

**The European species of the genus *Phyllocolpa*, part III:
the species-groups of *crassispina*, *scotaspis*, and *piliserra*
(Insecta, Hymenoptera, Tenthredinidae, Nematinae)**

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Abstract

The European species of the species-groups of *Phyllocolpa crassispina*, *Ph. scotaspis*, and *Ph. piliserra* (Tenthredinidae: Nematinae) are revised. The *crassispina*-group is composed of 5 species: *anomaloptera* (FÖRSTER 1854), stat. n. (= *Pontania joergenseni* ENSLIN 1916, syn. n., = *Amauronematus maidli* ZIRNGIEBL 1937, syn. n., = *Pontania cyrnea* LISTON 2005, syn. n.), *crassispina* (THOMSON 1871), *nudipectus* (VIKBERG 1965), *purpureae* (CAMERON 1884) (= *acuminata* ENSLIN 1915, syn. n.), and *tuberculata* (BENSON 1953). The *scotaspis*- and *piliserra*-groups are monotypic, including the species *scotaspis* (FÖRSTER 1854) (= *anglicus* CAMERON 1877, syn. n., = *nigrolineatus* CAMERON 1879, syn. n., = *fibulata* KONOW 1901, syn. n.) and *piliserra* (THOMSON 1862) (= *piliserra* var. *mascula* ENSLIN 1915, = *piliserra* var. *tristis* ENSLIN 1915), respectively. The species induce open leaf galls on *Salix* spp. with normally one edge of the leaf rolled down (*anomaloptera*, *crassispina*, *tuberculata*, *scotaspis*, ?*piliserra*) and/or both edges of leaf rolled down and curled along the longitudinal axis (*nudipectus*, *purpureae*). Collections for this study have been made since 1984 in 68 natural sites of 9 European countries. About 6980 galls of this species-groups were reared in the laboratory under ambient conditions. The material was collected from 5 willow species. Host specificity was tested by many ovipositing experiments. An identification key, descriptions, and illustrations are presented for the adults and galls, supplemented by distribution data. The females of the *crassispina*-group can be distinguished from species of related *Phyllocolpa*-groups especially by characters of the sawsheath which in lateral view is normally arcuated apically and not emarginate ventrally like in species of the *leucosticta*-group of the genus *Phyllocolpa*. The sheath of *scotaspis* is clearly pointed apically whereas the sheath of *piliserra* is bulbous in dorsal view unlike in any other species of the genus *Phyllocolpa*. Both, *scotaspis* and *piliserra*, differ also significantly from all other species of the genus in characters of the saw.

Key words: gall formers, taxonomy, description, identification key

Die europäischen Arten der Gattung *Phyllocolpa*, Teil III: die Artengruppen um *crassispina*, *scotaspis* und *piliserra* (Hymenoptera, Tenthredinidae, Nematinae)

Zusammenfassung: Die Arten der *Phyllocolpa crassispina*-, *scotaspis*-, und *piliserra*-Gruppe (Tenthredinidae: Nematinae) in Europa wurden revidiert. Die *crassispina*-Gruppe setzt sich aus 5 Arten zusammen: *anomaloptera* (FÖRSTER 1854), stat. n. (= *joergenseni* ENSLIN 1916, syn. n., = *maidli* ZIRNGIEBL 1937, syn. n., = *Pontania cyrnea* LISTON 2005, syn. n.), *crassispina* (THOMSON 1871), *nudipectus* (VIKBERG 1965), *purpureae* (CAMERON 1884) (= *acuminata* ENSLIN 1915, syn. n.) und *tuberculata* (BENSON 1953). Die *scotaspis*- beziehungsweise *piliserra*-Gruppe enthält jeweils nur 1 Art: *scotaspis* (FÖRSTER 1854) (= *anglicus* CAMERON 1877, syn. n., = *nigrolineatus* CAMERON 1879, syn. n., = *fibulata* KONOW 1901, syn. n.) beziehungsweise *piliserra* (THOMSON 1862) (= *piliserra* var. *mascula* ENSLIN 1915, = *piliserra* var. *tristis* ENSLIN 1915). Die Weibchen dieser Verwandtschaftsgruppen erzeugen auf ihren Wirtspflanzen (*Salix* spp.) offene Blattgallen in Gestalt von nach unten umgelegten Rollen (*anomaloptera*, *crassispina*, *tuberculata*, *scotaspis*, ?*piliserra*),

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die der Länge nach schraubig verdrillt sein können (*nudipectus, purpureae*). Seit 1984 wurden ca. 6980 Gallen an 68 verschiedenen Lokalitäten in 9 europäischen Ländern gesammelt und gezüchtet. Das Material stammt von 5 verschiedenen Weidenarten. Die Wirtspflanzenspezifität wurde durch Eiablageexperimente überprüft. Die taxonomischen Merkmale werden beschrieben und abgebildet, ergänzend wird ein Bestimmungsschlüssel der Arten präsentiert. Die Weibchen der meisten Arten der *crassispina*-Gruppe können von ihren Verwandten durch die am Ende abgerundete Sägescheide unterschieden werden, die ventral gewöhnlich nicht konkav ausgerandet ist wie bei Arten der *leucosticta*-Gruppe. Bei *scotaspis* ist die Sägescheide sehr stark zugespitzt, bei *piliserra* knollenartig, beide unterscheiden sich von allen anderen Arten auch in morphologischen Strukturen der Säge.

Introduction

Phyllocolpa, a genus in the Nematinae, makes open leaf rolls or folds on their willow hosts and includes 26 species in Europe, about 25 species were recorded from North America (SMITH 1979, SMITH & FRITZ 1996). The present study follows the traditional view, considering *Phyllocolpa* as a distinct genus and not as a subgenus of *Pontania* (BENSON 1960b, E. L. SMITH 1968, 1970, D. R. SMITH 1979, SMITH & FRITZ 1996, TAEGER et al. 1998, KOPELKE 1999, 2003a, 2007a, 2007b). The genus is separated into 5 species-groups, based on biological characters, the gall-type, and morphological characters mainly of females: i.e. the groups of *Ph. leucosticta*, *Ph. leucapsis*, *Ph. crassispina*, and the monotypic groups of *Ph. scotaspis* and *Ph. piliserra*. The *leucosticta*- and *leucapsis*-groups are dealt with in separate papers (KOPELKE 2007a, 2007b). The *crassispina*-group including North American species was recently revised by ZONOVJEV & VIKBERG (1999), however, due to the results of the examination of several types and lots of reared material it is updated in the present paper. The *scotaspis*- and *piliserra*-groups, if at all dealt with in the literature so far, are monotypic due to distinct differences to the other species of the genus in morphological characters mainly in females (Tab. 1). The present study is based exclusively on reared and original material to examine the variability of the morphological characters. In addition lots of oviposition experiments were conducted for checking the host-plant specificity (KOPELKE 1999, 2003, 2007a, 2007b).

The taxonomical and biological studies on *Phyllocolpa* have shown that among 26 European species only 4 species of the *leucosticta*-group are able to induce galls on different but closely related *Salix* spp. (Tab. 2) (KOPELKE 2007a, 2007b). The majority of species is monophagous with a distinct hostplant specificity. Otherwise there are at least 9 *Salix* spp. of the subgenus *Vetrix*, harbouring species-pairs of *Phyllocolpa*, which always belong to different species-groups and always produce different gall-types. Species-pairs of *Phyllocolpa* with identical gall-types on the same willow host are generally unknown, apart from *Ph. piliserra* and *Ph. scotaspis*

which are believed to induce the same gall-type on *S. viminalis*.

Material and methods

Sampling and rearing: Since 1984 the author has reared about 6980 galls of the *Phyllocolpa* species-groups dealt with in this paper. The material was collected from 5 willow species (*caprea*, *hastata*, *phylicifolia*, *purpurea*, *viminalis*) in 68 natural sites of 9 European countries. The rearing of entire galls was conducted in the laboratory under ambient conditions, supplemented by lots of oviposition experiments (specified in KOPELKE 1999, 2003, 2007a).

Types studied: In the context of the revisional study on the genus *Phyllocolpa* types of 50 species were examined (specified in KOPELKE 2007a). For most species the records of hostplants are based on reared specimens and oviposition experiments.

Types dealt with in this paper/collection: *Amauronematus maidli* ZIRNGIEBL (HT/NMV), *Euura acuminata* ENSLIN (LT/ZSM), *Nematus (Pontania) tuberculatus* BENSON (HT/BMNH), *Nematus anglicus* CAMERON (LT/BMNH), *Nematus anomalopterus* FÖRSTER (LT/ZSM), *Nematus bipartitus* SERVILLE (1 PLT/MRSN), *Nematus crassispinus* THOMSON (LT/ZML), *Nematus nigrolineatus* CAMERON (LT/BMNH), *Nematus piliserra* THOMSON (LT, 2 PLT/ZML), *Nematus purpureae* CAMERON (LT/BMNH), *Nematus scotaspis* FÖRSTER (LT/ZSM), *Nematus westermanni* THOMSON 1862 (LT, 9 PLT/ZML), *Nematus xanthogaster* FÖRSTER (LT, 2 PLT/ZSM), *Pontania cyrnea* LISTON (HT, 1 PT/ZSM), *Pontania fibulata* KONOW (LT, 1 PLT/DEI), *Pontania joergenseni* ENSLIN (LT, 2 PLT/DEI), *Pontania nudipectus* VIKBERG (HT, 3 PT/ZMH).

The following acronyms are used for the type Material: HT = holotype, PT = paratype, LT = lectotype, PLT = paralectotype. The following acronyms are used for Museums which have loaned type Material: BMNH: The Natural History Museum, London, U.K.; DEI: Deutsches Entomologisches Institut, Müncheberg, Germany; MRSN: Museo Regionale di Scienze Naturali, Museum of Systematic Zoology of the University, Torino, Italy; NMV: Naturhistorisches Museum, Vienna, Austria; ZML: Zoological Museum, Lund, Sweden; ZMH, Zoological Museum, University of Helsinki, ZSM: Zoologische Staatssammlung, Munich, Germany.

