

Mayfly types and additional material (Insecta: Ephemeroptera) examined by F.-J. Pictet and A.-E. Pictet, housed in the Museums of Natural History of Geneva and Vienna

Authors: Sartori, Michel, and Bauernfeind, Ernst

Source: Revue suisse de Zoologie, 127(2) : 315-339

Published By: Muséum d'histoire naturelle, Genève

URL: <https://doi.org/10.35929/RSZ.0022>

BioOne Complete (complete.BioOne.org) is a full-text database of 200 subscribed and open-access titles in the biological, ecological, and environmental sciences published by nonprofit societies, associations, museums, institutions, and presses.

Your use of this PDF, the BioOne Complete website, and all posted and associated content indicates your acceptance of BioOne's Terms of Use, available at www.bioone.org/terms-of-use.

Usage of BioOne Complete content is strictly limited to personal, educational, and non-commercial use. Commercial inquiries or rights and permissions requests should be directed to the individual publisher as copyright holder.

BioOne sees sustainable scholarly publishing as an inherently collaborative enterprise connecting authors, nonprofit publishers, academic institutions, research libraries, and research funders in the common goal of maximizing access to critical research.

Mayfly types and additional material (Insecta: Ephemeroptera) examined by F.-J. Pictet and A.-E. Pictet, housed in the Museums of Natural History of Geneva and Vienna

Michel Sartori^{1,2,*} & Ernst Bauernfeind³

¹ Musée cantonal de zoologie, Palais de Rumine, Place Riponne 6, CH-1005 Lausanne, Suisse.

² Département d'Ecologie et d'Evolution, Biophore, Université de Lausanne, CH-1015 Lausanne, Suisse.

³ Naturhistorisches Museum Wien, Burgring 7, A-1010 Wien, Österreich. E-mail: ernst.bauernfeind@nhm-wien.ac.at

* Corresponding author: michel.sartori@vd.ch

Abstract: Here we revise the entire Ephemeroptera collection of F.-J. Pictet deposited in the Natural History Museum of Geneva (MHNG) and voucher specimens housed in the Natural History Museum of Vienna (NMW). Due to several unforeseen turns of events, the MHNG collection housed was already in bad condition at the end of the 19th century. However, the specimens sent by V. Kollar to F.-J. Pictet, and used by the latter for his monograph (1843-1845), have been well curated after their return to the NMW and allow an important nomenclatural change. The species *Baetis forcipula* F.-J. Pictet, 1843 is now considered a junior subjective synonym of *Ephemerella venosa* Fabricius, 1775, currently *Ecdyonurus* (*Ecdyonurus*) *venosus* (Fabricius, 1775). The specimens described by Thomas in 1968b from southwestern France under the name *Ecdyonurus forcipula* (F.-J. Pictet, 1843) belong to a new species, *Ecdyonurus alaini* Bauernfeind sp. nov., which is described herein. Mayfly specimens described by F.-J. Pictet's son, A.-E. Pictet, are also reviewed. Furthermore, information is provided on some other valuable specimens housed in the MHNG and NMW, such as *Ametropus fragilis* Albarda, 1878 which was already collected in Italy in the 19th century, or *Rhithrogena cincta* Navás, 1921 from the Spanish Pyrenees, which is the second specimen currently known of this species.

Keywords: Ephemeroptera - taxonomy - type material - new species - new combination.

INTRODUCTION

The book “Histoire naturelle générale et particulière des Insectes Névroptères. Famille des Ephémérines” written by F.-J. Pictet (text volume published in 1843, plates volume in 1845) is considered the first modern synthesis of this insect order (Peters *et al.*, 1980). It followed two other monographs published by the same author in 1834 on Trichoptera and in 1841-1842 on Plecoptera. In his work on Ephemeroptera, F.-J. Pictet gives an account of the morphology of these insects, the characters to be used for their identification and mentions all species known at that time. His monograph encompasses the detailed descriptions of 54 species placed in seven genera only: *Ephemerella* Linnaeus, 1758, *Palingenia* Burmeister, 1839, *Baetis* Leach, 1815, *Potamanthus* F.-J. Pictet, 1843, *Cloë* Burmeister, 1839, *Caenis* Stephens, 1836 and *Oligoneuria* F.-J. Pictet, 1843. Eaton published the framework for the modern systematics of supraspecific taxa later in his numerous contributions to Ephemeroptera and in his monograph (Eaton, 1883-1888).

Among the 54 species mentioned in F.-J. Pictet's work, 33 were described as new for science. The material used for these descriptions had two origins: First, the specimens he had collected himself or those he had found in the collection of the Natural History Museum of Geneva (MHNG); these he described in his monograph and the species name is followed by the Latin word “Mihi”, i.e. “mine”. The second source were the specimens and a “manuscript” (presumably rather a list of names proposed by Kollar) sent by Vincenz Kollar from the Natural History Museum of Vienna. F.-J. Pictet acknowledged Kollar's contribution by giving these new species the names Kollar had proposed. These names are followed in the monograph by the letters “Kollar. Mss.” or “Koll. Mss.”, but the author, according to article 50.1 of the code of zoological nomenclature (International Commission on Zoological Nomenclature, 1999), is F.-J. Pictet. Part of the Kollar bequest is still housed at the Natural History Museum of Vienna (Dept. Archives of NMW). In a letter to Kollar, dated 7.6.1844, F.-J. Pictet confirmed the receipt of “un petit ballot intéressant des

insectes... de mes Perlides et Ephemérines". The material was sent back to Vienna after he had finished his study. F.-J. Pictet's own collection was kept at that time in the family mansion at Genthod, near Geneva.

Although less important, the contribution by his son, Albert-Edouard Pictet, is worth being mentioned. He published a monograph (A.-E. Pictet, 1865) in which he described, among other neuropteroid insects, two species of Ephemeroptera.

The Pictet Collection in the Natural History Museum of Geneva

The collection of the Pictets arrived at the Natural History Museum of Geneva in 1887. It presumably contained the original material used by the father and the son in their research. The collection was catalogued in 1892 and bears the number 620/48. Most of the pinned specimens possess a label with this code.

Currently the collection is in five insect boxes and contains 353 specimens. The first two boxes contain most of the material and most species. Two other boxes are smaller and contain a subset of one or two specimens of each species present in the first two boxes. The fifth box has labels of a different handwriting and is also a subset of selected species. As most of the specimens are labelled "coll. Pictet", they are considered in this catalogue although it is doubtful whether this is all part of the material seen either by F.-J. or A.-E. Pictet.

This collection has lost its originality to such an extent that it is difficult to recognise it as the one built up by F.-J. Pictet. The same had also been pointed out by Aubert (1947) and Zwick (1971) about the Plecoptera collection, as well as by Botosaneanu & Schmid (1973) about the Trichoptera collection of the MHNG. More dramatic is that most of the specimens studied by F.-J. Pictet are evidently lacking. Less than 10% of the specimens bear a label with a locality mentioned in his monograph, such as "Genthod" or "Genève", and only 7 specimens bear a label with the original handwriting of F.-J. Pictet. Most specimens have labels indicating that they originate from Burgdorf near Bern (often abbreviated "BgdF") and were formerly part of Meyer-Dür's collection. Other specimens simply bear a label with "coll. Pictet" but without any locality written on them, and others just indicate "Europe" or "Europe centr[ale]".

There are other indications that this collection has been supplemented, possibly several times, after it arrived in the MHNG. Several specimens originate from places never mentioned by F.-J. Pictet, such as the Balkans, Turkey, England, and Swiss localities outside the Lake Geneva area (e.g. Burgdorf, Aarau, Bernina). Secondly, the person (or persons) who "rearranged" the collection was not a specialist on Ephemeroptera. There are several examples of incredible mixing of species. Among the 10 specimens labelled as "*Leptophlebia*

submarginata Steph." one can find 7 *Paraleptophlebia submarginata*, 1 *Baetis rhodani*, 1 *Ecdyonurus venosus* and 1 *Ephemera glaucops*! There also are some *Baetis alpinus* among *Electrogena lateralis*, *Ephemera danica* among *Ecdyonurus venosus*, *Serratella ignita* among *Habrophlebia fusca* and so on. What happened to this collection? We have no solid information, but we can try to reconstruct its history.

François-Jules Pictet (1809-1872) (Fig. 1) married Eleonore de la Rive (1812-1887) in 1834 and had five children with her. The elder was Albert-Edouard Pictet (1835-1879) who was also an entomologist and who published a synopsis of Spanish Neuroptera (A.-E. Pictet, 1865). This work is based on a 4-months trip he made together with the Swiss entomologist Rudolf Meyer-Dür (1812-1885) in 1859. François-Jules' second son, Alphonse Pictet (1838-1903) is less known but was also an entomologist. Albert-Edouard Pictet married Emilie Mallet (1844-1897) in 1863, and together they had several children, the elder being Camille Pictet (1864-1893), a naturalist, who donated the collection to the MHNG in 1887.

Another important event in the history of this collection concerns F.-J. Pictet himself. His monograph on Ephemeroptera was in fact his last contribution to the extant neuropteroid insects on which he had been working since 1830. In 1844 he turned to palaeontology and published a number of important papers and treatises



Fig. 1. François-Jules Pictet de la Rive (1809-1872) in his library. Oil painting, without date or signature; attributed to a Mr Kaiser (according to an inscription on the back of the painting). Courtesy of the Fondation des Archives de la Famille Pictet, Geneva.

on that topic, including some fossil Ephemeroptera (F.-J. Pictet, 1846; F.-J. Pictet & Hagen, 1856). Supposedly his collection was subsequently left unused, his son Albert-Edouard being 10 years old at that time. According to information provided by Hagen (1859, cited by Meyer-Dür, 1874) “[F.-J.] Pictet’s eigene Sammlung war zur jener Zeit schon längstens zerstört“. Knowing the good relationships between Meyer-Dür and Albert-Edouard Pictet, one can suppose that it was at that time that F.-J. Pictet’s collection was supplemented and rearranged with material given or sold by Meyer-Dür. In his obituary of Albert-Edouard Pictet, Saussure (1879) wrote: “Malheureusement Edouard Pictet n’a jamais terminé les autres travaux d’Entomologie qu’il avait entrepris. Il avait en lui l’étoffe d’un homme d’action, plutôt que celle d’un homme de cabinet” (Unfortunately, Edouard Pictet never finished the other entomological works [besides a monograph in 1865] he has undertaken. He was more a man of action than a scholar). This may explain, in part, the neglect of the collection.

Alfred Edwin Eaton (1844-1929) did see this collection at least two times. In his 1871 paper (Eaton, 1871: 2) he wrote “At Geneva, M. A.E. Pictet very kindly submitted to me *the remains* [our italics] of Professor J.F. [sic] Pictet’s collection...”. In the same text (Eaton, 1871: 11) he also stated more precisely: “As the authentic and spurious specimens are not distinguished in M. Pictet’s collection, an accurate enumeration of them could not be made “. He is more precise when dealing with the species *Potamanthus ferreri* F.-J. Pictet, 1843 (see Eaton, 1883-1888: 80): “The unique specimen formerly in the Geneva Museum, was not there in 1867”. He saw the collection a second time, probably in 1879. He wrote about *Leptophlebia cincta* (Retzius, 1783) (see Eaton, 1883-1888: 96): “Pictet probably confused this species with *Habrophlebia lauta* [...] because it was mingled with a *Habrophlebia* in his collection, and is found in the neighbourhood of Geneva. In September 1879 I found both of these species beside a stream at Troinex, near Mt. Salève”. When describing *Ephemerella hispanica* Eaton, 1888 in the same publication (Eaton, 1883-1888: 306), he noted that “[the specimens were] captured by Messrs Ed. Pictet and Meyer-Dür in the year 1859. [...] I have lately examined all that remains of the Spanish Ephemeridae collected by the deceased Swiss entomologists above mentioned. [...] part of a male imago in Ed. Pictet’s Mus. but the ravages of *Anthrenus* preclude full description of the insect from these materials”. The Pictet collection arrived at the Natural History Museum of Geneva in 1887 but was not catalogued until 1892. What happened in the meantime?

During the 20th century the remains of the collection were partially studied by several mayfly specialists. The first one was probably Kimmins (1936) when dealing with the problematic species *Rhithrogena semicolorata* (Curtis, 1834) and *R. semitincta* (F.-J. Pictet, 1843). Thomas (1968b) later solved the problem of *Ecdyonurus*

fluminum (F.-J. Pictet, 1843), then Sowa (1971) cleared up the status of *Rhithrogena semitincta*. In three publications Puthz also revised part of the collection, i.e. *Epeorus sylvicola* (A.-E. Pictet, 1865) (see Puthz, 1973c), *Rhithrogena picteti* Sowa, 1971 (see Puthz, 1975) and *Siphonurus flavidus* (A.-E. Pictet, 1865) (see Puthz, 1977). Later, Sartori and co-workers cited some material from this collection (Sartori *et al.*, 1989, 1996).

A short history of the entomological collection at the Natural History Museum of Vienna

The Vienna Entomological Collection dates back to 1793, when the German Emperor Franz II. (Franz I. of Austria after 1806) acquired a collection of insects and birds from Josef Natterer sen. A separate department of insects (within the so called “Vereinigtes Naturalien-Cabinet”) was first established officially on May 2nd, 1802, when Johann Georg Megerle was appointed amanuensis for this collection. When Vincenz Kollar (1797-1860) systematically re-arranged the entomological collection between 1817 and 1820, its holdings included, among others, the following important collections: Johann Christian Gerning (1745-1802) Coll., acquired in 1796 (European Lepidoptera); Ludwig Heinrich v. Block (1764-? 1818) Coll., acquired in 1797 (insects and Arachnida); Leopold v. Fichtel (1770-1810) Coll., acquired in 1804, 1807 (East India, mainly Lepidoptera); Nepomuk C. M. Denis (1729-1800) & Ignaz Schiffermüller (1727-1806) Coll., acquired in 1806 (Austrian Lepidoptera, destroyed by fire in 1848); Johann Carl Megerle v. Mühlfeld (1765-1832) Coll., acquired in 1808 (all insect orders); Johann Natterer (1787-1843) Coll., acquired 1818-1838 (Brazil, all insect orders). Between 1836 and 1839 the collection was again revised by Kollar, adopting Latreille’s system, and (most probably) in this time fell his main contact with François-Jules Pictet.

Only few collectors, most prominent among them Josef Johann Mann (1804-1889), V. Kollar, J. Natterer, Emerich Frivaldszky (1799-1870) and Johann Lhotsky (1795-1866), had contributed Ephemeroptera specimens, and acquisitions remained rather casual in later decades too. Friedrich Moritz Brauer (1832-1904), curator since 1876, collected some specimens during the Novara-Expedition (1857-1859) and also on several excursions in Austria. Other collectors contributing Ephemeroptera from Austria include Ludwig Redtenbacher (1814-1876), Alois Rogenhofer (1831-1897), Hans Rebel (1861-1940), Anton Handlirsch (1865-1935), Peter Kempny (1862-1906), Hans Fruhstorfer (1866-1922), Franz Werner (1867-1939) and Egon Galvagni (1874-1955). Hans Zerny (1887-1945) collected many interesting specimens mainly in Austria, Spain and in the Balkans, material from Poland (Friedrich Kolenati, 1812-1894) and Greece (Theobald Krüper, 1829-1921) was purchased in 1847 and 1869, respectively.

Since F.-J. Pictet, only few scientists used the collection for new descriptions or revisions: Brauer (in Brauer & Löw, 1857) described *Ephemerella mesoleuca* and later published several faunistic records for Ephemeroptera (Brauer, 1876, 1878, 1885). Georg Ulmer revised the collection before 1919, describing *Paraleptophlebia werneri* (Ulmer, 1920a) and later redescribed several taxa from type material housed at that time in the NMW and elsewhere (Ulmer, 1921). Parts of the collection (western Palaearctic taxa) have been studied by Volker Puthz in 1971 and 1973. For his revision of European taxa of the family Caenidae (Malzacher, 1984, 1986), Peter Malzacher checked the respective material in 1983. Between 1985 and 1990 Ernst Bauernfeind catalogued the collection (in manuscript), established an annotated Austrian check-list (Bauernfeind, 1990) based in part on NMW material, and described *Rhithrogena zernyi* Bauernfeind, 1991 from material collected by H. Zerny in Bosnia-Herzegovina in 1929.

