

Remarks on *Zodion nigratarsis* (Strobl, 1902) and other European species of *Zodion* Latreille, 1796, with a revised key (Diptera, Conopidae)

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The male of *Zodion nigratarsis* (Strobl, 1902) is described and the known distribution of the species summarised. Some old names of *Zodion* Latreille, 1796 are reviewed and the following new synonymies are proposed: *Zodion frontalis* (Fabricius, 1805), *Z. notatum* (Meigen, 1804) and *Z. subapertum* Rondani, 1868 are synonymised with *Zodion cinereum* (Fabricius, 1794), *Zodion grande* Kröber, 1915 is synonymised with *Z. nigratarsis* Strobl, 1902. A key for the identification of the European *Zodion* species, with illustrations of the thecae and drawings of the male genitalia, is presented.

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Introduction

The conopid *Zodion nigratarsis* (Strobl, 1902) was originally described as a species of *Glossigona* Rondani, 1856, a junior synonym of *Melanosoma* Robineau-Desvoidy, 1853, on the basis of a female specimen from Niš (Yugoslavia). Strobl did not provide illustrations for the new species and, since the type specimen was never seen by later authors, *Z. nigratarsis* was dealt with as a species of *Melanosoma* in all of the subsequent revisions and catalogues (e.g., Kröber 1915a, 1936; Chvála & Smith 1988). Stuke (2003) only recently demonstrated that it represents a valid species of the genus *Zodion* Latreille, 1796.

We were able to find and study several additional specimens of this poorly known conopid and in the present paper we provide an improved diagnosis of the species, complete with illustrations and the

description of the previously unknown male. An investigation into the possible synonymies involved with this species led us to carry out a wider survey of some other problematic taxa, and to prepare a new and updated key to all of the European *Zodion* species.

The genus *Zodion* includes 64 valid species and is distributed in all the major biogeographical regions, except for the Australasian region. About half of the known species occur in the Neotropics (Camras 1978). The genus can be distinguished among the other Old World Myopinae by the characteristic proboscis, which is geniculate at the base only. All the species whose biology is known so far are parasitic in Hymenoptera Aculeata (Howell 1967; Maeta & MacFarlane 1993; de Meijere 1904; Severin 1937; Smith 1966).

Material and methods

Morphological terminology follows McAlpine (1981) and Stuckenberg (1999). For the examination of genital structures and taxonomically important sternites, the entire abdomen, or at least from segment 4 onwards, was detached and macerated in 10% aqueous potassium hydroxide (KOH), prior to dissection. Male terminalia were studied as temporary slide mounts, then stored in glycerine, in small plastic tubes pinned on the same pin as the relevant specimen. Drawings were done using a Wild M5A stereoscopic microscope (whole insect) and a Wild M12 compound microscope (male terminalia). All the photographs were taken with a Zeiss Stemi SV11 and a Nikon Coolpix 995 camera. Body length is approximate and is measured from the base of the antennae to the furthest limit of the abdomen in natural posture, viewed from above.

In the taxonomic account, the data given on the original labels of examined type specimens is rendered as follows: the labels are listed and numbered in the order found, commencing with the uppermost, and line-breaks on labels are indicated by a slash-mark (“/”).

The specimens studied in the present paper are preserved in the following collections: DCDS: Dipartimento di Coltivazione e Difesa delle Specie legnose dell'Università, Sezione di Entomologia Agraria, Pisa, Italy. – JHSC: Jens-Hermann Stuke, personal collection, Leer, Germany. – MSNM: Museo Civico di Storia Naturale, Milan, Italy. – MMC: Maurizio Mei, personal collection, Rome, Italy. – MZUC: Museum of Zoology of the University of Copenhagen, Denmark. – MZUF: Museo di Zoologia dell'Università di Firenze, Florence, Italy. – NMW: Naturhistorisches Museum Wien, Austria. – ZMHB: Museum für Naturkunde, Humboldt Universität, Berlin, Germany.