- Key to the females of the European species of the species-groups of *Phyllocolpa crassispina*, *scotaspis*, and *piliserra* (including notes to males, hostplants, galls, and distribution)
- 1 Head, thorax, and abdomen predominantly black coloured, sheath in dorsal view triangular (Figs. 2a–f) **2**
- 1* Head, thorax, and abdomen predominantly yellowish to brownish coloured, sheath (Fig. 2g) in dorsal view bulbous. Saw (Fig. 4b) in lateral view basal part widish, aulax slightly arcuated, ctenidea very short, normally present from annulus 2, serrulae rudimentary, cypsellae and postcalcares well developed. Male: Penisvalve (Fig. 5f) in lateral view straight, the basal part usually not broadened, spiny appendix narrow and straight, basal lobe with lower edge sometimes ripple-shaped. Gall? (see comment below) on *S. viminalis*. Distribution: Northern and Central Europe (*piliserra*-group) **piliserra**
- 2 Sheath in lateral view with curved apex, sometimes tapering (Figs. 2a–e), head with distinct tubercles (Figs. 1a, b) (*crassispina*-group) **3**
- 2* Sheath in lateral view acuminate and sharply pointed (Fig. 2f), head without distinct tubercles. Sheath hairs widely distributed on the lateral areas, in dorsal view slightly curled. Saw (Fig. 4a) in lateral view with aulax clearly arcuated, ctenidea and serrulae missing, cypsellae and postcalcares rudimentary. Male: Penisvalve (Fig. 5e) in lateral view straight, the basal part slightly broadened, spiny appendix narrow and slightly arcuated, basal lobe with lower edge conspicuously angled. Gall: (Fig. 6e) leaf roll on *Salix viminalis*, often both edges of a leaf rolled down. Distribution: Northern and Central Europe (*scotaspis*-group) **scotaspis**
- 3 Sheath in dorsal view with lateral hairs short and nearly straight (Fig. 2b, d), relativ small; proportion of length “a” to maximal width “b” (KOPELKE 2007b: fig. 1a) approximately 2.0 .. **4**
- 3* Sheath in dorsal view with lateral hairs long and clearly curled (Fig. 2a, c, e), proportion of length “a” to maximal width “b” < 1.5 **5**
- 4 Mesepisternum distinctly sculptured, pronotum entirely black, tegulae dark brown, sheath (Fig. 2b) in lateral view straight on upper margin, cerci extending at most half the length of the sheath, saw as in fig. 3b. Gall: probably leaf roll on *Salix ?glauca*. Distribution: Northern Europe **crassispina**
- 4* Mesepisternum unsculptured, pronotum black, often with lateral angles marginally brownish, tegulae yellowish. Sheath (Fig. 2d) in lateral view slightly emarginated on upper margin, cerci shorter than half the length of the sheath, saw as in fig. 3d. Male: Penisvalve as in fig. 5c. Gall (Fig. 6d): leaf roll on *Salix purpurea*, normally both edges of a leaf rolled down and forming a curled spiral. Distribution: Central Europe **purpureae**
- 5 Tegulae pale to dark brownish, sheath (Fig. 2a, c) in dorsal view with proportion of length “a” to maximal width “b” > 1.3, cerci extending at most half the length of the sheath **6**
- 5* Tegulae black, sheath (Fig. 2e) in dorsal view with proportion of length “a” to maximal width “b” approximately 1.1, cerci extending more than half the length of the sheath, Saw (Fig. 3e) in lateral view with aulax slightly S-shaped, thorax with mesepisternum (Fig. 1d) nearly entirely and densely pubescent and with upper two-thirds distinctly sculptured. Male: Penisvalve as in fig. 5d. Gall (Fig. 6b): Leaf roll on *Salix hastata*, normally one edge of a leaf rolled down, Distribution: Northern and Central Europe **tuberculata**
- 6 Pronotum with lateral angles often marginally yellowish lined, mesepisternum with upper two-thirds slightly sculptured, sheath (Fig. 2a) in lateral view straight on upper margin, proportion of length “a” to maximal width “b” approximately 1.3. cerci extending at most half the length of the sheath, Saw (Fig. 3a) in lateral view with aulax clearly S-shaped. Male: Penisvalve as in fig. 5a. Gall (Fig. 6a): Leaf roll on *Salix caprea*. Distribution: Northern to Southern Europe **anomalopectera**
- 6* Pronotum entirely black, mesepisternum with upper two-thirds distinctly sculptured (Fig. 1e), sheath (Fig. 2c) in lateral view slightly emarginated on upper margin, proportion of length “a” to maximal width “b” 1.5. Cerci shorter than half the length of the sheath, Saw (Fig. 3c) in lateral view with aulax clearly arcuated. Male: Penisvalve as in fig. 5b. Gall (Fig. 6c): Leaf roll on *Salix phylicifolia*, normally both edges of a leaf rolled down and forming a curled spiral along the longitudinal axis. Distribution: Northern Europe **nudipectus**

Taxonomy

Phyllocolpa crassispina-group*Phyllocolpa anomalopectera* (FÖRSTER 1854)

- Nematus anomalopecterus* FÖRSTER (1854: 308). — Type locality: [Germany], Aachen, **stat. n.**
 = *Pontania joergenseni* ENSLIN (1916: 17). — Type locality: Germany, Mecklenburg, **syn. n.**
 = *Amauronematus maidli* ZIRNGIEBL (1937: 336–337). — Type locality: Croatia, Istria, **syn. n.**
 = *Pontania cyrnea* LISTON (2005: 4). — Type locality: France, Corsica, Santo Pietro di Venacu, Corti, **syn. n.**
Pontania pedunculi HARTIG 1837: KONOW (1901: 129); misidentification.

Material: *Nematus anomalopecterus* FÖRSTER (ZSM), lectotype ♀ (designated by KOPELKE 2007a), *Pontania joergenseni* ENSLIN (DEI), lectotype ♀ (designated by ZINOVJEV & VIKBERG 1999), paralectotypes 1 ♀, 1 ♂, *Pontania cyrnea* LISTON (ZSM), holotype ♀, paratype 1 ♀, *Amauronematus maidli* ZIRNGIEBL (NMV), holotype ♀.

Additional material ♀♀, ♂♂, reared from a total of 1067 galls, KOPELKE leg.: Germany: Hesse, Wüstensachsen, NWR Stirnberg (26. vi. 2003: 35 galls); Mecklenburg-Western Pomerania: Usedom, Benz (14. viii. 2003: 43); Usedom, Neuendorf (13. viii. 2003: 25); Rügen, Neuensien (18. vii. 2005: 129); Rügen, Neukamp (24. vii. 2005: 70); Rügen, Zittvitz (15. vii. 2005: 42); Rügen, Bergen/Kaiseritz (20. vii. 2005: 7); Rügen, Glowitz (19. vii. 2005: 41); Baden-Württemberg: Dettingen (12. vi. 2004: 47); Markelfingen (3. vii. 2006: 26). — Denmark, Jylland, Gammelby (29. vii. 2005: 15). — Norway: Hordaland, Skutevik (21. viii. 2001: 58); Nordland: Lofot, Austvagoya, Rörvika (13. viii. 2001: 3). — Lithuania: Palanga (11. viii. 2006: 84, 13. viii. 2006: 90); Siluva (6. viii. 2006: 57); Sudargas (9. viii. 2006: 76). — Poland: Mazurskie, Dabrowka nr. Mikolaiken (15. viii. 2006: 99); Mazurskie, nr. Grabnik (3. viii. 2006: 39); Walcz (16. viii. 2006: 81).

Description: ♀

Head: Frontal area with flattish and broad depression, inner orbits nearly entirely pubescent, upper head shiny and densely pubescent, inner orbits and upper head with distinct tubercles as in fig. 1b, c. Antenna relative thick, hardly as long as head and thorax together. Front margin of the clypeus conspicuously incised. Colour: Face black apart from basis of mandibels and labrum dark brownish, upper head and antenna black.

Thorax: Black coloured and shiny, mesonotum with microsculpture between slight punctures, mesepisternum with upper two-thirds densely pubescent and slightly sculptured, lower third nearly glabrous and unstructured. Pronotum black, with lateral angles often marginally yellowish lined, tegulae pale to dark brownish. Forewing with stigma transparent and yellowish to brownish, nearly unicoloured and/or basal half somewhat paler, wing venation pale to dark brown. Legs with coxa dark brown to black, tibia and tarsomeres yellowish brown. Hindtarsus somewhat shorter than hindtibia, hindtibia spurs

unequally long and nearly straight, inner spur nearly as long as the half length of the basitarsus.

Abdomen: Completely dark brown to black coloured, sawsheath light brown, cerci yellowish brown and rather short, extending at most half the length of the sheath.

Sheath (Fig. 2a): Nearly unsculptured and shiny, in lateral view with curved apex, straight on upper margin, clearly konvex on lower, in dorsal view nearly triangular with lateral margin slightly angled. Proportion (KOPELKE 2007b: fig. 1a) of length “a” to maximal width “b” approximately 1,3. Sheath hairs not widely distributed on the lateral areas, in dorsal view clearly curled.

Saw (Fig. 3a): In lateral view with aulax clearly S-shaped, consisting of about 23 segments. Ctenidea very short, normally present from annulus 3. Serrulae rudimentary, cypsellae and postcalcares well developed.

♂: Microstructure and colour as in ♀, antenna are missing in the paratype. Forewing with stigma entirely brownish and transparent. Hypogydium dark brown, penisvalve (Fig. 5a) in lateral view straight, the basal part usually not broadened. Spiny appendix narrow, nearly straight, basal lobe with lower edge nearly right-angled.

Gall (Fig. 6a): Leaf roll, normally one edge of a leaf rolled down, creating a very small cavity for the larva, sometimes up to three rolls per leaf present. Older larva leave their gall and feed on the leaf edge, leaving behind characteristic feeding marks.

Hostplant: *Salix caprea* LINNAEUS 1753, belonging to the subgenus *Vetrix*, section *Vetrix*, growing up to 12–14 m, sometimes with a shrubby habit and occurring on well-drained soils as well as a vast variety of secondary postforest habitats, however, avoiding wet soils (SKVORTSOV 1999). LISTON (2005) collected some females of *Ph. anomalopectera* (= *Ph. cyrnea*) from *Salix atrocinerea* BROTERO 1804, but he did not find galls on it. Whether *Ph. anomalopectera* is able to induce galls also on *S. atrocinerea* needs confirmation.

Distribution: Northern to southern Europe, locally occurring in high densities.

Comment: FÖRSTER described *Nematus anomalopecterus* from collected specimens, not mentioning a hostplant and/or gall-type. Some authors already had suspected that *anomalopectera* is a synonym of KONOW's taxon *pedunculi* (*nec* HARTIG 1837) (e.g., ENSLIN 1915) and/or *joergenseni* ENSLIN 1916 (e.g., HELLEN 1977). Moreover KONOW's *pedunculi* (*nec* HARTIG 1837) was also regarded as a synonym of *joergenseni* (ENSLIN 1917, DITTRICH 1924, MALAISE 1931). The lectotype of *anomalopectera* in coll. FÖRSTER was as well identified and labelled by KONOW as *Pontania pedunculi* (handwritten label: “*Pontania pedunculi* HTG., KONOW det.”). ZI-

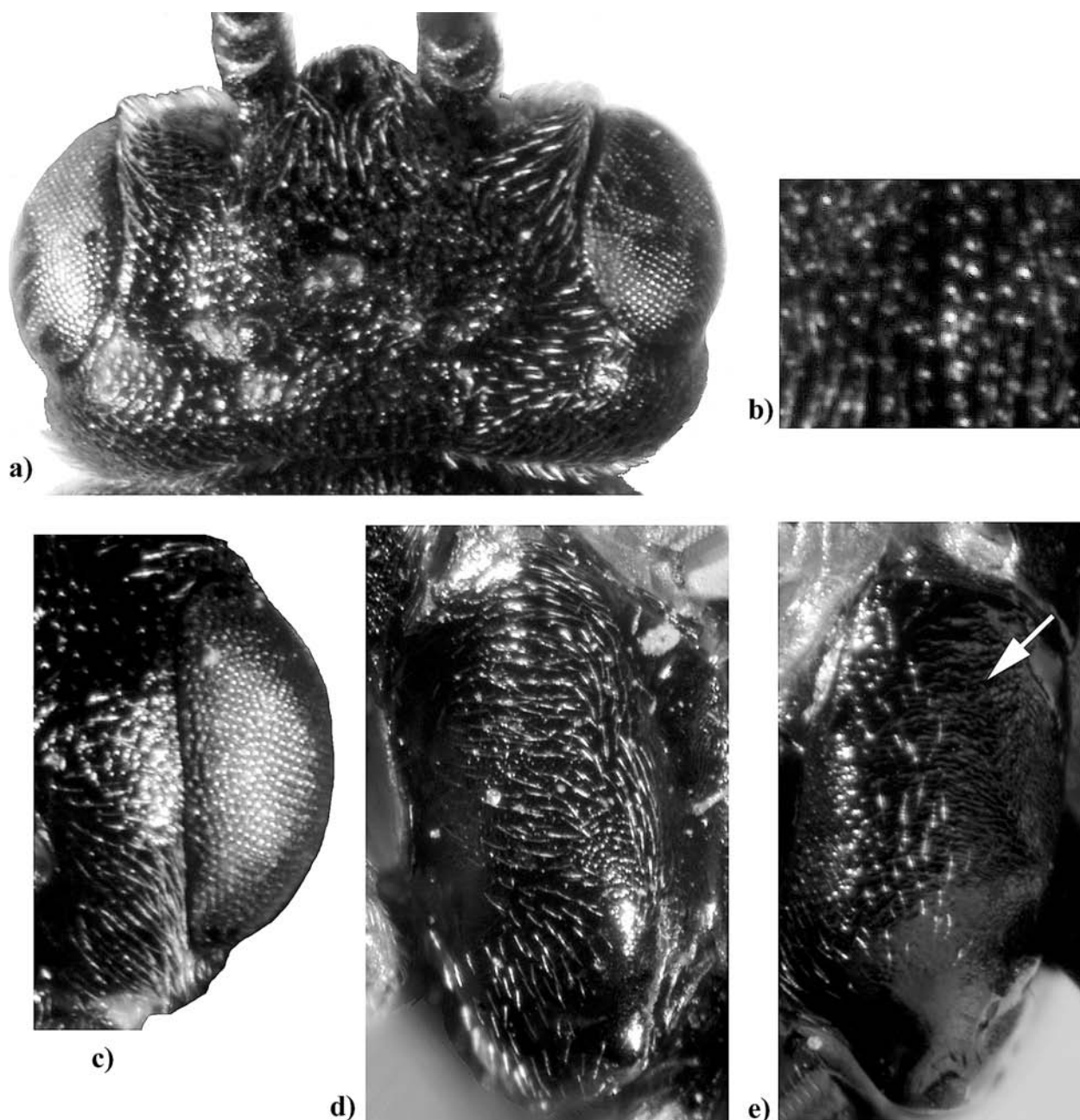


Fig. 1a-e: Microsculpture and pubescence in species of the *Phyllocolpa crassispina*-group: Fig. 1a. Head of *purpureae* (CAMERON 1884); Fig. 1b. Microsculpture with tubercles on the head and mesonotum of *anomalopecta* (FÖRSTER 1854); Fig. 1c. pubescence of inner orbits of *anomalopecta*; Fig. 1d. pubescence on mesepisternum of *tuberculata* (BENSON 1953); Fig. 1e. pubescence and microsculpture (arrow) on mesepisternum of *nudipectus* (VIKBERG 1965).

