

ALESSANDRO MASCAGNI

## THE VARIEGATED MUD-LOVING BEETLES OF EUROPE (first part)

(Coleoptera: Heteroceridae)

**Abstract.** Relative data on the morphology of adults and larvae are given and identification keys to genera, subgenera and European species are arranged. Of each species is given description, distribution and habitat as well as given the drawing of aedeagus.

**Riassunto.** *Eteroceridi d'Europa (prima parte) (Coleoptera: Heteroceridae)*. Vengono forniti dati sulla morfologia di adulti e larve e predisposte chiavi di identificazione dei generi, sottogeneri e specie europee. Per ogni specie, oltre al disegno dell'aedeago, viene data la descrizione, la distribuzione e l'habitat.

**Key words.** Coleoptera, Byrrhoidea, Heteroceridae, morphology, taxonomy, key to european genera and species, distribution.

### Introduction

Heterocerids are a group of morphologically similar, mudloving beetles found worldwide. Their common habitat is mud or sand at the edge of water which no doubt helps to explain why they are morphologically so similar. There are some 320 known species, varying in size from 1.0 to 7.6 mm and which belong to 5 genera: *Micilus*, *Augyles*, *Heterocerus*, *Tropicus* and *Elythomerus*. Heterocerids belong to the superfamily Dryopoidea (*sensu* CROWSON, 1978) or Byrrhoidea (*sensu* LAWRENCE & BRITTON, 1994) together with Psephenidae, Ptilodactylidae, Chelonariidae, Limnichidae, Dryopidae and Elmidae.

A single fossil species is known, *Heterocerus marginatus* (Fabricius, 1787) from Donets Basin in Ukraine (FEDCHENKO & TATOLI, 1981).

The present paper includes the species found in Europe but also in West Asia as the Ural Mountains, Caspian Sea and Anatolia and as far south as the Mediterranean basin.

### Distribution

The following list of fundamental European Heteroceridae chorotypes is based on VIGNA TAGLIANTI *et al.* (1999).

#### 1) Chorotypes of species widely spread in the Holarctic Region:

**Holarctic:** *Heterocerus fenestratus* (Thunberg, 1784).

**Paleartic:** *Heterocerus flexuosus* Stephens, 1829; *Heterocerus marginatus* (Fabricius, 1787).

**Asiatic-European:** *Heterocerus fossor* Kiesenwetter, 1843; *Heterocerus fuscus* Kiesenwetter, 1843; *Heterocerus obsoletus* Curtis, 1828; *Heterocerus parallelus* Gebler, 1830.

**Sibero-European:** *Augyles intermedius* (Kiesenwetter, 1843); *Augyles oblitteratus* (Kiesenwetter, 1843).

**Centralasiatic-European-Mediterranean:** *Augyles flavidus* (P. Rossi, 1794); *Augyles marmota* (Kiesenwetter, 1850).

**Turano-European:** *Augyles hispidulus* (Kiesenwetter, 1843).

A total of 12 species equal to 52,18% of the European species.

## 2) Chorotypes of species more or less widely spread in Europe:

**European:** *Augyles maritimus* (Guérin-Mèneville, 1844); *Augyles pruinosus* (Kiesenwetter, 1851); *Augyles sericans* (Kiesenwetter, 1843).

**N-European:** *Augyles aureolus* (Schiödte, 1866).

**Centraleuropean:** *Augyles crinitus* (Kiesenwetter, 1850); *Micilus murinus* (Kiesenwetter, 1843).

**W-European:** *Augyles senescens* (Kiesenwetter, 1865); *Augyles muelleri* (Breit, 1916).

A total of 8 species equal to 34,78% of the European species.

## 3) Chorotypes of species more or less widely spread in the Mediterranean countries:

**Mediterranean:** *Heterocerus holosericeus* Rosenhauer, 1856.

**W-Mediterranean:** *Augyles gravidus* (Kiesenwetter, 1850); *Heterocerus aragonicus* Kiesenwetter, 1850.

A total of 3 species equal to 13,04% of the European species.

