Annls Limnol. 31 (4) 1995 : 245-252.

Notes on some taxonomic problems in the Iberian species of *Brillia* Kieffer, 1913 (Diptera : Chironomidae), with a description of *B. pudorosa* sp.n.

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Keywords : Diptera, Chironomidae, *Brillia*, taxonomy, Iberian Peninsula.

The present paper describes the male and female of *Brillia pudorosa* sp. n. and attempts to summarize information with respect to previously described Holarctic species. The specific validity of *B. longifurca* Kieffer, 1921 is confirmed. The observation of an extra seminal capsule in nearly all species studied indicates a need to redefine the systematic relationships with some related genera.

Notes sur quelques problèmes taxonomiques chez les espèces ibériques de *Brillia* Kieffer, 1913 (Diptera : Chironomidae) et description de *B. pudorosa* n.sp.

Mots clés : Diptera, Chironomidae, *Brillia*, taxonomie, Péninsule ibérique.

Le présent article passe en revue l'information concernant les espèces holarctiques du genre *Brillia* et donne la description du mâle et de la femelle de *Brillia pudorosa* n.sp. *Brillia longifurca* Kieffer, 1921 est considérée comme une bonne espèce. La découverte d'une troisième capsule séminale chez la plupart des espèces étudiées a mis en évidence qu'il faut redéfinir les relations systématiques des genres du complexe *Brillia*.

1. Introduction

Oliver & Roussel (1983) reviewed the five species of *Brillia* Kieffer found in the Nearctic Region and, following a concept developed by Zavrel (1944), they recognized and keyed two species-groups within *Brillia*, the *modesta* group - *i.e. Brillia parva* Johannsen, 1934, and *Brillia retifinis* Sæther, 1969 - and the *flavifrons* group (changing Zavrel's group name *longifurca* because of the possibility of *Brillia longifurca* being a synonym of *Brillia flavifrons*) - *i.e. Brillia flavifrons* (Johannsen, 1905), *Brillia sera* Roback, 1957, *Brillia laculata* Oliver & Roussel, 1983 and *Brillia japonica* Tokunaga, 1939 (the last erroneously included in the previous group). As mentioned by them, the females exhibit the greatest species differences whereas the males are often difficult to distinguish, and they point out that their species concept is primarily based on females and on reared specimens. Similarly, characters of the female genitalia in genera like *Eudactylocladius* Thienemann and Australian *Conochironomus* Freeman (Cranston, *in litt.*) are very useful where the pupa and male are less help (see also Sæther 1977 : 170).

In addition to Nearctic species, at least seven species are known in the Palaearctic Region : *B. longifurca* Kieffer, 1921, *B. japonica* Tokunaga, 1939, *B. laculata* Oliver & Roussel, 1983 (recorded by Makarchenko et al. (1988) in the Russian Far East), *B. modesta* (Meigen, 1830), *B. bifasciata* Wang et al., 1994 and *B. brevicornis* Wang et al., 1994. However, unfortunately the females are poorly known or remain unknown and some disparities in their distribution (potential extra-limital distributions) are a further complication. Other published names like *B.* sp 1 and *B.* sp 2 (Moubayed 1986) or *B. brevimera* Wang & Zheng, in press (Wang & Zheng 1992), will be considered as *nomina non rite*

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publicata. Additional evidence of the existing nomenclatural confusion comes from the extensive list of *nomina dubia* (see Ashe & Cranston 1991) and *nomina rejicienda* belonging to this genus.

The adult males and females of three Iberian species, including one new species *Brillia pudorosa* are compared with other Holarctic species. As shown below, the taxonomic status of the species of this genus merits closer examination. The systematic position of some related genera is discussed.

2. Methods and terminology

The material studied was mounted on microscope slides in either Euparal or Polyvinyl-lactophenol. Acknowledging that colour in some chironomids is known to vary with degree of maturity (Boesel, 1974) and alcohol preservations causes fading, we describe the colour of the adults with caution. Association of the females of each species is based on pharate adults, or, when captured in a swarm of males, assumed to be the females of that species.

The general terminology follows Sæther (1980, 1989). The measurements are given as ranges followed by a mean.

3. Material examined

We have had the opportunity to examine not only Iberian material but also some specimens of other Holarctic species kindly loaned by several individuals and institutions.

Brillia flavifrons : 1 Adult male, Prince Fredericton, Md., 21-III-80, leg. D.M. Wood coll., D.R. Oliver det., CH2944 - Canadian National Collections (CNC). 1 Adult female, 1 Larva and 1 Pupal exuviae (reared), Kenora, Ont. Stream bfx. M 18-19 Mando Logging road, 22-VIII-67, D.R. Oliver det., CH2089 - (CNC) 1 Adult female (labelled *B. flavifrons* ?), Hedley B.C., 17-VII-76, I.M. Smith coll., CH4318 IM - CNC.

Brillia longifurca : 88 adult males and 2 adult females, Puentes de García Rodriguez (La Coruña), Spain, UTM 29TNJ0692, 530 m a.s.l. 28-X-85. 2 Pupal exuviae, Santiso (La Coruña), river Ulla, Spain, UTM 29TNH7944, 320 m a.s.l., 15-VII-86. 4 Pupal exuviae, Bertamirans (La Coruña), river Sar, Spain, UTM 29TNH3045, 40 m a.s.l., 26-I-86. 16 Adult males and 6 adult females, Hombreiro (Lugo), river Miño, Spain, UTM 29TPH1267, 370 m a.s.l., 23-VI-88. 1 Pharate male and 1 Pupal exuviae, Chaos, Viveiro (Lugo), river Landro, Spain, UTM 29TPJ1373, 15 m a.s.l., 11-X-88. 1 Larva, Santa Marina, Ourol (Lugo), river Landro, Spain, UTM 29TPJ1372, 80 m a.s.l., 14-X-88.