NOVJEV & VIKBERG (1999) selected from KONOW's collection a lectotype of *joergenseni* ENSLIN which was deposited in the collection under the name *pedunculi* and fits KONOW's description, but they did not consider *anomalopecta* in their study of the *crassispina*-group. KOPELKE (1999: 80) discussed the status of *anomalopecta* and already mentioned that it might be a species closely related to *crassispina*, *nudipectus*, *purpureae*, and *tuberculata* of the *Phyllocolpa crassispina*-group. In several studies *anomalopecta* remained out of con-

sideration, and consequently *joergenseni* was wrongly regarded as a valid species (LISTON 1981, 1995, VIKBERG 1982, VIITASAARI & VIKBERG 1985, ERMOLENKO 1988, ZINOVJEV 1998, ZHELOKHVOTSEV 1994, VIITASAARI et al. 1998, ZINOVJEV & VIKBERG 1998, 1999, LISTON & SPÄT 2005). ENSLIN (1917: 733) differentiated *anomalopecta* from *joergenseni* only on the basis of apparent colour differences in the forewing pterostigma and hypopygium. However, the hypopygium of the lectotypes does not show clear differences in colour. Moreover, in reared

Tab. 1: *Phyllocolpa* species of the species-groups of *Ph. crassispina*, *Ph. scotaspis*, and *Ph. piliserra* with notes to their distribution in Europe and their willow hostplants.

<i>Phyllocolpa</i> spp.	<i>Salix</i> spp. (hostplant)	Distribution
<i>crassispina</i>-group		
<i>anomalopectera</i> (FÖRSTER 1854), stat. n. = <i>Pontania joergenseni</i> ENSLIN 1916, syn. n. = <i>Amauronematus maidli</i> ZIRNGIEBL 1937, syn. n. = <i>Pontania cyrnea</i> LISTON 2005, syn. n.	<i>caprea</i> LINNAEUS 1753	Central, northern Europe
<i>crassispina</i> (THOMSON 1871)	? <i>glaucula</i> LINNAEUS 1753	Northern Europe
<i>nudipectus</i> (VIKBERG 1965)	<i>phyllicifolia</i> LINNAEUS 1753	Northern Europe
<i>purpureae</i> (CAMERON 1884) = <i>Euura acuminata</i> ENSLIN 1915, syn. n.	<i>purpurea</i> LINNAEUS 1753	Central Europe
<i>tuberculata</i> (BENSON 1953)	<i>hastata</i> LINNAEUS 1753	Central, northern Europe
<i>scotaspis</i>-group		
<i>scotaspis</i> (FÖRSTER 1854) = <i>Nematus anglicus</i> CAMERON 1877, syn. n. = <i>Nematus nigrolineatus</i> CAMERON 1879, syn. n. = <i>Pontania fibulata</i> KONOW 1901, syn. n.	<i>viminalis</i> LINNAEUS 1753	Central, northern Europe
<i>piliserra</i>-group		
<i>piliserra</i> (THOMSON 1862) = <i>Pontania piliserra</i> var. <i>mascula</i> ENSLIN 1915 = <i>Pontania piliserra</i> var. <i>tristis</i> ENSLIN 1915	<i>viminalis</i> LINNAEUS 1753	Central, northern Europe

material the colour of the pterostigma is variable, reaching from nearly unicolourous pale brownish to bicolourous with brown distal part. Similar colour variation was found in the tegulae of the lectotypes and reared material. However, the examination of the lectotypes has shown that *anomalopectera* corresponds definitely with *joergenseni* (together with material reared from leaf rolls on *S. caprea*) in the morphological characters (i.e. shape of sheath, saw, and sheath hairs, sculpture and pubescence on head and mesopleura, colour of head, thorax, and abdomen, etc.). ZINOVJEV & VIKBERG (1999) illustrated the pubescence of the abdominal terga of *joergenseni* which also corresponds clearly with *anomalopectera*. Moreover, *Ph. anomalopectera* is the only species of the *crassispina*-group with a clearly S-shaped saw (Fig. 3a) just like it was found in the lectotype of *joergenseni*. Thus, *joergenseni* is a junior synonym of *anomalopectera*.

ZINOVJEV & VIKBERG (1999) rightly attributed *Amauronematus maidli* ZIRNGIEBL 1937 to the *crassispina*-group but regarded it as a synonym of *tuberculata* BENSON 1953, preferring the well-known younger name *tuberculata*. However, *tuberculata* makes galls only on *S. hastata* which does not occur in the type locality as it was already mentioned by the authors. Furthermore, the types of *maidli* and *tuberculata* show some differences in the morphological characters. CONDE already labelled the holotype of *maidli* as “*anomalopectera*” but never published this synonymy (BLANK 1996). The examination of the types by the present author confirms the determination of CONDE. Most of the morphological characters of *maidli* correspond clearly with *anomalopectera*, differences are visible only in the colour of the pronotum

(entirely black in *maidli* versus marginally faintly lined brownish in *anomalopectera*) and the tegulae (entirely black in *maidli* versus brownish in *anomalopectera*). Thus, *A. maidli* is a junior synonym of *Ph. anomalopectera*, and the willow host *S. caprea* is also distributed in the type locality of *maidli*.

LISTON (2005) included *Ph. cyrnea* into the *crassispina*-group and differentiated it from *joergenseni* (= *anomalopectera*) due to slight differences in measurements and the shape of the sawsheath. However, the examination of the types has shown that *Ph. anomalopectera* corresponds definitely in the morphological characters with *Ph. cyrnea*. Moreover the saw of *Ph. cyrnea* is also clearly S-shaped just like it was found only in *anomalopectera*. Thus, *cyrnea* is regarded in the present study as a junior synonym of *anomalopectera*.

***Phyllocolpa crassispina* (THOMSON 1871)**

Nematus crassispinus THOMSON (1871: 164). — Type locality: Sweden, Jämtland, Skalstugan.

M a t e r i a l: *Nematus crassispinus* THOMSON (ZML), lectotype ♀ (designated by ZINOVJEV & VIKBERG 1999).

Description: ♀

H e a d: Frontal area with flattish and broad depression, inner orbits nearly entirely pubescent, upper head shiny and densely pubescent, inner orbits and upper head coriaceous sculptured, frons and vertex with small tubercles as in Fig. 1b. Antenna relative thick, hardly as long as head and thorax together. Front margin of the clypeus conspicu-

ously incised. Colour: Face black apart from basis of mandibels and labrum dark brown, upper head black with hind orbits slightly gleaming dark brownish, antenna black.

Thorax: Dark brown to black coloured, mesonotum with microsculpture between slight punctures, mesepisternum with upper half densely pubescent and distinctly sculptured, lower half nearly glabrous and unstructured. Pronotum entirely black, tegulae dark brown. Forewing with stigma transparent and uncoloured, light yellowish brown, wing venation pale to dark brown. Legs with coxa dark brown to black, tibia and tarsomeres light brown. Hindtarsus shorter than hindtibia, hindtibia spurs unequally long and nearly straight, inner spur somewhat shorter than the half length of the basitarsus.

Abdomen: Completely dark brown coloured, cerci brown, extending at most half the length of the sheath.

Sheath (Fig. 2b): Unsculptured and shiny, in lateral view with curved apex, clearly tapering, straight on upper margin, slightly konvex on lower, in dorsal view relative small and nearly triangular with lateral margin slightly angled. Proportion (KOPELKE 2007b: fig. 1a) of length “a” to maximal width “b” approximately 2.0. Sheath hairs not widely distributed on the lateral areas, in dorsal view hardly curled.

Saw (Fig. 3b): In lateral view with aulax clearly arcuated, consisting of about 20 segments. Ctenidea very short, normally present from annulus 2. Serrulae rudimentary, cypsellae and postcalcares well developed.

♂: Unknown to me. ZINOVJEV & VIKBERG (1999) described a single male with some significant morphological differences to the female. In contrast to the female the mesepisternum of the male is “without any sculpture” and the hind tarsus is “abnormally long”. In all species studied by me the microsculpture of the mesepisternum corresponds definitely in both sexes. Thus, the male was probably misidentified and the description incorrectly attributed to *crassispina*.

Gall: Not seen by me. According to ZINOVJEV & VIKBERG (1999): leaf roll.

Hostplant: According ZINOVJEV & VIKBERG (1999): *S. glauca* LINNAEUS 1753. Moreover, they associated this species also to the willow hosts *S. sphenophylla* SKVORTSOV 1966 and *S. arctica* PALLAS 1788; however, this requires confirmation.

Distribution: Northern Europe.

Comment: *Ph. crassispina* is generally considered as a valid species on *S. glauca* (VIKBERG 1970, HELLEN 1977, ZINOVJEV 1993c, 1998, LISTON 1995, ZINOVJEV & VIKBERG 1999, LACOURT 1999). However, the present author did not found a leaf roll-like gall-type on *S. glauca* in northern Europe so far. In all visited localities *S. glauca* harboured only the leaf folds of *Ph. plicaglauca* KOPELKE 2007 (KOPELKE 2007a), a species belonging to the *leucosticta*-group. Maybe that *crassispina* and *plicaglauca* are local species with different gall-types on

S. glauca just like, for example, *rolleri* LISTON 2005 and *tuberculata* (BENSON 1953) with different gall-types on *S. hastata* LINNAEUS 1753, and, moreover, belonging to different species-groups and distributed in different regions (KOPELKE 2007b). Due to the uncertainties concerning the real willow host, gall-type, and morphological characters of the male, additional studies are necessary.

Phyllocolpa nudipectus (VIKBERG 1965)

Pontania nudipectus VIKBERG (1965: 10 ff.). — Type locality: Finland, Kitee, reared from rolled and twisted leaf galls on *Salix phylicifolia*.

Pontania coriacea (BENSON 1953): VIKBERG (1970: 12, 22) on “*S. phylicifolia* (hybrid)”, partim; misidentification.

Pontania excavata (MARLATT 1896): VIKBERG (1970: 11, 22), on “*S. phylicifolia* ... the leaves were rolled and twisted throughout their length”; misidentification.

Pontania leucapsis (TISCHBEIN 1846): VIKBERG (1970: 11, 22), on “*S. phylicifolia*”, partim; misidentification.

