Zootaxa 4615 (1): 001–045
https://www.mapress.com/j/zt/

Article

ISSN 1175-5326 (print edition)
ZOOTAXA
ISSN 1175-5334 (online edition)

https://doi.org/10.11646/zootaxa.4615.1.1
http://zoobank.org/urn:lsid:zoobank.org:pub:69EA0294-F86A-4CE9-A4EC-C470611AA4E1

A review of West Palaearctic *Hoplocampa* species, focussing on Sweden (Hymenoptera, Tenthredinidae)

ANDREW LISTON[1,4], MARKO PROUS[1,2] & HEGE VÅRDAL[3]
[1]*Senckenberg Deutsches Entomologisches Institut, Eberswalder Straße 90, 15374 Müncheberg, Germany.*
E-mail: aliston@senckenberg.de
[2]*Department of Zoology, Institute of Ecology and Earth Sciences, University of Tartu, Vanemuise 46, 51014 Tartu, Estonia.*
E-mail: mprous@senckenberg.de
[3]*Swedish Museum of Natural History, Box 50007, SE-10405 Stockholm, Sweden. E-mail: Hege.Vardal@nrm.se*
[4]*Corresponding author*

Table of contents

Abstract . . . 1
Introduction . . . 2
Material and methods . . . 2
Results . . . 3
Key to West Palaearctic ***Hoplocampa*** species (imagines) . . . 8
Species treatments . . . 11
Hoplocampa alpina (Zetterstedt, 1838) . . . 11
Hoplocampa ariae Benson, 1933 . . . 12
Hoplocampa brevis (Klug, 1816) . . . 12
Hoplocampa cantoti Chevin, 1986 . . . 13
Hoplocampa chamaemespili Masutti & Covassi, 1980 . . . 14
Hoplocampa chrysorrhoea (Klug, 1816) . . . 15
Hoplocampa crataegi (Klug, 1816) . . . 15
Hoplocampa flava (Linné, 1760) . . . 17
Hoplocampa fulvicornis (Panzer, 1801) . . . 18
Hoplocampa minuta (Christ, 1791) . . . 20
Hoplocampa pectoralis Thomson, 1871 . . . 21
Hoplocampa phantoma Zinovjev, 1993 . . . 22
Hoplocampa plagiata (Klug, 1816) . . . 22
Hoplocampa tadshikistanica Muche, 1986 . . . 23
Hoplocampa testudinea (Klug, 1816) . . . 24
Nominal taxa removed from ***Hoplocampa*** . . . 24
Discussion . . . 38
Acknowledgments . . . 40
References . . . 40

Abstract

Fourteen *Hoplocampa* species have been recorded in the West Palaearctic. We provide an illustrated key to these species, together with *H. tadshikistanica*, which is so far only known from Tadshikistan, but could occur in the West Palaearctic. The suitability of genetic sequencing for identification, particularly of larvae, is discussed. COI barcoding reliably distinguishes all European species which have been sampled (only *H. phantoma* lacks data), except for *H. fulvicornis* and *H. minuta*, which can be identified using nuclear sequences. Distributions in the Fennoscandian countries are outlined, with particular reference to Sweden. *Hoplocampa chrysorrhoea* is recorded for the first time in Scandinavia, from southern Sweden. Lectotypes are designated for twelve nominal taxa: *Allantus ferrugineus* Panzer, 1802, *Hoplocampa chrysorrhoea* var. *nigrita* Enslin, 1914, *H. fabricii* W. F. Kirby, 1882, *H. oertzeni* Konow, 1888, *H. pectoralis* Thomson, 1871, *Hylotoma ferruginea* Fabricius, 1804, *Tenthredo alpina* Zetterstedt, 1838, *T. brevis* Klug, 1816, *T. chrysorrhoea* Klug, 1816, *T. crataegi* Klug, 1816, *T. plagiata* Klug, 1816, and *T. rutilicornis* Klug, 1816. *Hoplocampa minuta* forma *dudai* Gregor, in Gregor & Bata, 1942 is a new synonym of *H. fulvicornis* (Panzer, 1801).

Key words: Symphyta, Nematinae, sawflies, key, taxonomy, distribution

Accepted by A. Taeger: 24 Apr. 2019; published: 12 Jun. 2019

Introduction

The sawfly genus *Hoplocampa* Hartig, 1837 contains about 40 described extant species, distributed in the Holarctic and Oriental Realms (Taeger *et al*. 2010). Fourteen species were listed for Europe by Taeger *et al*. (2006). Adults can be recognised as belonging to the genus using the key to Nematinae genera by Prous *et al*. (2014). The known life histories of the species are similar: larvae develop in the fruits of various genera of rosaceous trees and shrubs. Three of the European species are generally considered to be widespread and significant pests of cultivated fruit crops: *Hoplocampa brevis* (pears), *H. minuta* (plums), and *H. testudinea* (apples). *Hoplocampa flava* (plums) has a lesser, regional importance, mainly in the South. These species have accordingly been rather well-studied, and numerous publications, particularly on *H. testudinea,* deal with various aspects of their biology and methods of control. Much less is known about the species whose larvae feed on hosts which are not of commercial interest to humans. Indeed, three of the European species were first discovered and described late last century.

Our main objective now is to present an illustrated key to all known West Palaearctic species, while taking into account the high level of variability in some species. This was not adequately allowed for in previous identification keys. Our second priority is to clarify which species occur in Fennoscandia, particularly in Sweden.

Material and methods

The names of collections in which specimens referred to in the text are deposited are abbreviated as follows:

BMNH	The Natural History Museum, London, United Kingdom
CBGP	Insect Collection, Centre de Biologie pour la Gestion des Populations, Montferrier sur Lez, France
MNHN	Muséum national d'Histoire naturelle, Paris, France
MRSN	Museo Regionale di Scienze Naturale, Turin, Italy
MSNV	Museo Civico di Storia Naturale, Verona, Italy
MZLU	Lunds universitet, Entomology Collection, Lund, Sweden
NHRS	Naturhistoriska riksmuseet, Stockholm, Sweden
NMPC	National Museum (Natural History), Prague, Czech Republic
OUMNH	Oxford University Museum of Natural History, Oxford, UK
SDEI	Senckenberg Deutsches Entomologisches Institut, Müncheberg, Germany
SMNG	Senckenberg Museum für Naturkunde, Görlitz, Germany
ZISP	Zoological Institute, Academy of Sciences, St Petersburg, Russia
ZMHUB	Naturkundemuseum, Berlin, Germany
ZMUC	Zoological Museum, University of Copenhagen, Copenhagen, Denmark
ZSM	Zoologische Staatssammlung, Munich, Germany

Registration numbers of specimens, allocated by the NHRS, SDEI, ZMUC and ZSM, are cited in the figure captions, thus enabling the corresponding collection data to be located in the text (material examined). Under "Specimens examined" an asterisk (*) indicates that we know of no previous published records from the territory concerned.

Plant names follow The Plant List (2017). Only a few of the many works which deal with aspects of the biology of the pest species were selected for citation under 'Life history'. These are not necessarily the most recent publications, because some of the earlier studies, notably that by Velbinger (1939), have not since been surpassed, either in their broad scope, or the quality of the original observational and experimental data. Morphological terminology follows Viitasaari (2002), except for the use of sawtooth instead of serrula, and serrula (plural, serrulae) instead of denticles (see Malagón-Aldana *et al*. 2017).

Genitalia were macerated in 10–15% KOH for four to five hours before being mounted temporarily in glycerine on glass slides for photography. Alternatively, they were cleared in proteinase during DNA extraction. After photography, the dissected parts were gummed with Berlese fluid to a card fixed to the specimen's pin.

Photos were taken at the SDEI with a Leica DFC295 digital camera and Olympus SZX12 microscope. Composite images with an extended depth of field were created from stacks of images using the software CombineZP, and finally arranged and partly enhanced with Ulead PhotoImpact X3.

To estimate phylogenetic relationships between *Hoplocampa* species, we used sequences of three gene fragments, one mitochondrial (COI) and two nuclear (NaK, TRRAP), which were sequenced as described by Prous *et al*. (submitted). For mitochondrial COI barcode data, minimal p-distances (proportion of differences) between BIN (Barcode Index Number) clusters and maximal distances within BIN clusters were taken from BOLD BIN database (http://www.boldsystems.org/). Some of the COI barcode sequences used here were obtained from BOLD. In such cases, DNA extraction, PCR amplification, and sequencing were conducted at the Canadian Centre for DNA Barcoding (CCDB) in Guelph, Canada, using standardised high-throughput protocols (Ivanova *et al*. 2006, deWaard *et al*. 2008; available online under www.ccdb.ca/resources). DNA aliquots of SDEI vouchers are deposited in the DNA storage facility of the SDEI (including those that were originally extracted at the CCDB). For phylogenetic analyses we used the maximum likelihood method (ML) implemented in IQ-TREE 1.5.6 (http://www.iqtree.org/) (Nguyen *et al*. 2015). By default, IQ-TREE runs ModelFinder (Kalyaanamoorthy *et al*. 2017) to find the best-fit substitution model and then reconstructs the tree using the model selected according to Bayesian information criterion (BIC). We complemented this default option with SH-like approximate likelihood ratio (SH-aLRT) test (Guindon *et al*. 2010) and ultrafast bootstrap (Hoang *et al*. 2017) with 1000 replicates to estimate robustness of reconstructed splits.

Results

Character assessment. Genetic data. During the past few years, genetic data (mainly COI barcodes) for all but one of the European *Hoplocampa* species have become available (Fig. 1). These may be used for identification of specimens, and for taxonomic purposes. The barcode clusters (Barcode Index Number Uniform Resource Identifier, i.e. BINs in BOLD Systems, http://www.boldsystems.org/) were used as support for the association of specimens to the species. None of the European species falls in more than one BIN, and only two species share the same BIN: *fulvicornis* and *minuta*. Note that the latter two taxa, however, exhibit differences in their nuclear genes that will enable identification (Fig. 2). For all other species, interspecific differences in COI barcodes are rather large, compared with many other groups of Nematinae (see Schmidt *et al*. 2017). Some further genetic sampling to cover a greater geographic range would be desirable, particularly for *brevis* (sequenced specimens are only from two Mediterranean islands, and Bulgaria). An effort should also be made to obtain fresh *phantoma*, the only European species still lacking sequence data. Worth noting is the presence of two copies of a nuclear gene POL2 (DNA dependent RNA polymerase II subunit RPB1) in *Hoplocampa* and possibly in *Monocellicampa* Wei, 1998 that are clearly distinguishable at the amino acid level. Although we could not separate or sequence both of the copies for most of the specimens with the available primers (Prous *et al*. submitted) they are sufficiently similar at the nucleotide level to form a strongly supported monophyletic group within Nematinae (not shown). At the amino acid level, one of the copies is hardly different from other Nematinae (maximum distance 1.1%), or even Tenthredinoidea (*Neodiprion lecontei*, GenBank accession XP_015520928, is only 0.6% different), while the minimum distance between the copies is 3.5%. The more divergent copy can be considered to be a *Hoplocampa* specific paralog, while the less divergent one seems to be a genuine ortholog that could still be used in phylogenetic analyses, although that would require cloning or additional sequencing with high-throughput methods. Because of the difficulties separating two copies using Sanger sequencing or preferential amplification of the paralog instead of the ortholog, we did not use POL2 for *Hoplocampa*. Instead we used transformation/transcription domain-associated protein (TRRAP) that in Hymenoptera has about 9100 bp exon, although we amplified only a 3379 bp fragment in two parts (Prous *et al*. submitted).

Genitalia. The penis valves of the males of most species are highly characteristic, and may be used for identification, if assessment of other characters leaves doubt as to their identity. Interspecific variability in the degree of sclerotisation is pronounced, ranging from hardly sclerotised at all (e.g. *phantoma*, Figs 98–99), to highly sclerotised (e.g. *flava*, Fig. 100; *testudinea*, Fig. 106). In several species, the valviceps is extended dorsally as a very delicate lobe (e.g. Figs 94, 95, 98). The lobe may easily be disrupted or destroyed during preparation of the genitalia, or by excessive maceration in KOH (compare Figs 98 and 99: penis valves of the same specimen of *phantoma*). Some existing illustrations of *Hoplocampa* penis valves omit this lobe, which can be misleading. Species with otherwise similar penis valves can sometimes easily be distinguished by the shape and length of a projection on the valviceps apex, e.g. *fulvicornis* (Fig. 102) and *minuta* (Fig. 103), or with more difficulty by the arrangement of a cluster of conspicuous setae on the valviceps apex, e.g. *alpina* (Fig. 94) and *ariae* (Fig. 96).

Interspecific differences in the morphology of the lancets of females are sometimes also evident, but are frequently not so pronounced as in the male genitalia. For example, the lancets of *fulvicornis* (Fig. 84) and *minuta* (Fig. 85) are so similar, that they are practically indistinguishable. This evaluation corresponds with that published by Ross (1943) for the Nearctic species. *Hoplocampa chrysorrhoea* (Figs 90–91) and *cantoti* (Figs 92–93) share the same type of lancet, which differs conspicuously (in concordance with genetic data: Figs 1, 2) from those of all other West Palaearctic species in being very narrow relative to its length, with the basal annuli poorly defined, so that the radix is apparently very long, and sawteeth are only present on the extreme apex. The shape of the sawteeth can be used to identify some of the other species. Those of *plagiata* (Fig. 88), for example, are very large and strongly protruding (on middle and apex of lancet about as high as long) compared to all other European species. Also useful is the presence or absence of ctenidial teeth, and their position or shape. Ctenidial teeth are very minute and easily overlooked in *cantoti* (Figs 92–93) and *chrysorrhoea* (Figs 90–91), and not developed at all in *pectoralis* (Fig. 89). In particular, the size and position of the most ventral ctenidial tooth (see Fig. 77, arrow), called a "spurette" by Ross (1943), is useful in distinguishing some species with otherwise similar lancets, e.g. *alpina* (Fig. 77) and *ariae* (Fig. 78).

Colour. Ross (1943) concluded that colour characters are useful for determining only a small number of Nearctic *Hoplocampa* species. By contrast, as can be seen from our identification key, determination of the majority of European specimens is possible using only colour characters. However, although colour patterns are rather stable in most species, wide variability in body coloration is particularly evident in *crataegi* and *fulvicornis*. In both of these, there is a clear tendency towards darker coloration in the more northern parts of their range, whereas specimens from the South can be extremely pale. Local populations in southern Europe of some other species, notably *plagiata* from the Massif Central and Pyrenees, and *crataegi* from Sicily, contain individuals which are completely atypically coloured. Although allowance for this variability has been made in the key, it seems likely that further similar cases still await discovery. Intraspecific variability in Central and northern European populations is apparently much smaller. Sexual dimorphism in coloration ranges from very slight (e.g. *testudinea*, Figs 11–14) to moderate (e.g. *chrysorrhoea*, with the thorax more extensively yellow in the male, Figs 15–16).

Larvae. The larvae of some species have not been described, or only very superficially, i.e. *ariae*, *cantoti*, *chamaemespili*, *chrysorrhoea*, *pectoralis*, and *phantoma*. The known larvae have a similar general appearance (Figs 3–4): head clearly longitudinally flattened, yellow to brown; antenna four-segmented, conical; the body pale (white or yellowish) and largely unpigmented, except for parts of the legs, and more or less the dorsum of the distal abdominal terga; 3rd abdominal segment with 5 dorsal annulets, 3 and 4 [see Vikberg & Nuorteva (1997) on correct notation] with setae; the 7 pairs of abdominal prolegs (as in other Nematinae) are relatively well-developed; pseudocerci absent [character states adapted largely from Lorenz & Kraus (1957)]. Species differ mainly in details of setation. Lorenz & Kraus (1957) provided a key to larvae of three species, and summarised what was known up to that date, but overlooked the detailed descriptions and comparisons of *brevis* and *testudinea* by Velbinger (1939) (see below, under *brevis*). From the foregoing, it is clear that morphological identification of larvae to species level is problematic. However, COI barcoding can be recommended for definite identification of the larvae of most of the European species (see above: Genetic data).

Host specificity. The host plant ranges of the West Palaearctic taxa, as far as at present known (Table 1), can be classified according to the definitions given by Viitasaari (2002) as ranging from 1st grade monophagous (e.g. *alpina*, *chamaemespili*, *plagiata*; each on a single host plant species), through 3rd grade monophagous (e.g. *flava*: on many species of the same genus), to 1st grade oligophagous (e.g. *brevis*, *testudinea*; each on both *Malus* and *Pyrus*). In other words, host plant association can be a useful identification character; but one should be cautious before inferring such an association merely because adults were collected from inflorescences of a particular plant species (see also below under Life history: general).

TABLE 1. The hostplants of the West Palaearctic *Hoplocampa* species in overview. *Hoplocampa tadshikistanica* is extralimital.

Species	**Hostplants**
Hoplocampa alpina	*Sorbus aucuparia*
Hoplocampa ariae	*Sorbus aria*
Hoplocampa brevis	*Pyrus communis,* rarely *Malus domestica*
Hoplocampa cantoti	? *Prunus spinosa*
Hoplocampa chamaemespili	*Sorbus chamaemespilus*
Hoplocampa chrysorrhoea	? *Crataegus* species and/or ? *Prunus spinosa*
Hoplocampa crataegi	*Crataegus* species
Hoplocampa flava	*Prunus* species, particularly *spinosa* and *domestica*, but also *avium*, *armeniaca*, and *salicina*
Hoplocampa fulvicornis	*Prunus spinosa*, *domestica, salicina*
Hoplocampa minuta	*Prunus domestica*, *salicina, armeniaca*
Hoplocampa pectoralis	*Crataegus* species
Hoplocampa phantoma	? *Sorbus* species
Hoplocampa plagiata	*Amelanchier ovalis*
Hoplocampa tadshikistanica	? *Cotoneaster* species
Hoplocampa testudinea	*Malus domestica*, rarely *Pyrus communis*

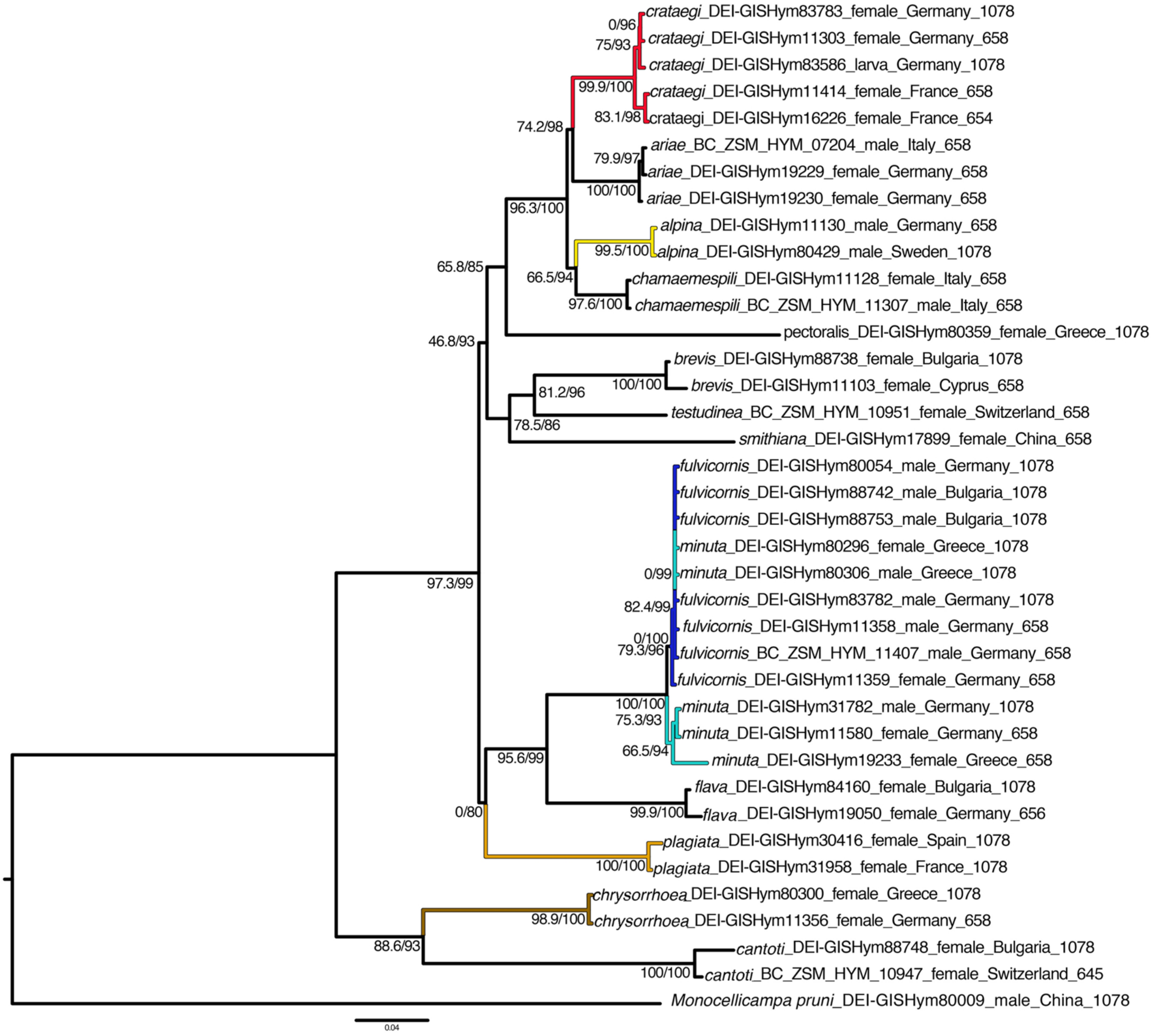


FIGURE 1. Maximum likelihood tree based on COI sequences. Best-fit model chosen according to Bayesian information criterion was TIM2+R3. Numbers at the branches are support values (%) in the order SH-aLRT test/ultrafast bootstrap. The numbers at the end of specimen names refer to the number of nucleotides available.

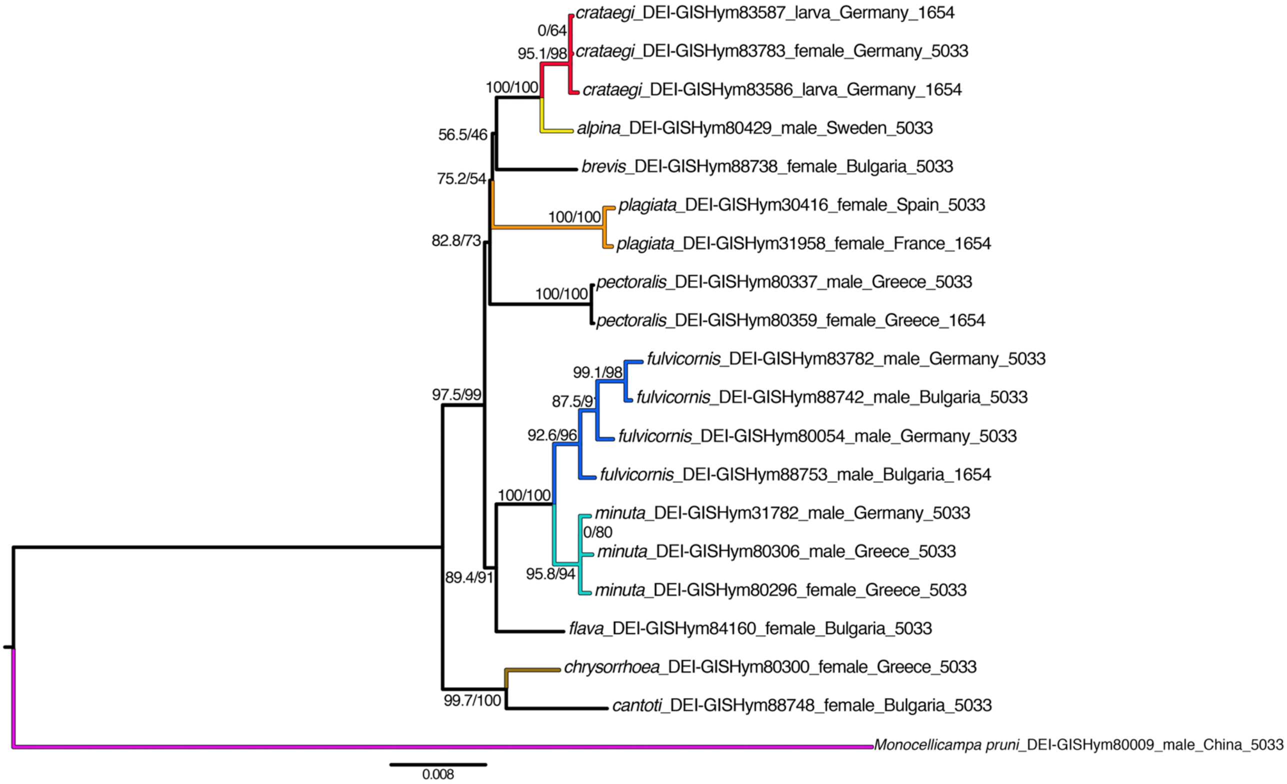


FIGURE 2. Maximum likelihood tree based on nuclear (NaK and TRRAP) sequences. Best-fit model chosen according to Bayesian information criterion was K2P+G4. Numbers below the branches are support values (%) in the order SH-aLRT/ultrafast bootstrap. The numbers at the end of specimen names refer to the number of nucleotides available (1654 means that only NaK was sequenced).