Key to the European *Zodion* species

1. Wing cell r4+5 open; at most only very inconspicuous black markings around the bases of the black hairs on tergite 4. Antennae completely orange. Palps orange; postpedicel clearly shorter than pedicel. Legs orange except for the last dark tarsomere, and occasional weak grey dusting on the dorsal surface of the femora. Proboscis at most $\frac{1}{4}$ longer again than height of head. Many bristles present on the katepisternum (at least 6), the frons (at least 7 pairs at the upper eye margin) and the posterior margin of the scutellum (at least 5 pairs). Abdomen orange-brown dorsally; apex of abdomen reddish. ♂: Epandrial vesicles only weakly separated, posterior surstylus (Fig. 11) straight or only weakly bent, with narrow membranous appendage that almost reaches as far as the tip. ♀: Theca (Fig. 6) long, with bristle field narrow and strongly curved *kroeberi* Szilády, 1926 (= *carceli* auct.)
- Wing cell r4+5 closed (very occasional specimens of *Z. cinereum*, with one or both cells open); conspicuous dark spots at the bases of the black hairs on tergite 4. Postpedicel weakly darkened apically at least (only *Z. nigritarsis* with complete orange antennae), about as long as pedicel. Legs usually extensively dark dusted, the apical tarsomere not usually contrastingly darker (only *Z. nigritarsis* and *Z. erythrurum* with all reddish femora and tibiae). Proboscis at least $\frac{1}{2}$ longer again than head height; usually fewer bristles on katepisternum, frons and posterior margin of scutellum; ♂: Epandrial vesicles obviously separated 2
2. Mesoscutum viewed from rear with submedian areas extensively undusted, black. Wing base dark brown, anterior edge of wing weakly darkened and crossvein rm with weakly indicated dark marking. Genae and parafacialia with strikingly long black hairs. Dense and long hairs on frons, clearly longer than pedicel; frons almost completely black. ♂: Posterior surstylus (Fig. 13) narrowed in the middle, with narrow membranous appendage that reaches to the tip. ♀: Theca as in Fig. 3. Endemic to the Canary Islands *caesium* Becker, 1908
- Mesoscutum with two pairs of narrow submedian strips of sparse dusting. Wing base yellowish, anterior edge of wing not darkened and crossvein rm without a darkened marking. At least genae and parafacialia without strikingly long black hairs. Hairs on frons usually sparse, and hardly reaching the length of the pedicel. Frons usually orange at least in the anterior third 3
3. Apex of abdomen reddish-brown; legs reddish-brown. ♂: Posterior surstylus (Fig. 12) straight, or only weakly bent, with wide membranous appendage that almost reaches to the tip. ♀: Theca as in Fig. 5. *erythrurum* Rondani, 1865
- Apex of abdomen blackish 4
4. Antennae entirely orange. Palps pale orange-brown. All femora entirely orange-reddish, all tibiae mainly orange-reddish, with darker tarsi contrasting. ♂: Genitalia as in Fig. 9;



Fig. 1. *Zodion nigratarsis*, habitus of female (Thessalia, Magnisia).

surstylus (Fig. 10) lacking a membranous appendage. ♀: Theca (Fig. 7) long and pointed, with the bristle field narrow and strongly curved *nigratarsis* Strobl, 1902

- Postpedicel darkened apically at least, sometimes completely black. Palps dark brown. Legs more-or-less strongly darkened, with no contrast between tibiae and tarsi. ♂: Posterior surstylus (Fig. 14) obviously bent, with narrow membranous appendage that only reaches as far as the middle of the surstylus. Narrow sclerotisation on the aedeagal apodeme often divided. ♀: Theca (Figs 4, 8) broad and short, trapezoidal, with the bristle field broader and less curved
 *cinereum* (Fabricius, 1794)

Taxonomic account

Zodion cinereum (Fabricius)

Myopa cinerea Fabricius, 1794: 399 ["Italia"].

Zodion frontalis (Fabricius, 1805):182 (*Myopa*) ["Kiliae" (Kiel, Schleswig-Holstein, Germany)] **syn n.**

Zodion notatum (Meigen, 1804): 288 (*Myopa*) [type locality not given (Aachen, env.)] **syn n.**

Zodion subapertum: Rondani, 1868: 56–57 [type locality not given (Italy)] **syn n.**

Synonymic notes. The interpretation of *Zodion frontalis* (Fabricius, 1805) has always been difficult with the original description being too general and the type material unavailable to other students. Kröber (1915b, 1936) recognised the species without

making any comment on its validity, but Chvála & Smith (1988) listed it as "doubtful". Unfortunately, the type specimen in the MZUC is "almost completely destroyed. The pin has only a few scraps of the thoracic muscles left." (Pape 2005, pers. comm.). The original description fits well with *Z. cinereum* [= *Z. notatum* (Meigen, 1804); see below], the only *Zodion* species otherwise known to occur in the *locus typicus* in northern Germany. All things considered, we therefore believe it reasonable to interpret *Z. frontalis* as a junior synonym of *Z. cinereum*.

