

Genus	Vol. 22(1): 123-132	Wrocław, 30 IV 2011
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A new species of the *Cryptocephalus marginellus* complex  
from Italian Western Alps  
(Coleoptera: Chrysomelidae: Cryptocephalinae)

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ABSTRACT. *Cryptocephalus hennigi* n. sp. is described from a restricted area of the Piedmontese Western Alps in Italy. It belongs to the *C. marginellus* species complex, characterized by the metallic blue dorsal surface, yellow elytral apex and sparse elytral punctuation.

Key words: entomology, taxonomy, new species, Coleoptera, Chrysomelidae, Cryptocephalinae, *Cryptocephalus*, Italy, Western Alps, superspecies.

For a long time *Cryptocephalus marginellus* OLIVIER, 1791 has been considered a relatively common South European species. However, SASSI (2001a) established that the taxon is in fact a complex of closely related and morphologically very similar species. The complex has a parapatric distribution as the species ranges are contiguous to each other with some narrow overlapping zones and can be seen as a superspecies of Artenkreis sensu RENSCH (MAYR 1963, SASSI 2008).

Following the International Code of Zoological Nomenclature (Art. 6.2) (1999) such a polytypic taxon can be regarded and named as *Cryptocephalus* (superspecies *marginellus*) and currently it comprises *Cryptocephalus (marginellus) marginellus* OLIVIER, 1791, *Cryptocephalus (marginellus) renatae* SASSI, 2001, *Cryptocephalus (marginellus) aquitanus* SASSI, 2001, *Cryptocephalus (marginellus) eridani* SASSI, 2001 and *Cryptocephalus (marginellus) zoiai* SASSI, 2001.

Among the examined material, SASSI (2001a) highlighted the presence of a remarkable specimen from Acceglio (Cuneo district, Piedmont) which showed a combination of ambiguous morphological characters that thwarted a satisfactory identification. In the mentioned work the possibility of hybridization or malformation was pointed out and

the matter required further investigation. In spring 2009 several specimens belonging to the superspecies *marginellus* were collected in the environs of Acceglio and these were identical to the specimen mentioned above. They are described here as a new species.

#### MATERIALS AND METHODS

SEM pictures of aedeagus were made using a Jeol JSM-5610 LV scanning electron microscope. Drawings of genitalia were made at 60X using a microscope eyepiece reticule with 400 squares in 1 square centimetre. Female genitalia were treated by immersing the pieces in 60% ethanol.

### *Cryptocephalus hennigi* n. sp.

#### ETYMOLOGY

The species is named after the eminent German entomologist Willi HENNIG who, founding the phylogenetic systematics, rounded off the Darwinian revolution in the taxonomical field.

#### DIAGNOSIS

The new species belongs to the *Cryptocephalus marginellus* group (= superspecies *marginellus*), characterized by the metallic blue dorsal surface; yellowish elytral apex, pronotal and elytral lateral margins; dorsal punctation sparse and well impressed; lateral margins of pronotum at the same time entirely visible from above. All the species of the group are hardly distinguishable from each other but detailed examination of the shape of male genitalia (figs. 1-6) provides useful diagnostic characters at the species level. The aedeagus is like in *C. eridani* and *C. aquitanus*, that is robust and stout, with apical tooth more distinctly angled in respect to apical rim of ostium and an evident longitudinal depression on sides, a bit less defined and deep in the new species (figs. 1c, 2c, 3c). In *C. eridani* the apical tooth has the shape of an equilateral triangle, whereas in *C. hennigi* n. sp. it is more prominent, and shaped like an isosceles triangle. Besides, in lateral view the aedeagus of *C. eridani* shows a more abrupt curvature towards apex and the ostium is significantly larger. *C. aquitanus* differs from all the allied species in the characteristic hammer-shaped ventral plates (fig. 3a). Both *C. eridani* and *C. aquitanus* clearly differ from the new species in the structure of the nucleus (figs. 16-17; 20-22). *C. marginellus* and *C. zoiai* differ from the new species in having a smaller and more slender aedeagus (figs. 4-5); in the new species the operculum is more robust and rounded and the ventral plates (fig. 1a) are more curved and more obliquely inserted; besides, in *C. zoiai* the flagellum (fig. 15) is flattened laterally (subcylindrical in *C. hennigi*), the apex of flagellum is truncated in a straight line (arrowhead-shaped in the new species) and at the insertion of flagellum the dorsal surface of nucleus is smooth or almost smooth while in *C. hennigi* this zone is dorsally marked by two sinuous keels (fig. 16). *C. renatae* differs in the stout operculum having a rounded central pit (fig. 6b), sides of aedeagus regularly convex (fig. 6c) and flattened flagellum (fig. 23). In the new species the membranous part of endophallus, as in the other species of the