Presently the Ephemeroptera collection at the Natural History Museum of Vienna consists of pinned specimens, a small collection of material preserved in alcohol (in part derived from originally pinned specimens) and a small collection of microscopic slides. Associated with the historic collection is the second author's collection (alcohol material and slides). For the pinned specimens, originally no identifications had been given on individual labels, the scientific name was provided separately at the head of each column of specimens within each entomological drawer. Only in a few cases the first specimen of a series carried a collector's label, and specimens originating from the same date and locality could only be distinguished by their grouping. However, subsequent changes in the arrangement (due to nomenclatural changes or prior misidentifications) did not always respect this principle and consequently assignment of original identification and label data to specimens has sometimes been rendered rather difficult. Fortunately no problems of that kind were observed concerning the specimens examined by F.-J. Pictet, which have all been carefully marked with the handwritten label: Pictet vidit (Kollar's handwriting).

Ephemeroptera form a rather insignificant part of the very large entomological collections and have been incorporated into the so called appended collections within the "insecta varia". Data concerning collections and their date of acquisition have mostly been compiled from Fitzinger (1868a, b, 1880a, b) and from the card files of collectors in the bird department of the NMW. Helpful information on biographies has also been derived from the collector's data bases at the German Entomological Institute (available at sdei.senckenberg.de/biographies/) and at the Oberösterreichisches Landesmuseum (www.zobodat.at/personen.php).

MAYFLY TAXA DESCRIBED BY FRANÇOIS-JULES PICTET

In the following list – if available – the status, sex, literally transcription of label data and condition are provided for all specimens. Different labels are indicated by strokes, additional remarks are between square brackets. The order of presentation follows the one adopted by F.-J. Pictet in his monograph (F.-J. Pictet, 1843) and using the original names as title. The currently accepted name is given separately.

Ephemerella glaucops F.-J. Pictet, 1843

Fig. 2

Ephemerella glaucops F.-J. Pictet, 1843-1845: 132-134, pl. 8, figs 1-3.

Accepted name: *Ephemerella glaucops* F.-J. Pictet, 1843.

Locus typicus: "... Genève au bord du lac...".

Type material: MHNG; syntype, ♂ imago; 620 Genthod 48 Genève, coll. Pictet / Gthod, 27.7 [written by F.-J. Pictet, probably giving the place (Genthod) and the date (July 27) of collecting]. – MHNG; syntype, ♂ imago bearing 4 labels (Fig. 2): 620 Genthod 48 Genève, coll. Pictet / *Eph[emera] glaucops* ♂ imago [F.-J. Pictet's handwriting] / Gthd 21.7 [Pictet's handwriting] / *Ephemerella glaucops* Pictet 1843 M. Sartori det. 1996. – MHNG; syntype, ♀ imago; 620 Genthod

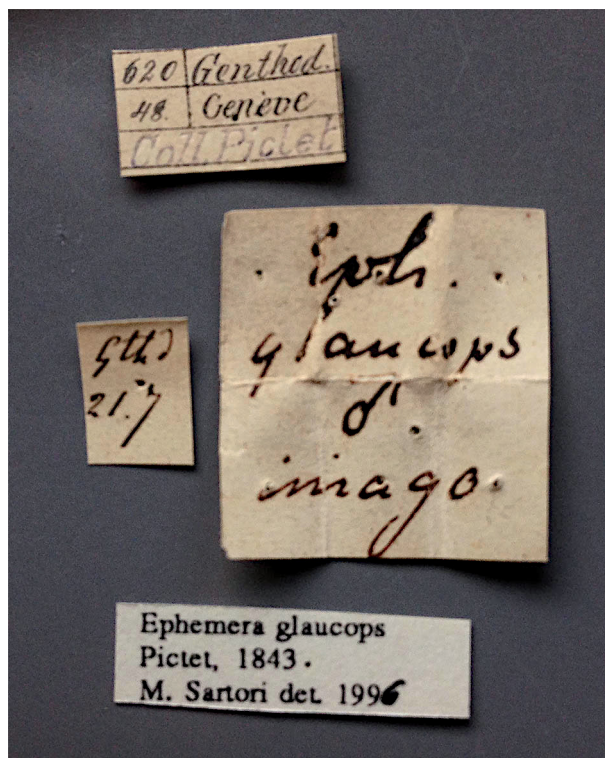


Fig. 2. *Ephemerella glaucops* F.-J. Pictet, 1843, labels of one male imago syntype.

48 Genève, coll. Pictet / G[en]thod, 27.7 [F.-J. Pictet's handwriting]. – MHNG; syntype, ♀ imago; 620 Genthod 48 Genève, coll. Pictet / G[en]thod, 21.7 [F.-J. Pictet's handwriting].

Remarks: This is the best series at the MHNG. Besides numerous subsequent misidentifications, there are 4 specimens that still bear a label handwritten by F.-J. Pictet and that were collected at Genthod, near Geneva. Only these 4 specimens can be considered syntypes of *E. glaucops*.

Ephemera guttulata F.-J. Pictet, 1843

Ephemera guttulata F.-J. Pictet, 1843-1845: 135, pl. 8, fig. 4.

Accepted name: *Ephemera guttulata* F.-J. Pictet, 1843.

Locus typicus: Not mentioned [North America].

Type material: Holotype [by monotypy], presumably a male imago (Eaton, 1871: 70). Not in MHNG, not traced.

Remarks: F.-J. Pictet mentioned that the single specimen he saw came from the collection of the Museum of Natural History in Neuchâtel and had been made accessible by M. Coulon. According to Dr Jean-Paul Haenni (in litt.), former curator at the Museum in Neuchâtel, the specimen is not in their collections. The specimen was already in a bad state when F.-J. Pictet described it. It is now presumably lost.

Palingenia puella F.-J. Pictet, 1843

Palingenia puella F.-J. Pictet, 1843-1845: 145, pl. 11, fig. 4.

Campsurus puella. – Eaton, 1871: 58 (transfer).

Polymitarcys albus Say, 1824. – Eaton, 1883: 47 (erroneous synonymization).

Tortopus puella. – McCafferty, 1996: 3 (transfer).

Tortopsis puella. – Molineri, 2010: 27 (transfer).

Accepted name: *Tortopsis puella* (F.-J. Pictet, 1843).

Locus typicus: “Cette espèce provient de la Nouvelle Orléans...” [Louisiana, USA].

Type material: Holotype [by monotypy], female imago. Not in MHNG, not traced.

Remarks: F.-J. Pictet mentioned that he had seen an incomplete female coming from the National Museum of Natural History (MNHN) in Paris. Attempts made by Jean Legrand, former curator of small insect orders at the MNHN, and by the first author to locate the specimen failed. It is presumably lost.

Palingenia indica F.-J. Pictet, 1843

Palingenia indica F.-J. Pictet, 1843-1845: 151-152, pl. 13, fig. 4.

Polymitarcys indicus. – Eaton, 1871: 61 (transfer).

Polymitarcys australis Hagen, 1888. – Ulmer, 1924b: 32 (tentative synonymization).

Ephoron indicus. – Spieth, 1940: 110 (transfer).

Accepted name: *Ephoron indicus* (F.-J. Pictet, 1843).

Locus typicus: “... qui provenait des Indes Orientales”.

Type material: NMW; holotype [by monotypy], ♀ imago; Pictet vidit / *Polymitarcys indicus* Pict. Type [Ulmer's handwriting].

Remarks: The specimen, sent by Kollar, is slightly damaged (distal half of right fore wing, right middle leg, left hind leg and right cercus missing). Most probably it was collected by Carl August v. Hügel (1759-1870), who travelled in southern India and Punjab in 1831-1836. His material was acquired in 1839.

The most complete description of this species was provided by Chopra (1928) based on new material from India. Moreover, he had the opportunity to examine the holotype deposited in Vienna. His material has in common with the type: (i) the costal field of the forewing tinted with violet, (ii) a longitudinal violet band dorsally on the abdomen, (iii) the coloration of the fore legs of the female. It differs, however, by the number of intercalaries in the cubital field (4-5 on the type specimen but 6 in the Indian material) and by the length of the terminal filament, equal in length to the cerci according to F.-J. Pictet's description and drawing. In the type specimen the right cercus is broken near the base (remainder missing), the left cercus and the terminal filament are apparently of equal length, but in fact the tip of the left cercus is missing and the correct measurements presumably correspond with Chopra's material. The paracercus is obviously shorter in the Indian material (“in the female the lateral ones are 11-13, while the median seta is 7-8 mm long”; Chopra, 1928: 128). According to Lestage (1921) the single female from Tonkin (Vietnam) and referred to *E. indicus* possessed a terminal filament as long as its cerci.

Ulmer (1913) reported several females of *E. indicus* from Java. According to his short description, the terminal filament is shorter and the cubital field of the fore wing is slightly different to what Lestage observed in his Vietnamese specimens.

Palingenia savignyi F.-J. Pictet, 1843

Fig. 3

Ephemera sp. – Savigny, 1817: 194, pl. 2, fig. 5.

Palingenia Savignyi F.-J. Pictet, 1843-1845: 157.

Polymitarcys Savignii [sic]. – Eaton, 1871: 61 (transfer).

Polymitarcys Savignyi. – Eaton, 1883: 46.

Ephoron savigni [sic]. – Oliff, 1960: 339 (transfer).

Accepted name: *Ephoron savignyi* (F.-J. Pictet, 1843).

Locus typicus: “Haute Egypte”.



Fig. 3. *Ephoron savignyi* (F.-J. Pictet, 1843), male imago and labels. Scale bar: 2 mm.

Type material: Holotype [by monotypy] female subimago, not traced.

Remarks: F.-J. Pictet briefly mentioned this species in the addenda of the genus *Palingenia*, saying he had not seen any specimens and based his diagnosis on the drawing provided by Savigny (of a female subimago), in accordance with article 12.2.7 of the International Code on Zoological Nomenclature (International Commission of Zoological Nomenclature, 1999). However, Eaton (1871) mentioned that several specimens were kept in F.-J. Pictet's collection, and that later F.-J. Pictet gave him a specimen (Eaton, 1883). In the MHNG two specimens are still present: a male imago (Fig. 3), 620 48 Egypte coll. Pictet / Savignyi Pict. [purple label broken in four pieces], and a male imago, 620 48 Egypte coll. Pictet / M. De Selys Longchamp. None of them can be considered as type material. The type material should be in Savigny's collection in the National Museum of Natural History in Paris, but a recent visit by the first author failed to find it. However, this is of no consequence for the validity of the species name (see International Commission on Zoological Nomenclature, 1999: article 73.1.4).

Baetis fluminum F.-J. Pictet, 1843

Baetis fluminum F.-J. Pictet, 1843-1845: 164-166, pl. 16-19.
Heptagenia fluminum. – Eaton, 1871: 146 (transfer).
Ecdyurus fluminum. – Eaton, 1888: 289 (transfer).
Ecdyonurus fluminum. – Ulmer, 1920b: 136 (transfer).
Ecdyonurus dispar (Curtis, 1834). – Thomas, 1968b: 52 (synonymization).

Accepted name: *Ecdyonurus* (*Ecdyonurus*) *dispar* (Curtis, 1834).

Locus typicus: "... le Rhône, tant dans les environs de Genève qu'à l'autre extrémité du lac".

Type material: Syntypes (male and female imagines and subimagines), not traced. No original material of *B. fluminum* remains in the MHNG.

Remarks: Eaton (1871) already mentioned that only subimagines were present in the collection, but none could be found during our study. The status of this species was enigmatic for a long time until Thomas (1968b) clarified it and suggested that the concept of *E. fluminum* had been applied differently among the mayfly taxonomists of the first half of the 20th century. Thomas (1968b) convincingly demonstrated that F.-J. Pictet's concept of *E. fluminum* corresponds to that of *E. dispar* Curtis, 1834.

Baetis forcipula F.-J. Pictet, 1843

Baetis forcipula F.-J. Pictet, 1843-1845: 170.
Heptagenia forcipula. – Eaton, 1871: 152 (transfer).
Ecdyurus forcipula. – Eaton, 1888: 286 (transfer).
Ecdyonurus forcipula. – Ulmer, 1920b: 136 (transfer).
Ecdyonurus (*Ecdyonurus*) *venosus* (Fabricius, 1775: 304). **new synonym**

Accepted name: *Ecdyonurus* (*Ecdyonurus*) *venosus* (Fabricius, 1775).

Locus typicus: "... la plus grande partie de l'Allemagne, ... Autriche, Bohême et de Bavière... Piémont".

Type material: NMW; syntype, ♂ imago; Reichenau, Koll[ar] / *Ecdyonurus forcipula* Pict. [Ulmer's handwriting] / Genitalia in glycerin in microvial. – NMW; syntype, ♂ imago; Reichenau, Koll[ar.] / Genitalia in glycerin in microvial, right fore leg missing. – NMW; syntype, ♂ imago; Aust[ria], Kollr. [= Kollar].

Remarks: F.-J. Pictet proposed the new taxon with reservations in a note (F.-J. Pictet, 1843: 169): "Il y a probablement une nouvelle espèce... Si c'est bien une espèce distincte, elle devra porter le nom de *B. forcipula*, nom sous lequel elle m'a été communiquée par M. Kollar". As the description of F.-J. Pictet was expressly based on material (and/or manuscript notes) provided by Kollar from Austria, those specimens are syntypes (International Commission on Zoological Nomenclature, 1999: article 73.2.1). While proposed

only conditionally by F.-J. Pictet, the name is clearly available under article 11.5.1. Although Ulmer (1921: 241) stated “Typen dieser Art finde ich nicht” [I cannot find types of this species], he nevertheless mentioned two of the above listed syntype specimens, which he (correctly) identified as *Ecdyonurus venosus*. Among the specimens present in the NMW collection and placed under the species name *E. forcipula*, three pinned specimens were without doubt collected by Kollar and bear his handwritten label. Considering all the circumstantial evidence, these specimens must be considered as part of the type series (syntypes) although they bear no direct reference to F.-J. Pictet.

The concept of *E. forcipula* has been interpreted differently among taxonomists in the past (e.g., Meyer-Dür, 1874: 314; Eaton, 1887: 286; Rostock, 1888: 154; Ulmer, 1929: 32; Schönemund, 1930: 23; Kimmins, 1942a: 123; Kimmins, 1942b: 504) and redescriptions have almost certainly been based on material that belongs to several taxa. Bauernfeind (1990: 76) stated that Kollar’s specimens belong to *Ecdyonurus venosus* but did not propose a formal synonym. In the meantime a neotype for *Ecdyonurus venosus* was proposed (Bauernfeind & Haybach, 2012) and subsequently fixed (International Commission on Zoological Nomenclature, 2015) which enables us to formally place *Baetis forcipula* F.-J. Pictet, 1843 (currently in *Ecdyonurus*) in the synonymy of *Ephemerella venosa* Fabricius, 1775 (currently in *Ecdyonurus*). The thorough description of *Ecdyonurus forcipula* by Thomas (1968b: 61) denotes a taxon new to science, for which the name *Ecdyonurus (Ecdyonurus) alaini* sp. nov. is proposed in honour of our friend Alain Thomas and his outstanding work on Ephemeroptera.

***Ecdyonurus (Ecdyonurus) alaini* Bauernfeind,**

sp. nov.

Fig. 4

Ecdyonurus forcipula. – Thomas, 1968b: 61. [misidentification, nec *Ecdyonurus forcipula* (F.-J. Pictet, 1843)]

Type material: NMW; holotype, ♂ imago [reared], with legs, wings and genitalia on microscope slide and accompanied by its nymphal skin (in parts on slide); Neste d’Aure, app. 42°48’N 0°6’E, Massif de Néouvielle, 1600 m a.s.l., Hautes-Pyrénées, France; 10.7.1965; leg. A. Thomas. – NMW; paratype, 1 ♂ imago [reared], accompanied by its nymphal skin; same data as for holotype. – NMW; paratype, 1 ♂ imago [reared], accompanied by its nymphal skin; Aure Valley, 1200 m a.s.l., Hautes-Pyrénées, France; 30.7.1965; leg. A. Thomas.

Diagnosis: The new taxon is characterized by the following combination of characters: Imagines usually slightly smaller than those of *E. venosus* (fore

wing length of holotype 14.0 mm), overall abdominal colouration more sombre, dull yellowish brown (in *E. venosus* more reddish), laterally a rather indistinct triangular brownish blotch in posterior half of abdominal segments 2-8 (frequently missing; a distinct triangular dark red to violet-black blotch in posterior half of abdominal segments in *E. venosus*), posterior margin of forceps base almost straight (distinctly convex in *E. venosus*) with (rarely without) low, broad and rounded lateral teeth. Penis lobes (Fig. 4A) slightly more massive, basal sclerite more broadly triangular, with few or no teeth along posterior margin (basal sclerite narrowly triangular, with strong teeth along posterior margin in *E. venosus*), median titillators with a longitudinal row of inconspicuous subapical teeth or smooth (median titillators with a longitudinal row of strong subapical teeth in *E. venosus*). Last instar larvae are characterized by rather strong, almost straight, apically broadly rounded pronotal processes (Fig. 4B) (apically bluntly pointed in *E. venosus*) and comparatively weak and short lateral processes (Fig. 4C) (1/5 of segment length) on abdominal sterna 2-9 (strong and long, 1/3 of segment length in *E. venosus*).