Phylogenetic analyses. Because *H. fulvicornis* and *H. minuta* could not be separated based on mitochondrial barcode sequences (which can be identical between these two species), we sequenced two nuclear genes to test monophyly of these species. For comparison, additional *Hoplocampa* species were sequenced to provide further phylogenies estimated from mitochondrial and nuclear sequences. Although nuclear data is missing for some species due to a lack of fresh samples, a mitochondrial COI tree (Fig. 1) and a nuclear tree (based on NaK and TRRAP; Fig. 2) are largely congruent with regard to well supported relationships. The *Hoplocampa chrysorrhoea*-*H. cantoti* clade appears to be the sister group to other sequenced species (Figs 1, 2). *Hoplocampa alpina, H. crataegi, H. ariae,* and *H. chamaemespili* (for the latter two species only COI barcodes are available) form a monophyletic group (Figs 1, 2), which is also supported by penis valve characters. Nuclear and mitochondrial data (as well as morphological) all indicate that *H. fulvicornis* and *H. minuta* are closely related, but COI does not support reciprocal monophyly of these species (Fig. 1), contrary to nuclear data (Fig. 2). Both nuclear genes support monophyly of *H. fulvicornis* and *H. minuta*, although this is more evident based on TRRAP (divergence between the species 0.7–1.2%) than NaK (0.4%).

Life history: general. The behaviour of adults and larvae, as far as is known, is quite similar in the European species. Oviposition is in the calyx of flowers of various genera of shrubs and trees of the Rosaceae (Miles *et al.* 1933, Roitberg & Prokopy 1980). For all species, the limited seasonal availability of flowers of the host entails a rather short period of adult activity, and a univoltine life cycle. Miles (1932) observed that adults of *testudinea* usually lived for 6–9 days. The young larva bores into the developing fruit, and eats a cavity in the centre, thereby destroying the seeds. Young larvae of *testudinea* differ from the other W. Palaearctic species, in that they feed in a tunnel just under the epidermis of the fruit (Fig. 5), before they bore into the centre (Fig. 6). Probably in all species, if a single fruit is insufficient for complete development of a larva, it moves to a new fruit. In this way, species such as *minuta,* which inhabits smaller fruits, may move 4 or 5 times (Sprengel 1930b). Even *testudinea* and *brevis* larvae, whose hosts have larger fruits, normally move at least once to a new fruit (Miles 1932). If population levels are high, several larvae may enter the same fruit, which is thus quickly eaten out. Consequently, a greater number of fruits are fed on by each larva in such cases (Sprengel 1930b). The ability of the larvae to change their feeding site is unusual among endophytic Symphyta, and is otherwise only known in the West Palaearctic sawfly fauna in the leaf-mining nematine genus *Pseudodineura*. The time taken for development of the immature stages is highly variable, even within the same species, and largely dependent on temperature: Miles (1932) gave the duration of the egg stage of *testudinea* as 8–15 days, and of larval development as 4–6 weeks. The fully-fed larvae spin parchment-like cocoons in the soil, in which they hibernate as quiescent larvae, until pupating shortly before emergence. Prolonged diapause, of up to three winters, has been reported by several authors for *minuta* and *testudinea* (Hadzistevic 1959, Tamosiunas *et al*. 2014). This is presumed to be an adaptation against the risk to a population's survival in years when very few or no fruits develop, e.g. as a result of late frosts.

It is not clear if the stage of development of the host's flowers affects the success of oviposition or larval development. Sprengel (1930b) observed that *minuta* oviposited into open and unopened flowers, apparently without preference. On the other hand, adult *alpina* are most frequently found on inflorescences which are fully open, shortly before their petals fall (observations by first author). The other extreme, of ovipositing only into very young, unopened flowers, might occur in *chrysorrhoea* (see Species treatments). Note that adults of several species frequently visit inflorescences of plants which are probably not hosts, particularly other species of woody Rosaceae growing near the real hosts: see, for example, Miles (1936) and Velbinger (1947).

In most *Hoplocampa* species which have been better studied, i.e. the "pests", the sex-ratio has generally been observed to be close to 1:1, with a slight bias towards females (e.g. Tamosiunas *et al*. 2014). Among the West Palaearctic species, *brevis* is clearly exceptional in being normally (or entirely?) parthenogenetic. Possibly *chrysorrhoea* is also at least regionally parthenogenetic. The sex-ratio of *alpina* in collections suggests that males are not abundant, but the total number studied is not large, and the apparent imbalance is possibly caused by sampling bias.

FIGURES 3–6. *Hoplocampa testudinea*. 3, near-mature larva: note the 7 pairs of prolegs, and the sclerotized dark head capsule and distal abdominal terga. 4, larva and exit holes in young unripe apple. 5, scar-tissue along tunnel made in unripe fruit by first or second instar larva. 6, cross section of unripe apple heavily damaged by larva. All photos: Dr. Janos Bodor.

Key to West Palaearctic *Hoplocampa* species (imagines)

Note: The male of *cantoti* is unknown. The male of *brevis* is extremely rare: we were unable to locate any specimens. *Hoplocampa tadshikistanica* is so far only known from the type series collected in Tadzhikistan, and is thus extra-limital, but is included because it might occur in the West Palaearctic. *Hoplocampa sogdiana* Zhelochovtsev, 1976 is not included, because no specimens were available for examination, and the original description is not very informative. It is also only known from the type series collected in Tadzhikistan, from *Crataegus laevigata* (Poir.) DC (= *oxyacantha* auct.) (Zhelochovtsev 1976).

1 a Base of metafemur clearly black on all surfaces; metacoxa completely black; metatrochanter mainly black (Figs 7–8) 2
\- aa Metafemur completely pale, *or* at most with an indistinct fuscous spot on basal ventral face; metacoxa *usually* at least apically pale; metatrochanter *usually* mainly pale (Figs 13, 14, 10) [only exception: rare ♂ colour form of *plagiata* from Massif Central and Pyrenees] 3

2(1) a Metatibia largely yellow, with black apex (Figs 7–8)
b Head completely black, except for apices of mandibles, and more or less palps and antennal flagellum (Fig. 55); abdomen completely black, including male sternum 9 (Figs 7–8)
[Male: antennomeres 1 and 2 black, 3–9 pale (except more or less for 3) (Fig. 55). Female: antenna black, with underside of flagellum more or less brownish] .... ***Hoplocampa minuta*** (Christ, 1791) ♀♂
\- aa Metatibia completely dark
bb At least labrum, clypeus and genae pale, orbits and temples sometimes obscurely brown; at least terga 9 and 10 pale...***Hoplocampa plagiata*** (Klug, 1816) ♀ [part: colour form only known from Massif Central and Pyrenees]

3(1) a Mesoscutum and mesoscutellum entirely black (Figs 9, 12, 23) 4
\- aa Mesoscutum and/or mesoscutellum at least partly pale (Figs 31, 35, 72) 13

4(3) a Body length 6.0–8.0mm
b Head orange apart from black postocellar area and confluent fleck around ocelli *and* antennal flagellum largely pale (Figs 11–14)
c Fore wing pterostigma bicoloured: black base *and* margins strongly contrasting with pale apical interior (Fig. 58) .... ***Hoplocampa testudinea*** (Klug, 1816) ♀♂
\- aa Body length 3.0–5.5mm
bb Head mainly black (Figs 13, 21) *or* antennal flagellum extensively black (Figs 17, 25)
cc Fore wing pterostigma unicoloured (Figs 10, 17), or only indistinctly darkened at base (Fig. 23) 5

5(4) a Females 6
\- aa Males 11

6(5) a Tarsi mostly black; apex of metatibia clearly black (Figs 10, 15) 7
\- aa Tarsi mostly pale, each tarsomere at most indistinctly fuscous apically; at most apex of metatibia indistinctly fuscous (Figs 22, 26, 30) 9

7(6) a Abdominal sterna mainly black, sometimes with obscure reddish tinge (Fig. 10); terga completely black (Fig. 9) .... ***Hoplocampa cantoti*** Chevin, 1986 ♀
\- aa All abdominal sterna, and terga 9–10 completely yellow; at least downturned edges of apical terga partly yellow (Fig. 15) 8

8(7) a Head largely black except more or less for mouthparts and genae (Fig. 59)
b Antenna largely black (Fig. 15)
c Mesopleuron entirely black (Fig. 15) .... ***Hoplocampa chrysorrhoea*** (Klug, 1816) ♀
\- aa Head largely yellow except for ocellar fleck and postocellar area (Fig. 60)
bb Antenna largely pale (Fig. 18)
cc Mesopleuron pale except for black anepimeron (Fig. 18) ...... ***Hoplocampa tadshikistanica*** Muche, 1986 ♀

9(6) a Terga completely black except, at most, for brown (8–)9–10; abdominal sterna 2–5 completely black (Figs 21–22)
b Scape and pedicel entirely pale (Fig. 24) .... ***Hoplocampa fulvicornis*** (Panzer, 1801) [part] ♀
\- aa At least downturned lateral parts of all terga yellow; all abdominal sterna *usually* completely yellow (Figs 25–26, 29–30)
bb Scape and pedicel dorsally at least partly fuscous (Figs 25–26, 29–30) 10

10(9) a Valvulae 3 in dorsal view more than 2 × as long as basal width, evenly tapering; longest setae arising on apical 0.2–0.3 (Fig. 61)
b Mesepisternum upper half yellow, lower half black (Fig. 26), or [rarely] entirely black .... ***Hoplocampa pectoralis*** (Thomson, 1871) ♀
- aa Valvulae 3 in dorsal view less than 2 × as long as basal width, tapering increasingly towards apex; longest setae arising near middle (Fig. 62)
bb Mesepisternum entirely black [colour form only known from Sicily] (Fig. 30).. ***Hoplocampa crataegi*** (Klug, 1816) [part] ♀

11(5) a Metatarsus and apex of metatibia black on upper surfaces (Fig. 16). .***Hoplocampa chrysorrhoea*** (Klug, 1816) ♂
- aa Metatibia and metatarsus entirely pale (Figs 24, 28).. 12

12(11) a Whole thorax black, except sometimes for tegulae and pronotum (Figs 23–24)
b Abdomen black, except for subgenital plate and harpes (Figs 23–24) ***Hoplocampa fulvicornis*** (Panzer, 1801) ♂
- aa Mesopleura and metapleura entirely yellow (Fig. 28)
bb All abdominal sterna entirely pale; terga usually extensively pale (Figs 27–28) .... ***Hoplocampa pectoralis*** (Thomson, 1871) ♂

13(3) a Head pale, whitish (except sometimes for darkened flagellum and narrow marks around ocelli) (Figs 35–40)
b Body pale, whitish (except more or less dark anterior mesoscutal lobe, metanotum, thin streaks on margins of basal terga) (Figs 35–40)
c Wing venation and membrane entirely pale (Figs 37–40)
d At most extreme inner apex of metatibia fuscous (Figs 36–40) 14
- [aa–dd not in above combination]:
aa Head may be more extensively black; pale colour more yellow/brown (Figs 69, 73)
bb Body may be more extensively black; pale colour more yellow/brown (Figs 43, 44, 47)
cc At least fore wing radius fuscous (Figs 49, 53), or wing membrane brown pigmented up to pterostigma (Fig. 67)
dd Apical 0.3–0.6 of metatibia inner side *may* be blackish (Figs 31–32)................................ 18

14(13) a Propleuron and base of procoxa narrowly black-margined (Fig. 63)
b Body colour of fresh specimens pale testaceous; integument thicker, not translucent
c Body length ca. 4.5–6.0mm.................................. ***Hoplocampa ariae*** Benson, 1933 ♀♂
- aa Propleuron and base of procoxa entirely pale (Fig. 60)
bb Body colour of fresh specimens pale whitish; integument thin, translucent (Fig. 39)
cc Body length ca. 3.5–5.0mm...15

15(14) a Females 16
- aa Males.. 17

16(15) a Valvulae 3 in dorsal view much longer than basal width; setae short, sparse (Fig. 65)
b Metatarsus entirely pale, like metatibia (Fig. 38) .... ***Hoplocampa phantoma*** Zinovjev, 1993 ♀
- aa Valvulae 3 in dorsal view about as long as basal width; setae long, dense (Fig. 66)
bb Metatarsus fuscous, darker than metatibia (Figs 39–40)..........***Hoplocampa alpina*** (Zetterstedt, 1838) ♀

17(15) a Penis valve without group of long setae on valviceps apex (Figs 98–99)...***Hoplocampa phantoma*** Zinovjev, 1993 ♂
- aa Penis valve with group of long setae on valviceps apex (Fig. 94)...***Hoplocampa alpina*** (Zetterstedt, 1838) ♂

18(13) a Females.. 19
- aa Males 24

19(18) a Fore wing membrane brown pigmented from base up to pterostigma, more hyaline beyond this (Fig. 67)
b Mesoscutum, mesoscutellum, entire abdomen, and head (except directly above and below toruli, and very narrowly around ocelli) pale (Figs 41–42, 68) ....***Hoplocampa flava*** (Linné, 1760) ♀
- aa Fore wing membrane uniformly subhyaline (Figs 21, 45, 49)
bb More extensively black is mesoscutum and mesoscutellum (Figs 71), *or* abdomen (Fig. 31), *or* at least one part of head (Fig. 73).. 20

20(19) a Clypeus broadly and shallowly emarginate (Fig. 69)
b Mesoscutum and mesoscutellum black, except for pale external margins of mesoscutal lobes (Fig. 71)......

. . . . **Hoplocampa fulvicornis** (Panzer, 1801) [part] ♀
Note. These pale females only in warmer, more southerly parts of Europe, and in Turkey
- aa Clypeus narrowly and deeply emarginate (Figs 68, 70)
bb Mesoscutum and mesoscutellum more extensively pale (Figs 31, 75–76) *or* only posterior edge of mesoscutellum pale (Fig. 72). 21

21(20) a All coxae, and sutures of meso- and metapleura entirely pale (Fig. 32)
b Dorsum of abdomen mainly yellow; at most abdominal terga 1–3 black-marked (Fig. 31). . . . .
. . . . **Hoplocampa crataegi** (Klug, 1816) ♀
- aa All coxae at least basally, and sutures of meso- and metapleura finely lined with black (Figs 46, 50, 52)
bb Dorsum of abdomen mainly black; at least abdominal terga 1–5 mainly black (Figs 45, 49, 51) 22

22(21) a Large black patch around and between ocelli, extending anteriorly at least to the antennal torulus (Fig. 73)
b Mesoscutum nearly entirely pale, except for sutures (Fig. 76)
Note. Antennal flagellum obscurely reddish ventroapically, to completely black...**Hoplocampa plagiata** (Klug, 1816) [part] ♀
- aa At most small area between ocelli black, and this never reaches to the antennal torulus (Figs 68, 74)
bb At least median mesoscutal lobe more extensively dark (Figs 49, 75) 23

23(22) a Occiput largely pale, only narrowly black around foramen magnum
b Antennal flagellum entirely pale towards apex (Fig. 50)
c Fore wing pterostigma basally fuscous, apically paler; costa apically fuscous (Fig. 49) . . . .
. . . .**Hoplocampa brevis** (Klug, 1816) ♀
- aa Whole of occiput fuscous
bb Upperside of antennal flagellum fuscous to apex (Fig. 51)
cc Fore wing pterostigma and costa unicolourous pale (Fig. 51)**Hoplocampa chamaemespili** Masutti & Covassi, 1980 ♀

24(18) a Fore wing membrane brown-pigmented from base up to approximately pterostigma, more hyaline beyond this (Fig. 67)
b Penis valve with a very long, thin, curled filament distally on valviceps (Fig. 100) .**Hoplocampa flava** (Linné, 1760) ♂
- aa Fore wing membrane uniformly hyaline or fuscous (Figs 19, 33–34, 47, 53)
bb Penis valve with at most a short, thick, nearly straight filament distally on valviceps (Figs 95, 97, 104, 107) . .25

25(24) a All coxae, and sutures of meso- and metapleura entirely pale (except more or less for katepimeron) (Figs 20, 34) 26
- aa All coxae at least basally, and sutures of meso- and metapleura extensively but finely lined with black (Figs 48, 55), or meso- and metapleura mostly black. 27
Note. Metatarsus *usually* fuscous, at least above: darker than metafemur.

26(25) a Legs entirely pale (Fig. 34)
b Dorsum of abdomen usually predominantly pale posterior of tergum 3 (Fig. 33). **Hoplocampa crataegi** (Klug, 1816) ♂
- aa Metatarsus and apex of metatibia clearly darker than rest of legs (Fig. 20)
bb Dorsum of abdominal terga 1–8 nearly entirely black (Fig. 19) . **Hoplocampa tadshikistanica** Muche, 1986 ♂

27(25) a Body length 3.5–4.0mm
b Clypeus broadly and shallowly emarginate (Fig. 69)
c Mesepisternum and abdominal sterna extensively black. . . . **Hoplocampa fulvicornis** (Panzer, 1801) [part] ♂
- aa Body length 4.5–6.0mm
bb Clypeus narrowly and deeply emarginate (Figs 68, 70)
cc Mesepisternum apart from narrow margins and epicnemial suture, and abdominal sterna completely pale . 28

28(27) a Inside posterior edge of lateral mesoscutal lobe pale (Fig. 76)
b Abdominal terga *may* be paler; palest specimens black only on terga 1–3 .**Hoplocampa plagiata** (Klug, 1816) ♂
- aa Inside posterior edge of lateral mesoscutal lobe broadly black (Fig. 75)
bb Abdominal terga with continuous black vitta extending posteriorly at least to tergum 6 (Fig. 53) . . . .
. . . .**Hoplocampa chamaemespili** Masutti & Covassi, 1980 ♂

Species treatments

Hoplocampa alpina (Zetterstedt, 1838)

Selandria pallida Newman, 1837: 262. Lectotype ♀, designated by Liston & Prous (2014: 88, DEI-GISHym19995), examined, in OUMNH. Type locality: no data [United Kingdom?]. Secondary homonym of *Tenthredo pallida* Serville, 1823 (= *Hoplocampa flava*). Placed as a synonym of *alpina* by Liston & Prous (2014).

Tenthredo alpina Zetterstedt, 1838: 339; Syntypes ♀♂, **lectotype** ♀ here designated (DEI-GISHym15883, images: https://doi.org/10.6084/m9.figshare.4755037), in MZLU. Type locality: Norway, Gamstenstind (see Greve 1986). Paralectotypes: 1 ♀ 2 ♂ same data as the lectotype, in MZLU (♂, DEI-GISHym15882, https://doi.org/10.6084/m9.figshare.4756771).

Additional description. Body length: 3.5–5.5mm. Clypeus narrowly and deeply emarginate. Pale colour milky-white. Female: valvula 3 and valvifer 2 combined length ca 0.79–0.97 as long as metafemur without trochantellus. The following may be more or less fuscous, or black: upperside of antennal flagellum, anterior of median mesoscutal lobe, interior mesopostnotum, tarsi. Lancet: Fig. 77. Male: the following may be more or less fuscous, or black: anterior of median mesoscutal lobe, interior mesopostnotum, metapostnotum, narrow basal and apical margins of abdominal terga 1–3. Penis valve: Fig. 94.

Total number of specimens examined: 44.

Similar species. Most similar in coloration are *Hoplocampa ariae* and *phantoma* (see key). Very pale specimens of *crataegi*, from southern Europe, are also similar, but in *crataegi* the radius is darker than the other venation, whereas in *alpina, ariae*, and *phantoma* all venation is equally pale. The lancet of *alpina* (Fig. 77) is closely similar to that of *ariae* (Fig. 78) and *crataegi* (Fig. 79), but the ventralmost ctenidial tooth on the middle annuli is situated more ventrally in the former. The most reliable difference between the lancets of *alpina* and *phantoma* (Fig. 80) is the presence of ctenidial teeth on annular sutures 1–2 or 1–3 in the former, and on ca. 1–7 in the latter. Males of *phantoma* and *alpina* are only distinguishable by examination of the penis valve: *phantoma* without group of long setae at apex of valviceps (Figs 98–99), *alpina* with group of long setae (Fig. 94). The penis valves of *alpina* and *crataegi* (Fig. 95) are closely similar. Possibly the long setae are apically more strongly curved in *crataegi*, but it is likely that this apparently slight difference will not separate all specimens. The penis valves of *alpina* and *ariae* (Fig. 96) are also similar, but differ in that *ariae* has a more obtuse valviceps apex and larger group of apical setae, which are also longer.

Life history. Host plant: *Sorbus aucuparia* (Pschorn-Walcher & Altenhofer 2000).

Distribution. Central and northern Europe, including Britain and Ireland (Taeger *et al*. 2006).

Occurrence in Sweden: published records: “rare in Sweden, but seems more widespread in Lapland” (Thomson 1871). Material examined: Skåne, Blekinge, Småland, Gotland, Bohuslän, Uppland, Dalarna, Hälsingland, Jämtland, Lycksele Lappland, Torne Lappmark (Torne Träsk Region and Karesuando).

Specimens examined. Austria: 2♀ (DEI-GISHym83554) (SDEI). Denmark: 1♀, Höruphav, 28.05.1899 [leg. Wüstnei], SDEI. France: 3♀, leg. H. Savina (priv. Coll. Savina). Germany: 5♀(DEI-GISHym83575, 83585) 1♂ (DEI-GISHym11130); Brandenburg; North Rhine-Westphalia; Saxony; Thuringia (SDEI). Sweden: Skåne; 1♀, leg. Boheman (MZLU). Bohuslän; 1♀ (NHRS-HEVA000003418), Kungshamn, +59.99390°N +17.69440°E, 18.06.1944, leg. Lundblad (NHRS). Gotland; 1 ♀, Farö, Sudersand, lok. 5, +57.95564°N +19.25152°E, 26.06.1964, leg. B.-O. Landin (MZLU). Småland; 3♀ (NHRS-HEVA000006515–6517), leg. Boheman (NHRS). Uppland; 1♀ (NHRS-HEVA000006518), leg. Boheman (NHRS). Dalarna; 1♂ (DEI-GISHym20575), Orsa 15km N, +61.26100°N +14.58200°E, 11.06.2013, leg. Liston, Prous & Taeger (SDEI). Hälsingland; 1♀ (NHRS-HEVA000006520), Delsbo, +61.80858°N +16.55020°E, August 1904 (NHRS). 1♀ (NHRS-HEVA000006519), Tensberget, +61.66670°N +15.20000°E, 26.06.1942, leg. Lundblad (NHRS). Jämtland; 1♀ (NHRS-HEVA000006521), leg. Boheman (NHRS). Ångermanland; 2♀, Mellerstan, 1.5km W Bodum, 26.06.1964, leg. Brinck-Cederholm (MZLU). Lule Lappmark; 1♀, Skalka-forsen, Kuoikavarats, 2km S Björkholmen, Lok. 15, +66.37022 +22.82429°, 04.07.1966, leg. P. Brinck & C. Gustafson (MZLU). Torne Lappmark; 1♀ (NHRS-HEVA000006522), 18.07.1903, leg. Roman (NHRS). 8♀ 1♂, Björkliden, 500m asl, +68.40900°N +18.63900°E, 28.07.2017, leg. Liston & Prous (SDEI). Sweden or Norway: Lapponia meridionalis, 1♀ (NHRS-HEVA000006523), leg. Zetterstedt (NHRS). No data: 1♀ 1♂ (SDEI).

Hoplocampa ariae Benson, 1933

Hoplocampa (*Hoplocampa*) *ariae* Benson, 1933: 255–256. Holotype ♀, not examined, in BMNH. Type locality: England, Surrey, Box Hill.

Additional description. Body length: 4.5–6.5mm. Clypeus narrowly and deeply emarginate. Pale colour creamy-white to testaceous. Female: the following may be more or less fuscous, or black: antenna above, sunken parts of meso- and metapostnotum, tarsi, apex of metatibia, apex of valvula 3. Lancet: Fig. 78. Male: the following may be more or less fuscous, or black: anterior of median mesoscutal lobe, meso- and metapostnotum, tarsi, apex of metatibia, basal and apical margins of abdominal terga 1–3, sometimes also a spot in middle of these terga, and a small lateral spot each side. Penis valve: Fig. 96.

Total number of specimens examined: 10.

