

In memory of Bruno Peter: fresh insights on the Swiss sawfly fauna (Hymenoptera, Symphyta)

With 18 figures and 1 table

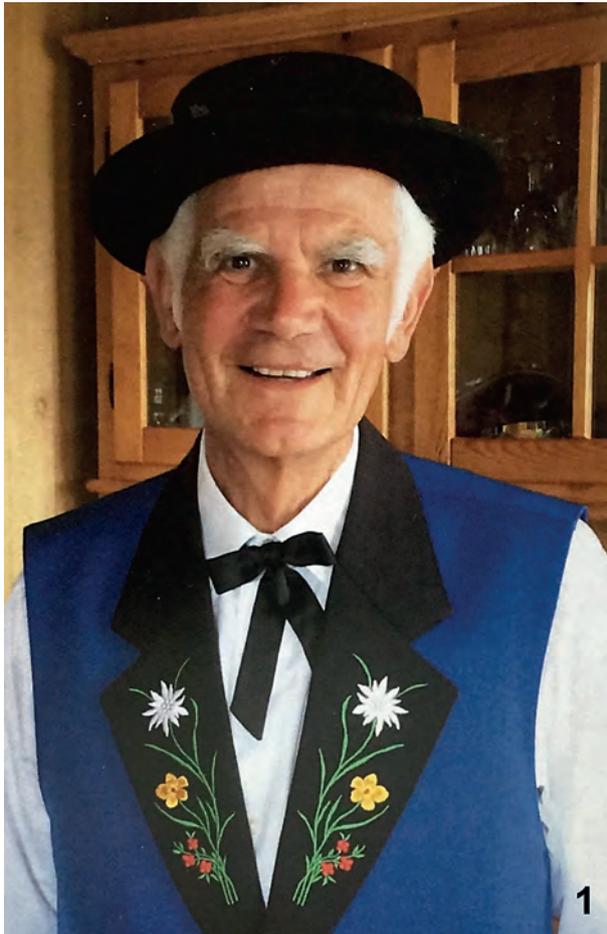
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Figs 1–2: Bruno Peter. Images courtesy of Emma Peter-Sager.

Abstract

Bruno Peter-Sager (1943–2018) was a Swiss entomologist who collected and studied sawflies, and published on these under the name Bruno Peter. His large collection is deposited in the Senckenberg Deutsches Entomologisches Institut, Müncheberg, Germany. Following a short biography, we present commentaries on noteworthy specimens from Switzerland and some general and specific characteristics of the Swiss sawfly fauna, based on his collection and database. Twenty sawfly species are recorded for the first time in Switzerland: *Aprosthemina bifurca*, *Arge fuscipennis*, *Cladardis hartigi*, *Dolerus altivolus*, *D. brevicornis*, *D. zhelochovtsevi*, *Empria fletcheri*, *Euura amentorum*, *E. cyrnea*, *E. longiserra*, *E. scotonota*, *Nescianeura noblecourti*, *Pristiphora depressa*, *P. luteipes*, *P. nigricans*, *Rhogogaster polaris*, *Taxonus alboscuteellatus*, *Tenthredo semicolon*, *Tenthredopsis tischbeinii*, and *Calameuta idolon*. Three species are removed from the national list: *Cladardis bordonii*, *Taxonus sticticus*, and *Tomostethus melanopygius*. Records from Switzerland of seven little-known or rarely recorded species are also discussed. Data for most specimens collected by B. Peter include altitude, enabling presentation of results of some analyses of species richness related to altitude, as well as examples of patterns of altitudinal abundance for selected species.

Key words

biography, Switzerland, new records, altitude, Argidae, Cephidae, Tenthredinidae, Xyelidae

Zusammenfassung

Bruno Peter-Sager (1943–2018) war ein Schweizer Entomologe, der Pflanzenwespen sammelte und studierte und unter dem Namen Bruno Peter darüber publizierte. Seine große Sammlung ist im Senckenberg Deutschen Entomologischen Institut, Müncheberg, Deutschland, deponiert. Nach einer kurzen Biographie werden bemerkenswerte Exemplare aus der Schweiz kommentiert und einige allgemeine und spezifische Merkmale der Schweizer Pflanzenwespenfauna vorgestellt, die auf seiner Sammlung und Datenbank basieren. Zwanzig Pflanzenwespenarten werden zum ersten Mal für die Schweiz gemeldet: *Aprosthemina bifurca*, *Arge fuscipennis*, *Cladardis hartigi*, *Dolerus altivolus*, *D. brevicornis*, *D. zhelochovtsevi*, *Empria fletcheri*, *Euura amentorum*, *E. cyrnea*, *E. longiserra*, *E. scotonota*, *Nescianeura noblecourti*, *Pristiphora depressa*, *P. luteipes*, *P. nigricans*, *Rhogogaster polaris*, *Taxonus alboscuteellatus*, *Tenthredo semicolon*, *Tenthredopsis tischbeinii*, und *Calameuta idolon*. Drei Arten werden von der nationalen Liste gestrichen: *Cladardis bordonii*, *Taxonus sticticus* und *Tomostethus melanopygius*. Die Nachweise von sieben wenig bekannten oder seltenen Arten aus der Schweiz werden ebenfalls diskutiert. Die Daten der meisten von B. Peter gesammelten Exemplare beinhalten die Höhenlage, so dass die Ergebnisse einiger Analysen des Artenreichtums in Abhängigkeit von der Höhenlage sowie Beispiele von Mustern der Höhenhäufigkeit für ausgewählte Arten präsentiert werden können.

Introduction

The paper by Theodor Steck (STECK 1893) laid the foundations for the systematic study of the sawfly fauna of Switzerland. A national checklist was published by LISTON (1981), but is now largely obsolete. This was followed by the checklist for all European countries within the area treated in “Fauna Europaea” (TAEGER et al. 2006), which listed 641 species as definitely present in Switzerland. A few taxa have since been added by BOILLAT (2010, 2016), LISTON et al. (2019), PETER (2012), SCHMIDT et al. (2017), and VIKBERG & LISTON (2009). The most up to date national inventory of species, with a cut-off date in 2018, can be accessed in the Electronic World Catalog of Symphyta, “ECatSym” (TAEGER et al. 2018).

Bruno Peter-Sager, whose entomological publications appeared under the name Bruno Peter, was foremost among the few entomologists who in recent decades have collected and studied sawflies in Switzerland. His

passion in the pursuit of his hobby was obvious, and the fact that his entomological work was conducted in his “spare” time, and paid for from his own pocket, deserves the highest recognition. His death came suddenly and unexpectedly, while he was still working on his collection and the associated database. We, the authors, knew him personally, and benefitted greatly from his friendship and freely shared knowledge. His large collection of pinned, adult sawflies, most of which were collected in Switzerland, was bequeathed to the Senckenberg Deutsches Entomologisches Institut, Müncheberg, and transferred there from his home in Unterägeri, Canton Zug, in 2019. This article highlights some of the “jewels” in his collection. Based on his data, we also present the results of some analyses of abundance and diversity, particularly with regard to the effect of altitude, for selected species and the whole Swiss sawfly fauna. At the same time, it should be noted that many of his specimens, particularly nematine

Tenthredinidae from higher altitudinal zones, remain at present undetermined. These are a valuable resource, which we hope will be used in future studies to help resolve the numerous taxonomic problems affecting the Nematinae, in particular the frequently unclear relationships of Alpine taxa to similar forms occurring in northern Europe.

Bruno Peter-Sager, 1943–2018: a short biography

Bruno Peter (Figs 1–2) grew up in central Switzerland. He first chose the profession of mechanic, but then took the adult school-leaving examination in order to be able to study. In 1969 he commenced studies in natural sciences, specialising in biology, at the Swiss Federal Institute of Technology (ETH) in Zurich. In 1974 he wrote his diploma thesis on faunistic-ecological studies on the sawfly fauna of the Uetliberg area (Canton Zurich), carried out at the Entomological Institute of the ETH Zurich under the supervision of Prof. Dr. W. Sauter.

After completing his studies, Bruno Peter trained as a teacher and was appointed to teach biology and natural sciences at various Swiss schools. During his early teaching career he married Emma Peter-Sager, with whom he had three children. During the school holidays, the family was always on the move with tent and backpacks, mostly in the mountains, on insect-collecting tours. He remained faithful to the teaching profession for 30 years.

In 2003, Bruno took early retirement from teaching in order to once again be active as a scientist. A lively exchange with insect specialists from all over Europe, and the associated travel, gave him a great sense of fulfillment. He also received numerous commissions from Swiss museums to identify the existing sawfly collections.

His almost 50 years of sawfly collecting culminated in him taking his grandson on hikes, during which he passed on his love of nature, and his view of the wonderful world of insects.

Unfortunately, an unexpected brain haemorrhage put an abrupt end to his life's work.