## Morphology

### ADULTS

Body suboval or elongated (Figs. 1, 2), usually depressed or feebly convex, and covered with a copious pubescence (Figs. 25, 28). Generally black or dark brown with a yellow border on the pronotum and abdomen, more or less entirely yellowish in juveniles. Head nested in the prothorax up to the posterior margin of the eyes, mandibles well developed particularly in the males, antennae with 9, 10 or 11 segments inserted in front of the eyes. Prothorax massive, sometimes much wider than, and more or less the same length as, the base of the elytra. Abdomen with five segments and, in contrast to all other Dryopoidea, a stridulatory arch (or ridge), a curved area with transversal stria on the lower part of the first segment which stridulates when rubbed by the posterior femurs (Fig. 26). Elytra often with yellow, ochre, orange or reddish marks of varying size which can be typical, though variable, in each species. Elytra completely cover the abdomen; the second pair of wings guarantees the insect an excellent capacity for flight (Fig. 6c). Anterior legs (Fig. 7b) typically fossorial with stout spines on the external margin of the tibia (Fig. 27); stout spines are also present on the second and third pair of legs (Fig. 5a). Tarsi with 4 segments. Size differences between males and females are rare; where present it is usually the female which is larger.

**Head:** Generally wider than long, and narrower than the pronotum. Mandibles are well developed and can be a taxonomic key; in some species these differ between the two sexes, particularly between females and large hypermandibulated males. Mandibles (Fig. 3a) consist of a basal part with a molar lobule, a central part, and an apical part with three surfaces more or less evenly divided by the mediodorsal, dorsal and lateroventral arista. The latter two converge to form a subapical tooth. Molar lobule with a row of spines along the longitudinal margin of its lateral surface; these spines vary within each species. Molar lobule gives rise to the prosthema, an elongated laminar organ with a series of dentelles on the internal margin which vary in number even within the same species. Prosthema partially divided by a depression situated about halfway along its internal margin. Maxillary palps formed of four, and labial palps of three, segments. Eyes well developed, placed laterally on the head and fairly prominent. Antennae inserted in front of the eyes, under the anterior corners of the forehead, with 9, 10 or 11 segments and antennal club with 6 or 7 segments. Antennae (Fig. 4) can have taxonomic importance.

**Thorax:** Prothorax (Fig. 5b) is of taxonomic importance for all of the following: in the presence or absence of a raised border along part or all of the pronotum base, in the ratio between its length and width, and in its form, color and sculpture. Form can be rectangular, trapezoidal or oval, with the posterior corners rounded or sharp, color can be black, brown or reddish sometimes with yellow, ochre or reddish margins, sculpture can consist of numerous punctures mixed with micropunctures. Pronotum profusely covered with setae of varying length.

**Elytra:** Always free, sometimes uniform in color but usually with a pattern fairly typical for each species (Fig. 6a, b); numerous punctures mixed with micropunctures, always in random order; profusely covered with setae of varying length. Elytral sculpture can be a good taxonomic character; second pair of wings always well developed and functional (Fig. 6c). Mid coxal cavities flanked on either side of the metasternum by arched post-mesocoxal ridges (Fig. 5a), separated by a distance approximately equal to their diameter except in the genus *Elythomerus* in which the two cavities are very close together. This makes them a taxonomically important character.

**Abdomen:** Formed of five segments (Fig. 7c, d) covered dorsally by the elytra and ventrally by setae which can be profuse; color generally dark, often bordered with ochre or yellow. First segment with a stridulatory arch on each side; ridge provided with a microscopic series of more or less pronounced transversal stria. Arch width and position, and stria number and size vary between species groups. First abdominal segment may or may not have a post-metacoxal line (or ridge), a very important taxonomic character at the generic level. Spiculum gastrale (ninth sternite) (Fig. 8a, b, c), generally well developed and sclerotized, invaginated in posterior part of abdomen; sternite with two arms which widen posteriorly and join together anteriorly, becoming more or less fused. The spiculum gastrale is placed longitudinally in the abdomen and sustains the aedeagus. The shape of this structure is an important taxonomic character: it is either in the form of a U (tribe Micilini), a V (tribes Augyliini, Heterocerini and Elythomerini) or a Y (tribe Tropicini).

**Genital apparatus:** The shape, size and degree of sclerification of the male aedeagus varies greatly between species but is very constant within species, making it fundamental to classification. On the contrary, the female genital apparatus has no sclerified parts and is thus practically unusable for species identification. Aedeagus (Fig. 9a, b, c) formed by penis and tegmen, in turn formed of the phallobase and parameres. Penis more or less flat with a well sclerified dorsal plate prolonged anteriorly and ventrally in the mid connecting rod; transversal opening (mid aperture) through which the ejaculatory conduit exits and inside which is the endophallus. Tegmen, arm form and size, and phallobase midplate all show variations some marked between species, while the parameres remain more constant. During copulation the tegmen and penis separate posteriorly and the endophallus extends.

