterum* (LIN.), as it has generally been interpreted and as also the type specimens confirm.

### III. O. F. Müller.

1. *Ephemera danica* (Fauna Ins. Friedrichsd. (1764) p. 63. N:o 554. — Zool. Dan. Prodröm. p. 142. N:o 1640). — The only character in the short diagnosis, that is mentioned as distinguishing this species from the following one (*E. vulgata*), is »*alis pallide aureis*». Though this character and »*E. vulgata major*», added in *Fauna Ins. Friedr.*, does not suffice to distinguish the two species from each other, the one in question surely may be explained as *Ephemera danica* auct. — if there has been two separate species — as it is the only species of *Ephemera* and of May-flies on the whole, hitherto found in Denmark, to which the description will apply, and it therefore may retain its old-established name. PICTET's *Ephemera danica*, that this has identified with MÜLLER's species with the same name, is another species, as EATON already has shown.

2. *Eph. vulgata* (Zool. Dan. Prodröm. p. 142. N:o 1641) is *Ephemera vulgata* LIN.

3. *Eph. marginata* (l. c. pag. 142. N:o 1642) is undoubtedly *Leptophlebia marginata* (LIN.) and not *Potamanthus luteus* (LIN.), as EATON is disposed to determine it, which species has not, however, been found in Denmark.

4. *Eph. plumosa* (l. c. pag. 142. N:o 1643) is a *Cænis* STEPH., subimago, probably *Cænis horaria* (LIN.) (= *dimidiata* STEPH.).

<sup>1</sup> l. c. pag. 57. N:o 183.

5. *Eph. minima* (l. c. pag. 142. N:o 1644) is the same species as the preceding one, but imago ♂ and probably, like this, *Cænis horaria* (LIN.).

6. *Eph. sulphurea* (l. c. pag. 142. N:o 1645) is *Heptagenia sulphurea* auct., as accepted.

7. *Eph. gemmata* (l. c. pag. 143. N:o 1646) is a mysterious species, that cannot be determined with surety.

8. *Eph. diaphana* (l. c. pag. 143, n:o 1647). — Modern authors have, based on EATON'S<sup>1</sup> authority, referred this species to the genus *Baëtis* and identified it with *B. bioculatus* auct., but, as I am convinced, wrongly. MÜLLER himself gives LINNÉ'S *E. bioculata* as identical. As I have tried to show above pag. 5, this species cannot be identified with *Baëtis bioculatus* auct., but is undoubtedly the same as *Centroptilum luteolum* auct., and according to my opinion, the species in question must also be determined in that way. The words in MÜLLER'S description, which seem to me absolutely decisive, are »lepidota», »alæ posticæ nullæ; squamulæ vero duæ, subulatæ», which characters, combined with the other characters given, do not apply to any other species, found in Denmark (or Norway) than *Centroptilum luteolum* auct., imago ♂. To some extent MÜLLER'S identifying of the species with LINNÉ'S *E. bioculata* will also bear out my above given determination.

9. *Eph. culiciformis* (l. c. pag. 143. N:o 1648) is certainly a *Baëtis*. The description applies to imago ♂, both of *B. tenax* EAT. and *B. scambus* EAT. Most probably it is the former.

10. *Eph. luteola* (l. c. pag. 143. N:o 1649). — EATON and other modern systematici have referred this species to *Centroptilum luteolum* auct. To this determination apply HAGEN'S<sup>2</sup> words: »Your determination is possible, but that is all that can be said about it». That MÜLLER with this species has intended the imago ♀ of either *Baëtis fuscatus* (LIN.) or *Centroptilum luteolum* auct., I think, in correspondence with EATON<sup>3</sup>, but based upon partly other premises (cf. above under N:o 8), indisputable, and it also seems to me most

<sup>1</sup> Trans. of Entom. Soc. 1871. p. 111 and Revis. Monogr. p. 158.

<sup>2</sup> H. A. HAGEN, Notes on the Ephemeroidea; compiled (with remarks) by the Rev. A. E. EATON. Trans. Entom. Soc. London 1873. p. 400.