For a long time some authors (e.g., Schiner 1862; Smith 1969) have admitted the possibility of *Z. notatum* being no more than a dark form of *Z. cinereum*, often occurring at higher altitudes at least in southern Europe. The two species are in fact very similar, *Z. notatum* differing only by the entirely black antennae, a more greyish and generally darker colouration and, on average, by its smaller size (3.9–5 mm, compared with a size of 4.5–10 mm in *cinereum*). *Zodion cinereum* and *Z. notatum* are the only European *Zodion* species that cannot be separated from each other using genital characteristics. Moreover, there are intermediates, with occasional specimens of *Z. cinereum* / *notatum* with dark but not completely black antennae being found that are difficult to ascribe to one or other species. Both species have a very similar and wide distribution in the Palaearctic region. Though one of us (MM) thinks that the problem should deserve a more thorough study, with a full analysis of the variability and ecology of both species in all part of their range, we agree in the fact that there are no reliable characters for a safe separation of the two forms, thus we propose a formal synonymy.

Under the name *Z. subapertum*, there is standing in MZUF a female specimen, which is labelled as follows: (1) "404" [oval, printed label on the pin], (2) "Zodion ?carceli/ (Rob.-Desv. 1830)/ L. Rivosecchi det." [rectangular, handwritten label on the pin] and (3) "subaper- / tum Rond / Etrur[ia]" [handwritten label, pinned in the box]. The specimen is in good condition but with the head, detached by accident, glued back in place. It agrees perfectly with the short description published by Rondani (1868), but there is a significant qualification required with respect to the main diagnostic characteristic of the species: in the left wing the veins R_{4+5} and M_2 reach the costa separately, as stated in the description by Rondani, and the cell r_{4+5} is therefore open. However, in the right wing these veins meet exactly on the costa and there is no visible space between their insertions.

The specimen in the Rondani collection appears to be the only one known of this species, and is assumed

