

# **Sawflies**

## **(Hymenoptera, Symphyta)**

### **I**

A review of the suborder,  
the Western Palaearctic taxa of  
Xyeloidea and Pamphilioidea

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ISBN 952-5274-01-2

**Key words:** *Insecta, Hymenoptera, Symphyta, Xyelidae, Pamphiliidae, Megalodontesidae.*

*Published 15 March 2002*

*Printed and bound in Jyväskylä, Finland by Gummerus Printing*

Front cover photograph: larvae of *Craesus septentrionalis* (Linnaeus) on Common Alder. Nature Photo Agency, Finland, Hannu Huovila.

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# The Western Palaearctic Xyelidae (Hymenoptera)

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**Abstract:** The Western Palaearctic xyelid fauna comprises 3 *Pleroneura* and 9 *Xyela* species. A key to genera and species is given. New and known ecological data are summarized with a strong emphasize on the larval host plant relationships. The oviposition is described for *Pleroneura coniferarum* (HARTIG, 1837) and *Xyela curva* BENSON, 1938. The available type material was studied and lectotypes are designated for *Pinicola alpigena* STROBL, 1895, *Xyela coniferarum* HARTIG, 1837, *X. dahlia* HARTIG, 1837, *X. henschii* MOC-SÁRY, 1912, and *X. piliserra* C. G. THOMSON, 1871. The following new synonyms have been found: *X. julii* BRÉBISSE, 1818 (= *X. henschii*, syn. nov.) and *X. longula* DALMAN, 1819 (= *X. piliserra*, syn. nov.). *Pleroneura numidica* BENSON, 1940 (species revocata) is a valid species from northern Algeria. The East Palaearctic *X. japonica* ROHWER, 1910 was removed from synonymy with *X. obscura* (STROBL, 1895).

Xyelidae are the earliest known Hymenoptera on fossil record. The oldest, the Archexyelinae and the Madygellinae, date from the Early Triassic some 220 million years ago (RASNITSYN 1969). During the Mesozoic age xyelid sawflies were the dominant group of Hymenoptera and must have occurred in far greater variety and abundance than they do now (RASNITSYN 1995). The ancestral Archexyelinae and Madygellinae are reported from the Triassic and Jurassic, Macroxyelinae and Xyelinae range from the Early Jurassic to present. Reports about fossil records from the Late Cretaceous are lacking (RASNITSYN 1971). In the Tertiary there is only a poor fossil record of Xyelidae belonging to ?*Enneoxyela*, *Xyela*, *Megaxyela*, and *Xyelecia*, *Xyela* species being dominant as in contemporary times. RASNITSYN (1995) described specimens from the Rott Formation near Bonn (Latest Oligocene), which are similar to the extant forms of the *Xyela julii*-group. Some 60 fossil forms have been studied and named mostly by A. P. RASNITSYN. Following his view they are classified into 35 genera and 4 subfamilies (see summary of data up to 1978 in SMITH's catalogue).

Fossil xyelids seem to be morphologically quite diverse. Contrary to this the extant fauna is comparatively poor. According to current knowledge the modern fauna consists of some 50 known species divided into five genera of two subfamilies: the Xyelinae (*Pleroneura* and *Xyela*) comprising 12 and 34 species respectively, and the comparatively species-poor Macroxyelinae (*Macroxyela*, *Megaxyela* and *Xyelecia*) comprising 2, 8 and 2 species respectively.

The current work presents keys to the world genera. The species occurring in the Western Palaearctic are revised. Data on biology are summarized from literature and new data are added. The host plants of the West Palaearctic taxa are revised mainly basing on actual breedings. This may lead to a better understanding of the ecological evolution of the basal hymenopterous lineages.

## Material and methods

Rearing of larvae: *Xyela* larvae were obtained – partly in large numbers – from male cones of pines. Larger twigs with flowers were cut from the tree and put into large plastic bags together with some paper to absorb condensation water. The bags were stored at room temperature. The larvae fell out of the cones and crawled around at the bottom of the bag. Once or twice per day they were sorted out. Best sampling results were obtained from cones which were collected some one or two days before blooming. Cones which had already enlarged to shed pollen had mostly been left by the larvae. Rearing from cones which were too young often failed due to desiccation. E. ALTENHOFER (pers. comm.), however, obtained larvae from cones of *Pinus halepensis* collected some two or three weeks before flowering. For the rearing of *Pleroneura*, infested shoots were cut from fir twigs and stored in large plastic bags. The mature larvae crawled out either immediately if the dried tip of the shoot broke off, or during the next two days.

For pupation the larvae were put in to 50–500 ml large glass jars filled with a moderately moist mixture of sand and humus. *Xyela* larvae dig themselves even into comparatively dry substrate, which was refused by *Pleroneura* for digging. Jars with *Xyela* were alternatively stored under laboratory conditions, in a humid cellar or in a shelter under almost natural conditions, the latter method yielding the best results in *Xyela*. The *Pleroneura* samples from 1999 were stored in a cellar, but soon after collection a lot of larvae became mouldy. During February and March of the following year the jars were brought to the laboratory and emerging adults were sorted out. *Xyela* larvae may diapause for a long period, thus the jars were stored for several years.

Identification and nomenclature of the host plants follows SCHÜTT (1991: *Abies*) and KINDEL (1995: *Pinus*). Original information upon host plants and distribution gained or confirmed hereby is marked by an asterisk, for other information the relevant reference to literature is given.

Morphology: Various morphological parameters were taken from individual specimens. Individual numbers are given to single specimens and preparations corresponding with the sets in a database. The antennal flagellum consists of the proximal synantennomere 3, which originates from a variable number of ontogenetically fused antennomeres, and distally of 5–24 or even more thin distal antennomeres. Article 3 of the maxillary palp corresponds with RASNITSYN'S (1965) "pmx". Flagellum (flagella) of the penis valve indicates the specialized, long hair(s) arising close to the lower distal margin of the valviceps in *Pleroneura* and *Xyela* males. The length of the ovipositor sheath is taken as the combined length of valvifer 2 (= proximal part of saw sheath) and of valvula 3 (= distal part). In adult *Xyela* and *Pleroneura* the male genitalia are twisted at 180° along their longitudinal axis (strophandrous state), whilst in *Xylecia*, *Macroxyela* and *Megaxyela* they remain untwisted (orthandrous state). To avoid confusion in comparing characters among the genera, the penis valves of *Xyela* and *Pleroneura* will be illustrated with the ventral margin directed upwards as it is usual for most sawflies.

Accordingly the physiological ventral vs. dorsal parts will be called upper vs. lower parts as illustrated throughout this work. Along the upper margin of the valviceps in most *Xyela* species there is an apparent proximal, medial and distal lobe.

Collection and type material: Labelling of holo- and lectotypes is cited as found on the original material. In case of STROBL's types, labels have been added which refer to STROBL's (1895) original publication. This additional labelling shall ensure the recognition of specimens and it will not be repeated below. Further additional green labels carrying database numbers are omitted, too.

## ***Xyelidae* NEWMAN, 1834**

Xyelites NEWMAN, 1834: 379, 408. Type genus: *Xyela* DALMAN, 1819; Xyelini: KONOW (1897); Xyelinae: ASHMEAD (1898); Xyelidae: ROSS (1932); Xyeloidea: BENSON (1951)  
= Pinicolidae ED. ANDRÉ, 1881: 465. Type genus: *Pinicola* BRÉBISSE, 1818

### ***Key to tribes and genera***

(modified from BENSON 1945, GOULET 1992, and SMITH & SCHIFF 1998)

- 1 Fore wing with junction of veins Sc2 and R apical to that of Rs and R. Article 3 of maxillary palp short, about half as long as scape. Macroxyelinae: Macroxyelini. .... 2
- Fore wing with junction of veins Sc2 and R basal to that of Rs and R. Article 3 of maxillary palp long, about as long as scape or longer (exceptionally shorter in some rare *Xyela* species). ..... 3
- 2(1) Apical margin of clypeus with long triangular projection medially. Labrum rounded, anterior margin notched. Fore wing with vein Sc2 joining vein Sc+R at 0.25–0.5 distance between separation of Rs and pterostigma. Labial palpus with 4 articles. 9.0–12.5 mm. East Palaearctic and Nearctic. ***Megaxyela* ASHMEAD, 1898**
- Apical margin of clypeus without projection but with slight notch medially. Labrum broad, rectangular, and nearly truncate anteriorly. Fore wing with Sc2 joining Sc+R very slightly apical to junction of Rs with Sc+R. Labial palpus with 3 articles. 7.0–9.0 mm. Nearctic. ***Macroxyela* KIRBY, 1882**
- 3(1) Distal thin part of antennal flagellum consisting of 24 or more antennomeres. Terga dorsally without longitudinal furrows above spiracles. Maxillary palp with 4 articles. Ovipositor sheath about 2 times longer than broad. Male genitalia orthandrous. Body 8 mm or longer. East Palaearctic and Nearctic. Macroxyelinae: Xyeleciini. ***Xyelecia* ROSS, 1933**
- Distal thin part of antennal flagellum consisting of 9–11 antennomeres. Terga dorsally with longitudinal furrow above spiracles. Maxillary palp with more than 4 articles, distal articles irregular. Ovipositor sheath much more elongate. Male genitalia strophandrous. Body shorter than 8 mm. Xyelinae. .... 4
- 4(3) Distal thin part of antennal flagellum longer than synantennomere 3. Fore wing with vein Sc very closely adpressed to vein R (apparently fused). Pterostigma twice as long

as wide. Wings without setae, surface coriaceous. Dorsal margin of ovipositor sheath straight or bent downwards. Body slender, shorter than 5 mm. Holarctic. Xyelini.

*Xyela* DALMAN, 1819

- Distal thin part of antennal flagellum shorter than synantennomere 3. Fore wing with vein Sc clearly removed from R. Pterostigma three times as long as wide. Wings pubescent, surface smooth. Dorsal margin of ovipositor sheath mostly curved up, seldom straight. Body stout and longer, 4–6 mm. Holarctic. Pleroneurini.

*Pleroneura* KONOW, 1897

## *Pleroneura* KONOW, 1897

*Pleroneura* KONOW, 1897: 55–56. Type species: *Xyela dahlia* HARTIG, 1837, subsequent designation by ROHWER, 1911; = *Pleuroneura*: ASHMEAD (1898), type error

= *Manoxyela* ASHMEAD in DYAR, 1898: 214. Type species: *Manoxyela californica* ASHMEAD, 1898, by original designation. Synonymy by ROHWER (1911)

## Key to adults of West Palaearctic *Pleroneura*

The dark body coloration may fade to pale brown in old collection material. The length of the first section of Rs2 varies between specimens as well as in the left and the right fore wing of the same specimen.

- 1 Ovipositor 1.5–1.6 times, valvula 3 0.90–1.00 times as long as posterior tibia. Length of valvifer 2 : valvula 3 = 1.60–1.80. In ♂ subgenital plate with apical margin distinctly convex. Clypeus black with a distinct pale anterior margin, which is at least as wide as ocellar diameter. Algeria.

Claws of posterior legs with a small subapical tooth. Wings slightly infusate. Scape, pedicel and more or less synantennomere 3 red. Coxae partly, femora almost completely red. POL : OOL in ♀ 0.55–0.65, in ♂ 0.80.

*Pleroneura numidica* BENSON, 1940 ♀♂

- Ovipositor 1.3–1.5 times, valvula 3 0.65–0.90 times as long as posterior tibia. Length of valvifer 2 : valvula 3 = 1.15–1.45. In ♂ subgenital plate truncate distally. Clypeus completely black or more or less brown (fading especially in old material). Unknown from North Africa. .... 2

- 2(1) ♀, ♂ unknown. Claws of posterior legs with a small, sometimes hardly perceptible subapical tooth (check all four claws!). Wings slightly to moderately infusate. Scape and pedicel black as is synantennomere 3. Coxae, trochanters and femora dark, narrow apical margins of femora red as are tibiae. Maxillary palp 3 dark in basal half and brown in apical half. Valvula 3 of ovipositor sheath black in basal half, seldom slightly brown. POL : OOL = 0.60–0.75. In fore wing first section of Rs2 usually significantly shorter than 200 µm, exceptionally 2r–m meeting Rs proximal to fork of Rs1 and Rs2.