<sup>3</sup> l. c. pag. 401.

probable, that it is the latter species that MÜLLER has had before him at the description, and that accordingly *E. luteola* (N:o 1649) is ♀ of the same species as *E. diaphana* (N:o 1647), which represents ♂. As *E. diaphana*, as I have shown above, can not be determined as any other species than *Centroptilum luteolum* auct., but the determination of *E. luteola* as the same species is somewhat uncertain, the species accordingly should take the name of *Centroptilum diaphanum* (MÜLL.), as also the rule of priority bids.

11. *Eph. rufula* (l. c. pag. 143. N:o 1650). — This species belongs to the genus *Cloëon* LEACH, but can not be determined as the *Cl. rufulum* of EATON and other modern authors, as this species is not found in Denmark<sup>1</sup>. The diagnosis and especially the character »setis annulatis», which is evidently taken as a contrary conception to »setis albis», »setis immaculatis», can of the Danish *Cloëon*-species only be applied to *Cl. dipterum* (LIN.), imago ♂, which by MÜLLER also is directly referred to the ♀, described under the following number (1651).

12. *Eph. striata* (l. c. pag. 143. N:o 1651) is *Cloëon dipterum* (LIN.), imago ♀.

13. *Eph. annulata* (l. c. pag. 143. N:o 1652) is the same species as N:o 12.

14. *Eph. horaria* (l. c. pag. 143. N:o 1653). — This is probably *Cænix horaria* (LIN.), as regards the setæ, a mutilated specimen.

#### IV. J. C. Fabricius.

1. *Ephemerella vulgata* (Entom. System. p. 68. N:o 1) is *Ephemerella vulgata* LINNÉ.

2. *Eph. lutea* (l. c. pag. 68. N:o 2). — Like LINNÉ's species with the same name<sup>2</sup>, as identical with which FABRICIUS considers his species, it has been identified as *Potamanthus luteus* auct. by PICTET<sup>3</sup> and recent authors in general. This

<sup>1</sup> The species, described by ESB. PETERSEN in Danmarks Fauna 8: Guldsmede, Døgnfluer, Slørvinger etc. p. 97 as *Cl. rufulum* MÜLL. belongs to *Cloëon bifidum* (see Neue Ephemeriden etc. p. 109).

<sup>2</sup> LINNÉ, Syst. Nat. Ed. XII. Tom I. Pars II. p. 906. N:o 2.

<sup>3</sup> l. c. pag. 132 f. and 205.

opinion is also favoured in the diagnosis by the words »*alis hyalinis*», where no spots are mentioned. As to the spread it is only stated, as for most of the other species, »in Europæ aquis». This does not, however, exclude the occurrence of the species also in Scandinavia, and therefore the species in question also could be determined as *Ephemera glaucops* PICT. It seems to me that in support of this interpretation could also be stated the sequence, in which the species is given both by LINNÉ and by FABRICIUS, and in which the idea of the affinity of the species finds expression to a certain degree. This sequence seems, as regards the section »*cauda triseta*», have been based upon the size of the species, and the fact that *lutea* by both the mentioned authors is placed immediately after the greatest species, *E. vulgata*, should, in my opinion, suggest that *E. glaucops* PICT. and not the smaller *Potamanthus luteus* auct., which is inferior in size also to the following species, *marginata*, has been intended in the description. Add to this that the spots of the wings, at least of Swedish specimens, are, especially in comparison with *vulgata* rather slightly marked, and it seems to me, that such an opinion is not at all improbable.

3. *Eph. marginata* (l. c. pag. 69. N:o 4) is *Leptophlebia marginata* auct., as I have tried to show above (see LINNÉ's species N:o 2).

4. *Eph. vespertina* (l. c. pag. 69. N:o 5) is without doubt the same species as LINNÉ's *vespertina* (see that species).

5. *Eph. halterata* (l. c. pag. 69. N:o 6). — EATON interpreted this species at first (Monogr. on Ephem. Trans. Entom. Soc. 1871 p. 87) as identical with »*Leptophlebia cincta* RETZ.», which opinion he seems to have based upon FABRICIUS' quotation of DE GEER's species N:o 3. This determination is, however, obviously wrong, as several of the characters, mentioned by FABRICIUS, as »*alæ duæ, margine crassiore nigricante*», »*cauda setis . . . corpore quadruplo longioribus*», are decidedly at variance both with the description and with the illustrations by DE GEER. HAGEN's<sup>1</sup> identification of it with a *Cænis* STEPH. has EATON<sup>2</sup> later on accepted and determined it as *Cænis macrura* STEPH. It seems to me, that

<sup>1</sup> Notes on the Ephemeridæ. Trans. Ent. Soc. London 1873. p. 396.