Material and methods

Abbreviations and symbols:

BPDB Bruno Peter database
 SDEI Senckenberg Deutsches Entomologisches Institut, Müncheberg, Germany
 MHNN Musée d'Histoire Naturelle, Neuchâtel, Switzerland
 NMBS Naturhistorisches Museum Bern, Switzerland

* An asterisk indicates that a species is recorded for the first time in Switzerland

Note: Some specimens from the MHNN had been sent to B. Peter for determination, and at the time of his death had not been returned. Those which he had determined to species level are indicated in the BPDB as belonging to the MHNN, and the ownership of some other previously unidentified specimens was clarified by Jean-Paul Haenni.

Bruno Peter maintained a comprehensive database (BPDB) for specimens in his collection, together with specimens which he had studied in other collections (mostly institutional and private collections in Switzerland). The database was also deposited in the SDEI, as a hodgepodge of different Filemaker database files (“fmp12”) in various folders labelled with the years 2013–2018. For an analysis, conducted by Jansen, the most recent version was selected: 20180116SymFeldOrtDetData.fmp12 [14.6 MB / 21500 datasets]. The objective was to derive an intuitively readable and searchable structure. This initially failed, due to the internal structure of the database, so that a detailed analysis and a complete rebuild was necessary.

The original structure of Bruno's database, and how the data were subsequently handled, are described in a comprehensive protocol by Jansen, available on request from the authors.

Finally, the restructuring and editing made over 99 % of the data evaluable, in an exchangeable format (Excel table). In total they comprise 23,266 datasets and 5,476 localities, referring to 35,333 individual specimens of approximately 665 taxa, including 13,277 individuals of approximately 585 taxa in Coll. Bruno Peter. 33,653 individuals are from Switzerland.

WGS84 coordinates were used only exceptionally in the BPDB. The norm adopted both in his database and on specimen labels was the CH1903 (or LV03; EPSG-Code: 21781) “Swiss Grid”. But for about 75 % of the sites in the database no coordinates were given, so that extensive georeferencing was necessary. For inclusion in the World Symphyta database of the SDEI, the WGS84 coordinates were used and, to comply with Swiss standards, converted to CH1903 data. In the data given below WGS84 coordinates were clipped to three digits (these three digits span an area of about 77 x 113 metres in Switzerland), and are followed [in square brackets] by the coordinates of the CH1903 system in the 1 km representation.

However, in some cases we encountered difficulties in reconciling his electronic data with the label data of specimens in his collection. Often, a data set for an individual specimen differed only slightly in the orthography of a locality name, the altitude, date of collection, or name

of the collector. In most of these cases, the data given below are according to the label data, especially when the specimens were not collected by Bruno. However, for specimens collected by Bruno during the last few years, the data for specimen labels were evidently culled from the BPDB, and in these cases we have relied on the content of the database. Where discrepancies were detected, the electronically held data were corrected accordingly.

More problematic are cases where Bruno's datasets apparently involve more than one specimen with very similar or identical data, but are recorded by him as deposited in different collections. We cannot be sure whether some of these datasets in fact refer to the same specimen. At the same time, no voucher specimens were located for many datasets, although he had recorded the specimens as in his collection. Part of the collection, while still in Bruno's home at Unterägeri, Canton Zug, had suffered from mould caused by dampness resulting from a defect to the building. Damage to some specimens received at the SDEI was severe. Possibly some of the missing specimens had already been disposed of, for this reason. This problem might affect the success of attempts to obtain genetic data from the material.

Some specimens in Bruno's collection had remained unidentified, or were under names different from those used here. The determinations of nearly all specimens mentioned in this article were checked or undertaken by Liston. Exceptions are explicitly indicated. Unless otherwise specified, specimens were collected by Bruno Peter, and are in the SDEI collection. In the Results, taxa are ordered alphabetically, records alphabetically according to the name of the canton, and collection events in the same canton chronologically. We mostly follow the nomenclature of TAEGER et al. (2018), rather than that adopted by LACOURT (2020a, b).

Results

Argidae

**Aprosthemina bifurca* (KLUG, 1834)

Ticino: 1 ♂, Somazzo, Torretta-Ost, 550–650 m, +45.879 +8.990 [720/082], 01.08.1990, leg. L. Rezbanyai. Two datasets in BPDB containing exactly the same data are considered to refer to this same specimen, mistakenly recorded twice at an interval of about two years.

Only a very few records of *Aprosthemina bifurca* exist, mostly from eastern parts of central Europe. However, the taxonomy of *Aprosthemina* is currently so badly understood, that it is impossible to gain a reliable picture of the true distributions of the species. LACOURT (2020a, b) provided a provisional key to European species.

**Arge fuscipennis* (HERRICH-SCHÄFFER, 1835)

Ticino: 1 ♂, Gandria, Gandrigna, 345 m, +46.006 +9.002 [721/096], 01.06.1986, leg. G. Cotti. 1 ♂, Mte Generoso, Bellavista, 1150–1160 m, +45.906 +9.003 [721/085], 21.05.1995, leg. L. Rezbanyai. According to BPDB: 1 ♀ [not examined], Valais, Saxon, +46.151 +7.179 [579/111], leg. Steck (NMBS).

This rarely recorded species has an extensive range in southern and eastern Europe, to the Orenburg area in Russia. According to KOSTJUNIN (2015), records from western Siberia are wrong. The record from Saxon seems to be the most westerly for the species.

Arge stecki BENSON, 1939

Valais: 1 ♀ (DEI-GISHym84732), Imfeld-Albrun, 1500–1850 m, +46.364 +8.185 [657/135], 29.5.1955, leg. E. Handschin.

This is the third identified specimen of *Arge stecki*, which was previously only known from the female holotype and one male paratype collected in mid- to late June 1935 in Valais, Val d'Hérens, Ferpècle, at around 1800 m (BENSON 1939). SCHEDL (1983) re-described *A. stecki* and the characters which distinguish adults from other European *Arge* species with a similar colour pattern. Some images of DEI-GISHym84732 are reproduced as Fig. 3.

Cephalidae

Caenocephalus lunulatus (STROBL, 1895)

Aargau: 1 ♂, Döttingen, Unterwald, 340 m, +47.533 +8.223 [659/265], 06.05.2008.

Solothurn: 1 ♀ (DEI-GISHym19780), Olten, Hasenweid, OL01, +47.356 +7.896 [634/245], 23.04.2011, leg. G. Artmann-Graf (Coll. Artmann-Graf, Olten).

Zürich: 1 ♀, Illnau-Effretikon, Soorhaldenstrasse, 510 m, +47.413 +8.723 [696/252], 19.05.1974, leg. W. Sauter.

Mentioned as occurring in Switzerland by SCHMIDT et al. (2017: Appendix S5), based on the specimen DEI-GISHym19780 (above), but without other collection data. Apart from the Swiss specimens listed above, *Caenocephalus lunulatus* was previously known in Europe only from five specimens, collected in Croatia (Dalmatia), Slovakia, Poland, Austria, and Germany according to ROLLER & OLISOVSKY (2012), who suggested that the host plant is *Spiraea salicifolia*, based on the habitat of a female specimen collected in Slovakia, and because the known host of the North American *Caenocephalus aldrichi* BRADLEY, 1905 is a rosaceous shrub. The Swiss specimens were all collected in or close to human settlements, and the holotype of *Cephus*