complex, is greatly shortened and reduced to two sack-shaped structures (membranous sacs) connected with the foot of dorsal sclerite (fig. 8). Membranous sacs are covered with small chitinous tubercles, with the exception of the tip.

#### DESCRIPTION

Total length (95% confidence intervals are reported as 1.96 standard error of the means): males (19 specimens measured)  $3.85 \pm 0.07$  mm (range: 3.55 – 4.10 mm); females (8 specimens measured)  $4.37 \pm 0.12$  mm (range: 4.05 – 4.60 mm).

Upper parts dark blue with metallic lustre. Clypeus, genae, two little spots on frons yellow. Pronotal lateral margin, anterior half of elytral margins and epipleura yellow. A yellow transverse spot on elytral apex not reaching the posterior margin, spot is fairly larger in females. Antennae black, three or four basal segments yellowish. Ventrites uniformly black. Anterior legs yellowish with tarsi and part of femora infusate, middle and posterior legs black.

In females clypeus is blackish in the centre and middle and posterior legs are partly yellowish as the anterior ones.

Frons smooth with scattered whitish hairs, fairly punctured, punctation coarser and almost wrinkled in males, prevalently thickened along the inner ocular margin. Antennae slender, second segment 1.3 times as long as wide, 6th - 11th segment equal in length.

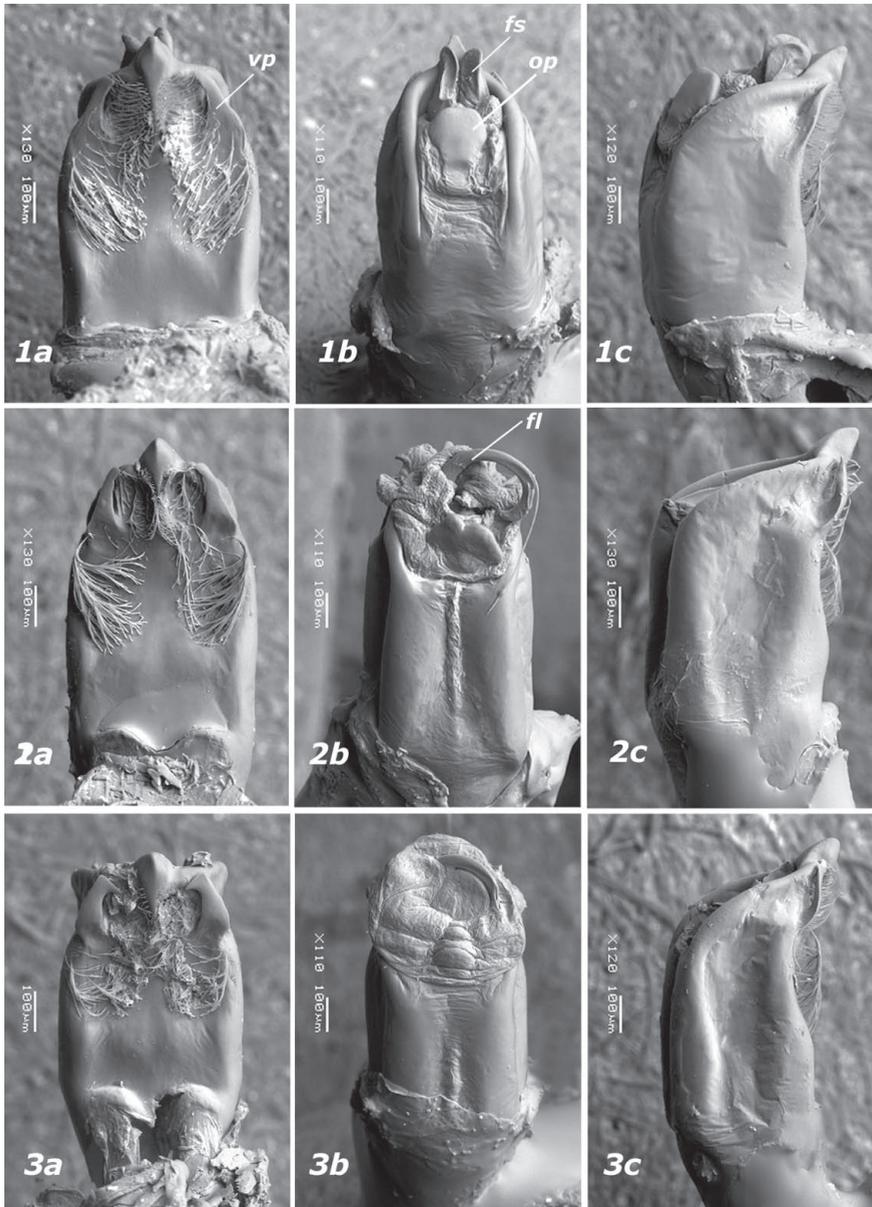
Pronotum regularly convex and tapered in the anterior half. Lateral margins narrow, but not folded downward anteriorly, so margins are entirely visible from above at the same time; punctation slightly lengthened, regularly distributed and fairly impressed.