Brillia sera : 1 Adult male, Four Mile Cr., Erie, Pa., 23-VI-80, E. Masteller coll., D.R. Oliver det., CH6951 - (CNC). 1 Adult female, 1 Larva and 1 Pupal exuviae (reared), White Mt. Nat. PK. N.H., 28-V-81, Oliver & Roussel coll., D.R. Oliver det., CH6900 - CNC.

Brillia modesta : 18 Adult males and 5 adult females, Bahabon de Esgueva (Burgos), river Esgueva, Spain, UTM 30TVM5048, 530 m a.s.l., 18-XII-85. 2 Adult males, Sobrado dos Monxes (La Coruña), river Tambre, Spain, UTM 29TNH3134, 510 m a.s.l., 7-XII-82. Martinez-Ansemil leg. 1 Pharate female, El Viso, Santiago (La Coruña), river Sar, Spain, UTM 29TNH4048, 280 m a.s.l., 29-I-86. 7 Adult males, 2 Adult females, 1 Pharate female and 13 Pupal exuviae, Bertamirans (La Coruña), river Sar, Spain, UTM 29TNH3045, 40 m a.s.l., 1-IV-86. 18 Pupal exuviae, Monterroso (Lugo), river Ulla, Spain, UTM 29TNH9338, 500 m a.s.l., 27-I-85. 3 Adult males and 1 Adult female, Valdomir (Lugo), Sierra del Caurel, river Lor, Spain, UTM 29TPH4616, 450 m a.s.l., 2-XI-85. 4 Pharate males, 12 Pharate females, 2 Pupal exuviae and 5 Larvae, Santa Marina, Ourol (Lugo), river Landro, Spain, UTM 29TPJ1372, 80 m a.s.l., 14-VI-89. 21 Adult males and 1 Adult female, Viveiró, Muras (Lugo), Sierra del Xistral, Spain, UTM 29TPJ1141, 600 m a.s.l., 4-I-89.

Brillia parva : 1 Adult male, Kouchibouguac National Park, N.B., 30-V-78, Oliver & Roussel coll., D.R. Oliver det., CH7185 - (CNC). 1 Adult female, 1 Larva and 1 Pupal exuviae (reared), Ammonoosuc R. White Mt. Nat. For. N.H., 28-V-81, Oliver & Roussel coll., D.R. Oliver det., CH6885.2 - CNC.

Brillia retifinis : 1 Adult male, 1 Adult female, 2 Larvae and 2 Pupal exuviae (reared) Mayfly Cr. Res. Forest nr. Haney, B.C., 28-VIII : 7-IX-86, J. Richardson coll., D.R. Oliver det., CH9107 - (CNC).

Brillia japonica : 4 Adult males and 2 Adult female, Kawasaki, Japan, 2-IV-90, T. Kobayashi leg. 1 Pupal exuviae, Kawasaki, Japan, 29-I-92, T. Kobayashi leg.

4. Results

4.1. Genus *Brillia* Kieffer

Brillia Kieffer, 1913 : 34 ; Edwards, 1929 : 309 ; Brundin, 1956 : 68, Oliver & Roussel, 1983 : 258.

Type-species : *Metriocnemus bifidus* Kieffer, 1909 : 48 (= *Chironomus modestus* Meigen, 1830 : 256) (original designation).

4.2. Emended diagnosis

As in Oliver & Roussel (1983) whith the following addition : Spermathecal system of the female with two or three seminal capsules, if three, the third seminal capsule is transparent, thin-walled, with separate duct and sometimes difficult to see ; the two well sclerotized capsules have nearly straight spermathecal ducts, widened before partly common opening.

***Brillia pudorosa* sp.n.**

Type locality : Valdomir, Sierra del Caurel, river Lor (Lugo, Spain), UTM 29TPH4616, 450 m a.s.l.

Type material : Holotype, male, Valdomir, Sierra del Caurel, river Lor (Lugo, Spain), 2-XI-85, in coll. F. Cobo, Dpto. Biología Animal, Univ. of Santiago. Allotype; female same locality and data as holotype. Paratypes : 4 males and 1 female as holotype, 1 female, 2 males and 2 females, and 2 males and 1 female, as holotype except 23-X-85, 7-IX-85 and 3-VII-85 repectively.

Derivatio nominis : From Latin *pudor-oris*, decency, shame, refering to the facility with which the third seminal capsule can go unnoticed.

Description

Male imago (means based on 6 measurements, except when otherwise stated). Total length, 4.51-4.65, 4.53 mm. Colour generally yellow to brown.

Head. AR, 0.88-1.00, 0.94. Temporal setae 14-20, 17. Frontals 2-4, 3.Clypeals 25-43, 32. Length of last four maxillary palp segments (in µm), 91-106, 96 ; 237-262, 249 ; 213-244, 237 ; 183-219, 201. Tentorium 178-189, 183 µm long ; 30-36, 34 µm wide at sieve pore. Cibarial pump, tentorium and stipes as in figure 2.

Thorax (Fig. 1). Antepronotum with 30-33, 31 setae. Dorsocentrals 79-87, 80. Prealars 25-27, 25. Scutellars 62-73, 69. Scutal stripes, postnotum and preepisternum yellow-brown, median anepisternum, epimeron and coxae of P_2 and P_3 darker than scutal stripes, halteres, antepronotal lobes and scutellum pale.

Wings (Fig. 4). Length 0.9-1.23, 1.13 mm. VR 1.2-1.3, 1.2 Wing membrane slightly brown in reflected light, covered with macrotrichia. Squama completely fringed with 37-51, 49 bristles. R_{2+3} faint, running parallel to R_1 and ending closely to it ; RM starting vertical and bending obliquely to R_{4+5}.