Similar species. Most similar are *Hoplocampa alpina* and *phantoma* (see key, and under *alpina*). Very pale specimens of *crataegi*, from southern Europe, are also similar, but in *crataegi* the radius is darker than the other venation, whereas in *ariae* and *alpina* all venation is equally pale. The lancet of *ariae* (Fig. 78) is closely similar to that of *alpina* (Fig. 77) and *crataegi* (Fig. 79), but the ventralmost ctenidial tooth on the middle annuli is situated more dorsally in *ariae* than in *alpina*. The most reliable difference between the lancets of *ariae* and *phantoma* is the presence of ctenidial teeth on annular sutures ca. 1–3 in the former, and on ca. 1–7 in the latter. The penis valves of *ariae* (Fig. 96) and *phantoma* (Figs 98–99) are clearly different in overall shape, and *ariae* has a group of long setae on the apex of the valviceps, which are absent in *phantoma*. The penis valves of *ariae* and *alpina* (Fig. 94) are also similar, but *ariae* has a more obtuse valviceps apex and larger group of apical setae, which are also longer.

Life history. Host plant: *Sorbus aria* (Pschorn-Walcher & Altenhofer 2000).

Distribution. Central Europe, England and Ireland (Taeger *et al*. 2006). Occurrence in Sweden: no records, but might occur on naturalised *Sorbus aria*, or potentially on the related, native *S. intermedia*, *S. rupicola*, or *S. norvegica*.

Specimens examined. Germany: Bavaria: 1♀ (DEI-GISHym19230), Trimbach, Trimburg, 14.05.2004, leg. Liston (SDEI). 3♀ (including DEI-GISHym19229, 83551), NW Regensburg, Deuerling, 24.05.2004, leg. Liston (SDEI). Italy: 1♀ 3♂ (BC-ZSM-HYM06414–06415, 07203–07204), 26 km SW Cuneo, Lago della Rovina, 17.06.2009 (ZSM). United Kingdom: 1♀ 1♂ (DEI-GISHym83574), England, Buckinghamshire, Aston Clinton, 06.06.1953, leg. R. B. Benson (SDEI).

Hoplocampa brevis (Klug, 1816)

Tenthredo (*Allantus*) *brevis* Klug, 1816: 53–54. Syntypes ♀, Berlin, **lectotype** ♀ here designated, in ZMHUB (GBIF-GISHym2434, images: https://doi.org/10.6084/m9.figshare.4724758). Type locality: Berlin (Germany). Paralectotype: 1 ♀ (GBIF-GISHym2435), same data as the lectotype, in ZMHUB.

Tenthredo fallax Serville, 1823: 50. Lectotype ♀, designated by Lacourt (2000: 97), not examined, in MNHN. Type locality: Soissons (France). Synonymy with *brevis* by Lacourt (2000: 106).

Tenthredo fallax Lepeletier, 1823: 108. Lectotype ♀, designated by Lacourt (2000: 97), not examined, in MNHN. Type locality: Soissons (France). Primary homonym of *Tenthredo fallax* Serville, 1823.

Tenthredo pyri Vallot, 1848: 203. Syntypes, larvae, by indication on Réaumur (1736: 476), lost. Type locality: France. Listed in synonymy of *brevis* by Taeger *et al*. (2010: 407).

Additional description. Body length: 5.0–5.5mm. Clypeus narrowly and deeply emarginate. Pale body colour orange-brown. Antenna mainly pale, more or less blackened basally and above. Head capsule pale, except for suture between clypeus and supraclypeal area, dorsal tentorial macula, postocellar furrows, postoccipital groove, and more or less narrowly around each ocellus. Wing venation partly pale, particularly M+Cu. Costa and radius of fore wing fuscous, except for bases. Mesoscutum more or less black, with pale posterior parts of median lobe and interior of lateral lobe. Mesoscutellum and appendage more or less pale. Coxae basally black-edged. More northern specimens usually with longitudinal black stripe on metacoxa. Femora and tibiae entirely pale. Tarsi pale to slightly fuscous. Specimens from Denmark and Germany have the entire dorsum of the abdomen black, except more or less for terga 8 and 10. Specimens from further south may have only terga 1–5 medially black. Valvula 3 pale. Lancet: Fig. 81.

[Male not examined]

Total number of specimens examined: 40.

Similar species. Most closely resembles *Hoplocampa testudinea*, with which it shares the same hosts. In direct comparison, imagines can be distinguished thus:

- Mesonotum completely black. Postocellar area black. Female valvula 3 black. Lancet (Fig. 87) with very large, horizontally orientated ventralmost ctenidial teeth, on middle annuli reaching back almost to base of adjacent sawtooth; middle and apical sawteeth without serrulae. Male relatively common . . . .***testudinea***
- Mesonotum partly pale (brown). Postocellar area pale. Female valvula 3 brown. Lancet (Fig. 81) with small, obliquely orientated ventralmost ctenidial teeth, on middle annuli not reaching near to base of adjacent sawtooth; middle and apical sawteeth with numerous serrulae. Male extremely rare . . . . ***brevis***

Larvae of these species were compared in detail by Velbinger (1939), who concluded that the only reliable character for separating them, is the presence in *brevis* of a small, triangular, dark marking on the middle of the upper labrum (often therefore obscured by the overlying clypeus). This marking is absent in *testudinea*. Roberti (1957) described and illustrated differences between these species in the setation and surface sculpture of abdominal tergum 10.

Life history. Host plants: *Pyrus communis* (Pschorn-Walcher & Altenhofer 2000), occasionally *Malus domestica* (Velbinger 1939). Biology: Velbinger (1939), Roberti (1946). *Hoplocampa brevis* is normally entirely parthenogenic, and the male is said to be very rare (Velbinger 1939, Masutti & Covassi 1980). In fact, the only original report of the occurrence of males appears to be by Konow (1888: 189–190).

Distribution. Southern and Central Europe, England (Taeger *et al*. 2006), north to southern Sweden (Jensen 2013), North Africa (Tunisia) (Wafa & Mars 2008), Caucasus (Zhelochovtsev & Zinovjev 1995), Jordan (Al-Qura'n 2008), Iran (Davoudi 1987), introduced to North America (Lacourt 1999). In contrast to *testudinea*, *brevis* reaches higher levels of abundance in warmer, more southern regions (Velbinger 1939).

Occurrence in Sweden: published records: Småland (Thomson 1871). According to Jensen (2013): "not very abundant in zones III and IV" [refers to the classification of cultivation zones, of which these two are represented from southern Sweden north to about Sundsvall (Svensk Trädgård Riksförbundet 2017)]. Material examined: Småland, Östergötland.

Specimens examined. Bulgaria: Pazardzhik: 1♀ (DEI-GISHym88738), Vinogradets 3 km N, 300 m, 31.03.2018, leg. Liston & Prous (SDEI). Burgas: 1♀, Slanchev Bryag 1 km N, 01.04.2018, leg. Liston & Prous (SDEI). Cyprus: 20♀, 17.04–20.04 (SDEI, ZSM). Germany: 6♀; 17.04–18.05, Baden-Wuerttemberg (SMNG); Mecklenburg-Vorpommern; North Rhine-Westphalia (SDEI). Greece: 8♀, Crete (including DEI-GISHym83557), 24.03–25.04 (SDEI). Poland: 1♀ (SDEI). Sweden: 2♀ Östergötland (NHRS-HEVA000003423, -6526), latter leg. Haglund; Småland 2♀ (NHRS-HEVA000006524–6525) (NHRM).

Hoplocampa cantoti Chevin, 1986

Hoplocampa cantoti Chevin, 1986: 21–23. Holotype ♀, not examined, in CBGP. Type locality: France, Eure-et-Loir, forêt de Dreux.

Additional description. Body length: 3.5mm. Clypeus broadly and shallowly emarginate. Female: Scape and pedicel black, underside of flagellum reddish. More or less gena, malar space and supraclypeal area pale (whitish). Metacoxa black with ventro-apical edge pale. Trochanters and femora entirely reddish. Valvula 3 black. The Swiss and Bulgarian specimens have pronotum, tegulae, and abdomen entirely black, whereas in the French specimens [according to original description] tegulae and posterior angles of pronotum are reddish, and underside of abdomen slightly reddish. Lancet: Figs 92–93. Male: unknown.

Total number of specimens examined: 10.

Similar species. Based on external characters, could be confused with *minuta*, *chrysorrhoea*, or *fulvicornis*: see key. The lancet (Fig. 92) has a highly distinctive shape, among W. Palaearctic species resembling only *chrysorrhoea* (Fig. 90). As illustrated by Chevin (1986), we found differences between these two species in the gross morphology of the lancets: narrower in *chrysorrhoea*, and apex curved somewhat upwards in *chrysorrhoea*, but straight in *cantoti*.

Life history. Host plants: not known for certain. The Bulgarian specimens were mostly swept from *Prunus spinosa*, and sometimes from *P. domestica* growing among these. Chevin (1986) suggested that the host is *Prunus mahaleb*, which is a characteristic component of the woody vegetation of the two known French localities. However, *Prunus mahaleb* was not seen close to the Bulgarian localities, and is not recorded at the Swiss locality (infoflora 2017). Therefore, we suppose that the host is *Prunus spinosa*.

Distribution. Bulgaria (Varna Province), France (Départements Eure-et-Loire, Indre-et-Loire), Switzerland (Canton Jura).

Occurrence in Sweden: not recorded, and not expected.

Specimens examined. Bulgaria: Varna Province: 1♀ (DEI-GISHym84161), Tsonevo 5km S, 100m, N42.982° E27.451°, 02.iv.2018, leg. Liston & Prous (SDEI); 1♀ (DEI-GISHym88748), Tsonevo 5km S, 100m, N42.982° E27.451°, 03.iv.2018, leg. Liston & Prous (SDEI); 5♀ (DEI-GISHym88769), Dolni Chiflik 2km SE, 50m, N42.983° E27.743°, 05.iv.2018, leg. Liston & Prous (SDEI); 1♀ (DEI-GISHym88854), Dolni Chiflik 2km SE, 50m, N42.983° E27.743°, 13.iv.2018, leg. Liston & Prous (SDEI); 1♀, Tsonevo 5km S, 100m, N42.982° E27.451°, 06.iv.2018, leg. Liston & Prous (SDEI). *Switzerland: 1♀ (BC-ZSM-HYM10947), Canton Jura, Gemeinde Montmelon, Les Oeuches, 440m asl, +47.35172°N +7.16793°E, 22.04.2009, leg. B. Peter (ZSM) [locality confirmed by the collector: differs slightly from that on label].

Hoplocampa chamaemespili Masutti & Covassi, 1980

Hoplocampa chamaemespili Masutti & Covassi, 1980: 222–225. Holotype ♀, not examined, in MSNV. Type locality: Italy, Alpi Carniche, Sappada, Monte Lastroni SE.

Additional description. Body length: 5.5–6.0mm. Clypeus narrowly and deeply emarginate. Pale body colour orange-brown. Anterior of median mesoscutal lobes broadly black. Inner and outer areas of lateral mesoscutal lobes broadly black (Fig. 75). Mesoscutellum largely pale, appendage entirely black. Female: dorsum of abdominal terga 1–6 black. Valvula 3 in lateral view pale, dorso-apically more or less black. Lancet: Fig. 82. Male: penis valve: Fig. 97.

Total number of specimens examined: 9.

Similar species. Only *Hoplocampa plagiata* is likely to be confused with *H. chamaemespili*. In direct comparison, they can *usually* be distinguished as follows [but see notes under *plagiata* on a very dark colour form of that species, only known from France (Massif Central and Pyrenees)]:

- Lateral mesoscutal lobe with internal and external black areas (Fig. 75). Mesoscutellar appendage entirely black. ♀: Occiput entirely dark. Sawteeth of lancet small, rather flat (Fig. 82). ♂: penis valve distally with group of long setae; valviceps distally acute (Fig. 97). . . . . ***chamaemespili***
- Lateral mesoscutal lobe nearly completely pale, except for sutures (Fig. 76). Mesoscutellar appendage at least pale in middle. ♀: Occiput largely pale, except around foramen magnum. Sawteeth of lancet large, strongly protruding (Fig. 88). ♂: penis valve distally without group of long setae; valviceps distally obtuse (Fig. 107). . . . . ***plagiata***

Life history. Host plant: *Sorbus chamaemespilus* (Masutti & Covassi, 1980). Biology: Masutti & Covassi (1980).

Distribution. Northern Italy: Monte Baldo, Dolomites, Carnic pre-Alps, and Western Julian Alps (Provinces Trento e Verona, Bolzano, Belluno, Pordenone, and Udine): Masutti & Covassi (1980) and records below. So far only found in the upper montane and subalpine zones, between approximately 1400–1900. Schedl (2017) published a record under the name *chamaemespili* of a female and male, illustrated with dorsal habitus images of both specimens, from Austria, Carinthia, Dobratsch, Schüttenwald, 700–900m. These specimens are *H. plagiata*, based on his illustrations.

Occurrence in Sweden: not recorded, and not expected.

Specimens examined. Italy: 6♀ (including DEI-GISHym11128, BC-ZSM-HYM11306) 3♂ (including BC-ZSM-HYM11307), Monte Baldo, ca. 1800 m, 24–26.06.2004 (SDEI, ZSM).

Hoplocampa chrysorrhoea (Klug, 1816)

Tenthredo (*Allantus*) *chrysorrhoea* Klug, 1816: 60–61. Syntypes ♀♂, Gartz in Pommern, **lectotype** ♀ here designated (GBIF-GISHym2444 , images: https://doi.org/10.6084/m9.figshare.4724812), in ZMHUB. Type locality: Gartz (Germany). Paralectotypes 1♂ (GBIF-GISHym2441, images: https://doi.org/10.6084/m9.figshare.4724809) 2 ♀ (GBIF-GISHym2442 & 2443) in ZMHUB.

Hoplocampa chrysorrhoea var. *nigrita* Enslin, 1914: 248. Syntype(s) ♀, no data, **lectotype** ♀ here designated (GBIF-GISHym3142, images: https://doi.org/10.6084/m9.figshare.4724821). Type locality: Mecklenburg (Germany).

Additional description. Body length: 3.5–4.5mm. Clypeus broadly and shallowly emarginate. Female: malar space, clypeus and labrum more or less pale (whitish). Scape and pedicel black, flagellum ventrally more or less pale. Pronotum black except sometimes for narrow posterior angles. Mesepisternum entirely black. [Smith (1982) examined specimens from Israel with "the pronotum and much of the mesopleura pale orange"] Yellow are: all abdominal sterna, terga 9 and 10, as well as lateral, downturned margins of all other terga. Valvula 3 black. Lancet: Figs 90–91. Male: gena, malar space, supraclypeal area, clypeus and labrum pale (whitish). Scape pale, pedicel black, flagellum ventrally more or less pale. Approximately posterior half of pronotum pale. Mesepisternum mainly yellow. [Smith (1982) noted that males from Israel had the pronotum and entire mesopleura yellow] Terga 1–8 black, except for lateral, downturned parts. Rest of abdomen yellow, including the harpes. Penis valve: Fig. 101.

Total number of specimens examined: 138.

Similar species. On external characters, could be confused with *minuta*, *cantoti*, or *fulvicornis*: see key. The lancet of *chrysorrhoea* (Figs 90–91) is similar only to that of *cantoti* (Figs 92–93): see comments under that species. The penis valve (Fig. 101) somewhat resembles those of *fulvicornis* (Fig. 102) and *minuta* (Fig. 103), but the distal prolongation in *chrysorrhoea* is much shorter and wider.

Life history. Host plants: not known for certain. Benson (1958) stated that *Prunus spinosa* is the host. Numerous subsequent authors have followed this, but it is not clear on what evidence the original statement was based. Adults are indeed often swept from flowering *Prunus spinosa*, but also from flowers of other Rosaceae, and in several countries have been found on *Crataegus*, at localities where *P. spinosa* was absent (e.g. Miles (1936), Liston *et al*. (2015), and Moroccan records, below). In our opinion, *Crataegus* could be the (only) host, but if this is so, then oviposition must be into flowers which are at an early stage of development, many days before they open. This would be unusual among European *Hoplocampa* species. Lorenz & Kraus (1957) cite Vallot (1848) as having found the larvae in the fruits of *Ribes uva-crispa* (Grossulariaceae), but this seems highly improbable, because all known *Hoplocampa* larvae feed on rosaceous hosts.

Distribution. Widespread in southern and central Europe, including the British mainland, North to Denmark (Taeger *et al*. 2006), East to Cyprus and Israel (Lacourt 1999), and also in North Africa (Morocco, Middle Atlas: see below); introduced to North America (Smith & Fitzgerald 2018).

Occurrence in Sweden: no published records. Material examined: Skåne, Öland.

Specimens examined. Cyprus: 1♀, Mandria, 16.04.2011, leg. H.-J. Jacobs (SDEI). France: 1♀ (BC-ZSM-HYM03414), Bollenberg, 21km NNW Mulhouse, 06.04.1999 (ZSM). Germany: 26♀ 2♂, 10.04–27.05, Baden-Wuerttemberg; Bavaria; Brandenburg (DEI-GISHym31789, 83548, 83549); Mecklenburg-Vorpommern; Thuringia. Greece: Crete; 13♀, 28.03–21.04 (SDEI); mainland 1♀, 30.04.2005 (SDEI). *Morocco: Meknes-Tafilalet Region [Middle Atlas Mts], all specimens swept from *Crataegus* ? *monogyna* that was not yet flowering: 5♀, Khenifra 18 km E., 1510m asl, +32.94300°N -5.47700°E, 18.04.2015, leg. Liston & Prous (SDEI); 2♀, same as preceding, but 21.04.2015. 2♀, Ifrane 5 km SSW, 1660 m asl, +33.48400°N -5.15000°E, 19/20.04.2015, leg. Liston & Prous (SDEI). Spain: 1♀ (SDEI). *Sweden: Skåne; 1♀, Lund, Botaniska Trädgaerden, +55.70380°N +13.20310°E, 03.05.1972, leg. R. Danielsson (MZLU). Öland; 72♀, Mörbylånga kommun, Gamla Skogsby (Kalkstad), „diversitetsängen", +56.61669°N +16.50759°E, 25.04–20.05.2005 , leg. SMTP (NHRS); 3♀, same data except 20.05.–01.06.2005 (NHRS); 6♀, same data except 20.05.–28.06.2006 (NHRS).

Hoplocampa crataegi (Klug, 1816)

Tenthredo (*Allantus*) *crataegi* Klug, 1816: 54. Syntypes ♂♀, Berlin, **lectotype** ♀ here designated (GBIF-GISHym2447, images: https://doi.org/10.6084/m9.figshare.4724824), in ZMHUB. Type locality: Berlin (Germany). Paralectotype ♂ (GBIF-GISHym2446, images: https://doi.org/10.6084/m9.figshare.4724827), in ZMHUB.

Tenthredo luteola Serville, 1823: 50–51. Syntype(s) ♂, most likely lost. Type locality: Soissons (France). Primary homonym of *Tenthredo luteola* Klug, 1816. Listed in synonymy of *crataegi* by Dalla Torre (1894).

Tenthredo luteola Lepeletier, 1823: 108. Syntype(s) ♂, most likely lost. Type locality: Soissons (France). Primary homonym of *Tenthredo luteola* Klug, 1816.

Tenthredo verticata Serville, 1823: 50. Syntypes ♂♀, most likely lost. Type locality: Soissons (France). Synonymy with *crataegi* by Lacourt (2000: 106).

Tenthredo verticata Lepeletier, 1823: 108. Syntypes ♂♀, most likely lost. Type locality: Soissons (France). Primary homonym of *Tenthredo verticata* Serville, 1823.

Additional description. Body length: 3.5–5.5mm. Clypeus narrowly and deeply emarginate. Pale body colour yellowish. Fore wing costa and M+Cu similarly coloured, and paler than Sc+R. Female: antennal flagellum completely black. Pedicel and/or scape partly or wholly pale [except in Sicily]. In Central and North European specimens, mesonotum usually entirely black, except for yellow posterior edge of mesoscutellum [but in Sicily completely black], and sometimes minute spots on lateral mesoscutal lobes, and head capsule with ocellar area and upper occipital area black [in Sicily more extensively black]. Pronotum yellow, except for black anterior angle [in Sicily nearly entirely black]. Mesepisternum entirely yellow [in Sicily entirely black]. Specimens from southern Europe (e.g. Portugal, France, Cyprus) may have mesonotum and head capsule nearly entirely pale. Furthermore, whereas northern and central European specimens have apical 0.5–0.7 of metatibia blackish on all surfaces, contrasting with completely pale yellow base, the metatibia of some southern females (Portugal, Sicily, Cyprus) is completely pale. Valvulae 3 in dorsal view less than 2 × as long as basal width, tapering increasingly towards apex; yellow [except in Sicily; black]. Lancet: Fig. 79. Male: antenna completely yellow. Colour and variability of mesonotum and head as for female. All legs completely pale. Penis valve: Fig. 95.

Total number of specimens examined: 109.

Similar species. Because they both have *Crataegus* species as hosts, darker individuals of the highly variable *crataegi* might be confused with *pectoralis*. In direct comparison, they may be separated thus:

Females

- Valvulae 3 in dorsal view less than 2 × as long as basal width, tapering increasingly towards apex; longest setae arise near middle (Fig. 62). Lancet (Fig. 79): ventralmost ctenidial teeth well-developed on basal and middle annuli; middle sawteeth strongly hooked. [In Central and northern Europe: apical 0.5–0.7 of metatibia blackish on all surfaces, contrasting with completely pale yellow base; valvula 3 largely pale in lateral view; mesepisternum yellow; mesoscutellum at least partly yellow]. . . . . ***crataegi***
- Valvulae 3 in dorsal view more than 2 × as long as basal width, evenly tapering; longest setae arise on apical 0.2–0.3 (Fig. 61) Lancet (Fig. 89): completely without ctenidial teeth; middle sawteeth weakly hooked. [Metatibia at most slightly fuscous on extreme apex; valvula 3 entirely black; mesepisternum yellow above, black below; mesoscutellum completely black] . . . . ***pectoralis***

Males

- mesoscutellum partly yellow, at least on posterior margin (Fig. 72); antenna completely pale; propleuron anteriorly edged with black (Fig. 34); penis valve: Fig. 95 . . . . ***crataegi***
- mesoscutellum completely black (Fig. 27); basal flagellomeres fuscous above (Fig. 27); propleuron entirely pale (Fig. 28); penis valve: Fig. 105 . . . . ***pectoralis***

Life history. Host plants: *Crataegus* spp. (Pschorn-Walcher & Altenhofer 2000). Liston (2007) thought that *crataegi* is mainly attached to *C. monogyna*, rather than *C. laevigata*, but this was based solely on observations on visits by adults to the respective inflorescences. Brischke (1883, caption to Plate IV) reared adults from *C. laevigata* (=*oxyacantha*). More recently, two larvae extracted from fruits of *C. monogyna* were identified by COI barcoding as *crataegi*.

Distribution. Southern and Central Europe, including Britain and Ireland; North to Denmark (Taeger *et al*. 2006) and southern Sweden; Turkey, Morocco (Lacourt 1999), and Caucasus (Zhelochovtsev & Zinovjev 1995).

Occurrence in Sweden: published records: Skåne (Thomson 1871, Andersson 1962, Benander 1966), Småland, Gotland (Thomson 1871). Material examined: Skåne, Småland, Öland, Gotland, Hälsingland.

Specimens examined. France: Corsica; 1♀ (ZSM); mainland; 2♀(DEI-GISHym11414) (SDEI). Germany: 69♀ 25♂, 16.04–07.06; Bavaria; Berlin; Brandenburg (DEI-GISHym83583, 83584); Mecklenburg-Vorpommern; Rhineland-Pfalz; Saxony (SDEI, ZSM). Italy: Sicily; 1♀ (DEI-GISHym19238) (SDEI). *Portugal: Leiria; 1♀, Leira 6 km ESE, 175 m asl, +39.71276°N -8.70976°E, 01.05.2012, leg. Blank, Jacobs, Liston & Taeger (SDEI). Viséu; 2♂ (DEI-GISHym31784), Nelas 4 km SE, 180 m asl, +40.50140°N -7.82295°E, 03.05.2012, leg. Blank, Jacobs, Liston & Taeger (SDEI). Guarda; 1♂, Seia 9 km NNW, 350 m asl, +40.47853°N -7.76223°E, 06.05.2012, leg. Blank, Jacobs, Liston & Taeger (SDEI). Braga; 1♀, Terras de Bouro 10 km NE, 630 m asl, +41.76297°N -8.19114°E, 10.05.2012, leg. Blank, Jacobs, Liston & Taeger (SDEI). Sweden: Skåne; 1♀ (NHRS-HEVA000006528), Ystad, +55.42873°N +13.81955°E, 13.06.1936 (NHRS). 1♂, Esperöd (MZLU). 1♀, Ringsjön, leg. Muchardt (NHRS). 2♀ (NHRS-HEVA000003416, NHRS-HEVA000006529), Ven, +55.90919°N +12.69814°E, 19.06.1946, leg. Lundblad (NHRS). Småland; 1♂ (NHRS-HEVA000006530), leg. Boheman (NHRS). 1♀, Hultsfred, Kloster Gård, 100 m., +57.49700°N +15.87100°E, 31.05.2013, leg. Liston, Prous & Taeger (SDEI). Öland; 1♀ (NHRS-HEVA000006531), Högby, +57.16667°N +17.01667°E, 06.1907, leg. Wirén (NHRS). Gotland; 3♂ (NHRS-HEVA000006532–6533, -6538), leg. Boheman (NHRS). Hälsingland; 4♂ (NHRS-HEVA000006534–6537), Kyrkbytjärn, Los, +61.72488°N +15.16921°E, 27.06.1942, leg. Lundblad (NHRS).

