

REVISION OF THE EUROPEAN SPECIES OF *BELYTA* JURINE

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Abstract. In this study the genus *Belyta* JURINE in Europe is redefined, the history of its classification briefly reviewed and 16 species recognized as valid are keyed out. Each species is introduced with its full synonymy, most of which results from the present study based on the examination of relevant type specimens. Two new species are described as new: *Belyta norica* and *Belyta nixonii* spp. n. The status of *Belyta borealis* is redefined. As a result of the study of intraspecific variation, types and a rich material from Europe, the following synonymy is proposed. *Tetrapsilus* KIEFFER and *Paraclista* KIEFFER are confirmed as junior synonyms of *Belyta*. Many new synonyms are recognized in the species-subspecies category: under *B. abrupta* THOMSON: *B. alticeps* KIEFFER; under *B. depressa* THOMSON: *Aclista areolata* KIEFFER, *B. bidentata* KIEFFER, *B. comitans* MASI, *B. hamata* KIEFFER with var. *carinula* KIEFFER, *B. lativentris* CAMERON, *B. nigriventris* THOMSON, *B. pedestris* KIEFFER, *B. quadrispinosa* KIEFFER, *B. rufa* KIEFFER and *B. tripartita* KIEFFER; under *B. elongata* THOMSON: *Paraclista carinifrons* KIEFFER; under *B. rugosicollis* KIEFFER: *B. brevinervis* KIEFFER, *B. gaullei* KIEFFER and *B. dorsalis* var. *thomsoni* KIEFFER; under *B. sanguinolenta* NEES: *B. arcuata* KIEFFER, *Pantoclis arcuata* KIEFFER, *P. arcuata* var. *festiva* KIEFFER, *P. atra* KIEFFER, *P. atristilus* KIEFFER, *Belyta brachyptera* THOMSON, *B. brachyptera* var. *halterata* THOMSON and var. *nervosa* KIEFFER, *B. crassinervis* KIEFFER with var. *scotica* KIEFFER, *B. dorsalis* THOMSON, *Pantoclis levistylus* KIEFFER, *P. longicollis* KIEFFER, *P. longifrons* KIEFFER, *B. longistilus* KIEFFER, *B. lubrica* KIEFFER, *B. marginalis* KIEFFER, *Leptorhaptus marginalis* KIEFFER, *Belyta mullensis* CAMERON, *Paraclista oriplana* KIEFFER, *Belyta peraffinis* KIEFFER, *Paraclista producticeps* KIEFFER, *Pantoclis proxima* KIEFFER, *Belyta quadridens* KIEFFER with var. *festiva* KIEFFER and var. *inermis* KIEFFER, *B. sexcarinata* KIEFFER, *Xenotoma scotica* KIEFFER, *Pantoclis sulcatifrons* KIEFFER, *Paraclista sulcigera* KIEFFER, *Belyta tenuicornis* KIEFFER and *B. tenuistilus* KIEFFER; under *B. subclausa* KIEFFER: *Tetrapsilus filicornis* KIEFFER and *B. major* WALL; under *B. validicornis* THOMSON: *B. brevifrons* KIEFFER, *B. evanescens* KIEFFER, *B. sicula* KIEFFER with var. *flavipennis* KIEFFER and *B. striativentris* KIEFFER and under *B. insignis* KIEFFER: *B. cordata* WALL. New combinations include *Belyta insignis* (KIEFFER) (from *Pantoclis*) and *Belyta subclausa* (KIEFFER) (from *Aclista* nec auct.). Neotype is designated for *B. sanguinolenta* NEES and lectotypes are designated for many nominal species. Moreover, based on type revision of *Aclista holotoma* KIEFFER, the type species of *Anaclista*, this genus is synonymized with *Anommatium*, here.

■ Diapriidae, *Belyta*, Europe, revision, key, new species, new synonymies, new combinations, lectotypes and neotype designation.

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Introduction

The family Diapriidae is one of the least known groups of the European Hymenoptera parasitoids, and rather numerous in genera and species. The recent Check-list of the Czechoslovak Hymenoptera (Macek 1989) includes no less than 40 genera with 176 species. The

genus *Belyta* is one of the more speciose genera of Diapriidae, containing 91 nominal species worldwide (Johnson 1992). In the Palaearctic region 61 nominal species are recorded, the two-thirds of all species described come from Europe. The great bulk of species were described by Kieffer (1906; 1907; 1909), however most of his species are unrecognizable from the descriptions alone, there are no recent revisions of the genus, and species identification is difficult so that relatively few species are correctly identifiable using existing keys (Nixon 1957). Jurine (1807) based his *Belyta* on a single species. The following authors (Nees 1834; Zetterstedt 1840; Thomson 1859) understood the genus in a broader sense comprising all subfamily Belytinae. The genus was conceptually restricted until Kieffer (1909); his concept is, with minor corrections, followed until recently. Kieffer (1909) described in *Belyta* a great number of species the majority of which, however, are questionable. Within the scope of his Identification keys of British Diapriidae, Nixon (1957) provides a very useful study of the genus having revised the types preserved in BMNH, and adapted the nomenclature of species accordingly. This work reveals how a thorough reevaluation of previously described species is needed. Subsequently, keys of varying completeness were published for the species of Finland (Hellén 1964), Switzerland (Wall 1967), European part of USSR (Kozlov 1978) and SW-Germany (Wall 1993). Additionally, Wall (1993) reviewed briefly the nomenclatural history of genus, listed nomenclatural changes in species as well as commented on those species of unclear identity.

The purpose of this paper is to revise the European species of *Belyta* on the basis of examination of types available, further including classification, generic diagnosis, synonymy, keys to species and brief characteristics of previously described valid species.

Material and methods

The greatest source of material for this revision was collecting in the past two decades (NMPC). Therefore, the study is mostly based on fresh, clean and properly mounted material. The total number of specimens examined is approximately 5000; figures for individual species are given in the text. Primary types of the species of *Belyta* examined are indicated by asterisk in synonymy of individual species treated. Lectotypes were designated where necessary. Unless, otherwise stated type material of the new species is deposited in the NMPC. Specimens in NMPC were collected by flight-interception traps (treated with pyrethroid), pan-traps and screen sweeping. Terminology of characters as used here is that adapted from Naumann (1982). The specimens studied are either in the National Museum in Prague (NMPC), or were borrowed from the following institutions with the curator's/donor's name given in parentheses.

- BMNH - Natural History Museum, London, England (N. Fergusson)
- CNCI - Canadian National Collection of Insects, Ottawa, Canada (L. Masner)
- HNMH - Hungarian Natural History Museum, Hungary (J. Papp)
- MCSN - Museo Civico di Storia Naturale, Genova, Italy (W. Rainieri)
- MNHN - Muséum National (Histoire de Naturelle), Paris, France (J. C. Weulersse)
- MZLU - Zoological Museum, Lund, Sweden (R. Danielsson)
- NHMV - Naturhistorisches Museum, Wien, Austria (M. Fischer)
- NHRS - Museum of Natural History, Stockholm, Sweden (I. Persson)
- ZSMC - Zoologische Staatssammlung, München, Germany (H. Hilpert)
- MHNG - Museum of Natural History, Genève, Switzerland (C. Besuchet)

Genus: *Belyta* JURINE, 1807: 311

Type species: *Belyta bicolor* JURINE, by monotypy
Belita HALIDAY, 1857: 169, emendation

Balyta ASHMEAD, 1893: 366, error

Paraclista KIEFFER, 1909: 476

Type species: *Belyta brachyptera* THOMSON, 1859, designated by Kieffer, 1910: 23

Tetrapsilus KIEFFER, 1908: 367, 369

Type species: *Tetrapsilus filicornis* KIEFFER 1908, by monotypy

Definition. Small (2.0 mm) to large (5.5 mm) specimens, frequently rather uniform black to light brown with mesosoma hardly or conspicuously depressed dorsoventrally. Head hypognathous to orthognathous with antennal sockets more or less projected anterodorsally; temples of varying length, slightly converging towards occipital hole; toruli mostly margined by sharp keel posteriorly, which may be produced between toruli into median tooth; both toruli closely approximated each other, its distance much less than half diameter of each torulus; antennal socket with strong rugosity below; subantennal furrows distinct (crenulate or smooth) or reduced; genae moderately concave above level of anterior tentorial pits. Mandibles short, asymmetrical with tips slightly overlapping (if closed); mandibular base wide; inner tooth of both mandibles rather a little truncated, slightly inverted inwards; apex of right mandible bifid, that of left mandible simple, blunt. Female antennae 15-segmented with transverse to submoniliform flagellomeres of equal width; male antenna 14-segmented with cylindrical flagellomeres, the first flagellomer with variable proximal emargination. Female mesosoma broad, moderately to conspicuously flattened dorsoventrally (especially in short-winged specimens); pronotum with narrow pronotal neck; pronotal collar wide, rugose, sometimes divided by median pit in two parts; posterior keel of pronotum developed, closely attached to anterior margin of mesoscutum; epomia present or absent; pronotal shoulders rounded; sides of pronotum compressed anteriorly. Mesoscutum flat in females, rather convex in males; notauli distinct, percurrent, diverging anteriorly; tegulae large, transscutal suture distinct; single scutellar fovea of varying shape and size; lateral concavities deep, smooth; axillae distinct; mesepisternum smooth with large median depression; episternal scrobe developed; dorsellum with flat longitudinal keel. Propodeum with median keel simple or bifurcate, plicae converging posteriorly and there produced into tubercles or projections of variable length; posterior margin of propodeum straight or concave.

Wings hyaline, densely covered with microtrichia; wing margin with fringe of moderately long hairs; wings of some species subjected to considerable polymorphism expressed by continual series of macropterous to micropterous individuals; fore wings of macropterous forms with radial cell closed to open; C, Sc+R, marginalis, stigmalis, basalis and radialis in species with closed radial cell dark, tubular; remaining veins, if indicated spurious; radialis subjected to obliteration with its distal part nebulous to absent; hind wing lanceolate with distinct basal cell. In males wing venation usually more distinct.

Legs slender to stout, short to long; femur with long to indistinct femoral stalk.

Petiole cylindrical to subcylindrical, at least slightly longer than wide, on dorsal surface with longitudinal keels, or rugose.

Gaster with enlarged first segment; praepygidium composed of four and three narrow, ring-like, tightly united tergites and sternites; penultimate tergite of gaster flat, triangular, broadly rounded posteriorly; ultimate tergite of gaster of variable position to body axis; ovipositor short with flat, dark sheaths; male genitalia considerably diverse providing good specific characters (see Figs).