Scutellum raised, as long as wide, punctured, subtruncate or slightly rounded at apex.

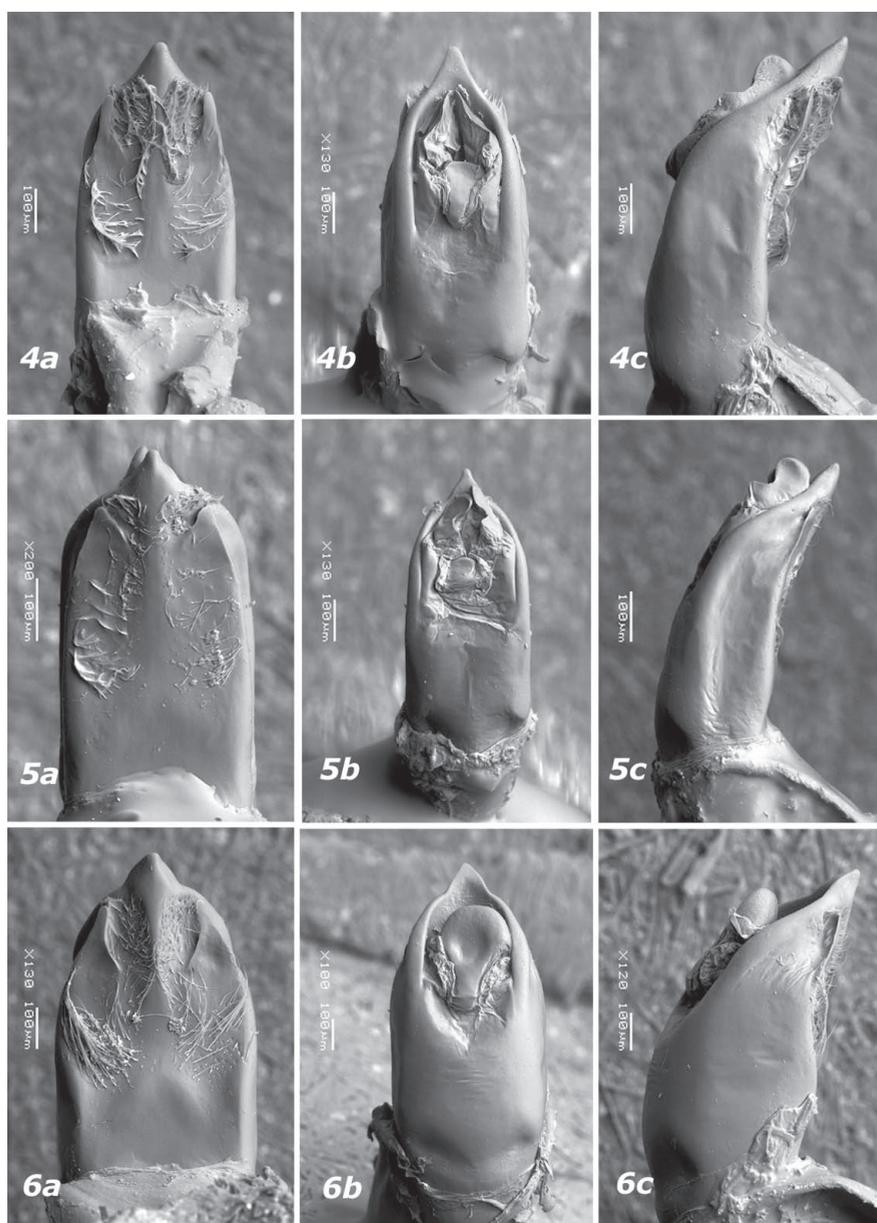
Elytra in males 2.5 times as long as pronotum and 1.5 times as long as wide at humeri, squared, parallel-sided, convex, with more elevated postscutellar area, irregularly punctuate, punctures partly lengthened and distinctly smaller than interspaces; interspaces slightly convex, very sparingly and shallowly micropunctured and wrinkled; humeral tubercles prominent, lengthened; margins of elytra simple, at the same time entirely visible from above; epipleura with sparse punctures.