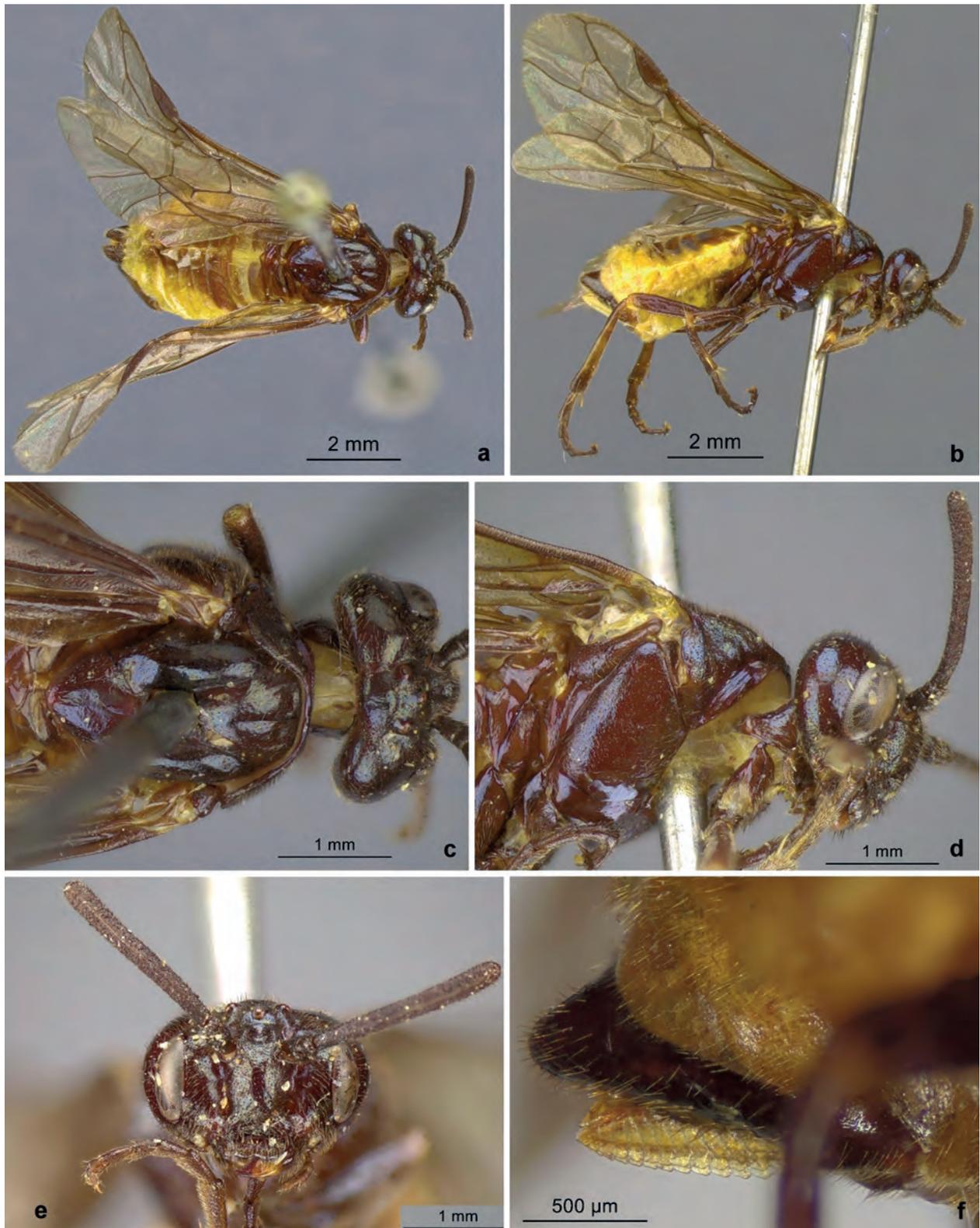


Fig. 3: *Arge stecki*. Female (DEI-GISHym84732). a complete dorsal; b complete lateral; c head and thorax dorsal; d head and thorax dorsal; e head frontal; f ovipositor.

lunulatus was collected [translated from German] “on shrubs in the monastery garden”, at Melk, Lower Austria (STROBL 1895). Given the widespread use of *Spiraea salicifolia* as a garden plant in Switzerland, particularly in hedges, ROLLER & OLISOVSKY’s host plant association is plausible, but requires corroboration.

**Calameuta idolon* (ROSSI, 1794)

Ticino: 1 ♀, Monte Generoso, 1200 m, +45.906 +9.003 [721/085], “6.vi.” [no year given], leg. G. C. Krüger.

In Europe, the species has a mainly Mediterranean distribution, already known to extend north to northern Italy (MASUTTI & PESARINI 1995) and Croatia (TAEGER et al. 2006). The Swiss locality is at the extreme northern edge of its European range.

Tenthredinidae

**Cladardis hartigi* LISTON, 1995

Neuchâtel: 2 ♀ ♀ 1 ♂, Grande Cassarde (Matile 77), forêt thermoph. / lisière, 545 m, +46.999 +6.938 [561/205], 29.04.1999, leg. J.-P. Haenni (1 ♀ 1 ♂ MHNN / 1 ♀ SDEI).

Ticino: 1 ♂, Val Canaria, Raled, +46.540 +8.639 [692/155], 1600 m, 01.06.1982. 1 ♂, Monte Caslano, Valentina +45.961 +8.875 [711/091], 380–500 m, 28.04.2005.

Zug: 1 ♂, Lorzentobel, Langmoos, 470 m, +47.162 +8.542 [683/224], 20.05.1974.

The distribution of this species in Europe is extensive: from southern Fennoscandia to northern Italy and Ukraine (TAEGER et al. 2006, PESARINI & SOMMAGGIO 2020). The record from the Val Canaria is remarkable for its high altitude: data for eleven other *C. hartigi* specimens collected in central Europe with altitude data in the SDEI database are from 150–570 m a.s.l.

**Dolerus altivolus* LACOURT, 1988

Graubünden: 1 ♀, Scuol, Mot Madlain, 2400 m, +46.727 +10.335 [821/179], 20.06.1955, leg. W. Eglin. 1 ♀, Val Müstair, Buffalora, 2080–2100 m, +46.647 +10.269 [816/170], 15.06.1980, leg. J.-P. Haenni, det. M. Heidema (MHNN). 1 ♀, Arosa, Arven, 2010–2070 m, +46.759 +9.646 [768/181], 18.06.2009.

Nidwalden: 1 ♀, Wolfenschiessen, Jochlirain, 1950 m, +46.902 +8.449 [677/195], 08.07.1985.

Ticino: 1 ♀, Quinto, Costa di Giubin, 2050–2100 m, +46.538 +8.717 [698/154], 24.07.1984. 1 ♀, Quinto, Pian Giubin, 2100–2160 m, +46.539 +8.730 [699/155], 24.07.1984. 1 ♀, Quinto, Taneda, 2300 m, +46.557

+8.699 [696/156], 11.07.1988. 1 ♀, Blenio, Foppe di Pönt, 1800–1860 m, +46.532 +8.862 [709/154], 06.06.2004. 1 ♀, Quinto, Pian Alto, 2230–2250 m, +46.538 +8.667 [694/154], 22.06.2006. 1 ♀, Quinto, Can. di Ritom, 1940–1960 m, +46.534 +8.692 [696/154], 04.07.2013. 1 ♀, Airolo, Alpe di Fieud, 2060–2090 m, +46.532 +8.560 [686/153], 26.06.2014. Uri: 1 ♀, Wassen, Wängen, 2000 m, +46.734 +8.456 [677/176], 17.06.1997.

Probably much more widely distributed in the Alps than published records indicate. Outside France, so far only previously recorded in Slovakia, Tatra Mts (ROLLER et al. 2006).

Dolerus asper ZADDACH, 1859

40 ♀ ♀ 73 ♂ ♂, Aargau, Basel-Landschaft, Bern, Graubünden, Luzern, Solothurn, Zug, Zürich, 320–1700 m, 10.03–08.06.

HEIDEMAA et al. (2004) re-established the status of *Dolerus asper* and *Dolerus brevicornis* (see below) as separate species.

**Dolerus brevicornis* ZADDACH, 1859

22 ♀ ♀ 17 ♂ ♂, Aargau, Graubünden, Luzern, Neuchâtel, Ticino, Zug, Zürich, 390–1800 m, 17.03–15.06.

Like *Dolerus asper* (see above), *D. brevicornis* is widespread and frequent in Switzerland.

**Dolerus zhelochovtsevi* HEIDEMAA & VIITASAARI, 2009

Bern: 1 ♂, Bern, +46.948 +7.448 [600/199], 21.03.1888, leg. T. Steck, det. M. Heidema. 1 ♀, Münchenbuchsee, Hofwil, 565 m, +47.022 +7.462 [601/207], 08.04.1892, leg. T. Steck, det. M. Heidema.

Thurgau: 2 ♂ ♂, Bürglen, 440 m, +47.550 +9.153 [729/267], 09.03.1948, leg. W. Sauter.

Zug: 1 ♂, Hünenberg, Schachenwiti, 394 m, +47.206 +8.419 [674/228], 19.04.2010. 1 ♂, as preceding, but 10.03.2011. 1 ♂, as preceding, but 21.03.2011. 1 ♀, as preceding, but 23.03.2011.

Previous to its description in BLANK et al. (2009), *Dolerus zhelochovtsevi* and *D. gibbosus* HARTIG, 1837 were treated as a single species, often under the latter name. *Dolerus gibbosus*, for which there are no verified records from Switzerland, is much more rarely recorded in Europe than *D. zhelochovtsevi*.

**Empria fletcheri* (CAMERON, 1878)

Bern: 1 ♀ 3 ♂♂, Tramelan, La Tourbière, 980 m, +47.225 +7.048 [570/230], 04.06.2003, leg. J.-P. Haenni (1 ♀ 1 ♂ SDEI, 2 ♂♂ MHNN).

Neuchâtel: 1 ♀ (DEI-GISHym84716), La Chaux-Du-Milieu, Le Cachot, tourbière [peat bog], 1050 m, +47.002 +6.671 [541/205], 17.06.1977, Malaise trap, leg. J.-P. Haenni (MHNN).