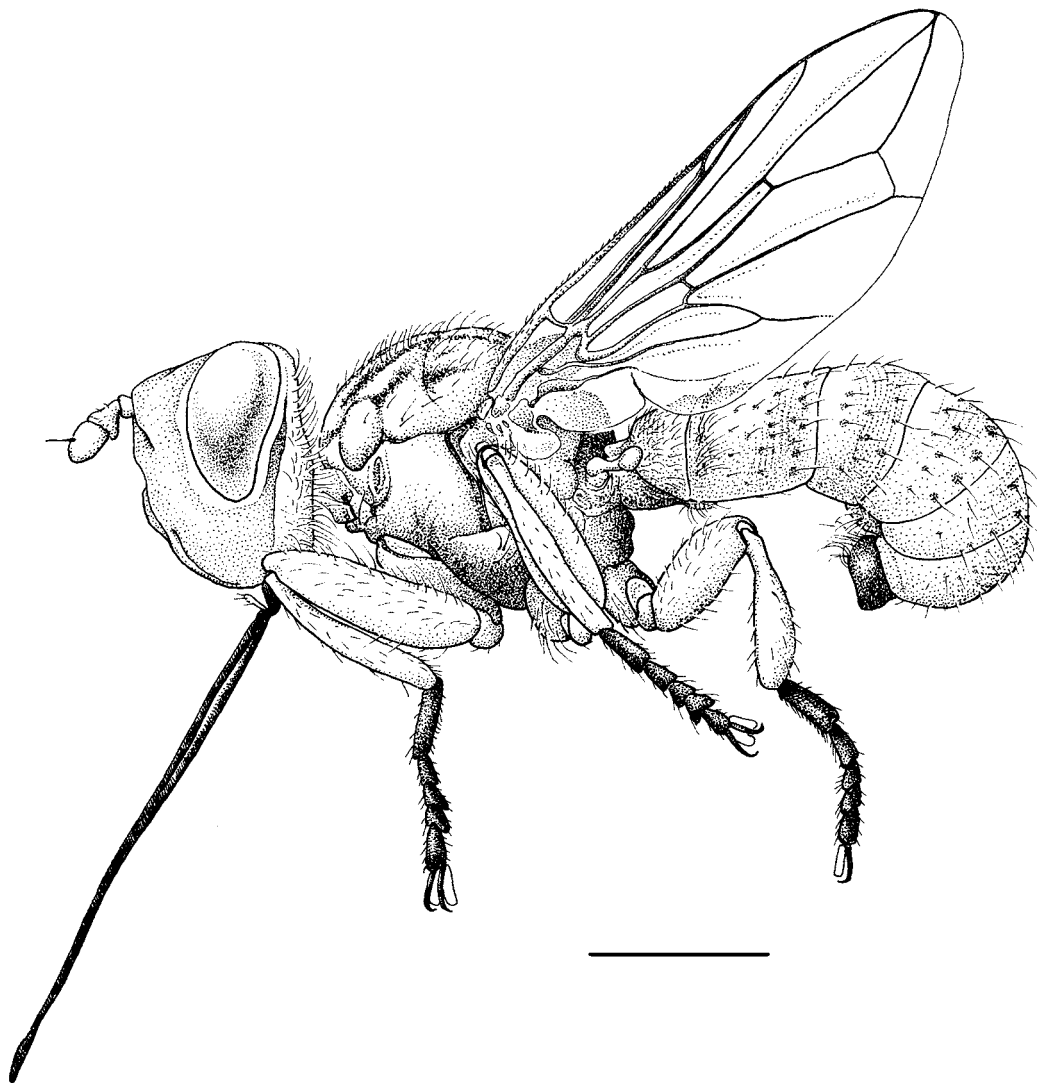


Fig. 2. *Zodion nigritarsis*, male (Italy, Latium). Scale bar = 2 mm.

to be the holotype of *Z. subapertum* Rondani, 1868. We have therefore added the following red label on the pin: "Holotypus / *Zodion subapertum* / Rondani, 1868 / labelled by Mei & Stuke, 2007". The specimen agrees with the current concept of *Z. cinereum* in every detail, including the wing venation (in *cinereum*, the cell r_{4+5} is normally closed and shortly petiolate, but we have seen occasional specimens with one or both cells open; see also Kröber 1915b: 87 and 89). Therefore we herewith propose the synonymy of *Z. subapertum* with *Z. cinereum*.

Zodion nigritarsis (Strobl)

Figs 2, 9–10

Glossigona nigritarsis Strobl, 1902: 483

Zodion grande Kröber, 1915b: 88 ["Dobrudscha, Brussa, Italien, Konia-Armenien?"] **syn. n.**

Material examined. Greece: 1 ♀, Thessalien, Magnisia, 35 km SE Vólos, 06.vi.2005, leg. Standfuss (JHSC) (see Stuke & Standfuss 2007) (Fig. 1); 1 ♂, Messinia, Kardamyli, 36.883° N, 22.223° E, 2.v.2007, leg. S.M. Blank, (JHSC). Italy: 1 ♀, Abruzzi, Cerchio (L'Aquila), leg.

Leoni (MSNM, Bezzi Collection; sub *Z. frontalis*, Kröber det., 1914); 1♂, Latium, Latina [=Littoria], 20.vi.1933 (MMC); 1♀, Latium, Rome, Prima Porta, vi.1941, Venturi leg. (DCDS, coll. Venturi; sub *Zodion carceli* R.-D.). **Russia:** 1♀, Ostrogožsk District, Voronež region, on the bottom of the ravine (grassland), 10.vii.[19]27, leg. N.N. Konakov (ZMHB, sub *Z. grande*). **Turkey:** 1♀, Brussa (=Bursa, NW Turkey), 1863, leg. Mann (NMW, the lectotype of *Z. grande* Kröber, see below).