Pygidium regularly convex in middle, matt, impunctate, covered with rather dense whitish hairs, posterior margin regularly arcuate; anal sternite in males with a shallow, faint and bare depression, posterior margin straight. In female pit on fifth sternite deep and bordered with posterior edge of the sternite. In male specimens a couple of long, sharp, yellow spines on sides of prosternal process posterior margin. Other ventrites and legs with no diagnostic characters, basal tarsomeres of fore legs in males only barely enlarged and rather short.

Male genitalia (figs. 1, 7-9, 16, 20): median lobe of aedeagus (fig. 1) with maximum width in the distal half, ventral surface faintly hollow, clothed with long recumbent hairs on apex and along sides, apical tooth strong, basally protracted in a short carina, the insertion on aedeagic tube is more definitely outlined than in *C. zoiai* (fig. 4); ventral plates prominent, noticeably curved inwards. Operculum well sclerotized, with anterior margin almost straight. In lateral view the outline reminds the "robust" type (as in *C. eridani* and *C. aquitanus*, figs 2-3, respectively), posterior margin thi-



1-3. Aedeagus: 1 – *Cryptocephalus hennigi* n. sp., holotype; 2 – *Cryptocephalus eridani* SASSI, 2001; 3 – *Cryptocephalus aquitanus* SASSI, 2001: a – ventral, b – dorsal, c – lateral. vp – ventral plates, fs – first sclerite, op – operculum, fl – flagellum. Collecting localities of the figured specimens: Aceglio, Italy (1); Castelnuovo Don Bosco, Italy (2a, 2c); Romagnese, Italy (2b); Cantal, France (3)



4-6. Aedeagus: 4 – *Cryptocephalus zoiai* SASSI, 2001; 5 – *Cryptocephalus marginellus* OLIVIER, 1791; 6 – *Cryptocephalus renatae* SASSI, 2001: a – ventral, b – dorsal, c – lateral. Collecting localities of the figured specimens: Colla Melosa, Italy (4); St. Vallier, France (5); Pietracamela, Italy (6)

ckened towards apex. Structure of endophallus in line with the *C. marginellus* pattern (SASSI 2001a). First sclerite generally protruding the ostium (fig. 1b) and similar to the *C. zoiai* - *C. marginellus* scheme (see SASSI 2001a: figs. 22-23), with appendix long and accessorial sclerite well developed (fig. 7). Foot of dorsal sclerite (fig. 8) V-shaped. Body of nucleus (figs. 9, 16, 20) regularly tapered toward apex, collar dorsally provided with a couple of sinuous carina, protracted over the basal half of the body. Flagellum regularly arcuate (fig. 20), laterally slightly flattened toward apex, apical foramen harrow-shaped. Basal section of nucleus (fig. 16) with lateral lamina rather stocky, arranged in an almost plane angle.

Female genitalia (figs. 10-11): vasculum of spermatheca (fig. 11) sickle-shaped, evenly pigmented or slightly lighter in the middle, apical and basal parts subequal in width. Ampulla short, comma-like. Ductus about 1mm long, thin, not coiled, with insertion placed at extremity of ampulla. Ventral sclerite of kotpresse (fig. 10) uniformly pigmented, ventral apodemes weakly differentiated, additional ventral sclerite present, dorsal sclerites transversely arranged.