Taxonomic remarks. The genus was established by Jurine (1807) with single species *Belyta bicolor*. Subsequent authors (Nees 1834; Haliday 1857; Thomson 1859) interpreted the genus in a rather loose sense having included here even such species which were later placed in unrelated genera such as *Pantoclis* and *Acropiesta*. Kieffer's (1909; 1916) concept of *Belyta*, based on the structure of mesosoma, is in agreement with the present interpretation of the genus. All species (except for one) classified by Kieffer under *Belyta* belong properly to the genus *Belyta*. The flattened mesosoma, on which Kieffer based his interpretation of the genus, is still a reliable diagnostic character, but only for the females; in the males the body is generally convex. The flattened female body might be an adaptation for facultative terrestrial habits (search for hosts), in difference to the predominantly free-living activity of males. Sexual dimorphism of *Belyta* species was not precisely studied by earlier students, which resulted in descriptions of the sexes as different species, sometimes they were assigned

to the different genera (*Pantoclis*, *Xenotoma*, *Aclista*). Kieffer (1909) emphasized the structure of the median keel of propodeum as a good diagnostic character of *Belyta*. On this basis he subdivided it into two subgenera, *Belyta* s. str. with bifurcate median keel and *Paraclista* with simple median keel. *Paraclista* was subsequently (Kieffer 1916) elevated to the generic status. Unfortunately, Kieffer was unaware of the fact that the structure of the median keel of propodeum in *Belyta* is extremely variable. For example, the median keel of *B. sanguinolenta* varies from simple to bifurcate state in an intergrading series of specimens. The bifurcation of the median keel occurs also frequently in some species of *Pantolytini*. The varying median keel of propodeum in Belytinae is a good example of taxonomic overrating of an insignificant character. As a result most species classified by Kieffer under subgenus (or later genus) *Paraclista* were found to be only forms of highly polymorphic species such as *Belyta depressa* THOMSON or *Belyta sanguinolenta* NEES. The unreliability of this character was recognized already by Nixon (1957) and repeated by Wall (1967).

Differential diagnosis and relationships. The range of the morphological variation of *Belyta* makes the unambiguous delimitation of genus rather difficult. In my opinion, the genus *Belyta* is best characterized by a set of characters as follows: a) short asymmetrical mandibles with wide base and wide inner tooth inverted backwards; b) subantennal furrows percurrent, confluent with subantennal rugosity; c) body slender, rather flattened; d) head with prominent, anterodorsal antennal sockets; e) pronotum more or less cervicoid subdivided into pronotal neck and pronotal collar. The most reliable characters for definition of a genus seems me to be a) and b) being applied to all *Belyta* species as treated here excluding *Belyta pelias*, in which mandibles are of different form and subantennal sutures entirely absent. However, it would now be premature to speculate here on the position of *B. pelias* without including further, extralimital species in study. The characters c), d), e) are of minor importance in definition of genus for being subject to variation, but help us, in combination with characters a) and b), to place the species in question properly. As remarked above, from the morphological point of view, the relationships of *Belyta* are obscured and could be established only as part of a review of the phylogeny of the Belytinae as a whole. With certainty, *Belyta* is closely related to *Synbelyta* only, which, however, might only be an aberrant *Belyta*.

Distribution. Worldwide; the great bulk of species described come from Holarctics, but I became familiar with a number of undescribed species from Oriental and Neotropical regions, respectively.

Biology. Poorly known; most species have a polyvoltine life cycle for their occurrence through all seasons. The adults predominantly prefer shady, humid habitats such as forests, marshlands and backyards. In some species, the particular affinity to the specific plant formation is expressed. The hosts are unknown, but it is expected there might be soil-inhabiting nematoceran Diptera as the main hosts.

Key to species of *Belyta* in Europe.

- 1 Females 2
- Males 21
- 2(1) Wings reaching at least apex of gaster; macropterous forms 3
- Wings short, not reaching apex of gaster; brachypterous or micropterous forms 20
- 3(2) Radial cell open; when closed, radialis is nebulous 4
- Radial cell closed with radialis tubular 7
- 4(3) Entire face strongly punctate; pronotal collar small, distinct, rugose; flagellar segments quadrate with homogeneous pilosity (Fig. 34) *abrupta* THOMSON

- Entire face smooth, impunctate; pronotal collar smooth; flagellar segments transverse with heterogeneous pilosity5
- 5(4) Epomia absent; median keel of propodeum simple; marginalis two thirds as long as parastigma (Fig. 54); radialis indistinct, nebulous, parallel to anterior margin of fore wing; large species (4.5–6.0 mm) with strikingly pale anterior part of gaster *subclausa* KIEFFER
- Epomia present; medial keel of propodeum forked; marginalis at most half as long as parastigma; radialis reduced, or if indicated, then converging with anterior margin of fore wing6
- 6(5) Scutellar fovea almost semicircular (Fig. 24); dorsal surface of propodeum strongly rugose; gaster stout, ellipsoidal; base of macrotergite with dense, strong striation; stout species *validicornis* THOMSON
- Scutellar fovea transversely reniform (Fig. 23); dorsal surface of propodeum smooth, at most with fine rugosity at plicae; base of macrotergite with fine and short basal striation; slender species*depressa* THOMSON
- 7(3) Femora slender with distinct basal femoral stalk (Figs 38; 39) 8
- Femora stout, short with indistinct femoral stalk (Fig. 40) 13
- 8(7) Marginalis long, more than half as long as parastigma (Fig. 44); the posterior keel produced sharply between toruli*sanguinolenta* NEES
- Marginalis short, at most half as long as parastigma; the posterior keel of toruli even 9
- 10(9) Gaster posteriorly truncate in lateral view; its last tergite surpassed by preceding one; lateral corners of macrotergite greater than width of petiole posteriorly; gaster broad, somewhat depressed*bicolor* JURINE
- Gaster posteriorly more pointed in lateral view; its last tergite protruded behind preceding one 11
- 11(10) Flagellar segments with pubescence distinctly shorter than their width (Fig. 32); mesoscutellar fovea semicircular *rugosicollis* KIEFFER
- Flagellar segments with pubescence at least as long as their width; mesoscutellar fovea transverse 12
- 12(11) Flagellar segments cylindrical; radial cell long, sharply pointed with postmarginalis overreaching as far as the third of radial cell length (Fig. 51); hind femur with basal stalk being about as long as thickened distal part (Fig. 38) *acuta* KIEFFER
- Flagellar segments transverse (Fig. 33); radial cell shorter with postmarginalis not overreaching it; hind femur with basal stalk shorter than thickened distal part (Fig. 39) *elegans* KIEFFER
- 13(7) Anterior side of front tibia spinose; the median area of antennal sockets impressed below; lateral pronotum, from dorsal view, visible as a narrow strip flanking mesoscutum; radialis curved posteriorly 14
- Anterior side of front tibia not spinose; the median area of antennal sockets flat below; lateral pronotum, from dorsal view, not visible at all; radialis straight .. 15
- 14(13) Median keel of propodeum simple*nixoni* sp. n.
- Median keel of propodeum forked *moniliata* CAMERON
- 15(13) Radial cell short, at most as long as marginalis; flagellar segments with heterogeneous

	pilosity	16
-	Radial cell long, always longer than marginalis; flagellar segments with homogeneous pilosity	17
16(15)	Large species (4.5–5.0 mm); wing venation very pale, radial cell paler than parastigma; marginalis at most as long as half of parastigma (Fig. 56)	<i>insignis</i> KIEFFER
-	Small species (2.5–3.0 mm); wing venation dark; radial cell distinct; marginalis nearly as long as parastigma (Fig. 50)	<i>seron</i> NIXON
17(15)	Median keel forked; subantennal furrows feebly developed or absent	18
-	Median keel simple; subantennal furrows distinct	19
18(17)	Antennal sockets prominent; head in dorsal view nasiform; pronotum cervicoid; plicae of propodeum not projecting posteriorly; mandibles narrow, sharply pointed	<i>pelias</i> NIXON
-	Antennal sockets small, slightly prominent; head in dorsal view not nasiform; plicae of propodeum sharply projecting posteriorly; mandibles wide and shortly pointed	<i>boreale</i> WHITTAKER
19(17)	Petiole smooth, with four longitudinal keels	<i>elongata</i> THOMSON
-	Petiole with rugose reticulation	<i>norica</i> sp. n.
20(2)	Antennae short and stout in appearance with flagellar segments transverse; posterior keel of toruli even; gaster truncate in lateral view with last tergite in vertical position	<i>depressa</i> THOMSON
-	Antennae longer and slender in appearance with flagellar segments quadrate; posterior keel of toruli projecting sharply between them; gaster pointed in lateral view with last tergite protruded behind the preceding one	<i>sanguinolenta</i> NEES
21(1)	Radial cell more or less open; radialis reduced, or if complete, nebulous	22
-	Radial cell closed; radialis complete, tubular	24
22(21)	Epomia absent; median keel of propodeum simple; marginalis as long as two thirds of parastigma; radialis hardly indicated, parallel to fore wing margin; large species (4.5–5.0 mm) with strikingly dichromic gaster; genitalia: Fig. 18	<i>subclausa</i> KIEFFER
-	Epomia present; median keel of propodeum forked; marginalis at most half as long as parastigma; radialis reduced, or if long, then converging with fore wing margin	23
23(22)	Radial cell long (Fig. 52); the plicae of propodeum sharply projecting posteriorly; genitalia: Fig. 3	<i>validicornis</i> THOMSON
-	Radial cell short (Fig. 43); the plicae of propodeum not projecting posteriorly; genitalia: Figs 4–6	<i>depressa</i> THOMSON
24(21)	Marginalis more than half as long as parastigma	25
-	Marginalis at most half as long as parastigma	26
25(21)	Antennal pilosity dense and very short, length of the hairs much shorter than half width of flagellar segments; emargination of F1 shallow; genitalia: Fig. 2	<i>seron</i> NIXON
-	Antennal pubescence sparse, longer, the hairs as long as half width of flagellar segments; emargination of F1 deep; genitalia: Figs 10–13	<i>sanguinolenta</i> NEES
26(24)	Median area of lower side of antennal sockets impressed; radialis slightly upcurved	

- apically; antennal pilosity thin and outstanding; marginalis very short, not longer than quarter length of parastigma 27
- Median area below of antennal sockets flat; radialis straight; antennal pilosity dense, semidecumbent; marginalis longer than the quarter of parastigma 28
- 27(26)** Median keel of propodeum simple; genitalia: Fig. 9 *nixoni* sp. n.
- Median keel of propodeum forked; genitalia: Fig. 8 *moniliata* CAMERON
- 28(26)** Pronotal collar strip-like, more or less angular, steeply descending towards pronotal neck29
- Pronotal collar large, not angular, gradually descending towards pronotal neck 32
- 29(28)** Face punctate; radial cell shorter than parastigma, radialis upcurved to fore wing margin (Figs 49; 57); genitalia: Fig. 7 *abrupta* THOMSON
- Face smooth; radial cell longer than parastigma, radialis tapering to fore wing margin 30
- 30(29)** Stout species; median keel of propodeum forked; head transverse with antennal sockets slightly prominent; toruli detached each other, not margined with posterior keel; fore tibia with homogeneous pilosity; the basal striation of macrotergite distinct; petiole short, almost quadrate; genitalia: Fig. 22 *boreale* WHITTAKER
- Slender species; median keel of propodeum simple; head nasiform with antennal sockets prominent; toruli approximated each other, margined with posterior keel; fore tibia with modified bristles; the basal striation of macrotergite reduced; petiole long, cylindrical 31
- 31(30)** Petiole smooth with four longitudinal keels; flagellar segments elongated, cylindrical; genitalia: Fig. 19 *elongata* THOMSON
- Petiole with rugose reticulation; flagellar segments shortened, cylindrical; genitalia: Fig. 20 *norica* sp. n.
- 32(28)** Subantennal furrows absent; dorsal surface of propodeum pubescent; mandibles narrow, sharply pointed; genitalia: Fig. 21 *pelias* NIXON
- Subantennal furrows present; dorsal surface of propodeum bare; mandibles short, wide 33
- 33(32)** Large (4.0–4.5 mm), stout individuals; pronotal collar large; pronotum not apparently cervicoid; femora with short femoral stalk (Fig. 40); radial cell short, a little longer than marginalis; antennal pilosity dense, very short; length of hairs as long as the thirds of width of flagellar segments; genitalia: Fig. 1 *insignis* KIEFFER
- Smaller and slender individuals; pronotal collar small; pronotum cervicoid; femora slender, with long basal stalk; radial cell shorter (excl. *acuta*); antennal pilosity longer, at least as long as half of width of flagellar segments 34
- 34(33)** Radial cell very short, at most as long as parastigma (Fig. 41); genitalia: Fig. 15 ...
..... *bicolor* JURINE
- Radial cell longer than parastigma 35
- 35(34)** Pronotum very narrow, situated far below level of mesoscutum, which steeply descends anteriorly; hind femora with long basal stalk, which is about as long as the thickened distal part (Fig. 38). Very slender species with thin, cylindrical scape and slender flagellum; pronotum coarsely rugose, with no indication of shoulders; genitalia: Fig. 14 *acuta* KIEFFER