Hoplocampa flava (Linné, 1760)

Tenthredo flava Linné, 1760: 395. Syntypes ♂♀?, most likely lost. Type locality: ?Sweden. Description refers also to Réaumur 1740: Pl.10, fig. 6 &7.

Tenthredo ruficapilla Gmelin, 1790: 2668. Syntypes ♂♀?, most likely lost. Type locality: Europe. Description refers to Zschach (1788: 56, nr. 124). Listed in synonymy by Dalla Torre (1894: 188).

Tenthredo Glaucopis [sic!] Rossi, 1790: vol. 2, 31–32. Syntypes ♂♀?, most likely lost. Type locality: Etrusca (provinces Florentina and Pisana, Italy). Listed in synonymy by Dalla Torre (1894: 188).

Allantus ferrugineus Panzer, 1802: 90/9. Syntypes ♂♀, Germany, **lectotype** ♂ here designated (ZMUC-GISHym1022, images: https://doi.org/10.6084/m9.figshare.7837790.v1), in ZMUC. Type locality: Germany. Paralectotype ♀ (ZMUC-GISHym1023, images: https://doi.org/106084/m9.figshare.7837856.v1), in ZMUC. Synonymy with *Tenthredo brunnea* Klug, 1816 by Klug (1816: 53).

Hylotoma ferruginea Fabricius, 1804: 26. Syntypes ♂♀, Germany, lectotype ♂ here designated (ZMUC-GISHym1022, images: https://doi.org/10.6084/m9.figshare.7837790.v1), in ZMUC [this specimen is also the lectotype of *Allantus ferrugineus*: see there]. Paralectotype ♀ (ZMUC-GISHym1023, images: https://doi.org/106084/m9.figshare.7837856.v1), in ZMUC [this specimen is also the paralectotype of *Allantus ferrugineus*: see there]. Type locality: Germany. Synonymy with *Tenthredo brunnea* Klug, 1816 by Klug (1816: 53).

Hylotoma simplex Fallén, 1807: 207–208. Holotype ♀, examined, in MZLU. Type locality: Sweden, Skåne [Esperöd: Fallén 1829]. Synonymy with *Hoplocampa ferruginea* by Thomson (1871: 201).

Tenthredo (*Allantus*) *brunnea* Klug, 1816: 53. Replacement name for *Hylotoma ferruginea* Fabricius, 1804. Synonymy with *Tenthredo flava* Linné, 1760 by Zaddach (1876: 51).

Tenthredo pallida Serville, 1823: 47. Syntype(s) ♀, most likely lost. Type locality: Paris (France). Synonymy by Lacourt (2000: 103).

Tenthredo pallida Lepeletier, 1823: 105. Syntype(s) ♀, most likely lost. Type locality: Paris (France). Synonymy by Lacourt (2000: 103). Primary homonym of *Tenthredo pallida* Serville, 1823.

Hoplocampa flava var. *dimidiata* Costa, 1894: 149. Holotype ♀, most likely lost. Type locality: Parma (Italy). Treated in legend (Costa 1894: [291] pl. II. 2) as *Hoplocampa dimidiata.*

Taxonomy. *Allantus ferrugineus* Panzer, *Hylotoma ferruginea* Fabricius, and *Tenthredo* (*Allantus*) *brunnea* Klug: Klug (1816) replaced the Fabricius' name because of secondary homonymy:

"Die Benennung Panzers, von welchem Fabricius diese Art, die er nachher so undeutlich und mangelhaft beschreibt, erhielt, mußte deshalb geändert werden, weil schon Schrank, (enum. p. 326 n. 656) eine *Tenthredo ferruginea* aufführt." He subsequently emphasised his reasoning (Klug 1819: 72): „Der Name *T. ferruginea* ist von mir in *T. brunnea* umgeändert worden weil Schrank schon früher als Fabricius eine *T. ferruginea* beschrieben hat."

Therefore, the specimens in Klug's collection cannot be considered to be types. Furthermore, because Panzer's description is obviously based on the same material as Fabricius' species, all three names are objective synonyms.

Hylotoma simplex: Three specimens, two females and one male, are in the Fallén Collection (MZLU) under the name *Phyllotoma simplex.* Either of the females might be the holotype. One is without any label, the other has a label similar to that of the male. The male specimen, which was described later by Fallén (1829), belongs to *crataegi*. We consider the female specimen, until now without any labels, to be the holotype of *simplex*, because the female and male standing under the name are very similarly labelled, and therefore probably collected at nearly the same time (later than the holotype).

Additional description. Body length: 3.5–5.5mm. Clypeus narrowly and deeply emarginate. Pale body colour yellowish. Antenna completely pale. Base of procoxa and margins of propleuron black-edged. Legs entirely pale, apart from bases of coxae. Metanontum black, except for pale metascutellum. Venation entirely pale yellowish, except for darkened base of fore wing pterostigma. Female: Head capsule completely pale except for postoccipital groove, and more or less dorsal tentorial macula and anterior tentorial pit. Mesonotum completely pale. Valvula 3 pale. Lancet: Fig. 83. Male: Small black patch between ocelli, more or less extending anteriorly along edges of frontal field. Median and lateral mesocutal lobes partly black. Penis valve: Fig. 100. Note that the curvature of the filament is highly variable in prepared specimens.

Total number of specimens examined: 38.

Similar species. The wing colour should separate *Hoplocampa flava* from all other European species, but when this cannot be clearly seen (as often in old, faded specimens) it is most likely to be misidentified as *crataegi*. In direct comparison, they may be separated thus:

Females

- Antennal flagellum black (Figs 31–32); epicnemial groove pale (Fig. 32); fore wing costa paler than radius (Fig. 31). [In northern and central Europe, apical 0.5–0.7 of metatibia dark, contrasting with pale yellow base (Fig. 31)]. Lancet (Fig. 79): particularly the middle and apical sawteeth more hooked, with fewer serrulae. . . . . ***crataegi***
- Antennal flagellum pale (Figs 41–42); epicnemial groove narrowly black (Fig. 42); fore wing costa and radius equally pale (Fig. 41). [Metatibia always completely pale (Fig. 42)]. Lancet (Fig. 83): particularly the middle and apical sawteeth less hooked, with more numerous serrulae . . . . ***flava***

Males

- Epicnemial groove pale (Fig. 34); valviceps of penis valve apically with group of long setae, but no filament (Fig. 95). . . . ***crataegi***
- Epicnemial groove black (Fig. 44); valviceps of penis valve apically without group of large setae, but with extremely long filament (Fig. 100) [often conspicuously projecting from tip of abdomen, without preparation] . . . . ***flava***

Life history. Host plants: *Prunus spinosa* and *P. domestica* are main hosts (Pschorn-Walcher & Altenhofer 2000). In southern Europe *Prunus armeniaca* and *P. salicina* are also affected (Roberti 1947, Perju *et al*. 1995). *Prunus avium* is an infrequent, probably secondary host (Velbinger 1947). A possible association with *P. cerasus*, mentioned as a host in earlier literature, needs confirmation (Sprengel 1930a). Biology: Sprengel (1930b), Miles *et al*. (1933), Roberti (1947), Boevé *et al*. (1997).

Distribution. Southern, Central and Northern Europe, including the British Isles; North to Denmark, S. Sweden, Estonia (Taeger *et al*. 2006), and Finland (Paukkunen *et al*. 2009); Turkey, Israel, and Transcaucasus (Lacourt 1999).

Occurrence in Sweden: published records: Skåne, Småland (Thomson 1871), Halland (Andersson 1962).

Material examined: Blekinge, Småland, Öland, Östergötland, Uppland, Hälsingland.

Specimens examined. Bulgaria: 1♀ (DEI-GISHym84160), Pazardzhik Province, Vinogradets 3km N, 300m, +42.31900°N +24.12800°E, 31.03.2018, leg. Liston & Prous (SDEI). Germany: 14♀ 3♂, 17.04–23.05, Baden-Wuerttemberg; Bavaria; Berlin; Brandenburg (including DEI-GISHym19235); Mecklenburg-Vorpommern; Rhineland-Pfalz; Saxony; Saxony-Anhalt; Thuringia (SDEI, ZSM). Sweden: Skåne; 1♀, Esperöd (MZLU). Blekinge; 1♀, Sjöarp, 16.05.1959, leg. T.-E. Leiler (NHRS). Småland; 1♀ (NHRS-HEVA000006539) 1?[abdomen missing] (NHRS-HEVA000006540), leg. Boheman (NHRS). Öland; 4♀ (DEI-GISHym83558) 3♂ (DEI-GISHym20595), Station Linné 1km E, 40 m asl, +56.61700°N +16.50700°E, 28–30.05.2013 (SDEI). Östergötland; 2♂ (NHRS-HEVA000006541–6542), leg. Haglund (NHRS). Uppland; 1♀ (NHRS-HEVA000003420) 1♂ (NHRS-HEVA000006543), Tursbo, +59.70950°N +17.61390°E, 16.05.1939, leg. Lundblad (NHRS). 1♀ (NHRS-HEVA000006544), Resarö, leg. Malaise (NHRS). Hälsingland; 1♀ (NHRS-HEVA000006545), Ljusdal, +61.83094°N +16.07886°E, leg. Muchardt (NHRS). No data; 1♀ 1♂ (SDEI).

Hoplocampa fulvicornis (Panzer, 1801)

Tenthredo fulvicornis Panzer, 1801: 82/13. Syntype(s) ♂, most likely lost (the specimens sent as *fulvicornis* by Panzer to Fabricius [ZMUC] belong to *minuta*). Type locality: Germany.

Tenthredo (*Allantus*) *rutilicornis* Klug, 1816: 54–55. Syntypes ♂♀, "verschiedene Gegenden Deutschlands", **lectotype** ♀ here designated (GBIF-GISHym2457, images: https://doi.org/10.6084/m9.figshare.4769503), in ZMHUB. Type locality: Germany. Paralectotypes 1♂ (GBIF-GISHym2453, images: https://doi.org/10.6084/m9.figshare.4769506), and 2♂ 2♀ (GBIF-GISHym2454–2456, 2548), all in ZMHUB. Described with *Tenthredo fulvicornis* Panzer, 1801 as its (unjustified) synonym.

Hoplocampa minuta forma *dudai* Gregor, in Gregor & Bata, 1942: 288. Syntype(s) ♀, not examined, in NMPC. Type locality: Jindrichuv Hradec (Czech Republic). **New synonym.**

Hoplocampa rutilicornis var. *pleuris* Zirngiebl, 1954: 152. Lectotype ♀, designated by Blank (1996: 210) (GBIF-GISHym3143, images: https://doi.org/10.6084/m9.figshare.4769632), in ZSM. Type locality: Naturschutzgebiet Dannstadt (Germany).

Hoplocampa prunicola Benson, 1968: 201. Holotype ♀, not examined, in BMNH. Type locality: Izmit (Turkey). Synonymy by Chevin (1986: 21).

Taxonomy. *Hoplocampa fulvicornis* (Panzer, 1801): Two male specimens in ZMUC, with handwritten labels "*fulvicornis*", were apparently sent by Panzer to Fabricius. They are both *H. minuta* (Christ), and cannot be considered to be types of *fulvicornis* Panzer, because they disagree with the original description of that species in having black metafemora bases ("Pedes omnes flavi" in *fulvicornis*), and a black subgenital plate ("Abdomen [..] ano rufo"). Klug (1816) apparently intended to replace Panzer's name. On p. 54, under his *Tenthredo* (*Allantus*) *rutilicornis,* Klug mentioned Panzer's *T. fulvicornis*, and on p. 61 he used the younger name *fulvicornis* Fabricius as the valid name for what is now called *H. minuta*. However, an explicit statement that the name *rutilicornis* is a replacement name (as in *brunnea*: see under *H. flava*), is missing. Taeger & Blank (1998) re-established Panzer's name.

Hoplocampa minuta forma *dudai*: This was listed as a synonym of *minuta* by Taeger *et al*. (2010). However, the brief original description states [translated from Czech and Latin] that forma *dudai* is similar to *rutilicornis*, with a red clypeus, antenna, and legs (apart from the black metacoxa), but that the pronotum and tegulae are black. This character combination falls within the range of variability of *fulvicornis*, but disagrees with the darker colour pattern of *minuta* in that the clypeus and most of the legs are pale.

Additional description. Body length: 3.5–4.0mm. Clypeus broadly and shallowly emarginate. Tegulae and pronotum completely black, to completely pale. Legs completely pale, except more or less coxae. Female: scape and pedicel pale, flagellum pale to dark. Head capsule except for clypeus and labrum black, or extensively pale so that only an ocellar fleck remains. Mesoscutal lobes and mesoscutellum completely black, or partly pale. Mesepisternum completely black, to completely pale. Abdomen entirely black, including valvula 3, to extensively pale, including valvula 3, with only most of terga 1–3 black and medial spots on some following terga. The darkest examined specimens are from Öland, Sweden, and the palest from southern France and Bulgaria. Lancet: Fig. 84. Male: antenna usually completely pale, but basal flagellomeres sometimes fuscous above. Head apart from pale clypeus and labrum completely black, to extensively pale, with black reduced to more or less postocellar area, edges of frontal area, and occiput. Mesoscutal lobes and mesoscutellum completely black. Abdomen black, except for more or less pale subgenital plate (at least apically pale) and harpes. Penis valve: Fig. 102.

Total number of specimens examined: 243.

Similar species. Could be confused with *minuta*, *cantoti*, or *chrysorrhoea*: see key for distinguishing characters. The lancets of *fulvicornis* (Fig. 84) and *minuta* (Fig. 85) are closely similar, and do not seem to offer characters that will enable reliable identification. The lancet of *brevis* (Fig. 81) resembles these species in its hooked sawteeth, but *brevis* has rows of ctenidial teeth on ca. annuli 1–7, whereas only the ventralmost ctenidial tooth is developed in the other two species. The penis valve of *fulvicornis* (Fig. 102) is most similar to that of *minuta* (Fig. 103), but in *fulvicornis* the distal filament is much longer than the maximal height of the valviceps, whereas shorter than the maximum height in *minuta*. Also, the valviceps is distally tapered in *fulvicornis*, but not tapered in *minuta*.

Life history. Host plants: *Prunus spinosa* is a main larval host, although the association is based on the occurrence of adults, not larvae (e.g. Pschorn-Walcher & Altenhofer 2000). Reports originating in the old literature, frequently repeated in more recent publications, of *Hoplocampa fulvicornis* feeding in cultivated *Prunus* species, may have partly arisen through misinterpretation of the species name, or misidentification of *fulvicornis* sensu Fabricius (= *minuta*) as what we now understand as *fulvicornis* (Panzer). On the other hand, Roberti (1948a) convincingly showed that *fulvicornis* does attack some plum varieties (*P. domestica*, *P. salicina*), at least in southern Italy. Biology: Roberti (1948a).

Distribution. Southern, Central and Northern Europe, including the British Isles; North to Denmark, Estonia (Taeger *et al*. 2006), and Finland (Paukkunen *et al*. 2009); Turkey (Benson 1968). Published information on *"fulvicornis*" as a pest of *Prunus salicina* in China refers to the two described *Monocellicampa* species (Liu *et al*. 2017).

Occurrence in Sweden: published records: Skåne (Thomson 1871, Benander 1966), Småland, Öland (Thomson 1871), Halland (Andersson 1962), Uppland (Thomson 1871).

Material examined: Skåne, Halland, Småland, Västergötland, Öland, Uppland.

Specimens examined. Bulgaria: 38♀, 27♂, 31.03–13.04, Burgas, Pazardzhik, and Varna Provinces (SDEI). France: mainland; 5♀ (including DEI-GISHym21046), 06.03–06.04 (SDEI). France: Corsica; 1♀ (SDEI). Germany: 51♀ 41♂, 23.03–05.06, Baden-Wuerttemberg; Bavaria; Brandenburg (DEI-GISHym83782); Mecklenburg-Vorpommern (DEI-GISHym31788, 11358, 11359); Rheinland-Pfalz (SDEI, ZSM). Italy: 2♀ 1♂ (SDEI). Sweden: Skåne; 1♀, Ven, +55.90919°N +12.69814°E, 07.05.1972, R. Danielsson (MZLU). Småland; 2♀ (NHRS-HEVA000006546–6547), leg. Boheman (NHRS). Öland; 1♀ 1♂, Mörbylånga kommun, Gamla Skogsby (Kalkstad), "diversitetsängen", +56.61669°N +16.50759°E, 30.03–01.05.2004, leg. SMTP (NHRS); 11♀ 4♂, same data, but 01.05–01.06.2004 (NHRS); 8♀ 14♂, same data, but 20.05–01.06.2005 (NHRS); 6♀ 3♂, same data, but 20.05.–28.06.2006 (NHRS); 12♀ 4♂, same data, but 25.04–20.05.2004 (NHRS). 2♀, Station Linné, 50 m asl, +56.61900°N +16.49900°E, 28–29.05.2015, leg. Liston (SDEI). Västergötland; 1♂ (NHRS-HEVA000006548), leg. Boheman (NHRS). Uppland; 1♂ (NHRS-HEVA000003419), Resarö, Vaxholm, +59.43006°N +18.32726°E, leg. Malaise (NHRS). 1♀ (NHRS-HEVA000006551) 2♂ (NHRS-HEVA000006549–6550), Stockholm [Holmiae], the ♀ leg. Boheman (NHRS).

Hoplocampa minuta (Christ, 1791)

Tenthredo minuta Christ, 1791: 438, Tab. 50, fig. 7. Syntypes ♂♀?, no data, lost.

Tenthredo hylotomoides Serville, 1823: 49. Holotype (assumed by Blank & Taeger 1998) ♀, not examined, in MRSN. Type locality: Soissons (France). Synonymy by Blank & Taeger 1998: 163).

Tenthredo hylotomoides Lepeletier, 1823: 107. Holotype (assumed by Blank & Taeger 1998) ♀, not examined, in MRSN. Type locality: Soissons (France). Synonymy by Blank & Taeger 1998: 163). Primary homonym of *Tenthredo hylotomoides* Serville, 1823.

Tenthredo parvula Serville, 1823: 49. Lectotype ♂, designated by Lacourt (2000: 103) not examined, in MNHN. Type locality: Soissons (France). Primary homonym of *Tenthredo parvula* Klug, 1816. Listed in synonymy with *Hoplocampa fulvicornis* auct. by Dalla Torre (1894: 189).

Tenthredo parvula Lepeletier, 1823: 107. Lectotype ♂, designated by Lacourt (2000: 103) not examined, in MNHN. Type locality: Soissons (France). Primary homonym of *Tenthredo parvula* Klug, 1816. Listed in synonymy with *Hoplocampa fulvicornis* auct. by Dalla Torre (1894: 189).

Tenthredo turcarum Vallot, 1848: 206. Syntypes ♂♀?, no data, most likely lost.

Hoplocampa fabricii W.F. Kirby, 1882: 167. Name for *Hoplocampa fulvicornis* Fabricius 1804, nec Panzer. Syntypes, sex not stated, "Habitat in Germania Dr. Panzer", **lectotype** ♂ here designated (ZMUC00240962, images: https://doi.org/10.6084/m9.figshare.7837949), ZMUC. Type locality: Germany. Paralectotype 1♂ (ZMUC00240961, images: https://doi.org/10.6084/m9.figshare.7842122.v1), ZMUC. Listed as synonym of *minuta* by Taeger *et al*. (2010).

Hoplocampa fulvicornis auct., nec Panzer

Additional description. Body length: 4.0–5.0mm. Clypeus broadly and shallowly emarginate. Thorax black, including pronotum and tegula. Pro- and mesofemur basally black or entirely pale. Apex of metatibia pale, to indistinctly fuscous. Metatarsus more or less fuscous. Female: antenna black, with flagellum indistinctly reddish ventro-apically. Lancet: Fig. 85. Male: scape and pedicel black, flagellum nearly completely red. Harpes from completely black, to ventrally and dorsoapically partly pale. Penis valve: Fig. 103.

Total number of specimens examined: 73.

Similar species. On external characters could be confused with *fulvicornis*, *cantoti*, or *chrysorrhoea*: see key. Whereas the lancets of *cantoti* (Fig. 92) and *chrysorrhoea* (Fig. 90) have a very different total shape compared to *minuta* (Fig. 85), the lancet of *minuta* does not appear to be reliably distinguishable from that of *fulvicornis* (Fig. 84). The penis valve of *minuta* (Fig. 103) is most similar to that of *fulvicornis* (Fig. 102), but in *minuta* the distal filament is shorter than the maximum height of the valviceps, whereas in *fulvicornis* it is much longer than the maximal height. Also, the valviceps is distally tapered in *fulvicornis*, but not tapered in *minuta*.

Life history. Host plants: Cultivated *Prunus* spp., particularly *P. domestica* (Pschorn-Walcher & Altenhofer 2000) and *P. salicina* (Roberti 1952), less often *P. avium* (Velbinger 1947). In southern Europe *P. armeniaca* is affected (Fintzescov 1921, Perju *et al*. 1995). Records of *H. minuta* on *Pyrus* in Japan refer to *H. pyricola* Rohwer, 1924 (Velbinger 1944). Biology: Sprengel (1930b), Miles *et al*. (1933), Ahlberg (1940), Roberti (1952), Bernard (1952).

Distribution. Southern, central and northern Europe, excluding the British Isles, and north to Denmark, Estonia (Taeger *et al*. 2006) and Norway (Jaastad *et al*. 2007); Caucasus, and Uzbekistan (Zhelochovtsev & Zinovjev 1995).

Occurrence in Sweden: published records: Skåne (Thomson 1871, Benander 1966), Blekinge, Halland, Småland, Östergötland (Ahlberg 1940), Västergötland, Bohuslän, Närke, Södermanland, Uppland (Lindblom 1936), Västmanland (Ahlberg 1940), Värmland (Lindblom 1936): Material examined: Skåne, Småland.

Specimens examined. Bulgaria: Burgas: 1♂, Mrezhichko 1 km W, 07.04.2018 (SDEI). Germany: 30♀ 10♂, 02.04–30.05; Baden-Wuerttemberg (DEI-GISHym83545); Bavaria; Berlin; Brandenburg (DEI-GISHym31782, 83546); Rhineland-Palatinate; Thuringia (SDEI, ZSM). Greece: 21♀ 4♂ (SDEI). Sweden: Skåne; 1♀, Lund (MZLU). 2♂ (NHRS-HEVA000003417, -6555), Arkelstorp, +56.17327°N +14.28841°E, 11.05.1935 (NHRS). Småland; 2♀ (NHRS-HEVA000006556–6557), Lessebo, +56.76138°N +15.26619°E, 22.05.1935 (NHRS).

Hoplocampa pectoralis Thomson, 1871

Hoplocampa pectoralis Thomson, 1871: 202–203. Syntypes ♀, Gottland (sic!), **lectotype** ♀ here designated (DEI-GISHym17569, images: https://doi.org/10.6084/m9.figshare.4763851), in MZLU. Type locality: Gotland (Sweden). Paralectotype ♀ (NHRS-HEVA000003421, images: https://doi.org/10.6084/m9.figshare.4764835), in NHRS.

Hoplocampa Oertzeni [sic!] Konow, 1888: 188, 190. Syntypes ♂♀, Karpathos, **lectotype** ♀ here designated (GBIF-GISHym3804, images: https://doi.org/10.6084/m9.figshare.4772125), in SDEI. Type locality: Karpathos (Greece). Paralectotype ♀ (GBIF-GISHym3805), in SDEI. Synonymy by Enslin (1914: 247).

Additional description. Body length: 3.0–5.0mm. Clypeus narrowly and deeply emarginate. Pale body colour yellowish. Fore wing costa and Sc+R similarly coloured, and darker than M+Cu. Female: Antennal flagellum entirely black (most northern and central European specimens), or more or less pale below (most southern European specimens); scape and pedicel more or less fuscous above, pale below. Upper head mainly black, usually with a pair of pale flecks anterior of ocelli, and outer orbits more or less pale. Whole occiput dark. Tegula and pronotum except extreme anterior yellow. Coxae usually completely yellow, rarely black-flecked. Abdominal terga and sterna from completely yellow except for black base of tergum 1, to extensively black on terga 1–4(–5). Sterna usually completely yellow, but rarely extensively fuscous. Even in darkest specimens, downturned edges of all terga remain pale. Valvulae 3 in dorsal view more than 2 × as long as basal width, gradually tapering; black. Lancet: Fig. 89. Male: Antennal flagellum largely pale, basal flagellomeres more or less fuscous above; scape and pedicel entirely pale. Head capsule entirely pale except for a contiguous patch around ocelli, postocellar area, and area of occiput directly behind this. Legs completely yellow. Medial area of only tergum 1 black, or a distally tapering black vitta reaching maximally to tergum 7. Penis valve: Fig. 105.