#### MATERIAL

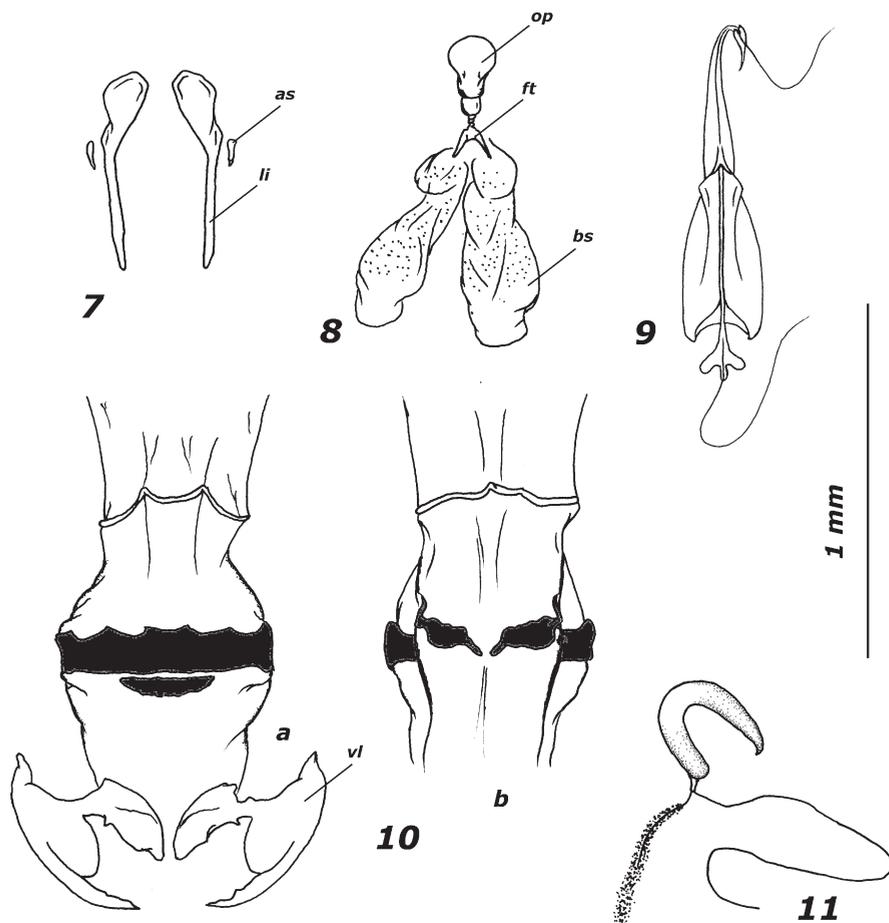
Holotype, male: Piemonte CN 3, Val Maira, Acceglio, 13.VI.2009, 1600m, D. Sassi leg., N 44°29'15.1" E 06°55'31.5", su *Cytisus sessilifolius*, *Cryptocephalus hennigi* n. sp. D. Sassi des., HOLOTYPE. Paratypes: Piemonte CN 3, Val Maira, Acceglio, 13.VI.2009, 1600m, D. Sassi leg., N 44°29'15.1" E 06°55'31.5", su *Cytisus sessilifolius*, 6 males and 4 females; Piemonte CN 1, Val Maira, Acceglio, 13.VI.2009, 1411m, D. Sassi leg., N 44°28'33.7" E 06°58'03.8", su *Cytisus sessilifolius*, 7 males and 7 females; Piemonte CN 4, Val Maira, Acceglio, Chiappera, 13.VI.2009, D. Sassi leg., da N 44°29'54.0" E 06°55'19.1", 1659m a N 44°31'11.1" E 06°54'18.6", 1926m, 6 males and 2 females; Appennino Ligure (Genova), M. Antola, m 1300, 31.VII.1986, C. Giusto leg., 1 male and 1 female; Prazzo Superiore (Cuneo), VII.1963, 1 male (this specimen was previously designated as paratypus of *Cryptocephalus eridani*); I, Acceglio (CN), 1 Km a SE di Chiappera, 1700m, 14.06.1998, G.B.Delmastro legit, 1 male and 1 female. Altogether 38 paratypes have been designated. All paratypes bring a red label (printed): *Cryptocephalus hennigi* n. sp. D. Sassi des., PARATYPE. Holotype and 2 paratypes at MM, 2 paratypes in Maurizio Bollino collection (Lecce, Italy), 2 paratypes in Mauro Daccordi collection (Verona, Italy), 2 paratypes in Matteo Montagna collection (Anzano del Parco, Italy), 29 paratypes preserved in author's collection.