*Pleroneura coniferarum* (HARTIG, 1837) ♀

- ♀ or ♂. Claws of posterior legs without subapical tooth (only exceptionally with a very feeble subapical tooth). Wings moderately to extensively infusate. Scape and pedicel



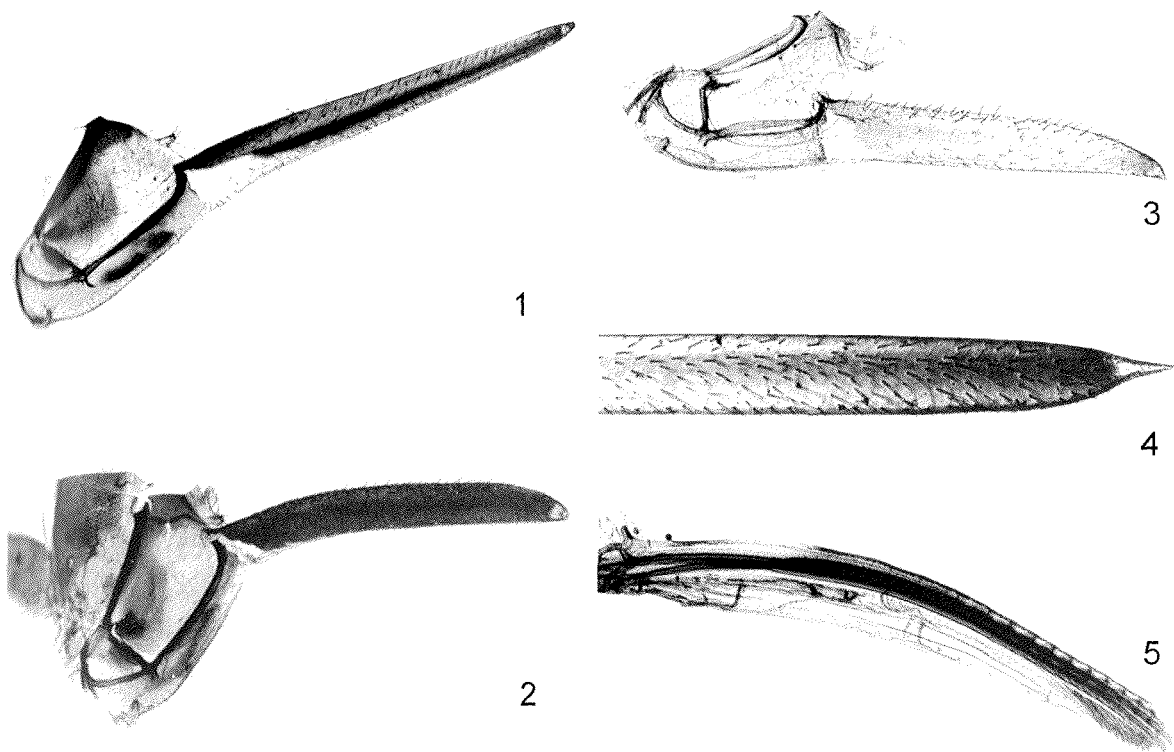
red, synantennomere 3 more or less dark. Femora predominantly red like tibiae, usually also coxae and trochanters at least partly red. Maxillary palp 3 completely brown or with indistinctly darkened basal half. Valvula 3 of ovipositor sheath usually predominantly brown in basal half. POL : OOL in ♀ 0.55–0.65, in ♂ 0.60–0.70. In fore wing first section of Rs2 usually longer than 200 µm.

*Pleroneura dahlii* (HARTIG, 1837) ♀♂

***Pleroneura coniferarum* (HARTIG, 1837)**

*Xyela coniferarum* HARTIG, 1837: 352, ♀. Type locality: Austria; = *Pinicola coniferarum* (HARTIG, 1837): ED. ANDRÉ (1881); = *Pleroneura coniferarum* (HARTIG, 1837): KONOW (1897)

Type material. Lectotype ♀ (hereby designated): “14581”; [red:] “Type”; [KLUG’s handwriting:] “*Coniferarum* KL. Austr. KL.”; “Zool. Mus. Berlin”; [red:] “Lectotypus ♀



**Figs. 1–3.** Ovipositor sheath of *Xyela* (valvifer 2 and valvula 3) and distal abdominal terga. **Fig. 1.** *X. alpigena*. **Fig. 2.** *X. curva*. **Fig. 3.** *X. obscura*. **Fig. 4.** *X. longula*, distal third of valvula 3. **Fig. 5.** *X. curva*, ovipositor

*Xyela coniferarum* HARTIG, 1837 des. S. M. BLANK 1999"; "*Pleroneura coniferarum* (HTG.) ♀ det. S. M. BLANK 1999". The right and the apical part of the left antennal flagellum are missing, otherwise in good condition. Coll. Museum für Naturkunde, Berlin. SCHEDL (1978) erroneously mentioned the Paris museum as the type deposition. However, it is evident from the original description that the types were from KLUG's collection in the Museum für Naturkunde in Berlin as 1. HARTIG stated "das hiesige Museum" as the deposition of the material; and 2. he attributed the name to KLUG ("von KLUG *Xyela Dahlii* genannt") as may also be read from the original labels. But KLUG had never described a *Pleroneura* species (cf. TAEGER & BLANK 1996). Number and gender of the types is not clear from the original description. A lectotype is hereby designated to clarify the identity of the original type material and to ensure stability of the species name. The collection catalogue lists under no. 14581: "*Xyela coniferarum* KL. / 3. [= 3 specimens] / Austria KL. / *Pinicola coniferarum* HTG.\*". Accordingly, the syntype series, which HARTIG had on hand, consisted of three specimens. In the Berlin collection three *P. coniferarum* females bear subsequently added type labels, however, only one bears labels showing the catalogue number and KLUG's handwritten label with the name of the taxon and the collecting locality. This specimen, which agrees with the original description, is hereby designated as the lectotype.

Diagnostic combination. Very similar to *P. dahlii*, but with wings more pale and femora predominantly black, at least posterior claws with subapical tooth, and first section of Rs2 of fore wing usually shorter.

Discussion. The identity of *P. coniferarum* and *P. dahlii* as separate species has been discussed for a long time. Already KONOW (1897) cast serious doubts upon their validity as he found both characters applied by him as being variable (coloration of wings and relative position of veins Rs1 and 2r-m to each other). Paucity of available material and the variability of several characters might be reasons for this discordance. In the material studied hereby morphological characters and color pattern are well correlated, although single specimens occur, whose coloration and morphology is intermediate. The two species usually differ in the length of the first section of vein Rs2 (radial vein between the branching of Rs1 and 2r-m from Rs2): In *P. coniferarum* the section is 40–275 µm long (usually less than 200 µm), and in *P. dahlii* it is 175–325 µm (exceptionally less than 200 µm). *P. coniferarum* bears a small subapical tooth on the posterior claw, which is lacking in *P. dahlii* (however, now and then it may be hardly perceptible even in *P. coniferarum*). Contrary to East Palaearctic forms (e.g. *P. subulata*) the claws of the medial and fore legs have no subapical tooth. *P. coniferarum* is characterized by a black scape and pedicel and predominantly dark femora (only a little pale distally). These parts are predominantly pale in *P. dahlii*. In *P. coniferarum* the article 3 of the maxillary palps is dark in the proximal half, in *P. dahlii* it is usually completely brown. The wings are less dark in *P. coniferarum* than in *P. dahlii*.

Although males of *P. coniferarum* are mentioned in literature (e.g. by KONOW 1897, SCHEDL 1978), none could be found by PESARINI (2000) and the present author. Each male checked hereby was lacking the subapical tooth of the posterior claws, had extensively red femora and a long first section of vein Rs2 in the fore wing, as is typical for *P. dahlii*.

*P. subulata* SHINOHARA, 1995 from Japan and Korea is very similar to *P. coniferarum*. An additional female, which agrees with SHINOHARA's (1995) description, has been collected in the Russian Far East (Primorskiy kray, Sikhote-Alin, Biological Station, Chuguyevka SE 30 km, 44.05 N 134.12 E, 650 m above sea level, 31.5.1993, leg. A. TAEGER). This specimen disagrees with *P. coniferarum* in the following characters: clypeus with broad anterior margin pale, basal articles of maxillary palps brown, coxae, trochanters and femora extensively brown, pterostigma comparatively stout (2.9 times longer than broad). Subapical teeth are present on all claws.

Host plant. \**Abies alba* and \**A. cephalonica*. As adults have repeatedly been collected from or close to *A. alba* (e.g. STROBL 1895, and own material), this tree has been reported as the host plant of *P. coniferarum* or *P. dahliei* respectively (e.g. by SCHEDL 1978, PESARINI 2000). In the Bayerischer Wald (south-eastern Germany) I found very young shoots of *A. alba*, and on Mt. Olympus (northern Greece) a few of *A. borisii-regis*, whose damage was similar to that found on *A. cephalonica* (see below). However, in both cases it was so far impossible to relate this damage to a particular *Pleroneura* species, because no adults could be found and at the Bavarian location the larvae had already left the shoots.

Biology. In central Europe the adults occur from mid April to early June (BERLAND 1943, SCHEDL 1978). In southern Bavaria JEMILLER (1894) collected several females from spruce ("Fichte"), in Austria STROBL (1895) observed females on willow catkins. On Mt. Ainos of the Greek island Kephallonia *P. coniferarum* has been collected several times from mid April to mid May (SCHEDL 1978 and pers. comm., LISTON 1983). In 1999 I saw several hundred females there swarming around *A. cephalonica* trees but no male. Along the large altitudinal gradient (600–1 630 m above sea level) the fir displayed a different phenological development, and the abundance and behavior of the sawflies seemed correlated to it. On top of Mt. Ainos *P. coniferarum* obviously started swarming on 27.–28.4.1999. The fir buds were completely closed there. Most ovipositing females were observed at 1 300 m on the northern slope of Mt. Ainos. The buds there were completely closed, swelling or partly shedding their scales. At 1 000 m I was able to capture only two females, and most fir trees were already bearing the enlarging green shoots there. On 30.4. I found many infested shoots at 600 m, which contained larvae at different development stages or which had already been left. Most of the collected mature larvae hatched from the shoots before 2.5. At 600 m most of the uninfested, well developed shoots were 3–8 cm long.

The females oviposit into the distal part of the completely closed buds through the scales, which often were partly resinous (Fig. 14). Swollen buds, in which the needle cluster is already shimmering through the scales, or later development stages are completely avoided for oviposition (even in a small field experiment, in which only twigs with buds of a distinct stage were available to the females inside a closed plastic bag). The female starts drilling into the bud with the tip of the abdomen strongly bent downwards, thus the longitudinal axis of the ovipositor being perpendicular to the longitudinal axis of the body and the tip of the sheath touching the bud surface. The apparatus is repeatedly pushed into the bud and withdrawn again during drilling until about the distal two thirds of valvula 3 are inserted. At this stage a part of the ovipositor

is visible lying free at the base of valvula 3 forming a triangle with the latter. Finally the apparatus is withdrawn within a few seconds assisted by the female running a few steps backwards. Drilling may last several minutes, and single females were observed ovipositing for more than 40 minutes. Rather often oviposition is interrupted by phases of inactivity or grooming.

Contrary to all other sawflies not only the ovipositor itself but also its sheath (valvula 3) is inserted into the bud during oviposition. The ovipositor sheath of *P. coniferarum* is wedge-shaped in outline, bent dorsad and pointed distally, its surface is smooth, and the setae in the distal half of valvula 3 are very short. In other Xyelinae the ovipositor sheath is more or less parallel-sided (except in the *Xyela alpigena*-group) with the tip blunt (except in *X. longula*), the surface is more or less rough, and the setae are long and rather uniform in length. The shape of the ovipositor sheath is much more dissimilar in Macroxyelinae. All *Pleroneura* species checked show this morphological pattern. Accordingly, the direct assistance of valvula 3 during oviposition can be claimed as an apomorphy of *Pleroneura*.

The larva (at least its later stages) feeds inside the stalk of the young shoot on the tissue until only a thin and brittle cover remains bearing the needles. Only a single larva occurs in a shoot. In the infested shoots the distal needles stop growing and wither. Contrary to the basal needles those distally do not spread from each other (Fig. 15). Often the fragile tip of the shoot breaks off during collection. Mature larvae leave the shoot when its tip breaks off, or they bite a hole at the side of the stalk close to its base. They fall to the ground and dig into the soil, where they spin a dark brown cocoon.

In close proximity to each other, trees free from *Pleroneura* larvae and trees with some 50% infested shoots were found. MASAKA & HARA (submitted) suppose that the dissimilar infestation rates of *Pleroneura piceae* SHINOHARA & HARA, 1995 within a *Picea glehnii* population depend on inter-tree differences of bud swelling (cf. MASAKA 1999). Thus genetically based differences in phenology could explain the different levels of infestation by *Pleroneura*.

Distribution. \*Austria (SCHEDL 1978), Belgium (WOLF 1967), Belgium and Luxembourg (MAGIS 1994), north-western Croatia (FINK 1923), \*Czech Republic (Bohemia and Moravia; BENEŠ 1989), \*France (BERLAND 1943), \*Germany (JANSEN 1989), \*Greece (SCHEDL 1978), Hungary (KONOW 1897, MÓCZÁR & ZOMBORI 1973), \*Italy (PESARINI 2000), Poland ("West-Beskidien"; KONOW 1897), \*Slovakia, \*Switzerland (STECK 1893), Ukraine (Carpathian Mountains; ZHELOCHOVTSEV 1988). LISTON (1983) and SCHEDL (1978) reported *Pleroneura "dahlii"* from the Greek island Cephalonia. According to the characters communicated by SCHEDL (pers. comm.) at least his female belongs in fact to *P. coniferarum*. Unfortunately the material, which LISTON had studied, could not be obtained for reexamination.