Pontania leucapsis (TISCHBEIN 1846): ZINOVJEV (1998: 216), on “*S. phylicifolia*”, partim; misidentification.

Pontania tuberculata (BENSON 1953): VIKBERG (1970: 12), reared from galls on *S. phylicifolia*, “similar to those of *P. nudipectus*”; misidentification.

Pontania tuberculata (BENSON 1953): ZINOVJEV (1998: 217), on “*S. phylicifolia*”; misidentification.

Pontania tuberculata (BENSON 1953): ZINOVJEV & VIKBERG (1999: 292), reared from “characteristic leaf rolls” on *S. phylicifolia*; misidentification.

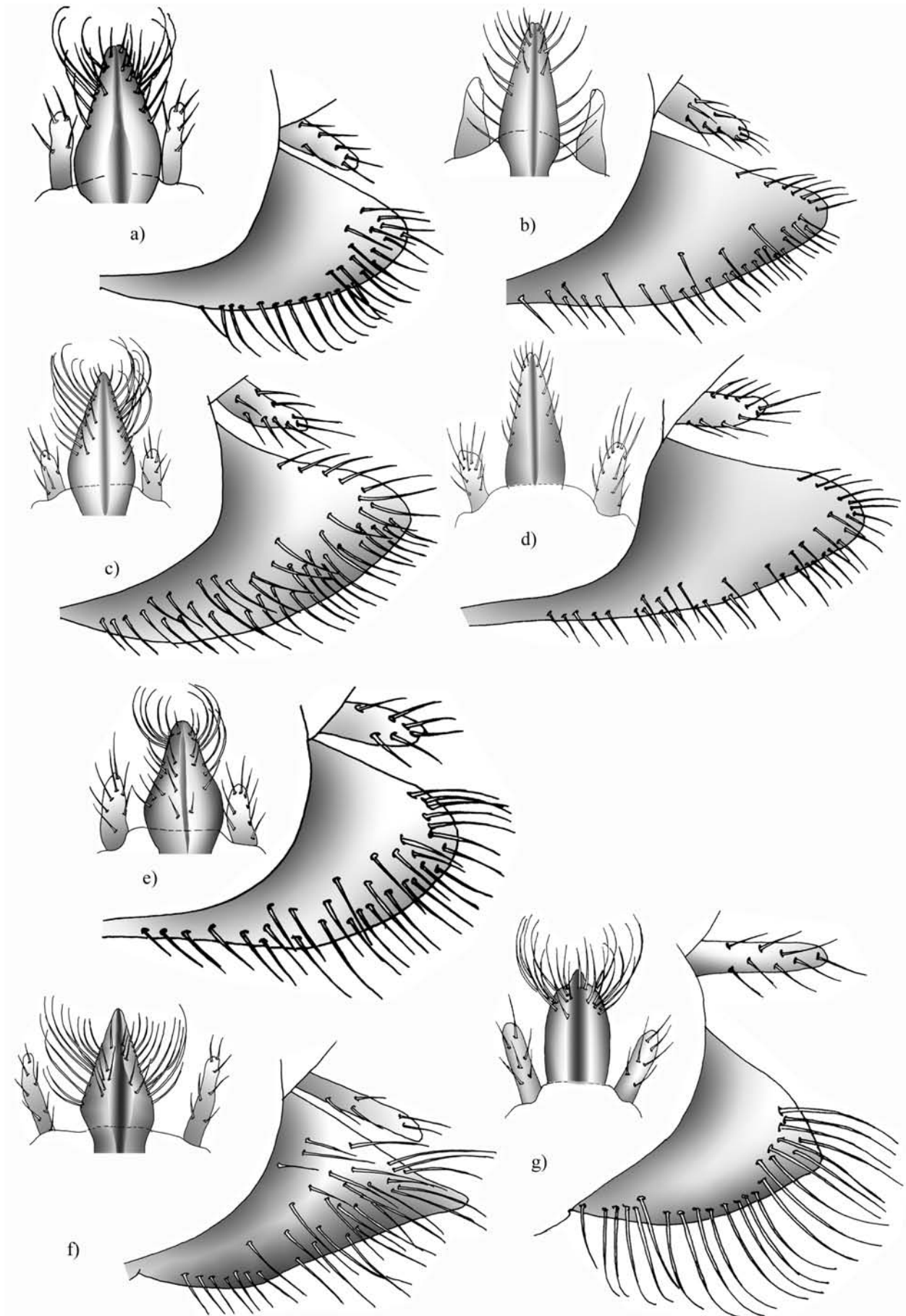
Material: *Pontania nudipectus* VIKBERG (ZMH), holotype ♀, paratypes 2 ♀♀, 1 ♂; *Nematus (Pontania) tuberculatus* BENSON (BMNH), holotype ♀.

Additional material: ♀♀, ♂♂ reared from a total of 307 galls, KOPELKE leg.: Norway: Finnmark: Ifjordfjellet, Gilojokka (8. VIII. 2001: 23); Karasjok (3. VIII. 2001: 25); Lakselv, Stabursnes (2. VIII. 2001: 33); N.-Varanger, Tanabru (3. VIII. 2001: 9); S.-Varanger, Nyrod (6. VIII. 2001: 30); S.-Varanger, Storskog (5. VIII. 2001: 20); S.-Varanger, Vaggatem (7. VIII. 2001: 17); S.-Varanger, Vaggatem, Elentj. (5. VIII. 2001: 16); N.-Trondelag: Skogan (16. VIII. 2001: 47, 19. VIII. 2004: 45); S.-Trondelag: Dovrefjell (26. VII. 2001: 17); Troms: Lapphau-gen nr. Bardu (10. VIII. 2001: 9). — Sweden: Lappland, Storuman (8. VIII. 2004: 9); Norrbotten, Torne Träsk, Abisko (11. VIII. 1993: 3). — Finland, Lappin, Kilpisjärvi (10. VIII. 2001: 4).

Description: ♀

Head: Frontal area with flattish and broad depression, inner orbits nearly entirely pubescent, upper head shiny and weakly pubescent, inner orbits and upper head coriaceous sculptured, frons and vertex with small tubercles as in fig. 1b. Antenna relative thick, as long as head and thorax together. Front margin of the clypeus conspicuously incised. Colour: Face black apart from basis of mandibels and labrum dark brown, upper head and antenna black.

Thorax: Black coloured, mesonotum slightly sculptured between distinct punctures, mesepisternum with upper two-thirds densely pubescent and distinctly



sculptured (Fig. 1e), lower third nearly glabrous and slightly structured. Pronotum entirely black, tegulae yellowish. Forewing with stigma transparent and unicoloured, light yellowish brown, wing venation pale to dark brown. Legs with coxa dark brown to black, tibia brown, tarsomeres somewhat darker. Hindtarsus shorter than hindtibia, hindtibia spurs unequally long and nearly straight, inner spur somewhat shorter than the half length of the basitarsus.

Abdomen: Completely dark brown to black coloured, sawsheath black, cerci yellowish brown, shorter than half the length of the sheath.

Sheath (Fig. 2c): With slight microsculpture and shiny, in lateral view with curved apex, a little tapering, slightly emarginated on upper margin, clearly convex on lower, in dorsal view relative small and nearly triangular with lateral margin slightly angled. Proportion (KOPELKE 2007b: fig. 1a) of length “a” to maximal width “b” approximately 1.5. Sheath hairs widely distributed on the lateral areas, in dorsal view clearly curled.

Saw (Fig. 3c): In lateral view with aulax clearly arcuated, consisting of about 20 segments. Ctenidea very short, normally present from annulus 2. Serrulae rudimentary, cypsellae and postcalcares clearly developed.

♂: Microstructure and colour like ♀, antenna relative thick, somewhat longer than thorax and abdomen together. Forewing with stigma entirely brownish and transparent. Hypogydium black, penisvalve (Fig. 5b) in lateral view straight, the basal part usually not broadened. Spiny appendix narrow, nearly straight, basal lobe with lower edge conspicuously angled.

Gall (Fig. 6c): leaf roll, normally both edges of a leaf rolled down and forming a curled spiral along the longitudinal axis, creating a very small cavity for the larva. Older larvae feed on the leaf edge at the top of the gall.

Hostplant: *S. phyllicifolia* LINNAEUS 1753, belonging to the subgenus *Vetrix*, section *Arbuscella*. A medium-sized shrub, occurring on edges of wetlands, damp lowlands banks of streams, common in willow shrublands in tundras (SKVORTSOV 1999).

Distribution: Northern Europe.

Comment: VIKBERG (1965) described *nudipectus* from material which he reared from twisted leaf rolls. This species is generally regarded as a valid species on *S. phyllicifolia* (VIKBERG 1970, 1982, HELLEN 1977, VIITASAARI & VIKBERG 1985, ZINOVJEV 1993c, 1998, ZHELOKHOVTSSEV 1994, LISTON 1995, KOPELKE 1999, 2003a, b, LACOURT 1999). Moreover, the leaf rolls on *S. phyllicifolia* were also misattributed to *tuberculata* of the same

species-group (BENANDER 1969, VIKBERG 1970, HELLEN 1977, ZHELOKHOVTSSEV 1994, LISTON 1995, TAEGER et al. 1998, ZINOVJEV & VIKBERG 1999) and/or to *Ph. leucapsis* (VIKBERG 1970, ZHELOKHOVTSSEV 1994, LISTON 1995, ZINOVJEV 1998), a species belonging to the *leucapsis*-group and producing a different gall-type on *S. cinerea* LINNAEUS 1753.

Phyllocolpa purpureae (CAMERON 1884)

Nematus purpureae CAMERON (1884: 80). — Type locality: England, Worcester.

= *Euura acuminata* ENSLIN (1915: 339); type locality: Germany, Meißen, 25. VI. [18]98, KRIEGER leg., **syn. n.**

Pontania leucapsis (TISCHBEIN 1846): ZINOVJEV (1998: 217), on “*S. purpurea*”, partim; misidentification.

Material: *Nematus purpureae* CAMERON (BMNH), lectotype ♀; *Euura acuminata* ENSLIN (ZSM), lectotype ♀ (lectotypes designated by KOPELKE 2007a).