Legs. Fore tibia with one spur of 55-66, 59 µm long ; mid tibia with two subequal spurs, both sinuate and barbed, 70-79, 72 µm long ; hind tibia with inner spur 104-128, 110 µm, outer spur 52-63, 56 µm long and tibial comb consisting of 8-11, 10 spurs, shortest 55-60, 58 µm long, longest 66-73, 68 µm long. Ranges (µm) and proportions of legs (n = 4 on p_1, 5 on p_2 and 3 on p_3) :

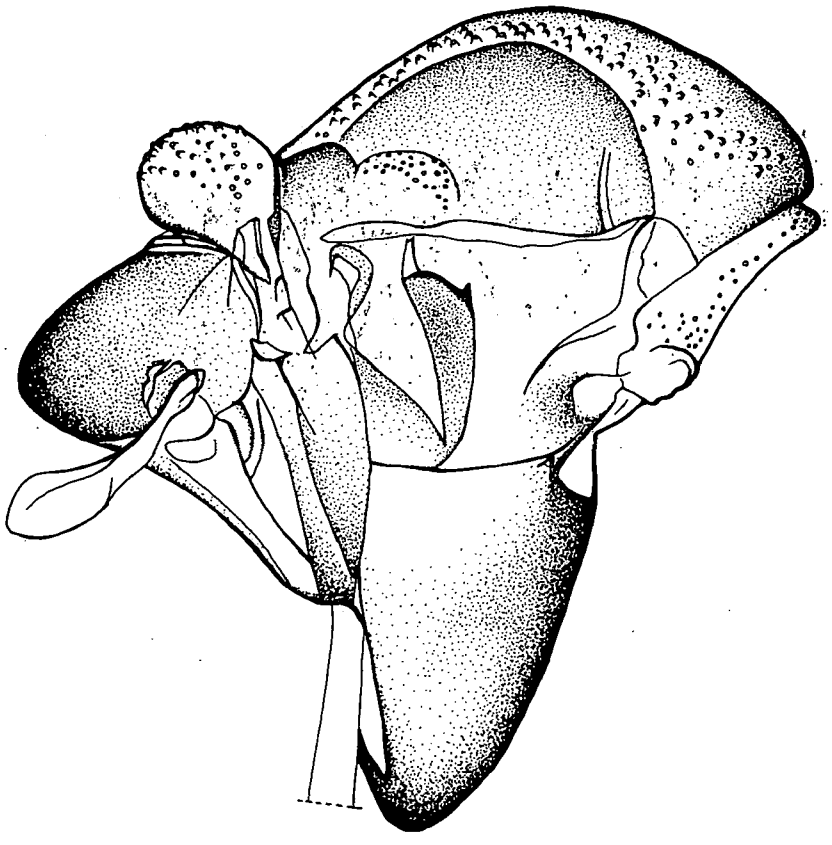
	fe	ti	ta_1	ta_2	ta_3	ta_4	ta_5
P1 :	1150-1297	1425-1675	1020-1275	645-675	495-525	345-378	200-213
P2 :	1334-1470	1368-1513	660-670	414-427	341-375	230-274	150-183
P3:	1500-1512	1900-1902	947-950	596-610	482-519	305-335	177-195

	LR	BV	SV	BR
P1 :	0.75-0.77	2.45.-2.46	2.29-2.40	0.95-1.08
P2 :	0.47-0.50	2.95-3.08	3.92-4.20	1.14-1.27
P3 :	0.48-0.49	2.63-2.79	3.62-3.74	1.18-1.29

Abdomen. Abdominal tergites with anterior and lateral margins yellow-brown to brown, central area light. Posterior tergites darker than anterior tergites. A narrow, dark brown cuticular band intersegmentally between sternites 2-3, 3-4 and 4-5. Ninth tergite with a reticular area in the middle.

Hypopygium (Fig. 3). Gonocoxite parallel-sided and somewhat elongate. Superior volsella with middle width subequal to apical or basal width, and with irregular posterior margin. Distomedial lobe slightly pronunced, fused with the inner margin of the gonocoxite. Subapical lobe of gonostylus with about one-half length of apical lobe and basal width wider than subapical width. Transverse sternapodeme usually with rounded anterolateral corners.

Female imago (means based on 4 measurements, except when otherwise stated). Similar to male except for following differences : Tergite IX of female genitalia (Fig. 6) without posterior emargination, but divided in two setigerous protrusions with altogether 47-84, 58 setae ; cercus 171-201, 178 µm long ; notum 134-158, 152 µm long ; depression on sternite VIII located near vaginal opening, vaginal opening nearly U-shaped, with lateral margins converging towards each other and anterior margin straight, anterior dark internal projection absent ; gonapophysis VIII with inner margin of ventrolateral lobe rounded ; apodeme lobe located far anterior to a slender coxosternapodeme IX ; hinge connecting gonapophyses VIII to each other sclerotized with pointed apex directed distolaterally ;



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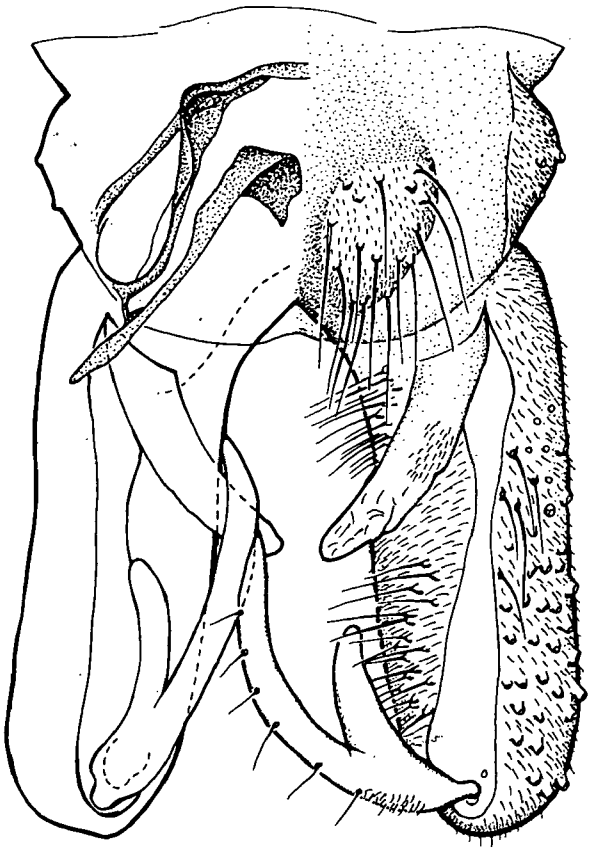