***Baetis cyanops* F.-J. Pictet, 1843**

Baetis cyanops F.-J. Pictet, 1843-1845: 171-172, pl. 20, fig. 2. *Heptagenia elegans* (Curtis, 1834). – Eaton, 1871: 145 (synonymization). *Heptagenia sulphurea* (Müller, 1776). – Eaton, 1888: 268 (synonymization).

Accepted name: *Heptagenia sulphurea* (Müller, 1776).

Locus typicus: “... au bord du Rhône ...” [Geneva].

Type material: Syntypes (male imagines?), not traced.

Remarks: A well-established synonymy. *Heptagenia sulphurea* is still present in the Rhone River at Geneva (Sartori *et al.*, 1989).

***Baetis montana* F.-J. Pictet, 1843**

Baetis montana F.-J. Pictet, 1843-1845: 172-173, pl. 20, fig. 3. *Heptagenia montana*. – Eaton, 1871: 154 (transfer). *Heptagenia montana*. – Eaton, 1888: 302 (species of uncertain generic placement).

Accepted name: *Baetis montana* F.-J. Pictet, 1843 **nom. dub.**

Locus typicus: “... petit ruisseau qui descend du Brévent au-dessus de Chamounix”.

Type material: Holotype [by monotypy], male imago?, not in MHNG.

Remarks: F.-J. Pictet gave a very brief description of this alpine species. Eaton (1888) was unable to place it with certainty among the Heptageniidae. No original

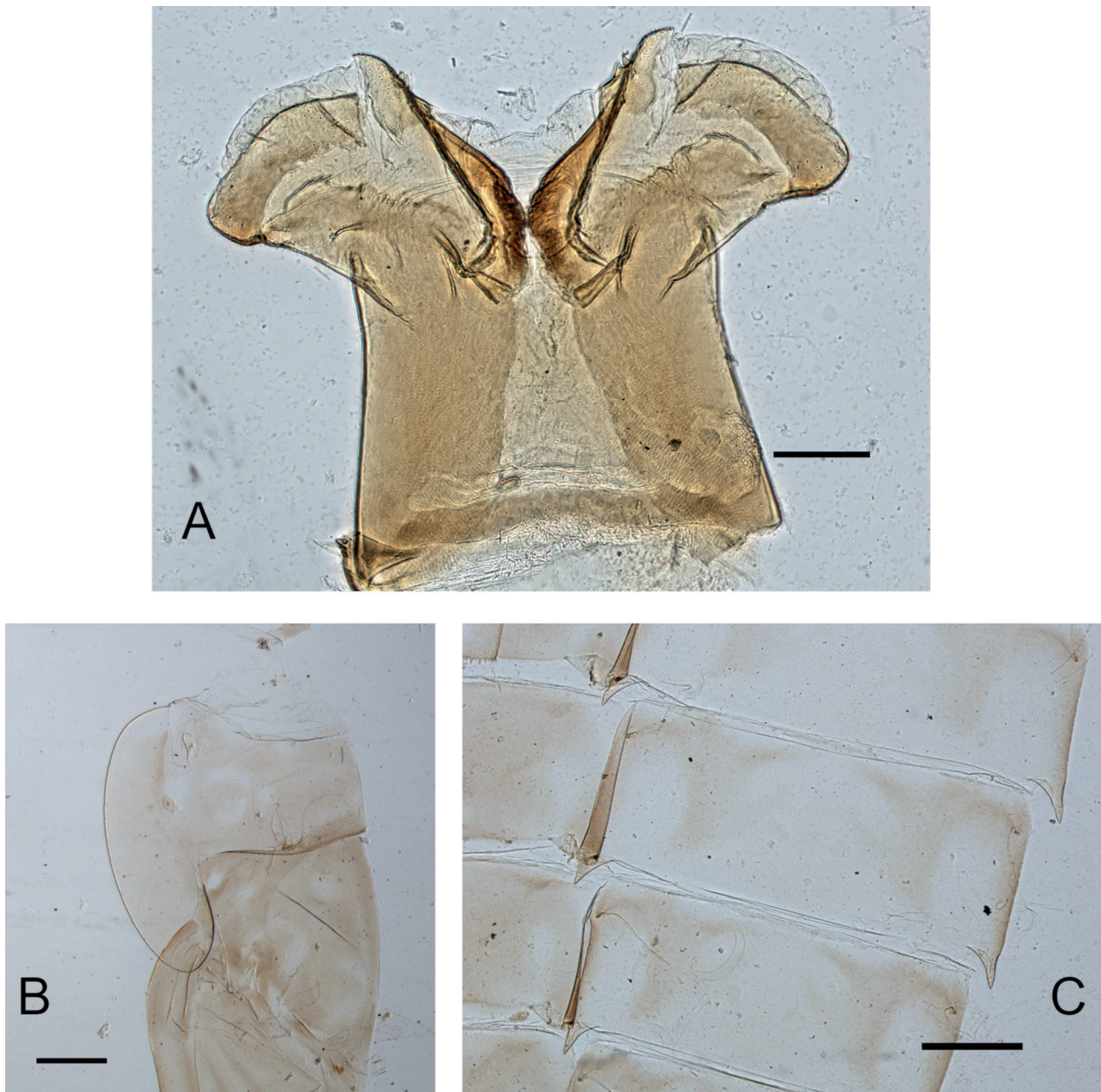


Fig. 4. *Ecdyonurus (Ecdyonurus) alaini* sp. nov. (A) Penis of holotype (dorsal view, slide preparation). Scale bar 0.2 mm. (B) Left half of pronotum (last larval instar exuvia of holotype; slide preparation). Scale bar 0.5 mm. (C) Abdominal sterna 4-6 (last larval instar exuvia of holotype; slide preparation). Scale bar 0.5 mm. Photos by Mag. H. Bruckner.

material of this taxon could be traced. In the MHNG there is one female imago with the following label data “620 Burgdorf 48 coll. Pictet / *Baetis montana* P. Bgdf 9 Juni”, obviously a specimen collected and identified by Meyer-Dür and most probably belonging to the so called *Ecdyonurus helveticus* species-group. The name *Baetis montana* F.-J. Pictet, 1843 should be considered a *nomen dubium* (see also Haybach, 2010).

***Baetis purpurascens* F.-J. Pictet, 1843**

Baetis purpurascens F.-J. Pictet, 1843-1845: 174-175, pl. 20, fig. 4.

Heptagenia venosa (Fabricius, 1775). – Eaton, 1871: 151 (synonymization).

Ecdyurus venosus (Fabricius, 1775). – Eaton, 1888: 302 (transfer).

Ecdyonurus venosus (Fabricius, 1775). – Ulmer, 1920b: 136 (transfer).

Accepted name: *Ecdyonurus* (*Ecdyonurus*) *venosus* (Fabricius, 1775).

Locus typicus: "... au bord de la petite rivière de Viaisson derrière le mont Salève".

Type material: Holotype [by monotypy], female imago, not in MHNG.

Remarks: The description was obviously based on a single female and the taxon was considered by F.-J. Pictet to be closely related and very similar to *Baetis venosa* Fabricius, 1775, except for some differences in colouration. No material could be traced and the name *Baetis purpurascens* F.-J. Pictet can be considered a well-established junior synonym of *Ecdyonurus venosus*, a species widespread in Europe.

***Baetis semitincta* F.-J. Pictet, 1843**

Baetis semitincta F.-J. Pictet, 1843-1845: 180-181, pl. 22, figs 1-3.

Heptagenia semicolorata (Curtis, 1834). – Eaton, 1871: 136 (synonymization with doubt).

Rhithrogena semicolorata (Curtis, 1834). – Eaton, 1888: 256 (transfer).

Rhithrogena semitincta. – Kimmins, 1936: 279 (revalidation of species name).

Rhithrogena semicolorata (Curtis, 1834). – Sowa, 1971: 897 (synonymization).

Accepted name: *Rhithrogena semicolorata* (Curtis, 1834).

Locus typicus: "...sur les bords de la petite rivière qui se jette à Versoix dans le lac de Genève".

Type material: MHNG; 3 syntypes (♂ and ♀ imagines, ♂ subimago).

Remarks: The two male specimens (considered by Sowa as part of the original type series) are pinned on the same needle, and the lower one has been designated as lectotype by Sowa (1971: 897). It bears the following labels: 620 Genthod 48 Genève coll. Pictet / *Baetis semitincta* [in Sowa's opinion probably F.-J. Pictet's handwriting] / *Rhithrogena semitincta* (Pictet), lectotype [= *semicolorata* (Curtis)] Det. R. Sowa.

This taxon has been controversial for a long time. Eaton (1888) mentioned several variants in the coloration of the wings, which he did not consider of taxonomic value. Kimmins (1936) proved that the concept of *R. semicolorata* sensu Eaton (1888) fits at least two species and he re-established *R. semitincta* as a valid name. Finally, Sowa (1971) studied the type series, proposed *R. semitincta* (F.-J. Pictet, 1843) as a junior subjective synonym of *R. semicolorata* (Curtis, 1834) and described *R. semitincta* sensu Kimmins (1936) nec *R. semitincta* (F.-J. Pictet, 1843) as a new species, *R. picteti* Sowa, 1971.

***Baetis cerea* F.-J. Pictet, 1843**

Baetis cerea F.-J. Pictet, 1843-1845: 183-184, pl. 23, fig. 2.

Heptagenia flavipennis (Dufour, 1841). – Eaton, 1888: 273 (synonymization).

Heptagenia longicauda (Stephens, 1836). – Kimmins, 1942a: 122 (synonymization).

Accepted name: *Heptagenia longicauda* (Stephens, 1836).

Locus typicus: "... sur les bords du lac de Genève...".

Type material: Holotype [by monotypy], male imago, not traced.

Remarks: In the absence of any specimen of this species in the MHNG, we follow the synonymy proposed by Kimmins (1942a). F.-J. Pictet (1843: 193) already noticed that *B. longicauda* Stephens, 1836 was closely related to his *B. cerea*.

Heptagenia longicauda is extremely rare in Switzerland, the last record from the lake of Geneva area is more than 30 years old (Sartori & Dethier, 1985).

***Baetis flaveola* F.-J. Pictet, 1843**

Fig. 5

Baetis flaveola F.-J. Pictet, 1843-1845: 186-187, pl. 23, fig. 4.

Heptagenia flaveola. – Eaton, 1871: 136 (transfer).

Ecdyurus verticis (Say, 1839). – Eaton, 1888: 256 (synonymy).

Heptagenia interpunctata (Say, 1839). – Ulmer, 1921: 242 (synonymization).

Stenonema flaveolum. – McCafferty & Bae, 1992: 169 (transfer and considered a *nomen dubium*).

Accepted name: *Baetis flaveola* F.-J. Pictet, 1843 **nom. dub.**

Locus typicus: "... Amérique septentrionale...".

Remarks: F.-J. Pictet (1843: 187) mentioned only one female specimen from the NMW sent by Kollar ("L'exemplaire qui a servi a cette description..."), and provided only one illustration (F.-J. Pictet, 1843: pl. 23, fig. 4). There is a heavily damaged specimen in the NMW, which corresponds well with Pictet's written description (but not with the illustration in fig. 4). As already pointed out by Ulmer (1921), another specimen has obviously been illustrated on plate 23, fig. 4 of the original publication.

Type material: NMW; ♀ subimago [syntype ?] (Fig. 5A); Pöp[pig] 852 / Pictet vidit / *Baetis flaveola* Pict. [Hermann Hagen's handwriting] / *Heptagenia interpunctata* Say [Ulmer's handwriting] / coll. Nat. Mus. Wien / (Fig. 5B). Heavily damaged (head, left wings, left middle leg, right middle and hind leg missing, right wings partly missing and glued to thorax, end of abdomen damaged and cerci missing). – NMW; ♂ subimago [syntype ?] (Fig. 5C); Par[reys]. c. 17. 196. / Pictet vidit / *Heptagenia pulchella* Walsh (?) [Ulmer's

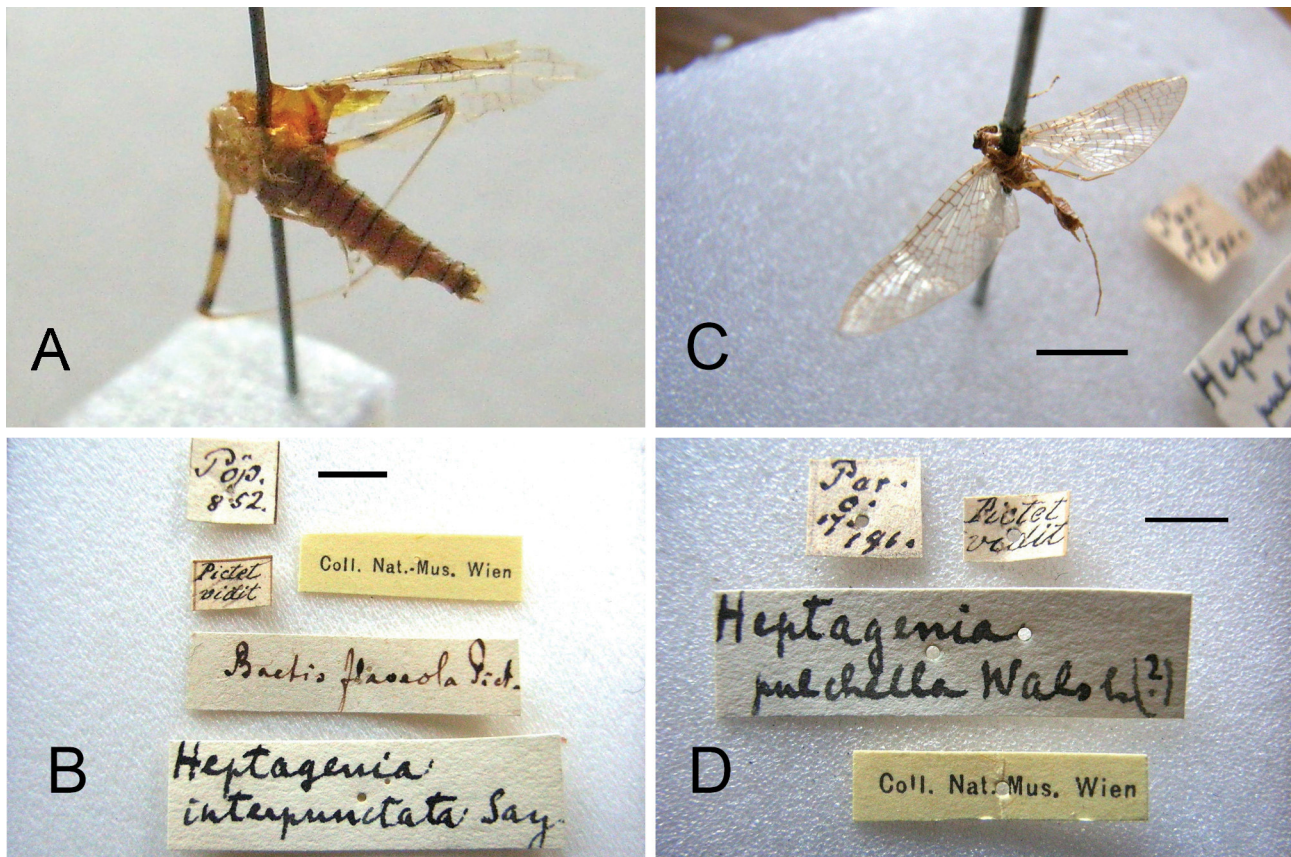


Fig. 5. *Baetis flaveola* F.-J. Pictet, 1843 **nom. dub.** (A) Syntype [?]. (B) Labels of syntype [?] 1. Scale bar: 5 mm. (C) Syntype [?] 2. Scale bar: 5 mm. (D) Labels of syntype [?] 2. Scale bar: 5 mm.

handwriting] / coll.Nat.Mus.Wien (Fig. 5D). Slightly damaged (left fore leg, basal half of left hind wing and right hind wing completely missing, distal part of cerci missing).

Remarks: Eduard Friedrich Poeppig (1797-1868) travelled in Cuba (1823-24) and Pennsylvania (1824-26). In 1826 he departed for Valparaiso and spent several years performing scientific explorations throughout Chile, Peru and Brazil during 1827-1832. Material from his travels was acquired by the NMW in 1840. In later years he also sold specimens from different sources (Cuba 1843, Port Natal 1845, etc.). Ludwig Parreyss (1796-1879) was an established natural history dealer (mostly in insects and birds) in Vienna and material has been very frequently acquired from him by the NMW.