<sup>2</sup> Revis. Monogr. p. 144.

even this interpretation can not be correct, because it is incompatible with »abdomine albo» and »pedes . . . albi». Everything in the description better applies to *Cænis horaria* (LIN.) (= *C. dimidiata* STEPH.), imago ♂.

6. *Eph. brevicauda* (l. c. pag. 69. N:o 7). — The description completely applies to *Cænis horaria* (LIN.), subimago, and accordingly the species is the same as N:o 6. EATON, WALLENGREN and others have interpreted it as identical with *Cænis macrura* STEPH., but this is incompatible with »abdomen pallidum, basi fuscescens» and »pedes pallidi» in the description.

7. *Eph. venosa* (l. c. pag. 70. N:o 8) is somewhat dubious. FABRICIUS says about its occurrence »habitat in Daniæ paludosis», wherefore it cannot be referred to *Heptagenia (Ecdyurus) venosa* auct., as this species has not been found in Denmark. FABRICIUS himself identifies it with DE GEER's species N:o 4. It also seems to me most probable, that it is this species, i. e. *Ecdyurus fusco-griseus* RETZ.<sup>1</sup> with which *Ecdyurus volitans* EATON is identical. It seems, however, not to be excluded, that it may have been smaller individuals of a *Siphylurus*.

8. *Eph. bioculata* (l. c. pag. 70. N:o 9). — The words »capite tuberculis duobus . . .» indicate a ♂, as also »alis albis» an imago. Both PICTET<sup>2</sup> and EATON<sup>3</sup>, as well as already FABRICIUS himself regarded it as identical with LINNÉ's species with the same name. To this the character »caudæ albæ, fusco punctatæ» is opposed, because those in the Linnéan species are one-coloured white, and therefore the species is dubious.

9. *Eph. nigra* (l. c. pag. 70. N:o 10) is possibly identical with LINNÉ's species of the same name.

10. *Eph. fuscata* (l. c. pag. 70. N:o 11) is scarcely the same species as LINNÉ's *E. fuscata*, i. e. *Baëtis bioculatus* auct., as it has commonly been regarded. It seems to me that the character »corpus medium» more likely points to a *Cloëon*. About the colour of the setæ nothing is said.

11. *Eph. horaria* (l. c. pag. 71. N:o 13). — Under his species N:o 6 *Eph. halterata* FABRICIUS says »nimis affinis videtur

<sup>1</sup> A. J. RETZIUS, l. c. pag. 57. N:o 183.

<sup>2</sup> l. c. pag. 244.

<sup>3</sup> l. c.

*E. horariæ*». With the support of this comparison and FABRICIUS' quoting of LINNÉ's species of the same name, it probably must be identified with *Cænis horaria* (LIN.) (= *dimidiata* STEPH.), though it is said to have »cauda biseta».

12. *Eph. culiciformis* (l. c. pag. 71. N:o 14). — On account of the short, rather insignificant diagnosis, impossible to determine, like LINNÉ's species of the same name.

13. *Eph. striata* (l. c. pag. 71. N:o 15). — Dubious. Possibly identical with LINNÉ's species of the same name, i. e. *Baëtis muticus* (LIN.), which is given as identical.

14. *Eph. diptera* (l. c. pag. 71. N:o 16) is *Cloëon dipterum* (LIN.), imago ♀.

## V. J. W. Zetterstedt.

1. *Ephemera vulgata* (Insecta Lappon. p. 1044. N:o 1). — This species is represented in the collection by 2 imagines ♂ and 1 subimago ♀, which all are *Ephemera vulgata* LINNÉ.

2. *Eph. marginata* (l. c. pag. 1044. N:o 2). — All the specimens, 2 imagines ♂ and 1 im. ♀, are *Leptophlebia marginata* (LIN.).