Total number of specimens examined: 37.

Similar species. See under *crataegi*, above.

Life history. Host plants: *Crataegus* spp. (Pschorn-Walcher & Altenhofer 2000). Liston (2007) thought that *pectoralis* is attached to *C. laevigata*, rather than *C. monogyna*, but this was based only on observations on visits by adults to the respective inflorescences.

Distribution. Southern and Central Europe, including the British Isles; North to Denmark, and S. Sweden (Taeger *et al*. 2006); Caucasus (Zhelochovtsev & Zinovjev 1995), Transcaucasus, N. Iran, Siberia (Lacourt 1999). A record from Sicily (Liston *et al*. 2013) resulted from the misidentification of an unusually coloured female of *crataegi* (see key, and under treatment of *H. crataegi*).

Occurrence in Sweden: published records: Skåne (Benander 1966), Gotland (Thomson 1871)

Material examined: Öland, Gotland.

Specimens examined. Germany: 18♀ 9♂, 28.04–16.06; Baden-Wuerttemberg; Bavaria; Berlin; Brandenburg; Hesse; Mecklenburg-Vorpommern; Rhineland-Palatinate; Saxony; Thuringia (DEI-GISHym83550) (SDEI) (SDEI, ZSM). Greece: 1♀ 1♂ (DEI-GISHym80337) (SDEI). *Portugal: Viséu; 3♂, Nelas 4 km SE, 180 m asl, +40.50140°N -7.82295°E, 03.05.2012, leg. Blank, Jacobs, Liston & Taeger (SDEI). Coimbra; 1♂, Coimbra 10 NE, +40.25000°N -8.34997°E, 01.05.2012, leg. Blank, Jacobs, Liston & Taeger (SDEI). Sweden: Öland; 1♀, Resmo N, 28.05.2013, leg. Liston, Prous & Taeger (SDEI). Gotland; 1♀ (NHRS-HEVA000003421), leg. Boheman (NHRS). Switzerland: 1♀ (ZSM). UK: Scotland: 1♂, Gorebridge, Edgehead, 18.06.2010 (DEI-GISHym19234) (SDEI).

Hoplocampa phantoma Zinovjev, 1993

Hoplocampa phantoma Zinovjev, 1993: 31–33. Holotype ♀, not examined, in ZISP. Type locality: Russia [Far East], Khabarovsk Terr., Khekhtsir, 24 km S Khabarovsk.

Note. The characters in the key, and our illustrations, are from specimens collected in the Russian Far East. According to Zinovjev (1993), the specimens from Sverdlovsk oblast [W. Palaearctic] differ from Far Eastern ones, in having a shorter ovipositor (the lower end of the range given below), and slight [unspecified] differences in the male genitalia.

Additional description. Body length: 3.3–3.8mm. Clypeus narrowly and deeply emarginate. Pale body colour yellowish. Female: Valvula 3 and valvifer 2 combined length in lateral view 1.03–1.31 as long as metafemur without trochantellus. Lancet: Fig. 80. Male: penis valve: Figs 98–99.

Total number of specimens examined: 9.

Similar species. Superficially similar to *alpina*, especially in coloration, from which it is externally distinguishable only in the female sex: see key. The lancet of *phantoma* (Fig. 80) is narrower in relation to its length than that of *alpina* (Fig. 77), and *phantoma* has rows of ctenidial teeth on annuli ca. 1–7 (*alpina*: rows of teeth only on basal 2–3 annuli). The penis valve of *phantoma* (Figs 97–98) differs markedly in the profile of the valviceps and some details, such as the gap in the dorsal sclerotised strut just anterior of the valviceps apex, from all other West Palaearctic *Hoplocampa* species.

Life history. Host plants: unknown, but Zinovjev (1993) considered that these could be *Sorbus* species; perhaps *S. sibirica* in the Urals, and *S. amurensis* in the Far East.

Distribution. Russia. Northern Urals (Sverdlovsk oblast), and the Far East (Zinovjev 1993).

Occurrence in Sweden: not recorded, and not expected.

Specimens examined. Russia: Primorskiy Kray; 8♀ (DEI-GISHym83552) 1♂ (DEI-GISHym83553), Samarka 70 km N, Chuguyevka, Gordeyevskaya Mt., +44.76667°N +134.21667°E, 29.05.1993, leg. A. Taeger (SDEI).

Hoplocampa plagiata (Klug, 1816)

Tenthredo (Allantus) plagiata Klug, 1816: 56. Syntypes ♀♂, Wien, **lectotype** ♀ here designated (DEI-GISHym2448, images: https://doi.org/10.6084/m9.figshare.7837937.v1), in ZMHUB. Type locality: Vienna (Austria). Paralectotypes: 4♀ (DEI-GISHym2449–2452), in ZMHUB.

Additional description. Body length: 4.5–5.5mm. Clypeus narrowly and deeply emarginate. Lancet: Fig. 88. Penis valve: Fig. 107. Normal colour pattern [all specimens except some from France]: Pale body colour orange-brown. Mesoscutellar appendage at least pale in middle. Metatibia largely pale with obscurely fuscous apex, to extensively fuscous. Tarsi pale, to more or less fuscous. Fore wing pterostigma unicolorous pale. Female: Antenna mainly black, more or less pale apically and ventrally. Occiput largely pale, except around foramen magnum. Abdominal sterna and all downturned lateral areas of terga pale, with a broad black vitta on dorsum of terga 1–4(–6). Valvula 3 basally pale, apically black. Male: Antenna largely pale, basal antennomeres sometimes slightly fuscous above. Dorsum of terga 1–4(–8) with black vitta, progressively interrupted distally. Colour pattern of dark form [only known from France: Massif Central and Pyrenees]: Female. The darkest specimen examined has head black, except for pale labrum, clypeus and genae, and obscurely brown orbits and temples. Thorax entirely black; all legs nearly completely suffused with black. At least terga 9 and 10 pale. Male. The darkest specimen examined is markedly paler than the darkest female. Head with large dark fleck from post-ocellar area to around toruli, contiguous with dark occiput. Mesoscutal lobes partly pale, and posterior of mesoscutellum; mesepisternum largely black, with ventral part pale. Femora entirely pale; tibiae largely pale. Abdomen mainly black, with apical terga and sterna more or less pale.

Total number of specimens examined: 35.

Similar species. Normal, paler coloured *plagiata* are only likely to be mistaken for *chamaemespili*: see under the latter, above. The dark form of *plagiata* (only known from the Massif Central and Pyrenees) might be mistaken for *minuta*. In cases of doubt, *plagiata* females can be easily distinguished from all other European *Hoplocampa* species by the very large and strongly projecting sawteeth (Fig. 88), and the male by the outline of the penis valve (Fig. 107), which resembles only slightly that of the very differently coloured (pale) *phantoma*.

Life history. Host plant: *Amelanchier ovalis* (Masutti & Covassi 1980, Pschorn-Walcher & Altenhofer 2000). Mentions in the earlier literature of *Crataegus* as a host (e.g. Enslin 1914) arose through misidentification of *crataegi*. *Aronia*, also mentioned by Enslin (1914), probably refers to a synonym, *Aronia amelanchier*, of *Amelanchier ovalis*. Biology: Masutti & Covassi (1978).

Distribution. Central Europe (Taeger *et al*. 2006), the Iberian Peninsula (see below), and Caucasus (Zhelochovtsev & Zinovjev 1995), from lowland altitudes (e.g. Vienna Basin) to around the tree-line in the Alps; not in the British Isles.

Occurrence in Sweden: not recorded, and not expected.

Specimens examined. Austria: 1♂ (DEI-GISHym18918), Hernstein, Piesting, 31.05.1996, leg. S. M. Blank (SDEI). France: 12♀, 5♂, including dark form 7♀ (DEI-GISHym31957, DEI-GISHym31958), 1♂ (DEI-GISHym31959) from Midi-Pyrénées, Dept. Ariège, Sinsat/Ornolac-Ussat-les-Bains, 18/21.04.2018, leg. H. Savina (SDEI) [collected together with 4♀, 4♂ pale form]. Germany: 5♀, 06.05–10.06; Baden-Wuerttemberg; Bavaria (DEI-GISHym19411); North Rhine-Westphalia (DEI-GISHym83556); Rhineland-Palatinate (SDEI, ZSM). *Spain: Aragón; 2♀ (including DEI-GISHym83555), Camarena de la Sierra 7 km SSW, 1470 m asl, +40.12173°N -1.05021°E, 05.05.2014, leg. Liston, Prous & Taeger (SDEI). Valencia; 1♀, Parque Natural Puebla de San Miguel, Mas del Olmo, 980 m asl, +40.06434°N -1.17838°E, 05.05.2014, leg. Liston, Prous & Taeger (SDEI). Switzerland: 1♂ (BC-ZSM-HYM10950) (ZSM).

Hoplocampa tadshikistanica Muche, 1986

Hoplocampa tadshikistanica Muche, 1986: 195–196. Holotype ♂, examined, GBIF-GISHym2445, in ZMHUB. Type locality: Tadshik SSR, Hissar Mountains, Romit Gorge.

Note. A slide preparation of two lancets and a lance, with the handwritten inscription by Muche "*Hoplocampa tadshikistanica* Muche Holotypus ♀" and a printed label "GBIF-GISHym2445" obviously does not belong to the male holotype.

Additional description. Body length: 2.3–3.0mm (after Muche 1986). Clypeus widely and deeply emarginate. Pale body colour orange-brown. Head largely pale. Dorsum of thorax and abdomen largely black (terga 1–8); sides and underside pale except for dark anepimeron. Legs pale except for clearly blackened metatarsi and apices of metatibiae; in female other legs more or less similarly dark. Venation pale, except for slightly darkened base of pterostigma. Female: somewhat darker than the male. Black on head are small patch around ocelli, the postocellar area, and antenna more or less dorsally and apically. Dorsum of thorax entirely dark, except for yellow tegulae and nearly entire pronotum. Apex of valvula 3 darkened. Valvulae 3 in dorsal view less than 2 × as long as basal width. Lancet: Fig. 86. Male: Head entirely pale except for small ocellar fleck. Mesoscutal lobes laterally slightly pale; posterior edge of mesoscutellum somewhat pale. Penis valve: Fig. 104.

Total number of specimens examined: 3.

Similar species. Externally, the most similar species is *crataegi*. Males of *tadshikistanica* are easily distinguished by their darkened metatarsi and apices of metatibiae from *crataegi*, with completely pale legs. Lancets of these two species are quite similar, but the sawteeth of *crataegi* (Fig. 79) are more acutely hooked, with a larger number of serrulae. We have not examined *tadshikistanica* penis valves, but if the drawing by Muche (1986, fig. 1) (reproduced here as Fig. 104) is accurate, then they are clearly different from those of any of the other species which we treat.

Life history. Host plant: perhaps *Cotoneaster*, from which the type series was collected.

Distribution. Tadshikistan (only known from the type series).

Specimens examined. Tadshikistan: 1♀ (DEI-GISHym31786) 1♂ (DEI-GISHym31787), Hissar Mts, Romit Gorge, 1600m asl, 14.05.1985, leg. W. H. Muche (ZMHUB).

Hoplocampa testudinea (Klug, 1816)

Tenthredo (*Allantus*) *testudinea* Klug, 1816: 60. Holotype "♀" (recte ♂, GBIF-GISHym2459 https://doi.org/10.6084/m9.figshare.4772152), in ZMHUB. Type locality: Gartz (Germany).

Additional description. Body length: 6.0–8.0mm. Clypeus narrowly and deeply emarginate. Pale body colour orange-brown. Wing venation black, except for extreme bases of wings, and pale pterostigma apex. Legs entirely pale. Female: Valvula 3 black. Lancet: Fig. 87. Male: penis valve: Fig. 106.

Total number of specimens examined: 21.

Similar species. Most closely resembles *Hoplocampa brevis*, with which it shares the same hosts. See under *brevis*, above.

Life history. Host plants: *Malus* spp., particularly cultivated *M. domestica* (e.g. Boevé *et al*. 1996), but also *M. sylvestris* in semi-natural vegetation types (e.g. Liston, personal observations in southern Scotland). Mentions of *M. pumila* as a host (e.g. Burgart *et al*. 2016) seem to involve cultivated varieties more usually referred to as *M. domestica*. *Pyrus communis* is apparently a rarely used, secondary host (Stritt 1943). Biology: Miles (1932), Velbinger (1939), Roberti (1948b), Boevé *et al*. (1997), Lennartsson (2012).

Distribution. Southern, Central and Northern Europe, including the British Isles; North to Denmark, Sweden, and Finland (Taeger *et al*. 2006), with a single Norwegian record from Oslo (Velbinger 1939); Caucasus (Zhelochovtsev & Zinovjev 1995), Turkey, Transcaucasus, introduced to North America (Lacourt 1999). In contrast to *brevis*, *testudinea* reaches higher levels of abundance in cooler, more northern regions (Velbinger 1939).

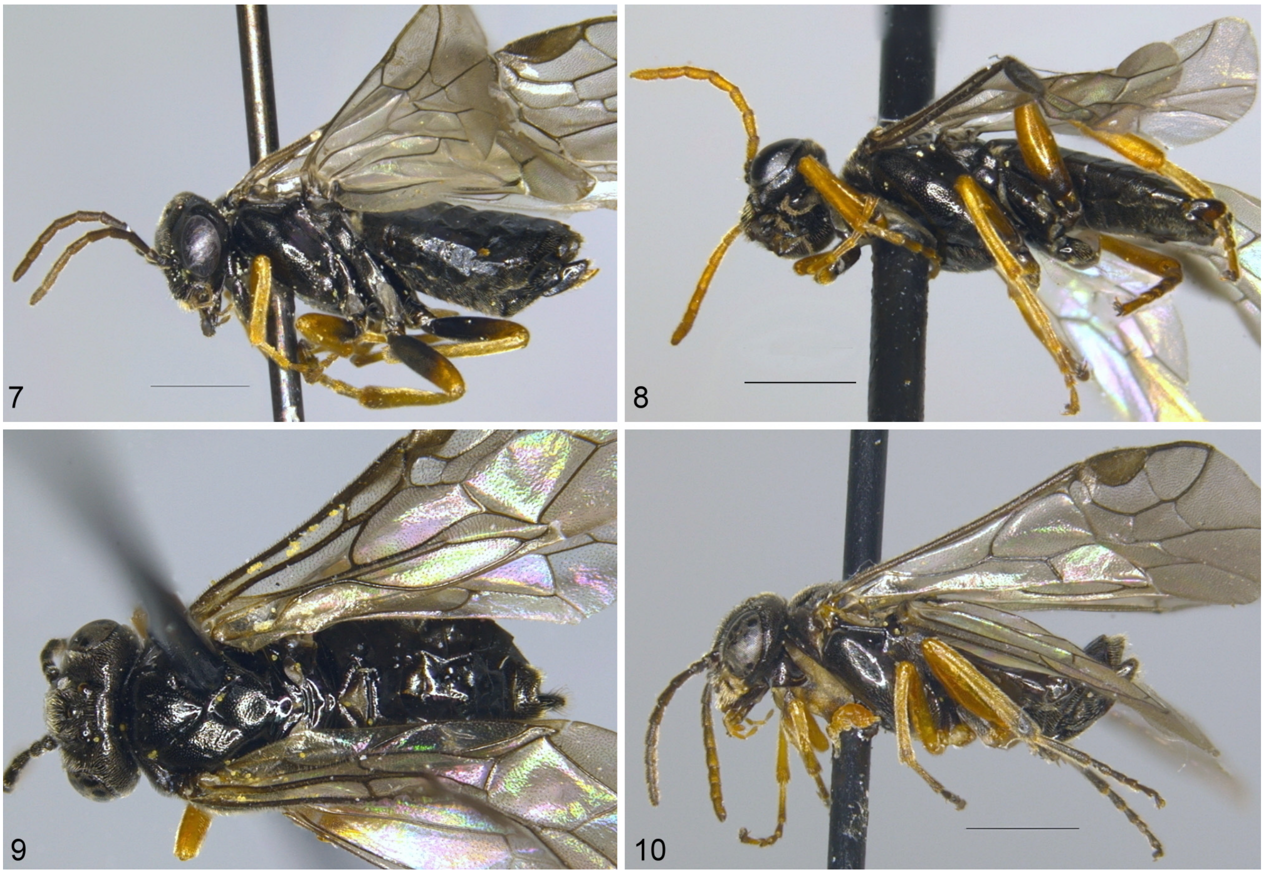
Occurrence in Sweden: published records: Skåne (Thomson 1871, Neupane 2013), Småland (Velbinger 1939), Västmanland (Thomsen 1929), Gästrikland (Gävle, ca. 60.7°N) (Lindblom 1938). In recent years, *testudinea* has caused serious damage to organically-grown apple crops in many countries, including Sweden (Sjöberg *et al*. 2015).

Material examined: Skåne, Östergötland, Uppland.

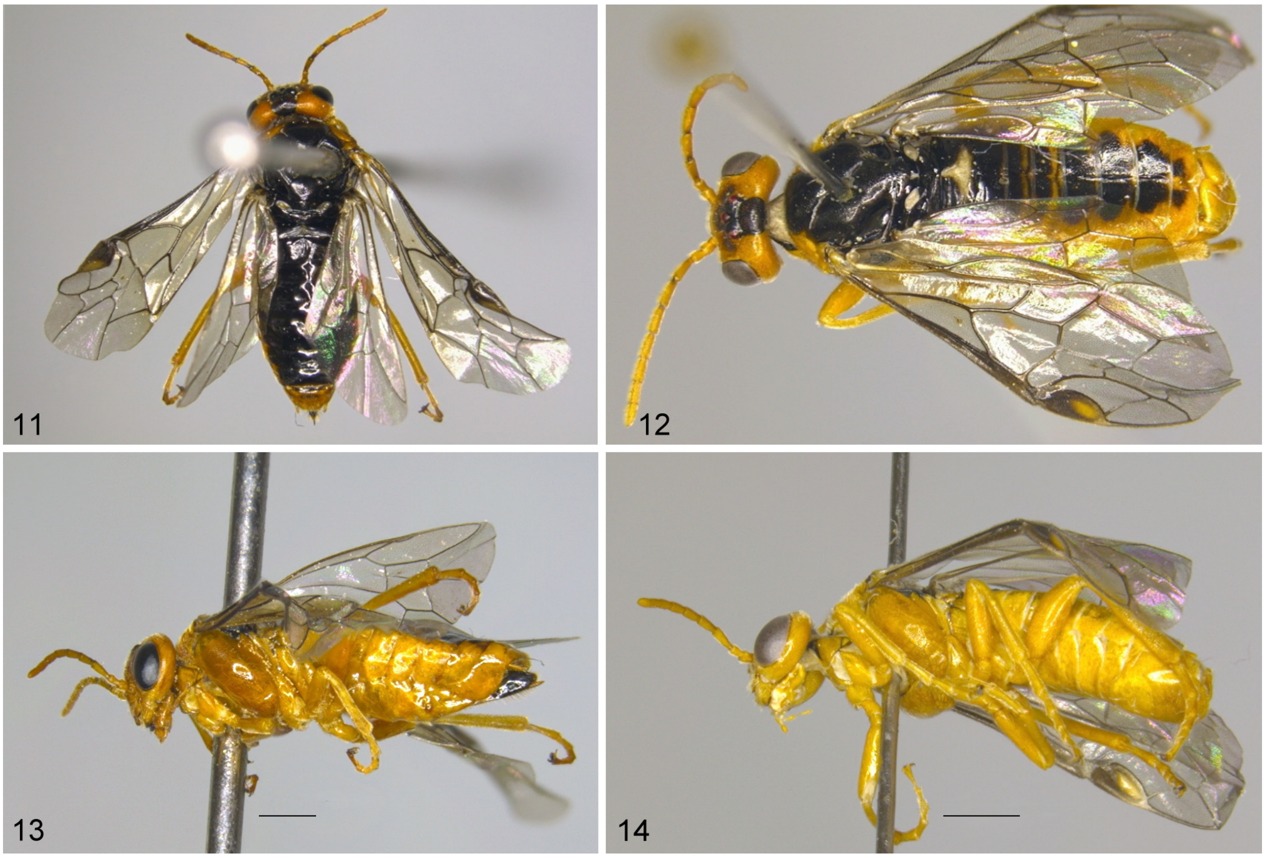
Specimens examined. Germany: 9♀ 7♂, 01.05–16.06; Baden-Wuerttemberg; Bavaria; Brandenburg (DEI-GISHym11132, 31790); Mecklenburg-Vorpommern; Saxony (SDEI, ZSM). *Greece: 1♀ 1♂ (DEI-GISHym83547), Platania, Volos, 350 m asl, +39.80000°N +23.16000°E, 21.04.2010 and 17.04.2010, leg. K. Standfuss (SDEI). Sweden: Uppland; 1♀ (NHRS-HEVA000003422), Stockholm, Experimentalfältet, Norra Djurgården, +59.36820°N +18.05510°E, 20.05.1917, leg. Tullgren (NHRS). Switzerland: 1♀ (ZSM).

Nominal taxa removed from *Hoplocampa*

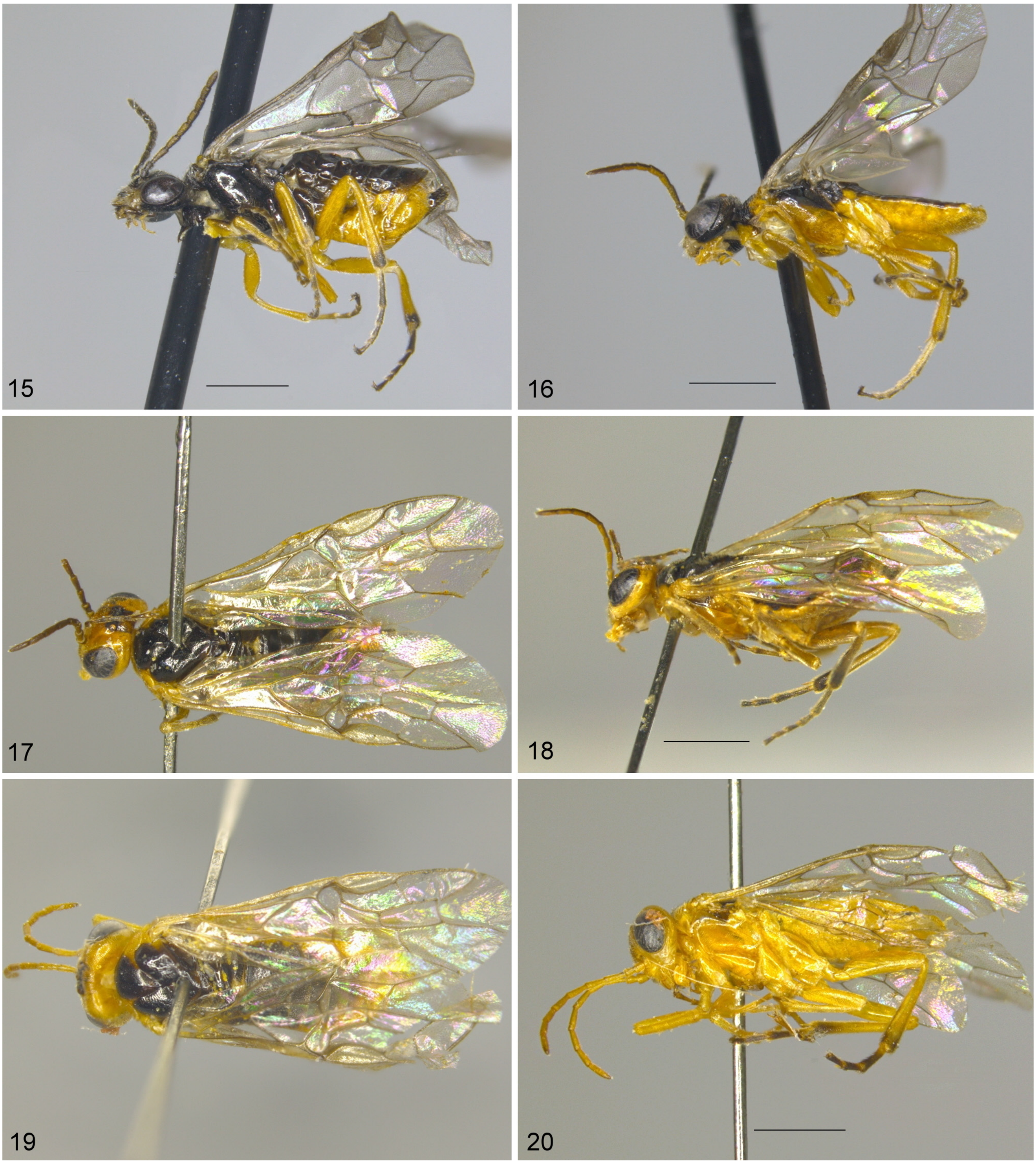
Tomostethus testaceus Niezabitowski, 1899, **species incertae sedis**. This was treated as a synonym of *Hoplocampa flava* by Taeger *et al*. (2010), following the tentative synonymy by Konow (1905). However, the described wing venation ("Nervus discoidalis nervo recurrenti primo paralellus. Alae posteriores cellula discoidali non occlusa.") disagrees with that of Nematinae.