(1985) recorded an unspecified number of specimens of unspecified sex under the name *E. fletscheri* (misspelling) from Germany, “Ilbeshausen und Schmelztal b. Gießen im 5 [in May]”. Currently, however, *Empria fletcheri* is not recognized as having been reliably recorded from Germany (BLANK et al. 2001, LISTON et al. 2012a). Secondly, KUST & RESSL (2015) recorded an unspecified number of specimens of unspecified sex of “*E. fletscheri*” from two localities in Austria (Scheibbs District, Lower

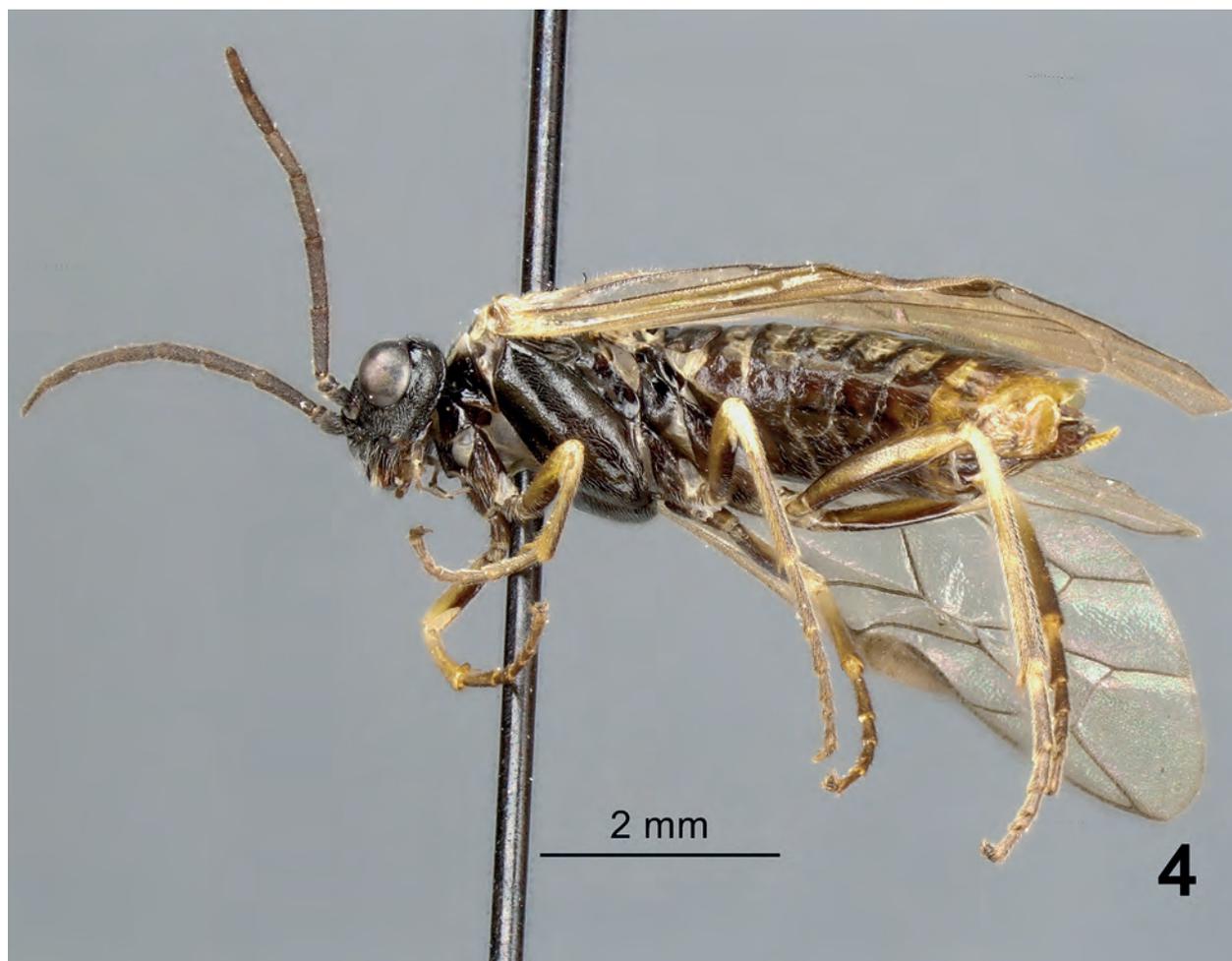


Fig. 4: *Empria fletcheri*. Female (DEI-GISHym84716), lateral.

Empria fletcheri has previously been found locally, usually in small numbers, in northern Europe, particularly Fennoscandia, but also in Estonia (PROUS 2012) and the Scottish Highlands, where the type locality is located (LISTON et al. 2012b). The host plants in northern Europe are *Betula nana*, *B. pubescens*, and *B. humilis* (PROUS 2012). V. Vikberg (personal communication), recorded both *B. nana* and *B. pubescens* as hosts in oviposition experiments. However, in Fennoscandia *B. nana* may be the main host, based on field occurrences of adults as observed by M. Prous and A. Liston (unpublished).

Correctly, in our opinion, LACOURT (2020a, b) gave the (European) distribution of *E. fletcheri* as only “Northern Europe”. However, published records under this species name do exist for Central Europe: Firstly, WEIFFENBACH

(Austria), determined by H. Weiffenbach. Based on this, SCHEDL (2017) added *E. fletcheri* to the faunal list of Austria. If these purported German or Austrian specimens can be located, they should be re-examined.

Generally, apart perhaps for some very dark specimens from the extreme northern edge of its range (e.g. Kiruna Municipality, Swedish Lapland), female *E. fletcheri* are reliably distinguishable from other European *Empria* by the red-brown colour of parts of the distal abdominal segments. The two Swiss females show this very clearly (Fig. 4). Identification of males is somewhat more difficult, although useful external characters were already described by BENSON (1952). In view of the significance of records from Central Europe, their penis valves should be examined. The differences

between the penis valves of *E. fletcheri* and *E. immersa* (KLUG, 1818), the species with which it is most likely to be mixed up, were illustrated in LISTON et al. (2012b). One male specimen recorded in the B. Peter database as *E. fletcheri* (Graubünden: Pontresina, Morteratsch, 2011 m, +46.429 +9.939 [792/145], 19.06.2008, leg. Riesen), with corresponding determination label, is *E. immersa*, det. M. Prous. Finally, we note that both of the Swiss localities of *E. fletcheri* are among the few central European sites where apparently still thriving populations of *Betula nana* occur: <https://www.info-flora.ch/en/flora/betula-nana.html#map>.

**Euura amentorum* (FÖRSTER, 1854)

Bern: 1 ♀, Limpach, KGF 87.1 F4W 8, +47.110 +7.499 [604/217], 30.04.1987, leg. P. Duelli.

A widespread species in northern and central Europe, but rarely recorded in the more southern parts of its range.

**Euura cyrnea* (LISTON, 2005)

Zug: 1 ♀, Unterägeri, Berneren, 930–980 m, +47.137 +8.581 [686/221], 04.05.2006.

A widespread species in northern and central Europe, but infrequently recorded (LISTON et al. 2017).

**Euura longiserra* (THOMSON, 1863)

Zug: 1 ♀, Unterägeri, Ampferenboden, 1260–1340 m, +47.089 +8.571 [686/215], 25.05.2009.

A widespread species in northern and central Europe, but infrequently recorded. Unlike the above specimen, from the montane zone, most records are from lowland sites.

**Euura scotonota* (FÖRSTER, 1854)

Graubünden: 1 ♀, Arosa, Seehalde, 1760–1790 m, +46.787 +9.681 [771/184], 11.06.2012.

Neuchâtel: 1 ♀, La Chaux-Du-Milieu, Le Cachot, 1050 m, +47.002 +6.671 [541/205], 17.06.1977, leg. J.-P. Haenni (MHNN). 1 ♀, St. Sulpice (La Baume), 1190 m, +46.933 +6.564 [533/198], 24.06.1999, leg. J.-P. Haenni (MHNN).

A boreo-montane species, recorded sporadically in northern and central Europe (LACOURT 2020a, b; TAEGER et al. 2006).

Hoplocampa cantoti CHEVIN, 1986

Zürich: 1 ♀, Birmensdorf, Ob. Reppischtal, 480 m, +47.361 +8.419 [674/246], 12.04.1974.

Hoplocampa cantoti apparently has a wide range in southern parts of central Europe (LISTON et al. 2019, MACEK et al. 2020), but is probably often mixed up with other species. From Switzerland, only a single female from Canton Jura has previously been recorded (LISTON et al. 2019).

**Nescianeura noblecourti* LACOURT, 2006

Basel-Stadt: 1 ♂, Zool. Garten, 266 m, +47.545 +7.611 [613/266], 15–22.04.2005, leg. unknown.

This very distinctive species was previously known only from the female holotype (France, Lorraine, Saint Maurice-sur-Moselle) and a male and female from Germany (Baden-Württemberg, Grenzach-Wyhlen) (JANSEN 2017, PROUS et al. 2019). The Swiss and German localities are only about 8 km apart, and the French locality about 65 km from Basel Zoo.

Pristiphora aphantoneura (FÖRSTER, 1854)

Zug: 1 ♀, Baar, Neufeld, 430 m, +47.180 +8.507 [681/226], 08.05.1975. 1 ♀, Baar, Heiligchrüz, 500 m, +47.198 +8.534 [683/228], 24.04.1978. 1 ♀, Unteraegeri, Rigistrasse 29, 767 m, +47.142 +8.569 [685/221], 07.06.2003.