#### LARVAE

The larvae are campodeiform with a cylindrical body covered with setae of varying length (Fig. 10g, h). Total length of fully developed larvae from 3 to 12 mm. Head pubescent, wider than long, and narrower than the thorax. Mandibles (Fig. 3b, c) well developed and with a prosthema. Antennae (Fig. 4g) hard to see, short and wide with three segments, inserted on the sides of the head at the base of the mandibular sclerites. Ocelli 10-12 in *Heterocerus aragonicus* Kiesenwetter, 1850, arranged as follows: 4 lateral, 4 tergal and 2-4 sternal (Fig. 3b). Thorax with three segments more or less pubescent according to the species. Prothorax, much wider than long, oval or trapezoidal with rounded anterior and posterior angles; mesothorax with obtusely angled sides much wider than long but shorter than the preceding segment; metathorax similar to the latter but sometimes smaller. Legs often robust and short, femurs pubescent and often provided with longer setae; tibia with spines, legs ending with a nail. Abdomen with nine segments, subcylindrical and progressively longer and narrower than the preceding one, so as to assume a vaguely conical appearance. Segments more or less pubescent according to the species.

#### Present knowledge on the taxonomy of the pre-imaginal states

Of the 23 European species only 8 have been documented in their pre-imaginal state (equal to 34,78%) which comments on the present level of knowledge on Heteroceridae larvae. The most significant works on European larvae are those of WESTWOOD (1839), LETZNER (1853), PORTEVIN (1896), URBAN (1933), LARSSON (1938) and PIERRE (1946). Pierre also gives keys for identifying the larvae of 6 of the 8 known species, attributing taxonomic importance to the form of the nail and to the placement and size of the tibiae and unguis spines (Fig. 10a, b, c, d, e, f). Though not wishing to enter into the merit of the author's method I feel that keys which do not allow identification of single species are not only useless but probably impossible to construct. The larvae of the following species are known:

*Augyles hispidulus* (Kiesenwetter, 1843) [PIERRE, 1946] : Fig. 9a  
*Heterocerus aragonicus* Kiesenwetter, 1850 [PIERRE, 1946] : Fig. 9e  
*H. fenestratus* (Thunberg, 1784) [LETZNER, 1853; PIERRE, 1946] : Fig. 9c  
*H. flexuosus* Stephens, 1829 [PIERRE, 1946] : Fig. 9b  
*H. fusculus* Kiesenwetter, 1843 [PORTEVIN, 1896; PIERRE, 1946] : Fig. 9d  
*H. marginatus* (Fabricius, 1787) [WESTWOOD, 1839]  
*H. obsoletus* Curtis, 1828 [PIERRE, 1946] : Fig. 9f  
*H. parallelus* Gebler, 1830 [URBAN, 1933]

### Taxonomy

The first species of the family was described as *Dermestes fenestratus* by Thunberg in 1784 while the family Heteroceridae was instituted by Mac Leay in 1825. The first monograph on the family was published by KIESENWETTER (1843) who based his classification on the design, color and sculpture of the elytra and on the pronotum sculpture. KUWERT (1890b) published the first monograph on European Heteroceridae, subdividing the genus *Heterocerus* in 4 subgenera: *Micilus*, *Phyrites*, *Heterocerus* and *Taenheterocerus*. He considered as taxonomically important the presence or absence of the posterior border of the pronotum, but not the presence or absence of the post-mesocoxal ridge. In the 1960's three fundamental monographs on Heteroceridae were published: on the biology, morphology, systematics, phylogeny and distribution of the known North, Central and South American species by PACHECO (1964) who subdivided the family in 5 subfamilies (Micilinae, Augyliinae, Heterocerinae, Tropicinae and Elythomerinae) and 20 genera; on the morphology, systematics and distribution of the Ethiopian species by CHARPENTIER (1965); and on the systematics and distribution of the Australian species by CHARPENTIER (1968). Both authors stress the taxonomic importance of the aedeagus which is illustrated for each species discussed.

The family Heteroceridae currently numbers fewer genera than those indicated by the above mentioned authors. Instead of the 20 genera indicated by Pacheco and the 4 genera listed by Charpentier the family is now subdivided into 5 genera on the basis of the structure of the aedeagus and the spiculum gastrale: *Micilus*, *Augyles*, *Heterocerus*, *Tropicus* and *Elythomerus*; subdivision recently accepted also by KING *et al.* (2011) with molecular analysis.