McCafferty & Bae (1992: 70) in their discussion confused part of the labels and erroneously reported Hagen's label as being with the male subimago. None of the specimens, however, can be identified with any degree of certainty and McCafferty & Bae's decision to consider the name *Baetis flaveola* F.-J. Pictet, 1843 as a *nomen dubium* should be followed.

***Baetis guttata* F.-J. Pictet, 1843**

Baetis guttata F.-J. Pictet, 1843-1845: 187-188, pl. 24, fig. 3.
Heptagenia guttata. – Eaton, 1871: 156 (transfer).
Ecdyurus guttatus. – Eaton, 1888: 301 (transfer).
Ecdyonurus guttatus. – Ulmer, 1920b: 136 (transfer).
 ? *Siphonella guttata*. – Flowers & Peters, 1981: 153 (transfer).
Siphonella guttata. – Domínguez *et al.*, 2006: 556 (*nomen dubium*).

Accepted name: *Baetis guttata* F.-J. Pictet, 1843 **nom. dub.**

Locus typicus: “Chili”.

Type material: Holotype [by monotypy] female imago, not traced.

Remarks: F.-J. Pictet examined a single female from the National Museum of Natural History in Paris. This species certainly does not belong to the genus *Ecdyonurus* nor to the family Heptageniidae, which is absent from South America. The combination with *Siphonella* (Oniscigastridae) proposed by Flowers & Peters (1981) is mainly based on the colour pattern. The holotype is presumably lost and the name *Baetis guttata* should be considered a *nomen dubium*.

***Baetis australasica* F.-J. Pictet, 1843**

Baetis australasica F.-J. Pictet, 1843-1845: 189-190, pl. 24, fig. 1.

Leptophlebia australasica. – Eaton, 1871: 78 (transfer).

Atalophlebia australasica. – Eaton, 1888: 86 (transfer).

Atalophlebia costalis (Burmeister, 1839). – Ulmer, 1920b: 115 (synonymization).

Atalophlebia australasica. – Harker, 1954: 248 (*Baetis costalis* Burmeister, 1839 is a *nomen praeoccupatum*).

Accepted name: *Atalophlebia australasica* (F.-J. Pictet, 1843).

Locus typicus: “...Nouvelle-Hollande” [New South Wales, Australia].

Type material: NMW; holotype [by monotypy], ♂ imago; Pictet vidit / *Atalophlebia costalis* Burm. (*australasica* Pict.) [Ulmer’s handwriting].

Remarks: F.-J. Pictet mentioned “Les deux exemplaires figurés ...” and described the male imago and [female] subimago, attributing the latter only doubtfully (F.-J. Pictet, 1843: 189 “Id.? Pseudimago, Planche XXIV, FIG. 2”; F.-J. Pictet, 1845: 10 “Probablement le mâle [sic] subimago ...”). According to the International Commission on Zoological Nomenclature (1999: article 72.4.1), the male specimen is therefore the holotype by monotypy.

Kollar probably had sent three specimens to F.-J. Pictet: a male (listed above), a female subimago (Lotz. 12 [= Johann Lhotsky, who collected in New South Wales in 1832-1838] / *australasica* subimago), and a female (Pictet vidit / Lotz. 11).

Ulmer (1921: 243) listed “drei Typen [three types]” but obviously confused one label. The remark “Sidney” [probably in F.M. Brauer’s handwriting] refers to an additional male specimen which was collected during the Novara Expedition in November 1858 but was not examined by F.-J. Pictet.

Ulmer (1920b) synonymized *B. australasica* F.-J. Pictet, 1843 with *B. costalis* Burmeister, 1839, but Harker (1954) recognized that *Baetis costalis* Burmeister, 1839 is a homonym of *B. costalis* Curtis, 1834 and so she reinstated the older synonym as the valid name of the species.

***Potamanthus ferreri* F.-J. Pictet, 1843**

Potamanthus Ferreri F.-J. Pictet, 1843-1845: 203-204, pl. 25, fig. 1.

Potamanthus luteus (Linné, 1767). – Bae & McCafferty, 1991: 53 (synonymization).

Accepted name: *Potamanthus luteus* (Linné, 1767).

Locus typicus: “... aux environs de Turin...” [Italy].

Type material: Holotype [by monotypy], male imago, not traced.

Remarks: Eaton (1884) already noticed that the type was missing in F.-J. Pictet’s collection in 1867. The synonymy proposed by Bae & McCafferty (1991) is consistent with the fact that *P. luteus* is the only *Potamanthus* species found throughout Europe.

***Potamanthus geerii* F.-J. Pictet, 1843**

Potamanthus Geerii F.-J. Pictet, 1843-1845: 211-214, pl. 26, figs 1-3.

Leptophlebia helvipes (Stephens, 1836). – Eaton, 1871: 85 (transfer and synonymization).

Leptophlebia submarginata (Stephens, 1836). – Eaton, 1884: 94 (synonymization).

Paraleptophlebia submarginata (Stephens, 1836). – Lestage, 1917: 344 (transfer).

Accepted name: *Paraleptophlebia submarginata* (Stephens, 1836).

Locus typicus: “J’en possède des exemplaires de l’Italie septentrionale, ... elle n’est pas rare aux environs de Genève...”.

Type material: Syntypes (male and female imagines, female subimago, larva), not traced.

Remarks: In the MHNG there is a series of *Leptophlebia submarginata*; 3 specimens (1 male, 2 females) among them bear the label “*Potamanthus geerii* L.”, but they originate from Burgdorf (ex. coll. Meyer-Dür) and have obviously been collected after the publication of the original description.

Note the obvious printing error in the original description (F.-J. Pictet, 1843: 211), attributing this species to Lin[naeus] instead of declaring it a new species.

***Potamanthus castaneus* F.-J. Pictet, 1843**

Potamanthus castaneus F.-J. Pictet, 1843-1845: 215-216, pl. 26, figs 4-5.

Leptophlebia castanea. – Eaton, 1871: 86 (transfer).

Paraleptophlebia castanea. – Ulmer, 1920: 116 (transfer).

Paraleptophlebia submarginata (Stephens, 1836). – Puthz, 1978: 262 (synonymization).

Accepted name: *Paraleptophlebia submarginata* (Stephens, 1836).

Locus typicus: “... au bord d’un ruisseau d’eau vive, à l’extrémité du lac de Genève, près des marais de Villeneuve...”.

Type material: Syntypes (male and female imagines, male subimago), not traced.

Remarks: As already mentioned by Puthz (1978), material housed in the MHNG consists of 10 subimagines, none of them originating from the type locality or its surroundings. Description and drawings of the subimaginal wing pattern correspond well with *P. submarginata*.

***Potamanthus brunneus* F.-J. Pictet, 1843**

Potamanthus brunneus F.-J. Pictet, 1843-1845: 217-219, pl. 27.
Leptophlebia fusca (Curtis, 1834). – Eaton, 1871: 90 (transfer and synonymization).
Habrophlebia fusca (Curtis, 1834). – Eaton, 1884: 116 (transfer).

Accepted name: *Habrophlebia fusca* (Curtis, 1834).

Locus typicus: “... dans des ruisseaux qui prennent leur source au pied du mont Salève”.

Type material: Syntypes (male and female imagines, male subimago, larva), not traced.

Remarks: In the MHNG five non-type specimens are present under the name *H. fusca*. One bears the label “*Potamanth. brunneus* Pict.” representing in fact a male imago of *Serratella ignita* (Ephemereidae). Among the four others, three also belong to *S. ignita* and the last one probably to *H. fusca*, with a label “Rch 19.5” (for May 19 ?).

***Potamanthus gibbus* F.-J. Pictet, 1843**

Potamanthus gibbus F.-J. Pictet, 1843-1845: 226-228, pl. 31-32.
Ephemerella gibba. – Eaton, 1871: 99 (transfer).
Ephemerella ignita (Poda, 1761). – Eaton, 1884: 126 (synonymization).
Serratella ignita (Poda, 1761). – Jacob, 1993: 107 (transfer).

Accepted name: *Serratella ignita* (Poda, 1761).

Locus typicus: “... sur les bords d’un petit ruisseau d’eau vive près de Villeneuve, à l’extrémité du lac de Genève”.

Type material: Syntypes (male and female imagines and subimagines), not traced.

Remarks: In the MHNG no specimens remain from the type locality and/or bear an original identification. Some of them are labelled “*Ephemerella ignita* Poda Eaton determ[inavit]”. *Serratella ignita* is a species wide-spread and common throughout Europe that exhibits various colour patterns, from green to red.

***Potamanthus aeneus* F.-J. Pictet, 1843**

Potamanthus aeneus F.-J. Pictet, 1843-1845: 229-231, pl. 33.
Ephemerella aenea. – Eaton, 1871: 99 (transfer).
Ephemerella ignita (Poda, 1761). – Eaton, 1884: 126 (synonymization).
Serratella ignita (Poda, 1761). – Jacob, 1993: 107 (transfer).

Accepted name: *Serratella ignita* (Poda, 1761).

Locus typicus: “... un ruisseau qui prend sa source au pied du mont Salève”.

Type material: Syntypes (male and female imagines

and subimagines, larva), not traced. No relevant material in the MNHG.

***Potamanthus inanis* F.-J. Pictet, 1843**

Fig. 6

Potamanthus inanis F.-J. Pictet, 1843-1845: 232-234, pl. 24, fig. 4.
Potamanthus (?) *inanis*. – Eaton, 1888: 296 (*incertae sedis*).
Leptohyphodes inanis. – Ulmer, 1920a: 50-51 (transfer). – Domínguez *et al.*, 2006: 279.

Accepted name: *Leptohyphodes inanis* (F.-J. Pictet, 1843).

Locus typicus: “... elle provient du Brésil” [Rio de Janeiro].

Type material: NMW; 7 syntypes (Fig. 6A): 6 ♂ imagines, Shtt.[Schott] (blue label) / Pictet vidit; 1 ♂ imago, Shtt.[Schott] (blue label) / Pictet vidit / *Leptohyphodes* (Ulm.) *inanis* Pictet Typen [Ulmer’s handwriting].

Remarks: Some specimens are more or less damaged but on the whole in comparatively good condition (Fig. 6B-C). Heinrich Wilhelm Schott collected in Rio de Janeiro during 1817-1821, where he was practically all the time restricted to the vicinity of the city (Schott, 1822). Two of his excursions reached Canta Gallo (= Cantagalo 21°58’S 42°22’W) and Macacú (22°42’S 43°02’W). Ulmer (1921: 244) listed “acht Typen” and provided a redescription of the material. It seems probable that Kollar sent just a sample of 2 specimens to F.-J. Pictet (he based his description on “... deux exemplaires secs”), and afterwards labelled the complete series. F.-J. Pictet, however, seems to have recognized this and according to the International Commission on Zoological Nomenclature (1999: article 72.4.1.1), the seven existing specimens constitute the type series. *Leptohyphodes inanis* is the type species of the genus *Leptohyphodes* Ulmer, 1920a and is so far only known from Brazil (Domínguez *et al.*, 2006).

***Cloe rhodani* F.-J. Pictet, 1843**

Cloe rhodani Pictet, 1843-1845: 248-251, pl. 36-39.
Baetis rhodani. – Eaton, 1871: 114 (transfer).

Accepted name: *Baetis rhodani* (Pictet, 1843).

Locus typicus: “... aux environs de Genève, dans le Rhône...”.

Type material: Syntypes (male and female imagines and subimagines, larvae), not traced and most probably lost.

Remarks: Most of the material still present in the MHNG came from Meyer-Dür and is labelled

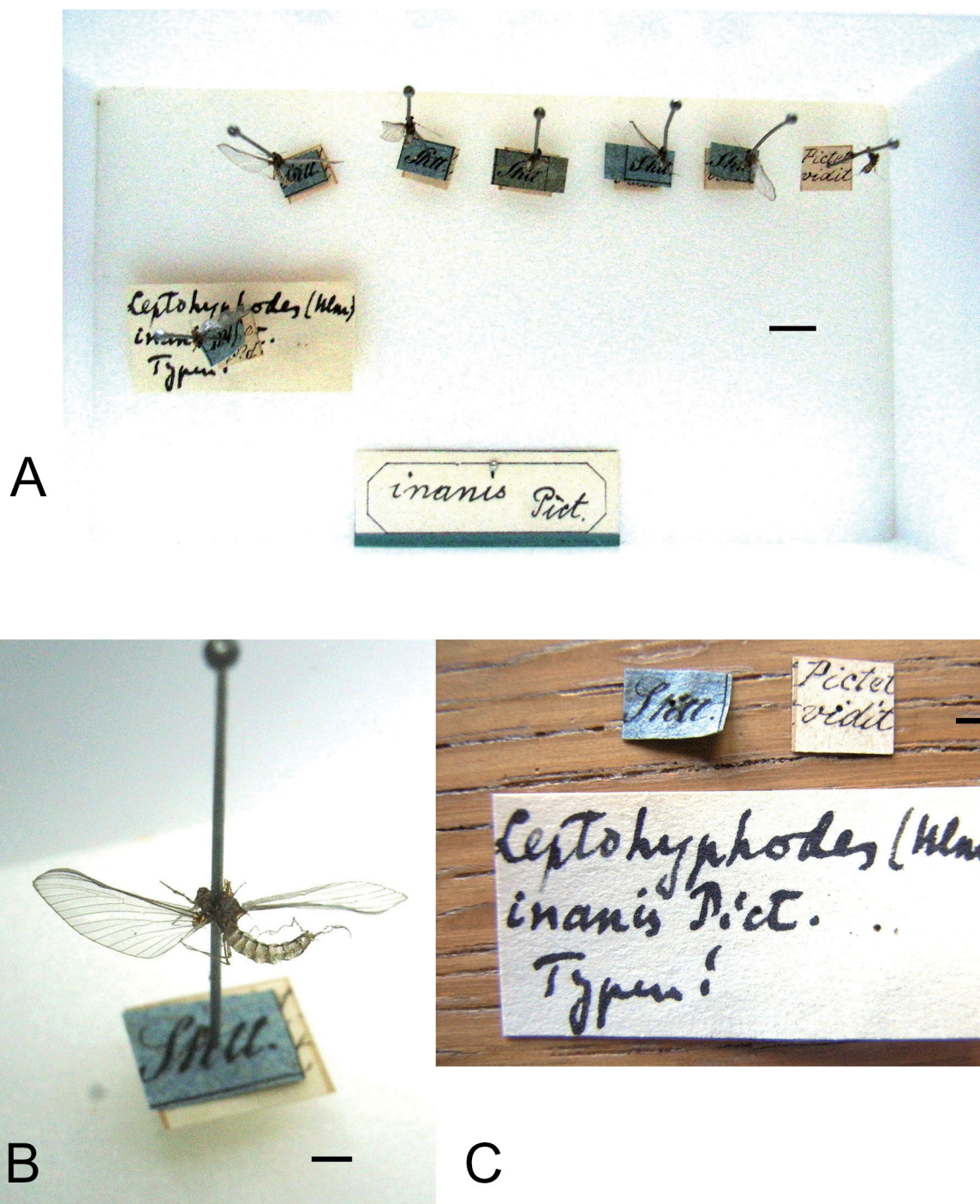


Fig. 6. *Leptohyphodes inanis* (F.-J. Pictet, 1843). (A) Type series. Scale bar: 5 mm. (B) Syntype. Scale bar: 1 mm. (C) Labels of the type series. Scale bar: 5 mm.

“Burgdorf”. *Baetis rhodani* is considered as one of the most abundant mayfly species in Europe. However, recent investigations indicate that it is a species complex (Bisconti *et al.*, 2016; Gattolliat *et al.*, 2015; Lucentini *et al.*, 2011; Rutschmann *et al.*, 2014; Williams *et al.*, 2006). Therefore Gattolliat & Sartori (2008) designated a neotype, which is deposited in the collection of the Museum of Zoology, Lausanne, with voucher specimens in the MHNG and the NMW.

Cloe translucida F.-J. Pictet, 1843

Cloe translucida F.-J. Pictet, 1843-1845: 255-256, pl. 40, figs 3-4.

Baetis luteolus (Müller, 1776). – Eaton, 1868: 88 (transfer and synonymization).

Centroptilum luteolum (Müller, 1776). – Eaton, 1871: 108 (transfer).

Accepted name: *Centroptilum luteolum* (Müller, 1776).

Locus typicus: “... sur les bords du lac de Genève... Des exemplaires venant d’Autriche m’ont été communiqués par M. Kollar, et la collection du chanoine Ferrero en renfermait un pris aux environs de Turin”.

Type material: Syntypes (male and female imagines), not traced and most probably lost.

Remarks: Ulmer (1921: 246) already stated that he could not locate any specimens of *Cloe translucida* in the NMW collection.