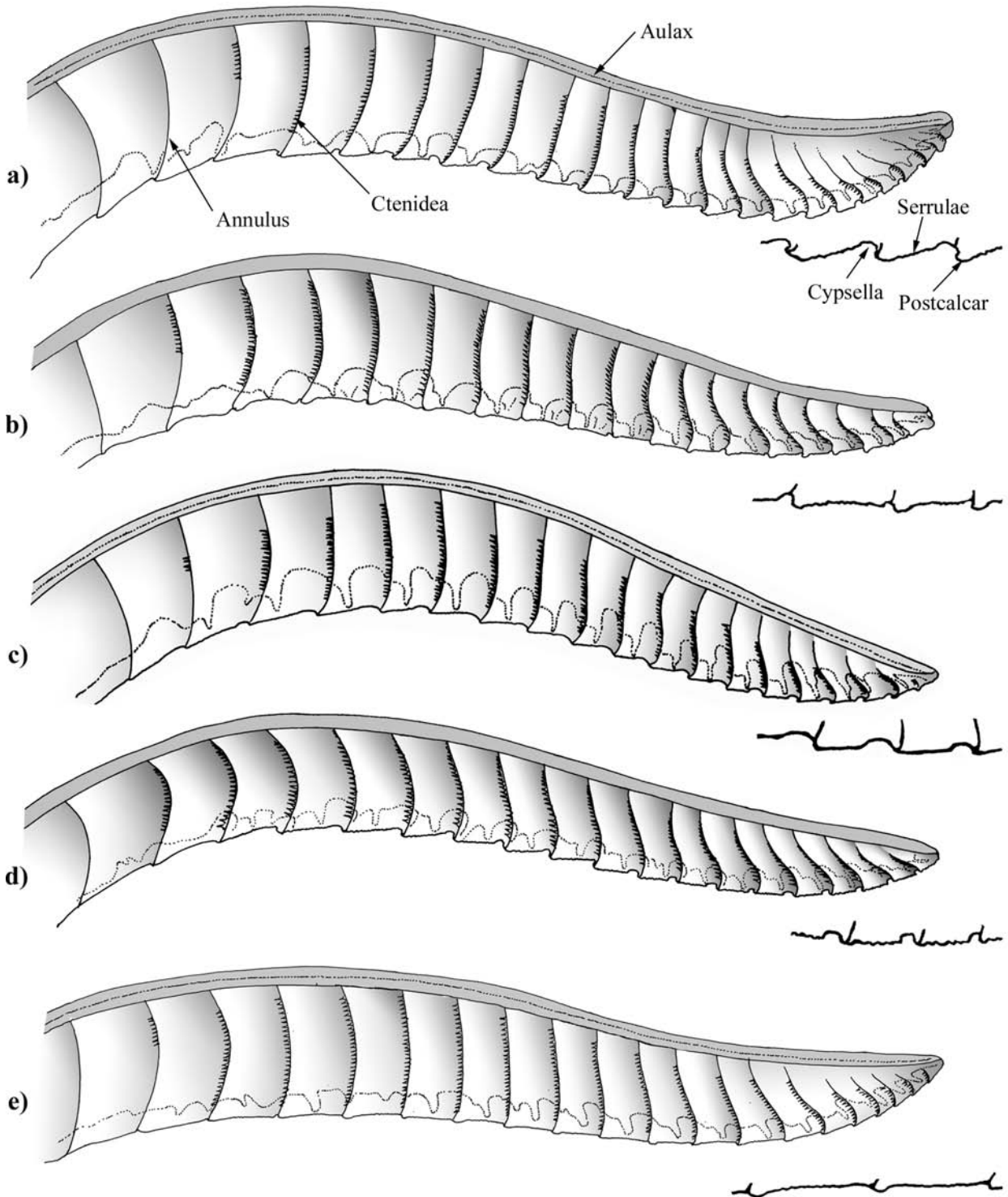
Additional material: ♀♀, ♂♂ reared from a total of 685 galls, KOPELKE leg.: Austria: Niederösterreich: Waldverchs (ALTENHOFER leg. 14. VII. 2003: 78); Grafenschlag (ALTENHOFER leg. 15. VII. 2006: 56); Neustift (ALTENHOFER leg. 25. VII. 2005: 14); Rastenfeld (ALTENHOFER leg. 5. VII. 2005: 202); Salzburg: Defereggental, Erlsbach (7. VIII. 2002: 9); Defereggental, St. Jakob, Trojer Alm (7. VIII. 2002: 52); Ramsau, Silberklamm (29. VII. 2003: 18); Weißenbach (31. VII. 2003: 107). — Switzerland, Thurgau: Neuwilten, Bommer Weiher (15. VI. 2005: 5); Weinfeldten/Thur (14. VI. 2005: 23). — Germany, Baden-Württemberg: Hegne nr. Allensbach (4. VII. 2006: 2); Lindenbühl nr. Reichenau (4. VII. 2006: 2); Markelfingen (3. VII. 2006: 1); Markelfingen, Schlafbach (17. VI. 2005: 4, 4. VII. 2006: 4); Radolfzell, Mettnau (10. VI. 2005: 13, 18. VI. 2005: 29, 2. VII. 2006: 7). — Poland, Mazurskie, nr. Grabnik (3. VIII. 2006: 59).

Description: ♀

Head: Frontal area with deep and broad depression, inner orbits nearly entirely pubescent, upper head shiny and slightly sculptured between distinct tubercles (Fig. 1a). Antenna relative thin, somewhat longer than head and thorax together. Front margin of the clypeus conspicuously incised. Colour: Face black apart from basis of mandibels, labrum, and front margin of clypeus yellowish to dark brown, upper head black, sometimes with hind orbits gleaming dark brownish. Antenna black.

Thorax: Black coloured, mesonotum slightly sculptured between distinct punctures, mesepisternum unsculptured, with upper two-thirds densely pubescent, lower third nearly glabrous. Pronotum black, often with lateral angles marginally brownish, tegulae yellowish. Forewing with stigma transparent and unicoloured, yellowish brown, wing

Figs. 2a–g: Sawsheaths of the European species of the *Phyllocolpa crassispina*- (a–e), *scotaspis*- (f), and *piliserra*-group (g) in dorsal and lateral view: Fig. 2a. *anomalopecta* (FÖRSTER 1854); Fig. 2b. *crassispina* (THOMSON 1871); Fig. 2c. *nudipectus* (VIKBERG 1965); Fig. 2d. *purpureae* (CAMERON 1884); Fig. 2e. *tuberculata* (BENSON 1953); Fig. 2f. *scotaspis* (FÖRSTER 1854); Fig. 2g. *piliserra* (THOMSON 1862)



Figs. 3a–e: Saws of the European species of the *Phyllocolpa crassispina*-group in lateral view: Fig. 3a. *anomalopecta* (FÖRSTER 1854); Fig. 3b. *crassispina* (THOMSON 1871); Fig. 3c. *nudipectus* (VIKBERG 1965; Fig. 3d. *purpureae* (CAMERON 1884); Fig. 3e. *tuberculata* (BENSON 1953).

venation pale to dark brown. Legs with coxa dark brown to black, tibia yellowish brown, tarsomeres somewhat darker. Hindtarsus nearly as long as hindtibia, hindtibia spurs unequally long and nearly straight, inner spur somewhat shorter than the half length of the basitarsus.

A b d o m e n: Completely dark brown to black coloured, sawsheath dark brown to black, cerci yellowish brown, shorter than half the length of the sheath.

S h e a t h (Fig: 2d): Unsculptured and shiny, in lateral view with curved apex, a little tapering, slightly emarginated

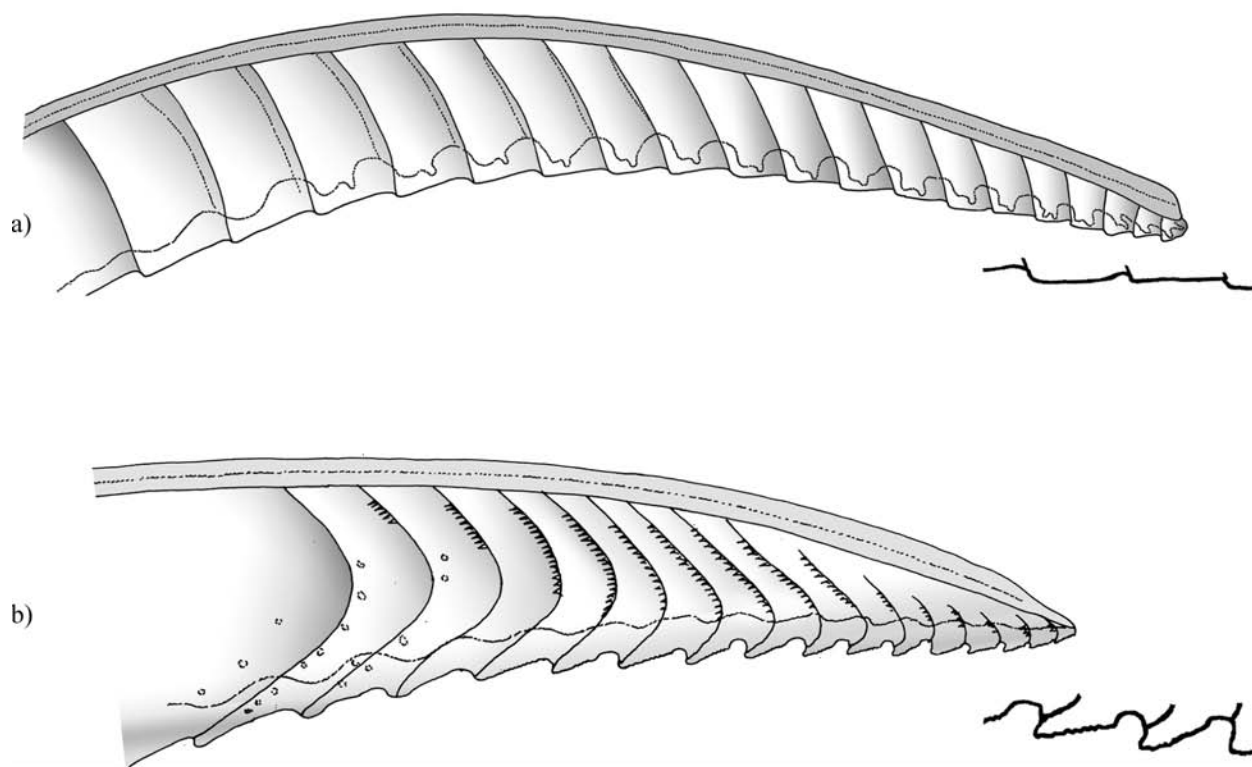


Fig. 4a–b: Saws of the European species of the *Phyllocolpa scotaspis*- and *piliserra*-groups in lateral view: Fig. 4a. *scotaspis* (FÖRSTER 1854); Fig. 4b. *piliserra* (THOMSON 1862).

on upper margin, slightly convex on lower, in dorsal view relative small and nearly triangular with lateral margin slightly angled. Proportion (KOPELKE 2007b: fig. 1a) of length “a” to maximal width “b” 2.0. Sheath hairs not widely distributed on the lateral areas, in dorsal view nearly straight.

Saw (Fig. 3d): In lateral view with aulax clearly arcuated, consisting of about 20 segments. Ctenidea very short, normally present from annulus 2. Serrulae rudimentary, cypsellae and postcalcares well developed.

♂: Microstructure and colour like ♀, antenna relative thick, somewhat longer than thorax and abdomen together. Forewing with stigma entirely dark brownish and transparent. Hypogydium black, penisvalve (Fig. 5c) in lateral view straight, the basal part usually not broadened. Spiny appendix narrow, nearly straight, basal lobe with lower edge conspicuously angled.

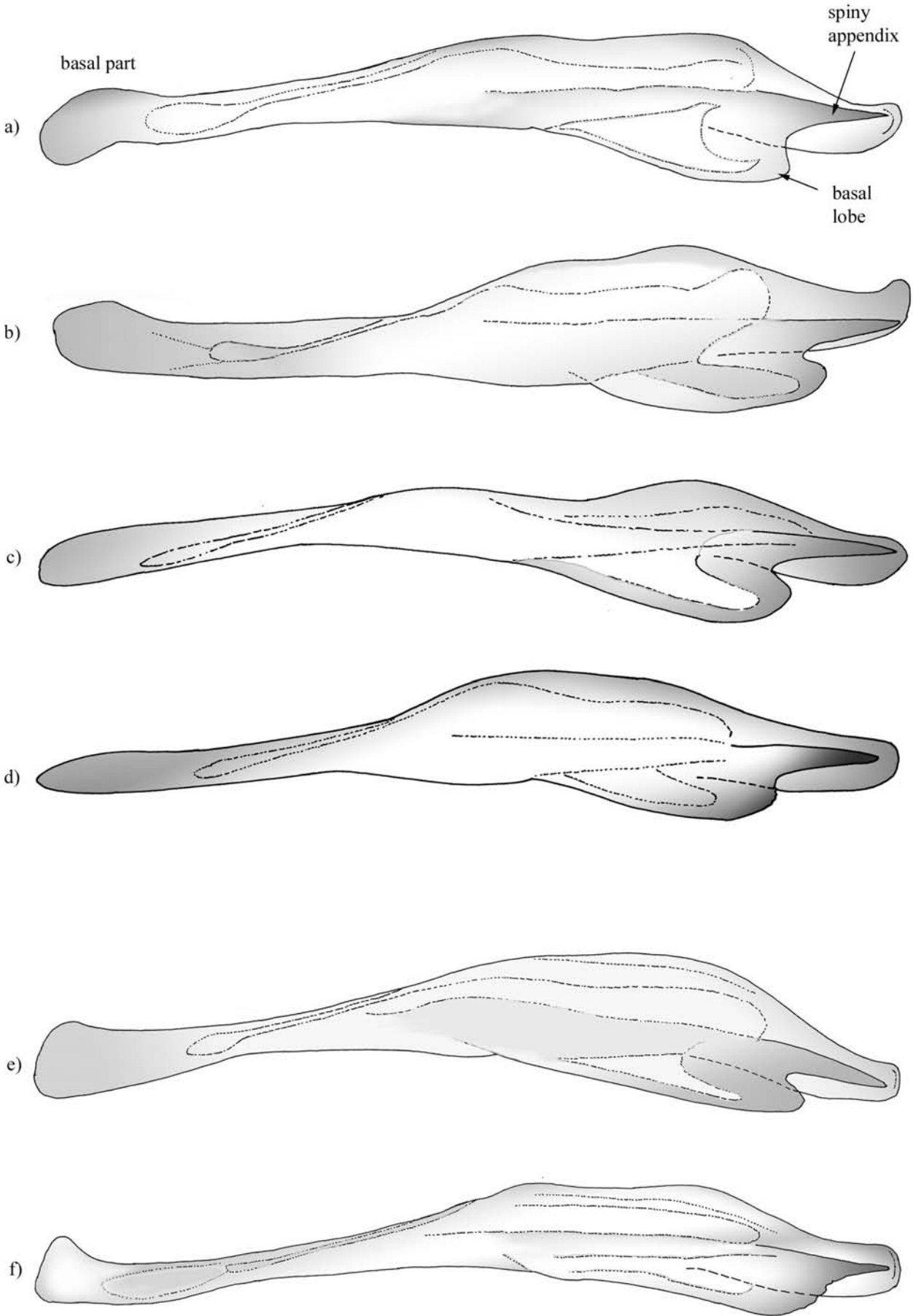
Gall (Fig. 6d): leaf roll, normally both edges of a leaf rolled down and forming a curled spiral along the longitudinal axis, creating a very small cavity for the larva. Older larvae feed on the leaf edge at the top of the gall.