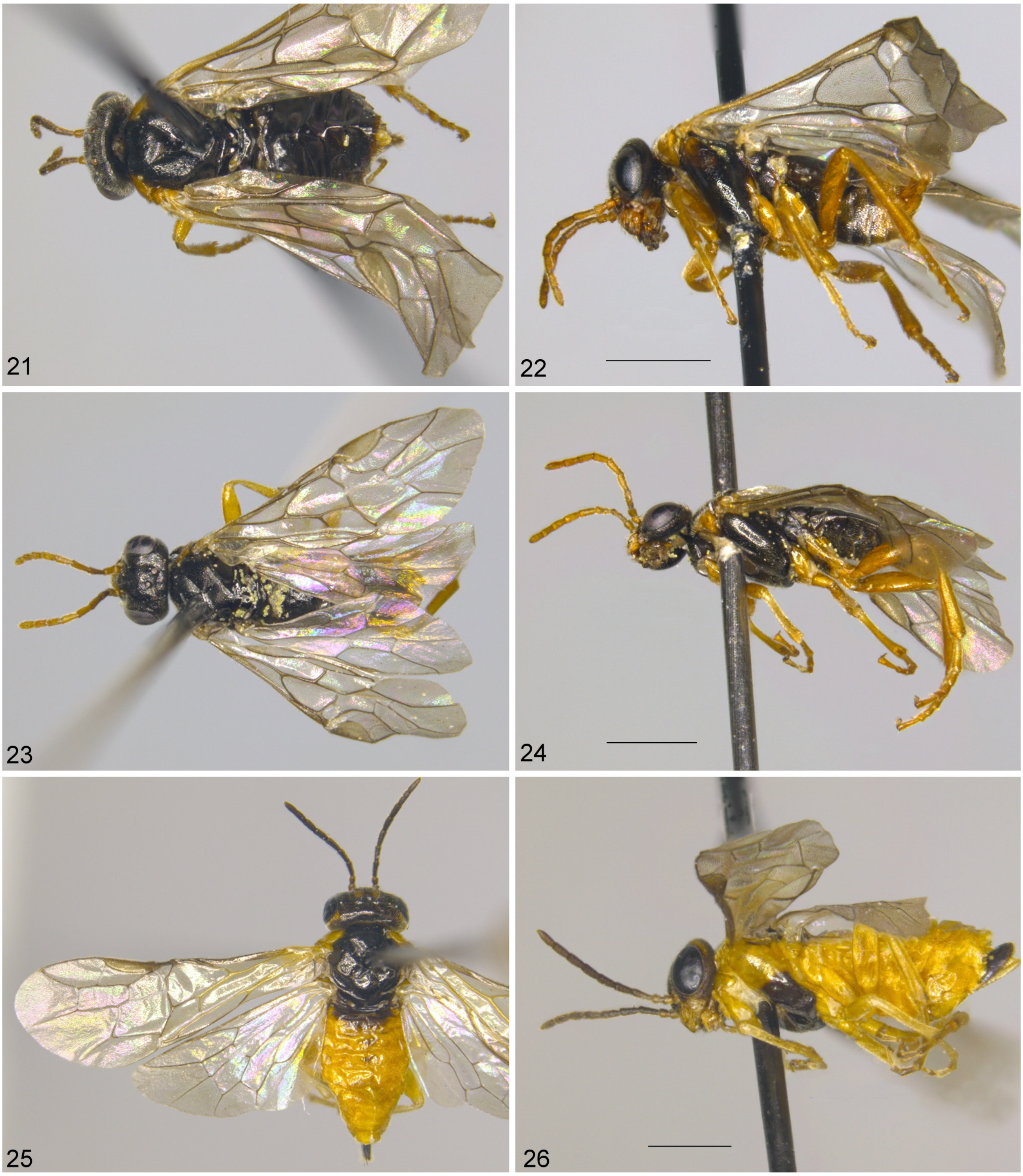
FIGURES 7–10. 7, *minuta* ♀ (DEI-GISHym83545) lateral. 8, *minuta* ♂ (DEI-GISHym83546) lateral. 9–10, *cantoti* ♀ (BC-ZSM-HYM10947) dorsal, lateral. Scale bars 1mm.



FIGURES 11–14. 11, 13, *testudinea* ♀ (DEI-GISHym11132) dorsal, lateral. 12, 14, *testudinea* ♂ (DEI-GISHym83547) dorsal, lateral. Scale bars 1mm.



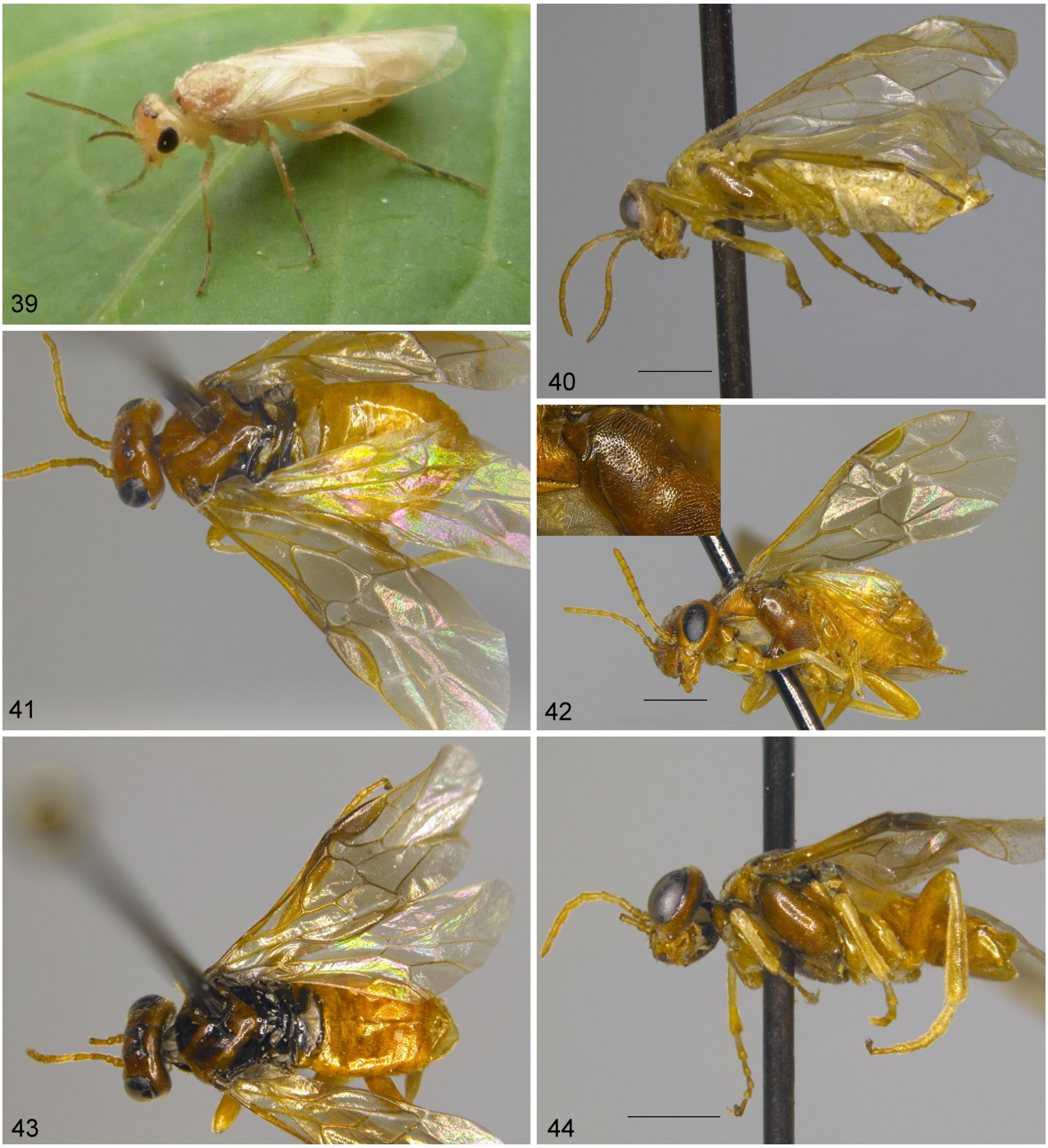
FIGURES 15–20. 15, *chrysorrhoea* ♀ (DEI-GISHym83549) lateral. 16, *chrysorrhoea* ♂ (DEI-GISHym83548) lateral. 17–18, *tadshikistanica* ♀ (DEI-GISHym31786) dorsal, lateral. 19–20, *tadshikistanica* ♂ (DEIGISHym31787) dorsal, lateral. Scale bars 1mm.



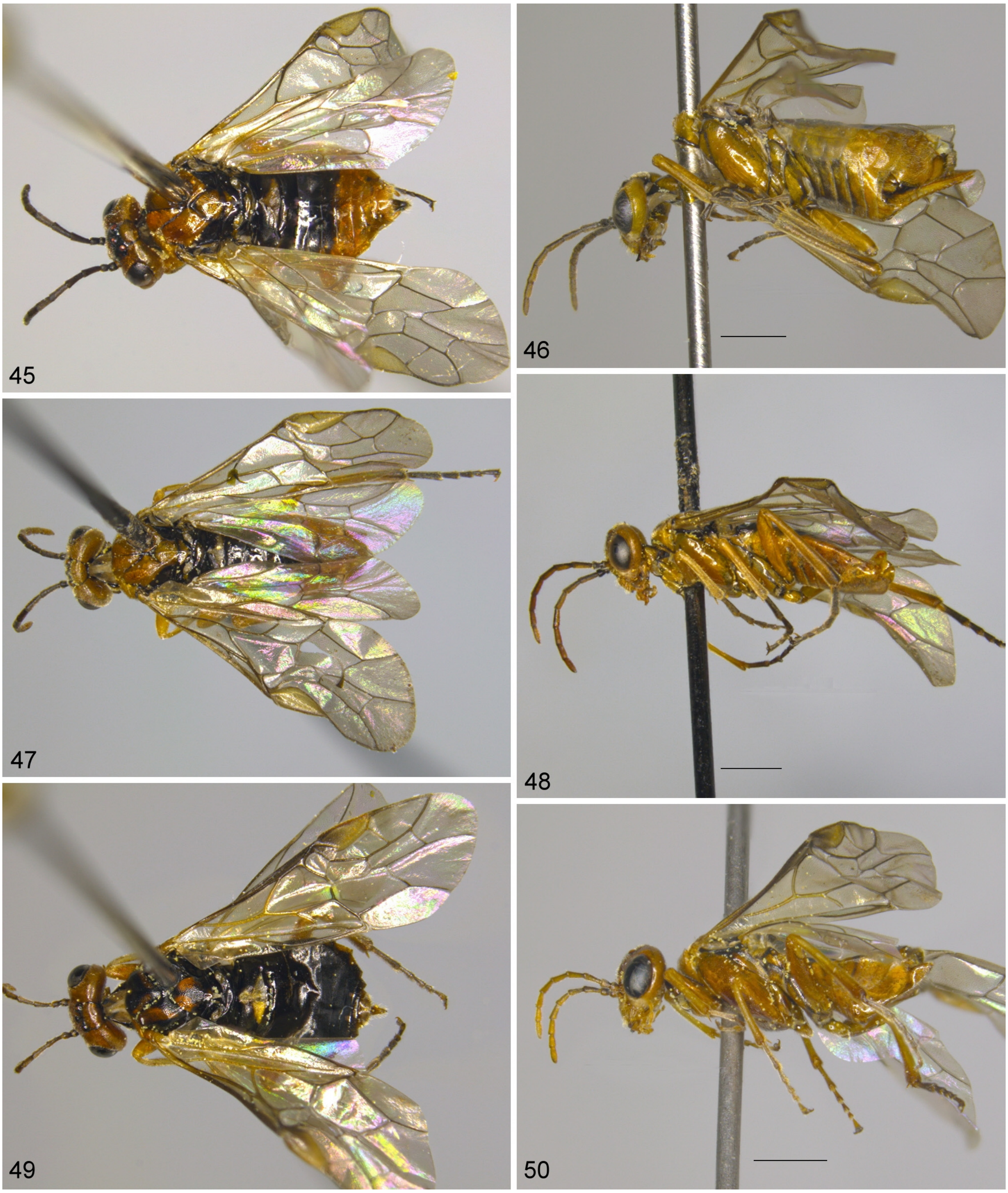
FIGURES 21–26. 21–22, *fulvicornis* ♀ (DEI-GISHym11359) dorsal, lateral. 23–24, *fulvicornis* ♂ (DEI-GISHym11358) dorsal, lateral. 25–26, *pectoralis* ♀ (DEI-GISHym83550) dorsal, lateral. Scale bars 1mm.

FIGURES 27–32. 27–28, *pectoralis* ♂ (DEI-GISHym19234) dorsal, lateral. 29–30, *crataegi* ♀ (DEIGISHym19238), unusually dark colour form from Sicily, dorsal, lateral. 31, *crataegi* ♀ (DEIGISHym11414) dorsal. 32, *crataegi* ♀ (DEI-GISHym83583) lateral. Scale bars 1mm.

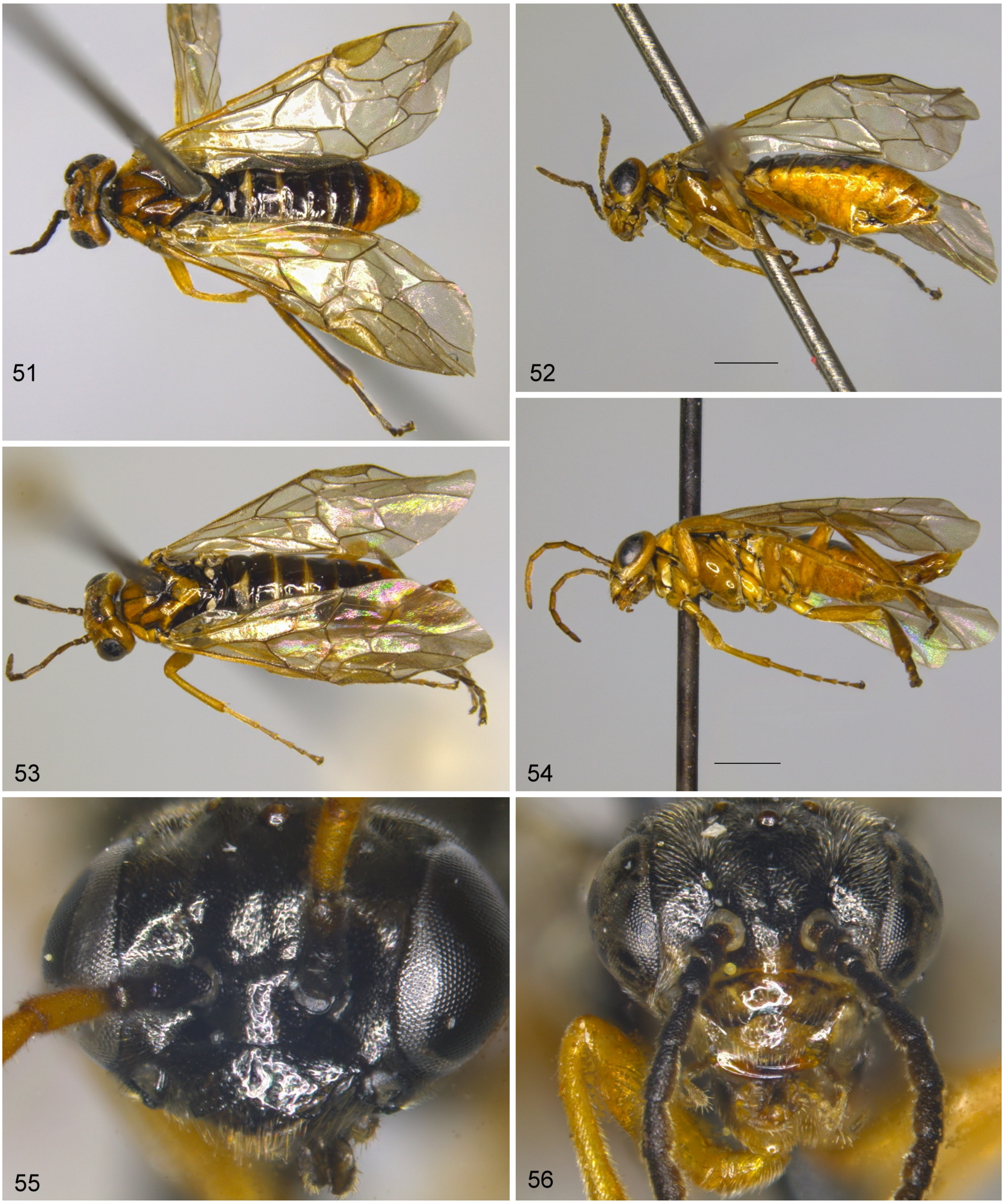
FIGURES 33–38. 33–34, *crataegi* ♂ (DEI-GISHym83584) dorsal, lateral. 35, *ariae* ♀ (DEI-GISHym83551) dorsal. 36, *ariae* ♂ (DEI-GISHym83574) dorsal. 37–38, *phantoma* ♀ (DEI-GISHym83552) dorsal, lateral. Scale bars 1mm.



FIGURES 39–44. 39, *alpina* ♀, live (England, Leicestershire, High Cross, 03.06.2016: photo by G. Calow). 40, *alpina* ♀ (DEI-GISHym83554) lateral. 41, *flava* ♀ (DEI-GISHym83558) dorsal. 42, *flava* ♀ (DEI-GISHym19235) lateral (inset: mesepisternum). 43–44, *flava* ♂ (DEI-GISHym20595) dorsal, lateral. Scale bars 1mm.

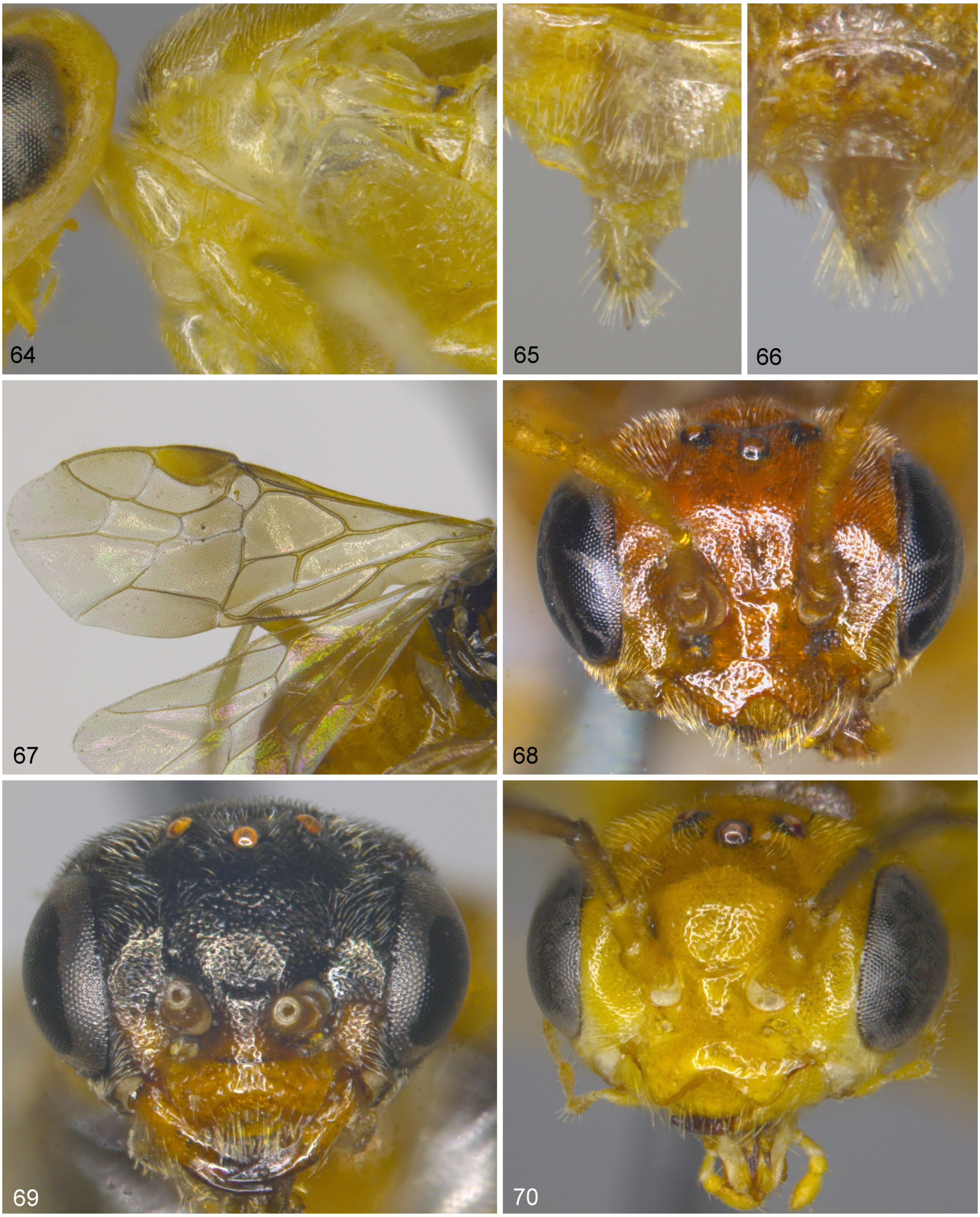


FIGURES 45–50. 45, *plagiata* ♀ (DEI-GISHym83555) dorsal. 46, *plagiata* ♀ (DEI-GISHym19411) lateral. 47, *plagiata* ♂ (BC-ZSM-HYM10950) dorsal. 48, *plagiata* ♂ (BC-ZSM-HYM10950) lateral. 49–50, *brevis* ♀ (DEI-GISHym83557) dorsal, lateral. Scale bars 1mm.

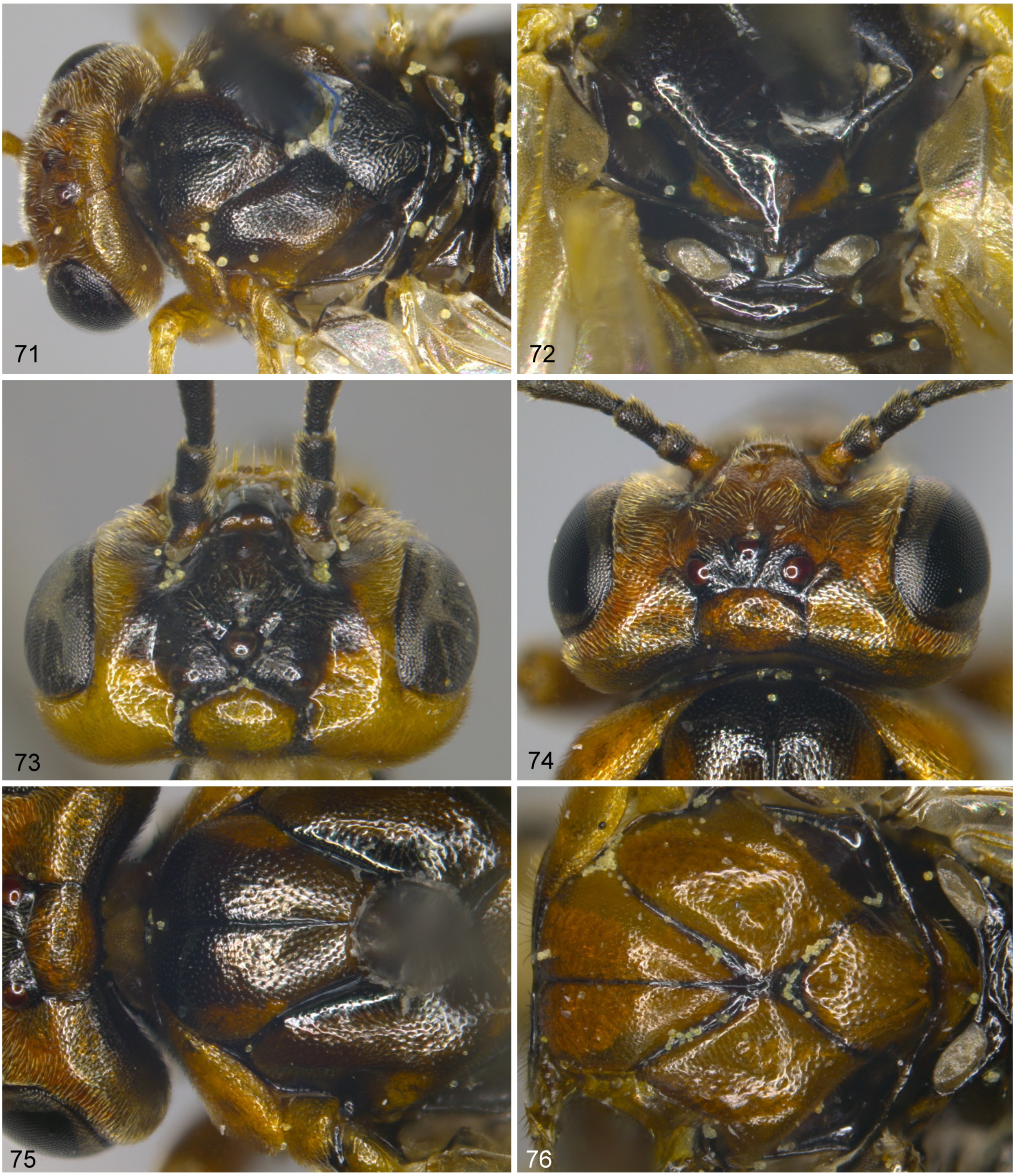


FIGURES 51–56. 51–52, *chamaemespili* ♀ (DEI-GISHym11128) dorsal, lateral. 53–54, *chamaemespili* ♂ (BC-ZSM-HYM11307) dorsal, lateral. 55, *minuta* ♂ (DEI-GISHym83546) head. 56, *cantoti* ♀ (BC-ZSM-HYM10947) head. Scale bars 1mm.