## *Pleroneura dahlia* (HARTIG, 1837)

= *Xyela dahlia* HARTIG, 1837: 352, ♀♂. Type locality: Austria; = *Pinicola dahlia* (HARTIG, 1837): ED. ANDRÉ (1881); = *Pleroneura dahlia* (HARTIG, 1837): KONOW (1897); = *Pleroneura dahlia*, type error

Type material. Lectotype ♀ (hereby designated): [red:] “Type”; “14579”; “*Xyela Dahlia*”; “Zool. Mus. Berlin”; [red:] “Lectotypus ♀ *Xyela dahlia* HARTIG, 1837 des. S. M. BLANK 1999”; “*Pleroneura dahlia* (HARTIG) ♀ det. S. M. BLANK 1999”. The right antennal flagellum is missing, otherwise in perfect condition. Coll. Museum für Naturkunde, Berlin. It is evident from HARTIG’s publication that material from the Berlin collection constitutes the types (see above). Number and gender of the types is not clear from the original description. Therefore a lectotype is designated to promote stability of the name should additional syntypes be found. The collection catalogue lists under no. 14579: “*Xyela Dahlia* KL. / 4. [= 4 specimens] / Austria KL. / *Pinicola dahlia* KL.\* / 1 fehlt St.”. Accordingly, the original syntype series consisted of four specimens. Among the *P. dahlia* from the Berlin museum two bear subsequently added type labels. Only one of these is labelled as “*Xyela dahlia*” and bears the catalogue number 14579. This specimen is hereby designated as the lectotype.

HARTIG’s characterization of the color of the antennae apparently disagrees with the type as he described the fourth antennal article as being brown. However, from his general introduction to the genus *Xyela* (HARTIG 1837: 349–350) it is evident that he counted the scape as two articles (“Grundglied” and “Schaft”), the pedicel as the third (“Wendeglied”), and the following enlarged article as the fourth (“das vierte Glied der Fühler, das erste der Geißel”).

Diagnostic combination. Close to *P. coniferarum*, but with wings more dark and femora predominantly reddish brown, subapical tooth of claws wanting, and first section of Rs2 of fore wing usually longer.

Host plant. \**Abies alba*. See *P. coniferarum* above and Pesarini (2000) for discussion. A male has been collected close to *Abies alba* in Lower Austria by E. ALTENHOFER. *A. cephalonica* should be deleted from the list of host plants of *P. dahlia*, as 1. the record is based on the finding of a female on the island Kefhalonia (SCHEDL 1978), which belongs to *P. coniferarum* (“*P. dahlia*” material reported by LISTON [1983] could not be checked); 2. among some 60 *P. coniferarum* females from this *A. cephalonica* stand, which were checked hereby, not any *P. dahlia* could be found.

Biology. Adults have been collected from mid April to mid May in central Europe (SCHEDL 1978, FLÜCKIGER & PETER 1998) and at end May in the Apennines (Pesarini 2000). In Switzerland FLÜCKIGER & PETER (1998) collected a single male from treetop (28 m) by a window trap on 11.5.1994. Together with several *P. coniferarum* JEMILLER (1894) collected a single female *P. dahlia* from spruce (“Fichte”) in southern Bavaria.

Distribution. \*Austria (SCHEDL, 1978), \*Czech Republic (Moravia: BENEŠ 1989; Bohemia: PÁDR 1990), \*Germany (JANSEN 1989), Hungary (KONOW 1897, MÓCZÁR & ZOMBORI 1973; Carpathian Basin: ZOMBORI 1974), \*Italy (Pesarini 2000), \*Poland (“West-Beskidien”; KONOW 1897), Slovakia (BENEŠ 1989), \*Switzerland (STECK 1893,

FLÜCKIGER & PETER 1998), Ukraine (Carpathian Mountains; ZHELOCHOVTSEV 1988). Records from Japan, first made as "*Pleroneura dahli*" by TAKEUCHI (1938) all refer to *P. piceae* SHINOHARA & HARA, 1995 (SHINOHARA 1995).

### ***Pleroneura numidica* BENSON, 1940, species revocata**

= *Pleroneura numidica* BENSON, 1940: 39–40, ♀ ♂. Type locality: Algeria, northern slope of Mt. Babor [= Djebel Babor], Kabylie Range

Type material. Holotype ♀: [round label with red margin:] "Type"; "Muséum Paris Algérie Babor 1900 m"; "PEYERIMHOFF 16–20–vi–1939"; "Holotype *Pleroneura numidica* sp. nov. ♀ det. R. B. BENSON 1939"; "*Pleroneura numidica* BENSON ♀ det. S. M. BLANK 1999". In perfect condition. Paratypes: 2 ♀ 1 ♂ (♂ labelled as allotype, others not labelled as types). Coll. Musée d'Histoire Naturelle, Paris. According to the original description 2 ♀ paratypes in the Museum of Natural History, London (not checked). BERLAND (1943), who had *P. numidica* types on hand, synonymized it with *P. coniferarum* as he judged the differences as not considerable. This opinion has been accepted (e. g. SMITH 1978), although SCHEDL (1978) listed *P. numidica* as valid without further comments on its status.

Diagnostic combination. The female differs from the other West Palaearctic taxa in the longer ovipositor sheath, the male in the distally rounded subgenital plate.

Host plant. \**Abies numidica* is certainly the host plant, although *P. numidica* has not been reared from it. The type locality is identical with the some 10 km<sup>2</sup> large stand of this endemic fir species on Mt. Babor in north-eastern Algeria (BENSON 1940, SCHÜTT 1991).

Distribution. \*Algeria (BENSON 1940).

### ***Xyela* DALMAN, 1819**

= *Pinicola* BRÉBISSEON, 1818: 116–117. Type species: *Pinicola julii* BRÉBISSEON, 1818, by monotypy. Preoccupied by *Pinicola* VIEILLOT, 1805 (birds, cf. HELLMAYR 1938).

= *Mastigocerus* (KLUG in litt.) LATREILLE, 1818: 451 [*Mastigocère*], unavailable name; = *Mastigocera* BERTHOLD, 1827, unavailable name; = *Mastigoceras* KLUG (THOMSON 1871), unavailable name; cf. TAEGER & BLANK (1996)

= *Xyela* DALMAN, 1819: 122–124. Type species: *Xyela pusilla* DALMAN, 1819, subsequent designation by CURTIS, 1824; = *X. julii*-group (RASNITSYN 1965); = *X. bakeri*-group (RASNITSYN 1965)

= *Pinicolites* MEUNIER, 1920: 896. Type species: *Pinicolites graciosus* MEUNIER, 1920, by monotypy; = *Xyela* subgen. *Pinicolites* (RASNITSYN 1997)

= *Tritokreion* SCHILLING, 1825, no species included; = *Tritocreion*: KONOW (1905), type error

= *Neoxyela* CURRAN, 1923: 20. Type species: *Neoxyela alberta* CURRAN, 1923, by monotypy. Synonymy by ROSS (1937)

= *Xyelatana* BENSON, 1938: 34. Type species: *Xyela longula* DALMAN, 1819, by original designation. Synonymy by BURDICK (1961); = *X. longula*-group (RASNITSYN 1965)

= *Xyela* subgen. *Mesoxyela* RASNITSYN, 1965: 491, 497–498, 512–513. Type species: *Xyela* (*Mesoxyela*) *mesozoica* RASNITSYN, 1965, by original designation

= *Xyela* subgen. *Xyela* section *Alpigenixyela* RASNITSYN, 1971: 194. Unavailable name for *X. alpigena*–group of RASNITSYN (1965)

= *Xyela* subgen. *Xyela* section *Concavixyela* RASNITSYN, 1971: 194. Type species: *Xyela concava* BURDICK, 1961, by monotypy; = *X. concava*–group (RASNITSYN 1965)

= *Xyela* subgen. *Xyela* section *Desertixyela* RASNITSYN, 1971: 194. Type species: *Xyela deserta* BURDICK, 1961, by monotypy; = *X. deserta*–group (RASNITSYN 1965)

= *Xyela* subgen. *Xyela* section *Linsleyixyela* RASNITSYN, 1971: 193. Unavailable name for *X. linsleyi*–group of RASNITSYN (1965)

= *Xyela* subgen. *Xyela* section *Magnixyela* RASNITSYN, 1971: 193. Unavailable name for *X. magna*–group of RASNITSYN (1965)

= *Xyela* subgen. *Xyela* section *Minorixyela* RASNITSYN, 1971: 194. Unavailable name for *X. minor*–group of RASNITSYN (1965)

BENSON (1938) described *Xyelatana* basically on the very small maxillary palps and the long ovipositor. Here he placed the taxa *longula* and *piliserra*. BERLAND (1943) added *Xyelatana lugdunensis*, BENSON (1961) *X. helvetica*. BURDICK (1961) placed *Xyelatana* in synonymy with *Xyela* owing to the discovery of new species having various combinations of characters previously believed to be diagnostic for *Xyelatana*.

RASNITSYN (1965) subdivided *Xyela* s. str. (= *Xyela* excluding the fossil subgenus *Mesoxyela* RASNITSYN, 1965) into 9 species groups. Six of them he named in 1971 as “sections” as e.g. “*Magnixyela* sect. nov. = *Xyela* ex. gr. *magna* STATZ, cf. RASNITSYN 1965”. Such uninominal names proposed for genus-group divisions lower than subgeneric level are on principle deemed to be valid (Art. 10.4, ICZN 1999). *Concavixyela* RASNITSYN, 1971 and *Desertixyela* RASNITSYN, 1971 are available, because the species groups referred to in RASNITSYN (1965) both include only a single species, and thus the type species is fixed by monotypy (Art. 68.3, ICZN 1999). Four names, however, are in fact not available under the provisions of Art. 13.3 of the Code, because the necessary type species were neither fixed by the author nor automatically by monotypy. This applies to *Alpigenixyela* RASNITSYN, 1971, *Linsleyixyela* RASNITSYN, 1971, *Magnixyela* RASNITSYN, 1971, and *Minorixyela* RASNITSYN, 1971. The corresponding species groups comprise 2–11 species each. *Minorixyela* is replaced by *Neoxyela* CURRAN, 1923, because the type species of *Neoxyela*, *N. alberta* CURRAN, 1923, was listed in the *minor*–group by RASNITSYN (1965). If valid names are needed for the other three taxa, they will have to be described as new. Other synonymous names of *Xyela* cannot be taken into consideration: *Pinicola* BRÉBISSE, 1818 is preoccupied by *Pinicola* VIEILLOT, 1805. *Mastigocerus* and the orthographically similar names are unavailable as demonstrated by TAEGER & BLANK (1996). *Tritokreion* SCHILLING, 1825 is associated with *Xyela* but no nominal species was included in the original description (SMITH 1978), therefore its taxonomic placement is doubtful.

The subdivision of *Xyela* to species groups is less evident than the separation of the genera *Pleroneura* and *Xyela*. This is partly due to the fact that some species are available only from very few specimens (in *X. helvetica* a couple, in *X. lugdunensis* two females). Currently I propose the following subdivision of the western Palaearctic taxa:

– *longula*–group: *X. helvetica* and *X. longula*. Ovipositor sheath very long and

straight, parallel-sided, round with an acicular tip (Fig. 4). The maxillary palps are very short (about 0.75 times as long as scape). Gonostyli of male genitalia shorter than wide distally. Basiparameres with longitudinal apodeme completely on lower side. Valviceps most likely without a vertical lamella (Figs. 6–7).

– *alpigena*-group: *X. alpigena* and *X. lugdunensis*. Ovipositor wedge-shaped, diamond-shaped in cross-section and rounded distally (Fig. 1).

**Tab. 1.** Host plant relationships of Western Palearctic *Xyela* and *Pleroneura* species. The classification of *Pinus* follows KINDEL (1995). Legend: ● – host plant relationship hereby observed (oviposition, breeding, only available host species on collecting site); ● – exceptional occurrence of *Xyela* species on this host; ○ – host plant relationship cited in literature and hereby excluded; ? – unproven but expected host plant relationship. Larvae were obtained from *P. brutia*, *P. halepensis* and *P. heldreichii*, but no adults hatched so far. No *Xyela* larvae were found on *P. pinea* (4 samples), *P. pinaster* (8 samples), *P. rotundata* (1 sample) and *P. uncinata* (1 sample). *P. peuce* has not been studied so far.

Genus	Pines ( <i>Pinus</i> )												Firs ( <i>Abies</i> )				
Subgenus	<i>Strob.</i>		<i>Pinus</i>														
Section	<i>Strobus</i>		<i>Ternata</i>	<i>Sylvestres</i>													
Subsection	<i>Cembrae</i>	<i>Strobi</i>	<i>Pinea</i>	<i>Sylvestres</i>													
species	<i>cembra</i>	<i>peuce</i>	<i>pinea</i>	<i>brutia</i>	<i>halepensis</i>	<i>heldreichii</i>	<i>mugo</i>	<i>nigra</i>	<i>pinaster</i>	<i>rotundata</i>	<i>sylvestris</i>	<i>uncinata</i>	<i>alba</i>	<i>borisii-regis</i>	<i>cephalonica</i>	<i>numidica</i>	
<i>Pleroneura</i> <i>coniferarum</i> <i>dahlia</i> <i>numidica</i>													● ●	?	● ○	●	
<i>Xyela</i> <i>alpigena</i> <i>curva</i> <i>graeca</i> <i>helvetica</i> <i>julii</i> <i>longula</i> <i>lugdunensis</i> <i>menelaus</i> <i>obscura</i>	● ○    ○    ○	?         		○			○  ?  	● ●  ? ● ○			○ ● ●  						



– *curva*-group: *X. curva*. Ovipositor sheath in most females evidently bent ventrad (Fig. 2). Additionally the valvula 2 of the ovipositor itself shows an undulatory dark and pale pattern, which is unique among West Palaearctic taxa (Fig. 5).

– *julii*-group: *X. graeca*, *X. julii*, *X. menelaus*, *X. obscura*. Antennae shortened, femora colored uniformly, penis valve with an evident, spur-like longitudinal swelling, medial lobe of penis valve prominent, lower ergot tiny (Figs. 10–13). Currently this group seems to be defined most satisfyingly.