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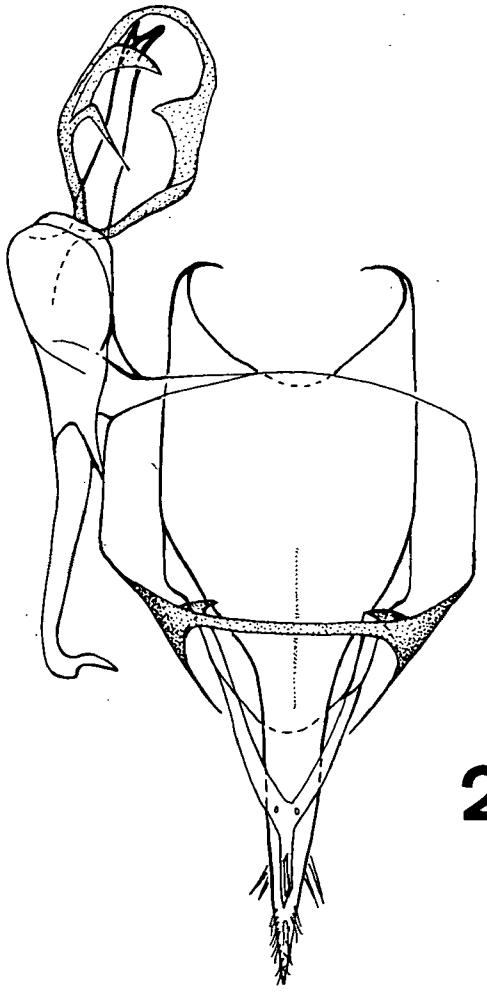

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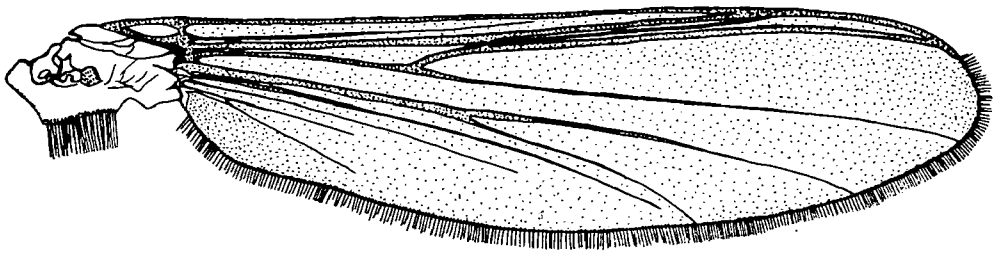