Description of the male

Head. Antennae orange-brown, scape and pedicel with short, black bristles dorsally, and also sparingly on the ventral surface; pedicel and postpedicel of the same length. Eyes brown, hairless. Frons, parafacialia, antennal grooves and facial keel all of the same deep orange as the antennae, genae ochre yellow; all surfaces, with exception of the facial keel, covered with silvery-white dusting, which is particularly dense on the orbits and the antennal grooves. Frons and genae with only few, short, inconspicuous hairs. Ocellar triangle shining black, with two black, decumbent ocellar bristles. Occiput and postgenae grey dusted; the median occipital sclerite is laterally marked with two dark stripes, and a dark spot is present in the middle of the sclerite and also in each of the upper corners of the postgenae; the whole rear of the head, with the exception of the median sclerite, covered with long, black hairs, becoming finer and whitish on the lower part of the postgenae. Palps pale orange. Proboscis very long (2.3 times head height), black.

Thorax. Mesoscutum and scutellum yellowish-brown, with seven dark longitudinal stripes as in the female: the fine midline stripe and the middle pair interrupted behind at the suture, the second pair longer and ending in a row of dots, the most external pair, wide and triangular, beginning just behind the postpronotal lobe. Postnotum shining black, only its upper margin greyish pruinose. Mesoscutum with short, sparse, black bristles; acrostichal and dorso-central rows clearly visible, in correspondence with the black stripes. Sides of thorax densely covered with greyish pruinosity, lower half of katapisternum and parts adjacent to coxa 3, black. Scutellum with 3 pairs of setae (partly rubbed off in the specimen seen).

Legs. All coxae brown, covered with light greyish dusting, especially dense on the front coxae. Femora and tibiae orange-yellow, dorsal surface of front femora pale grey. A dense patch of black, short bristles on the apical internal half of hind tibiae. Femora and tibiae covered with pruinosity, denser on the tibiae which, at certain angles, appear almost white. Tarsi brownish-black, claws brown, pulvilli yellow.

Wings. Membrane evenly greyish, yellowish only in

the basal third of the wing; membrane completely covered with microtrichia. Proximal portion of the veins orange-yellow, veins otherwise brown. Cell r4+5 closed, non-petiolate. Halter yellowish-white; upper calypter white, lower calypter yellow.

Abdomen. First tergite greyish, tergites 2–6 yellowish-brown, with tergites 2–3 darkened in the middle; all tergites transversely rugose, densely pruinose, and sparsely covered with black, decumbent bristles of uneven length; the insertions of the bristles are marked by black spots, those on the posterior margin of tergites 3–5 being larger and more conspicuous. Terminalia as in Figs 2, 9, 10: blackish brown, epandrial vesicles separated, posterior surstylus flattened, very weakly bent, slightly tapering toward the apex and lacking the membranous appendage.

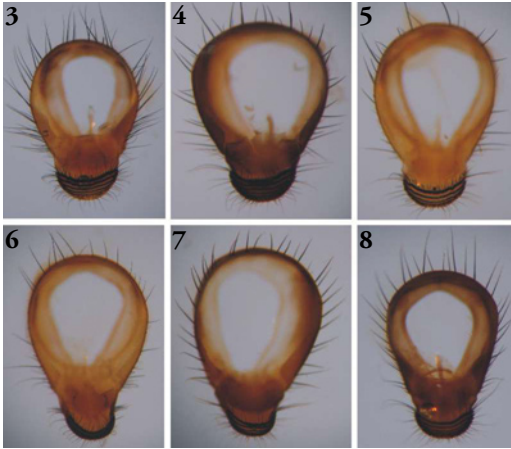
Diagnosis

Zodion nigritarsis is well distinguished by the following combination of characteristics (Fig. 1): large size (9.5–12 mm, in mounted specimens); orange-coloured antennae; frons with only very short, sparse and inconspicuous hairs; postgenae with pale coloured setae; pale orange palps; mesonotum with seven longitudinal, more-or-less complete dark stripes; orange-coloured femora and tibiae, sharply contrasting with all blackish tarsi; scutellum with 3 pairs of marginal bristles; theca (Fig. 7) large, long, nearly lanceolate, apically pointed.