The relation of the species groups to each other remains dubious for the reasons already explained above. The grouping of (*curva*-gr. + *julii*-gr.) seems most stable. Both species-groups share the missing subapical tooth of the posterior claw (although variable in *X. curva* and *X. menelaus*) and the flat shape of the ovipositor with a largely rounded tip bearing a shining area distally (Figs. 2–3). The group [*alpigena*-gr. + (*curva*-gr. + *julii*-gr.)] might possibly be supported by the presence of the strongly sclerotized lateral lamella of the penis valve, which is vertical in *X. alpigena* (Fig. 8) and *X. curva* (Fig. 9) and oblique in the *julii*-group (Figs. 10–13; males of *X. lugdunensis* unknown). Furthermore, this grouping is supported by the lateral position of the proximal portion of the basiparamere apodeme. Its position on the lower face of the basiparameres – as found in *X. longula* – would be the ground plan state for *Xyela* accordingly.

The host plant relationships of the Western Palearctic *Xyela* species are summarized in table 1, which also displays the classification of the relevant pine species. All *Xyela* species occur on *Pinus* sect. *Pinus* species except for *X. alpigena*, which infests *Pinus* sect. *Strobilus*. No larvae could be found on *Pinus* sect. *Ternata*.

### **Key to adults of West Palaearctic *Xyela***

*Xyela* species, particularly those of the *X. julii*-group are difficult to distinguish and it is sometimes impossible to identify single specimens for certain. This is primarily caused by the paucity of utilizable characters. The present work mainly utilizes the relative length of the body appendages for species identification such as the antennae and single antennal segments respectively, the maxillary palp 3, the fore wing, and the ovipositor sheath. The relative distance of the posterior ocelli from each other (POL) and from the eye margin (OOL) may be an additional aid in separating *X. obscura* from *X. julii*. Male genitalia and the female ovipositor may also be decisive in identification. The following color pattern is typical for the genus: head pale with postocellar area in the middle, surroundings of ocelli, kidney shaped spots of the vertex, stripes along the antennal furrows, and a longitudinal spot in the middle of the frontal area black or dark brown. This general pattern may become darker (e. g. head predominantly black in *X. obscura* females) or more pale (e. g. stripes along the antennal furrows largely reduced in *X. graeca*). On species level the coloration was always found to be more or less variable.

Secondly difficulties in species identification are caused by the variability of characters. When considering material from a larger geographical area, several species overlap in their external morphological characters. Specimens from single collecting

localities may be comparatively uniform morphologically and in color compared to material from the complete distribution range. Additionally, in reared series single “abnormal” specimens with enlarged or shortened body appendages (mainly the antennal segments, the ovipositor and its sheath) or with an atypical deflection of the ovipositor sheath have regularly been observed.

1	♀	.....	2
—	♂	.....	10

- 2(1) Antennae longer, antennomere 4 (5.5–)6–8 times longer than wide distally. Posterior claws each with a small subapical tooth (sometimes missing in small specimens). Femora pale ventrally and mostly dorsally, anteriorly with a dark longitudinal stripe (at least on posterior femora), posteriorly more or less infusate.  
Valvula 3 in lateral view with an asymmetric tip in *X. curva* (dorsal outline preapically curved ventrad), symmetric in the other species. .... 3
- Antennae shorter, antennomere 4 4–6 times longer than wide distally. Posterior claws smooth (seldom with a subapical tooth in large specimens). Femora colored uniformly. Valvula 3 in lateral view always with an asymmetric tip (dorsal outline preapically curved ventrad). .... 7
- 3(2) Valvula 3 distinctly bent downwards (Fig. 2), compressed, 4.5–5 times higher than wide in the preapical third. Ovipositor compressed, valvula 2 in the distal half with a characteristic regular undulatory pale and dark pattern (Fig. 5).

***Xyela curva* BENSON, 1938 ♀**

[See **couplet 7** for material with compressed valvula 3 and claws bearing a subapical tooth. Such specimens usually with ovipositor sheath straight or indistinctly bent downwards, valvula 3 predominantly yellow to pale brown, and antennae shorter with antennomere 4 at most 4–6 times longer than broad.]

- Valvula 3 straight, in cross-section round (Fig. 4) or diamond-shaped (Fig. 1), 1.0–1.5 times higher than wide in the preapical third. Ovipositor needle-like or wedge-shaped, without regular undulatory pattern. .... 4
- 4(3) Ovipositor sheath 0.8–1.1 times as long as fore wing. Upper and lower side of valvula 3 parallel in basal half, distally with an acicular tip (Fig. 4), yellowish brown close to the base and brown to black distally. Maxillary palp 3 0.75–0.9 times as long as scape, thinner than synantennomere 3. Wings brownish infusate. .... 5
- Ovipositor sheath 0.5–0.65 times as long as fore wing. Valvula 3 wedge shaped, upper and lower margins narrowed uniformly to a narrow, rounded tip. Valvula 3 largely pale along baso-ventral margin, dorsally and distally black (Fig. 1). Maxillary palp 3 1.1–1.65 times as long as scape, thicker than synantennomere 3 (indistinct in *X. lugdunensis*). Wings almost clear in *X. alpigena* but brownish infusate in *X. lugdunensis*. .... 6

- 5(4) Valvula 3 longer, (3.4–)3.6–4.0(–4.2) times longer than valvifer 2. Fore wing 0.9–1.1 times as long as ovipositor sheath. Synantennomere 3.4–4.2 times longer than antennomere 4.

***Xyela longula* DALMAN, 1819 ♀**

- Valvula 3 shorter, 2.8 times longer than valvifer 2. Fore wing 1.3 times as long as ovipositor sheath. Synantennomere 3 3.1 times as long as antennomere 4.  
POL : OOL = 1 : 2.4. In fore wing first section of M more proximally, fusion of Rs and M almost point-like, or 1r–m up to 100 µm long. Flagellomere 4 about 6 times longer than wide distally.

***Xyela helvetica* (BENSON, 1961) ♀**

- 6(4) Maxillary palp 3 1.45–1.65 times as long as scape, about 1.3 times thicker than synantennomere 3. Fore wing 1.8–2.0 times longer than ovipositor sheath. Valvifer 2 : valvula 3 = 1 : 1.8–2.0 (Fig. 1). *Xyela alpigena* (STROBL, 1895) ♀
- Maxillary palp 3 1.1 times as long as scape, smaller or indistinctly thicker than synantennomere 3 (about 1.05 times). Fore wing 1.6 times longer than ovipositor sheath. Valvifer 2 : valvula 3 = 1 : 2.4.  
POL : OOL = 1 : 1.7–1.9. In fore wing first section of M (after forking of vein M+Cu) more distally, thus a ca 140 µm long cross-vein 1r-m present. Antennomere 4 8–10 times longer than wide distally. Male unknown. *Xyela lugdunensis* (BERLAND, 1943) ♀
- 7(6) Valvula 3 at most 5.3 times longer than high basally. Posterior coxae pale with a small brown latero-ventral stripe, sometimes dark laterally and pale ventrally (some Austrian *X. graeca*). Kidney shaped spots of vertex distinctly outlined. .... 8
- Valvula 3 at most 6.3 times longer than high basally. Posterior coxae predominantly dark, sometimes pale ventrally (some *X. julii*). Kidney shaped spots of vertex usually flowing together anteriorly with other dark pattern of the head or head predominantly dark. .... 9
- 8(7) Fore wing 2.1–2.3(–2.5) times longer than ovipositor sheath. Valvifer 2 : valvula 3 = 1 : (1.6–)1.8–2.0. Valvula 3 4.8–5.5 times longer than high basally. *Xyela graeca* J.P.E.F. STEIN, 1876 ♀
- Fore wing 2.5–2.7 times longer than ovipositor sheath. Valvifer 2 : valvula 3 = 1 : 1.4–1.6(–1.7). Valvula 3 4.1–4.4(–5.0) times longer than high basally. *Xyela menelaus* BENSON, 1960 ♀
- 9(7) Ovipositor sheath longer, fore wing 1.55–1.80 times longer than ovipositor sheath. Valvifer 2 : valvula 3 = 1 : 2.0–2.2(–2.3). Valvula 3 7.0–8.4 times longer than high basally. POL : OOL = 1 : 1.45–1.55(–1.6). More pale colored species with head, mesoscutum and mesoscutellum usually rich yellow. Mesepisternum largely pale brown. Kidney shaped spots of vertex usually perceptible (in most Scandinavian specimens confluent with dark coloration of frons). In dark specimens at least facial orbits continuously yellow, usually interantennal area and sometimes frontal area partly yellow. Distributed mainly in the lowlands. *Xyela julii* (BRÉBISSE, 1818) ♀
- Ovipositor sheath shorter, fore wing 1.95–2.05 times longer than ovipositor sheath. Valvifer 2 : valvula 3 = 1 : 1.7–1.9(2.1). Valvula 3 6.3–7.1 times longer than high basally (Fig. 3). POL : OOL = 1 : (1.55)1.6–1.8. Darker species, head and dorsal face of thorax usually completely black. Mesepisternum brown, median ventral suture pale. In pale specimens vertex with brown pattern, facial orbits at least below antennae and frontal area completely black. Distributed in the mountains at the timber line. *Xyela obscura* (STROBL, 1895) ♀
- 10(1) Maxillary palp 3 shorter than scape (0.75–0.90 : 1) and thinner than synantennomere 3 (0.65–0.90 : 1). Gonostyli shorter than wide distally (0.6–0.7 : 1). Valviceps without an evident lamella below the proximal lobe (Figs. 6–7). Femora pale dorsally and ventrally, anteriorly with a longitudinal brown stripe, posteriorly largely infusate, sometimes predominantly dark. The gonostyli of the unknown ♂ of *X. lugdunensis* might be short, too. .... 11
- Maxillary palp 3 always longer than scape and thicker than antennomere 3. Gonostyli as long as wide distally or more elongate. Valviceps with a vertical (Figs. 8–9) or oblique lamella below the proximal lobe (Figs. 10–13). Femora usually uniformly pale or dark anteriorly and more or less darkened posteriorly (in *X. alpigena* and *X. curva* sometimes with a similar pattern as described above but less distinct). .... 12

- 11(10) Synntennomere 3 shorter than posterior tibia (0.8–0.9 : 1). Penis valve as in Fig. 6.  
*Xyela longula* DALMAN, 1819 ♂
- Synntennomere 3 about as long as posterior tibia (1.03 : 1). Penis valve as in Fig. 7.  
*Xyela helvetica* (BENSON, 1961) ♂
- 12(10) Antennomere 4 (10–)11–14 times longer than wide distally and (250–)290–350 µm long, synntennomere 3 (700–)830–980 µm long. Larger species: fore wing 4.0–4.6 mm long. Posterior claws with a small subapical tooth (often very feeble in *X. curva*). Penis valve with a vertical lamella below the proximal lobe at the base of the medial lobe, upper margin of medial lobe almost on the same level as the proximal lobe, valviceps often without a medial longitudinal swelling, valviceps covered with many setae and conelike sensillae, lower ergot of the stalk usually evident (Figs. 8–9). . 13
- Antennomere 1 5–7(–8) times longer than wide distally and 110–190 µm long, synntennomere 3 480–730 µm long. Smaller species: fore wing 2.7–3.6 mm long. Posterior claws lacking a subapical tooth. Penis valve with an oblique lamella below the proximal lobe, upper margin of medial lobe strongly protruding above the level of the proximal and the distal lobes, valviceps with a medial longitudinal swelling, valviceps covered with evidently fewer, scattered setae and conelike sensillae, lower ergot of the stalk very small or apparently missing (Figs. 10–13). The following species (*X. julii*-group) often overlap in their characters. .... 14
- 13(12) Distal filament of penis valve 0.80–0.85 times as long as the width of the distal lobe. Medial lobe of the penis valve 1.6–1.7 times as wide as the distal lobe. Vertical lamella with a small velum (Fig. 8). Frontal area distinctly rounded in lateral view. Head in dorsal view 2.2–2.3 times wider than long. Antennal furrows with small black or brown stripes or dark pattern partly inconspicuous. *Xyela alpigena* (STROBL, 1895) ♂
- Distal filament of penis valve 1.05–1.15 times as long as the width of the distal lobe. Medial lobe of the penis valve 1.0–1.1 times as wide as the distal lobe. Vertical lamella with a wide velum (Fig. 9). Frontal area almost flat in lateral view. Head in dorsal view 1.9–2.2 times wider than long. Antennal furrows mostly bordered with broad brown stripes. *Xyela curva* BENSON, 1938 ♂
- 14(12) Distal margin of medial lobe of the valviceps smoothly ascending. Longer distal filament of the penis valve extending up to 0.80–1.05 of the complete width of the distal lobe (Figs. 10, 12). Posterior coxae predominantly yellow or pale brown, longitudinally with a brown latero–ventral stripe, often darkened ventrally near base. Frontal area often very pale, pale brown pattern of antennal furrows often inconspicuous. .... 15
- Distal margin of medial lobe of the valviceps steeply ascending. Longer distal filament of the penis valve extending up to 0.65–0.75 of the complete width of the distal lobe (Figs. 11, 13). Posterior coxae predominantly brown, often ventrally pale brown in apical third. Frontal area usually darker, antennal furrows mostly bordered with broad brown stripes.  
 In contrast to the females, the males of the following two species are very similar in color. Their morphological characters overlap. The illustrated penis valves lie within the variability of both species (Figs. 11, 13) ..... 16
- 15(14) Longer distal filament of the penis valve extending up to 0.90–1.05 of the complete width of the distal lobe. Valviceps more elongate, about 1.65–1.85 times longer than high, medial lobe comparatively flat (Fig. 10). *Xyela graeca* J.P.E.F. STEIN, 1876 ♂
- Longer distal filament of the penis valve extending up to 0.80–0.85 of the complete width of the distal lobe. Valviceps more stout, about 1.55(–1.70) times longer than high,

medial lobe more protruding above the level of the proximal and distal lobe (Fig. 12).