- Pronotum less narrow and not situated far below level of mesoscutum; hind femur with its stalk shorter than the thickened distal part 36
- 36(35) Scape, seen from above, with sparse, fairly long pilosity (Fig. 28); genitalia: Fig. 6 *elegans* KIEFFER
- Scape, seen from above, with dense pilosity (Fig. 30); most of hairs, especially on inner convex side of scape short; genitalia: Fig. 17 *rugosicollis* KIEFFER

Review of species

1. *Belyta bicolor* JURINE, 1807 (Figs 15; 41)

**Belyta bicolor* JURINE, 1807: 311.

Belyta longifurca KIEFFER, 1909: 500. Syn. nov.

Belyta tenuicornis; Nixon, 1957: 35, 41 (nec Kieffer 1909).

Recognition. Closely related to *Belyta elegans* and *Belyta acuta* differing from them by the truncate apex of gaster, the gastral base wider than the width of petiole and by the short radial cell. The variation analysis of Central European material indicates no variability in this species.

Taxonomic remarks. For comments on the type and synonymy see Masner (1964). I have examined the lectotype from Geneva designated by Masner (1964) and I agree with his statement as to its identity with Nixons concept of *Belyta tenuicornis*. The type of *Belyta longifurca* was not available for examination but I have little doubt on its conspecificity with *B. bicolor* based on study of the original description.

Biology. Host unknown; flight period VI - IX; collecting data indicate that *B. bicolor* is a thermophilous species associated with oak formations.

Distribution. England, Sweden, Germany, Switzerland, Czech Republic, Hungary.

Material examined. Types: *Belyta bicolor*, 32, lectotype (designated by Masner 1964), female, (Jurine, MNHG). Further material: Czech Republic (30 specimens).

2. *Belyta acuta* KIEFFER, 1909 (Figs 14; 38; 51)

**Belyta acuta* KIEFFER, 1909: 510.

Belyta lubrica; NIXON, 1957: 41 (nec Kieffer 1909).

Recognition. This species has been known only from male sex; the female has been found recently and here associated properly (see key above). *B. acuta* is closely related to *B. elegans* but differs from it as follow: i) slender habitus; ii) scutellar fovea large and transverse; iii) legs long with slender femora having long femoral stalk; iv) long, slender petiole; v) radial cell long, narrow, sharply pointed apically; vi) pronotum narrow, cervicoidal, situated far below the mesoscutum which descends very steeply to it.

Taxonomic remarks. Nixon (1957) without examining the types synonymized incorrectly *B. acuta* with *B. elegans*. He also misinterpreted *B. lubrica* which is, in reality conspecific with *B. sanguinolenta*. The above synonymy is proposed after the examination of the relevant type material.

Distribution. Very rare species with scattered collecting data from Italy, Austria, Germany, Slovakia and Czech Republic.

Material examined. Types: *B. acuta*, Switzerland, Vall d' Illicz, lectotype (present designation), male, (de Gaulle, MNHN). Further material: Czech Republic (6), Slovakia (4), Germany (2), Austria (1).

3. *Belyta elegans* KIEFFER, 1909

(Figs 16; 28; 33; 39)

**Belyta elegans* KIEFFER, 1909: 504.

**Belyta atriceps* KIEFFER, 1909: 502. Syn. nov.

**Pantoclis pallidipes* KIEFFER, 1909: 554. Syn. nov.

**Aclista silvicola* SZABÓ, 1977: 71–79. Syn. nov.

Recognition. This species is closely related to *B. bicolor* but differs from it as follows: i) temples covered with long, outstanding pubescence; ii) posterior margin of propodeum straight, lateral keels projecting into short tubercles posteriorly, iii) radial cell sharply pointed apically, distinctly longer than the marginalis; iv) anterior furrow of macrotergite short without lateral depressions; v) gaster anteriorly not wider than petiole; vi) apical tergite surpassing the praepical tergite.

Variation. Range of variation very slight.

Distribution. All over Europe, apparently associated with temperate deciduous forests.

Material examined. Types: *B. elegans*, France, St. Cloud (nr. Paris), lectotype (present designation), female, (de Gaulle, MNHN Paris); *B. atriceps*, Croatia, Gospic, 21.vii., lectotype (present designation), male (Kieffer, MNHN Paris); *Pantoclis pallidipes*, Hungary, Sátoraljaújhely, 14.viii. 1892, lectotype (present designation), male (Szepligeti, HNMH Budapest); *Aclista silvicola*, Hungary, Répashuta, 1.viii. 1970, holotype, male (Szabó, HNMH Budapest). Further material: Czech Republic (158), Germany (14), Sweden (8).

4. *Belyta rugosicollis* KIEFFER, 1909

(Figs 17; 25; 30; 32; 55)

**Belyta rugosicollis* KIEFFER, 1909: 490.

**Belyta dorsalis* var. *thomsoni* KIEFFER, 1909: 507. Syn. nov.

**Belyta brevinervis* KIEFFER, 1909: 508. Syn. nov.

**Belyta gaullei* KIEFFER, 1909: 503. Syn. nov.

Recognition. Based on the structure of male genitalia *B. rugosicollis* forms together with the previously mentioned species *B. elegans*, *B. bicolor* and *B. acuta* a complex of closely related species. It differs from all the allied species by shorter flagellar pilosity, the length of which does not surpass the width of the flagellar segments and in the structure of digitus of the male genitalia, which bears three spines. *B. rugosicollis* exhibits considerable intraspecific variability, which is apparent especially in the following characters: i) the body colour varies from pale brown to blackish brown, with gaster regularly paler; ii) female flagellar segments vary from transverse to elongate; iii) the emargination of the F1 from very shallow and indistinct to deep, slightly arched. The form with slight emargination of F1 was described as *B. brevinervis*, that with deep emargination as *B. dorsalis* var. *thomsoni*; iv) radial cell varies from short (radialis is only a little longer than stigmalis) to long cell, which might be sharply pointed distally (radialis twice as long as stigmalis), v) the shape of female gaster varies from widely elliptical to fusiform.

Taxonomic remarks. The lectotype of *B. rugosicollis* is a teneral female specimen with imperfect development of wing venation. The radialis is incomplete, hence the radial cell appears open. Because of this structural deficiency Kieffer (1909) classified the species in his key among the species with open radial cell. The mature specimen was described by Kieffer (1909) as *B. gaullei*, which was misinterpreted by Nixon (1957) as belonging to species closely related to *B. bicolor*. The Nixons series of *B. gaullei* consists of eight female specimens, seven of which are wingless. All specimens are rather different from typical *B. bicolor*, however, since the pterygopolymorphism is a frequent phenomenon in other *Belyta* species (e.g. *B. sanguinolenta*, *B. depressa*) it is possible that *B. gaullei* sensu Nixon might prove to be a micropterous form of *B. bicolor*. More information as well as a larger quantity of material is needed to resolve this question satisfactorily. I had also an opportunity to

examine the type of *B. norvegica*. This species exhibits a mosaic of characters common both in *B. rugosicollis* and *B. elegans*, suggesting an intermediate position between them. Its status remains uncertain and the species was omitted in the above key.

Distribution. Widespread in Europe.

Material examined. Types: *B. rugosicollis*, France, Mesnil le Roy, lectotype (present designation), regarded as holotype by Kellner-Pillault (1957), female (Kieffer, MNHN Paris); *B. gaullei*, France, Maisons Laffite, lectotype (present designation), regarded as holotype by Kellner-Pillault (1957), female (Kieffer, MNHN Paris); *B. brevinervis*, France, Fontainebleau, lectotype (present designation), regarded as holotype by Kellner-Pillault (1957), male (Kieffer, MNHN Paris); *B. dorsalis* var. *thomsoni*, Sweden, lectotype (present designation), male (Boheman, NHRS Stockholm). Further material: Czech Republic (254 specimens), Slovakia (28), Germany (36).

5. *Belyta sanguinolenta* NEES, 1834

(Figs 10–13; 44)

Belyta sanguinolenta NEES, 1834: 341. Type lost. Neotype here designated.

**Belyta brachyptera* THOMSON, 1859: 167. Syn. nov.

**Belyta dorsalis* THOMSON, 1859: 169. Syn. nov.

**Belyta forticornis* CAMERON, 1887: 302. Syn. nov.

Belyta mullensis CAMERON, 1887: 304. Syn. nov.

Belyta arcuata KIEFFER, 1909: 505. Syn. nov.

Belyta crassinervis KIEFFER, 1909: 509. Syn. nov.

**Belyta crassinervis* var. *scotica* KIEFFER, 1909: 509. Syn. nov.

Belyta longistilus KIEFFER, 1909: 514. Syn. nov.

**Belyta lubrica* KIEFFER, 1909: 499. Syn. nov.

Belyta marginalis KIEFFER, 1909: 405. Syn. nov.

Belyta peraffinis KIEFFER, 1909: 505. Syn. nov.

**Belyta quadridens* KIEFFER, 1909: 483. Syn. nov.

Belyta quadridens var. *festiva* KIEFFER, 1909: 483. Syn. nov.

**Belyta quadridens* var. *inermis* KIEFFER, 1909: 483. Syn. nov.

**Belyta sexcarinata* KIEFFER, 1909: 501. Syn. nov.

**Belyta tenuicornis* KIEFFER, 1909: 512. Syn. nov.

Belyta tenuistilus KIEFFER, 1909: 513. Syn. nov.

**Belyta* (*Paraclista*) *brachyptera* var. *halterata* KIEFFER, 1909: 481. Syn. nov.

**Belyta* (*Paraclista*) *brachyptera* var. *nervosa* KIEFFER, 1909: 481. Syn. nov.

Pantoclis proxima KIEFFER, 1907: 35. Syn. nov.

**Pantoclis arcuata* KIEFFER, 1909: 557. Syn. nov.

**Pantoclis arcuata* var. *festiva* KIEFFER, 1909: 558. Syn. nov.

**Pantoclis atra* KIEFFER, 1909: 557. Syn. nov.

**Pantoclis atristilus* KIEFFER, 1909: 556. Syn. nov.

**Pantoclis levistylus* KIEFFER, 1909: 555. Type examined. Syn. nov.

Pantoclis marginalis KIEFFER, 1909: 554. Syn. nov.