Cloe alpina F.-J. Pictet, 1843

Cloe alpina F.-J. Pictet 1843-1845: 257-258, pl. 40, fig. 5.

Baetis alpinus. – Eaton, 1871: 118 (transfer).

Accepted name: *Baetis alpinus* (F.-J. Pictet, 1843).

Locus typicus: “... au bord d’un torrent très rapide, qui descend du mont Brévent dans la vallée de Chamounix”.

Type material: Holotype [by monotypy], male imago, not traced. Müller-Liebenau (1969: 201) already mentioned that the type was probably missing.

Remarks: *Baetis alpinus* is a widespread species in montane and submontane zones of Europe. It is by far the most abundant species in the Alps.

Cloe melanonyx F.-J. Pictet, 1843

Cloe melanonyx F.-J. Pictet, 1843-1845: 258-259, pl. 40, fig. 6.

Baetis melanonyx. – Eaton, 1871: 118 (transfer).

Accepted name: *Baetis melanonyx* (F.-J. Pictet, 1843).

Locus typicus: “... dans la vallée d’Entremont (Faucigny)” [France].

Type material: Holotype [by monotypy?], male imago, not traced and most probably lost.

Remarks: Müller-Liebenau (1969: 201) designated a neotype in the collection of McLachlan deposited in the Natural History Museum of London, which was identified as *Baetis melanonyx* by Eaton and originates from Samoens in France.

Cloe litura F.-J. Pictet, 1843

Cloe litura F.-J. Pictet, 1843-1845: 258-259, pl. 41, figs 1-3.

Centroptilum lituratum. – Eaton, 1871: 109 (transfer).

Accepted name: *Cloe litura* F.-J. Pictet, 1843 **nom. dub.**

Locus typicus: “... au pied du mont Salève...”.

Type material: Syntypes (male and female imago, male subimago), not traced and probably lost.

Remarks: In the MHNG eleven specimens are present under the name *Centroptilum lituratum*. All originate from Burgdorf (coll. Meyer-Dür) and cannot belong to the type series. All belong to the genus *Baetis* except for one female of *Centroptilum luteolum*. Seven are unidentifiable *Baetis* females, and three are males of *Baetis alpinus*. The taxon is only known from F.-J. Pictet’s description and illustrations, and the name *Cloe litura* F.-J. Pictet should be considered a *nomen dubium*.

Cloe fasciata F.-J. Pictet, 1843

Cloe fasciata F.-J. Pictet, 1843-1845: 262-263, pl. 41, fig. 4.

Baetis fasciatus. – Eaton, 1871: 123 (transfer).

Callibaetis fasciatus. – Eaton, 1885: 197 (transfer).

Callibaetis (Abaetetuba) fasciatus. – Cruz *et al.*, 2017: 147 (transfer and designation as type species of the subgenus *Abaetetuba*).

Accepted name: *Callibaetis (Abaetetuba) fasciatus* (F.-J. Pictet, 1843)

Locus typicus: “... provient du Brésil” [Ipanema, Sao Paulo; 23°26’S 47°36’W].

Type material: NMW; holotype [by monotypy], ♀ imago; Natt[er]er: Brasi.: Ypanema / N[at]terer]. c[ollec]tio]. Y[panema]. [on blue paper] / *Callibaetis fasciatus* Pict. [Ulmer’s handwriting] / Pictet vidit.

Remarks: Damaged (most legs, left hind wing and right cercus missing). The holotype was already in bad condition when F.-J. Pictet described it. Ulmer (1921: 246) quoted the label incompletely (and probably misread “N.c.Y.” for “No. 31”) when he provided a complete redescription of the specimen and confirmed Eaton’s (1885) assignment to the Panamerican genus *Callibaetis* Eaton, 1881. Johann Natterer collected in Brasil during 1817-1835 and stayed several times at Ipanema (1819-1822; see Vanzolini, 1993).

***Cloe undata* F.-J. Pictet, 1843**

Cloe undata F.-J. Pictet, 1843-1845: 264-265, pl. 41, fig. 6.
Callibaetis undatus. – Eaton, 1885: 196 (transfer).

Accepted name: *Cloe undata* F.-J. Pictet, 1843 **nom.dub.**

Locus typicus: “... elle provient du Mexique”.

Type material: Holotype [by monotypy], female imago, not traced and most probably lost.

Remarks: The specimen F.-J. Pictet examined was already in bad condition and was sent by Mr Coulon from Neuchâtel. The specimen is neither housed in the Natural History Museum of that town (J.P. Haenni in litt.) nor in the MHNG. The taxon is only known from F.-J. Pictet’s description and illustration, and the name *Cloe undata* Pictet, 1843 should be considered a *nomen dubium*.

***Caenis grisea* F.-J. Pictet, 1843**

Caenis grisea F.-J. Pictet, 1843-1845: 278-279, pl. 45, figs 1-2.
Caenis macrura (Stephens, 1836). – Eaton, 1871: 93 (synonymization). – Malzacher, 1986: 15.
Caenis halterata (Fabricius, 1777). – Eaton, 1885: 145 (synonymization).

Accepted name: *Caenis macrura* (Stephens, 1836).

Locus typicus: “... dans un petit marais situé au pied du mont Salève”.

Type material: Syntypes (male imago and subimago), not traced and most probably lost.

Remarks: In the MHNG there is one specimen (female subimago) which bears the name *Caenis halterata* Fabr. and originates from Burgdorf (coll. Meyer-Dür). This specimen belongs to *Caenis luctuosa* (Burmeister, 1839). Without any new available data, we accept the synonymy proposed by Eaton (1871) and followed by Malzacher (1986), but in our opinion *C. grisea* could also be considered a junior subjective synonym of *C. luctuosa* (Burmeister, 1839).

***Caenis argentata* F.-J. Pictet, 1843**

Caenis argentata F.-J. Pictet, 1843-1845: 279-280, pl. 43, fig. 6. – Kluge, 2020 (*nomen dubium*).
Caenis halterata (Fabricius, 1777). – Ulmer, 1921: 248 (synonymization).

Accepted name: *Caenis argentata* F.-J. Pictet, 1843 **nom.dub.**

Locus typicus: “... se trouve en Sicile”.

Type material: NMW; holotype [by monotypy], female subimago.

Remarks: F.-J. Pictet wrote “Je ne connais que la femelle subimago de cette espèce... elle m’a été communiquée par le musée de Vienne”. It is, however,

rather doubtful whether the specimen in the NMW actually represents the type specimen: female subimago / *Caenis argentata* ? Kollar *lactea* Hffm. [Kollar’s handwriting] / *Caenis horaria* (L.) det. Malzacher 1983 [no collector’s label, no locality]. Ulmer (1921: 248) erroneously quoted three male subimagines in the NMW carrying F.-J. Pictet’s label: “... davon stammen zwei aus Sizilien, eins aus Ischl.”. None of these specimens actually bears F.-J. Pictet’s label nor could they have represented type material, and most probably Ulmer’s remark was based on a confusion with later acquisitions from Sicily not seen by F.-J. Pictet. Two additional male specimens and one female (in the NHW, all without labels) have been transferred to glycerin: “*Caenis horaria* (L.) sub nom. *C. lactea* (Pict.) det. Malzacher 6. 1983”. None of them can be considered to represent type material.

Caenis horaria has so far not been recorded from Sicily and in our opinion it is most likely that Kollar incorrectly labelled a specimen of unknown origin at a later time. The specimen in question lacks the “Pictet vidit” label as well as any evidence concerning its origin, and it therefore seems justified to consider the name *Caenis argentata* F.-J. Pictet, 1843 as a *nomen dubium*.

***Caenis varicauda* F.-J. Pictet, 1843**

Ephemera sp. – Savigny, 1817: 194, pl. 2, figs 6-7.
Caenis varicauda F.-J. Pictet, 1843-1845: 281-282, pl. 43, fig. 5.

Tricorythus varicauda. – Eaton, 1868: 82 (transfer).

Accepted name: *Tricorythus varicauda* (F.-J. Pictet, 1843).

Locus typicus: “... se trouve dans les partie supérieures de l’Egypte”.

Type material: NMW; syntype, ♂ imago; KOTS 1 [= Kotschy leg.] / Pictet vidit / Typus [Ulmer’s handwriting]. – NMW; syntype, ♂ imago; KOTS 2 / Pictet vid. – NMW; syntype, ♂ imago; KOTS 3 / Pictet vid.

Remarks: Theodor Kotschy (1813-1866) travelled the White and Blue Nile (Cairo to Torra, El Obeid, Torra, Karthum, Beni Shanqul) during 1836-1839. Material from this expedition was acquired by the NMW in 1839.

In his redescriptions Ulmer (1916: 14; 1921: 248) quoted “vier Typen [four types]” misreading the collector’s acronym for “No. 21”. The fourth specimen, however, does not represent type material and actually originates from a series collected by Josef Franz Natterer (1819-1862) in “Egypt” [Karthoum], acquired by the NMW in 1858 and not seen by F.-J. Pictet.

Beside this material, and as F.-J. Pictet mentioned “... et je la possède aussi dans ma collection”, four specimens are located in the MHNG. They were found under the name *Caenis lactella* Eaton, 1884 (a synonym of

C. horaria) and all bear the same label: 620 48 Europe centr[ale] coll. Pictet. As no *Tricorythus* species has ever been reported from Europe, we can conclude that this is an example of the poor care the collection has suffered. These specimens fit the description given by F.-J. Pictet and may well constitute part of the original type series. This material is currently in ethanol.

Eaton (1868) based his genus *Tricorythus* on *Caenis varicauda* F.-J. Pictet, 1843 which was recently redescribed by Kluge (2010).

***Caenis oophora* F.-J. Pictet, 1843**

Caenis oophora F.-J. Pictet, 1843-1845: 284-285, pl. 45, fig. 4. *Caenis macrura* (Stephens, 1836). – Ulmer, 1921: 248 (synonymization).

Accepted name: *Caenis oophora* F.-J. Pictet, 1843 **nom. dub.**

Locus typicus: “... originaire de Sardaigne”.

Type material: NMW; holotype [by monotypy], ♀ [subimago]; *Caenis macrura* Stephens, female subimago / Dhl. a. c. [= Dahl, alte collection ?] / Pictet vidit.

Remarks: The type specimen, denoted “femelle imago” by F.-J. Pictet, corresponds with his description and illustration. It had presumably been collected by Georg Dahl (1769-1832), naturalist and dealer in natural history specimens, who collected in Sardinia and whose respective material was acquired by the NMW in 1826. Ulmer (1921: 248) mentioned two female specimens with F.-J. Pictet’s label, originating from Sardinia, but Pictet (1843) expressly mentioned that he examined only one specimen: “L’individu que j’ai eu à ma disposition...”. The second specimen, with protruding eggs and labelled “Pictet vidit” (but without collector’s label or locality) which corresponds with Ulmer’s description, was doubtfully identified as “*C. ? luctuosa* (Burm.) det. Malzacher 1983”. Another female specimen, labelled “*C. oophora* Pict. Sardinien (Mann) [probably Kollar’s handwriting] / Pictet vidit” does not correspond with F.-J. Pictet’s description and was probably subsequently identified by Kollar, but it had not been examined by F.-J. Pictet. It had either been obtained from or collected by Josef Johann Mann (1804-1889), who travelled Corsica in 1855 and Sicily in 1858 (Rogenhofer, 1889). In the light of this poor and contradictory evidence, the name *C. oophora* Pictet, 1843 is probably best considered a *nomen dubium*.

***Oligoneuria anomala* F.-J. Pictet, 1843**

Oligoneuria anomala Pictet, 1843-1845: 291-292, pl. 47 figs 1-2.

Oligoneuria (Oligoneuria) anomala. – Salles *et al.*, 2014: 241.

Accepted name: *Oligoneuria anomala* F.-J. Pictet, 1843.

Locus typicus: “... venant du Brésil” [Rio de Janeiro district, Brasil].

Type material: NMW; one syntype (♀ subimago); Shtt [= Schott] [blue paper] / Pictet & Hagen vid. [remark: “& Hagen” obviously added later, probably by Hagen] / *Oligoneuria anomala* Kllr. Pict. Bras[ilien] Rio Janeiro [in Kollar’s handwriting] / *Oligoneuria anomala* Pict. Type [Ulmer’s handwriting]. Slightly damaged, hind wings crumpled and legs missing. – MHNG; one syntype (female subimago); not traced, probably lost.

Remarks: The original illustrations (F.-J. Pictet, 1845: pl. 46, figs 1-5) have obviously been drawn from the second syntype (femelle subimago, Pictet’s specimen from an unknown locality [presumably Switzerland], “conservé dans alcool”) which belongs to *Oligoneuriella rhenana* (Imhoff, 1852), as already stated by Hagen (1855: 270).

This taxon has been quite enigmatic for a long time although additional descriptions had been provided by Hagen (1855), Ulmer (1921), Needham & Murphy (1924) and Puthz (1973a). Domínguez *et al.* (2006) recently published supplementary information on the type material. A cladistics analysis by Salles *et al.* (2014) showed this species to be distinguishable by wing venation, but no other specimens are currently known.

MAYFLY TAXA DESCRIBED BY ALBERT-EDOUARD PICTET

***Baetis flavida* A.-E. Pictet, 1865**

Baetis flavida A.-E. Pictet, 1865: 24, pl. 3, figs 1-6.

Siphonurus flavidus. – Eaton, 1871: 125 (transfer).

Siphonurus flavidus. – Ulmer, 1920b: 135 (transfer).

Accepted name: *Siphonurus flavidus* (A.-E. Pictet, 1865).

Locus typicus: “... à San Ildefonso...”.

Type material: MHNG; lectotype, ♂ imago [Puthz design.]; 620 Granjas 48 coll. Pictet / 156 female [sic] / *Siphonurus flavidus* (Pictet) (= *Baetis flavida*) Pictet, V. Puthz vide 1969, spec. in alcohol, wings & genitalia on microsc. slides. – MHNG; 2 ♂ and 1 ♀; same data as for lectotype; also in alcohol.

Remarks: Puthz (1977) redescribed the species from the type series and designated a lectotype. This taxon seems to be endemic to the Iberian Peninsula.

***Baetis sylvicola* A.-E. Pictet, 1865**

Baetis sylvicola A.-E. Pictet, 1865: 24, pl. 3, figs 7-12.

Heptagenia sylvicola. – Eaton, 1871: 147 (transfer).

Epeorus sylvicola. – Eaton, 1887: 6 (transfer).

Accepted name: *Epeorus sylvicola* (A.-E. Pictet, 1865).

Locus typicus: "... à San Ildefonso...".

Type material: MHNG; ♂ lectotype [Puthz design.]; *Baetis sylvicola* Edouard Pictet / 4 males / Granjas Juillet 1859 / 4 / 620 Granjas 48 Espagne coll. Pictet / *Epeorus sylvicola* (Pictet) (= *Baetis sylvicola* Pictet) male / LECTOTYPUS Puthz 1971 Genitalia im mikrosk. Präp.

Remarks: Besides the lectotype and according to Puthz (1973c), two other specimens have been transferred to ethanol. Two damaged paralectotypes are still pinned, but only the thorax of one specimen and the thorax and hind legs of the other are still present. One specimen has a label saying "Hind wing of *Epeorus sylvicola* Ed Pictet, Eaton exam[inavit]. " and the other the following: "*Epeorus sylvicola* (A.-E. Pictet) Syntypes because of fragmental character not designated as paralectotypes PUTHZ, 1971".

Since Puthz (1973c), it has been admitted that the central European species known as *Epeorus assimilis* Eaton, 1885 is a junior subjective synonym of *E. sylvicola*. However, more recent investigations by Thomas *et al.* (2000) indicate that *E. assimilis* is a closely related but distinct taxon. Hence, *E. sylvicola* seems restricted to the Iberian Peninsula and also to North Africa.

OTHER MAYFLY TAXA DESCRIBED FROM SPECIMENS OF THE PICTET COLLECTION

In order to avoid presenting the complicated nomenclatural history of these taxa, we list them with their current names in this chapter and in the following one.

Ecdyonurus (Helvetoraeticus) picteti (Meyer-Dür, 1864)

Baetis sp. ? *Picteti* Meyer-Dür, 1864: 221.

Heptagenia Picteti. – Eaton, 1871: (transfer).

Ecdyonurus picteti. – Puthz, 1975: 321 (transfer).

Ecdyonurus (Helvetoraeticus) picteti. – Bauernfeind & Soldán, 2012: 279 (transfer to new subgenus).

Locus typicus: „... Muraglbach bei Pontresina, im Rosegthal, am Chalchagn und am Bernina bis 6700' ü.M...“.