*Xyela menelaus* BENSON, 1960 ♂

- 16(14) Specimens from the lowlands, in the Alps and low mountain ranges up to ca. 1 200 m, on stands of *Pinus sylvestris*. Maxillary palp 3 shorter, scape : maxillary palp 3 = 1 : 1.25–1.5. POL : OOL = 1 : 1.4–1.65. Synantennomere 3 480–630(–680) µm long, synantennomere 3 : antennomere 4 = 3.5–4.1 : 1 *Xyela julii* (BRÉBISSE, 1818) ♂
- Specimens from the Alps and low mountain ranges, usually above 1 500 m, from stands of *Pinus mugo*. Maxillary palp 3 longer, scape : maxillary palp 3 = 1 : 1.5–1.65. POL : OOL = 1 : 1.6–2.0. Synantennomere 3 (550–)630–730 µm long, synantennomere 3 : antennomere 4 = 3.9–4.5 : 1 *Xyela obscura* (STROBL, 1895) ♂

*Xyela alpigena* (STROBL, 1895)

= *Pinicola alpigena* STROBL, 1895: 277–278, ♀♂. Type locality: Austria, Styria, Rottenmanner Tauern, environs of Scheibelsee [= Scheiplsee]; = *Xyela alpigena* (STROBL, 1895): BENSON (1938)

= ?*Xyela brunneiceps* ROHWER, 1913: 269–270, ♀. Type locality: USA, Colorado, Boulder County, Loaf Mountain. Synonymy by BENSON (1962).

= ?*Xyela kamtschatica* GUSSAKOVSKIJ, 1935: 131, 133–134, 363–364, ♀. Type locality: Russia, Kamchatka, Klyuchevskoe [= Klyuchi] at the river Kamchatka. Synonymy by BENSON (1961).

= ?*Xyela middlekauffi* BURDICK, 1961: 343–344, ♀. Type locality: USA, Ithaca, New York. Synonymy by BENSON (1961).

Type material. *Pinicola alpigena*. Lectotype ♀ (hereby designated): [green label:] “*Xyela* sp. *alpigena* [...; illegible Gabelsberg stenography] 26/5 90”; [label added by G. MORGE, green handwriting:] “22”; “*Xyela alpigena* (STROBL) ♀ det. W. SCHEDL 1971”; [red:] “Lectotypus ♀ *Pinicola alpigena* STROBL, 1895 des. S. M. BLANK 1999”; “*Xyela alpigena* (STR.) ♀ det. S. M. BLANK 1999”. The head is missing. One male syntype bearing STROBL’s original label “*Xyela alpigena* STR.”, “Scheiplsee 26/5 90” and MORGE’s label “23” (= *X. obscura*). Coll. Naturhistorisches Museum, collection of G. STROBL, Admont. In his original description STROBL (1895) mentioned an unknown number of males and females. As the type series consists of two different species, a lectotype is hereby designated from the syntypes to maintain the current understanding and the stable use of the name *alpigena*. The lectotype agrees well with the current opinion on *X. alpigena*. The only other syntype of the collection keys out as *X. obscura*. In the region of the Rottenmanner Tauern the Central Alps (primary rock) overlap with the Southern Alps (limestone mountains), and *Pinus cembra* may therefore grow intermingled with *P. mugo*. Accordingly *X. alpigena* and *X. obscura* could be collected at the same location.

Diagnostic combination. Distinguished from adults of other *Xyela* females by the predominantly black, wedge-shaped ovipositor sheath (Fig. 1). The similar *X. lugdunensis* has the ovipositor a little longer. The shape of the male penis valve bearing a small, vertical lamella is unique (Fig. 8; male of *X. lugdunensis* unknown).

Host plants. \**Pinus cembra* (RASNITSYN 1965). Already STROBL (1895) supposed that

*X. alpigena* might live on *P. cembra*. In the Bulgarian mountains *X. alpigena* possibly feeds on *P. peuce*, which replaces *P. cembra* in this region at higher altitude. BENSON (1962) supposed that *X. alpigena* occurs on the same host plant across Asia to Japan. In the Alps *P. cembra* is represented by the subspecies *cembra*, in the western part of the East Palaearctic by ssp. *sibirica* (KINDEL 1995). However, in the eastern part of the East Palaearctic it is largely replaced by the closely related *P. pumila* (distribution areas partly overlapping with ssp. *sibirica*). *X. kamtschatica*, which was described from the distribution range of *P. pumila* but was reported from *P. koraiensis* by RASNITSYN (1965), is identical with *X. alpigena* according to BENSON (1961). In eastern north America the closely related *P. strobus* occurs and BURDICK (1961) reared *X. middlekauffi* from this pine. BENSON (1961, 1962) synonymized *X. middlekauffi* and *X. brunneiceps* with *X. alpigena*. But this urgently needs reexamination.

**Biology.** In the Swiss National Park and in the Austrian Alps adults were caught on *Pinus cembra* at 1 600–2 250 m from mid May to early June (BENSON 1961, SCHEDL 1978, own data). Bulgarian specimens were collected during the first half of June at 1 000–2 185 m partly close to snow patches (TAEGER 1987).

ALTENHOFER (pers. comm.) observed an ovipositing female, which pushed its abdomen almost completely into the interspace between the staminate cones. Surprisingly he found the eggs not inside a cone, but they were deposited between the glandular hairs close to the base of the cone. Under laboratory conditions the larvae develop within a few days feeding on the pollen in the cones (SCHEDL 1997). Larvae from the Austrian Alps hatched from the cones to pupate in the ground mostly in mid of July. *X. alpigena* makes an obligate diapause of at least two years. PSCHORN-WALCHER & ALTENHOFER (2000) mentioned two undescribed *Gelanes* (Ichneumonidae) species as parasitoids.

**Distribution.** A boreo-subalpine species according to BENSON (1961). \*Austria (STROBL 1895), \*Bulgaria (\*Pirin [TAEGER 1987] and \*Rila mountains), Italy (South Tyrol; HELLRIGL et al. 1996), \*Switzerland (BENSON 1938, BERLAND 1943). BENSON (1962) characterized *X. alpigena* as a Holarctic species, however, records from the Far East of Russia, Kamchatka (= *X. kamtschatica*), North America (= *X. brunneiceps*, *X. middlekauffi*) and Japan need taxonomic reexamination.

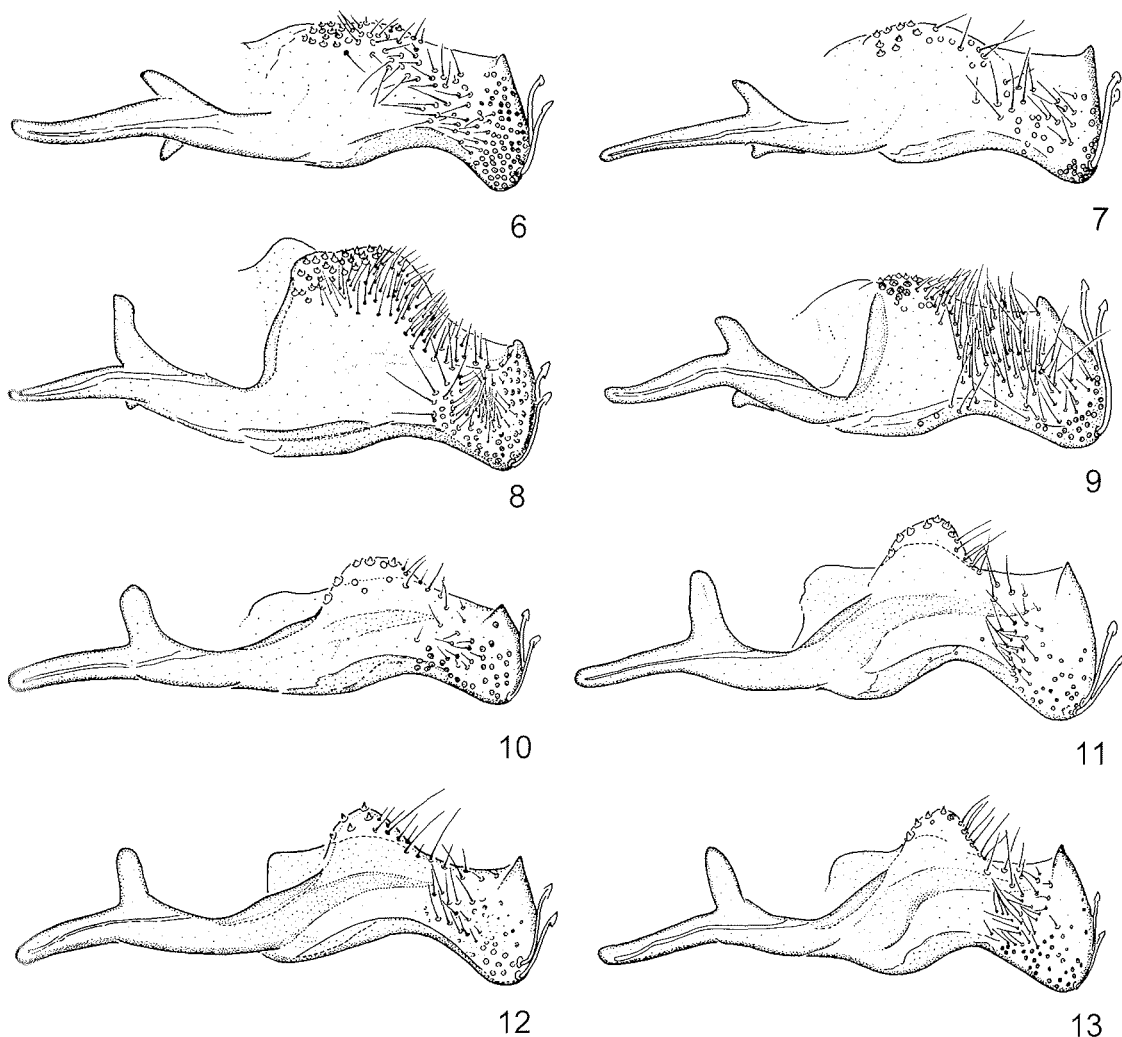
### ***Xyela curva* BENSON, 1938**

= *Xyela curva* BENSON, 1938: 35–36, ♀ ♂. Type locality: Austria, Weissenbach an der Triesting [= Weissenbach on river Triesting]

**Type material.** Holotype ♀: [round label with red margin:] “Type”; “Weissenbach a. d. Triesting 5.83”; [leg.] “KOLAZY”; “*Julii* det. KONOW”; “Holotype *Xyela curva* sp. nov. ♀ det. R. B. BENSON 1937”; [red:] “Typus”; “*Xyela curva* BENSON ♀ det. S. M. BLANK”. Left antenna, left middle and hind legs and ovipositor sheath missing. Coll. Naturhistorisches Museum, Wien. Paratypes: 1♂ in the same collection, 2♀ 1♂ in The Natural History Museum, London, other paratypes not checked.

Diagnostic combination. In females the shape of valvula 3 is similar to the *julii*-group but predominantly dark. The ovipositor sheath is more or less bent ventral at the articulation of valvifer 2 and valvula 3 (Fig. 2). The ovipositor itself bears a pale and dark pattern dorsally (valvula 2), which is unique among the West Palaearctic taxa (Fig. 5). The valvices of the males bears a large, perpendicular velum (Fig. 9).

Host plants. \**Pinus nigra* ssp. *nigra* (VAN ACHTERBERG & ALTENHOFER, 1997), \**Pinus nigra* ssp. *pallasiana*.



Figs. 6-13. Penis valves of *Xyela*.

Fig. 6: *X. longula*. Fig. 7: *X. helvetica*.

Fig. 8: *X. alpigena*. Fig. 9: *X. curva*. Fig. 10: *X. graeca*.

Fig. 11: *X. julii*. Fig. 12: *X. menelaus*. Fig. 13: *X. obscura*.

Biology. Adults occur from mid April to mid May in Germany and Austria. They are usually found in warm lowland stands, single specimens have been collected at higher altitude (1 ♀ at 550 m in Röhrmoos north of Munich, coll. BLANK). *X. curva* reported by BENSON (1961) from 1 800 m in the Swiss National Park actually is a comparatively pale *X. obscura*, coll. The Natural History Museum, London. Sometimes they fly in large numbers around *Pinus nigra* or other trees. Adults have been observed on cherry blossoms and on the leaves and catkins of nearby birch trees.