**Pantoclis sulcatifrons* KIEFFER, 1909: 556. Syn. nov.

Paraclista longicollis KIEFFER, 1909: 391. Syn. nov.

**Paraclista longifrons* KIEFFER, 1909: 390. Syn. nov.

**Paraclista producticeps* KIEFFER, 1909: 391. Syn. nov.

Paraclista sulcigera KIEFFER, 1909: 390. Syn. nov.

Xenotoma scotica KIEFFER, 1910: 609. Syn. nov.

**Paraclista oriplana* KIEFFER, 1913: 169. Syn. nov.

Recognition. This species is in appearance similar to *B. rugosicollis* differing from it as follow: i) posterior keel of antennal sockets sharply projected mesally; ii) marginalis as long as parastigma and radialis, respectively; iii) paramerae of male genitalia attenuated distally; iv) digitus detached from cuspis.

Variation. *B. sanguinolenta* exhibits considerable intraspecific variability, which is apparent especially in the following characters: i) body size varies between 2,5 – 4,5mm; ii) colour varies from black to ferruginous with anterior part of gaster usually paler in dark specimens; iii) variable width/length ratio of flagellar segments in females; iv) medial keel of propodeum varies from forked to simple; v) variable form of dentes of male genitalia (see Figs 10–13).

Taxonomic remarks. Because of extensive polymorphism of the species the former authors described numerous nominal species, which are now recognized, based on examination of types, as conspecific with *B. sanguinolenta*. Nixon (1957) already noticed the polymorphism in his *B. forticornis* and *B. quadridens*, respectively, but he considered both these species as valid species taxa but closely related each other. The different form of dentes in male genitalia he considered as distinct character for keeping both species separated, however the other differential characters he noticed are too laconic to allow to distinguish both species unequivocally. The population analysis based on rich material from major parts of Europe proved the form of dentes to be highly variable and confirmed the conspecificity of *B. forticornis* and *B. quadridens*. On the other hand, females exhibit an extensive polymorphism as to wing development. In collecting samples the micropterous forms, described by Thomson (1858) under the name *brachyptera*, predominate those of alate, which are all very rare. The different appearance of *B. brachyptera* encouraged Kieffer (1909) to establish a new subgenus *Paraclista* for it, subsequently upgraded into generic status. However, huge problems have arisen as to the correct identification of *B. sanguinolenta* NEES. Because the type specimen is lost and the original diagnosis very vague, the interpretation of this species became a matter of speculation. Kieffer (1909) mentioned under his redescription of *B. sanguinolenta* two localities: Germany and Vall' d Illicz (Switzerland). The first locality evidently relates to the Nees' type locality (Sickerhausen), however it is not clear, if Kieffer would have seen Nees' type or not, but the other specimens from Switzerland, by Kieffer (1909) here included and now revised by me, might correspond to the original Nees' concept of *B. sanguinolenta*. Further, Kieffer (1909) noticed, that Thomson's *B. sanguinolenta* relates to *B. dorsalis* as well as a new variety named by him *thomsoni*. I revised both types and confirmed both the conspecificity of *B. dorsalis* with *B. sanguinolenta* and *B. dorsalis* var. *thomsoni* with *B. rugosicollis*. For the persistent nomenclatoric confusions as well as misconceptions of *B. sanguinolenta* by various authors I found it reasonable to fix this species name by designation of neotype. For neotype designation Kieffer's specimen from Val d'Illicz (Switzerland) has been selected as the most convenient.

Neotype designation: *Belyta sanguinolenta*, Switzerland, Val d'Illicz, male (de Gaulle, MNHN Paris), remounted on triangular label with genitalia extracted and glued below the specimen.

Material examined. Types: *Belyta dorsalis*, Sweden, Skane, lectotype (present designation), male (Boheman, NHRS Stockholm); *B. lubrica*, sine loc., lectotype (present designation), male, (Kieffer, MNHN Paris); Germany, Aachen, 2 paralectotypes (present designation), males, (Förster, NHMV Wien); *B. quadridens*, France, Elbeuf, lectotype (male) + paralectotype (female) (present designation); Romania, Bukarest, female; Yugoslavia, Novi, female, all paralectotypes (present designation) (all de Gaulle, MNHN Paris); *B. quadridens* var. *inermis*, Italy, Trieste, x.1906, lectotype (present designation), female, (Kieffer, MNHN Paris); *B. quadridens* var. *festiva*, France, Amiens, lectotype (present designation), male, (Kieffer, MNHN Paris); *B. crassinervis*, France, Maisons-Laffite, lectotype (present designation), male;

France, Mesnil le Roy, paralectotype (present designation), male (all de Gaulle, MNHN Paris); *B. marginalis*, Scotland, lectotype (Nixon 1957), female, (Cameron, BMNH London); *B. forticornis*, Scotland, Cadder Wilderness, lectotype (Nixon 1957), female (Cameron, BMNH London); *B. tenuicornis*, Italy, Trieste, lectotype (present designation), male, (Kieffer, MNHN Paris); *B. brachyptera*, Sweden, lectotype (present designation), female (Thomson, MZLV Lund); *B. brachyptera* var. *nervosa*, France, Mesnil le Roy, lectotype (present designation), female, (Kieffer, MNHN Paris); *B. brachyptera* var. *halterata*, Hungary, Tragöss, lectotype (present designation), female (Kieffer, MNHN Paris); *B. sexcarinata*, France, Forêt d' Saint Germaine, lectotype + paralectotype (present designation), females, (de Gaulle, MNHN Paris); *Pantoclis marginalis*, France, Forêt d' Saint Germaine, lectotype (present designation), male, (de Gaulle, MNHN Paris); *P. arcuata*, France, Mesnil le Roy, lectotype (present designation), female (de Gaulle, MNHN Paris); *P. arcuata* var. *festiva*, France, Mesnil le Roy, lectotype (present designation) male, (de Gaulle, MNHN Paris); *P. atra*, France, Amiens, lectotype (present designation), male (Kieffer, MNHN Paris); *P. atristylus*, Switzerland, Val d'Illicz, lectotype (present designation), male (de Gaulle, MNHN Paris); *P. levistylus*, France, Maisons Laffite, lectotype (present designation), male, (de Gaulle, MNHN Paris); *P. sulcatifrons*, France, Chaville, lectotype (present designation), male (de Gaulle, MNHN Paris); *Paraclista ori plana*, Norway, Solum, Overhalden, 18.viii.1903, lectotype (present designation), male (Strand, ZMHB Berlin); *P. longifrons*, Italy, Trieste, lectotype (present designation), male, (de Gaulle, MNHN Paris); *P. producticeps*, France, Fontainebleau, lectotype (present designation), male (de Gaulle, MNHN Paris). Further material: Czech Republic (2513 specimens), Germany (96), Hungary (342), Slovakia (139), Poland (55), Finland (34), Sweden (67), Russia (20), Japan (30), Taiwan (15).

Distribution. The most common *Belyta* species widely distributed throughout over all Palearctics up to Taiwan.

Biology. Host unknown. Adults inhabit humid forest habitats, parklands and backyards. Flight period VI - X.

6. *Belyta depressa* THOMSON, 1859

(Figs 4-6; 23; 43)

- **Belyta depressa* THOMSON, 1859: 169.
- **Belyta nigriventris* THOMSON, 1859: 168. Syn. nov.
- **Belyta lativentris* CAMERON, 1887: 301. ? Syn. nov.
- **Aclista areolata* KIEFFER, 1908: 445. Syn. nov.
- **Belyta arietina* KIEFFER, 1909: 492.
- **Belyta arietina* var. *brevipennis* KIEFFER, 1909: 492.
- **Belyta arietina* var. *erythrocerata* KIEFFER, 1909: 492.
- **Belyta bidentata* KIEFFER, 1909: 497. Syn. nov.
- **Belyta costalis* KIEFFER, 1909: 511.
- **Belyta costalis* var. *armata* KIEFFER, 1909: 511.
- **Belyta costalis* var. *cataniensis* KIEFFER, 1909: 512.
- **Belyta costalis* var. *divergens* KIEFFER, 1909: 511. Syn. nov.
- Belyta costalis* var. *fusciscapa* KIEFFER, 1909: 512.
- Belyta costalis* var. *helvetica* KIEFFER, 1909: 511.
- **Belyta costalis* var. *insularis* KIEFFER, 1909: 511.
- Belyta costalis* var. *obliterata* KIEFFER, 1909: 511.
- **Belyta costalis* var. *vanescens* KIEFFER, 1909: 511.
- **Belyta depressa* var. *cursitans* KIEFFER, 1909: 486.

**Belyta furcata* KIEFFER, 1909: 489.

Belyta modesta KIEFFER, 1909: 516.

**Belyta quadrispinosa* KIEFFER, 1909: 496. Syn. nov.

**Belyta rufa* KIEFFER, 1909: 491. Syn. nov.

**Belyta tripartita* KIEFFER, 1909: 495. Syn. nov.

**Belyta (Paraclista) hamata* KIEFFER, 1909: 478. Syn. nov.

**Belyta (Paraclista) hamata* var. *carinula* KIEFFER, 1909: 478. Syn. nov.

Belyta (Paraclista) pedestris KIEFFER, 1909: 480. Syn. nov.

Variation. Variable species with body size varying between 1.8 – 4.0 mm; body colour varies from piceous to ferrugineous with appendages paler. The habitus of individuals correlates with wing development (micropterous forms have extraordinary depressed appearance). The micropterous forms, which lead epigeic or terricolous modes of life for which additional morphological adaptations such as shortening of appendages are more abundant. In opposite to females, the free-living males are more conservative as to variability. The analysis of large populations coming from diverse habitats confirmed the existence of two discrete ekotypes distinguished each other on the base of genitalic structure (particularity form of dentes) of males. The forms with slender digitus occur in colder, humid habitats either in higher altitudes in spruce, fire or beech plant associations, or in lowland with occurrence in peatbogs, turf-spruce and beech plant formations on the northern slopes of hills. The forms with stout digitus are encountered in xerothermophilous plant formations such as oak associations or even open habitats such as grasslands. The ecological data suggest the form with stout digitus is more in dry habitats than the form with slender digitus. This form also belongs to those of the few Belytins being able to invade open habitats. However, the populations of both forms can overlap in contact zones thus making hybrid populations (i.e. Central Bohemia, Český kras). Conclusively, in spite of evident ecological segregation of both forms, they cannot still be considered as distinct species, but just evolving ecospecies in the state of progressing sympatric speciation. Explicitly, both forms are included into the common species name *Belyta depressa*.

Taxonomic remarks. Due to the extensive variability of the species, the former students described numerous nominal species taxa related to *B. depressa*. Especially the apparent sexual dimorphism caused the description of both sexes as separate species taxa (see Kieffer 1909). As the first author, Nixon (1957) based on examination of types available, recognized the conspecificity of both sexes and synonymized them with *B. depressa* appropriately, but until recently the great bulk of *Belyta* species remained unrecognized. I have now succeeded in getting most of *Belyta* types available for revision and hence the list of synonyms of *B. depressa* can be completed. Among all nominal species taxa related to *B. depressa*, only the status of *B. lativentris* is still disputable. This species is known only by the type specimen preserved in BMNH. It differs from typical *B. depressa* by larger size (4.0 mm), quadrate flagellomeres and large, reniform mesoscutellar fovea. For the uniqueness of the specimen it cannot be concluded unequivocally if this specimen is only a large form of *B. depressa* or a valid species.