Zürich: 1 ♀, Zürich, Borrweg, 450 m, +47.360 +8.498 [680/246], 16.05.1973. 1 ♀, as preceding, but +47.362 +8.510 [680/246] 04.08.1973.

VIKBERG (2006) recognised that two species had previously been mixed under the name *Pristiphora aphantoneura* (in earlier literature mostly referred to as *P. fulvipes* (FALLÉN, 1808), a junior primary homonym). See also under *Pristiphora luteipes*, below.

**Pristiphora depressa* (HARTIG, 1840)

Solothurn: 1 ♀, Stüsslingen, 475 m, +47.394 +7.971 [640/249], 28.04.2008, leg. G. Artmann.

This is one of several related *Pristiphora* species whose larval hosts are maples (*Acer* spp.). A revised key to west Palaearctic species was presented by LISTON & PROUS (2020). *Pristiphora depressa* has a wide distribution in Europe, but is rarely collected.

**Pristiphora luteipes* LINDQVIST, 1955

Graubünden: 1 ♀, Pontresina, Val da Morteratsch, 1950–2000 m, +46.435 +9.938 [791/145], 21.06.2011.

Ticino: 1 ♀, Ritomsee, Passo Camoghe, 2100–2180 m, +46.531 +8.665 [694/154], 22.06.2006. 2 ♀ ♀, Airolo, Campiöi, 1230–1250 m, +46.522 +8.625 [691/153], 20.05.2010.

Zug: 1 ♀, Zugerberg, Ewegstaffel, 930 m, +47.131 +8.527 [682/220], 21.06.1974. 1 ♀, Oberägeri, Zigerhüttli, 980–990 m, +47.134 +8.651 [692/221], 07.05.2009.

Pristiphora luteipes occurs throughout most of Europe. Until a few years ago, it was mostly mixed up with *P. aphantoneura*, see above. These two species are very similar, and may not even be distinct (PROUS et al. 2017). However, based on the slightly sculptured and dull mesepisternum, the specimens above seem to belong to *P. luteipes*, whereas the specimens with an unsculptured (shiny) mesepisternum were determined as *P. aphantoneura*.

**Pristiphora nigricans* (EVERSMANN, 1847)

Bern: 1 ♀, Weissenburg im Simmental [„Weissburg Bern. Oberl.“] +46.658 +7.475 [602/167], undated, [? leg. T. Steck].

PROUS et al. (2017) presented identification characters for this rather rare and local species, whose only known host plant is *Sanguisorba officinalis*. It is not clear why MACEK et al. (2020: 576) also mentioned *Sanguisorba minor* as a host.

**Rhogogaster polaris* LINDQVIST, 1964

Graubünden: 2 ♂ ♂, Pontresina, Val da Morteratsch, 1950–2000 m, +46.435 +9.938 [791/145], 21.06.2011.

See TAEGER & VIITASAAI (2015) on the taxonomy and identification characters of this species. They considered that it is possibly restricted to northern Europe (Norway, Sweden, Finland and Russian Karelia). A record from France, Hautes Alpes, by CHEVIN (1972) under the name *Rhogogaster californica* (NORTON, 1862) might also refer to *R. polaris*, but according to TAEGER & VIITASAAI (2015) requires checking. LACOURT (2020a, b) gave only northern Europe as the known range of *R. polaris*.

**Taxonus alboscuteatus* NIEZABITOWSKI, 1899

Luzern: 2 ♂ ♂, Schwarzenberg, Rümli Schlucht, 750 m, +47.003 +8.175 [656/206], 01.06.1977. 1 ♀, Hasle, Bramösl, 970 m, +46.958 +8.056 [647/201], 11.07.1978.

Zug: 1 ♂, Unterägeri, Rämseibach, 720 m, +47.135 +8.559 [685/221], 26.05.1985. 1 ♂, as preceding, but 16.06.1985. 1 ♀, as preceding, but 15.06.1986. 1 ♀, as preceding, but 27.06.1987. 2 ♂ ♂, Unterägeri, Elsisried / Vorder Chuewart, 800 m, +47.126 +8.546 [684/220], 25.05.1986.

These specimens had all been identified as *Taxonus sticticus* (KLUG, 1817) by Bruno Peter, and the records were published under the names *Ametastegia stictica* by PETER (1981) and *Taxonus sticticus* by FLÜCKIGER & PETER (1998; Anhang). The female specimen referred to in the latter publication is almost certainly identical to that entered in B. Peter's database with the collection data: Solothurn, Lostorf, 540 m, +47.373 +7.902 [635/247], 29.06.1995, leg. P. Flückiger (Coll. Eidgenössische Forschungsanstalt für Wald, Schnee und Landschaft, Birmensdorf/ZH). We have not seen this specimen. However, it seems highly unlikely that specimens of *T. sticticus* and *T. alboscuteatus* could be mixed up, given their strikingly different colour patterns (see MACEK 2010). We assume that Peter's misidentification arose through his use of ENSLIN (1912–1918) for identification. ENSLIN, like most other authors prior to the revision of European *Taxonus* by TAEGER (1986), did not know *T. alboscuteatus*, and interpreted it as a synonym, or “variety” of *T. sticticus* or *Ametastegia perla* (KLUG, 1818). Until now, *T. alboscuteatus* was only known from a few localities in Ukraine, Slovak Republic, Poland, Czech Republic, and Germany (only one area in Thuringia). The Swiss records therefore seem to represent a major extension south-westwards of the species' known range. However, in this context we note that *T. alboscuteatus* was recently also identified in material collected in the southern Black Forest, Germany: 3 ♂ ♂, Baden-Württemberg, Todtnau, NSG Feldberg, S-exp. WR 300 m w ST., Wilhelmer Hütte, 1320 m., 08–30.05.2003, Malaise trap, leg. D. Doczkal (SDEI).

Tenthredo caucasica cinctaria (ENSLIN, 1912)

Bern: 1 ♂, Lenk, Simmenfälle, 1200–1300 m, +46.420 +7.478 [603/141], 26.06.2004, leg. S. Klopstein.
Valais: 1 ♀ 1 ♂, Ferden, Kumminalp, 2080 m, +46.402 +7.738 [623/139], 20.07.1998.

The subspecies *cinctaria* is restricted to the European Alps and the mountains of south-east Europe. SCHMIDT et al. (2017: Appendix S5) mentioned two specimens from Switzerland, but without any further details.

**Tenthredo semicolon* MOL, 2013

Graubünden: 1 ♂, Arosa: Rütland, 1500–1530 m, +46.785 +9.692 [772/184], 23.06.2010.

Uri: 1 ♀, Gurtellen, Cholgrueben, 710–750 m, 46.743 +8.643 [692/177], 19.05.2014.

Zug: 1 ♂, Unterägeri, Sod, 1010–1040 m, +47.107 +8.598 [688/218], 06.06.2010. Zürich: 1 ♀, Stallikon, Folenweid, 720 m, +47.333 +8.498 [680/243], 17.08.1973.

MOL (in TAEGER 2013) proposed *Tenthredo semicolon* as a replacement name for *Tenthredo punctulata* KONOW, 1887 [junior primary homonym in *Tenthredo*]. *Tenthredo punctulata* KONOW had previously generally been treated as conspecific with *Tenthredo colon* KLUG, 1817. Distinguishing characters for *T. colon* and *T. semicolon* were outlined by LISTON (2016) and LACOURT (2020a, b). The distribution and host plants of both species require clarification.

**Tenthredopsis tischbeinii* (FRIVALDSZKY, 1877)

Neuchâtel: 1 ♀, Val-de-Travers, Couvet, 780 m, +46.930 +6.625 [538/198], 11.08.1984, leg. Jeanneret (MHNN).

Widely distributed in central and southern Europe, but perhaps under-recorded because of its unusually late flight period.

Xyelidae

Pleroneura coniferarum (HARTIG, 1837)

Zug: 1 ♀, Hünenberg, Schachenwiti, 394 m, +47.206 +8.419 [674/228], 12.04.2013. 1 ♀, as preceding, but 06.04.2015. 1 ♀, as preceding, but 02.04.2016.

Rarely recorded in Switzerland. The only published record from Switzerland is from Aargau, Bremgarten, prior to 1893 (STECK 1893, BLANK 2002).

Species removed from the faunal list of Switzerland

Tenthredinidae

Cladardis bordonii ZOMBORI, 1976

PETER (2006) recorded *Cladardis bordonii* as new to Switzerland, based on “2 ♂♂, 08.05.?, Maroggia (TI) am Luganer See, leg. C. Krüger” (+45.934 +8.971 [718/088]). These two specimens are now in the SDEI Collection. They are *Eurhadinoceraea amauros* (ZOMBORI, 1977). A third male *E. amauros* specimen (DEI-GISHym12684), apparently belongs to the same series, but is labelled in B. Peter’s handwriting including the date 8.5.1893. It was mentioned by LISTON & PROUS (2020). 1 ♀, identified by B. Peter as *C. bordonii*: “[Italy: Lombardy] Cusano

[Cusano Milanino, +45.553 +9.184], 05.08.[19]19, Ad. Nadig” (SDEI) is *Cladardis elongatula* (KLUG, 1817). As far as we are aware, this record has not been published.