Several times vast swarms of both sexes have been observed hovering over trees and shrubs. On 2.5.1999 at 5–7 p.m. several thousand *X. curva*, *X. graeca* and *X. mene-laous* males and females were found in a *Pinus nigra* wood at an altitude of 1 300 m near Konitsa (Greece) on two blooming and sunlit *Ostrya carpinifolia* bushes. Part of the specimens was swirling around the bushes whilst a greater part was crawling around on leaves, twigs and catkins. Some copulated in tandem position (Fig. 19) even after being netted. The xyelids seemingly gathered just on those two bushes as other nearby bushes were not visited. Some female *X. curva* oviposited into nearby *P. nigra*. On 5.5.1992 L. BEHNE (pers. comm.) collected swarming *Xyela* males and females of the same species in Turkey (Burdur province) from blooming oaks.

In spring 2000 the adults of a population close to Eberswalde were observed from 19.4.–27.4. with a maximum on 21.4. The females oviposit into the male cones of *P. nigra*, which are some 4–6 mm long at that time, and which sometimes still are completely covered by the leaflike bracts (Fig. 16). The female runs around on the flowers and neighbouring needles with its vibrating antennae touching the plant surface. Sometimes it pushes its head in between two cones, then turns its body around and starts with oviposition. At the beginning the complete ovipositor apparatus is bent below the body. The ovipositor is completely enclosed by its sheath with the tip of valvula 3 resting on the cone surface. Whilst the female drills the ovipositor into the plant substrate, the ovipositor first separates basally from the saw sheath forming a triangle. Subsequently valvula 3 snaps dorsad in resting position. As the ovipositor gets pushed deeper the sheath waggles to the left and right. Then follows an up and down movement of the sheath, which might possibly indicate the movement of the valvulae 1 supporting the egg sliding through the olistether of the ovipositor. Finally the ovipositor is withdrawn from the cone with the saw sheath again wagging to the left and right. The whole action may be interrupted by phases of resting or grooming. Several eggs may be laid in a single cone (after oviposition under laboratory conditions up to 16 were found, but usually there are only 1–3 under outdoor conditions). They are laid at a depth of 0.15–0.80 of the complete length of the cone with two third of the eggs found in between the distal 0.25 and 0.45 (Fig. 17). The eggs either lie free between the scales of the cone or they are lowered into the central axis with their tip. However, among some 180 eggs prepared from the cones not a single one was found to be laid into a scale (Fig. 18). Under laboratory conditions (about 20 °C, eggs kept in a moist chamber on filter paper) the embryos develop within four or five days. During the last day the eyes and then the tips of the mandibles become pigmented. The larva mainly feeds on the pollen developing in the bases of the sporophylls. Inside a cone several larvae may develop. The faeces are deposited inside the cone. Infested cones are often covered with some



resin on their outer surface, and they may become deformed (Fig. 20). The mature larvae hatch from the cones (in spring 2000 between 7.5. and 12.5.), before the latter dries and releases its pollen. They drop to the ground for pupation (Fig. 21). The flimsy and transparent cocoon has been described by SCHEDL (1997).

Many adults hatch in the next spring, but diapause may take 2–3(–4) years. Emergence is performed still in pupal stage (pupa dectica, Figs. 22–23). The fully coloured pupa digs wrigglingly to the surface, where it runs around for some hours or 1–2 days until the adult hatches from the exuvia. Obviously hatching of the adult from the pupal exuvia can be induced by the uptake of water: Some *X. curva* and *X. graeca* pupae, which had already emerged from the ground at least one day before, hatched immediately after drinking some water and stretched their wings within less than 10 minutes.

The larvae are parasitized by *Gelanes* spec. (Ichneumonidae, Tersilochinae; det. K. HORSTMANN). In Thuringia a female was observed to oviposit into cones, which were infested by *X. curva* larvae. In Greece *Gelanes* females were regularly observed on male *Pinus nigra* cones infested by *Xyela* (possibly by both *X. curva*, *X. graeca* and *X. menelaus*). Probably *Xyeloblacus leucobasis* VAN ACHTERBERG & ALTENHOFER, 1997 also parasitizes on *X. curva* (Braconidae, Blacinae; VAN ACHTERBERG & ALTENHOFER 1997).

Distribution. \*Austria (BENSON 1938 and 1961), \*Czech Republic (BENEŠ 1989), \*France (CHEVIN 1984), \*Germany (BLANK & BURGER 1996), \*Greece (erroneously reported as *X. graeca* ♂ by BLANK 1993), \*Hungary (MÓCZÁR & ZOMBORI 1973), northern and \*southern Italy (MASUTTI & PESARINI 1995), \*Netherlands, Slovakia (MOCZÁR & ZOMBORI 1973), subalpine Spain (Pyrenees; BENSON 1961) and \*Turkey.

*Pinus nigra* is widespread in the Mediterranean region and represented by several subspecies (KINDEL 1995). Here *X. curva* might be found in virtually every *P. nigra* stand. Due to the historical lack of the host plant *X. curva* is a **neozoon** in larger, northern parts of its distribution area. The most northern **autochthonous** stands of the host are in the Vienna basin of Lower Austria (SCHENCK 1939). In more northerly regions *P. nigra* has been introduced as a timber tree to afforest warm and dry locations. In the environs of Berlin *P. nigra* has been cultivated possibly since 1785 (DRESCHER & MOHRMANN 1986; cited by KOWARIK 1992). Today *X. curva* occurs – sometimes in vast number – in such areas of Germany (e. g. Gabower Hänge in north eastern Brandenburg, Kyffhäuser in northern Thuringia; BLANK & BURGER 1996), and it can also be found in lower numbers in less warm localities (e. g. in gardens where *P. nigra* is frequently cultivated as an ornamental tree). The dispersal northwards over some 500 km must have been an active process. There is no reasonable clue that *X. curva* extended its distribution area passively with the introduction of the pines into the northern areas, as the pines are planted without root bales which could contain cocoons, and staminate cones suitable for larvae are absent from the pines during planting time in autumn. It is noteworthy that *X. graeca*, whose larvae also feed on *P. nigra*, could so far not be found north of the autochthonous *P. nigra* stands in Lower Austria (cf. distribution data in SCHEDL 1978), and *X. menelaus* seems to be restricted to the immediate Mediterranean region.

## *Xyela graeca* J.P.E.F. STEIN, 1876

= *Xyela graeca* J.P.E.F. STEIN, 1876: 57–58, ♀. Type locality: Greece; = *Pinicola graeca* (J.P.E.F. STEIN, 1876): ED. ANDRÉ (1881)

= *Xyela pinicola* BERLAND, 1943: footnote on p. 90. Unavailable name (in litt.)

= *Xyela nigrae* RASNITSYN, 1965: 519, ♀. Type locality: Ukraine, Transcarpathia, Tur'i–Remety near Perechin. Synonymy by RASNITSYN (1971).

= *Xyela julii* auct. partim (e.g. BERLAND 1937: Algeria; BERLAND 1943: France)

Type material. The type of *X. graeca* should be at the Berlin museum, but it could not be traced as it was never received there with the rest of the STEIN collection (BENSON 1938).

In a footnote BERLAND (1943) mentioned *X. graeca* collection material from the Paris museum labelled as *X. "pinicola*, n. sp." by ABEILLE DE PERRIN. However, the name is not available as "*pinicola*" refers to the former generic name *Pinicola*.

*Xyela nigrae*. Holotype ♀: [Kyrillic letters:] "Karpati, Tur'i–Remety bliz Perechina [= Tur'i–Remety near Perechin], 15.V.65, A. RASNITSYN"; [rot:] "Holotypus *Xyela nigrae* ♀ A. RASNITSYN". In good condition. Paratype: 1♀ with identical collecting data. Coll. Zoological Museum Moscow. Both specimens were reared from *Pinus nigra*. The synonymy of *X. nigrae* with *X. graeca*, which has already been proposed by RASNITSYN (1971), can be confirmed.

Diagnostic combination. Females are similar to *X. menelaus* and these taxa often overlap in their morphological characters. Usually the ovipositor sheath is longer in *X. graeca*. Males of the two species can be distinguished with help of their penis valves (*X. graeca*: Fig. 10; *X. menelaus*: Fig. 12).

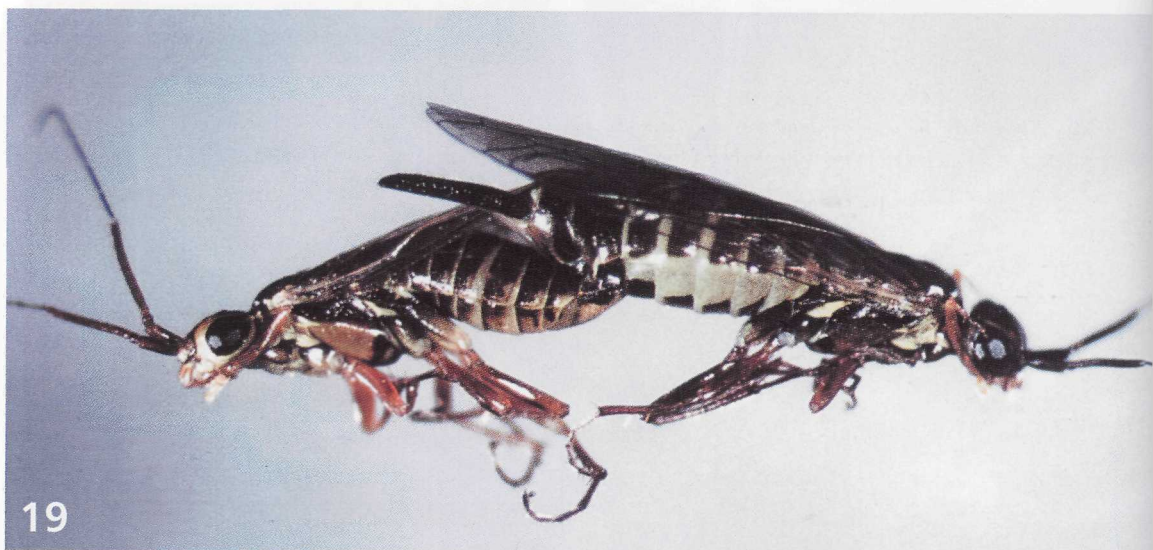
Host plants. \**Pinus nigra* (RASNITSYN 1965 under the name *X. nigrae*; VAN ACHTERBERG & ALTENHOFFER 1997), \**P. nigra* ssp. *nigra* and \**P. nigra* ssp. *pallasiana*, possibly also on *P. nigra* var. *mauretanica* (BERLAND 1937). Single specimens of *X. graeca* occurred in a reared series of *X. julii* from \**P. sylvestris*. SCHEDL (1981) mentioned *P. brutia* as an additional host. On the Greek island of Crete SCHEDL collected some *X. graeca* females from this pine, which he characterized as being a little darker. The identity of material actually reared from *P. brutia* needs reexamination.

Biology. In Algeria adults were swept from *Pinus nigra* var. *mauretanica* at Tikdja in the Djurjura in February 1937 (BERLAND 1937 erroneously citing *X. julii*). In France females have been collected earliest on 18. February (CHEVIN et al. 1987) and latest on

**Figs. 14–15.** *Pleroneura coniferarum* (Hartig, 1837). **Fig. 14.** Female ovipositing into a closed bud of *Abies cephalonica*. **Fig. 15.** Young shoots of *A. cephalonica* infested by larvae of *P. coniferarum* and showing the typical damage. **Figs. 16–18.** *Xyela curva* Benson, 1938. **Fig. 16.** Female ovipositing into a closed staminate cone of *Pinus nigra*. **Fig. 17.** Position of the egg inside the cone (proximal sporophylls removed). **Fig. 18.** Egg lying between sporophylls and touching the central axis of the cone.







25. April (CHEVIN 1990). In Austria they emerge in April, 1 or 2 weeks later than *X. curva* (cf. PSCHORN-WALCHER & ALTENHOFER 2000). The larvae may remain in diapause for up to three years (E. ALTENHOFER, pers. comm.). They are possibly parasitized by *Xyeloblasticus leucobasis* VAN ACHTERBERG & ALTENHOFER, 1997 (Braconidae, Blacinae; VAN ACHTERBERG & ALTENHOFER 1997).

Distribution. Widespread in the Mediterranean and adjacent areas with *Pinus nigra*. The most northern records in Europe are from Lower Austria and Transcarpathia, although *P. nigra* is cultivated also on more northern sites. \*Algeria (BERLAND 1937 citing *X. julii*), \*Austria (BENSON 1938), Bulgaria (VASILEV 1987), \*Croatia (SCHEDL 1978), France (BERLAND 1937 citing *X. julii*, CHEVIN 1977), \*Greece including Crete (SCHEDL 1978 and 1981, BLANK 1993 [only ♀]), \*Hungary (MÓCSÁR & ZOMBORI 1973), \*Israel (SCHEDL 1978), northern and \*southern Italy (MASUTTI & PESARINI 1995, TURRISI 1999), \*Spain, \*Turkey (BENSON 1938), \*Ukraine (RASNITSYN 1965).

### ***Xyela helvetica* (BENSON, 1961)**

= *Xyelatana helvetica* BENSON, 1961: 171, ♀. Type locality: Switzerland, Grisons, Val Ftur, near Fuorn

Type material. Holotype ♀: [round label with red margin:] “Type”; “Suisse – Gr. Val Ftur 23 IV 53 J. AUBERT”; “*Xyelatana helvetica* sp. n. ♀ det. R. B. BENSON 1960”; “*Xyela helvetica* (BENSON) ♀ det. S. M. Blank 2000”. Right antennal flagellum and parts of the posterior tarsi missing. Coll. Bündener Naturmuseum, Chur.

Diagnostic combination. *X. helvetica* females are distinguished from the similar *X. longula* by the shorter ovipositor sheath, males by their penis valves (Fig. 7).