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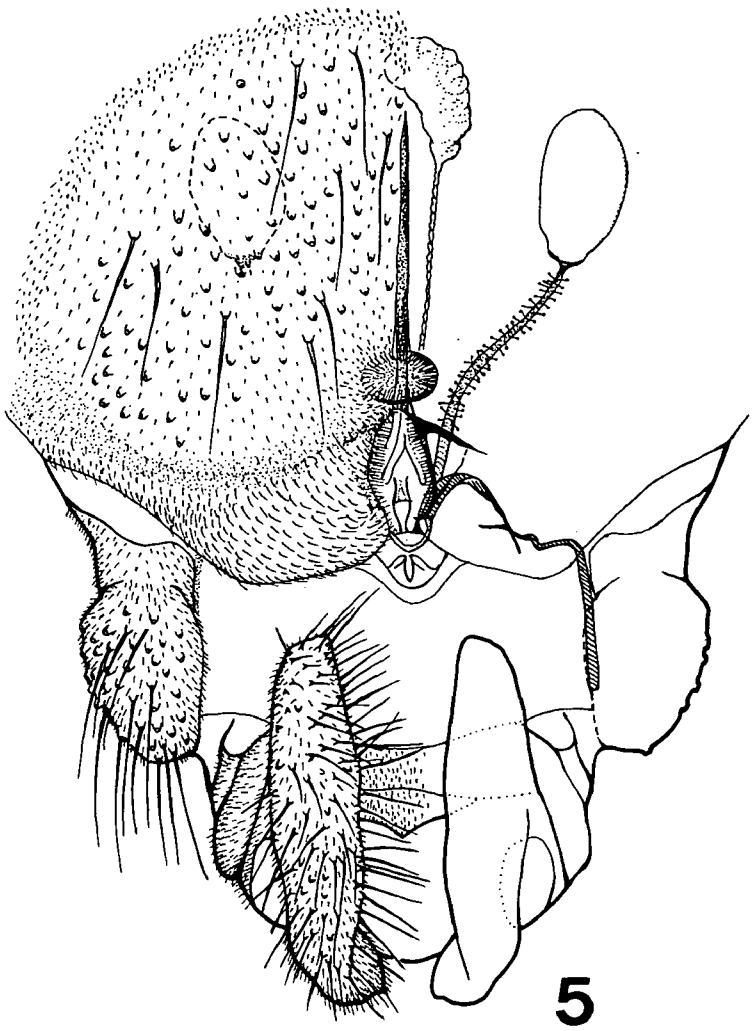
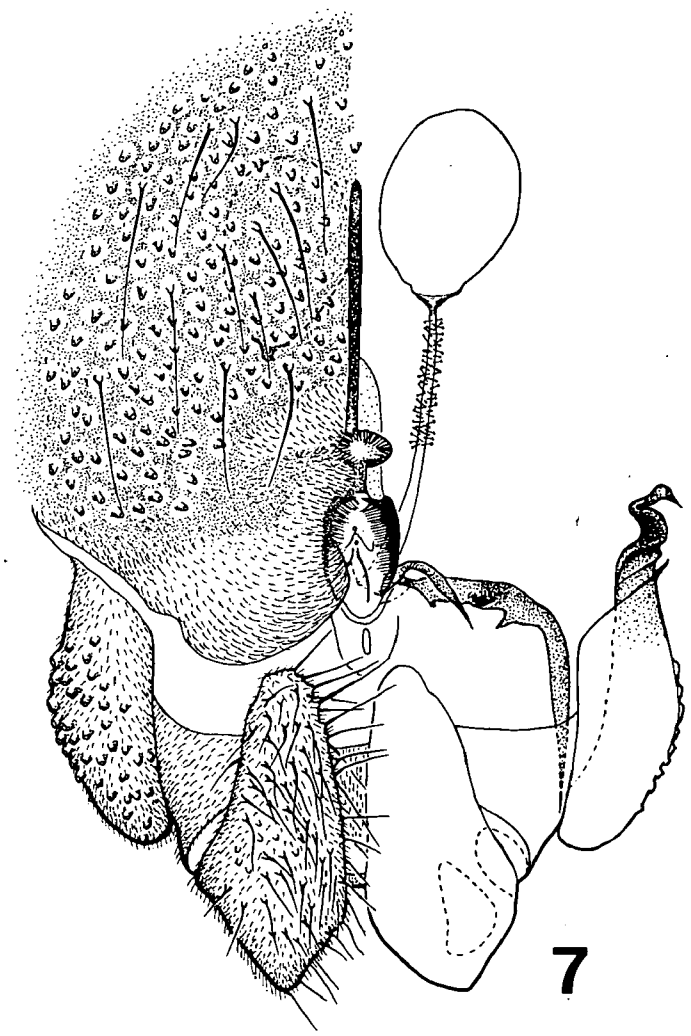
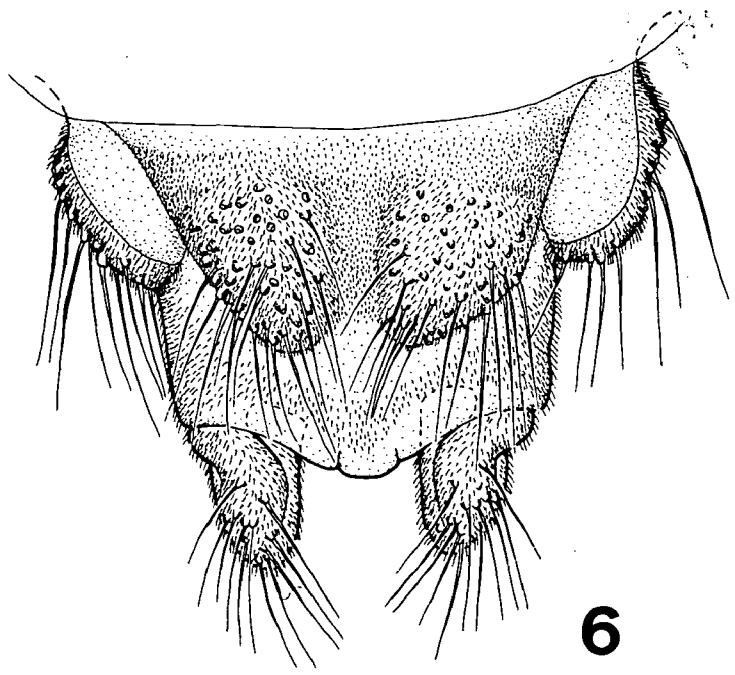
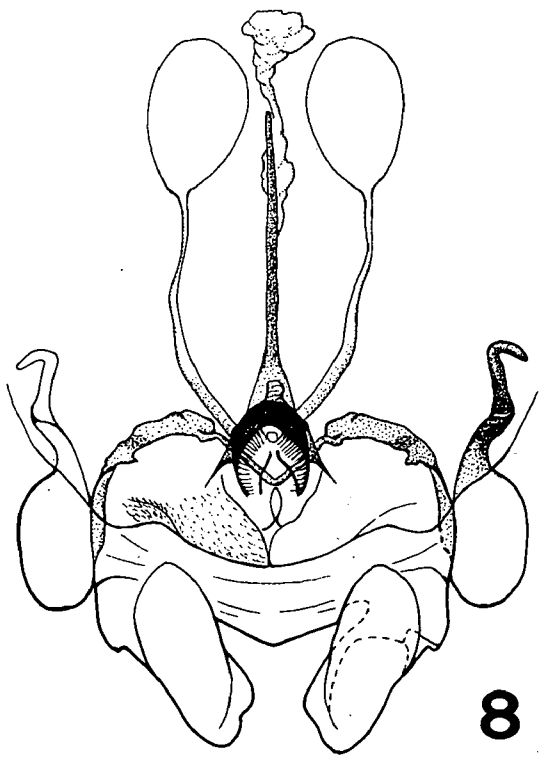
Figs. 1-4. *Brillia pudorosa* sp.n. 1 : thorax. 2 : Cibarial pump and tentorium ; 3 : Hypopygium ; 4 : Wing.
Figs. 1-4. *Brillia pudorosa* n.sp. 1 : thorax ; 2 : pompe du cibarium et tentorium : 3 : hypopyge ; 4 : aile.









Figs. 5-8. *Brillia pudorosa* sp.n. 5 : female genitalia, ventral view. 6 : *Brillia pudorosa* sp.n. female genitalia, dorsal view. 7 : *Brillia longifurca*, female genitalia, ventral view. 8 : *Brillia japonica*, female genitalia, ventral view.