ZOMBORI (1976) described *Cladardis bordonii* from a single female, not examined, collected in Italy, Liguria. No other specimens of this species are known. His diagnosis of *C. bordonii* is: “The new species is at once separable from *C. elongatula* (KL.) by the general surface sculpture, the truncate clypeus (vs. triangularly excised front margin in *elongatula*), by the greater distance between cenchri (vs. closer together than width of one in *elongatula*), and by the very peculiar and striking feature on the outer orbit, i.e. a short but wide groove at the upper corner of the eye extending 1/3 distance downward (vs. smooth outer orbit without any indication of a groove in *elongatula*)”. The description of *C. bordonii* includes the statement “Abdomen [...] only 1st tergite smooth and shining, tergites 2–4 very densely striated, 5–9 weakly alutaceous [...]”. Based on examination of a large number of *C. elongatula* specimens in the SDEI, we disagree with ZOMBORI’s characterisation of the clypeus shape of that species. The lower margin is broadly, but shallowly, arcuately excised. In some specimens a small median depression, or even a notch, can be visualized, but only within a narrow range of viewing angles, when the specimen is tilted vertically relative to its longitudinal axis. We attribute this either to natural variability, or distortion arising from drying in the dead specimens. The apparent distance between the cenchri is somewhat variable in *C. elongatula*, and can be slightly more or less than the width of a cenchrus. The cenchri of the Italian female identified as *C. bordonii* by Peter are slightly further apart than the width of a cenchrus. The specimen lacks any indication of a groove or depression on the upper orbits or temples, and abdominal terga 1–4 are shiny, without conspicuous sculpture, whereas the distal terga are duller, mostly because of progressively denser pubescence: these character states agree with other specimens of *C. elongatula*.

Taxonus sticticus (KLUG, 1817)

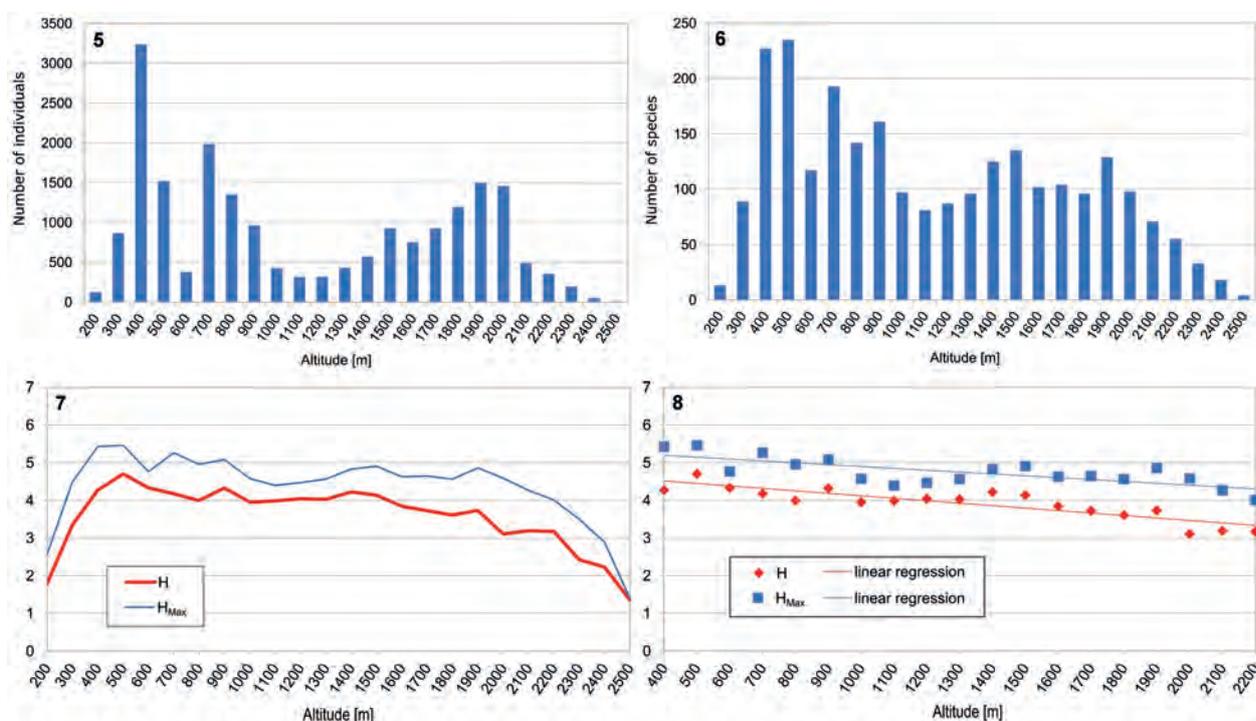
All records of this species from Switzerland are probably based on misidentifications of *Taxonus alboscuteellatus* (see under that name, above).

Tomostethus melanopygius (COSTA, 1859)

PETER (2006) recorded *Tomostethus melanopygius* as new to Switzerland based on a single female (SDEI) from Ticino. This specimen is *Parna tenella* (KLUG, 1816). The confirmed range of *T. melanopygius* currently includes only the South of Italy, with Sicily. A published record of a single female from the Burgenland, Austria, by FRANZ (1982), determined by B. Pittioni, has been gener-

Tab. 1: The twenty species each with number of individuals making up >1 % of total specimens collected by B. Peter in Switzerland.

| Rank | Species | No. individuals | % | Rank | Species | No. individuals | % |
|------|---|-----------------|------|------|--|-----------------|------|
| 1 | <i>Dolerus aeneus</i> HARTIG, 1837 | 1621 | 8.42 | 11 | <i>Dolerus vestigialis</i> (KLUG, 1818) | 390 | 2.02 |
| 2 | <i>Dolerus nigratus</i> (O.F. MÜLLER, 1776) | 876 | 4.55 | 12 | <i>Tenthredo mioceras</i> (ENSLIN, 1912) | 377 | 1.96 |
| 3 | <i>Tenthredo arcuata</i> FORSTER, 1771 | 830 | 4.31 | 13 | <i>Tenthredo algoviensis</i> ENSLIN, 1912 | 333 | 1.73 |
| 4 | <i>Pachyprotasis rapae</i> (LINNAEUS, 1767) | 602 | 3.13 | 14 | <i>Macrophya duodecimpunctata</i> (LINNAEUS, 1758) | 311 | 1.61 |
| 5 | <i>Tenthredo velox</i> FABRICIUS, 1798 | 455 | 2.36 | 15 | <i>Rhogogaster punctulata</i> (KLUG, 1817) | 304 | 1.58 |
| 6 | <i>Tenthredo brevicornis</i> (KONOW, 1886) | 433 | 2.25 | 16 | <i>Tenthredo notha</i> KLUG, 1817 | 247 | 1.28 |
| 7 | <i>Dolerus bimaculatus</i> (GEOFFROY, 1785) | 424 | 2.20 | 17 | <i>Dolerus gonager</i> (FABRICIUS, 1781) | 213 | 1.11 |
| 8 | <i>Tenthredo olivacea</i> KLUG, 1817 | 421 | 2.19 | 18 | <i>Athalia cordata</i> SERVILLE, 1823 | 211 | 1.10 |
| 9 | <i>Tenthredo mesomela</i> LINNAEUS, 1758 | 406 | 2.11 | 19 | <i>Dolerus bensoni</i> P.R. MÜLLER, 1985 | 211 | 1.10 |
| 10 | <i>Tenthredo crassa</i> SCOPOLI, 1763 | 392 | 2.04 | 20 | <i>Tenthredo vespa</i> RETZIUS, 1783 | 200 | 1.04 |

**Figs 5–8:** 5 Number of individuals per altitude zone; 6 Number of species per altitude zone; 7 Diversity within each altitude zone. y-axis: index of diversity; 8 Diversity in the altitude zones 400 to 2200 m. y-axis: index of diversity.

ally accepted as evidence for an occurrence in Austria (e.g. by TAEGER et al. 2006), but this specimen should be re-examined.