These characteristics are quite constant in the five females examined by us. The male (Fig. 2) also agrees well with this diagnosis, the most obvious difference being the yellowish-brown abdomen, which is not greyish as in female. Occasionally, large-sized (~9 mm) *Z. cinereum* specimens with pale coloured legs are found which could be misidentified as *Z. nigritarsis* (see also Chvála 1965: 99); however, the completely orange-coloured antennae, palps, femora and tibiae, a frons devoid of long bristles, and the shape of the theca in females, are all sufficient for correct identification of the latter. *Zodion kroeberi* Szilady, 1926 (= *carceli* R.-D. auct.; see: Stuke & Clements 2005) is also superficially similar, being a large, reddish-coloured *Zodion* with completely orange antennae and a narrow theca. However, *Z. kroeberi* differs in almost every other detail (as indicated in the key above), and a misidentification should therefore be unlikely.

Synonymic notes

In the original description of *Z. grande*, Kröber dealt with four females from “Dobrudscha, Brussa, Italien, Konia-Armenien:” (Kröber 1915b: 88). The description itself was based on all of these specimens, as indicated by the body length range of



Figs 3–8. Thecae of *Zodion* spp. – 3, *Zodion caesium* (Tenerife NE Las Mercedes); 4, *Zodion cinereum* (Bulgaria, near Nesebar); 5, *Zodion erythrurum* (Spain, Costa del Sol, Olivar N Almuñecar); 6, *Zodion kroeberi* (Deutschland, Kielitz); 7, *Zodion nigritarsis* (Russia, Ostrogožsk District); 8, *Zodion cinereum* (=notatum) (Germany, Baden-Württemberg, Oberrheinebene). Scale not uniform.

“9.5–10.5 mm” provided by the author. Kröber (l. c.) stated that the “type” was in his collection, but he did not specify which of the four females was so designated. In any event, the specimen in question was destroyed during the Second World War together with the Kröber collection (Weidner 1967).

We were, however, able to find one of the females studied by Kröber in the collections of the NMW. This specimen, which is in perfect condition, is the female from Brussa (=Bursa, NW Turkey), and is labelled as follows: (1) “Mann / 1863 / Brussa” (2) “frontale / Alte Sammlung” (3) *Zodion* ♀ / *grande* Krb. / O. Kröber det. 1914”. This female can be considered to be a syntype of *Z. grande*. To fix this interpretation, we herewith designate this specimen, the only known remaining syntype, as lectotype, and have added a red label with the following text: “Lectotypus / *Zodion grande* / Kröber, 1915 / des. Mei & Stuke, 2007”.

The specimen is in fact a female of *Z. nigritarsis*. Chvála & Smith (1988) considered *Z. grande* to be a synonym of *Z. erythrurum* Rondani, 1865; however, on the basis of the present study, *Z. grande* Kröber, 1915 should be correctly placed as a junior synonym of *Z. nigritarsis* (Strobl, 1902).

We are aware of at least two additional published records of *Z. nigritarsis* (as *Z. grande*) both from the Dobrogea Region in Romania: a female from

Sulina, in the Danube Delta, taken on 8.vii.1959 (Bankowska 1961) and another one from Baneasa, taken on 17.vii.1964 (Chvála & Weinberg 1969).

Distribution

Summarising all known data, including those published as *Z. grande* (see above), *Z. nigritarsis* is presently known only from the south of Europe (Greece, Italy, Yugoslavia, South European Russia, Rumania) and nearby Turkey. It seems to be a very rarely collected species, only being recorded twice recently. It is almost certain, however, that more specimens will be discovered in museum collections, perhaps misidentified as *Z. grande*, *Z. kroeberi* or even as *Z. erythrurum* Rondani, 1865.