#### BIOLOGICAL REMARKS

Most of the specimens were collected on *Cytisus sessilifolius*, which represents the host-plant of *C. hennigi*. The taxa of the superspecies *marginellus* have been reported in literature as feeding on several genera of shrubs (*Rosa*, *Crataegus*, *Quercus*, *Salix*, *Corylus*, *Cytisus* - MOHR 1966, PETITPIERRE 2000, THEROND 1976). However, the species are mainly associated with bushy Fabaceae (*Cytisus* and *Genista* particularly, personal observations), so the apparent polyphagy, if real, seems to reveal a fair tendency to oligophagy. In mid June the collected specimens of the new species were fully engaged in feeding and mating activities.

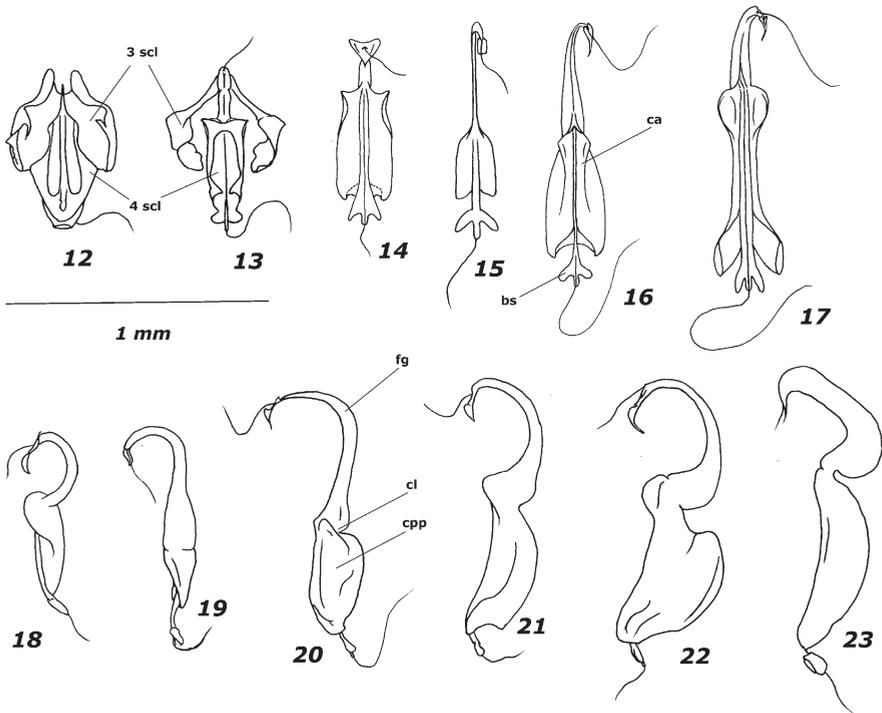
## PHYLOGENETIC REMARKS

As previously reported (SASSI 2001a), the morphology of the endophallus in the superspecies *marginellus* shows remarkable peculiarities. The correct interpretation of the structures and related evolutionary changes can represent a convenient tool for phylogenetic analysis within the superspecies and throughout the genus *Cryptocephalus* as well. In particular, the shape of the nucleus is the most remarkable distinctiveness. This large endophallic sclerite, according to the position of the ejaculatory duct, functionally matches the fourth sclerite (fig. 12) observed in the *C. sericeus* / *C. hypochaeridis* species group (DE MONTE 1948, LEONARDI & SASSI 2001, SASSI 2001b), while the third