Biology. Host unknown. Most individuals were caught in forest habitats with peak occurrence in VI–VIII.

Distribution. All over Europe; the species splits into two ecologically defined, sympatric subspecies (see comments above).

Relationships. Both *B. depressa* and *B. validicornis* form a closely related group of species with the centre of diversity in East Palaeoarctic where still further undescribed species were found. The European species differ distinctly by male genitalia, the shape of mesoscutellar fovea, the expression of radial vein and basal striation of macrotergite. The micropterous and small female specimens of both species are hard to distinguish.

Material examined. Types: *Belyta depressa*, Sweden, Gotland, lectotype (present designation), male, (Bohemian, NHRS Stockholm); *B. nigriventris*, Sweden, lectotype (present designation), male (Bohemian, NHRS Stockholm); *B. lativentris*, Scotland, Pottal, lectotype (Nixon 1957), female (Cameron, BMNH London); *Aclista areolata*, Scotland, lectotype (pre-

sent designation), male (Cameron, BMNH London; *B. arietina*, Germany, Aachen, lectotype (present designation), female (Förster, MNHN Paris); Germany, Aachen, 3 paralectotypes (present designation), females (Förster, NHMV Wien); *B. arietina* var. *brevipennis*, Germany, Aachen, lectotype (present designation), female (Förster, MNHN Paris); *B. arietina* var. *erythrocephala*, Germany, Aachen, lectotype (present designation), female (Förster, MNHN Paris); *B. bidentata*, France, Saint Germaine, lectotype (present designation), female (de Gaulle, MNHN Paris); *B. costalis*, France, Maisons Laffite, lectotype + paralectotype (present designation); France, Mesnil le Roy, paralectotype (present designation); France, Fontainebleau, paralectotype (present designation), all males (all de Gaulle, MNHN Paris); Italy, Trieste, 4 paralectotypes (present designation); France, Amiens, 2 paralectotypes (present designation), all males (Kieffer, MNHN Paris); Italy, Barzoli, 2 paralectotypes (present designation), males (Doria, MCSN Genova); *B. costalis* var. *armata*, Italy, Isle Giglio, iv. 1902, lectotype (present designation), male (Doria, MCSN Genova); England, paralectotype (present designation), male (HNMH Budapest); *B. costalis* var. *vanescens*, Italy, Isle Giglio, iv. 1902, lectotype (present designation), male (Doria, MCSN Genova); *B. costalis* var. *insularis*, Italy, Isle Giglio, v. 1902, lectotype (present designation), male (Doria, MCSN Genova); *B. costalis* var. *divergens*, Italy, Volosca, ix. 1907, lectotype (present designation, male (Kieffer, MNHN Paris); *B. costalis* var. *cataniensis*, Italy, Catania, lectotype (present designation), (Kieffer, MNHN Paris); *B. depressa* var. *cursitans*, France, Paris-Secaux, lectotype (present designation), female (de Gaulle, MNHN Paris); *B. furcata*, Italy, Isle Giglio, viii. 1902, lectotype (present designation), female (Doria, MCSN Genova); *B. quadrispinosa*, Italy, Trieste, lectotype (present designation), male (Kieffer, MNHN Paris); *B. rufa*, Italy, Volosca, lectotype (present designation), male (Kieffer, MNHN Paris); *B. tripartita*, France, Amiens, lectotype (present designation), female (Kieffer, MNHN Paris); Italy, Isle Giglio, v. 1902, paralectotype (present designation), female, (Doria, MCSN Genova); *B. (Paraclista) hamata*, France, Amiens, lectotype (present designation), female (Kieffer, MNHN Paris); *B. (Paraclista) hamata* var. *carinula*, France, Amiens, lectotype (present designation), female (Kieffer, MNHN Paris). Further material: Czech Republic (cca 1500 specimens), Slovakia (158), Germany (65), Austria (82), Poland (38), Italy (16), Sweden (123), Finland (47).

7. *Belyta validicornis* THOMSON, 1859

(Figs 3; 24; 31; 52)

**Belyta validicornis* THOMSON, 1859: 168.

Belyta brevifrons KIEFFER, 1909: 488. Syn. nov.

**Belyta evanescens* KIEFFER, 1909: 493. Syn. nov.

**Belyta sicula* KIEFFER, 1909: 493. Syn. nov.

**Belyta sicula* var. *flavipennis* KIEFFER, 1909: 515. Syn. nov.

Belyta striativentris KIEFFER, 1909: 498. Syn. nov.

Recognition. Variable species closely related to *Belyta depressa* with which it may be confused easily. The largest specimens over 3 mm length are good distinguishable from *B. depressa* by the characters as follow: i) scutellar fovea transversely reniform (Fig. 24); ii) peculiar form of male genitalia (Fig. 3); iii) propodeum with strong rugosity along posteriorly projecting plicae; iv) base of macrotergite with strong striation beside long median furrow; v) radialis nebulous, distinctly converging to the fore wing margin. Decrease in body size correlates with obliteration of typical *validicornis* characters, thus resulting in the acquisition of an overall *depressa* habitus. The males are most reliably distinguishable by the genitalia, however the small females seem to me to be almost undistinguishable from those of *depressa* in all respects. The problem might become more complicated by the presumed existence of micropterous forms of females of *validicornis*.

Taxonomic remarks. The species is based on the male type specimen from Bohemans collection in Stockholm. The specimen which has been remounted on a triangular label, is in good condition and designated by me as lectotype. This *B. validicornis* is in accordance with both Kieffer's (1909; 1916) and Nixon's (1957) interpretation of species. For the close

resemblance of *B. validicornis* to *B. depressa*, the female of the former species remained unrecognized till recently, however, it is highly probable that she was described formerly under other name(s). I believe that *B. brevifrons* and *B. striativentris* are just those species corresponding to this expectation. The original descriptions of both species fit perfectly that of *B. validicornis*, but the synonymization of them with *B. validicornis* is, for lack of types, a matter of speculation. The new synonymization of *B. evanescens* as well as *B. sicula* is based on the examination of types.

Distribution. Widespread in Europe.

Biology. Host unknown; adults occur in humid forest habitats with flight period V.-X.

Material examined. Types: *B. validicornis*, Sweden, lectotype (present designation), male, (Boheman, NHRS Stockholm); *B. evanescens*, Hungary, lectotype (present designation), male, (Szepliget, MNHN Paris); Italy, Val Pesio, Benza, paralectotype (present designation), male, (Solari, MCSN Genova); Italy, Borzoli, 1883, paralectotype (present designation), male, (Doria, MCSN Genova); Hungary, Budapest, 3 paralectotypes (present designation), males, (Szepliget, HNMH Budapest); *B. sicula*, Italy, Catania, lectotype (present designation), male, (Kieffer, MNHN Paris); *B. sicula* var. *flavipennis*, Italy, Volosca, lectotype (present designation), male, (Kieffer, MNHN Paris). Further material: Germany (17); Czech Republic (86 specimens); Slovakia (32); Hungary (21); Sweden (46)

8. *Belyta seron* NIXON, 1957

(Figs 2; 50)

**Belyta seron* NIXON, 1957: 32.

Recognition. The species is closely related to *B. depressa* from which it differs by small, completely closed radial cell as well as long marginalis.

Distribution. England, Germany, Sweden, Czech Republic, Slovakia, Finland; very rare species.

Biology. Host unknown; flight period VI - IX.

Material examined. Types: *B. seron*, England, Surrey, Horsley, 14.vi.1930, (holotype des. Nixon 1957), female, (Nixon, BMNH London). Further material: Finland (1 specimen); Germany (2); Sweden (1); Czech Republic (10); Slovakia (2); Poland (2).

9. *Belyta insignis* (KIEFFER, 1909) comb. nov.

(Figs 1; 29; 40; 56)

**Pantoclis insignis* KIEFFER, 1909: 577.

Belyta cordata WALL, 1993: 41. Syn. nov.

Recognition. Very large (4-5 mm) species belonging to *depressa*-complex. For its peculiar habitus and large size this species is easily distinguishable from all other *Belyta*. The relations to *B. depressa*-complex are indicated by synapomorphies as follows: i) short pilosity of male antenna; ii) female antennae with transverse, submoniliform segments; iii) the apical (7-th) segment of gaster vertical to body axis; iv) the body of female depressed; v) femora of female short and stout with indistinct femoral stalk.

Taxonomic remarks. The species is based on a single type specimen (male) from Paris. The placement of *insignis* in *Belyta* is corroborated by the presence of synapomorphies given above. The synonymization of *B. cordata* is based on its original diagnosis.

Distribution. Germany, Czech Republic, Italy; very rare species.

Material examined. Type: *Pantoclis insignis*, Italy, Trieste, lectotype (present designation), male, (Kieffer, MNHN Paris). Further material: Czech Republic (13 specimens); Germany (8).

10. *Belyta subclausa* (KIEFFER, 1907) comb. nov.

(Figs 18; 54)

**Zelotypa subclausa* KIEFFER, 1907: 452.

Tetrapsilus filicornis KIEFFER, 1908: 400. Syn. nov.

Tetrapsilus subclausus; Kieffer, 1909: 452.

Aclista filicornis; Kieffer, 1910: 24.

Aclista subclausa; Kieffer, 1916: 446.

Anaclista subclausa; Kieffer, 1916: 463.

Belyta major WALL, 1993: 41. Syn. nov.

Recognition. This species is best characterized as follows: i) large size (3,5-5,5 mm); ii) intensively pale anterior part of gaster; iii) absence of epomia; iv) open radial cell with radialis nebulous and parallel along the fore wing margin; v) simple medial keel of propodeum and vi) peculiar shape of male genitalia (Fig. 18). The placement of *subclausa* in the *B. depressa*-complex is corroborated by presence of the same synapomorphies as given in *B. insignis* above. The total absence of epomia and open gonobase of male genitalia are considered autapomorphies of *B. subclausa*.

Taxonomic remarks. The interpretation of the species is based on examination of types (both males and females) from Paris and Budapest. The male specimen from Paris has been selected lectotype (see material examined below). The synonymization of *Tetrapsilus filicornis* is based on its original diagnosis for lack of type. Kieffer (1916) caused some confusion as he segregated his isospecific *Zelotypa subclausa* into two genera, *Aclista* and by him newly established *Anaclista*, respectively. The genus *Anaclista* now revealed to be a heterogeneous assemblage including two distant species, *A. subclausa* and *A. holotoma*. Recent revision of the type of *Aclista holotoma* (also type species of *Anaclista*) confirmed its conspecificity with *Anommatium ashmeadi*, and hence the synonymy of *Anaclista* with *Anommatium*. *Anaclista subclausa* is now transferred in *Belyta*, hence completing the synonymic list of *Belyta subclausa* definitely. For the lack of types, the synonymies of *Aclista filicornis* and *B. major* with *Belyta subclausa* are based on the original descriptions only.

Distribution. Germany, Austria, Switzerland, Czech Republic, Slovakia, Hungary, Romania; rare species.

Biology. Hosts unknown; flight period VI - IX.