Host plant. A female of *X. helvetica* was swept from *Pinus mugo* in Austria (Hall in Tirol N, Karwendelgebirge, Haller Zunderkopf). The single known male, which was published as *X. longula* by SCHEDL (1978), was collected in the most eastern Austrian Alps – possibly also at higher altitude (Wiener Neustadt W 20 km, Hohe Wand). *P. mugo* might be suspected as the host plant of this rare species, however, it has never been bred from this pine. SCHEDL (1978) additionally supposed *P. sylvestris* according to the collecting localities.

Biology. A boreo-subalpine species according to BENSON (1961), which was collected at 1 900 m on 23.4.1953.

Distribution. \*Switzerland (BENSON 1961) and \*Austria (SCHEDL 1978). The male has been reported by SCHEDL (1978) as *Xyelatana longula* (Lower Austria, Hohe Wand,

**Figs. 19–23.** *Xyela curva* Benson, 1938. Fig. 19. Copula (specimens killed in a freezer at almost natural position). Fig. 20. Deformed staminate cones of *Pinus nigra* infested by *Xyela* larvae. Fig. 21. Larvae freshly hatched from the cones before digging into the ground. Fig. 22. Male pupa dectica running on the surface of the substrate. Fig. 23. Female adult just hatching from the skin of the pupa dectica and enlarging the wings. (Pictures 16 and 21–23 by C. Kutzscher.)

24.4.1948, coll. FULMAREK; specimen: preserved in NHMW, the penis valve as genital preparation no. 172 in coll. SCHEDL), and SCHEDL's illustration of the *X. longula* penis valve (Fig. 5c) indeed corresponds with *X. helvetica* as indicated by VIITASAAI (1980).

### *Xyela julii* (BRÉBISSEON, 1818)

= *Pinicola julii* BRÉBISSEON, 1818: 117, ♀ ♂. Type locality: France, Tour; = *Xyela julii* (BRÉBISSEON, 1818): KONOW (1897)

= *Xyela pusilla* DALMAN, 1819: 124, Figs. 1–11, ♀ ♂. Type locality: Sweden, Uplandia and Vestrogothia. Synonymy by LEPELETIER & SERVILLE (1828)

= ?*Xyela variegata* ROHWER, 1910: 100, 118, ♀. Type locality: Japan, Hakone. Synonymy by TAKEUCHI (1938)

= *Xyela henschii* MOCSÁRY, 1912: 131, ♀ ♂. Type locality: Croatia, Krapina; = *Xyela henschi*, type error. **Syn. nov.**

Type material. *Xyela henschii*. Lectotype ♀ (hereby designated): “Dr. HENSCH Krapina Cro.”; “*Xyela henschii* MOCS. typ. det. MOCSÁRY”; [label with red margin:] “Lectotypus ♀ *Xyela Henschii* MOCSÁRY, 1912 des. ZOMBORI, 1976”; [label with red margin:] “Paralectotypus ♂ *Xyela Henschii* MOCSÁRY, 1912 des. ZOMBORI, 1976”; “*Xyela julii* (BRÉBISSEON, 1818) ♀ ♂ det. S. M. Blank 1999”. The lectotype ♀ is missing both valvulae 3, otherwise in good condition. Paralectotype 1 ♂ on the same mount with genitalia prepared on a small slide. Coll. Hungarian Natural History Museum, Budapest. ENSLIN had checked the original material of *X. henschii* before MOCSÁRY, and in 1918 he stated that the characters published by MOCSÁRY are not suitable to discern a separate species. This doubtful synonymy was also noted by Gussakovskij (1935). Indeed the types agree with *X. julii* perfectly. ZOMBORI never published the designation of a lectotype. A lectotype is designated to fix the current status of *X. henschii* as a synonym of *X. julii* should additional syntypes be found.

Diagnostic combination. *X. julii* is similar to *X. obscura*. Usually the head is extensively colored yellow in female *X. julii*, whereas it is almost completely dark in *X. obscura*. The ovipositor sheath is shorter in *X. obscura* (Fig. 3) than in *X. julii*. Males of the two taxa overlap in their morphological characters (e.g. in the shape of the penis valves, Figs. 11, 13), but usually they can be distinguished with help of their collecting site (altitude and available host plants).

Host plant. \**Pinus sylvestris* (RASNITSYN, 1965) and exceptionally on *P. nigra* (RASNITSYN, pers. comm.). The types of *X. pusilla* have been collected in a *P. sylvestris* wood (DALMAN 1819). RUDOW (1912) supposed that he had reared *X. julii* from enlarged shoots of *P. sylvestris* with swollen buds, but obviously his sample contained not only buds infested by the moth *Rhyacionia buoliana* (DENIS & SCHIFFERMÜLLER, 1775) (Tortricidae) but also staminate cones with *Xyela* larvae. Development on *P. cembra* as assumed by SCHEDL (1978) can not be confirmed.

Biology. Adults occur from mid April to mid May in Germany. In Spain and Great

Britain in May, in subalpine Switzerland (up to 2 550 m on snow) and in Sweden up to 68° latitude in June (BENSON 1940, 1960, 1961), in Norway up to 1 100 m above sea level (MIDTGAARD 1987). In Scotland they were present from 16th April to 23rd May, peaking in about the first week of May (LISTON 1984, ENTWISTLE 1996). Sometimes they fly around the pines in large numbers and they visit birch trees shedding pollen (KALTENBACH 1858, MOCSÁRY 1912, HAUPT 1913, BENSON 1940, HARWOOD 1950, LISTON 1980, own observation). JANSEN (1988) swept adults from sedges and other low vegetation close to pine trees, LISTON (1984) and ENTWISTLE (1996) from flowers of *Calluna vulgaris*, *Salix* and *Ulmus*.

A first clue to the preimaginal stages of *X. julii* was reported by BENSON (1940), who supposed the biology to be similar to that of the Nearctic *X. minor* NORTON, 1869. BENSON found a female ovipositing into the male cones of *Pinus sylvestris* and he observed a small whitish larva emerging from such cones. Indeed the larvae leave the cones before these begin to enlarge and dry. They drop to the ground, where they pupate in the earth. Occasionally cocoons have been found in the bark of a birch tree close to pines (BENSON, 1940). PSCHORN-WALCHER & ALTENHOFER (2000) reported *Gelanes fuscus* (HOLMGREN, 1860) and *G. simillimus* HORSTMANN, 1981 as parasites, ACHTERBERG (pers. comm. to E. ALTENHOFER) additionally *Idiogramma* cf. *euryops* FÖRSTER, 1888 (Ichneumonidae).

Distribution. \*Austria (BENSON 1961), \*Belgium (MAGIS 1988), \*Croatia (MOCSÁRY 1912 under the name *X. henschii*), \*Czech Republic (BENEŠ 1989), \*Denmark (MIDTGAARD et al. 1987), \*England (ENTWISTLE 1996), \*Finland (LINDQVIST 1966), France perhaps except for the mediterranean regions (BRÉBISSE 1818, BERLAND 1943), \*Germany, Hungary (Carpathian Basin; ZOMBORI 1974), \*Italy (South Tyrol; HELLRIGL et al. 1996), Luxembourg (CHEVIN & SCHNEIDER 1988), \*Netherlands, Norway (MIDTGAARD 1987), \*Poland, \*Russia (from Kola Peninsula to Caucasus, Siberia according to ZHELOCHOVTSEV 1988; Baikal Region according to VERZHUTSKII 1966), \*Scotland (LISTON 1984), \*Slovakia (BENEŠ 1989), Spain (CEBALLOS et al. 1956, BENSON 1960), \*Sweden (BENSON 1960), Switzerland (BENSON 1961, FLÜCKIGER & PETER 1998), Ukraine (ERMOLENKO 1964). *X. julii* is said to occur in the northern Africa, in the Eastern Palaearctic and in the Nearctic regions (e. g. ZIRNGIEBL 1937, TAKEUCHI 1938, BENSON 1961, TOGASHI 1974) but such records need taxonomic reexamination.

### ***Xyela longula* DALMAN, 1819**

= *Xyela longula* DALMAN, 1819: 124–125, ♀. Type locality: Sweden, Vestrogothia; = *Pinicola longula* (DALMAN, 1819): ED. ANDRÉ (1881); = *Xyelatana longula* (DALMAN, 1819): BENSON (1938); = *Xyelatana longula* ssp. *longula* (DALMAN, 1819): BENSON (1945)

= ?*Xyela erichsoni* DAHLBOM, 1835: 16, nomen nudum; = *X. erichsonii*, type error

= *Xyela piliserra* C. G. THOMSON, 1871: 317, ♀. Type locality: Sweden, Lapland, **syn. nov.**; = *Pinicola piliserra* (C. G. THOMSON, 1871): ED. ANDRÉ (1881); = *Xyelatana piliserra* (C. G. THOMSON, 1871): BENSON (1938); = *Xyelatana longula* ssp. *piliserra* (C. G. THOMSON, 1871): BENSON (1945)

Type material. *Xyela piliserra*. Lectotype ♀ (hereby designated): [small blue label]; “Lpl.” [= Lappland]; [large label with red margin, possibly a cabinet label:] “*piliserra*”; “1978 292”; [yellow:] “ZML 1998 269”; [red:] “Lectotypus ♀ *Xyela piliserra* C. G. THOMSON, 1871 des. S. M. BLANK 1999”; “*Xyela longula* DALMAN, 1819 ♀ det. S. M. BLANK 1999”. In perfect condition. Coll. Zoological Museum, Lund.

Several authors have discussed the validity of *X. longula* and *X. piliserra* (e.g. HELLÉN 1948, VIITASAARI 1980), and already KONOW (1897) had supposed the synonymy of these taxa. As the types were lost, the relationship of these taxa has been resolved insufficiently. Former specialists knew either *X. longula* or *X. piliserra*, but not both. The characters mentioned by THOMSON (1871) show no important differences among the material here studied (color of legs and wings, pilosity of ovipositor). For *X. piliserra* a type specimen has been found now in the ZML. This is hereby designated as the lectotype, because the number of syntypes is not clear from the original description by THOMSON (1871). Additionally it is designated to ensure the state of *X. piliserra* as a synonym of *X. longula* in view of additional, possibly undiscovered type material.

VIITASAARI (1980, Fig. 1) found the penis valve of Finnish *X. longula* to be different from SCHEDL's (1978, Fig. 5c) illustration. Unfortunately, SCHEDL neither gave evidence why he regarded this to be *X. longula*, nor did he illustrate the possibly similar valve of *X. helvetica*. Some of the alleged differences in SCHEDL's illustration arise from the fact, that the penis valve is extremely faded and accordingly some structures are insufficiently visible or missing (e.g. lacking setae).

Diagnostic combination. See *X. helvetica*.

Host plant. Under the names *X. longula* or *X. piliserra* this species has repeatedly been reported to be attached to (the possible host) *P. sylvestris* (HARWOOD 1950, CROOKE 1957, RASNITSYN 1965 and pers. comm., SCHEDL 1978, ENTWISTLE 1996), however, up to present the larvae themselves have not yet been found. This supposed relationship is certainly correct, because *P. sylvestris* is the only pine species in the Scandinavian part of *X. longula*'s distribution range.

Biology. It seems likely that the period of *X. longula* activity commences earlier than that of *X. julii* and ends sooner. Adults occur from mid April to mid May in France (BERLAND 1943), and from mid March with a peak period in the second half of April in Scotland (HARWOOD 1950, ENTWISTLE 1996). KONOW (1897, 1904) reported adults from north-eastern Germany found during the first half of April in pine forests on twigs lying on the ground. Due to the early activity of the adults, the later maturing male birch catkins seem not to be available to *X. longula* as a food resource (ENTWISTLE 1996).

Distribution. Northern and central part of Western Europe: \*Austria (SCHEDL 1978), Belgium and Luxembourg (MAGIS 1994), \*Czech Republic (BENEŠ 1989), \*France (BERLAND 1943 as *X. piliserra*), \*Finland (HELLÉN 1935, 1948 as *X. longula*, VIITASAARI 1980 as *X. piliserra*), \*Germany (BLANK et al. 1998), Great Britain (ENTWISTLE 1996), Hungary (Carpathian Basin; ZOMBORI 1974), Netherlands, northwestern \*Russia (GUSSAKOVSKIJ 1935), \*Sweden (DALMAN 1819).



## *Xyela lugdunensis* (BERLAND, 1943)

= *Xyelatana lugdunensis* BERLAND, 1943: 90–91, ♀. Type locality: France, Lyon; = *Xyela lugdunensis* (BERLAND, 1943): RASNITSYN (1965)  
= *Xyela curva* auct. partim

Type material. Holotype ♀: “Lyon”; “Museum Paris Coll. J. DE GAULLE 1919”; “*Xyela Julii* BRÉB.”; “*Xyelatana lugdunensis* BERL. L. BERLAND det. 1943”; [red letters:] “Type”; [red:] “Holotypus ♀ *Xyelatana lugdunensis* BERLAND, 1943 det. S. M. BLANK 1999”; “*Xyela lugdunensis* (BERLAND, 1943) ♀ det. S. M. BLANK 1999”. Left anterior leg and right flagellum missing. Coll. Musée d’Histoire Naturelle, Paris.

*Xyela lugdunensis* has been combined with the generic name *Xyelatana* (e. g. by BERLAND 1947, BENSON 1961, and SCHEDL 1978), which is a synonym of *Xyela*. The ovipositor sheath morphology is very similar to *X. alpigena*.