Figs. 5-8. *Brillia pudorosa* n.sp. 5 : genitalia ♀, vue ventrale ; 6 : genitalia ♀, vue dorsale ; 7 : *Brillia longifurca*, genitalia ♀, vue ventrale ; 8 : *Brillia japonica*, genitalia ♀, vue ventrale.

three seminal capsules present, the median one thin-walled, reduced, with longer and separate duct and opening, the two remaining capsules normal (79-104, 83 μm long and 48-61, 52 μm wide, n=3, with brownish neck and special secretory cells on separated and relatively straight ducts with common opening).

Remarks

Males of this species are nearly identical to the known species of the *longifurca* group in genitalia structure, but differ slightly in a number of other features such as low AR, wing length and VR ; RM starting vertical and not obliquely in a close angle. The coloration of the thorax and abdominal tergites will separate it from other species, nevertheless pinned specimens are required to adequately assess these differences.

B. pudorosa is very closely allied to *B. laculata*, but the shape of the female genitalia display a mixed set of characters between *B. laculata* and *B. longifurca* (Fig. 7) and makes the species easily separable from all other previously described species. The distinctive spermathecal ducts and the basal constrictions and brownish necks of the seminal capsules separate *B. sera* (Fig. 11) from *B. pudorosa*. With regard to *B. japonica* (Fig. 8) there is no possibility of confusion because from among the Holarctic species of the group, *B. japonica* can be easily separated by the shape of the margins of the female vaginal opening. Finally, it is noteworthy that the females of other allied species such as *B. bifasciata* and *B. brevicornis*, with a very low male AR (Wang et al. 1994), remain unknown.

The immature stages are unknown but we have observed two different pupal exuviae belonging to the *longifurca* group, the first has the posterior margin of abdominal tergite VIII with a transverse band of spinules, as in *B. sera*, while the second, larger type, has the posterior margin of abdominal tergite VIII with or without sparsely distributed spinules. Unfortunately, a final decision about identity can only be made when reared Iberian material becomes available.

Brillia longifurca Kieffer, 1921 and ***Brillia flavifrons*** (Johannsen 1905)

Sublette & Sublette (1979) place *B. longifurca* in synonymy with *B. flavifrons* ; however Oliver & Roussel (1983) point out that until more work is done on Palaearctic specimens, specially on females, the status of the two species remains in doubt. Later Makarchenko et al. (1988) were of the opinion that these species should be considered synonymous because the male hypopygia are identical. The study of the Iberian adult females seemed to prove this assumption, *B. longifurca* females very closely resemble *B. flavifrons* according to the literature, but surprisingly, when we compared our material with that kindly sent to us by Dr. Oliver, we could distinguish them by genitalia characters. The vaginal opening with anterior margin more or less straight and distinctive anterior oval projection, and the ventrolateral lobe of gonapophysis VIII with inner margin strongly diverging from inner margin of opposite lobe will separate *B. longifurca* from *B. flavifrons*.

Despite the fact that Nearctic and Palaearctic populations may be contiguous through the Arctic, one might reasonably suppose that, as Oliver & Roussel (1983) say, most records of *B. longifurca* from the Nearctic are really misidentifications of *B. flavifrons*, and as far as the Palaearctic records of *B. longifurca*, and recently *B. flavifrons*, are concerned, there must be serious doubts about their identity within the species group.

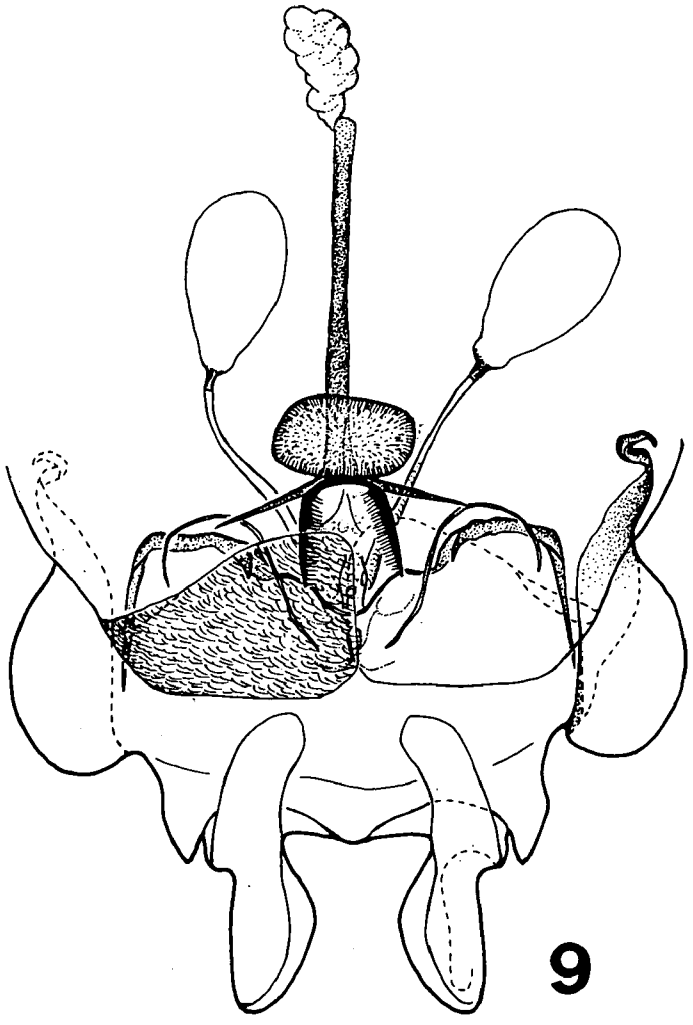
Brillia modesta (Meigen, 1830)