7-11. *Cryptocephalus hennigi* n. sp.: 7 – first sclerite of endophallus, 8 – dorsal sclerite of endophallus, 9 – nucleus of endophallus, dorsal view, 10 – kotpresse, 11 – spermatheca. a – ventral, b – dorsal. as – accessorial sclerite, li – appendix of first sclerite, op – operculum, ft – foot of dorsal sclerite, bs – membranous sac, vl – sclerites of female abdominal segment IX. Collecting locality of the figured specimens: Acceglio, Italy (7-11)

sclerite, well developed in *C. hypochaeridis* and the related species (fig. 12), seems to be missing in the *C. marginellus* group. However, three distinct hypotheses could be put forward: 1) the third sclerite in superspecies *marginellus* is fused with the fourth one (this could explain the remarkable expansion of the ventral side of nucleus, shown above all in lateral view in *C. hennigi*, *C. eridani* and *C. aquitanus* (figs. 20-22); 2) the third sclerite, shortened and shifted backwards toward the proximal edge of the endophallus, constitutes the basal section of the nucleus (fig. 16); 3) the third sclerite is missing in the *C. marginellus* species group. The course and insertion of the ejaculatory duct could favour this latter assumption. If that is the case, the basal section of the nucleus could match the thickened envelopment that marks the last trait of the ejaculatory duct before its insertion in the fourth sclerite in *C. hypochaeridis* and allied species (LEONARDI & SASSI 2001).



12-13. Third and fourth sclerite. 14-17. Nucleus of endophallus, dorsal view. 18-23. Nucleus of endophallus, lateral view: 12 - *Cryptocephalus transiens* FRANZ, 1949; 13 - *Cryptocephalus nitidus* LINNAEUS, 1758; 14, 18 - *Cryptocephalus marginellus*; 15, 19 - *Cryptocephalus zoiai*; 16, 20 - *Cryptocephalus hennigi* n. sp.; 17, 21 - *Cryptocephalus eridani*; 22 - *Cryptocephalus aquitanus*; 23 - *Cryptocephalus renatae*. 3 scl - third sclerite, 4 scl - fourth sclerite, ca - carina, bs - basal section of nucleus, fg - flagellum, cl - collar of nucleus, cpp - body of nucleus. Collecting localities of the figured specimens: Montello, Italy (12); Asso, Italy (13); Vaucluse, France (14, 18); Colla Melosa, Italy (15), Acceglio, Italy (16, 20); Loano, Italy (17); Imperia, Italy (19); Castelnuovo Don Bosco, Italy (21), Puy de Dôme, France (22); Genova, Italy (23)

A useful approach for testing such hypotheses is provided by the morphology of *C. nitidus* LINNAEUS, 1758, a species most closely related to the *C. marginellus* complex. In this species (fig. 13) the third sclerite is well developed and the morphology of the fourth one remarkably approaches the shape of the nucleus of *C. marginellus* (fig. 14). This suggests that the third sclerite is really missing in the superspecies *marginellus*, and moreover the *C. marginellus*-structure could be the closest one to the ancestral condition of the group. Assuming a linear transformation series in the shape of the nucleus, it could be argued, starting with a *C. marginellus*-like form (figs. 14, 18), a reduction of the large dorsal hollow (*C. zoiai*, figs. 15, 19) and subsequently a progressive prominent stoutness of the nucleus with at first the development of the sinuous carina at the collar of the sclerite (*C. hennigi*, fig. 16, 20) and at last the acquisition of a sturdy sandglass-like structure (*C. eridani* and *C. aquitanus*, figs. 17, 21, 22). The condition observed in *C. renatae* (fig. 23) could be viewed as the most derived



24. *Cryptocephalus hennigi* n. sp. (habitus). Left – male, paratype, right – female, paratype. Collecting locality of the figured specimens: Acceglio, Italy

condition, produced by a lateral flattening of the *C. eridani*-like form. However, with the current knowledge, we must consider the alternative possibility that the speciation process had occurred according to a multiple parapatric mode within several disjunct demes. In such circumstances we do not expect that derived traits are shared between populations and the sequence of speciation events could be impossible to determine (BROOKS and McLENNAN 1991). If that is the case, the likelihood of a not-dichotomous phylogenetic structure of the monophylum could be very high.

#### ACKNOWLEDGEMENTS

I express my sincere gratitude to Dr. Mauro MARIANI (MM) for the permission to use the S.E.M. and Dr. Michele ZILIOLI (MM) for substantial technical support in the preparation of the S.E.M. pictures. I would like to express my thanks to Mr. Valter FOGATO (Museo civico di Storia naturale, Milan) for preparing the colour photos. My cordial thanks are also due to Dr. David MIFSUD (University of Malta, Biology Dept.) for the English language revision.

#### ABBREVIATIONS USED IN THIS PAPER

DS - Davide SASSI personal collection;

MM - Museo Civico di Storia naturale, Milano.

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