FIGURES 57–63. 57–58, *testudinea* ♀ (DEI-GISHym11132) head, pterostigma. 59, *chrysorrhoea* ♀ (DEIGISHym83549) head. 60, *tadshikistanica* ♀ (DEI-GISHym31786) head. 61, *pectoralis* ♀ (DEIGISHym83550) valvulae 3. 62, *crataegi* ♀ (DEI-GISHym19238) valvulae 3. 63, *ariae* ♀ (DEIGISHym19229) propleuron.

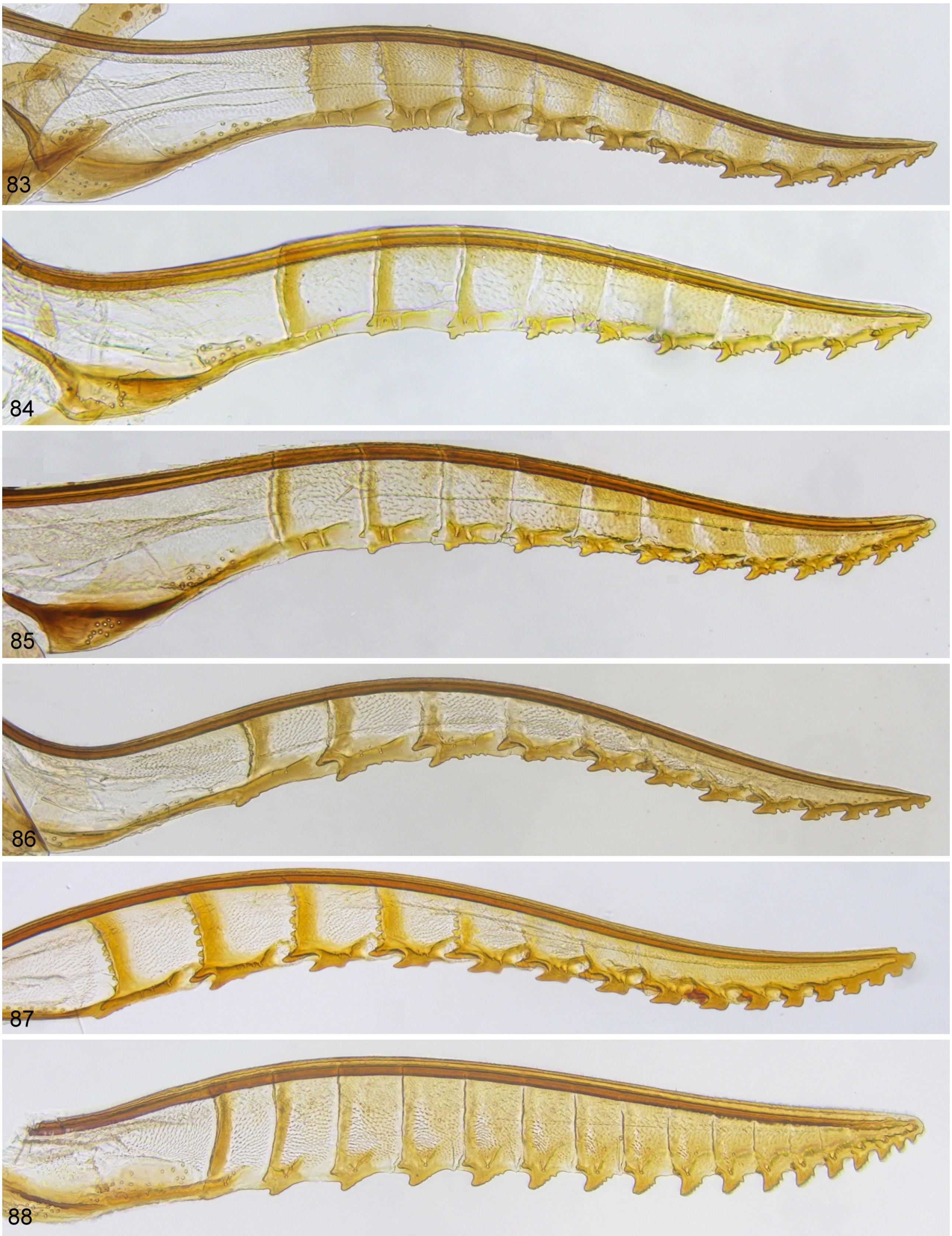


FIGURES 64–70. 64, *alpina* ♂ (DEI-GISHym11130) propleuron. 65, *phantoma* ♀ (DEIGISHym83552) valvulae 3. 66, *alpina* ♀ (DEI-GISHym83585) valvulae 3. 67–68, *flava* ♀ (DEI-GISHym83558) fore wing, head. 69, *fulvicornis* ♀ (DEI-GISHym11359) head. 70, *crataegi* ♀ (DEI-GISHym11414) head.

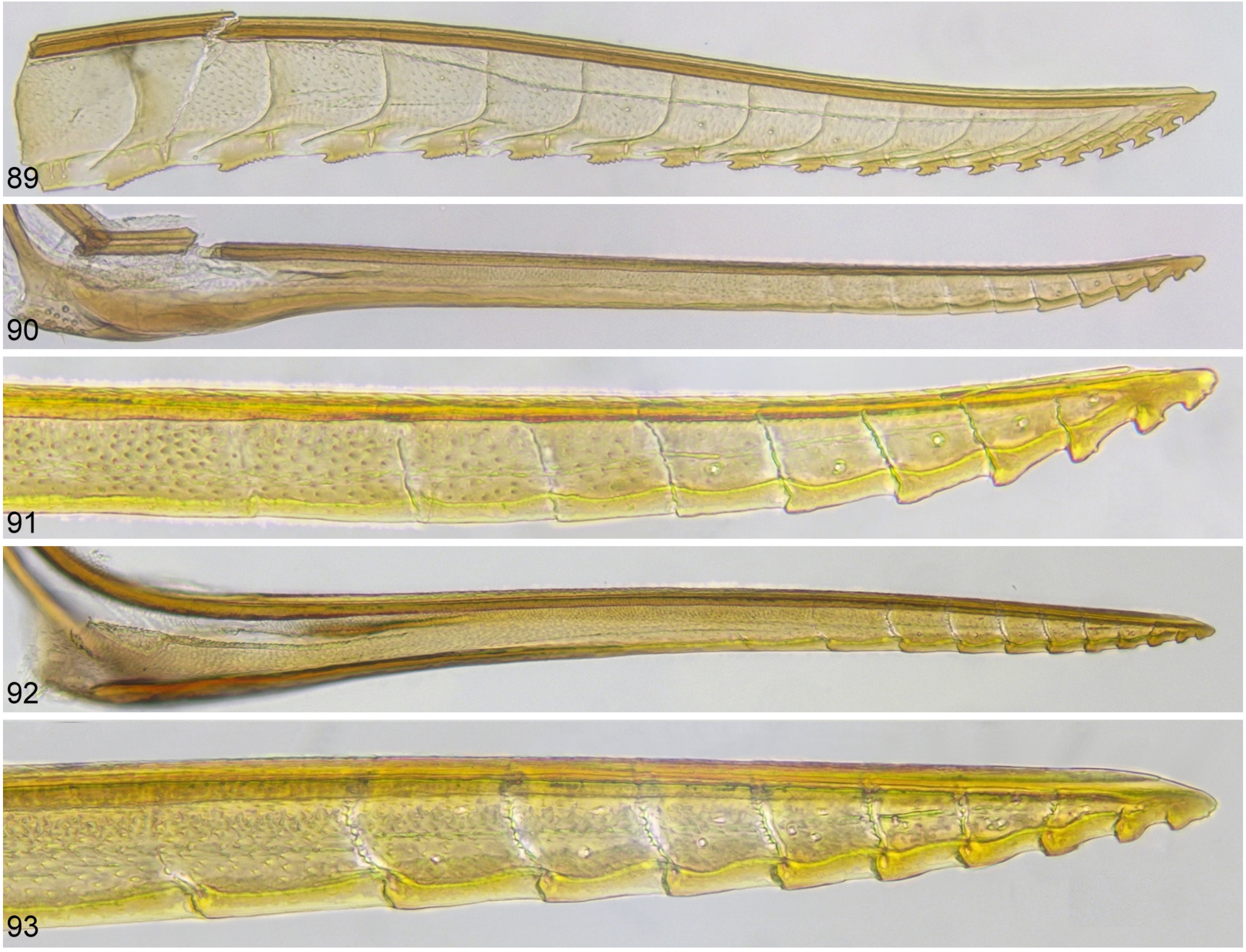


FIGURES 71–76. 71, *fulvicornis* ♀ (DEI-GISHym21046) head and thorax. 72, *crataegi* ♀ (DEI-GISHym83583) mesoscutellum. 73, *plagiata* ♀ (DEI-GISHym19411) head. 74, *chamaemespili* ♀ (BC-ZSM-HYM11306) head. 75, *chamaemespili* ♀ (BC-ZSM-HYM11306) mesoscutum. 76, *plagiata* ♀ (DEI-GISHym19411) mesoscutum.

FIGURES 77–82. Lancets: 77, *alpina* (DEI-GISHym83575), spurette arrowed. 78, *ariae* (DEI-GISHym83551). 79, *crataegi* (DEIGISHym83583). 80, *phantoma* (DEI-GISHym83552). 81, *brevis* (DEI-GISHym83557). 82, *chamaemespili* (DEI-GISHym11128).



FIGURES 83–88. Lancets: 83, *flava* (DEI-GISHym83558). 84, *fulvicornis* (DEI-GISHym31788). 85, *minuta* (DEI-GISHym83545). 86, *tadshikistanica* (DEI-GISHym31786). 87, *testudinea* (DEI-GISHym31790). 88, *plagiata* (DEI-GISHym83555).



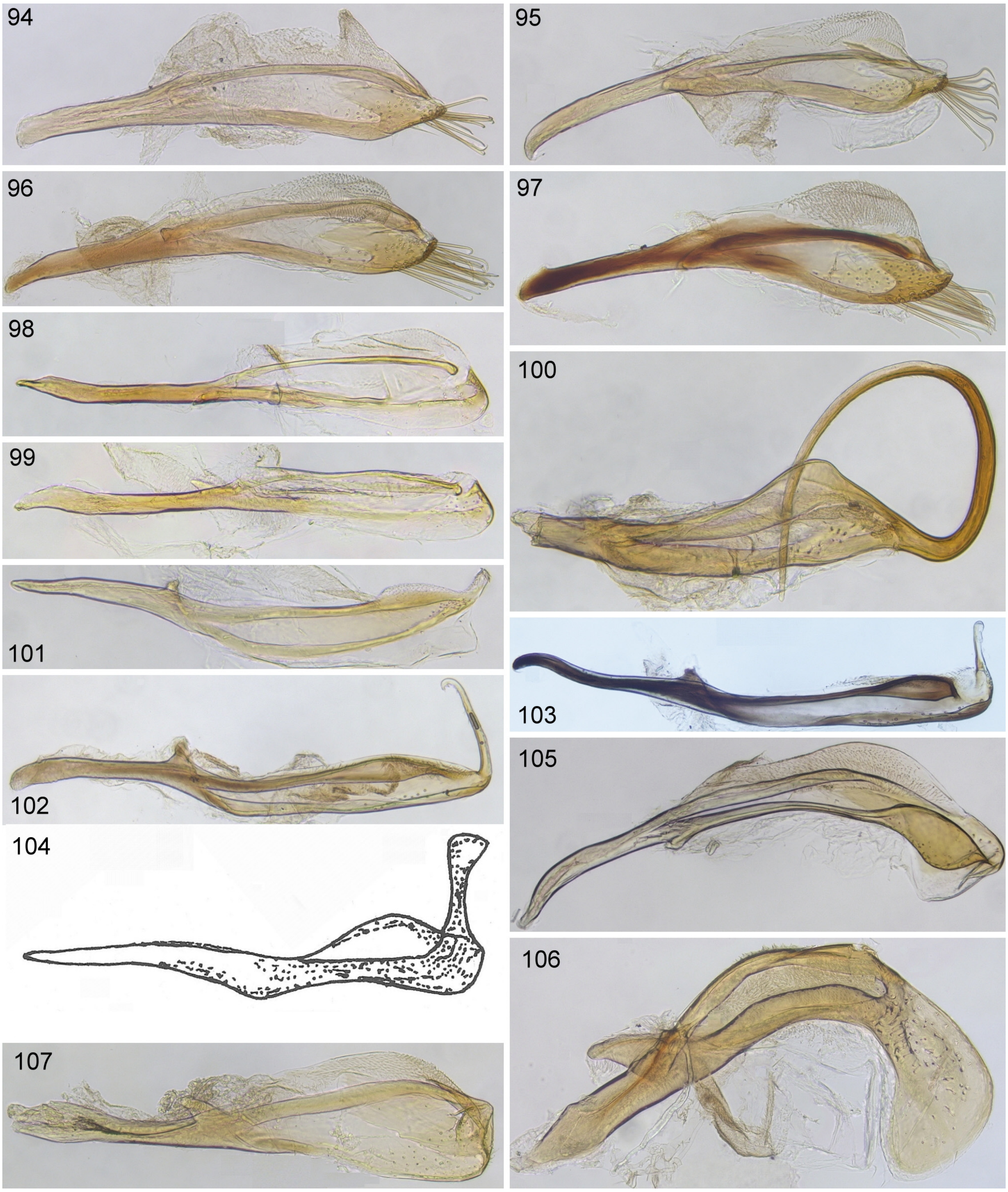
FIGURES 89–93. Lancets: 89, *pectoralis* (DEI-GISHym83550). 90–91, *chrysorrhoea* (DEI-GISHym31789) complete, detail of tip. 92–93, *cantoti* (DEI-GISHym88748), complete, detail of tip.

Discussion

The taxonomy of the European *Hoplocampa* species currently seems to be quite clear, despite the lack of genetic sequence data for a single species, *phantoma*. On the other hand, a number of knowledge gaps and unclarities pertain to the host plant spectra of some species, for example:

- The identities of the host plants of *chrysorrhoea* and *cantoti* have not been definitely established. Detailed observations on oviposition behaviour by *chrysorrhoea* or *cantoti* would also be of interest, because the gross morphology of their ovipositors is substantially different from all the other European species.
- The status of *Hoplocampa fulvicornis* as a pest of cultivated plums is not clear. It is possible that it attacks these more frequently than is indicated in the literature, but that its damage has generally been attributed to *minuta*. According to Roberti (1957), the larvae of these two species are not morphologically distinguishable. Genetic sequencing of larvae could help to shed light on their relative importance in plum cultivation.
- Only *Sorbus aria* s. str. has so far been identified as a host of *Hoplocampa ariae*. There are no indications that any of the numerous other related taxa in the subgenus *Aria* and hybrids of these with subgenus *Sorbus* occurring in the West Palaearctic are hosts, and some targeted attempts should be made to collect *Hoplocampa* from these, particularly from *S. intermedia*, which is widespread and often abundant as a native in southern Scandinavia, and frequently planted further South in Europe.

Although the name is currently not of taxonomic or nomenclatural significance, the existence of original type specimens of *Allantus ferrugineus* Panzer is noteworthy in that these are among only a very few extant types of any species described by Panzer.



FIGURES 94–107. Penis valves: 94 *alpina* (DEIGISHym20575). 95, *crataegi* (DEI-GISHym31784). 96, *ariae* (DEI-GISHym83574). 97, *chamaemespili* (BC-ZSM-HYM11307). 98–99, *phantoma* (DEI-GISHym83553): dorsal lobe intact, dorsal lobe destroyed during preparation. 100, *flava* (DEI-GISHym20595). 101, *chrysorrhoea* (DEI-GISHym83548). 102, *fulvicornis* (DEI-GISHym83782). 103, *minuta* (DEI-GISHym31782). 104, *tadshikistanica* [after Muche (1986), fig. 1]. 105, *pectoralis* (DEI-GISHym80337). 106, *testudinea* (DEI-GISHym83547). 107, *plagiata* (DEI-GISHym83556).

Acknowledgments

This work was funded by the Swedish Taxonomy Initiative. For the loan of material examined, as well as other assistance and information, we thank Rune Bygebjerg and Dr. Christer Hansson (MZLU), Dr. Frank Koch (ZMHUB), Dr. Manfred Kraus (Nürnberg, Germany), Dr. Darren Mann (Oxford, UK) the late Bruno Peter, Henri Savina (Toulouse, France), Prof. Klaus Standfuss (Dortmund, Germany), Dr. Lars Vilhelmsen (ZMUC), and Dr. Stefan Schmidt (ZSM). We are most grateful to Graham Calow (Leicestershire, UK) and Dr. Janos Bodor (Budapest, Hungary) for permitting us to reproduce their images of live specimens and damage to fruit caused by larvae. Christian Kutzscher (SDEI) is author of many of the images published on figshare. Katrin Elgner (SDEI) kindly obtained some of the literature.

References

Ahlberg, O. (1940) Besprutningsförsök mot plommonstekeln, *Hoplocampa minuta* Chr. *Meddelanden, Statens Vaxtskyddanstalt*, 32, 1–24.

Al-Qura'n, S. (2008) Pollen morphology of *Hyoscyamus* L. (Solonaceae) attracts Hymenoptera species as pollen visitors in Jordan. *Pakistan Entomologist*, 30 (1), 83–91.

Andersson, H. (1962) Bidrag till kännedomen om de skandinaviska växtsteklarnas utbredning (Hym. Phytophaga). *Opuscula Entomologica*, 27 (1–2), 28–34.

Benander, P. (1966) Kullabergs Växtsteklar. *Kullabergs Natur*, 11, 1–31.

Benson, R.B. (1933) Four new species of nematine sawflies from Britain (Hymenoptera, Symphyta). *Stylops*, 2 (2), 255–260. https://doi.org/10.1111/j.1365-3113.1993.tb00962.x

Benson, R.B. (1958) Hymenoptera, Symphyta. *Handbooks for the Identification of British Insects*, 6 (2c), 139–258.

Benson, R.B. (1968) Hymenoptera from Turkey, Symphyta. *Bulletin of the British Museum (Natural History). Entomology Series*, 22 (4), 111–207.
https://doi.org/10.5962/bhl.part.9952

Bernard, J. (1952) Observations sur le vol et la ponte chez *Hoplocampa minuta* Christ (Hymen. Tenthredinidae). *Parasitica*, 8 (4), 159–173.

Blank, S.M. (1996) Revision of the sawflies described by Lothar Zirngiebl. (Preliminary studies for a catalogue of Symphyta, part 2.) (Insecta, Hymenoptera, Symphyta). *Spixiana*, 19 (2), 195–219.

Blank, S.M. & Taeger, A. (1998) Comments on the taxonomy of Symphyta (Hymenoptera) (Preliminary studies for a catalogue of Symphyta, part 4). *In*: Taeger, A. & Blank, S.M. (Eds.), *Pflanzenwespen Deutschlands (Hymenoptera, Symphyta). Kommentierte Bestandsaufnahme*. Goecke & Evers, Keltern, pp. 141–174.

Boevé, J.-L., Gfeller, H., Schlunegger, U.P. & Francke, W. (1997) The Secretion of the Ventral Glands in *Hoplocampa* Sawfly Larvae. *Biochemical Systematics and Ecology*, 25 (3), 195–201.
https://doi.org/10.1016/S0305-1978(96)00112-3

Boevé, J.-L., Lengwiler, U., Tollsten, L., Dorn, S. & Turlings, T.C.J. (1996) Volatiles emitted by apple fruitlets infested by larvae of the European Apple Sawfly. *Phytochemistry*, 42 (2), 373–381.
https://doi.org/10.1016/0031-9422(95)00948-5

Brischke, C.G.A. (1883) Beobachtungen über die Arten der Blatt- und Holzwespen von C.G.A. Brischke, Hauptlehrer a. D. in Langfuhr und Dr. Gustav Zaddach weiland Professor in Königsberg. Zweite Abtheilung. *Schriften der Naturforschenden Gesellschaft in Danzig*, New Series, 5 (4), 201–328. [1881–1883]

Burgart, C., Hillier, N.K. & Blatt, S. (2016) Apple cultivar preferences by *Hoplocampa testudinea* (Hymenoptera: Tenthredinidae) in the Annapolis Valley of Nova Scotia, Canada. *The Canadian Entomologist*, 148 (6), 724–735.
https://doi.org/10.4039/tce.2016.16

Chevin, H. (1986) *Hoplocampa cantoti*, espèce nouvelle proche d'*H. chrysorrhoea* (Klug) (Hymenoptera, Tenthredinidae). *Cahiers des Naturalistes, Bulletin des Naturalistes Parisiens*, New Series, 42, 21–24.

Christ, J.L. (1791) *Naturgeschichte, Klassification und Nomenclatur der Insekten vom Bienen, Wespen und Ameisengeschlecht; als der fünften Klasse fünfte Ordnung des Linneischen Natursystems von den Insekten: Hymenoptera. Mit häutigen Flügeln*. Hermann, Frankfurt a. M., 535 pp.
https://doi.org/10.5962/bhl.title.87724

Costa, A. (1894) Prospetto degli Imenotteri Italiani. III, Tenthredinidei e Siricidei. *Atti della Reale Accademia delle Scienze Fisiche e Matematiche*, 3, 1–290.

Dalla Torre, C.G. de (1894) *Catalogus Hymenopterorum hucusque descriptorum systematicus et synonymicus. Vol. 1. Tenthredinidae incl. Uroceridae (Phyllophaga & Xylophaga)*. Engelmann, Leipzig, [6] + VIII + 459 pp. https://doi.org/10.5962/bhl.title.10348

Davoudi, Z. (1987) Pear sawfly [*Hoplocampa brevis* Klug. (Hym. Tenthredinidae)] in Iran. [In Farsi, abstract in English]. *Entomologie et Phytopathologie appliquées*, 54 (1–2), 45–46 + 111–121.

deWaard, J.R., Ivanova, N.V., Hajibabaei, M. & Hebert, P.D.N. (2008) Assembling DNA Barcodes. *In*: Martin, C.C. (Ed.), *Environmental Genomics*. Humana Press, Totowa, New Jersey, pp. 275–294. https://doi.org/10.1007/978-1-59745-548-0_15

Enslin, E. (1914) Die Tenthredinoidea Mitteleuropas III. *Deutsche Entomologische Zeitschrift*, Beiheft 3, 203–309. [1914] https://www.zobodat.at/pdf/Deutsche-Ent-Zeitschrift_1914_BH_0203-0309.pdf

Fabricius, J.C. (1804) *Systema Piezatorum secundum ordines, genera, species adiectis synonymis, locis, observationibus, descriptionibus*. Carolus Reichard, Brunsvigae, 30 + 440 pp. https://doi.org/10.5962/bhl.title.10490

Fallén, C.F. (1807) Försok till uppställning och beskrifning å de i Sverige fundne Arter af Insect-Slägtet *Tenthredo* Linn. *Kongliga Vetenskaps Academiens nya Handlingar*, 28 (3), 179–209.

Fallén, C.F. (1829) *Monographia Tenthredinidum Sveciae*. Londini Gothorum, Berling, 48 pp. https://doi.org/10.5962/bhl.title.65801

Fintzescov, G.-N. (1921) La Mouche à scie des Prunes *Hoplocampa fulvicornis* Fabricius Hym. Tenthrédinidé. Insecta. *Revue Illustrée d'Entomologie*, 11, 5–23.

Gmelin, J.F. (1790) *Caroli a Linné Systema Naturae*. *Tom. I. Pars V*. G. E. Beer, Lipsiae, pp. 2225–3020.