3. *Eph. hyalinata* (l. c. pag. 1044—45. N:o 3). — EATON and recent authors refer this species to »*Leptophlebia cincta* RETZ.» All the specimens of the principal form, 3 im. ♂ and 1 im. ♀, belong to *Euphyurus albitarsis* BGTN, var.<sup>1</sup>, i. e. *Euphyurus vespertinus* (LIN.), cf. above under LINNÉ N:o 3. — *Var. b.*, represented by 1 im. ♂, is *Leptophlebia Strandii* EAT.<sup>2</sup>

4. *Eph. halterata* (l. c. pag. 1045. N:o 4). — EATON has identified this species with *Ephemera halterata* FABR. and according to his later determination in Revis. Monogr. consequently referred it to the genus *Cænis*. WALLENGREN<sup>3</sup> has referred it to *Leptophlebia cincta* (RETZ.). — All the specimens in the collection are in a fragmentary condition. The specimen, signed ♂ and bearing the label »Muonioniska», is

<sup>1</sup> S. BENGTSSON, Beiträge z. Kenntn. d. paläarkt. Ephemeriden p. 5.

<sup>2</sup> A. E. EATON, Entom. Monthl. Magaz. Ser. 2. Vol. XII. London 1901. p. 253.

<sup>3</sup> H. D. J. WALLENGREN, Förteckn. etc. p. 176.



*Cloëon bifidum* BGTN<sup>1</sup>, im. ♂. Of the three specimens, marked as ♀, the individual from »Alten et Kautokeino» belongs to *Cloëon simile* EAT., im. ♂ and the two others, which are marked »Muonioniska», are *Ephemerella ignita* POD., im. ♂.

5. *Eph. vespertina* (l. c. pag. 1045. N:o 5). — ZETTERSTEDT himself and almost all of the authors, that have taken up a position to the species, have identified it with LINNÉ's species with the same name. WALLENGREN<sup>2</sup> refers it to *Habrophlebia fusca* (CURT.) (*Potamanthus brunneus* PICT.), probably supporting himself on the authority of HAGEN<sup>3</sup>, who says about this species: »I have types of ZETTERSTEDT's species. I used to think them to be identical with *Pot. brunneus* PICT., but this must be verified». *Habrophlebia fusca* (CURT.) has, however, not been found in Sweden. — The species is in the collection represented by 1 ♂ and 2 ♀, all subimagines, and 1 larva. A close examination has in an entirely decisive manner established that all the subimagines, and probably also the larva, belong to *Leptophlebia marginata* (LIN.).

6. *Eph. brevicauda* (l. c. pag. 1045. N:o 6). — EATON, WALLENGREN and other modern systematici, as, besides, already ZETTERSTEDT, have identified the species with *Ephemerella brevicauda* FABR. and accordingly determined it as *Cænis macrura* STEPH. Both the types, 1 im. ♀ and 1 subim., belong to *Cænis horaria* (LIN.) (= *dimidiata* STEPH.).

7. *Eph. venosa* (l. c. pag. 1045. N:o 7). — By EATON considered as a *Siphylurus*, it was referred by WALLENGREN<sup>4</sup> to *Ephemerella venosa* FABR. Of the three specimens (»mares») from Lycksele, two belong to *Siphylurella Thomsoni* BGTN<sup>5</sup>, im. ♂, while the third is *Heptagenia dalecarlica* BGTN<sup>6</sup>, im. ♀. The female from »Bossekop Finmarkiæ» is *Heptagenia dalecarlica* BGTN, subim. ♀. — »Var. b.», represented by 1 ♂ and 1 ♀ from »Kautokeino», is *Heptagenia dalecarlica* BGTN, im. ♂ ♀.

8. *Eph. vitreata* (l. c. pag. 1045. N:o 8) was interpreted by EATON as »*Leptophlebia cincta* RETZ.». As to this WALLEN-

<sup>1</sup> S. BENGTSSON, Neue Ephemeriden p. 109.

<sup>2</sup> H. D. J. WALLENGREN, Förteckn. etc. p. 176.

<sup>3</sup> l. c. pag. 396.

<sup>4</sup> l. c. pag. 178.

<sup>5</sup> Beiträge p. 11.

<sup>6</sup> Neue Ephemer. p. 116.