Host plant: *S. purpurea* LINNAEUS 1753, belonging to the subgenus *Vetrix*, section *Helix*, growing as a medium-sized or tall shrub, sometimes up to 6–8 m tall, occurring on the banks of streams often in close proximity to the flowing water (SKVORTSOV 1999).

Distribution: Central Europe.

Comment: CAMERON (1884) described *Ph. purpureae* from material which he reared from leaf rolls on *S. purpurea*. The validity of the species was generally not doubted (CAMERON 1885, KONOW 1890, STRITT 1938, BENSON 1940b, 1958, ZIRNGIEBL 1954, LORENZ & KRAUS 1957, BENES 1968, MUCHE 1970, LISTON 1981, 1995, PSCHORN-WALCHER 1982, WEIFFENBACH 1985, URBAN 1993a, ZINOVJEV 1993c, 1998, ZHELOKHVOTSEV 1994, LACOURT 1997, 1999, TAEGER et al. 1998, ZINOVJEV & VIKBERG 1998, 1999, KOPELKE 1999, LISTON & SPÄT 2004). Only ENSLIN (1915) and DITTRICH (1924) misinterpreted *Ph. purpureae* as a junior synonym of *Ph. leucapsis* (TISCHBEIN 1846).

ENSLIN (1915) described *acuminata* from collected material and associated the species with the genus *Euura*. In the literature it was generally regarded as a valid species of the genus *Euura* (KONTUNIEMI 1960, MUCHE 1977, WEIFFENBACH 1985, ERMOLENKO 1988, LISTON 1995, TAEGER et al. 1998, LACOURT 1999). In his description ENSLIN (1915) mentioned similarities of morphological characters between *E. atra* (JURINE 1807) and *acuminata*, overlooking a typical character which separates them: the different length of the cerci. The cerci of *acuminata* extend at most over half the length of the sheath whereas in the species of the *E. atra*-group (KOPELKE 1996, 2006) the cerci extend significantly longer. Above all, the inner orbits of *acuminata* are nearly entirely pubescent



whereas in *Euura* species they are only sparsely pubescent at the margins of the eyes. KOPELKE (1999) already mentioned these differences and assumed that *acuminata* might belong to the genus *Phyllocolpa* rather than *Euura*. After all, the examination of the types has shown that *acuminata* corresponds definitely with *purpureae* in the morphological characters. Thus, *acuminata* is a junior synonym of *purpureae*.

***Phyllocolpa tuberculata* (BENSON 1953)**

Nematus (Pontania) tuberculatus BENSON (1953: 151). — Type locality: Ireland, Co. Cavan, Lough Mentis (R. C. FARIS).

Material: *Nematus (Pontania) tuberculatus* BENSON (BMNH), holotype ♀; *Pontania nudipectus* VIKBERG (ZMH), holotype ♀, paratypes 2 ♀♀, 1 ♂.

Additional material: ♀♀, ♂♂ reared from a total of 291 galls, KOPELKE leg.: Switzerland, Wallis, Nufenenpaß, Paßhöhe I (10. IX. 1995: 119). — Norway: Finnmark, S.-Varanger, Nyrod (6. VIII. 2001: 19); Nordland, Lofot, Austvagoya, Morfjord (12. VIII. 2001: 139); Troms, Lapphaugen nr. Bardu (10. VIII. 2001: 11). — Finland, Lappin, Kilpisjärvi (10. VIII. 2001: 3).

Description: ♀

Head: Frontal area with flattish and broad depression, inner orbits nearly entirely pubescent, upper head shiny and weakly pubescent, inner orbits and upper head with distinct tubercles as in fig. 1b. Antenna relative thick, nearly as long as head and thorax together. Front margin of the clypeus conspicuously incised. Colour: Face black apart from basis of mandibels and labrum brownish to dark brown, upper head and antenna black.

Thorax: Black coloured, mesonotum with distinct microsculpture, mesepisternum (Fig. 1d) nearly entirely and densely pubescent and with upper two-thirds distinctly sculptured, lower third lesser structured. Pronotum entirely black, tegulae black. Forewing with stigma transparent and unicoloured, light yellowish brown, wing venation pale to dark brown. Legs with coxa dark brown to black, tibia and tarsomeres yellowish brown. Hindtarsus shorter than hindtibia, hindtibia spurs unequally long and nearly straight, inner spur somewhat shorter than the half length of the basitarsus.

Abdomen: Completely dark brown to black coloured, sawsheath dark brown to black, cerci light brown, extending at most half the length of the sheath.

Sheath (Fig. 2e): Unsculptured and shiny, in lateral view with curved apex, not tapering, straight on upper margin, clearly konvex on lower, in dorsal view nearly triangular with lateral margin slightly angled. Proportion (KOPELKE 2007b: fig. 1a) of length “a” to maximal width

“b” approximately 1.1. Sheath hairs not widely distributed on the lateral areas, in dorsal view clearly curled.

Saw (Fig. 3e): In lateral view with aulax slightly S-shaped, consisting of about 21 segments. Ctenidea very short, normally present from annulus 2. Serrulae, cypselae, and postcalcares hardly developed.

♂: Microstructure and colour like ♀, antenna longer than thorax and abdomen together. Forewing with stigma entirely pale brownish and transparent. Hypogydium dark brown, penisvalve (Fig. 5d) in lateral view straight, the basal part usually not broadened. Spiny appendix narrow, nearly straight, basal lobe with lower edge normally homogeneously rounded.

Gall (Fig. 6b): Leaf roll, normally one edge of a leaf rolled down, creating a very small cavity for the larva, sometimes two rolls per leaf present. Older larvae do not leave their gall for feeding on the leaf edge.

Hostplant: *S. hastata* LINNAEUS 1753, belonging to the subgenus *Vetrix*, section *Hastatae*. A shrub up to 1.5 m, occurring on banks of streams, meadows, depressions and small mountain valleys. Common in the forest-tundra belt and subalpine zone of northern mountains, alpine zone of the Alps, Pyrenees, French Massiv Central, and Apennines (SKVORTSOV 1999).

Distribution: Northern and Central Europe, locally occurring in high densities.

Comment: BENSON (1953) described *tuberculata* from collected material and already pointed at the close relationship to *joergenseni*. *Ph. tuberculata* is generally regarded as a valid species which, however, was often attributed to a wrong willow species (*S. atrocinerea*: BENSON 1953, 1954, BENES 1968; *S. phylicifolia*: BENANDER 1969, ZINOVJEV & VIKBERG 1999; *aurita*: MUCHE 1970, 1976) and/or spectrum of willow species (VIKBERG 1970, SCHEDL 1976, SPOONER 1991, ZINOVJEV 1993c, ZHELOKHVOTSEV 1994, LISTON 1995, TAEGER et al. 1998), misleadingly assuming that *tuberculata* is able to attack several hostplant species. VIKBERG (1970: 12) made an oviposition experiment on *S. phylicifolia* with a female which he regard as *tuberculata*. He was surprised that “galls similar to those of *P. nudipectus* developed” and, above all, he referred to similar galls on *S. hastata*, attributing them also to *tuberculata*. In the present study *tuberculata* could be reared only from leaf rolls (Fig. 6b) on *S. hastata* and never from galls, forming a curled spiral along the longitudinal axis as it is made by *nudipectus* on *S. phylicifolia* (Fig. 6c). Thus, VIKBERG’s *tuberculata* attributed to curled spiral-galls on *S. phylicifolia* is apparently misidentified and belongs more likely to *nudipectus*. The examination of the types has shown that the holotype of *tuberculata* (not examined by ZI-

Figs. 5a–f: Penisvalves of the European species of the *Phyllocolpa crassispina*- (a–d), *scotaspis*- (e), and *piliserra*-group (f) in lateral view: Fig. 5a. *anomalopecta* (FÖRSTER 1854); Fig. 5b. *nudipectus* (VIKBERG 1965); Fig. 5c. *purpureae* (CAMERON 1884); Fig. 5d. *tuberculata* (BENSON 1953); Fig. 5e. *scotaspis* (FÖRSTER 1854); Fig. 5f. *piliserra* (THOMSON 1862).

Tab. 2: *Salix* spp. (systematic arrangement according to SKVORTSOV 1999) hostplants and *Phyllocolpa* spp. in Europe with reference to the species-groups and gall-types. Note: some *Salix* spp. harbour two different *Phyllocolpa* species, each one belonging to a different species-group and inducing a different gall-type, whereas some *Phyllocolpa*-species are able to attack more than a single hostplant species.