Material examined. Types: *Aclista subclausa*, Italy, Trieste, lectotype (present designation), male; paralectotypes (present designation): Italy, Trieste, female; Switzerland, Vall d'Illicz, female; Switzerland, Charmy, male (all Kieffer, MNHM Paris); Romania, Mehadia, male (Biró, HNMH). Further material: Czech Republic (9 specimens), Poland (1), Germany (4).

11. *Belyta pelias* NIXON, 1957

(Figs 21; 42)

**Belyta pelias* NIXON, 1957: 34, 38.

Recognition. This species is best distinguished from all other *Belyta* species as follows: i) mandibles distinctly asymmetrical, slender and sharply pointed; ii) male genitalia with gonobase partially open, the posterior margin of gonobase distinctly emarginated, volsellae fused with cuspis, digiti detached and the paramere with looping distal portion (Fig. 21); iii) gonostyli large, pigmented and protruding. These characters can also be considered as autapomorphies assuming rather peculiar position of the species within *Belyta*.

Distribution. Sweden, Poland, Slovakia, Czech Republic, Germany, Austria.

Biology. Hosts unknown; flight period VI-IX.

Material examined. Types: *Belyta pelias*, Sweden, Skane, Höör dist., 18.vi.1938, holotype + 4 paratypes (des. Nixon 1957) (Perkins, BMNH London). Further material: Czech Republic (56 specimens); Slovakia (32); Poland (8); Germany (3); Austria (1); Sweden (5).

12. *Belyta elongata* THOMSON, 1859

(Figs 35; 37; 53)

**Belyta elongata* THOMSON, 1859: 174.

Pantoclis elongata; Kieffer, 1909: 563.

**Paraclista carinifrons* KIEFFER, 1909: 390. Syn. nov.

Belyta carinifrons; Nixon, 1957: 34.

Recognition. Distinctive species easily distinguished from other *Belyta* species by characters given in key.

Taxonomic remarks. Since Thomson's (1859) description there has been no other reference to name *elongata* until present. Nixon (1957) recognized *Paraclista carinifrons* to belong to *Belyta*. The conspecificity of both taxa was at present confirmed by me by the revision of types of both species concerned. In result, however, the current name *carinifrons* must be now replaced by the older one, *elongata*.

Distribution. England, Ireland, Sweden, France, Czech Republic, Slovakia, Italy.

Biology. Hosts unknown; rare species with occurrence in natural forests; flight period VI-IX.

Material examined. Types: *Belyta elongata*, Sweden, Smaland, lectotype + 2 paralectotypes (present designation), females (Boheman, NHRS Stockholm); *Paraclista carinifrons*, France, Sevres, lectotype (present designation), female (de Gaulle, MNHN Paris). Further material: Czech Republic (14 specimens); Slovakia (10); Austria (1); Italy (1); Sweden (2).

13. *Belyta norica* sp. n.

(Figs 20; 36; 45)

Diagnosis and recognition. (Females and males). Medium - sized (3.1-3.9 mm) black specimens of slender habitus with pale appendages; female antenna submoniliform with subcylindrical flagellar segments; male F1 with slight emargination at ventral base; radial cell long, closed; median propodeal keel low and simple; mesosoma depressed, gaster fusiform, convex; apical tergite horizontal.

Belyta norica is closely related to *B. elongata* from which it differs by characters as follows: i) different shape of flagellar segments in both males and females; ii) posteriorly concave scutellar fovea; iii) strongly rugose petiole and iv) different form of male genitalia (Fig. 20).

Description. Female (Holotype). Length 3.3 mm. Black, smooth; the appendages, tegulae and mandibles ochraceous.

Head in dorsal view slightly wider than long with distinct frontal prominence; temples distinctly receding behind eyes; the head with dense, semidecumbent pilosity; eyes pubescent; ocelli arranged in equilateral triangle, the distance between hind ocelli smaller than the distance of the each of them from the eye margin; head in lateral view subtriangular, almost as long as high, with vertex rounded; antennal shelf curved slightly anterodorsally, with ventral rugosity; toruli closely attached to each other; head in frontal view subtriangular, as wide as high, subantennal furrows distinct, confluent with subantennal rugosity; fore tentorial pits large and deep; clypeus moderately convex; epistomal sulcus deep and complete; mandibles short, asymmetrical; female antennae 15-segmented, submoniliform, with short, dense pilosity; scapus stout, pedicellus shorter than F1, proximal flagellar segments a little transverse, the distal ones subquadrate; F13 subovoid.

Pronotum subdivided into pronotal collar and pronotal neck, both separated from each other by a distinct transverse keel; epomia present; lateral pronotum smooth, depressed; mesonotum flattened; mesoscutum and scutellum flattened dorsally, mesosoma distinctly wider than high; notauli distinct, becoming parallel posteriorly; parapsidal sutures slightly indicated; mesoscutellar fovea small, subreniform; scutellar disc smooth and flattened; mesopleuron smooth, depressed with deep posterodorsal scrobe margined from above by short ridge; the anteroventral bar of mesopleuron short; dorsellum with 3 low keels; dorsal surface of propodeum quadrate, flattened and pubescent, median propodeal keel low and simple; plicae not projected posteriorly; protibia smooth; femora shortly clavate; radial cell closed, as long as parastigma; marginalis as long as half of parastigma; radialis tubular completely

fused with postmarginalis thus forming closed radial cell; stigmalis oblique, a little shorter than marginalis; cubitalis nebulous, slightly indicated; the veins M and Cu nebulous; basalis tubular, shorter than parastigma; hind wing wide with basal cell distinct; petiolus cylindrical strongly rugose; gaster convex, fusiform; median furrow of macrotergite short with fine, fan-shaped lateral striae; apical tergite subtriangular, in horizontal position; the lateral sternal lines complete; ovipositor short.

Male (Allotype). Differs from female as follows: Antenna (Fig. 36) long, slender; F1 shortly emarginate proximally; F1-F13 about three and half time as long as wide; eyes larger than in female; legs more slender.

Type material. 16 specimens (males and females). HOLOTYPE female, Italy, Riva, 500m, 13.vi. 1976, female, Haselbarth lgt. (NMPC Praha); PARATYPES: Italy: Riva, 500m, 13.vi. 1976, 5 males; Piovenne, Mte. Summano, 900 - 1300m, 3.vii. 1985, 2 females, 7 males, all Haselbarth lgt. (coll. Hilpert, München and NMPC Praha); Sicilia, Nebrodi (ME), Contrada Crocitti, cerra VC 49 01, 800 m, female, Alicata lgt. (coll. Hilpert, München).

Etymology. From Noricum (The ancient Roman territory) referring to the holotype's locality.

Distribution. Italy, Sicily.

Biology. Host unknown. Flight period in June and July.

Variation. No significant variation in the limited material available.

14. *Belyta abrupta* THOMSON, 1858

(Figs 7; 26; 34; 49; 57)

**Belyta abrupta* THOMSON, 1858: 167.

**Belyta alticeps* KIEFFER, 1909: 488. Syn. nov.

Recognition. Distinctive species easily distinguished from all other *Belyta* by both face and clypeus heavily punctate. The form of radial cell is sex - different, closed in males and open in female.

Taxonomic remarks. The species is based on a type couple from Stockholm, from which the female specimen has been selected lectotype.

Distribution. Widespread in Europe.

Biology. Host unknown. Flight period VI - IX.

Material examined. Types: *B. abrupta*, Sweden, Skane, lectotype (present designation), female, (Boheman, NHRS Stockholm); Sweden, Smaland, paralectotype (present designation), male (Boheman, NHRS Stockholm); *B. alticeps*, France, Amiens, lectotype (present designation), female (Kieffer, MNHN Paris). Further material: Czech Republic (36 specimens); Slovakia (21); Germany (14); Austria (6); Italy (3); Sweden (12).

15. *Belyta nixonii* sp. n.

(Figs 9; 47)

Belyta pedestris; Nixon, 1957: 35, 38 (nec Kieffer, 1909: 480).

Diagnosis and Recognition (female and male). Medium size (around 3 mm) elongate black specimens with pale appendages; subantennal furrows very short, not confluent with the weak subantennal sculpture; frontal prominence slightly depressed below; legs short and thick with basal stalk slightly indicated; radial cell very short with radialis distinctly curved; scutellar fovea small, more or less circular and smaller than the distance between the posterior extremities of the notauli; propodeum long, smooth; propodeal keel simple; gaster long, fusiform, not wider than mesosoma.

B. nixonii is closely related to *B. moniliata* because of spinose fore tibia, depressed ventral side of frontal prominence, small scutellar fovea as well as convex lateral pronotum. It can be easily distinguished from *B. moniliata* by simple median keel of propodeum and short radial cell.

Description. Female (Holotype). Head in dorsal view elongated anteriorly, nasiform, with

fine scattered pale pilosity; eyes a little convex, sparsely pubescent; temples moderately receding; ocelli small, arranged in equilateral triangle; the mutual distance of posterior ocelli shorter than the distance of each of them from eye margin; toruli closely approximated each other; the lower side of frontal prominence finely rugose and depressed; head in frontal view a little higher than wide, face smooth with scattered fine pilosity; clypeus slightly convex, smooth, subantennal furrows short, smooth, not confluent with subantennal rugosity; tentorial pits small; mandibles short, crossing at tips; antenna short, submoniliform with transverse flagellar segments; the antennal pubescence short.

Mesosoma in dorsal view distinctly longer than wide, depressed; pronotum cervicoid, rather convex posterolaterally with strong crenulae posteriorly; epomia short; mesonotum flattened, smooth, with scattered, long pilosity; notauli percurrent; parapsidal sutures indistinct; scutellar fovea small, partially subdivided by short posterior keel; dorsellum with three moderate keels; mesepisternum smooth, with transversal median depression; subalar keel strong, complete; mesepisternal scrobe shallow; propodeum subquadrate, elongate with smooth and bare dorsal surface; medial keel of propodeum low and simple; plicae not projecting posteriorly.

Legs short and thick; femora without a basal stalk.

Wings hyaline with complete venation; the closed radialis small, shorter than parastigma; radialis distinctly curved at apex; stigmalis oblique, longer than marginalis, which is shorter than half length of parastigma.

Petiole cylindrical, strongly rugose.

Gaster slender, fusiform, sparsely pubescent; T2 proximally with short, fan-shaped striae; T9 oblique.

Male (Allotype). Differs from female as follows: Antenna long and slender with F1 slightly emarginated at ventral base; the body more convex; the head with short frontal prominence.

Taxonomic remarks. Nixon (1957) implicitly assigned this species the name *pedestris*, having referred to *Paraclista pedestris* KIEFFER. For lack of types I can not make an explicit recognition of this species, however, following the Kieffer's diagnosis of *Paraclista pedestris* carefully, I was immediately convinced of Nixon's (1957) misidentification of *pedestris* because of Kieffer's diagnosis fitting perfectly *B. depressa*. In result, the Nixon's species belongs, in reality, to a new, properly unrecognized species. Consequently, *Paraclista pedestris* is a junior synonym of *B. depressa* (see *B. depressa* above). The crucial differential characters of both confused species are compared below:

Paraclista pedestris KIEFFER
(= *Belyta depressa* THOMSON)

Body strongly depressed, stout
Micropterous
Radialis as long as stigmalis
Radial cell open
Antena of female stout with flagellar segments markedly abuted
Scutellar fovea transverse

Belyta nixon sp. nov.