GRE<sup>1</sup> says: »EATON har sammanfört ZETTERSTEDTS art med *Leptophlebia cincta*, dit den alls icke kan höra». He considered it as a *Baëtis* LEACH. WALLENGREN probably has based his opinion upon ZETTERSTEDT's statement »cauda biseta». — Both the specimens in the collection (1 ♂ im., 1 ♀ im.) show three setæ, though in ♂ one is lost and in ♀ all three are broken, and they both belong to *Euphyurus vespertinus* (LIN). (*Euphyur. albitarsis* BGTN).

9. *Eph. bioculata* (l. c. pag. 1046. N:o 9). — Has by ZETTERSTEDT and all later authors been regarded as synonymous with LINNÉ's species with the same name. Is represented in the collection by five specimens, all collected at Stensele the 3 July. Of the three male specimens two belong to *Centroptilum diaphanum* (MÜLL.) (*luteolum* auct.), im. ♂, and the third is a *Baëtis*, probably *Baëtis Wallengreni* BGTN<sup>2</sup>. Of the two other specimens, which are marked as ♀, one, which is very defective, is probably *Centroptilum diaphanum* (MÜLL.), subim. ♂, the other is imago ♀ of the same species.

10. *Eph. culiciformis* (l. c. pag. 1046. N:o 10). — All the three specimens in the collection are subimagines ♀. Two of them, both labelled »Grönland (Westermann)», belong to *Baëtis tenax* EAT., and the third, which is defective, seems to be *Cloëon simile* EATON.

## VI. H. Ström.

1. *Ephemera leucophthalma* (Norske Insecters Beskrivelse med Anmerkninger. K. Dansk. Vid. Selskabs Skrift. Ny Samling. Anden Deel. Kjøbenhavn 1783. p. 90. N:o 131) is probably *Heptagenia sulphurea* (MÜLL.), imago ♂, as it has also been regarded by WALLENGREN<sup>3</sup> and others. He says, however, that the »Rumpehaarene» are merely »hvide».

2. *Eph. caudata* (l. c. pag. 91. N:o 132). — The character »undervingerne aflange og meget smaa» indicates the

<sup>1</sup> l. c. pag. 177.

<sup>2</sup> Neue Ephem. p. 112.

<sup>3</sup> H. D. J. WALLENGREN, Ett försök att bestämma en del af de utaf H. Ström beskrifna Norska Insekter. Forhandl. i Vidensk. Selskab i Christiania år 1880. Christiania 1881. p. 21.

genus *Centroptilum* EATON, and the dark wings, that are said to be »rödskinnende som Kaaber», an subimago. Against the last mentioned supposition, however, swears the length of the setæ, which are described as »dobbelt saa lange som Kroppen». The species may surely be referred to *Centroptilum diaphanum* (MÜLL.) (*luteolum* auct.).

3. *Eph. bioculata* (l. c. pag. 91. N:o 133). — The character »undervingerne aflag rundede og meget smaa» indicates the genus *Baëtis*, as also the long setæ, that are described as »2 Gange saa lange som Kroppen» indicate imago and the great eyes »neden til smalle» ♂. The species has commonly and already by STRÖM been identified with *Ephemerella bioculata* LIN., but »overlivet» (= thorax) is described as »oventil sort», while LINNÉ for his species, which is also an imago ♂, gives the character »totum corpus . . . pallide flavescens». It seems to me that the description applies best to *Baëtis tenax* EAT.

4. *Eph. ciliata* (l. c. pag. 91. N:o 134). — Like N:o 1 and N:o 2 this is a species, first described by STRÖM. It surely, like N:o 3, belongs to *Baëtis* LEACH and the description has evidently been based on the subimago-stage. WALLENGREN regards it as identical with *Baëtis pumilus* BURM., an opinion, with which also EATON<sup>1</sup> hesitatingly agrees. This seems rather possible, even if perhaps the character »lidet større end *Culex vulgaris*» combined with the other characters rather applies to *Baëtis Wallengreni* BGTN.

## VII. H. D. J. Wallengren.

1. *Ephemerella vulgata* L. (Förteckning på de Ephemerider, som hittills blifvit funna på Skandin. halfön. Entom. Tidskr. Årg. 3. 1882. p. 175). — Many specimens in the collection, all belonging to this Linnéan species.