Type material: MHNG; lectotype, ♀ subimago; 620 Engadin 48 Alpes coll. Pictet / val Muragl 25 (6) / *Baetis Picteti* Meyer Engadin / *Ecdyonurus picteti* (Meyer-Dür) ♀ Lektotypus Puthz 1973 (Fig. 7).

Remarks: Puthz (1975) was the first to rediscover specimens of this species in F.-J. Pictet's collection. Besides the lectotype, there is another female subimago with the following labels: 620 Pontresina 48

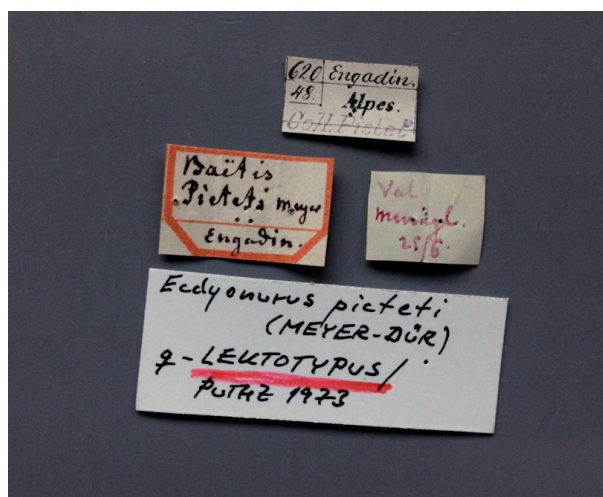


Fig. 7. *Ecdyonurus (Helvetoraeticus) picteti* (Meyer-Dür, 1864). Labels of the female subimago lectotype.

Alpes coll. Pictet / Pontresina 5/6 selten / *Ecdyonurus picteti* (Meyer-Dür) ♀ Paralektotypus Puthz 1973. Furthermore, there is a third one, also a female subimago, which does not belong to this species: 620 Bernina 48 6700' Alpes coll. Pictet / Bernina bis 6700' 4/6 / Syntypus von *Baetis picteti* Meyer-Dür = cf. *Ecdyonurus venosus* (F.) Puthz 1973.

Choroerpes picteti (Eaton, 1871)

Potamanthus marginatus. – F.-J. Pictet, 1843-1845: 208-211, pl. 55, figs 4-5 (nec *Ephemera marginata* Linné, 1767; misidentification).

Leptophlebia Picteti Eaton, 1871: 87 (original description).

Habrophlebia Picteti. – Eaton, 1881: 195 (transfer).

Choroerpes picteti. – Eaton, 1884: 105 (transfer).

Locus typicus: "... aux environs de Genève...".

Type material: Syntypes (male and female imago, female subimago), not traced and probably lost.

Remarks: From F.-J. Pictet's text and illustrations it is clear that he based his descriptions on material from the surroundings of Geneva. Obviously Eaton (1871) based his description of *Leptophlebia picteti* only on F.-J. Pictet's description of *P. marginatus*, which he literally translated into Latin, and according to the International Commission on Zoological Nomenclature (1999: article 72.4.2) the type series consists of the material originally examined by F.-J. Pictet. When Eaton erected the genus *Choroerpes* Eaton, 1881, he based it exclusively on his new species *C. lusitanica* Eaton, 1881. It was only later (Eaton, 1884: 105) that he considered *C. lusitanica* a junior subjective synonym of *C. picteti* and consequently used this name for the type species of *Choroerpes*.

In the MHNG exists at least one specimen which had

been examined by Eaton: male / 620 48 Espagne coll. Pictet / 66 / 31 / M. 2 Selys Longchamps / Chloroterpes [sic] Picteti Eaton Eaton type. The material is in alcohol and in poor condition, in several pieces, and it is completely faded, as are the labels. The origin of the specimen (Spain) indicates that it came from A.-E. Pictet's collection and was seen and labelled by Eaton himself, but obviously at a later time than the original description in 1871. The specimen is most probably not part of the original type series and therefore not available for lectotype fixation (International Commission on Zoological Nomenclature, 1999: article 74.1) and Eaton's remark on the label ("type") cannot be understood as a valid neotype designation (International Commission on Zoological Nomenclature, 1999: article 75.3).

There is also a pinned specimen in the MHNG placed under the name *Leptophlebia marginata* L. It is a male subimago with the following labels: 620 Burgdorf 48 Suisse coll. Pictet / Pot. Marginatus. This specimen (probably collected by Meyer-Dür) also belongs to *C. picteti* but can also not be considered to represent type material.

Teloganopsis hispanica (Eaton, 1888)

Ephemerella hispanica Eaton, 1888: 306.

Serratella hispanica. – Gonzalez del Tanago & Garcia de Jalon, 1983: 149 (transfer).

Teloganopsis hispanica. – Jacobus & McCafferty, 2008: 241 (transfer).

Locus typicus: "Spain, San Ildefonso, Segovia".

Type material: MHNG; syntype, ♂ imago; 620 48 Espagne coll. Pictet / n°5 Potam. / 22 / Potam. n.sp./ *Ephemerella hispanica* Eaton MS sp. nov. Eaton type [abdomen missing] (Fig. 8). – Rijksmuseum van Natuurlijke Historie, Leiden; syntype, female subimago.

Remarks: The MHNG specimen is damaged and was already broken when Eaton (1888) described it, since he gave no information about abdominal colouration, forceps and cerci. Nevertheless, the specimen fits well the concept that following taxonomists have applied



Fig. 8. *Teloganopsis hispanica* (Eaton, 1888). Male imago holotype. Scale bar: 1 mm.

(Studemann & Tomka, 1987), especially regarding the shape of fore and hind wings.

The second syntype (a female subimago, "female allotype" sensu Kimmins, 1960: 304) should be in Herman Albarda's collection at the Rijksmuseum van Natuurlijke Historie in Leiden, The Netherlands.

Rhithrogena picteti Sowa, 1971

Baetis semicolorata. – F.-J. Pictet, 1843-1845: 208-211, pl. 22, figs 4-7 (nec *Baetis semicolorata* Curtis, 1834; misidentification).

Rhithrogena semitincta. – Kimmins, 1936: 280, fig. 2 (nec *Baetis semitincta* Pictet, 1843; misidentification).

Rhithrogena picteti Sowa, 1971: 903 (original description).

Locus typicus: "... la Versoix à Richelien...".

Type material: MHNG; holotype, ♂ imago; bords de la Versoix à Richelien vers 450 m.; 19.V.1968; leg J.C. Régnier. – MHNG; paratypes, 3 ♂ imagines; same data as for holotype.

Remarks: Sowa (1971) described this species based on fresh material collected by J.-C. Régnier, a former technician at the MHNG, in the Versoix River, close to Geneva. In the F.-J. Pictet collection at the MHNG there are several pinned specimens which had also been studied by Kimmins (in part; 1936) and by Sowa. However, contrary to what Sowa stated, these specimens do not constitute the "original material" studied by F.-J. Pictet ("... commune dans les ruisseaux des environs de Genève"). The old MHNG series consists of 12 male imagines labelled: 620 Hindelbank 48 Suisse coll. Pictet / Rh. semicolorata Curtis / *Rhithrogena picteti* Det. R. Sowa. This locality is not mentioned in the original work of F.-J. Pictet and the material was certainly collected later by Meyer-Dür.

Asthenopodes picteti Hubbard, 1975

Palingenia albicans Percheron in Guérin & Percheron, 1838. – F.-J. Pictet, 1843-1845: 149-150, pl. 13, figs 1-3 (nec *Ephemerella albicans* Percheron in Guérin & Percheron, 1838; misidentification).

Asthenopus albicans (F.-J. Pictet, 1843) (unavailable species name). – Ulmer, 1921: 239 (transfer).

Asthenopodes albicans (F.-J. Pictet, 1843) (unavailable species name). – Ulmer, 1924a: 27 (transfer).

Asthenopodes picteti Hubbard, 1975: 111 (establishment of available species name). – Molineri *et al.*, 2015: 73 (reverse transfer).

Asthenopus picteti. – Hubbard & Domínguez, 1988: 209 (transfer).

Locus typicus: "... il provient du Brésil" [Rio de Janeiro province, Brasil].

Type material: NMW; 1 ♂, presumably a syntype; Shtt[= Schott]. [blue paper] / Pictet vidit / *Asthenopus albicans* Pict. Type [Ulmer's handwriting] / TYPE

[printed on red paper]. Damaged, most legs, hind wings and abdomen missing. – NMW; 1 ♂, presumably a syntype; Pb [= probably reads Paraíba, collected by Schott]. [blue paper] / Pictet vidit / *Campsurus truncatus* Ulmer [in Ulmer's handwriting].

Remarks: The status of the NMW material is not altogether clear; these are probably syntypes (male imagines). The first specimen had been collected by H.W. Schott during 1817-1821 in Brazil, Rio de Janeiro province. Although F.-J. Pictet stated “L'exemplaire figuré m'a été communiqué par le Musée de Vienne, ...”, Ulmer (1921: 239) found two male specimens arranged under the name *Palingenia albicans* Pictet and identified the second specimen as *Campsurus truncatus* Ulmer, 1920a.

It is not known whether F.-J. Pictet really examined both specimens or rather Kollar later added a second male when he labelled the material. F.-J. Pictet's description and illustration, however, agree with the specimen labelled “type” by Ulmer, suggesting that this specimen actually represents the holotype by monotypy.

Palingenia albicans F.-J. Pictet, 1843 nec *Ephemera albicans* Percheron, 1838, which was transferred as *Campsurus albicans* by Eaton (1883), has a long and controversial nomenclatural history. *Palingenia albicans* F.-J. Pictet, 1843 is actually a misidentification, not a formally established species name. Ulmer (1924b) based his genus *Asthenopodes* on this incorrectly named taxon, and Hubbard (1975) proposed a valid name (*nomen novum*) in honour of F.-J. Pictet, because the species-group name used by Ulmer was not available (species-group name wrongly applied through misidentification; International Commission on Zoological Nomenclature, 1999: article 49).

OTHER VALUABLE MAYFLY SPECIMENS HOUSED IN NMW AND MHNG

During the preparation of his monograph, F.-J. Pictet also used several specimens from the Vienna Museum collection for his (re)descriptions of taxa of previous authors. Usually they are recognizable by the label “Pictet vidit”. The collection in Geneva houses some uncommon species, which are also briefly listed here.

Hexagenia limbata (Serville in Guérin, 1829)

Ephemera limbata Serville in Guérin, 1829: 384, pl. 60, figs 7-9.

Palingenia limbata. – F.-J. Pictet, 1843-1845: 146-148, pl. 12, figs 1-3 (transfer).

Hexagenia limbata. – Walsh, 1863: 197 (transfer).

Material: NMW; ♂ subimago; Am[erica]. s[eptentrionalis]. Parreyss / Pictet vidit. – NMW; ♀ subimago; 190 Par[reyss]. / Pictet vidit; legs and abdomen missing.

– NMW; 1 ♀ subimago; Pictet vidit; fore legs and tip of left fore wing missing.

Remarks: F.-J. Pictet (1843: 148) mentioned only two specimens from Vienna, figured on plate XII, fig. 1 (male) and fig. 3 (female). For a detailed discussion of Serville's material see Ulmer (1921: 233-239). Ludwig Parreyss (1796-1879) was an established dealer in natural history specimens (mostly insects and birds) in Vienna and the MNW acquired very frequently material from him.

Campsurus dorsalis (Burmeister, 1839)

Palingenia dorsalis Burmeister, 1839: 803. – F.-J. Pictet, 1843-1845: 153-154, pl. 13, fig. 5.

Campsurus dorsalis. – Eaton, 1883: 41 (transfer).

Material: NMW; 6 ♀ subimagines; N[atterer]. c[ollectio]. Y[panema]. [blue paper; presumably collected by J. Natterer in Ipanema, Sao Paulo, Brasil, 23°26'S 47°36'W] / Pictet vidit [slightly damaged].

Remarks: F.-J. Pictet mentioned only “deux exemplaires qui m'ont été communiqués par le musée de Vienne”. It seems probable that Kollar sent just a sample (2 specimens) to F.-J. Pictet but afterwards labelled the complete series accordingly.

Palingenia longicauda (Olivier, 1791)

Ephemera longicauda Olivier, 1791: 418.

Palingenia longicauda. – F.-J. Pictet, 1843-1845: 155-157, pl. 14, 14bis, 15, fig. 1 (transfer).

Material: NMW; 2 ♂ imagines; Ungarn, Friv[aldszky leg.].

Remarks: F.-J. Pictet (1843: 157 “de Hongrie”) mentioned specimens provided by Kollar. This probably relates to the mentioned material, but no specimens with F.-J. Pictet's label are to be found in the NMW collection.

Baetis fuscatus (Linnaeus, 1761)

Ephemera bioculata Linnaeus, 1758: 547 [*nomen suppressum*; see International Commission on Zoological Nomenclature, 1966: 209].

Cloe bioculata (Linnaeus, 1758). – Pictet, 1843-45: 244, pl. 4-35 (transfer).

Baetis fuscatus (Linnaeus, 1761). – Eaton, 1871: 111 (synonymization).

Material: NMW; 5 ♂ imagines [without data]; Pictet vidit / *Baetis venustus* Etn. [Ulmer's handwriting].

Remarks: F.-J. Pictet (1843: 244) did not expressly mention any specimens from Austria.

***Alainites muticus* (Linnaeus, 1758)**

Cloe pumila. – F.-J. Pictet, 1843-1845: 253, pl. 40, fig. 2. (nec *Cloe pumila* Burmeister, 1839; misidentification).

Baetis pumilus. – Eaton, 1870: 5 (transfer).

Baetis muticus (Linnaeus, 1758). – Bengtsson, 1912: 7 (synonymization).

Alainites muticus (Linnaeus, 1758). – Waltz *et al.*, 1994: 34 (transfer).

Material: NMW; 3 ♂ imagines; “Pictet vidit”, one male labelled “Baden [about 22 km southeast of Vienna], Kollar”.

Remarks: F.-J. Pictet mentioned “M. Kollar m’*en* a communiqué quelques exemplaires des environs de Vienne”. A female specimen of *B. muticus* bears the label: *vitreipennis* Kllr Pictet Aust[ria] [Kollar’s handwriting?] / *Baetis pumilus* Burm. [Ulmer’s handwriting]. Kollar’s manuscript name “*Cloe vitreipennis*” obviously has never been published and is therefore a *nomen nudum*.

***Caenis horaria* (Linnaeus, 1758)**

Caenis lactea. – F.-J. Pictet, 1843-1845: 276-277, pl. 43, figs 1-4, pl. 44 (nec *Oxygypha lactea* Burmeister, 1839; misidentification).

Caenis horaria (Linnaeus, 1758). – Jacob, 1974: 94.

Material: NMW; 2 ♂ imagines, 1 ♂ subimago; coll. Nat. Mus. Wien [without locality data].

Remarks: F.-J. Pictet did not mention that he received material from Kollar, but in the NMW three specimens presumably had originally been deposited under the name *Caenis lactea* Pictet and identified by Malzacher as: *Caenis horaria* (Linnaeus, 1758) / Malzacher det. 1983.

***Caenis luctuosa* (Burmeister, 1839)**

Oxygypha luctuosa Burmeister, 1839: 797.

Caenis luctuosa. – F.-J. Pictet, 1843-1845: 283-284, pl. 45, fig. 3 (transfer).

Material: NMW; 1 ♂, 1 ♀ (without data); Pictet vidit / *Caenis luctuosa* (Burmeister, 1839) / Malzacher det. 1983.

Remarks: F.-J. Pictet did not mention that he received material from Kollar. The female specimen presumably had originally been placed under *Caenis oophora* (see above).

***Ametropus fragilis* Albarda, 1878**

Ametropus fragilis Albarda, 1878: 129.

Material: MHNG; 1 ♂ imago; 600 81 Italie Anc[ienne] Coll[ection] / 192 61 / 30 / *Ametropus fragilis* Albarda

Eaton determ. [abdomen broken, remaining parts with fungal growth] (Fig. 9B).

Remarks: This specimen is intriguing. The identification made by Eaton is correct, because it is based on the peculiar arrangement of veins in the cubital and anal fields (Fig. 9A). Eaton (1885) did not mention this specimen from Italy, restricting the distribution of the species to the type locality in Holland. It is therefore possible that the specimen was identified by Eaton after the publication of his monograph. The first record of *A. fragilis* from Italy was by Turin *et al.* (1997). These authors suspected this surprising discovery to be due to a recent introduction with fishes from Eastern Europe. The fact that this specimen was collected more than 150 years ago indicates that further investigations on the distribution of this species in Italy are needed and that its occurrence may be natural. The recent discovery of *A. fragilis* in Croatia points in the same direction (Cuk *et al.*, 2015).