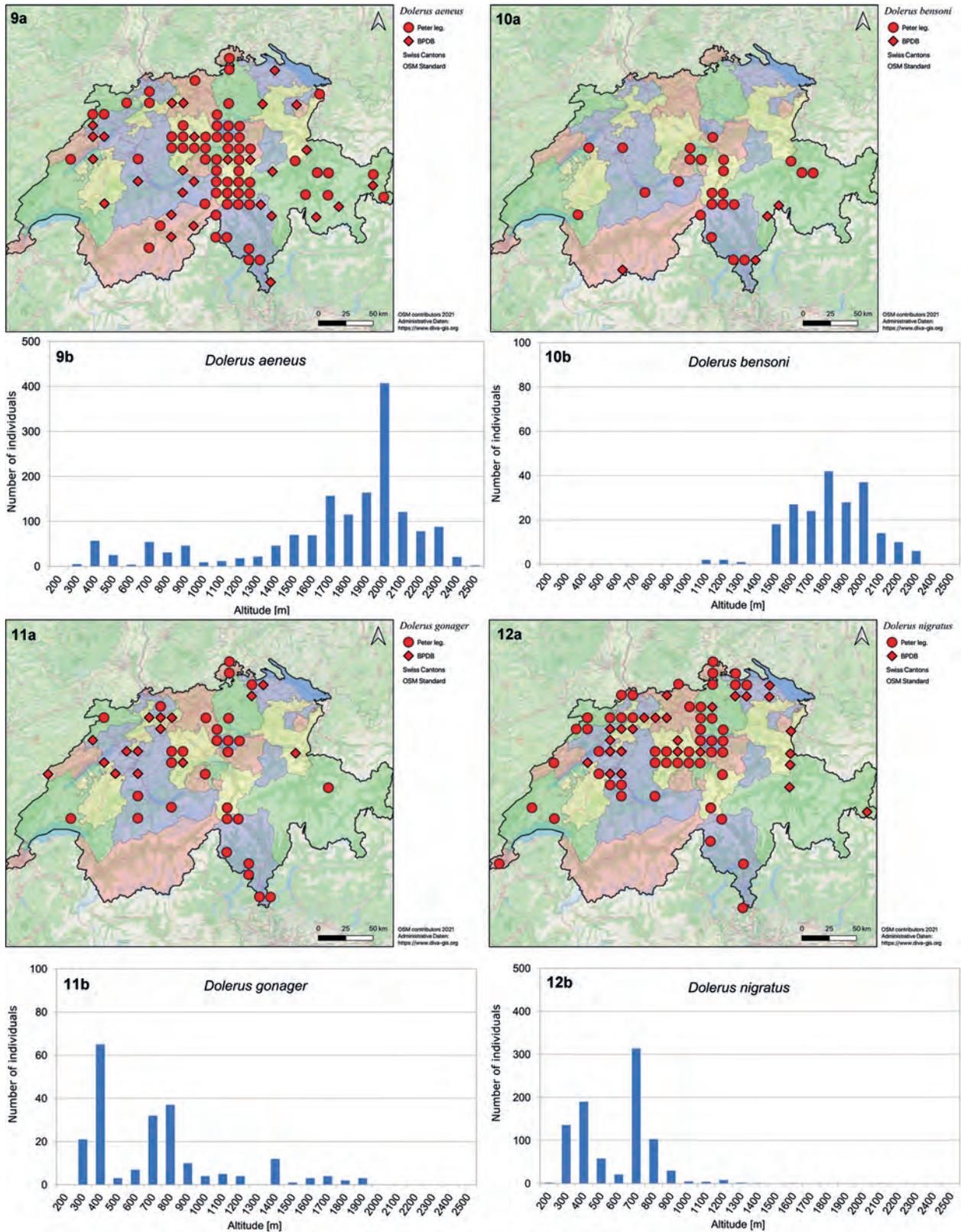
Abundance and diversity, with particular reference to altitude

In the BPDB, 12,340 datasets for 19,261 individuals are recorded as collected by B. Peter in Switzerland. These represent 460 species. The 20 most frequently recorded species are listed in Table 1. A total of 71 species (0.37 % of all individuals) were collected only as single individuals.

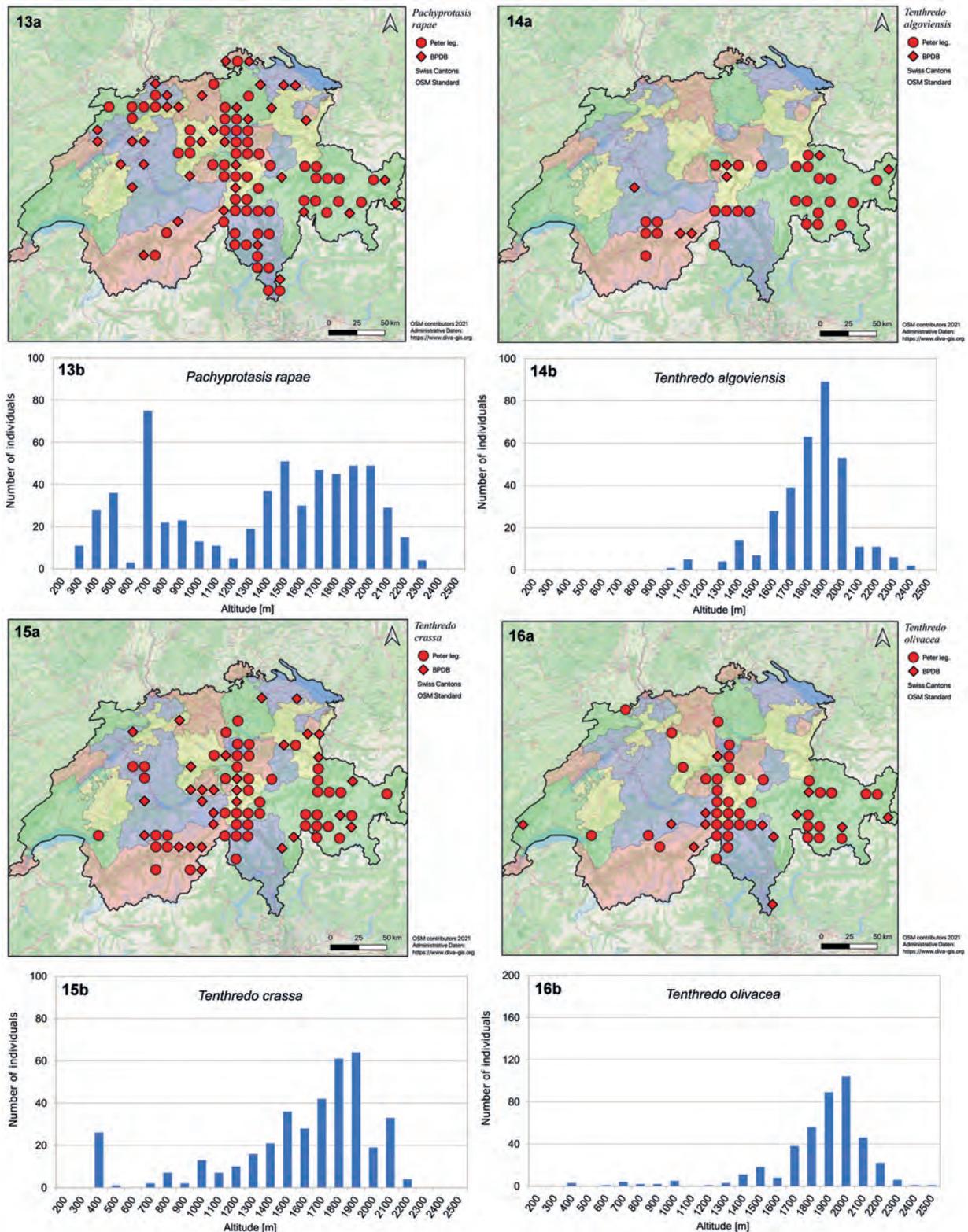
Nearly all specimens were databased in the BPDB with a record of the altitude of the collection locality. Mostly, a single value was recorded, but 3,976 datasets included an upper limit. In these cases, a median value for altitude was calculated.

To calculate the diversity according to the Shannon-Weaver equation and maximum diversity (as the logarithm of the number of species), the altitude values were divided into 100 m steps.