2. *Eph. lineata* EATON (l. c. pag. 175). — In the collection are three somewhat defective specimens, all labelled in WALLENGREN'S hand »*Ephemerella lineata* EAT. subimago» and the locality »Ifösjön 7—81». All the three specimens belong to *Ephemerella vulgata* LIN.

<sup>1</sup> Revis. Monogr. p. 167.

3. *Eph. danica* MÜLL. (l. c. pag. 175). — Of this species WALLENGREN says »från Skandinavien ej sedd af förf.». In the collection it is, however, represented under this name by two specimens, bearing the label »Fht <sup>10</sup>/<sub>6</sub>», which belong to this species.

4. *Eph. glaucops* PICT. (l. c. pag. 175) is represented in the collection by 2 specimens collected at »Fht <sup>10</sup>/<sub>6</sub>», which both are *Ephemera vulgata* LIN., subimago ♀. Of its occurrence is said in »Förteckningen»: »under Juli månad vid Ringsjön i Skåne».

5. *Leptophlebia marginata* L. (l. c. pag. 176). — Is not found in the collection.

6. *Leptophlebia cincta* RETZ. (l. c. pag. 176). — Of the two specimens in the collection, one, bearing a label with the name »*Potamanthus cinctus*» and an other with the locality »Fht» belongs to *Euphyurus vespertinus* (LIN.) (*albitarsis* BGTN), im. ♂, and the other, which has the labels »Jerkin, Norige (Schøyen)» and »*Leptophlebia cincta* RETZ.» and which is very defective, is *Chitonophora Aurivillii* BGTN, imag.

7. *Leptophl. fusca* CURT. (l. c. pag. 176) is not found in the collection.

8. *Cænis brevicauda* FABR. (l. c. pag. 176). — The two specimens in the collection are labelled, the one »*Cænis macrura* STEPH., *C. grisea* PICT. ♀» and »Ifösjön 7—81», the other, which is defective, »*Cænis macrura* STEPH.», all in WALLENGREN's hand. Both belong to *Centroptilum diaphanum* (MÜLL.) (*luteolum* auct.), subim. ♀.

9. *Cænis horaria* L. (l. c. pag. 176). — Is not found in the collection.

10. *Cloëon dipterum* LIN. (l. c. pag. 176). — Several specimens in the collection. It is this species.

11. *Cloëon russulum* MÜLL. (l. c. pag. 176). — Is represented in the collection by about twenty specimens, the most part of which, labelled »*Cloëon russulum* MÜLL. ♀. Ifösjön 7—81» in WALLENGREN's hand, belong to *Centroptilum diaphanum* (MÜLL.) (*luteolum* auct.), the others are *Cloëon dipterum* (L.), im. ♂ and (1 specimen) *Baëtis* sp.

12. *Centroptilum luteolum* MÜLL. (l. c. pag. 176) is not found in the collection.

13. *Baëtis broculatus* LIN. (l. c. pag. 177) is represented in the collection by 1 very defective and indefinable subimago.

14. *Baëtis muticus* LIN.,

15. *Baëtis niger* LIN. and

16. *Baëtis vitreatus* ZETT. (l. c. pag. 177) are not found in the collection.

17. *Heptagenia semicolorata* CURT. (l. c. pag. 177) is not found in the collection.

18. *Heptagenia sulphurea* MÜLL. (l. c. pag. 177). — Both the specimens in the collection, 1 ♂, 1 ♀ imag., labelled »Ifösjön 7. 81» belong to this species.

19. *Heptagenia fluminum* PICT. (l. c. pag. 178) is not found in the collection.

20. *Heptagenia venosa* FABR. (l. c. pag. 178). — Three specimens are found in the collection, of which one, from »Aaset i Norge» is *Heptagenia dalecarlica* BGTN<sup>1</sup>, one, labelled »*Baëtis venosa*», is *Euphyurus vespertinus* (LIN.) (*albitarsis* BGTN). The third specimen is defective and undefinable.

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<sup>1</sup> Neue Ephemer. p. 116.

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Tryckt den 22 oktober 1912.