<i>Salix</i> spp.	<i>Phyllocolpa</i> spp.	Species group within <i>Phyllocolpa</i>	Gall-type
Subgenus <i>Salix</i>			
Section <i>Pentandrae</i>			
<i>pentandra</i> LINNAEUS 1753	<i>carinifrons</i> (BENSON 1940)	<i>leucosticta</i>	fold
Section <i>Salix</i>			
<i>alba</i> LINNAEUS 1753			
<i>fragilis</i> LINNAEUS 1753 × <i>rubens</i> SCHRANK 1789	<i>oblita</i> (SERVILLE 1823)	<i>leucosticta</i>	fold
Subgenus <i>Chamaetia</i>			
Section <i>Chamaetia</i>			
? <i>reticulata</i> LINNAEUS 1753	<i>kopelkei</i> (LACOURT 1996)	<i>leucosticta</i>	fold
Section <i>Retusae</i>			
? <i>retusa</i> LINNAEUS 1763			
Section <i>Glaucæ</i>			
<i>glaucæ</i> LINNAEUS 1753			
<i>glauco-sericea</i> FLODERUS 1943	<i>plicaglaucæ</i> KOPELKE 2007	<i>leucosticta</i>	fold
? <i>glaucæ</i> LINNAEUS 1753	<i>crassispina</i> (THOMSON 1871)	<i>crassispina</i>	roll
Subgenus <i>Vetrix</i>			
Section <i>Hastatae</i>			
<i>hastata</i> LINNAEUS 1753	<i>rolleri</i> LISTON 2005 <i>tuberculata</i> (BENSON 1953)	<i>leucapsis</i> <i>crassispina</i>	twisted roll roll
Section <i>Nigricantes</i>			
<i>mielichhoferi</i> SAUTER 1849 <i>mysinifolia</i> SALISBURY 1796	<i>ischnocera</i> (THOMSON 1862)	<i>leucosticta</i>	fold
Section <i>Vetrix</i>			
<i>appendiculata</i> VILLARS 1789	<i>pschornwalcheri</i> KOPELKE 2007 <i>spirappendiculata</i> KOPELKE 2007	<i>leucosticta</i> <i>leucapsis</i>	fold twisted roll
<i>caprea</i> LINNAEUS 1753	<i>anomaloptera</i> (FÖRSTER 1854) <i>leucosticta</i> (HARTIG 1837)	<i>crassispina</i> <i>leucosticta</i>	roll fold
<i>cinerea</i> LINNAEUS 1753	<i>leucapsis</i> (TISCHBEIN 1846) <i>prussica</i> (ZADDACH 1883)	<i>leucapsis</i> <i>leucosticta</i>	twisted roll fold
<i>aurita</i> LINNAEUS 1753	<i>alienata</i> (FÖRSTER 1854) <i>erythro-pyga</i> (FÖRSTER 1854)	<i>leucapsis</i> <i>leucosticta</i>	twisted roll fold
Section <i>Arbuscella</i>			
<i>phyllicifolia</i> LINNAEUS 1753	<i>nudipectus</i> (VIKBERG 1965) <i>plicaphyllicifolia</i> KOPELKE 2007	<i>crassispina</i> <i>leucosticta</i>	curled roll fold
Section <i>Vimen</i>			
<i>viminalis</i> LINNAEUS 1753	<i>piliserra</i> (THOMSON 1862) <i>scotaspis</i> (FÖRSTER 1854)	<i>piliserra</i> <i>scotaspis</i>	roll? roll
Section <i>Villosae</i>			
<i>lapponum</i> LINNAEUS 1753	<i>acutiserra</i> (LINDQUIST 1948) <i>plicalapponum</i> KOPELKE 2007	<i>leucapsis</i> <i>leucosticta</i>	twisted roll fold
<i>helvetica</i> VILLARS 1789	<i>spirhelvetica</i> KOPELKE 2007	<i>leucapsis</i>	twisted roll
Section <i>Daphnella</i>			
<i>daphnoides</i> VILLARS 1789 ? <i>acutifolia</i> WILLDENOW 1806	<i>plicadaphnoides</i> KOPELKE 2007	<i>leucosticta</i>	fold
Section <i>Helix</i>			
<i>purpurea</i> LINNAEUS 1753	<i>polita</i> (ZADDACH 1883) <i>purpureae</i> (CAMERON 1884)	<i>leucosticta</i> <i>crassispina</i>	fold curled roll

NOVJEV & VIKBERG 1999: 292) corresponds definitely in the morphological characters with material reared from the leaf rolls on *S. hastata*. (Note: VIKBERG also wrongly described that the female laid 1–4 eggs per leaf of *S. phyllicifolia*. The present author could never find ovipositing females of the genus *Phyllocolpa* which deposit more than one egg per leaf. The oviposition behavior of several species of the genera *Euura*, *Pontania*, and *Phyllocolpa* was studied and documented by shootings and pictures which is planned to be published in a separate paper. Moreover, in thousands of dissected leaf folds always only one larva per leaf was found.)

Phyllocolpa scotaspis-group

Phyllocolpa scotaspis (FÖRSTER 1854)

Nematus scotaspis FÖRSTER (1854: 299). — Type locality: Germany, Aachen.

= *Nematus anglicus* CAMERON (1877: 173). — Type locality: unknown; **syn. n.**

= *Nematus nigrolineatus* CAMERON (1879: 108) (on *S. viminalis* = “wrongly recorded: *vitellina*”, see BENSON 1940), — Type locality: Severn, Gloucester; **syn. n.**

= *Pontania fibulata* KONOW (1901: 84, 133, 134). — Type locality: Moravia; **syn. n.** — A specimen from France, Nantes (7. vi. 1897), quoted in the original description as part of the type series, was not located, see KOPELKE (2007a); the type locality is restricted to Moravia by subsequent lectotype designation.

Material: *Nematus scotaspis* FÖRSTER (ZSM), lectotype ♀; *Nematus anglicus* CAMERON (BMNH), lectotype ♀; *Nematus nigrolineatus* CAMERON (BMNH), lectotype ♀; *Pontania fibulata* KONOW (DEI), lectotype ♀, paralectotype ♂ (all lectotypes designated by KOPELKE 2007a).

Additional material: ♂♂, ♀♀ reared from a total of 4637 galls, KOPELKE leg.: Germany, Mecklenburg-Western Pomerania: Rügen, Bergen, Nonnenweiher (22. vii. 2005: 104), Rügen, Stedar (17. vii. 2005: 113), Baden-Württemberg: Hartheim (6. vii. 1999: 43; 8. vii. 1999: 104, 17. vii. 2000: 466, 4. ix. 2000: 91, 5. ix. 2000: 94, 15. vii. 2004: 182); Honau (19. vii. 2000: 233, 7. ix. 2000: 93); Hesse: Griesheim nr. Darmstadt (24. vii. 1984: 10); Hanau, Steinheim (3. vii. 1995: 21, 4. vii. 1995: 21); Kilianstätten (18. vii. 1996: 114; 9. vii. 1997: 143; 12. vii. 1998: 250; 16. vi. 2002: 193); Wetterau, Ortenberg I (4. vii. 1995: 5; 18. vii. 1996: 7); Ortenberg II (18. vii. 1996: 99); Ortenberg III (4. vii. 1995: 74); Wetterau, Heldenbergen (18. vii. 1996: 61); Nordrhein-Westfalen: Grietherbusch/Dornick (29. vi. 1999: 12, 30. vi. 1999: 114); Urdenbacher Kempe (1. vii. 1999: 355); Schleswig-Holstein: Kiel, Dietrichsdorf (29. vi. 2002: 237; 21. viii. 2003: 242, 26. vii. 2004: 197). — Austria, Lower Austria: Waldverchs, ALTENHOFER leg. (14. vii. 2003: 233). — Switzerland, Thurgau: Neuwilten, Bommer Weiher (15. vi. 2005: 48); Weinfeldten, Thur (14. vi. 2005: 199). — Lithuania: Jurbarkas (5. viii. 2006: 102), Kiduliai nr. Jurbarkas (7. viii. 2006: 62), Raudone (10. viii. 2006: 56).

Description: ♀

Head: Frontal area with deep and broad depression, inner orbits entirely pubescent, upper head shiny and

weakly pubescent, with slight microsculpture. Antenna relative thin, somewhat longer than head and thorax together. Front margin of the clypeus conspicuously incised. Colour: Face black apart from basis of mandibels, labrum, clypeus, and supraclypeal area yellowish to brownish, upper head black with hind orbits slightly gleaming brownish, antenna dark brown to black.

Thorax: Black coloured and shiny, mesonotum with slight microsculpture between punctures, mesepisternum unsculptured, with upper two-thirds densely pubescent, lower third nearly glabrous. Pronotum black, with lateral angles largely yellowish, tegulae yellowish to whitish. Forewing with stigma transparent and brownish, basal half paler, wing venation pale to dark brown. Legs with coxa dark brown to black, tibia and tarsomeres yellowish brown. Hindtarsus somewhat shorter than hindtibia, hindtibia spurs unequally long and nearly straight, inner spur shorter than the half length of the basitarsus.

Abdomen: Completely dark brown to black coloured, sawsheath black, cerci yellowish to dark brown and long, extending more than half of the sheath length.

Sheath (Fig. 2f): Unsculptured and shiny, in lateral view acuminate and sharply pointed, straight on upper as well as on lower margin, in dorsal view nearly triangular with lateral margin slightly angled. Sheath hairs widely distributed on the lateral areas, in dorsal view slightly curled.

Saw (Fig. 4a): In lateral view with aulax clearly arcuated, consisting of about 20 segments. Ctenidea and Serulae missing, cypsellae and postcalcares rudimentary.

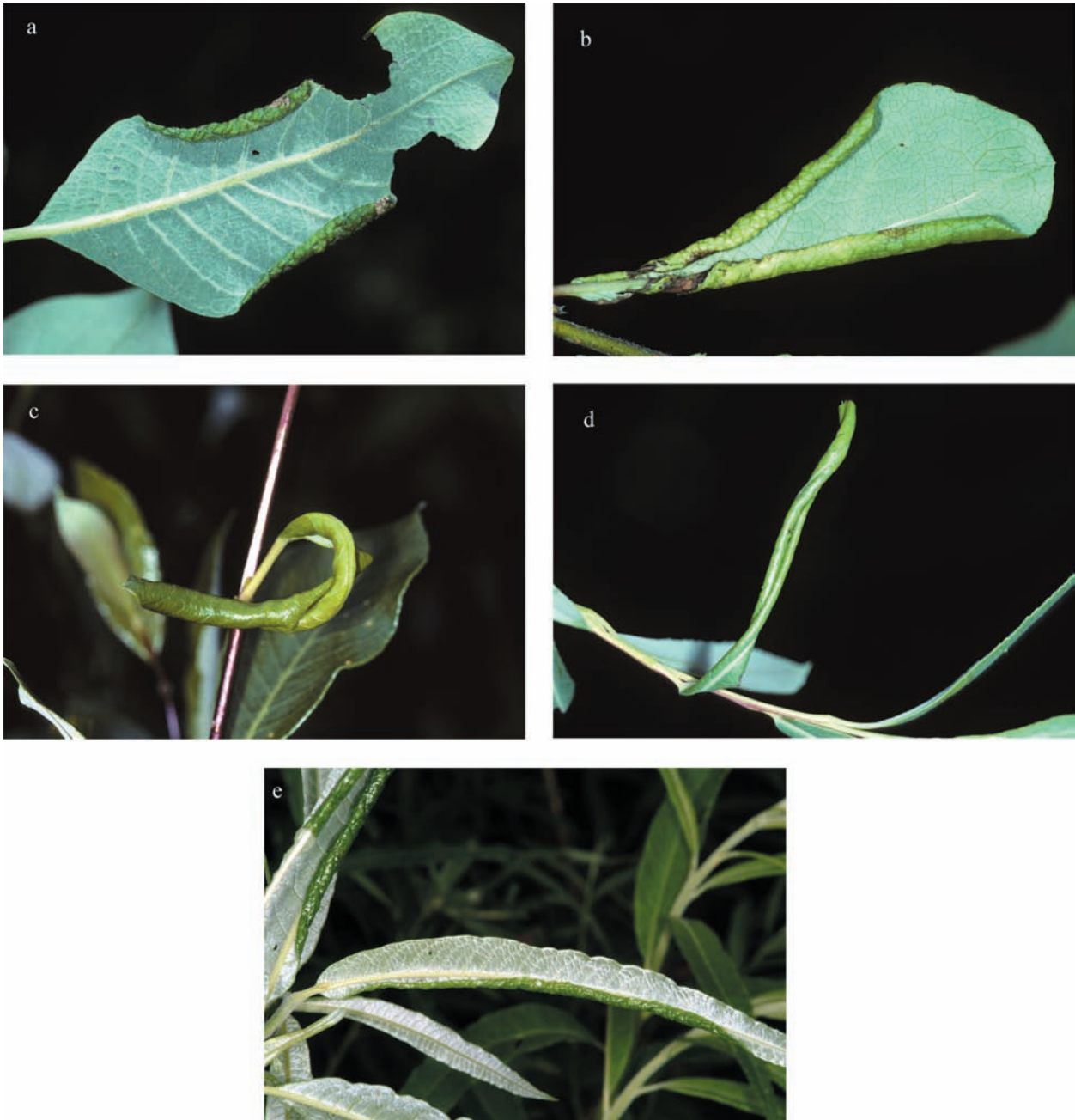
♂: Microstructure and colour like ♀, antenna longer than thorax and abdomen together. Forewing with stigma entirely brownish and transparent. Hypopygium dark brown to black, penisvalve (Fig. 5e) in lateral view straight, the basal part slightly broadened. Spiny appendix narrow and slightly arcuated, basal lobe with lower edge conspicuously angled.