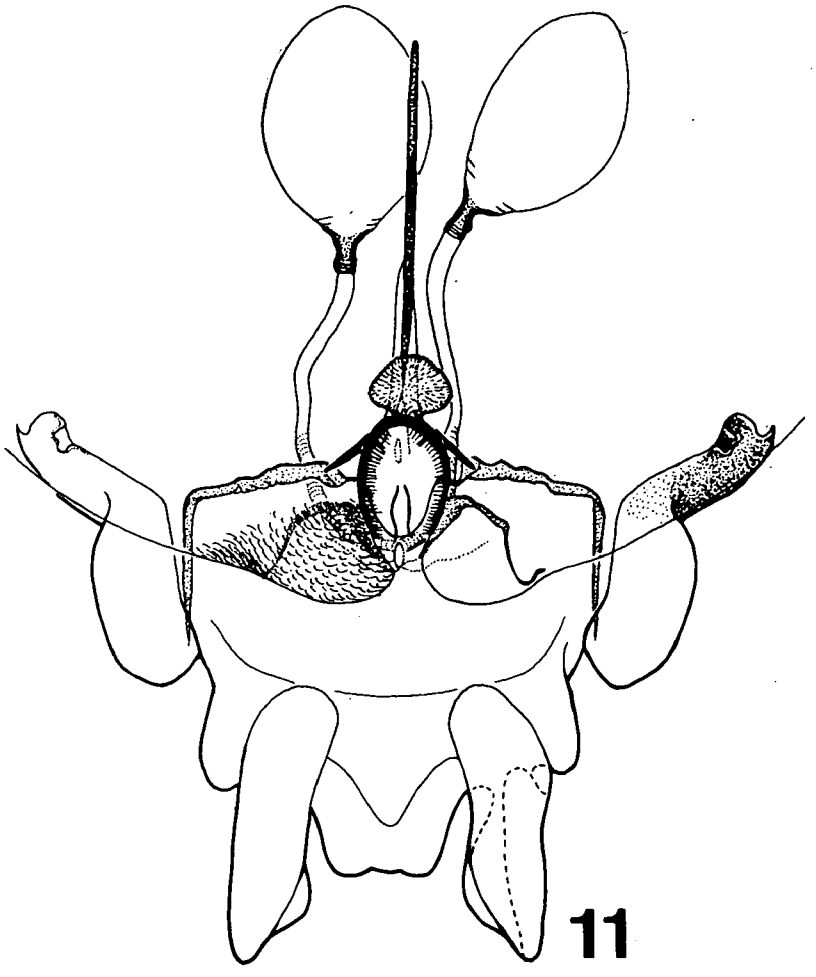
When comparing a somewhat atypical material from Burgos (mid-northern Spain) with other specimens in our collection, we observed some differences. The Burgos specimens are dark forms with superior volsella of the male hypopygium extended, and with shorter appendages on gonostylus ; the females with usually the ventrolateral lobe of gonapophysis VIII larger, third seminal capsule without brownish neck and with polygons present on ninth tergite. We are, however, more inclined to believe that these differences may not be specific but connected with the habitat, and *B. modesta* is a single highly variable species.

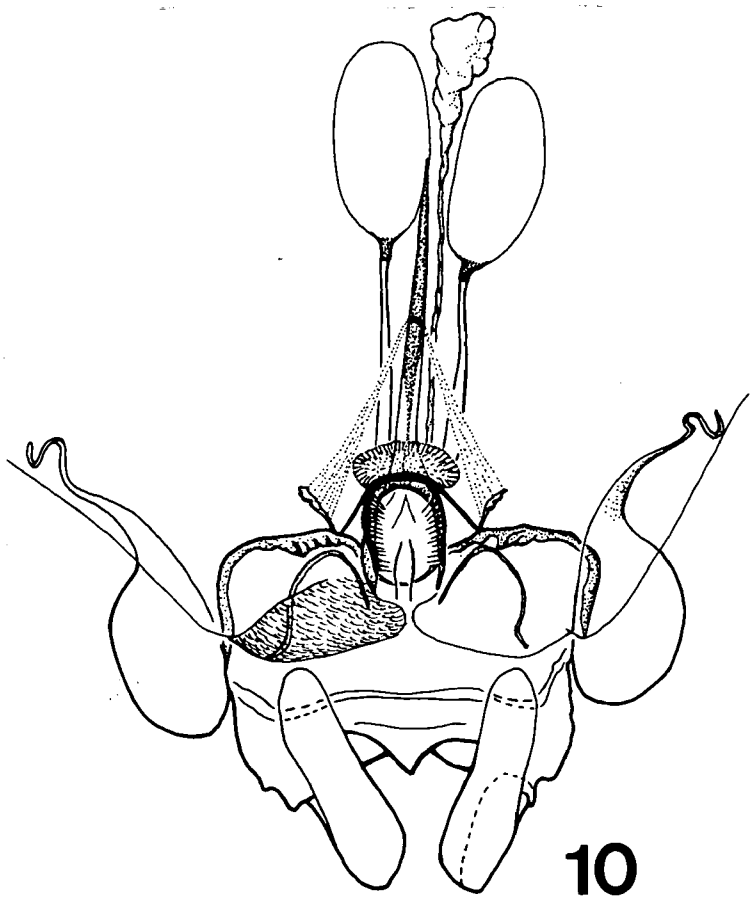
With regard to those species of the *modesta* group, the straight inner margin of the ventrolateral lobe of gonapophysis VIII will easily distinguish the females of *B. parva* (Fig. 10), but females of *B. modesta* (Fig. 9) and those of the Nearctic species *B. retifinis* (Fig. 12) cannot always be separated except by the relative size of the two normal seminal capsules, bigger in *B. retifinis*, and by geographic location ; nevertheless both species can be separated by the coloration of the submentum of the larvae, black in *B. modesta* and concolorous with the rest of the head capsule in *B. retifinis*.