(= *Belyta pedestris* auct.)

Body slightly depressed, slender
Holopterous
Radialis longer than stigmalis
Radial cell closed
Antenna of female slender with flagellar segments loose
Scutellar fovea subcircular

Type material. 5 specimens (4 females and 1 male). HOLOTYPE, female, Danmark, Jylland, Hojen Baek, Vejle env., 17.vii. 1983, Munk lgt., (NMPC Praha); PARATYPES: Sweden, Karlskrona, 2.viii. 1955, Sundholm lgt., 1 male, (MZLU Lund); *B. pedestris*, England, SS., Brompton Regis, Haddeo Valley, 12.viii. 1952 et 13.viii. 1952, J.F.P. & D.M.S.P., B.M. 1953-223, 2 females, Nixon det., 1957 (Nixon, BMNH London); Germany, Oberbayern, Jettenhausen, 12.vii. 1968, Haselbarth lgt. (Hilpert, München).

Etymology. The species name is dedicated to the British hymenopterologist G. E. J. Nixon.

Distribution. Very rare species with scattered collecting data from England, Sweden, Danmark and Germany.

Biology. Host unknown; flight period VII-VIII.

Variation. No variation in limited material available.

16. *Belyta moniliata* CAMERON, 1887

(Figs 8; 27; 46)

**Belyta moniliata* CAMERON, 1887: 303.

Recognition. Closely related to *B. nixonii*, differing from it by the characters as follows: i) median keel of propodeum forked with plicae converging posteriorly; ii) dorsal surface of propodeum flat; iii) radial cell long, two and half times longer than marginalis; iv) petiole subcylindrical, smooth with longitudinal keels.

Distribution. Scotland, Sweden, Germany; very rare species.

Biology. Unknown.

Material examined. Type: *B. moniliata*, Scotland, Mugdock, 9.viii, lectotype (designated by Nixon 1957), female, (Cameron, BMNH London). Further material: Sweden (1 specimen); Germany (4).

17. *Belyta borealis* WHITTAKER, 1931

(Figs 22; 48)

**Belyta boreale* WHITTAKER, 1931: 179.

Cinetus borealis; Muesbeck et Walkley, 1951: 682. Generic transfer

Belyta borealis; Muesbeck, 1979: 1136. Emendation.

Pantoclis brevicornis; Nixon, 1957: 45, 47. Misinterpretation.

Recognition. Nixon (1957) placed this species in *Pantoclis* under name *Pantoclis brevicornis*, in spite of his comments on the possible conspecificity with *Belyta boreale* WHITTAKER. The recent morphological analysis confirmed its unambiguous placement in *Belyta* based on the synapomorphies as follow: i) body slender, elongate, ii) mesosoma depressed; iii) antennal sockets prominent, directed anterodorsally; iii) mandibles wide, asymmetrical; iv) pronotum distinctly subdivided into strip-like pronotal collar and pronotal neck; v) medial keel of propodeum forked.

Taxonomic remarks. I have revised the type of *B. boreale* and compared it with both American and European populations, respectively. The American specimens, all coming from eastern part of North America (Canada and USA), proved to be more variable and more closely related to *B. boreale*, than the European ones. The varying characters are as follows: i) scutellar fovea transverse, reniform to subcircular; ii) radial cell as long as parastigma (or longer) to shorter than parastigma; iii) plicae not projecting posteriorly to plicae projecting posteriorly; iv) flagellar segments of female transverse to cylindrical; v) femora slender to stout; vi) medial furrow of base of macrotergite long to short. Evaluating the extensive variability of the American population, it seems to me very likely, that the type specimen of *B. boreale* (British Columbia) is only an aberrant form, differing from the specimens from the eastern part of North America by slender femora and propodeum with non projecting plicae, the differentials, which are constituents of variation in the range of this species. Because of the rarity of the species in Europe I had limited material available for variation analysis. However, it is most likely, that the European population is more uniform than the American one and that the forms with small and subcircular scutellar fovea, short radial cell, strongly projecting plicae and short medial furrow of macrotergite clearly predominate here. In result, there are no doubts as to consider both transatlantic populations as conspecific under the common name *borealis*. The collecting data suggest the transatlantic distribution of *B. borealis* because no records from East Palaeoarctic exists. Moreover, this species is replaced there by a closely related, still undescribed species, widespread from Japan to Thailand.

Distribution. Transatlantic: Canada, USA; Ireland, Finland, Sweden, Czech Republic, Austria, Germany, Slovakia.

Biology. Host unknown; flight period VI-IX.

Material examined. Type: *B. boreale*, Canada, British Colombia, Hollyburn, 30.ix. 1929, leg O. Whittaker, type (designated by Whittaker 1931), female (BMNH London). Further

material: Czech Republic (24 specimens); Germany (4); France (1); Slovakia (2); USA (78); Canada (16).

Acknowledgments

Curators from various European museums kindly loaned types and further material of *Belyta* (cf. Material and Methods).

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Explanation of plates

Plate 1

Figs 1-9. Male genitalia: 1, *B. insignis*; 2, *B. seron*; 3, *B. validicornis*; 4-6, *B. depressa*; 7, *B. abrupta*; 8, *B. moniliata*; 9, *B. nixonii*. Scale: 0,2 mm.

Plate 2

Figs 10-18. Male genitalia: 10-13, *B. sanguinolenta*; 14, *B. acuta*; 15, *B. bicolor*; 16, *B. elegans*; 17, *B. rugosicollis*; 18, *B. subclausa*. Scale: 0,2 mm.

Plate 3

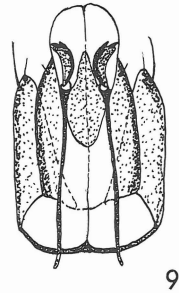
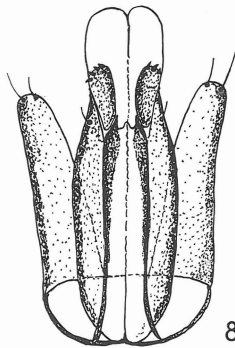
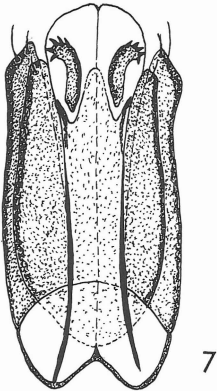
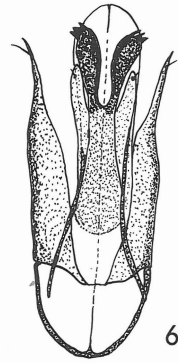
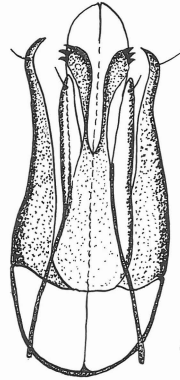
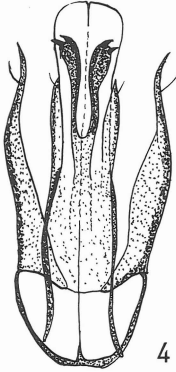
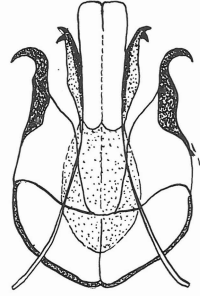
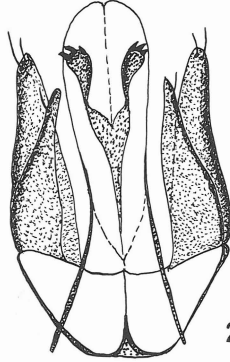
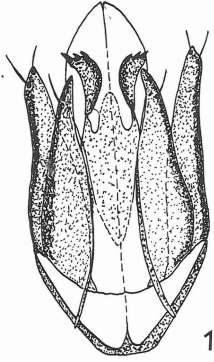
Figs 19-30. Male genitalia: 19, *B. elongata*; 20, *B. norica*; 21, *B. pelias*; 22, *B. borealis*. Scale: 0,2 mm. Scutellum: 23, *B. depressa*; 24, *B. validicornis*. Scale: 0,4 mm. Head, lateral view: 26, *B. rugosicollis*; 27, *B. abrupta*. Scale: 0,7 mm. Male antenna, proximal part: 27, *B. moniliata*; 28, *B. elegans*; 29, *B. insignis*; 30, *B. rugosicollis*. Scale: 0,4 mm.

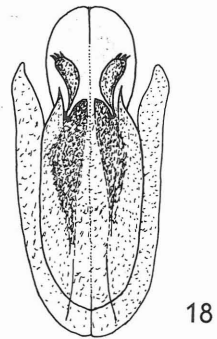
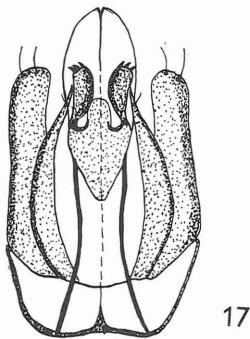
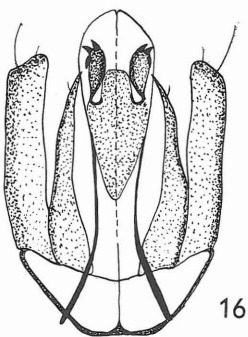
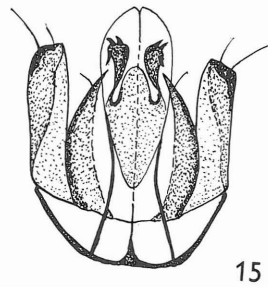
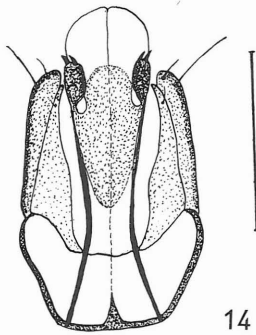
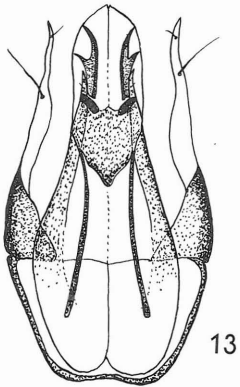
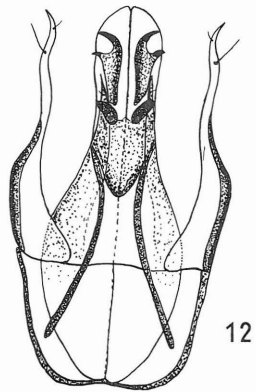
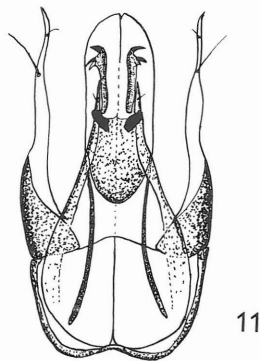
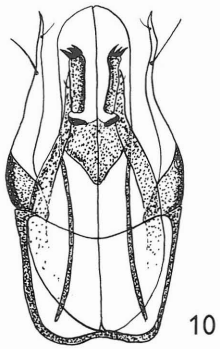
Plate 4