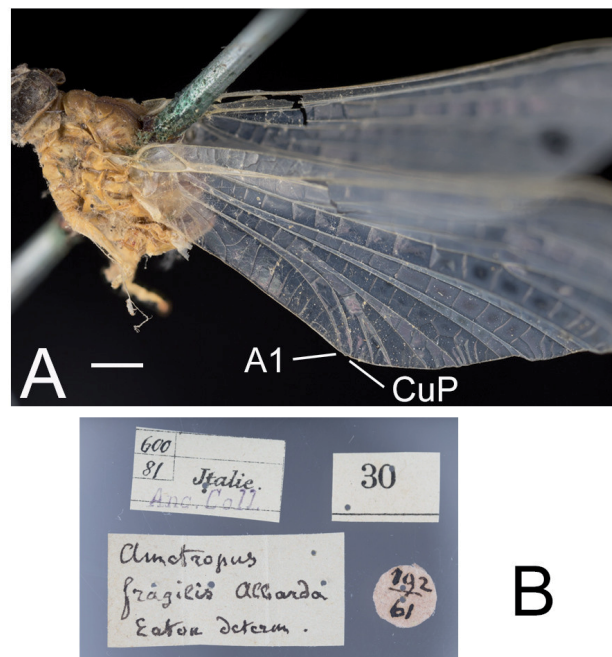


Fig. 9. *Ametropus fragilis* Albarda, 1878. (A) Male imago in dorso-lateral view; A1: first anal vein, CuP: posterior cubital vein. Scale bar: 1 mm. (B) Corresponding labels.

***Rhithrogena cincta* Navás, 1921**

Rhithrogena cincta Navás, 1921: 14, fig. 1. – Thomas, 1968a: 212 (lectotype designation).

Material: MHNG; 1 ♂ imago; 620 Pyrénées 48 Espagne coll. Pictet / Pyrénées Juillet 1859 / 149 [handwriting] / 24 [printed] / Pot[amanthus] n. sp. / *Rhithrogena aurantiaca* Burm. Eaton determ. [fore legs

missing, forewings damaged, genitalia rehydrated and put in microvial with glycerine].

Remarks: This specimen has certainly been collected by A.-E. Pictet on his way back to Geneva when he left San Ildefonso in mid July 1859. The identification by Eaton followed the common interpretation of *Baetis aurantiaca* at that time. Since then, it has been shown that Burmeister's concept of *R. aurantiaca* applies to an *Ecdyonurus* species (Puthz, 1973b). *Rhithrogena cincta* has been redescribed by Thomas (1968a), who designated from Navás' collection a lectotype originating from Vilallonga in the Spanish Pyrenees. The specimen collected by A.-E. Pictet completely fits the diagnosis proposed by Thomas (1968a), particularly in the shape of the styliger plate with well marked postero-lateral protuberances, in the marking of the abdomen, and in the marking of the coxae with two elongated stripes (see Thomas 1968a: pl. I, figs 2-3, pl. II, fig. 2 and Fig. 10). Penes lobes clearly correspond to those of the *diaphana*-group, but differences between *R. diaphana* and *R. cincta* are insignificant. The status of this species should be solved on the basis of new material. This specimen is only the second one known for this species.



Fig. 10. *Rhithrogena cincta* Navás, 1921. Male imago in lateral view. Scale bar: 1 mm.

ACKNOWLEDGMENTS

We are especially indebted to the curators of different museums for their invaluable help during the long duration of this research: Dr Bernd Hauser and later Dr Peter Schwendinger, curators at the MHNG, for their hospitality and for allowing us to study their collections; Jean Legrand (Muséum National d'Histoire Naturelle, Paris) for accepting to make inquiries in the collections for us, as well as for his hospitality during our numerous stays in Paris; Jean-Paul Haenni, former curator at the Musée d'histoire naturelle de Neuchâtel; Director Dr Christa Riedl-Dorn (Archivabteilung, NMW) for making Pictet's letter available to us, and to Director Mag. Dr Martin Lödl (Dept. II. Zoology-Insecta, NMW) and Curator Dr Susanne Randolph (Insecta varia, NMW) for

their extended hospitality. We are most indebted to Mr Laurent Christeller, Historical Archival Manager at the Fondation des Archives de la Famille Pictet, Geneva, for his help and for providing a painting of F.-J. Pictet. Finally our sincere gratitude goes to Dr Arne Haybach (Saarbrücken) and John Hollier (MHNG) for their constructive remarks, and to Dr Peter Schwendinger for his help in editing the manuscript.

REFERENCES

- Albarda H. 1878. Descriptions of three new European Ephemeroptera. *Entomologist Monthly Magazine* 15: 128-130.
- Aubert J. 1947. Notes sur la collection de Plécoptères du Muséum d'Histoire Naturelle de Genève (coll. Pictet). *Revue suisse de Zoologie* 54: 545-552.
- Bae Y.J., McCafferty W.P. 1991. Phylogenetic systematics of the Potamanthidae (Ephemeroptera). *Transactions of the American Entomological Society* 117(3-4): 1-143.
- Bauernfeind E. 1990. Der derzeitige Stand der Eintagsfliegen-Faunistik in Österreich (Insecta: Ephemeroptera). *Verhandlungen der zoologisch-botanischen Gesellschaft, Wien* 127: 61-82.
- Bauernfeind E. 1991. *Rhithrogena zernyi* sp. n., ein neuer Vertreter der *diaphana*-Gruppe aus Jugoslawien (Insecta: Ephemeroptera). *Annalen des Naturhistorischen Museums in Wien* 92 (Serie B): 135-138.
- Bauernfeind E., Haybach A. 2012. Case 3594. *Ecdyonurus* Eaton, 1868 and *Ephemerella venosa* Fabricius, 1775 (currently *Ecdyonurus venosus*; Insecta, Ephemeroptera): proposed conservation of usage by designation of a neotype under ICZN (1999) Article 75.6. *Bulletin of Zoological Nomenclature* 69(4): 254-259.
- Bauernfeind E., Soldán T. 2012. The Mayflies of Europe. *Apollo Books, Ollerup* [now: Brill Publ., Leiden], 781 pp.
- Bengtsson S. 1912. An analysis of the Scandinavian species of Ephemeroptera described by older authors. *Arkiv för Zoologi* 7(36): 1-21.
- Bisconti R., Canestrelli D., Tenchini R., Belfiore C., Buffagni A., Nascetti G. 2016. Cryptic diversity and multiple origins of the widespread mayfly species group *Baetis rhodani* (Ephemeroptera: Baetidae) on northwestern Mediterranean islands. *Ecology and Evolution* 6(21): 7901-7910.
- Botosaneanu L., Schmid F. 1973. Les Trichoptères du Muséum d'Histoire Naturelle de Genève (situation en 1970-1971). *Revue suisse de Zoologie* 80(1): 221-256.
- Brauer F. 1876. Die Neuropteren Europas und insbesondere Oesterreichs mit Rücksicht auf ihre geographische Verbreitung [pp. 263-300]. In: Festschrift zur Feier des fünfundzwanzigjährigen Bestehens der Kaiserlich-Königlichen Zoologisch-Botanischen Gesellschaft Wien. *F.A Brockhaus, Leipzig*, 396 pp.
- Brauer F. 1878. Verzeichnis der Neuropteren Deutschlands und Oesterreichs. II. *Entomologische Nachrichten* 4(7): 85-90.
- Brauer F. 1885. Neuroptera des Gebietes von Herrnstein in Niederösterreich und der weiteren Umgebung [pp. 19-27]. In: Becker M.A. (ed.), Herrnstein in Niederösterreich 2(2). *Adolf Holzhausen, Wien*, 247 pp.
- Brauer F., Löw F. 1857. Neuroptera austriaca. Die im Erzherzogthum Oesterreich bis jetzt aufgefundenen Neuropteren nach der analytischen Methode zusammengestellt, nebst

- einer kurzen Charakteristik aller europäischen Neuropteren-Gattungen. *Gerold, Wien*, XXIII + 74 pp., 5 lithograph. Tafeln.
- Burmeister H. 1839. Ephemera. *Handbuch der Entomologie* 2(2): 788-804.
- Chopra B. 1928 (for 1927). The Indian Ephemeroptera (mayflies). *Records of the Indian Museum* 39: 91-138.
- Cruz P.V., Salles F.F., Hamada N. 2017. Phylogeny of *Callibaetis* (Ephemeroptera: Baetidae) based on morphology of nymphs and adults. *Zoologica Scripta* 46(2): 138-149.
- Cuk R., Cmrlec K., Belfiore C. 2015. The first record of *Ametropus fragilis* Albará, 1878 (Insecta: Ephemeroptera) from Croatia. *Natura Croatica* 24(1): 151-157.
- Curtis J. 1834. Descriptions of some nondescript British species of May-flies of anglers. *London and Edinburgh Philosophical Magazine and Journal of Science* (3)4(20): 120-125.
- Domínguez E., Molineri C., Pescador M.L., Hubbard M.D., Nieto C. 2006. Ephemeroptera of South America. *Pensoft Press, Sofia and Moscow*, 650 pp.
- Dufour L. 1841. Recherches anatomiques et physiologiques sur les Orthoptères, les Hyménoptères et les Névroptères. *Mémoires de l'Académie des Sciences de l'Institut Impérial de France* 7:265-647.
- Eaton A.E. 1868. An outline of re-arrangement of the genera of Ephemeridae. *Entomologist's Monthly Magazine* 5: 82-91.
- Eaton A.E. 1870. On some new British species of Ephemeridae. *Transactions of the Entomological Society of London* 1870(1): 1-8.
- Eaton A.E. 1871. A monograph of the Ephemeridae. *Transactions of the Entomological Society of London* 1871: 1-164.
- Eaton A.E. 1881. An announcement of new genera of the Ephemeridae. *Entomologist's Monthly Magazine* 17: 191-197.
- Eaton A.E. 1883-1888. A revisional monograph of recent Ephemeridae or mayflies. *Transactions of the Linnean Society of London* (2nd Ser. Zoology) 2: 1-352.
- Fabricius J.C. 1775. Systema entomologicae, sistens insectorum classes, ordines, genera, species, adjectis synonymis, locis, descriptionibus, observationibus. *Officina Libraria Kortii, Flensburgi, Lipsiae*, 832 pp.
- Fabricius J.C. 1777. Genera insectorum eorumque characteres naturales secundum numerum, figuram, situm et proportionem omnium partium oris adiecta mantissa specierum nuper detectarum. *M. F. Bartschii, Chilonii (=Kiel)*, i-xiv + 310 pp + 16 pl.
- Fitzinger L.J. 1868a. Geschichte des kais. - königl. Hof - Naturalien-Cabinetes zu Wien. II. Abtheilung: Periode unter Franz II. (Franz I. Kaiser von Österreich) bis zu Ende des Jahres 1815. *Sitzungsberichte der mathematisch - naturwissenschaftlichen Klasse der kaiserlichen Akademie der Wissenschaften* 58(1): 1013-1092.
- Fitzinger L.J. 1868b. Geschichte des kais. - könig. Hof - Naturalien-Cabinetes zu Wien. III. Abtlg.: Periode unter Kaiser Franz I. von Österreich von 1816 bis zu dessen Tode 1835. *Sitzungsberichte der mathematisch - naturwissenschaftlichen Klasse der kaiserlichen Akademie der Wissenschaften* 57(1): 35-120.
- Fitzinger L.J. 1880a. Geschichte des k. k. Hof-Naturalien-Cabinetes in Wien. IV. Abtheilung. Periode unter Kaiser Ferdinand I. von Österreich von 1830 bis zu Ende des Jahres 1841. *Sitzungsberichte der Kaiserlichen Akademie der Wissenschaften, Mathematisch-Naturwissenschaftliche Classe* 81: 267-329.
- Fitzinger L.J. 1880b. Geschichte des k. k. Hof-Naturalien-Cabinetes in Wien. V. Abtheilung. Periode unter Kaiser Ferdinand I. von Österreich von 1842 bis zum Rücktritte des Kaisers von der Regierung Anfang Dezember 1848. *Sitzungsberichte der Kaiserlichen Akademie der Wissenschaften, Mathematisch-Naturwissenschaftliche Classe* 82: 279-339.
- Flowers R.W., Peters W.L. 1981. *Stenonema mexicana* (Heptageniidae: Ephemeroptera) in southern Central America. *Entomological News* 92(4): 152-154.
- Gatolliat J.-L., Cavallo E., Vuataz L., Sartori M. 2015. DNA barcoding of Corsican mayflies (Ephemeroptera) with implications on biogeography, systematics and biodiversity. *Arthropod Systematics & Phylogeny* 73(1): 3-18.
- Gatolliat J.-L., Sartori M. 2008. What is *Baetis rhodani* (Pictet, 1843) (Insecta, Ephemeroptera, Baetidae)? Designation of a neotype and redescription of the species from its original area. *Zootaxa* 1957: 69-80.
- Gonzalez del Tanago M., Garcia de Jalon D. 1983. New Ephemerellidae from Spain (Ephemeroptera). *Aquatic Insects* 5(3): 147-156.
- Guérin E. 1829-1844. Iconographie du règne animal de G. Cuvier: ou, représentation d'après nature de l'une des espèces les plus remarquables, et souvent non encore figurées, de chaque genre d'animaux. Avec un texte descriptif mis au courant de la science. *J. B. Baillière, Paris*, 217 plates.
- Guérin E., Percheron A. 1838. Genera des insectes, ou exposition détaillée de tous les caractères propres à chacun des genres de cette classe d'animaux. Part 6, 10 pl., *Méguignon-Marvis, père et fils, Paris*, 358 pp.
- Hagen H.A. 1855. Die Ephemeriden-Gattung *Oligoneuria*. *Entomologische Zeitung, Stettin* 16: 262-270.
- Hagen H. 1888. Unsere gegenwärtige Kenntniss der Ephemeriden. *Stettiner Entomologische Zeitung* 49(7-9): 221-232.
- Harker J.E. 1954. The Ephemeroptera of Eastern Australia. *Transactions of the Royal Entomological Society of London* (ser. B) 105(12): 241-268.
- Haybach A. 2010. Katalog der aus Deutschland, Österreich und der Schweiz bekannten Eintagsfliegen und ihrer Synonyme (Insecta, Ephemeroptera). *Mainzer Naturwissenschaftliches Archiv* 32: 1-75.
- Hubbard M.D. 1975. The genus *Asthenopodes* Ulmer and its type species (Ephemeroptera: Polymitaecidae). *The Florida Entomologist* 58(2): 111-112.
- Hubbard M.D., Domínguez E. 1988. Synonymy of the neotropical mayfly genera *Asthenopus* and *Asthenopodes* (Ephemeroptera: Polymitaecidae: Asthenopodinae). *The Florida Entomologist* 71(2): 207-210.
- Imhoff L. 1852. *Oligoneuria rhenana*. *Bericht über die Verhandlungen der Naturforschenden Gesellschaft in Basel* 10: 177-180.
- International Commission on Zoological Nomenclature 1966. Opinion 787. *Ephemera bioculata* Linnaeus, 1758 suppressed under the plenary power for the purposes of the Principle of Priority but not for those of the Principle of Homonymy. *Bulletin of Zoological Nomenclature* 23(5): 209.
- International Commission on Zoological Nomenclature 1999. International Code of Zoological Nomenclature. *International Trust for Zoological Nomenclature, London*, 306 pp.
- International Commission on Zoological Nomenclature 2015. Opinion 2356 on Case 3594. *Ecdyonurus* Eaton, 1868 and