### Key to Genera

1. Antennae with 9 segments (Fig. 4a). Spiculum gastrale in the form of an overturned U (Fig. 8b). Beetle length 1.3-1.6 mm (only one species in Europe) (Fig. 1a) ..... ***Micilus*** (p. 81)
- Antennae with 10 or 11 segments. Spiculum gastrale in the form of an overturned V. (Fig. 8a, c). Beetle length 2.0-7.6 mm ..... 2
2. Post-metacoxal line complete, 13 species (Fig. 7c) ..... ***Augyles*** (p. 82)
- Post-metacoxal line incomplete, 9 species (Fig. 7d) ..... ***Heterocerus*** (p. 89)

### Chiave dei Generi

1. Antenne composte da 9 segmenti (Fig. 4a). Spiculum gastrale a forma di U rovesciata (Fig. 8b). Insetti lunghi mm 1,3-1,6 (solo una specie in Europa) (Fig. 1a) ... ***Micilus*** (p. 81)
- Antenne composte da 10 o 11 segmenti. Spiculum gastrale a forma di V rovesciata (Fig. 8a, c). Insetti lunghi mm 2,0-7,6 ..... 2
- 2 Linea post-metacoxale completa, 13 specie (Fig. 7c) ..... ***Augyles*** (p. 82)
- Linea post-metacoxale incompleta, 9 specie (Fig.7d) ..... ***Heterocerus*** (p. 89)

**Genus *Micilus*** Mulsant & Rey, 1872: 15

type species *Heterocerus murinus* Kiesenwetter, 1843

*Mirulus* Mulsant & Rey, 1872: 40

*Mirulus* Gozis, 1885: 120

*Micromicilus* Sahlberg, 1900: 205

1. **Micilus murinus** (Kiesenwetter, 1843): 22

*Heteroceris murinus* Kiesenwetter, 1843: 22

**Description.** Total length: 1.3-1.6 mm (Figs. 1a, 29). Head brown with whitish pubescence; mandibles concave, dentate and broad; antennae with 9 segments, last segment large and oval.

Pronotum brown or dark brown, narrowing strongly anteriorly and bordered posteriorly; copious whitish setae; densely punctured.

Elytra uniformly brown or dark brown, densely punctured; wings membranous, normal. Legs light brown with whitish setae; tibiae with numerous spines.

Abdomen dark brown covered by whitish setae; stridulatory arch marked; post-metacoxal line complete (Fig. 1b). Aedeagus (Fig. 1d).

Larva unknown.

**Distribution and habitat:** Albania, Austria, Croatia, France, Germany, Hungary, Italy, Slovenia, Switzerland, Yugoslavia (MASCAGNI, 2005b, 2006).

Exposed river beds and at the mouth of rivers.

**Genus *Augyles*** Schiödte, 1866: 141

type species *Heteroceris hispidulus* Kiesenwetter, 1843

*Littorimus* Gozis, 1885: 120 type species *Scarabaeus flavidus* P. Rossi, 1794

*Taenheteroceris* Kuwert, 1890a: 528 type species *Heteroceris crinitus* Kiesenwetter, 1850

### Key to Subgenera

1. Antennae with 11 segments, with segments broadening beginning at the third segment; only one species (Fig. 4b) ..... ***Phyrites*** (p. 82)

-- Antennae with 10 or 11 segments, with the last 6 or 7 segments decidedly bigger in comparison with the previous two segments, 12 species (Fig. 4c, d, e) .... ***Augyles*** (p. 82)

### Chiave dei Sottogeneri

1. Antenne di 11 segmenti, con i primi due segmenti molto allargati rispetto ai tre successivi; solo una specie (Fig. 4b) ..... ***Phyrites*** (p. 82)

-- Antenne con 10 o 11 segmenti, con gli ultimi 6 o 7 segmenti decisamente più grandi se comparati ai primi due, 12 specie (Fig. 4c, d, e) ..... ***Augyles*** (p. 82)

**Subgenus *Phyrites*** Schiödte, 1866: 159

type species *Phyrites aureolus* Schiödte, 1866

2. ***Augyles (Phyrites) aureolus*** Schiödte, 1866: 159

*Phyrites aureolus* Schiödte, 1866: 159.

**Description.** Total length: 4.5-5.0 mm. Head black, whitish pubescence interposed with longer setae; mandibles dentate with fairly acute apex; clypeus with fine copious setae; antennae with 11 segments growing in width from the third segment (Fig. 4b).