Diagnostic combination. See *X. alpigena*.

Host plants and biology. Unknown.

Distribution. Only known from two specimens collected in \*France, the holotype collected in Lyon in 1919 (BERLAND 1943) and a so far unrecognized ♀ from Cabrerets, 1.-5.4.1983, leg. H. TUSSAC (coll. H. CHEVIN; erroneously published as *X. curva* by CHEVIN & TUSSAC 1992, collected close to *Pinus nigra* [TUSSAC, pers. comm.]).

## *Xyela menelaus* BENSON, 1960

= *Xyela menelaus* BENSON, 1960: 111, ♀. Type locality: Greece, Peloponnesos, Taïygetos Mountains  
= *Xyela graeca* auct. partim

Type material. Holotype ♀: [round label with red margin:] “Type”; “Grèce – Péloponèse Taygète 21 V 1955 J. AUBERT [back side:] 2400 m”; “*Xyela menalaus* [sic!] sp. n. ♀ det. R. B. BENSON 1959”; “*Xyela menelaus* BENSON det. S. M. BLANK 2000”. Abdomen partly covered by mould, right anterior wing missing. Coll. Zoological Museum, Lausanne. According to BENSON (1960) the relative length of valvifer 2 : valvula 3 should be 1 : 1.1. Actually the holotype measures as 1 : 1.48.

Diagnostic combination. *X. menelaus* differs from the other European *Xyela* species in the very short ovipositor, although there is plenty material in which the relative length of the saw sheath overlaps with *X. graeca*. The male is similar to *X. graeca*, too, but the distal filaments of the penis valve are shorter in *X. menelaus* (Fig. 12).

Host plant and biology. \**Pinus nigra pallasiana* and most likely also *Pinus nigra nigra* as a single female was swept from this subspecies in Croatia. The holotype was collected on 21.5.1955, the Croatian female on 7.4.1999 at 150 m above sea level. Adults hatched from larvae collected close to the timber line (1 700 m) in the Bey Dağları in southern Turkey on 3.6.1998.

Distribution. \*Croatia, \*Greece (BENSON 1960), \*Hungary, \*Turkey.

### *Xyela obscura* (STROBL, 1895)

= *Pinicola julii* var. *obscura* STROBL, 1895: 277, ♀. Type locality: Austria, Styria, environs of Admont, Scheibleggerhochalpe; = *Xyela obscura* (STROBL, 1895): BENSON (1960)

= ?*Xyela pini* ROHWER, 1913: 267–268, ♂. Type locality: USA, Call, Texas. Synonymy by BENSON (1962)

= *Xyela julii* var. *tatrica* GREGOR, 1940 (in GREGOR & Bafa, 1940): 225, ♀. Type locality: Slovakia, Vysoké Tatry Mts., Štrbské Pleso. Synonymy by BENEŠ (1975)

= *Xyela curva*: BENSON (1961), misidentification

Type material. *Pinicola julii* var. *obscura*. Lectotype ♀ (designated by SCHEDL 1978): [label added by G. MORGE, green handwriting:] “4”; “*Xyela obscura* (STROBL) ♀ stat. nov. BENSON 1960 det. W. SCHEDL 1971”; [red:] “Lectotypus ♀ *Pinicola julii* var. *obscura* STROBL, 1895 S. M. BLANK 1999”; [hereby added copy of cabinet label:] “*X. Julii* v. *obscura* m. Scheibleggerhochalpe 26/5 94 ♀”; “*Xyela obscura* (STR.) ♀ det. S. M. BLANK 1999”. In perfect condition. Paralectotypes: 1 ♀ with STROBL’s label “v. *obscur* [sic!] Scheiblstein [...; illegible Gabelsberg stenography] 6/6 95 ♀. STROBL” and MORGE’s label “5” and 1 ♀ with STROBL’s label “*Jul.* v. *obscur*. Kalbling [...; illegible Gabelsberg stenography] 8/6 95. ♀.” and MORGE’s label “6”. Coll. Naturhistorisches Museum, collection G. STROBL, Admont. A mount with two females from the Hungarian Natural History Museum, Budapest, bearing a typical label of Strobl (“*Xyela Julii* Breb. v. *obscura* m. ♀ [...; illegible Gabelsberg stenography] 8/6.”) doubtfully belongs to the syntype series, because neither collecting date nor locality can be read from the label and related unequivocally to the published data of the type series.

*P. julii* var. *obscura* was described from an unknown number of females collected in various locations in the mountains near Admont. The syntype series has already been checked by SCHEDL (1978: 110), who unintentionally designated the lectotype by referring to the specimen from Scheibleggerhochalpe as “Typus”. The lectotype bears no original label, but its status as syntype can be confirmed by the following circumstances. Lending STROBL’s xyelid sawflies to W. SCHEDL in 1970, the former curator G. MORGE labelled each preparation with individual numbers written in green. On the accompanying loan form, which J. GÖTZE has kindly put at my disposal, MORGE listed bottom labels and specimens in the order found in STROBL’s collection. Accordingly the lectotype (MORGE’s no. 4) immediately followed the bottom label “*X. Julii* v. *obscura* m. Scheibleggerhochalpe 26/5 94 ♀” (MORGE’s no. 30). The types agree well with the species currently called *X. obscura*.

*X. julii* var. *tatrica* GREGOR, 1940. BENEŠ (1975) studied the type material in the National Museum, Praha, and regarded var. *tatrica* as a junior synonym of *X. obscura*. This is certainly correct as GREGOR mentioned a predominantly black head for *tatrica*. Additionally the high altitude of the collecting locality (1 350 m above sea level) and the series being caught on *Pinus mugo* (cf. BENEŠ 1975) support this opinion. GREGOR (1940) had exclusively listed females as types, the males mentioned additionally by BENEŠ do not belong to the type series.

BENSON (1961) synonymized *X. japonica* with *X. obscura* (*Xyela japonica* ROHWER, 1910: 99–100, 118, ♀. Type locality: Japan, Hakone). This was possibly induced by the predominant dark coloration of the head in female *X. japonica*. Actually, the study of the type and additional collection material from South Korea reveals that *X. japonica* is

the valid name for a species, which is related to *X. curva*.

Diagnostic combination. See *X. julii*.

Host plants. \**Pinus mugo* (RASNITSYN 1965, VAN ACHTERBERG & ALTENHOFER 1997). The type specimens were collected from *P. mugo* (STROBL 1895). In the Alpes de Haute-Provence several specimens here identified as *X. obscura*, which have been collected on *P. uncinata* stands (T. NOBLECOURT, pers. comm.). Material from Mt. Olympus, which was collected in the *P. heldreichii* woodland zone, is similar in morphology and color (see below). Development on *P. cembra* (cf. SCHEDL 1978) can not be confirmed.

The host plant *P. mugo* is autochthonous to the mountains of Europe (KINDEL 1995), but today it is often cultivated as an ornamental shrub in gardens and cemeteries. In Central Europe *X. obscura* so far could not be traced in the lowlands. Outside the Alps *P. mugo* occurs at higher altitudes in low mountain ranges of Central and Southeastern Europe (KINDEL 1995). Such stands may have split off from each other at the end of the post-glacial period, and today they may be rather isolated. *X. obscura* material has been found on Mt. Lusen in the National Park Bayerischer Wald (Germany) and the mountains of southern Bulgaria. Most surprising is the discovery of a morphologically similar couple on the Olympus Mountains, where *P. mugo* is absent (STRID 1980). If *P. heldreichii* is presumed as an additional host plant – which urgently needs confirmation by breeding –, and if this material actually is conspecific with *X. obscura*, then this species might be considered to be a specialist of the subalpine zone.

In pursuing this discussion any *Xyela* material reared from *P. uncinata* or *P. rotundata* might be decisive in establishing the actual host plant range of *X. obscura*. The distribution areas of both pine taxa, which are closely related to *P. mugo*, are in close touch with *P. mugo* (*P. uncinata* from 1 400–2 000 m on rocky places of the Western Alps of France and additionally in the Pyrenees, *P. rotundata* at 700–1 200 m on moist banks of alpine river valleys and alpine bogs of the Bavarian Alps; KINDEL 1995, J. VOITH, Munich pers. comm.). Both *uncinata* and *rotundata* have been discussed controversially as varieties or subspecies of *mugo* and their status seems still uncertain. Unfortunately no larvae hatched from the *P. uncinata* and *P. rotundata* samples in 1999, because the collecting date might have been too early.

This bears immediately on the discussion about the taxonomic status of similar East Palaearctic and Nearctic taxa, which repeatedly have been reported under the name *X. obscura*: *X. variegata* ROHWER, 1910 was reared from *P. densiflora* in Japan (KONDO & MIYAKE 1974, MIYAKE & KONDO 1974), and *X. pini* ROHWER, 1913 at least from *P. banksiana*, *P. palustris*, *P. ponderosa*, *P. virginiana* in the United States and Canada (BURDICK, 1961). Observing no decisive differences among such material from the northern hemisphere, BENSON (1962) – contradicting to other authors such as BURDICK (1961), RASNITSYN (1965) and SHINOHARA (pers. comm.) – has considered *X. obscura* to be a holarctic species.

Biology. Adult specimens may be abundant on *Pinus mugo* and on nearby blooming *P. cembra* and *Alnus viridis* (SCHEDL 1978, COLPI & MASUTTI 1984). Depending on the altitude of the collecting locality they occur from the beginning of May until the beginning of July at 1 000–2 600 m above sea level in the Alps (SCHEDL 1978, T.

NOBLECOURT pers. comm.). Bulgarian specimens from the Rila and Pirin Mts. were partly collected close to snow patches in mid June (cf. TAEGER 1987). *X. obscura* prepupae make an obligate diapause of at least two years.

The larvae are parasitized by *Xyeloblacus leucobasis* VAN ACHTERBERG & ALTENHOFER, 1997 (Braconidae, Blacinae; VAN ACHTERBERG & ALTENHOFER, 1997).

Distribution. Boreo-subalpine according to BENSON (1961). \*Austria (STROBL 1895), \*Bulgaria (\*Rila [TAEGER 1987] and \*Pirin mountains), \*France, \*Germany, Hungary (Carpathian Basin; ZOMBORI 1974), \*Italy (Dolomiti trentine, COLPI & MASUTTI 1984; PESARINI & PESARINI 1988), Slovakia (BENEŠ 1989), \*Switzerland (BENSON 1961, partly under the name *X. curva*). According to ZHELOCHOVTSEV (1988) also in the mountainous Altai. Several authors reported this species additionally from Japan and North America (e. g. BENSON 1962, TOGASHI 1974), however, the conspecificity of such material partly also mentioned as *X. pini* needs confirmation (for *X. japonica* see above).

## Acknowledgements

First of all I wish to express my cordial thanks to E. ALTENHOFER (Etzen) for large series of reared *Xyela*, for information on ecological aspects of this group, and for many productive joint discussions. A. P. RASNITSYN (Moscow), A. SHINOHARA (Tokyo), D. R. SMITH (Washington), and A. TAEGER (Eberswalde) helpfully commented on the work. C. KUTZSCHER (Eberswalde) accompanied me during several trips to German, Greek and Portuguese collecting sites and supported me with observations and video recordings of the oviposition. Some friends and colleagues, C. LANGE (Bernau), L. BEHNE, L. ZERCHE, and J. ZIEGLER (Eberswalde) collected larval and adult material for my study during their own holidays and collecting trips. The following colleagues generously put collection material at my disposal: A. V. ANTROPOV (Moscow), S. A. BELOKOBYLSKIJ and A. ZINOVJEV (St. Petersburg), H. CHEVIN (Fontenay le Fleury), E. DILLER and J. SCHUBERTH (Munich), M. DREES (Hagen), R. ECK (Dresden), A. FREIDBERG (Tel Aviv), J. GÖTZE (Berlin / Admont), F. GUSENLEITNER (Linz), E. JANSEN (Engelsdorf), L.-Å. JANZON (Stockholm), F. KOCH (Berlin), J.-P. KOPELKE (Frankfurt / M.), M. KRAUS (Nürnberg), N. P. KRISTENSEN (Kopenhagen), J. LACOURT (Ig  ), J. P. M  LLER (Chur), T. NOBLECOURT (Antugnac), T. OSTEN (Stuttgart), F. PESARINI (Ferrara), H. PSCHORN-WALCHER (Neulengbach), A. P. RASNITSYN, C. RITZAU (Oldenburg), W. SCHEDL (Innsbruck), S. SCH  DL (Vienna), A. SHINOHARA (Tokyo), D. R. SMITH (Washington), C. TAYLOR (LONDON), H. TUSSAC (Cahors), M. VIITASAARI (Helsinki), and L. ZOMBORI (Budapest). R. GAEDIKE (Eberswalde), A. P. RASNITSYN and A. SHINOHARA kindly supported me with several translations from Russian and Japanese publications and labels. B. EWALD and C. KUTZSCHER (Eberswalde) made the final drawings and photos. A. D. LISTON (Frontenhausen) corrected the English of an earlier version. The study was financed by the Deutsche Forschungsgemeinschaft (DFG) within the graduate colleague "Evolutionary Transformations and Mass Extinctions" (GRK 503). Some material studied was collected during the first expedition of the Deutsches Entomologisches Institut to the Russian Far East in 1993, which was supported by the DFG travel grant 436 RUS 111-14-93.

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