- Ephemera venosa* Fabricius (currently *Ecdyonurus venosus*; Insecta, Ephemeroptera): usage conserved by designation of a neotype for *Ephemera venosa*. *Bulletin of Zoological Nomenclature* 72(2): 162-163.
- Jacob U. 1974. Zur Kenntnis zweier *Oxycypha*-Arten Hermann Burmeisters (Ephemeroptera, Caenidae). *Reichenbachia* 15(14): 93-97.
- Jacob U. 1993. Zur Systematik und Verbreitung der europäischen Ephemerellidae (Ephemeroptera). *Verhandlungen Westdeutscher Entomologentag* 1992: 101-110.
- Jacobus L.M., McCafferty W.P. 2008. Revision of Ephemerellidae genera (Ephemeroptera). *Transactions of the American Entomological Society* 134(1-2): 185-274.
- Kimmins D.E. 1936. *Rhithrogena semicolorata* Curtis and *R. semitincta* Pictet (Ephemeroptera). *The Entomologist* 69: 279-280.
- Kimmins D.E. 1942a. Notes on Ephemeroptera. *The Entomologist* 75: 121-125.
- Kimmins D.E. 1942b. The British species of the genus *Ecdyonurus* (Ephemeroptera). *Annals and Magazine of Natural History* 11(9): 486-507.
- Kimmins D.E. 1960. The Ephemeroptera types of species described by A.E. Eaton, R. McLachlan and F. Walker, with particular reference to those in the British Museum (Natural History). *Bulletin of the British Museum (Natural History), Entomology* 9(4): 269-318.
- Kluge N.J. 2010. Redescription of the taxon *Tricorynatha* (Ephemeroptera, *Tricorythus* s.l.) based on new findings in Africa and Indonesia. *Russian Entomological Journal* 19(2): 79-104.
- Kluge N.J. 2020. Ephemeroptera of the world. Available at <http://www.insecta.bio.spbu.ru> [accessed 20.04.2020].
- Leach W.E. 1815. Entomology. *Brewster's Edinburgh Encyclopaedia* 9: 57-172.
- Lestage J.-A. 1917. Contribution à l'étude des larves des Ephémères paléarctiques. *Annales de Biologie Lacustre* 8(3/4): 213-458.
- Lestage J.-A. 1921. Les Ephémères indo-chinoises. *Bulletin et Annales de la Société Entomologique de Belgique* 61: 211-222.
- Linnaeus C. 1758. *Systema Naturae*, ed. X. L. *Salvii, Holmiae*, 824 pp.
- Linnaeus C. 1761. *Fauna Svecica sistens Animalia Sveciae regni: mammalia, aves, amphibia, pisces, insecta, vermes. Distributa per classes & ordines, genera & species, cum differentiis specierum, synonymis auctorum, nominibus incolarum, locis natalium, descriptionibus insectorum. L. Salvii, Holmiae*, 824 pp.
- Linné C. a. 1767. *Systema Naturae*, ed. XII., vol. 1., pars II. L. *Salvii, Holmiae*, 1327 pp.
- Lucentini L., Rebora M., Puletti M.E., Gliarelli L., Fontaneto D., Gaino E., Panara F. 2011. Geographical and seasonal evidence of cryptic diversity in the *Baetis rhodani* complex (Ephemeroptera, Baetidae) revealed by means of DNA taxonomy. *Hydrobiologia* 673(1): 215-228.
- Malzacher P. 1984. Die europäischen Arten der Gattung *Caenis* Stephens (Insecta: Ephemeroptera). *Stuttgarter Beiträge zur Naturkunde* (Serie A, Biologie) 373: 1-48.
- Malzacher P. 1986. Diagnostik, Verbreitung und Biologie der europäischen *Caenis*-Arten (Ephemeroptera: Caenidae). *Stuttgarter Beiträge zur Naturkunde* (Serie A, Biologie) 387: 1-41.
- McCafferty W.P. 1996. The Ephemeroptera species of North America and index to their complete nomenclature. *Transactions of the American Entomological Society* 122(1): 1-54.
- McCafferty W.P., Bae Y.J. 1992. Taxonomic status of historically confused species of Potamanthidae and Heptageniidae (Ephemeroptera). *Proceedings of the Entomological Society of Washington* 94(1): 169-171.
- Meyer-Dür L.R. 1864. Beobachtungen auf einer entomologischen Reise während des Sommers 1863 durch das Seegebiet von Tessin und Oberengadin. *Mitteilungen der Schweizerischen Entomologischen Gesellschaft* 1(7): 219-225.
- Meyer-Dür L.R. 1874. Die Neuropteren-Fauna der Schweiz. *Mitteilungen der Schweizerischen Entomologischen Gesellschaft* 4(6): 281-436.
- Molineri C. 2010. A cladistic revision of *Tortopus* Needham & Murphy with description of the new genus *Tortopsis* (Ephemeroptera: Polymitarcyidae). *Zootaxa* 2481: 1-36.
- Molineri C., Salles F.F., Peters J.G. 2015. Phylogeny and biogeography of Asthenopodinae with a revision of *Asthenopus*, reinstatement of *Asthenopodes*, and the description of the new genera *Hubbardipes* and *Priasthenopus* (Ephemeroptera, Polymitarcyidae). *ZooKeys* 478: 45-128.
- Müller O.F. 1776. *Zoologiae Danicae Prodomus, seu Animalium Daniae et Norvegiae indigenarum characteres, nomina, et synonyma imprimis popularium. Hallageri, Havniae [Copenhagen]*, xxxii + 274 pp.
- Müller-Liebenau I. 1969. Revision der europäischen Arten der Gattung *Baetis* Leach, 1815 (Insecta, Ephemeroptera). *Gewässer und Abwässer* 48/49: 1-214.
- Navás L. 1921. Mis excursiones científicas del verano de 1919. *Memorias de la Real Academia de Ciencias y Artes de Barcelona* 17: 143-169.
- Needham J.G., Murphy H.E. 1924. Neotropical mayflies. *Bulletin of the Lloyd Library* (22, Entomological Serie) 4: 1-79.
- Oloff W.D. 1960. Hydrobiological studies of the Tugela River System. Part I. The main Tugela River. *Hydrobiologia* 14(3-4): 281-385.
- Olivier G.A. 1791. *Encyclopédie méthodique. Histoire naturelle. Insectes. Panchoucke, Paris*, 704 pp.
- Peters J.G., Arvy L., Peters W.L. 1980. Pictet et Eaton: les premiers spécialistes des Ephéméroptères [pp. 531-537]. In: Flanagan J.F., Marshall K.E. (eds), *Advances in Ephemeroptera Biology. Plenum Press, New York*, 552 pp.
- Pictet A.-E. 1865. Synopsis des Névroptères d'Espagne. *H. Georg, Genève*, 123 pp.
- Pictet F.-J. 1834. Recherches pour servir à l'histoire et à l'anatomie des Phryganides. *A. Cherbuliez, Genève*, 240 pp. + 20 pl.
- Pictet F.-J. 1841-1842. Histoire naturelle des Insectes Névroptères. Première monographie: Famille des Perlides. *J. Kessmann, Genève*, 446 pp. + 33 pl.
- Pictet F.-J. 1843-1845. Histoire naturelle des Insectes Névroptères. Famille des Ephémérines. *J. Kessmann, Genève*, 300 pp. + 47 pl.
- Pictet F.-J. 1846. Considérations générales sur les débris organiques qui ont été trouvés dans l'Ambre et en particulier sur les insectes. *Bibliothèque Universelle de Genève, Archives des sciences physiques et naturelles* 2: 5-16.
- Pictet F.-J., Hagen H. 1856. Die im Bernstein befindlichen Neuropteren der Vorwelt [pp. 41-126]. In: Berendt G.C.

- (ed), Die in Bernstein befindlichen organischen Reste der Vorwelt, gesammelt und in Verbindung mit Mehreren herausgegeben, 2. Band, 2. Abtheilung. *Nicolaische Buchhandlung, Berlin*, 2 + 126 pp.
- Poda N. 1761. Insecta musei Graecensis, quae in ordines, genera et species juxta systema naturae Caroli Linnaei digessit. *Hoeredes Widmanstadii, Graecii*, 127 pp.
- Puthz V. 1973a. Eintagsfliegen (Ephemeroptera) aus Südamerika. *Opuscula Zoologica Budapest* 12(1-2): 91-97.
- Puthz V. 1973b. Was ist *Baetis aurantiaca* Burmeister 1839 (Ephemeroptera, Insecta)? *Philippia* 1(5): 262-270.
- Puthz V. 1973c. Zwei neue Synonyme in der Gattung *Epeorus* Eaton (Insecta, Ephemeroptera: Heptageniidae). Sur les Ephéméroptères du Muséum d'histoire naturelle de Genève. III. *Revue suisse de Zoologie* 80(2): 577-580.
- Puthz V. 1975. Über einige europäische Heptageniiden (Insecta, Ephemeroptera). Sur les Ephéméroptères du Muséum d'histoire naturelle de Genève. IV. *Revue suisse de Zoologie* 82(2): 321-333.
- Puthz V. 1977. Bemerkungen über europäische *Siphonurus*-Arten (Insecta, Ephemeroptera). *Reichenbachia (Staatliches Museum für Tierkunde in Dresden)* 16(16): 169-175.
- Puthz V. 1978. Ephemeroptera [pp. 256-263]. In: Illies J. (ed.), *Limnofauna Europaea*. *Gustav Fischer Verlag, Stuttgart*, 532 pp.
- Retzius A.I. 1783. Ephemera [pp. 56-57]. In: Caroli De Geer genera et species insectorum et generalissimi auctoris scriptis extraxit, digessit, latinae quand. partem reddidit, et terminologiam insectorum Linnaeanum addidit. *Siegfried Lebrecht Crusium, Lipsiae*, 220 pp.
- Rogenhofer A. 1889. Josef Mann. Ein Nachruf. *Wiener Entomologische Zeitung* 8(7): 241-245.
- Rostock M. 1888. Neuroptera germanica - Die Netzflügler Deutschlands. Die Netzflügler Deutschlands mit Berücksichtigung auch einiger ausserdeutscher Arten nach der analytischen Methode unter Mitwirkung von H. Kolbe bearbeitet. *Jahresbericht des Vereins für Naturkunde zu Zwickau* 18: 1-198.
- Rutschmann S., Gattolliat J.L., Hughes S.J., Baez M., Sartori M., Monaghan M.T. 2014. Evolution and island endemism of morphologically cryptic *Baetis* and *Cloeon* species (Ephemeroptera, Baetidae) on the Canary Islands and Madeira. *Freshwater Biology* 59(12): 2516-2527.
- Salles F.F., Soares E.D.G., Massariol F.C., Faria L.R.R. 2014. *Oligoneuria* Pictet: phylogenetic analysis and description of three new species from Brazil (Ephemeroptera: Oligoneuriidae). *Systematic Entomology* 39(2): 223-241.
- Sartori M., Dethier M. 1985. Faune aquatique du Canton de Genève: II. Ephéméroptères (Insecta, Ephemeroptera). *Mitteilungen der Schweizerischen Entomologischen Gesellschaft* 58: 493-510.
- Sartori M., Dethier M., De Sousa J. 1989. Faune aquatique de la région genevoise. III. Compléments aux Ephéméroptères (Insecta; Ephemeroptera). *Mitteilungen der Schweizerischen Entomologischen Gesellschaft* 62: 113-118.
- Sartori M., Zabric D., Jann B. 1996. Trois espèces d'éphémères nouvelles pour la faune de Suisse (Ephemeroptera: Baetidae, Leptophlebiidae). *Mitteilungen der Schweizerischen Entomologischen Gesellschaft* 69: 135-139.
- Saussure H. de 1879. Edouard Pictet. *Le Naturaliste. Journal des Échanges et des Nouvelles* 1: 134.
- Savigny J.C. 1817. Description de l'Égypte, ou recueil des observations et des recherches qui ont été faites en Égypte pendant l'Expédition de l'armée française, publiée par ordre du gouvernement. Histoire naturelle. Planches, vol. I. *Imprimerie Royale, Paris*, 2 pls.
- Say T. 1824. Zoology [pp. 253-278]. In: Keating W.H. (ed.), Narrative of an expedition to the source of St. Peter's River, Lake Winnepeck, Lake of the Woods, &c. &c. performed in the year 1823, by order of the Hon. J.C. Calhoun, Secretary of War, under the command of Stephen H. Long, Major U.S.T.E. Volume 2. comp. from the notes of Major Long, Messrs. Say, Keating, and Calhoun. *H.C. Carey & I. Lea, Philadelphia*, 444 pp.
- Say T. 1839. Descriptions of new North American neuropterous insects, and observations on some already described. *Journal of the Academy of Natural Sciences of Philadelphia* 8: 9-46.
- Schönemund E. 1930. Eintagsfliegen oder Ephemeroptera. In: Dahl F. (ed.), Die Tierwelt Deutschlands und der angrenzenden Meeresgebiete, 19 Teil. *Fischer Verlag, Jena*, 107 pp.
- Schott H.W. 1822. Tagebücher des k.k. Gärtners, Hr. H. Schott, in Brasilien. In: Schreibers K.v. (ed.), Nachrichten von den kaiserl. österreichischen Naturforschern in Brasilien und den Resultaten ihrer Betriebsamkeit, aus den Amtsrerhältnissen der k. k. Gesandtschaft am Hofe von Rio Janeiro an das k. k. Ministerium der auswärtigen Angelegenheiten in Wien, aus den Berichten und Briefen der Naturforscher an den k. k. Hof-Naturalienkabinettsdirector, Herrn Karl v. Schreibers. II Heft, Anhang. *Joseph Georg Traßler, Brünn*, 116 pp.
- Sowa R. 1971. Sur la taxonomie de *Rhithrogena semicolorata* (Curtis) et de quelques espèces voisines d'Europe continentale (Ephemeroptera: Heptageniidae). *Revue suisse de Zoologie* 77(4): 895-920.
- Spieth H.T. 1940. The genus *Ephoron*. *The Canadian Entomologist* 72(6): 109-111.
- Stephens J.F. 1836. Family III. - Ephemeridae, Leach. *Illustrations of British Entomology, Mandibulata* 6: 54-70, pl. 29.
- Studemann D., Tomka I. 1987. Contribution to the study of European Ephemerellidae (Ephemeroptera). I. Completion of description of three endemic Iberian species. *Mitteilungen der Schweizerischen Entomologischen Gesellschaft* 60: 361-378.
- Thomas A. 1968a. Quelques *Ecdyonurus* et *Rhithrogena* européens de la collection Navás (Ephemeroptera). *Annales de Limnologie* 4(2): 209-218.
- Thomas A. 1968b. Sur la taxonomie de quelques espèces d'*Ecdyonurus* du Sud-Ouest de la France. *Annales de Limnologie* 4(1): 51-71.
- Thomas A., Marie V., Brulin M. 2000. Corrections à la faune des Ephémères d'Europe occidentale: 2. *Epeorus assimilis* Eaton, 1885 est une espèce valide, distincte d'*E. sylvicolus* (Pictet, 1865) (Ephemeroptera, Heptageniidae). *Ephemera* 1(2): 85-91.
- Turin P., Bilo M.F., Belfiore C. 1997. Primo reinvenimento in Italia di *Ametropus fragilis* Albarda 1878 (Ephemeroptera: Ametropodidae). *Lavori della Società venetiana di Scienza Naturale* 22: 7-14.
- Ulmer G. 1913. Ephemeren aus Java, gesammelt von Edw. Jacobson. *Notes from the Leyden Museum* 35: 110-115.
- Ulmer G. 1916. Ephemeropteren von Äquatorial-Afrika. *Archiv für Naturgeschichte (Abteilung A)* 81(7): 1-19.
- Ulmer G. 1920a. Neue Ephemeropteren. *Archiv für Naturgeschichte (Abteilung A)* 11: 1-80.

- Ulmer G. 1920b. Übersicht über die Gattungen der Ephemeropteren, nebst Bemerkungen über einzelne Arten. *Stettiner Entomologische Zeitung* 81: 97-144.
- Ulmer G. 1921. Über einige Ephemeropteren-Typen älterer Autoren. *Archiv für Naturgeschichte* (Abteilung A) 87(6): 229-267.
- Ulmer G. 1924a. Einige alte und neue Ephemeropteren. *Konowia* 3: 23-37.
- Ulmer G. 1924b. Ephemeropteren von den Sunda-Inseln und den Philipinen. *Treubia* 6(1): 28-91.
- Ulmer G. 1929. 6. Ordnung: Eintagfliegen, Ephemeroptera (Agnatha). *Die Tierwelt Mitteleuropas* 4(3): 1-43.
- Vanzolini, P.E. 1993. As viagens de Johann Natterer do Brasil, 1817-1835. *Papeis Avulsos de Zoologia* 28(3): 17-60.
- Walsh B.D. 1863. Observations on certain N. A. Neuroptera, by H. Hagen, M. D., of Königsberg, Prussia; translated from the original French ms., and published by permission of the author, with notes and descriptions of about twenty new N. A. species of Pseudoneuroptera. *Proceedings of the Entomological Society of Philadelphia* 2: 167-272.
- Waltz R.D., McCafferty W.P., Thomas A. 1994. Systematics of *Alainites* n. gen., *Dipheter*, *Indobaetis*, *Nigrobaetis* n. stat., and *Takobia* n. stat. (Ephemeroptera, Baetidae). *Bulletin de la Société d'Histoire Naturelle de Toulouse* 130: 33-36.
- Williams H.C., Ormerod S.J., Bruford M.W. 2006. Molecular systematics and phylogeography of the cryptic species complex *Baetis rhodani* (Ephemeroptera, Baetidae). *Molecular Phylogenetics and Evolution* 40(2): 370-382.
- Zwick P. 1971. Die Plecopteren Pictets und Burmeisters, mit Angaben über weitere Arten (Insecta). *Revue suisse de Zoologie* 78(4): 1123-1194.