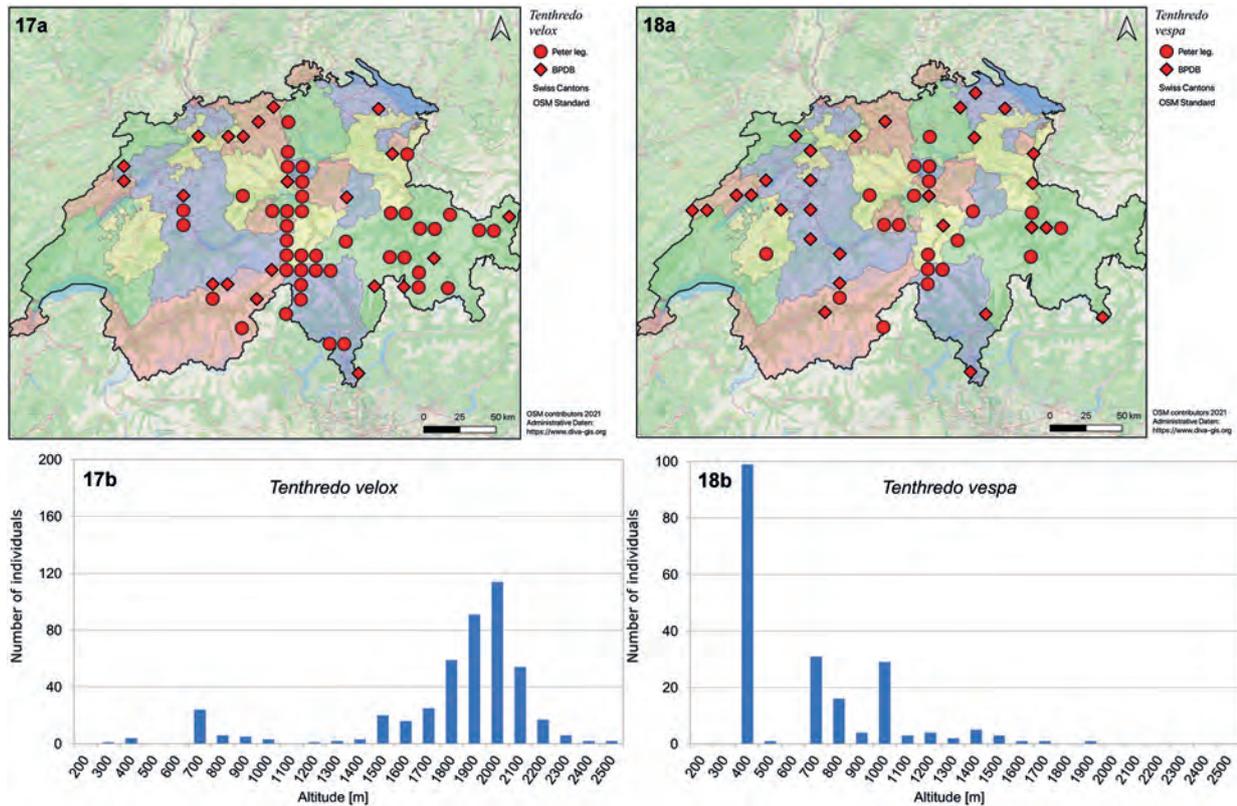
Bruno's collection contains sawflies collected between 200–2,900 m. No records exist from the 2,600–2,800 m zone. The two individuals from above 2,800 m belong to



Figs 9–12: a Distribution in Switzerland of specimens collected by B. Peter (red dots) or other specimens in his database (red diamonds). Data plotted on 10 km Swiss grid; b Number of individuals of selected species collected in Switzerland by B. Peter. 9a *Dolerus aeneus*, n=1800; 10a *Dolerus bensoni*, n=227; 11a *Dolerus gonager*, n=267; 12a *Dolerus nigratus*, n=1124; 9b *D. aeneus*, n=1642; 10b *D. bensoni*, n=214; 11b *D. gonager*, n=214; 12b *D. nigratus*, n=979.



Figs 13–16: a Distribution in Switzerland of specimens collected by B. Peter (red dots) or other specimens in his database (red diamonds). Data plotted on 10 km Swiss grid; b Number of individuals of selected species collected in Switzerland by B. Peter; 13a *Pachyprotasis rapae*, n=836; 14a *Tenthredo algoviensis*, n=378; 15a *Tenthredo crassa*, n=535; 16a *Tenthredo olivacea*, n=487; 13b *P. rapae*, n=681; 14b *T. algoviensis*, n=333; 15b *T. crassa*, n=400; 16b *T. olivacea*, n=421.



Figs 17–18: a Distribution in Switzerland of specimens collected by B. Peter (red dots) or other specimens in his database (red diamonds). Data plotted on 10 km Swiss grid. b Number of individuals of selected species collected in Switzerland by B. Peter. x-axis: altitude in metres, in 100 m zones. y-axis: number of individuals. 17a *Tenthredo velox*, n=521; 18a *Tenthredo vespa*, n=315. 17b *T. velox*, n=457; 18b *T. vespa*, n=200.

Athalia rosae, whose presence there can be interpreted as either the result of wind-drift, or active dispersal from lower levels. The largest number of individuals (3,236) was collected between 400–500 m (Fig. 5). The number of species per zone (Fig. 6) shows a similar pattern to the distribution of individuals. The results of the diversity calculations across all altitude zones are shown in Fig. 7. The values rise steeply up to a highest value in the range 400–600 m, remain at a high level up to 2,200 m, and drop sharply again at higher altitudes. If one only considers the range from 400 to 2200 a picture emerges as in Fig. 8. In this range, diversity and maximum diversity can be well described by linear regression. The slopes diverge slightly with increasing altitude, which is possibly an indication of less efficient collection at higher altitude.

Figs 9–18 illustrate the frequency of collection at different altitudes and the geographical distribution of the records for some of the more abundant species. In most cases, the illustrated patterns of altitudinal abundance correspond broadly with the subjective impressions gained by the authors during many years of field-work. *Dolerus aeneus* (Fig. 9), for example, is well-known for its apparent ecological versatility and wide distribution in Europe (BENSON 1952). On the other hand, although *Pachyprotasis rapae* (LINNAEUS, 1767) (Fig. 13), a highly

polyphagous species, has already also been recognised as being abundant and widespread in the planar to montane zones of central and northern Europe, its high abundance in the upper subalpine to lower alpine zones has not previously been documented. For some species, the pattern of altitudinal abundance correlates well with the altitudinal distribution of their known host plants (as given by OBERDORFER 1994). The main host in the eastern Alps of *Tenthredo crassa* SCOPOLI, 1763 (Fig. 15), for instance, was recently discovered by E. Altenhofer and R. Netzberger (personal communications to AL) to be *Chaerophyllum hirsutum*. According to OBERDORFER (1994), this plant species is found up to 2100 m in the Alps, with no *Chaerophyllum* species reaching higher. An additional host of *T. crassa*, recorded by C. Brückner (personal communication to AT), is *Chaerophyllum aureum*, but this is stated by OBERDORFER (1994) to occur only up to 1420 m in the Alps. A correlation between the altitudinal range of *Tenthredo vespa* RETZIUS, 1783 (Fig. 18b) and those of its hosts is more tenuous, given the diverse host plant species listed by TAEGER et al. (1998). Its upper altitudinal range clearly exceeds the upper range of its probable main host in the montane zone of the Alps, *Fraxinus excelsior*, given by OBERDORFER as 1360 m.

Discussion

Many of the species which we mention for the first time from Switzerland have already been found infrequently in adjacent localities in neighbouring countries (e.g. *Cladardis hartigi*, *Tenthredopsis tischbeinii*), or are more widespread and abundant in Europe but have until recently been mixed up with morphologically similar species (e.g. *Dolerus brevicornis*, *Pristiphora luteipes*). More interesting, because of the large distances between Swiss localities and those previously known, are the records of *Caenocephus lunulatus*, *Empria fletcheri*, *Rhogogaster polaris*, and *Taxonus alboscuteellatus*. Also intriguing is the record of *Arge stecki*, known worldwide from only three specimens from Valais.

If the host plant association of *Caenocephus lunulatus* with *Spiraea salicifolia* is correct, then European records of *C. lunulatus*, apart from those in Slovakia and Croatia, are from outside the native range of the host. In the more western countries of occurrence, such as Switzerland and Germany, *C. lunulatus* might therefore be regarded as a neozoon.

The concurrence of the Swiss records of *Empria fletcheri* with well-documented occurrences of *Betula nana*, seems likely to be more than a coincidence. Although the sawfly fauna of *Betula nana* is still poorly-known, in Europe and worldwide, compared to that of tree-birch species, at least 15 species use *B. nana* as a host in Finland, most of these being nematine Tenthredinidae (PERKIÖMÄKI 1971, VIKBERG & VIITASAARI 1991). They range from highly polyphagous taxa, through species whose larvae feed only on *Betula* but have more frequently been found on birch species other than *B. nana*, to a small minority of apparent specialists on *B. nana* (mostly unpublished observations by V. Vikberg, M. Prous and A. Liston). By contrast, BACHMAIER (1965) found no sawfly larvae during a survey of the insects on relict stands of *B. nana* in southern Germany and Austria. It is probable that *B. nana* in Europe only supports a larger number of sawfly species within its northern area of “closed distribution”, as described and mapped by BACHMAIER. Against this background, the first definite records of *Empria fletcheri* from Central Europe are remarkable.

The altitudinal data associated with Bruno Peter’s collection are certainly by far the most extensive which are available for sawflies in Switzerland, and probably more widely within central Europe. Although one can question how much these data were influenced by Bruno’s preferences and habits as a collector, we think that the picture which emerges is likely to be generally valid for Alpine countries, i.e. species numbers are highest in the colline zone, and decrease steadily but rather gradually up to the alpine zone. This pattern is partly supported, although not explicitly addressed therein, by previous publications

on sawflies of Alpine regions, e.g. BENSON (1955, 1961), and SCHEDL (1976). However, these publications deal only with the fauna of the higher part of the montane zone to the high alpine zone, and lack data from planar and colline sites. Furthermore, apart from rather few data in SCHEDL (1976), quantification of records for specified altitudes is missing.

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