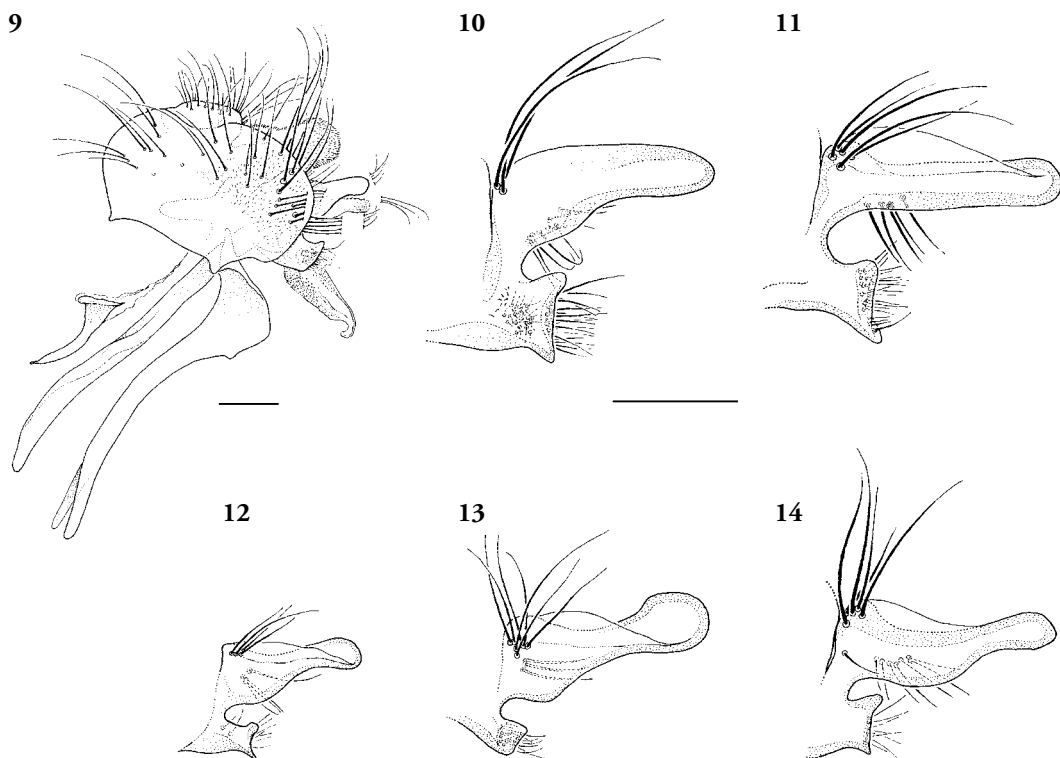
Zodion sardeum Rondani

Zodion sardeum: Rondani, 1865: 146 [“Sardiniae Insula (Sardinia)”]

This species was described by Rondani as being very similar in habitus, size and colouration to *Z. cinereum*, but differing in two important characteristics: 1) the pedicel “at least twice as long as the postpedicel” [our translation], and 2) the absence of paired dark spots on the tergites of the second and third abdominal segments. The author has studied a single male from Sardinia. The relative length of the antennal segments appears to be the only valid characteristic with which to differentiate *Z. sardeum*, since the paired black spots on the abdominal tergites are actually variable in *Z. cinereum*, and are not always well defined.

In the Rondani collection in MZUF there is a male specimen labelled as follows: (1) “406” [oval, printed label on the pin] and (2) “sardeum Rond” [handwritten label, pinned in the box]; the head of this specimen is missing, otherwise the specimen is in fairly good condition, although the setae on the thoracic dorsum are almost completely rubbed off. This specimen is assumed to be the holotype because it is the only specimen standing under this name, and we have therefore added the following red label on the pin: “Holotypus / *Zodion sardeum* / Rondani, 1865 / labelled by Mei & Stuke, 2007”. Unfortunately, it is impossible to check the antennae of this specimen to see if they agree with the description of *Z. sardeum*.

The only other known European *Zodion* with a pedicel twice as long as the postpedicel is *Z. kroeberi*. However, considering the other characteristics of colouration, wing venation and chaetotaxy, we can state that the Rondani specimen is definitely not *Z. kroeberi*, and consider that it could instead perhaps be identified as *Z. cinereum*. For the present,



Figs 9–14. – 9, Male genitalia of *Zodion nigritarsis* (Italy, Latium) [scale bar = 2 mm]; 10–14, Surstyli of *Zodion* spp. 10, *Zodion nigritarsis* (Italy, Latium); 11, *Zodion kroeberi* (Italy, Piedmont, Val Ghisone); 12, *Zodion erythrurum* (Italy, Rome); 13, *Zodion caesium* (Tenerife, El Bailadero); 14, *Zodion cinereum* (Italy, Rome). Scale bar = 0.2 mm.

however, we agree with Chvála & Smith (1988) that *Z. sardeum* is a doubtful species of uncertain status.

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