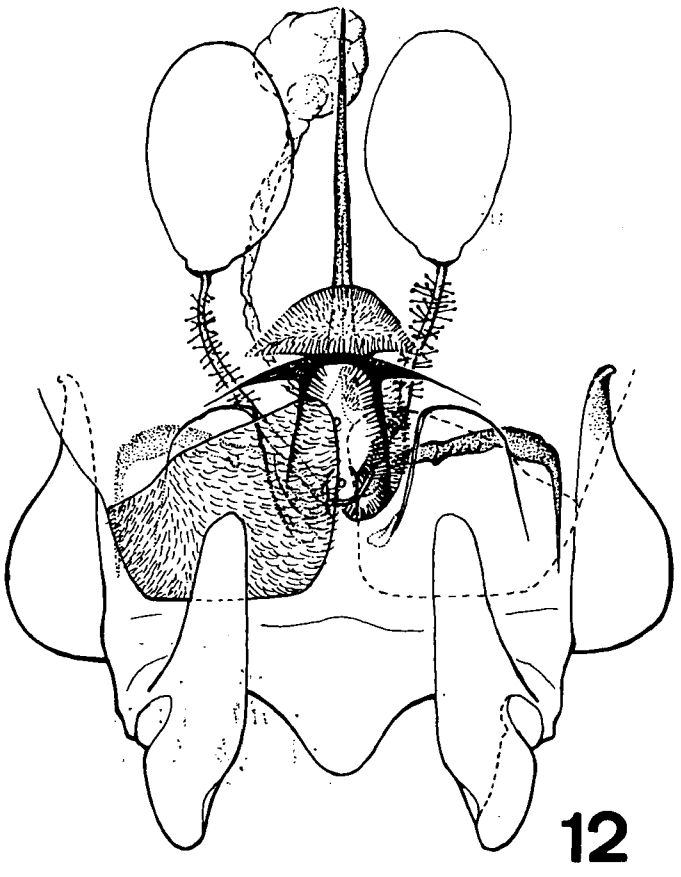
5. Discussion

Amongst the material examined, we have verified the presence of a third seminal capsule in *B. pudorosa*, *B. japonica*, *B. modesta*, *B. parva* and *B. retifinis*. This extra seminal capsule has never been found in females of *Brillia*, because it is usually indistinct, depending on how the specimen was treated before mounting and on the degree of sclerotization ; also, in some cases, it can be confused with tracheal trunk.









Figs. 9-12. *Brillia modesta*. 9 : female genitalia, ventral view. 10 : *Brillia parva*, female genitalia, ventral view. 11 : *Brillia sera*, female genitalia, ventral view. 12 : *Brillia retifinis*, female genitalia, ventral view.

Figs. 9-12. *Brillia modesta*. 9 : genitalia ♀, vue ventrale ; 10 : *Brillia parva*, genitalia ♀, vue dorsale ; 11 : *Brillia sera*, genitalia ♀, vue ventrale ; 12 : *Brillia retifinis*, genitalia ♀, vue ventrale.

Previously to this paper, Sæther (1977) has examined and illustrated two females of *Brillia* with quite different types of seminal capsules, one (*Brillia* sp B) with two oblong seminal capsules of differing size, void of microtrichia, and another, *Brillia* sp A, actually *Xylotopus par* (Oliver, 1985), with three spherical seminal capsules covered with strong microtrichia.

Sæther & Wang (1992) suggested that the shape of the spermathecal system may be a synapomorphy for the *Brillia* group plus *Diplocladius* and *Pludsonia*, with secondary loss of a seminal capsule in *Brillia* and *Pseudobrillia*. At that time the known genera of the group with two seminal capsules were *Irisobrillia* Oliver, 1985, *Neobrillia* Kawai, 1991 (=*Pseudobrillia* Niitsuma, 1991) and *Brillia*. On the strength of this Sæther & Wang have pointed out that while the presence of a third thin-walled seminal capsule in *Tokyobrillia* suggests a relationship with *Euryhapsis*, the absence of a third capsule in *Irisobrillia* and *Neobrillia* suggests that these genera are closer to *Brillia*. Thus, it is reasonable to assume that they all can be regarded as separate genera. However, a number of complex questions arise from the presence of a reduced third seminal capsule in the females of *Brillia*. For instance, if within a single genus there can be species with different spermathecal systems, it is conceivable that *Tokyobrillia* and *Neobrillia* should be regarded as subgenera of *Irisobrillia* because they are quite similar, just as Sæther & Wang have suggested, despite their different seminal capsules. Then, the presence or absence of a third thin-walled seminal capsule is not an argument in favour of the relationship of *Tokyobrillia* with *Euryhapsis*, or *Irisobrillia* and *Neobrillia* with *Brillia*. A further complication is that, seeing that we have verified the presence of a third seminal capsule in other species of the genus, it may well be that the third seminal capsule has gone unnoticed in several specimens, in which case the form of the spermathecal system will be a reliable synapomorphy for the *Brillia* group.

In this connection, we observe that the simple gonostylus of *Neobrillia* appears to be secondarily developed by the loss of the subapical lobe of *Brillia* (we can see the different levels of its development in the species of this genus), whereas, the simple gonostylus of *Irisobrillia* and *Tokyobrillia* appears secondarily developed from the fusion of the subapical and apical lobes of *Euryhapsis* (see Sæther & Wang 1992). According to this *Neobrillia* and *Brillia* appear closely related, just as *Tokyobrillia* and *Irisobrillia* are related between them and with *Euryhapsis*.

Acknowledgments

We are indebted to Dr. D.R. Oliver (Biological Resources Div. Agric. Canada), Dr. T. Kobayashi (Caritas Jr. & Sr. High School, Kanagawa, Japan), Dr. E. Martinez-Ansemil (Univ. La Coruña, Spain), and Mr. O. Soriano (Museo de Ciencias Naturales, Madrid, Spain) for the loan of specimens from their collections. Also many thanks to Dr. P.S. Cranston (CSIRO Entomology, Australia), Dr. P.H. Langton (Huntingdon, England) and Dr. O.A. Sæther (Museum of Zoology, University of Bergen, Norway) for reading and providing helpful comments upon the manuscript and for correcting the language.

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