Gregor, F. & Bata, L. (1942) Prodromus našeho blanokrídlého hmyzu. Prodromus Hymenopterorum patriae nostrae. Pars V.[recte VI] Podrád Symphyta (Chalastogastra, Tenthredinoidea.) Fam. Tenthredinidae: Subfam. Dolerinae, Selandriinae, Hoplocampinae, Blennocampinae, Nematinae. *Sbornik Entomologického Odděleni při zoologických sbírkach Zemského Musea v Praze*, 20 (250), 259–344.

Greve, L. (1986) Gamsttind/Gamstenstind og Raschtind. To insektlokaliteter fra Zetterstedts tid som i dag ikke finnes på norske kartverk. *Insekt-Nytt. Medlemsblad for Norsk Entomologisk Forening*, 11 (1), 12–13.

Guindon, S., Dufayard, J.-F., Lefort, V., Anisimova, M., Hordijk, W. & Gascuel, O. (2010) New algorithms and methods to estimate maximum-likelihood phylogenies: assessing the performance of PhyML 3.0. *Systematic Biology*, 59, 307–321. https://doi.org/10.1093/sysbio/syq010

Hadzistevic, D. (1959) The existence of several years' diapause in the plum sawflies (*H. minuta* and *H. flava*) in the Sarajevo region. *Proceedings of the 1st World Congress of Agricultural Research*, 1959, 1371–1376.

Hartig, T. (1837) *Die Aderflügler Deutschlands mit besonderer Berücksichtigung ihres Larvenzustandes und ihres Wirkens in Wäldern und Gärten für Entomologen, Wald- und Gartenbesitzer. Erster Band. Die Familien der Blattwespen und Holzwespen nebst einer allgemeinen Einleitung zur Naturgeschichte der Hymenopteren*. Haude und Spener, Berlin, xiv + 416 pp., pls. I–VIII.

Hebert, P.D.N., Cywinska, A., Ball, S.L. & deWaard, J.R. (2003) Biological identifications through DNA barcodes. *Proceedings of the Royal Society of London Series B: Biological Sciences*, 270, 313–321. https://doi.org/10.1098/rspb.2002.2218

Hoang, D.T., Chernomor, O., von Haeseler, A., Minh, B.Q. & Vinh, L.S. (2017) UFBoot2: Improving the ultrafast bootstrap approximation. *Molecular Biology and Evolution*, 35 (2), 518–522. https://doi.org/10.1093/molbev/msx281

infoflora (2017) *Das nationale Daten- und Informationszentrum der Schweizer Flora*. https://www.infoflora.ch/de/flora/1094-prunus-mahaleb.html (accessed 25 April 2017)

Ivanova, N.V., Dewaard, J.R. & Hebert, P.D.N. (2006) An inexpensive, automation-friendly protocol for recovering high-quality DNA: technical note. *Molecular Ecology Notes*, 6, 998–1002. https://doi.org/10.1111/j.1471-8286.2006.01428.x

Jaastad, G., Røen, D., Bjotveit, E. & Mogan, S. (2007) Pest management in organic plum production in Norway. *Acta horticulturae*, 734, 193–199. https://doi.org/10.17660/ActaHortic.2007.734.24

Jensen, K. (2013) *Ekologisk odling av päron*. Länsstyrelsen i Västra Götalands län, Landsbygdsenheten, 40 pp.

Kalyaanamoorthy, S., Minh, B.Q., Wong, T.K.F., von Haeseler, A. & Jermiin, L.S. (2017) ModelFinder: Fast Model Selection for Accurate Phylogenetic Estimates. *Nature Methods*, 14, 587–589.
https://doi.org/10.1038/nmeth.4285

Kirby, W.F. (1882) *List of Hymenoptera with Descriptions and Figures of the Typical Specimens in the British Museum. 1. Tenthredinidae and Siricidae*. By order of the Trustees, London, 450 pp.

Klug, F. (1816) Die Blattwespen nach ihren Gattungen und Arten zusammengestellt. *Der Gesellschaft Naturforschender Freunde zu Berlin Magazin für die neuesten Entdeckungen in der gesamten Naturkunde*, 8 (1), 42–84. [1814]

Klug, F. (1819) Die Blattwespen (*Tenthredo* Linn.) der Fabricischen Sammlung. *Zoologisches Magazin* (herausgegeben von C. R. W. Wiedemann), 1 (3), 64–91. [1817–1819]

Konow, F.W. (1888) Zwei neue Blattwespenarten. *Sitzungsberichte der Preussischen Akademie der Wissenschaften zu Berlin*, 1888, 187–193.

Konow, F.W. (1905) Hymenoptera. Fam. Tenthredinidae. *Genera Insectorum*, 29, 1–176.

Lacourt, J. (1999) Répertoire des Tenthredinidae ouest-paléarctiques (Hymenoptera, Symphyta). *Mémoires de la Société entomologique de France*, 3, 1–432.

Lacourt, J. (2000) Liste des espèces de la famille des Tenthredinidae décrites par J. G. Audinet-Serville, en Mai 1823 et par A. L. M. Le Peletier Comte de Saint-Fargeau, en Août 1823, avec désignation de lectotypes [Hymenoptera, Symphyta]. *Revue française d'Entomologie*, New Series, 22 (2–3), 77–108.

Lennartsson, E. (2012) *Äpplestekel (Hoplocampa testudinea Klug)—Prognos och övervakning i svenska äppelodlingar*. Sveriges Lantbruksuniversitet. Självständigt arbete vid LTJ-fakulteten, SLU, Alnarp, 44 pp.

Lepeletier de Saint-Fargeau, A. ["Le Peletier de Saint-Fargeau, A."] (1823) *Monographia Tenthredinetarum synonymia extricata*. Plassan, Paris, 176 pp.

Lindblom, A. (1936) Skadedjur i Sverige år 1935. *Meddelanden, Statens Växtskyddsanstalt*, 16, 60 pp.

Lindblom, A. (1938) Skadedjur i Sverige år 1936. *Meddelanden, Statens Vaxtskyddsanstalt*, 26, 1–71.

Linné, C. ["Linnaeus, C."] (1760) *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. Editio altera, auctior*. Laurentius Salvius, Stockholm, 578 pp.
https://doi.org/10.5962/bhl.title.46380

Liston, A.D. (2007) Notes on Palaearctic sawflies, with particular reference to the German fauna (Hymenoptera, Symphyta). *Nachrichtenblatt der Bayerischen Entomologen*, 56 (3–4), 82–97.

Liston, A.D., Jacobs, H.-J. & Prous, M. (2015) The Sawflies of Crete (Hymenoptera, Symphyta). *Deutsche entomologische Zeitschrift*, Neue Folge, 62 (1), 65–79.
https://doi.org/10.3897/dez.62.4737

Liston, A.D., Jacobs, H.-J. & Turrisi, G.F. (2013) New data on the sawfly fauna of Sicily (Hymenoptera, Symphyta: Xyeloidea, Tenthredinoidea, Pamphilioidea, Cephoidea, Orussoidea). *The Entomologist's Monthly Magazine*, 149 (1), 29–65.

Liston, A.D. & Prous, M. (2014) Sawfly taxa (Hymenoptera, Symphyta) described by Edward Newman and Charles Healy. *Zookeys*, 398, 83–98.
https://doi.org/10.3897/zookeys.398.6595

Liu, T., Liu, L. & Wei, M. (2017) Review of *Monocellicampa* Wei (Hymenoptera: Tenthredinidae), with Description of a New Species from China. *Proceedings of the entomological Society of Washington*, 119 (1), 70–77.
https://doi.org/10.4289/0013-8797.119.1.70

Lorenz, H. & Kraus, M. (1957) Die Larvalsystematik der Blattwespen (Tenthredinoidea und Megalodontoidea). *Abhandlungen zur Larvalsystematik der Insekten*, 1, 1–389.

Malagón-Aldana, L.A., Serna, F. & Smith, D.R. (2017) The Introduced Willow Sawfly *Nematus oligospilus* (Hymenoptera: Tenthredinidae: Nematinae): First Record for Colombia and Northern South America, with Some Notes on Its Ovipositor Anatomy. *Entomological News*, 127 (1), 28–35.
https://doi.org/10.3157/021.127.0105

Masutti, L. & Covassi, M. (1978) Imenotteri Sinfiti di habitat forestali e montani del Friuli. *Redia. Giornale di Entomologia*, 61, 107–174.

Masutti, L. & Covassi, M. (1980) Contributo alla conoscenza delle *Hoplocampa* Hartig italiane e descrizione di *H. chamaemespili* n. sp. (Hymenoptera, Tenthredinidae). *Redia. Giornale di Entomologia*, 63, 221–247.

Miles, H.W. (1932) On the biology of the apple sawfly, *Hoplocampa testudinea* Klug. *Annals of Applied Biology*, 19, 420–431.

https://doi.org/10.1111/j.1744-7348.1932.tb04332.x

Miles, H.W. (1936) A revision of the British species of *Hoplocampa* Hartig (Hymenoptera, Symphyta). *The Entomologist's Monthly Magazine*, Third Series, 72 (22), 58–62.

Miles, H.W., Thomas, I. & Hey, G.L. (1933) On *Hoplocampa flava* L., the Plum Sawfly. *Annals of Applied Biology*, 20 (4), 722–730.
https://doi.org/10.1111/j.1744-7348.1933.tb07453.x

Muche, W.H. (1986) *Hoplocampa tadshikistanica* sp. n. aus Mittelasien (Hymenoptera, Symphyta, Tenthredinidae). *Reichenbachia, Zeitschrift für entomologische Taxonomie*, 23 (36), 195–196.

Neupane, D. (2013) *Apple sawfly (Hoplocampa testudinea, Klug) situation, forecasting, monitoring and use of extract from Quassia amara for controlling the apple sawfly in organic apple orchards in Sweden.* Sveriges Lantbruksuniversitet. Självständigt arbete vid LTJ-fakulteten, SLU, Alnarp, 50 pp.

Newman, E. (1837) Notes on Tenthredinina. *The Entomological Magazine*, 4 (3), 258–263. [1836–1837]

Nguyen, L.-T., Schmidt, H.A., von Haeseler, A. & Minh, B.Q. (2015) IQ-TREE: A Fast and Effective Stochastic Algorithm for Estimating Maximum-Likelihood Phylogenies. *Molecular Biology and Evolution*, 32, 268–274.
https://doi.org/10.1093/molbev/msu300

Niezabitowski, E.L. (1899) Materyaly do fauny rosliniarek (Phytophaga) Galicyi. *Sprawozdán Komisyi fizyograficznej Akademii Umiejetnosci w Krakowie*, 34, 3–17.

Panzer, G.W.F. (1801) *Faunae Insectorum Germanicae initia oder Deutschlands Insecten*. *7 [1799–1801] (80–83)*. Felssecker, Nürnberg, each issue 24pp., 24 pls. [published after June 1800, not later than June 1801]

Panzer, G.W.F. (1802) *Faunae Insectorum Germanicae initia oder Deutschlands Insecten*. *8 [1801–1804] (86–90)*. Felssecker, Nürnberg, each issue 24pp., 24 pls.

Paukkunen, J., Söderman, G., Leinonen, R., Pöyry, J., Raekunnas, M., Teräs, I., Viitasaari, M. & Vikberg, V. (2009) Havainto- ja Suomelle uusista, hävinneistä, uhanalaisista ja silmälläpidettävistä myrkky- ja sahapistiäislajeista. *Sahlbergia*, 15 (1), 2–20.

Perju, T., Bunescu, H. & Bodis, I. (1995) Viespile cu fierastrau ale prunelor - *Hoplocampa flava* L. si *H. minuta* Christ., daunatoare fructelor de cais in tara noastra. Plum sowflies [sic]— *Hoplocampa flava* L. and *H. minuta* Christ. pests of the apricot fruits. *Buletinul Universitatii de Stiinte Agricole Cluj Napoca Seria Agricultura si Horticultura*, 48 (2), 115–118.

Prous, M., Blank, S.M., Goulet, H., Heibo, E., Liston, A., Malm, T., Nyman, T., Schmidt, S., Smith, D.R., Vardal, H., Viitasaari, M., Vikberg, V. & Taeger, A. (2014) The genera of Nematinae (Hymenoptera, Tenthredinidae). *Journal of Hymenoptera Research*, 40, 1–69.
https://doi.org/10.3897/JHR.40.7442

Pschorn-Walcher, H. & Altenhofer, E. (2000) Langjährige Larvenaufsammlungen und Zuchten von Pflanzenwespen (Hymenoptera, Symphyta) in Mitteleuropa. *Linzer biologische Beiträge*, 32 (1), 273–327.

Réaumur, R.A.F. de (1736) Douziéme Mémoire. Des Chenilles qui vivent dans les riges, les branches, & les racines des plantes & des arbres; des Chenilles, & de quelques vers qui vivent dans l'interieur des fruits. *In*: Réaumur, R.A.F. de, *Memoires pour servir a l'histoire des insectes. Tome second. Suite de l'Histoire des Chenilles & des Papillons; Et l'Histoire des Insectes ennemis des Chenilles*. L'Imprimerie royale, Paris, pp. 467–514, pls. 38–40.

Réaumur, R.A.F. de (1740) Troisieme Mémoire. Et le premier sur les Mouches à quatre aîles. Des fausses Chenilles, & des Mouches à scies, dans lesquelles elles se transforment. *In*: *Réaumur, R.A.F. de, Mémoires pour servir à l'histoire des Insectes. Tome Cinquiéme. Suite de l'Histoire des Mouches à deux aîles, & l'Histoire de plusieurs Mouches à quatre aîles, sçavoir, des Mouches à scies, des Cigales, & des Abeilles*. L'Imprimerie royale, Paris, pp. 87–144.

Roberti, D. (1946) Contributo alla conoscenza della biologia della Tentredine delle pere (*Hoplocampa brevis* Klug). *Bolletino del Laboratorio di Entomologia Agraria "Filippo Silvestri" Portici*, 6, 122–126.

Roberti, D. (1947) Le Oplocampe del Susino I. *Hoplocampa flava* (L.). *Bolletino del Laboratorio di Entomologia Agraria "Filippo Silvestri" Portici*, 7, 41–92.

Roberti, D. (1948a) Le Oplocampe del Susino II. *Hoplocampa rutilicornis* Klug. *Bolletino del Laboratorio di Entomologia Agraria "Filippo Silvestri" Portici*, 9, 8–26.

Roberti, D. (1948b) L'Oplocampa del melo (*Hoplocampa testudinea* Klug). *Bolletino del Laboratorio di Entomologia Agraria "Filippo Silvestri" Portici*, 8, 221–235.

Roberti, D. (1952) Le Oplocampe del Susino: III. *Hoplocampa minuta* Christ. *Bolletino del Laboratorio di Entomologia Agraria "Filippo Silvestri" Portici*, 11, 243–255.

Roberti, D. (1957) Caratteri differenziali delle larve delle specie di *Hoplocampa* viventi sui fruttiferi. *Bolletino del Laboratorio* *di Entomologia Agraria "Filippo Silvestri" Portici*, 15, 176–179.

Rohwer, S.A. (1924) Notes on and descriptions of some sawflies from Japan (Hym.). *Journal of the Washington Academy of Sciences*, 14, 213–215.

Roitberg, B.D. & Prokopy, R.J. (1980) Oviposition behaviour and egg distribution of the European sawfly *Hoplocampa testudinea* Klug. (Hymenoptera: Tenthredinidae). *Journal of the New York Entomological Society*, 88 (1), 69.

Ross, H.H. (1943) The North American sawflies of the genus *Hoplocampa* (Hymenoptera: Tenthredinidae). *Transactions of the American Entomological Society*, 69, 61–92, pls. VI–X.

Rossi, P. (1790) *Fauna Etrusca sistens Insecta, quae in provinciis Florentina et Pisana praesertim collegit Petrus Rossius in regio Pisano Athenaeo*. *Vols. 1 & 2.* Typis Thomae Masi & Sociorum, Liburni, frontispiece + XXII + 272 pp. & frontispiece + 348 pp.
https://doi.org/10.5962/bhl.title.15771

Schedl, W. (2017) Zweite Ergänzung zur Checkliste der Symphyta (lnsecta: Hymenoptera) Österreichs. *Linzer biologische Beiträge*, 49 (2), 1157–1162.

Schmidt, S., Taeger, A., Moriniere, J., Liston, A., Blank, S.M., Kramp, K., Kraus, M., Schmidt, O., Heibo, E., Prous, M., Nyman, T., Malm, T. & Stahlhut, J.K. (2017) Identification of sawflies and horntails (Hymenoptera, 'Symphyta') through DNA barcodes: successes and caveats. *Molecular Ecology Resources*, 17, 670–685.
https://doi.org/10.1111/1755-0998.12614

Serville, A.J.G. (1823) Hyménoptères Térébrans Porte-scie (Tenthrédines). *In*: *Vieillot, P., Desmarest, A.G., Ducrotay de Blainville, H., Audinet-Serville, J.G., Le Peletier de Saint-Fargeau, A. & Walckenaer, C.A., Faune Française, ou Histoire naturelle, générale et particuliére, des Animaux qui se trouvent en France, constamment ou passagèrement, à la surface du sol, dans les eaux qui le baignent, et dans le littoral des mers qui le bornent*. *Vol. 7 & 8.* Levrault, Paris, pp. 1–96.

Sjöberg, P., Swiergiel, W., Neupane, D., Lennartsson, E., Thierfelder, T., Tasin, M. & Rämert, B. (2015) Evaluation of temperature sum models and timing of *Quassia amara* (Simaroubaceae) wood-chip extract to control apple sawfly (*Hoplocampa testudinea* Klug) in Sweden. *Journal of Pest Science*, 88, 301–310.
https://doi.org/10.1007/s10340-014-0616-0

Smith, D.R. (1982) List of the Symphyta (Hymenoptera) of Israel, with description of four new species. *Israel Journal of Entomology*, 16, 1–25.

Smith, D.R. & Fitzgerald, S.J. (2018) *Hoplocampa chrysorrhoea* (Klug) (Hymenoptera: Tenthredinidae), a Palaearctic sawfly new to North America. *Proceedings of the entomological Society of Washington*, 120 (2), 412–415.
https://doi.org/10.4289/0013-8797.120.2.412

Sprengel, L. (1930a) Die Verbreitung der beiden Blattwespenarten *Hoplocampa minuta* Christ und *Hoplocampa flava* L. als Schädlinge in der Pfalz. Mit einem Beitrag zur Blattwespenzucht. *Pfälzisches Museum—pfälzische Heimatkunde*, 47/26, 41–43.

Sprengel, L. (1930b) Die Pflaumensägewespen, *Hoplocampa minuta* Christ. und *Hoplocampa flava* L. (Hym., Tenthr.). *Zeitschrift für angewandte Entomologie*, 16 (1), 1–86.
https://doi.org/10.1111/j.1439-0418.1930.tb00130.x

Stritt, W. (1943) Kleine Mitteilungen über Blattwespen II. (Hym. Tenthr.). *Mitteilungen der Deutschen Entomologischen Gesellschaft e.V.*, 11 (7–10), 90–98.

Svensk Trädgård Riksförbundet (2017) Available from:
http://www.tradgard.org/svensk_tradgard/zonkartan.html (accessed 26 April 2017)

Taeger, A. & Blank, S.M. (1998) Beitrag zur Kenntnis einiger Nematinae (Hymenoptera: Tenthredinidae). *In*: Taeger, A. & Blank, S.M. (Eds.), *Pflanzenwespen Deutschlands (Hymenoptera, Symphyta). Kommentierte Bestandsaufnahme*. Goecke & Evers, Keltern, pp. 247–277.

Taeger, A., Blank, S.M. & Liston, A.D. (2006) European Sawflies (Hymenoptera: Symphyta) - A Species Checklist for the Countries. *In*: Blank, S.M., Schmidt, S. & Taeger, A. (Eds.), *Recent Sawfly Research: Synthesis and Prospects*. Goecke & Evers, Keltern, pp. 399–504.

Taeger, A., Blank, S.M. & Liston, A.D. (2010) World Catalog of Symphyta (Hymenoptera). *Zootaxa*, 2580 (1), 1–1064.
https://doi.org/10.11646/zootaxa.2580.1.1

Tamosiunas, R., Valiuskaite, A., Surviliene, E. & Rasiukeviciute, N. (2014) Species ratio, spring emergence, population dynamics and damage of plum sawflies *Hoplocampa minuta* and *H. flava* in plum orchard. *Zemdirbyste-Agriculture*, 101 (1), 91–100.
https://doi.org/10.13080/z-a.2014.101.013

The Plant List. A working list of all plant species (2017). Available from: http://www.theplantlist.org (accessed 20 April 2017)

Thomsen, M. (1929) Zur Biologie der *Hoplocampa testudinea* Kl. (Vorläufige Mitteilung.). *Anzeiger für Schädlingskunde*, 5 (7), 80–84.
https://doi.org/10.1007/BF02340155

Thomson, C.G. (1871) *Hymenoptera Scandinaviae (Tenthredo et Sirex Lin.). 1*. H. Olsson, Lund, 342 pp.

Vallot, J.N. (1848) Observations d'histoire naturelle. *Mémoires de l'Académie des Sciences, Arts et Belles-Lettres de Dijon*, 1847–1848 (Partie des Sciences), 179–217.

Velbinger, H. (1939) Beitrag zur Biologie und Bekämpfung der Äpfel- und Birnensägenwespe (*Hoplocampa testudinea* Klg., *H. brevis* Klg.) (Hym. Tenthr.). *Gartenbauwissenschaft*, 13 (4), 492–566.

Velbinger, H.H. (1944) Die asiatische und europäische Birnensägewespe, *Hoplocampa pyricola* Rohw. u. *Hoplocampa brevis* Klg. (Hym. Tenthr.). Eine vergleichend-morphologische Studie. *Bulletin de la section scientifique Académie roumaine*, 27, 80–91.

Velbinger, H.H. (1947) *Prunus avium* L. als neue Brutpflanze der Pflaumensägewespe *Hoplocampa minuta* Christ. *Nachrichtenblatt für den Deutschen Pflanzenschutzdienst*, Neue Folge, 1, 120–121.

Viitasaari, M. (Ed.) (2002) *Sawflies (Hymenoptera, Symphyta) I. A review of the suborder, the Western Palaearctic taxa of Xyeloidea and Pamphilioidea*. Tremex Press Ltd., Helsinki, 516 pp.

Vikberg, V. & Nuorteva, M. (1997) On the rearing of *Nesoselandria morio* (Fabricius) and *Birka cinereipes* (Klug) (Hymenoptera, Tenthredinidae), with descriptions of their larvae. *Entomologica Fennica*, 8 (1), 27–38.

Wafa, B. & Mars, M. (2008) Prospection du poirier local (*Pyrus communis* L.) au centre-est (Sahel) de la Tunisie. *FAO-Biodiversity*, 153, 55–60.

Wei, M. (1998) Two New Genera of Hoplocampinae from China with a Key to Known Genera of the Subfamily in the World (Hymenoptera: Nematidae). *Journal of Central South Forestry University*, 18 (4), 12–18.

Zaddach, G. (1876) Beobachtungen über die Arten der Blatt- und Holzwespen von C.G.A. Brischke Hauptlehrer in Danzig und Dr. Gustav Zaddach, Professor in Königsberg, mitgetheilt von Zaddach. *Schriften der physikalisch-ökonomischen Gesellschaft zu Königsberg*, 16 [1875], 23–89, Taf. I(4)–III(6).

Zetterstedt, J.W. (1838) Ordo IV. Hymenoptera. *In*: *Zetterstedt, J.W., Insecta Lapponica descripta. Sectio Secunda*. L. Voss, Leipzig, pp. 326–358.

Zhelochovtsev, A.N. (1976) Materialy po faune pilil'shhikov i rogohvostov srednej Azii, I. [Materials on the fauna of sawflies and woodwasps of Central Asia, I.]. *Sbornik trudov Zoologicheskogo Muzeja MGU*, 15, 3–73.

Zhelochovtsev, A.N. & Zinovjev, A.G. (1995) Spisok pilil'shhikov i rogohvostov (Hymenoptera, Symphyta) fauny Rossii i sopredel'nyh territorij. I. [A list of the sawflies and horntails (Hymenoptera, Symphyta) of the fauna of Russia and adjacent territories. I. *Entomologicheskoe obozrenie*, 74 (2), 395–415.

Zinovjev, A.G. (1993) Two new species of Nematinae (Hymenoptera Tenthredinidae) from the Eastern Palaearctic. *Russian Entomological Journal*, 2 (2), 31–35.

Zirngiebl, L. (1954) Zur Wespenfauna der Pfalz. II. Teil: Blatt-, Holz- und Halmwespen. *Mitteilungen der Pollichia, des Pfälzischen Vereins für Naturkunde und Naturschutz*, III (Reihe), 2, 119–194.

Zschach, J.J. (1788) *Museum N. G. Leskeanum. Pars Entomologica ad systema entomologiae cl. Fabricii ordinata*. I. G. Müller, Lipsiae, 4 (unpag.) + 136 pp.
https://doi.org/10.5962/bhl.title.152350