Gall (Fig. 6e): Leaf roll, normally both edges of a leaf rolled down, creating a very small cavity for the larva.

Hostplant: *S. viminalis* LINNAEUS 1753, belonging to the subgenus *Vetrix*, section *Vetrix*, growing up to 12–14 m, sometimes with a shrubby habit and occurring on well-drained soils as well as a vast variety of secondary postforest habitats, however, avoiding wet soils (SKVORTSOV 1999).

Distribution: Northern and Central Europe, locally occurring in high densities.

Comment: In the literature there is some confusion about the taxonomical status of various species attributed to *S. viminalis*. FÖRSTER (1854) described *Nematus scotaspis* from material which was collected next to Aachen, the hostplant was unknown to him. In the literature *scotaspis* is generally attributed to *S. viminalis* (JÖRGENSEN 1906, ENSLIN 1916, DITTRICH 1924, BEN-



Figs. 6a–e: Galls of the European species of the *Phyllocolpa crassispina*- (a–d) and *scotaspis*-group (e): Fig. 6a. *anomalopecta* (FÖRSTER 1854) on *S. caprea* LINNAEUS 1753; Fig. 6b. *tuberculata* (BENSON 1953) on *S. hastata* LINNAEUS 1753; Fig. 6c. *nudipectus* (VIKBERG 1965) on *S. phylicifolia* LINNAEUS 1753; Fig. 6d. *purpureae* (CAMERON 1884) on *S. purpurea* LINNAEUS 1753; Fig. 6e. *scotaspis* (FÖRSTER 1854) on *S. viminalis* LINNAEUS 1753.

SON 1940b, 1958, LORENZ & KRAUS 1957, BENES 1968, BENANDER 1969, MUCHE 1970, ZHELOKHOVTSEV 1994, LISTON 1995, TAEGER et al. 1998, LACOURT 1999, KOPELKE 2003), which could be confirmed by the present study. Moreover, *fibulata* (KONOW 1901) was also regarded as a valid species (ENSLIN 1915, WEIFFENBACH 1962, MUCHE 1970, LACOURT 1999) just like *anglica* (CAMERON 1877) (BENSON 1940, 1941, 1958, BENES 1968, BENANDER 1969, MUCHE 1970, ZHELOKHOVTSEV 1994, LISTON 1995, ZINOVJEV 1998, LACOURT 1999) which was also attributed to *S. viminalis*. Above all, CAMERON (1879) described

nigrolineatus from *S. viminalis* which some authors already regarded as a junior synonym of *anglica* (BENSON 1940b, 1958, MUCHE 1970, SPOONER 1991, LACOURT 1999). The examination of the types and reared material has shown that *fibulata*, *anglica*, and *nigrolineatus* correspond definitely in the morphological characters with *scotaspis*, thus, they are regarded in this paper as junior synonyms of *scotaspis*.

N. westermanni THOMSON 1862 was generally regarded as a synonym of *scotaspis* (KONOW 1890, 1901, JÖRGENSEN 1906a, ENSLIN 1915, 1916, DITTRICH 1924,

LINDQUIST 1954, LACOURT 1999). However, the potential willow-host *S. viminalis* is not naturally distributed at the locus typicus of *westermanni*. Besides, the examination of the types has shown that *westermanni* does not correspond to *scotaspis* in different morphological characters (e.g., colour, shape of the saw). Thus, *westermanni* is regarded as a separate species, not belonging to a species-group of *Phyllocolpa*.

LACOURT (1999) attributed *Ph. scotaspis* to the *leucoticta*-group. However, the morphological characters especially of the sheath and the saw (it is the only species of the genus with ctenidea and serrulae missing) do not closely resemble those of any other species of *Phyllocolpa*. According to the apparently isolated status of this species the monotypic *scotaspis*-group is established here.

Phyllocolpa piliserra-group

Phyllocolpa piliserra (THOMSON 1862)

Nematus piliserra THOMSON (1862: 616). — Type locality: Sweden, Skane, Arrie.

= *Pontania piliserra* var. *mascula* ENSLIN (1915: 344). — Type locality: unknown.

= *Pontania piliserra* var. *tristis* ENSLIN (1915: 344). — Type locality: unknown.

M a t e r i a l: *Nematus piliserra* THOMSON (ZML), lectotype ♀, paralectotypes 2 ♀♀; *Nematus westermanni* THOMSON 1862, lectotype ♀, paralectotypes 6 ♀♀, 3 ♂♂ (ZML); *Nematus xanthogaster* FÖRSTER (ZSM), lectotype ♂, paralectotypes 2 ♂♂ (all lectotypes designated by KOPELKE 2007a); *Nematus bipartitus* SERVILE (MRSN), paralectotype fragment (after designation by BLANK & TAEGER 1998).

A d d i t i o n a l m a t e r i a l: ♀♀, ♂♂, reared from galls on *Salix viminalis*: Germany, Baden-Württemberg: Hartheim (galls leg. 23. IX. 1999: 2 ♀♀, 2 ♂♂, KOPELKE). — Austria, Lower Austria: nr. Zwettl, ALTENHOFER (galls leg. 14. VII. 2003: 233).

Description: ♀

H e a d: Frontal area with deep and broad depression, inner orbits nearly entirely pubescent, upper head shiny and weakly pubescent, upper head slightly sculptured between indistinct punctures. Antenna thin, clearly longer than head and thorax together. Front margin of the clypeus conspicuously incised. Colour: Face yellowish, upper head yellowish apart from patch covering frontal and post-ocellar areas, antenna dark brown.

T h o r a x: Mesonotum black coloured and shiny, with microsculpture between slight punctures, mesepisternum yellowish with dark brown strip on lower part, upper two-thirds densely pubescent and nearly unsculptured, lower third nearly glabrous. Pronotum with lateral angles entirely yellowish, median part dark brown, tegulae yellowish. Forewing with stigma transparent and unicoloured light yellowish brown, wing venation dark brown. Legs with coxa, tibia and tarsomeres yellowish. Hindtarsus significantly shorter than hindtibia, hindtibia spurs unequally long and nearly straight, inner spur shorter than the half length of the basitarsus.

A b d o m e n: Entirely yellowish apart from the first tergites median dark brown, sawsheath dark brown, cerci yellowish brown and rather long, extending significantly more than half the length of the sheath.

Sheath (Fig. 2g): Nearly unsculptured and shiny, in lateral view slightly acuminate, convex on upper as well on lower margin, in dorsal view bulbous with lateral margin narrowing sharply near apex. Sheath hairs long, not widely distributed on the lateral areas, in dorsal view clearly curled.

S a w (Fig. 4b): In lateral view the basal part widish, with aulax slightly arcuated, consisting of about 17 segments. Ctenidea very short, normally present from annulus 2. Serrulae rudimentary, cypsellae and postcalcares well developed.

♂: Microstructure and colour like ♀, antenna relative thick, longer than thorax and abdomen together. Forewing with stigma transparent and unicoloured light yellowish brown. Hypogydium yellowish, penisvalve (Fig. 5f) in lateral view straight, the basal part usually not broadened. Spiny appendix narrow and straight, basal lobe with lower edge sometimes ripple-shaped.

G a l l: Both, *Ph. piliserra* and *Ph. scotaspis*, are generally reported as producers of rolled leaf edges on *S. viminalis* (BENSON 1958), hints to clear differences between these species in the shape of the galls are not given so far.

H o s t p l a n t: *S. viminalis* LINNAEUS 1753, belonging to the subgenus *Vetrix*, section *Vimen*, growing up to 12–14 m, a tall shrub or multi-stemmed tree, occurring on river banks, in areas of sufficient moisture on sandy soil, primarily along large rivers with wide valleys (SKVORTSOV 1999). Note: *S. viminalis* is not naturally distributed at the locus typicus of *piliserra*; possibly *piliserra* was collected from cultivated plants.

D i s t r i b u t i o n: Northern and Central Europe, locally occurring in high densities.

C o m m e n t: THOMSON (1862) described *piliserra* from material collected in the region Skane in South Sweden; a hostplant was not mentioned. The species is generally regarded as a leaf roller on *S. viminalis* (ENSLIN 1915, 1916, DITTRICH 1924, BENSON 1940b, 1958, LORENZ & KRAUS 1957, BENES 1968, MUCHE 1970, URBAN 1993a, ZHELOKHOVTSEV 1994, LISTON 1995, TAEGER et al. 1998, ZINOVJEV 1998, ZINOVJEV & VIKBERG 1999, KOPELKE 1999, 2003, LACOURT 1999) which was cultivated in South Sweden since 1750 (JONSELL 2000). Above all, some authors misattributed *piliserra* also to the willow hosts *S. aurita* and *S. cinerea* (JÖRGENSEN 1906) and/or *S. purpurea* (WEIFFENBACH 1985).

Nematus xanthogaster (FÖRSTER 1854) was generally regarded as a synonym of *piliserra* (ENSLIN 1915, 1916, DITTRICH 1924, BENSON 1958, SCOBIOLO-PALADE 1981, LACOURT 1999), however, this synonymy cannot be confirmed by me due to significant differences in the micro-

sculpture especially on the upper head and mesonotum of the types.

JÖRGENSEN (1906) regarded *Nematus bipartitus* SERVILLE 1823 as a synonym of *piliserra*. However, the type material is in very poor condition (see BLANK & TAEGER 1998: 165) and does not allow to fix the the status of this species without doubt.

According to BENES (1968) and ZINOVJEV (1993b), a gall of *piliserra* could harbour up to eight larvae. However, this requires confirmation because a gregarious development of the larvae was never found by me in more than 4600 dissected galls, collected from *S. viminalis* at several European localities. Surprisingly, within a sample only few adults of *Ph. piliserra* emerge among lots of specimens of *Ph. scotaspis*, which appears to be the apparently regular leaf-roller on *S. viminalis*. Similar findings resulted from ALTENHOFER's rearings.

Moreover, there are great differences in the morphological characters between *piliserra* and species of other *Phyllocolpa* species-groups. ZINOVJEV & VIKBERG (1999) assumed that the ability to make leaf-rolls might have arisen independently also in other groups of *Phyllocolpa*. According to the isolated status of *piliserra* within the genus, VIKBERG (1982) suggested that it perhaps requires a genus of its own. ZINOVJEV & VIKBERG (1999: 284) mentioned that the shape of the sheath and characters of

the lamnium are similar to species of *Euura*. This, however, can not be confirmed by me (see illustrations of the morphological characters of *Euura*-species in KOPELKE 1996, 2001, 2006, differing distinctly from *piliserra*). The shape of the saw of *piliserra* does more likely resemble a species of a free-feeding nematine genus.

Thus, further studies are necessary to assess the question whether *Ph. piliserra* and *Ph. scotaspis* really induce the same gall-type on *S. viminalis*. According to my studies it appears quite dubious that different gall forming species would be able to produce identical gall-types on the same willow host. Several examples show that different species of a genus always produce different gall-types on the same hostplant, i.e. *Pontania virilis* ZIRNGIEBL 1955, *P. vesicator* (BREMI 1848), and *P. viminalis* (LINNAEUS 1758) that induce different gall-types on *Salix purpurea* (KOPELKE 1999). The species pairs *Phyllocolpa prussica* (ZADDACH 1883) and *Ph. leucapsis* (TISCHBEIN 1846), living on *Salix cinerea* LINNAEUS 1753, as well as *Ph. erythropyga* (FÖRSTER 1854) and *Ph. alienata* (FÖRSTER 1854), living on *Salix aurita* LINNAEUS 1753, were also reared from different gall-types on the same hostplant species (Tab. 2). Thus, different gall-making species which live on the same hostplant species in Europe evidently always produce different gall-types and belong to different species-groups (KOPELKE 2007a, 2007b).

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