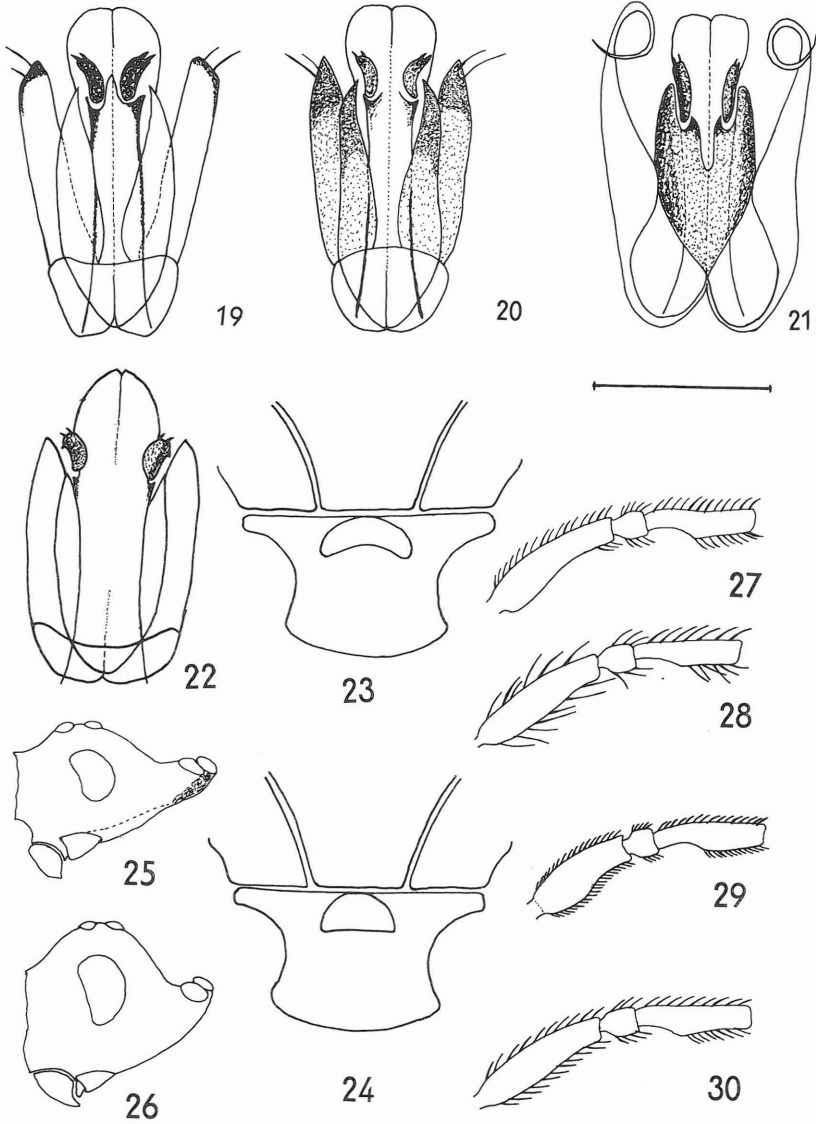
Figs 31-40. Female antenna: 31, *B. validicornis*; 32, *B. rugosicollis*; 33, *B. elegans*; 34, *B. abrupta*; 35, *B. elongata*. Scale: 0,7 mm. Male antenna, distal part: 36, *B. norica*; 37, *B. elongata*. Scale: 0,3 mm. Femur: 38, *B. acuta*; 39, *B. elegans*; 40, *B. insignis*. Scale: 0,2 mm.

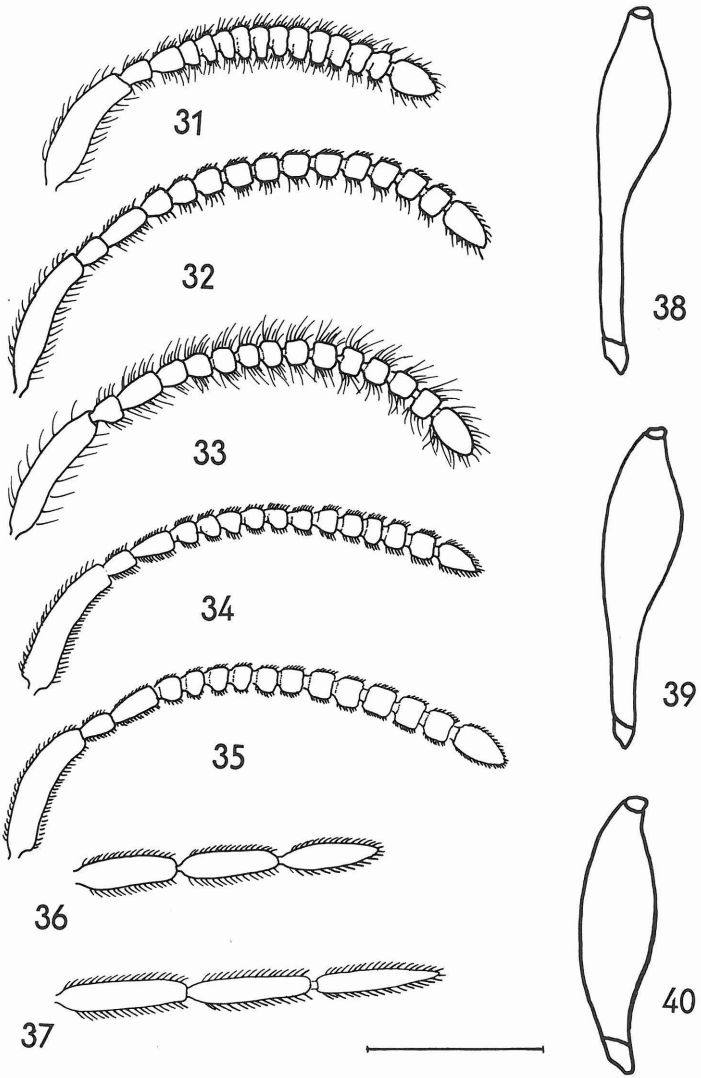
Plate 5

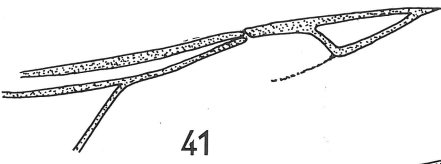
Figs 41-57. Fore wing venation: 41, *B. bicolor*; 42, *B. pelias*; 43, *B. depressa*; 44, *B. sanguinolenta*; 45, *B. norica*; 46, *B. moniliata*; 47, *B. nixonii*; 48, *B. borealis*; 49, *B. abrupta*, male; 50, *B. seron*; 51, *B. acuta*; 52, *B. validicornis*; 53, *B. elongata*; 54, *B. subclausa*; 55, *B. rugosicollis*; 56, *B. insignis*; 57, *B. abrupta*, female. Scale: 0,5 mm.



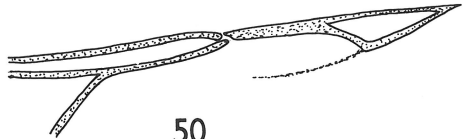




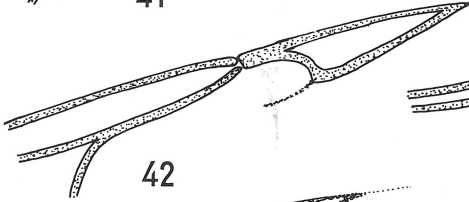




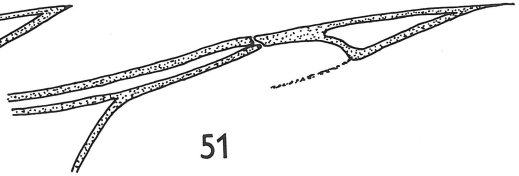
41



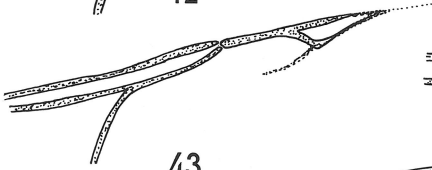
50



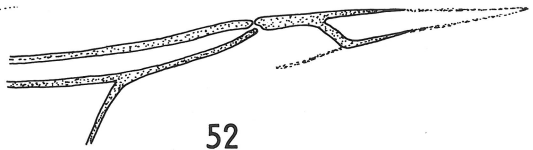
42



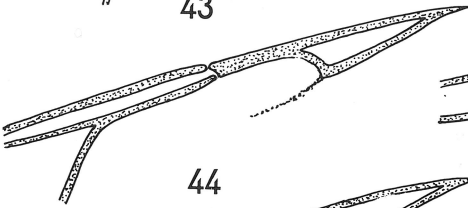
51



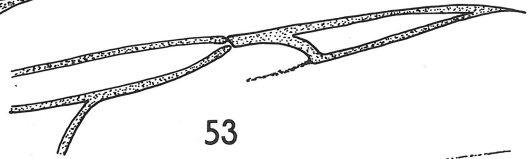
43



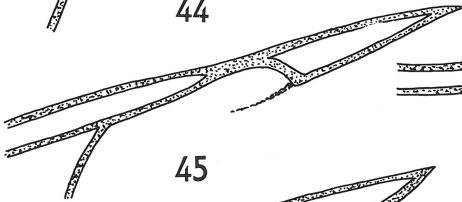
52



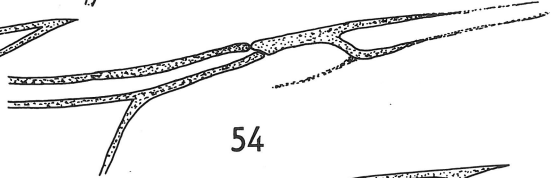
44



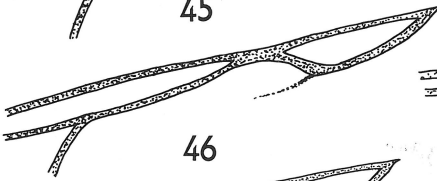
53



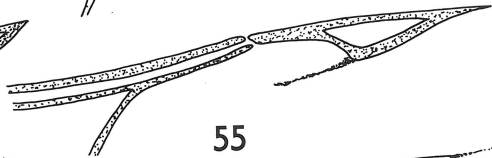
45



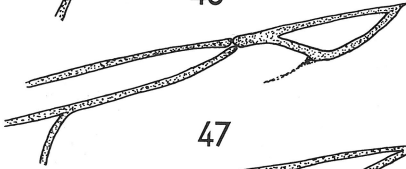
54



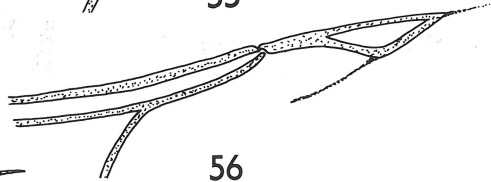
46



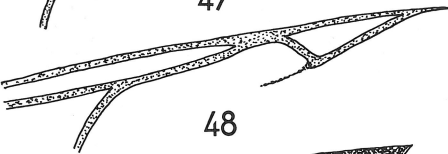
55



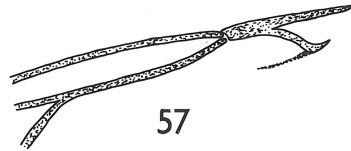
47



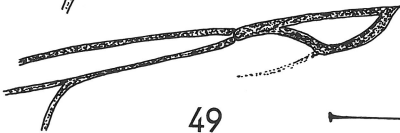
56



48



57



49