Pronotum black, narrowing anteriorly and bordered posteriorly; whitish pubescence with longer setae especially on the sides.

Elytra black, copious short golden pubescence; wings membranous, normal. Legs reddish brown; tibiae with numerous spines.

Abdomen black or dark brown; stridulatory arch marked, striae evident; post-metacoxal line complete; copious whitish pubescence.

Larva unknown.

**Distribution and habitat:** Belgium, Denmark, Finland, France, The Netherlands (STRIEN, 1980; MASCAGNI, 2006).

In sand near brackish water.

**Subgenus *Augyles*** Schiödte, 1866: 141

type species *Heteroceris hispidulus* Kiesenwetter, 1843

## Key to Species

1. Antennae with 10 segments and 6-segmented club (Fig. 4c) ..... 2  
-- Antennae with 11 segments and 7-segmented club (Fig. 4d, e) ..... 6
2. Head brown. Pronotum brown with middle line light brown or dark orange. Elytra brown or light brown, finely and densely punctured. Femurs and tibiae ochre or dark orange .... 3  
-- Head black or dark brown. Pronotum black or brown with middle line reddish or reddish brown. Elytra black or dark brown, micropunctured and coarsely and irregularly punctured. Femurs and tibiae black, reddish brown or pale brown ..... 4
3. Pronotum brown with light brown border and sometimes middle line. Legs ochre. Abdomen brown with ochre border. Total length 2.0-3.0 mm. Aedeagus (Fig. 11a) ..... **flavidus** (p. 84)  
-- Pronotum brown with dark orange border and frequently middle line. Legs dark orange. Abdomen dark brown frequently with ochre border. Total length 2.5-3.6 mm. Aedeagus (Fig. 11c) ..... **obliteratus** (p. 85)
4. Mandibles with rather roundish apex ..... 5  
-- Mandibles with rather acute apex. Pronotum dark brown with reddish brown border and middle line, densely and finely punctured. Elytra dark brown with reddish markings, striations missing. Femurs and tibiae reddish brown. Total length 2.2-3.0 mm. Aedeagus (Fig. 12a) ..... **marmota** (p. 86)
5. Pronotum black sometimes with reddish border and middle line, coarsely and densely punctured. Elytra black or dark brown with ochre markings, striations evident. Femurs and tibiae black. Total length 2.9-3.6 mm. Aedeagus (Fig. 13a) ..... **hispidulus** (p. 87)  
-- Pronotum dark brown with reddish border and middle line, finely punctured. Elytra dark brown with reddish markings, without evident striations. Femurs and tibiae pale brown. Total length 2.6-2.9 mm. Aedeagus (Fig. 14a) ..... **muelleri** (p. 87)
6. Mandibles fairly straight and developed with acute apex. Pronotum densely and finely punctured. Elytra without striations ..... 7  
-- Mandibles rather short and curved with quite acute apex. Pronotum densely and coarsely (sometimes irregularly) punctured. Elytra with evident striations ..... 8
7. Head dark brown. Pronotum with dark orange border and middle line. Elytra dark brown with ochre markings, finely and densely punctured. Legs dark orange. Total length 2.8-3.6 mm. Aedeagus (Fig. 11b) ..... **sericans** (p. 85)  
-- Head black. Pronotum with reddish brown border and middle line. Elytra black or dark brown with reddish markings, coarsely and irregularly punctured. Legs reddish brown. Total length 2.2-3.4 mm. Aedeagus (Fig. 12b) ..... **maritimus** (p. 86)
8. Elytra brown or reddish brown. Legs ochre. Total length 3.0-3.5 mm. Aedeagus (Fig. 12c) ..... **gravidus** (p. 86)  
-- Elytra black or dark brown. Legs brown or black and ochre ..... 9
9. Body with copious very long setae. Elytra with faint markings. Legs and abdomen brown. Total length 3.0-4.0 mm. Aedeagus (Fig. 15b) ..... **crinitus** (p. 89)  
-- Body with fewer hairs and shorter setae. Elytra ochre markings of varying size. Legs brown or black and ochre ..... 10
10. Pronotum dark brown with reddish or reddish brown border and middle line, densely and irregularly punctured. Elytra with evident striations. Total length 3.1-4.0 mm. Aedeagus (Fig. 13b) ..... **pruinus** (p. 88)  
-- Pronotum black, coarsely and densely punctured. Elytra with faint striations ..... 11
11. Femurs and tibiae black or dark brown, with ochre tarsi. Abdomen black, fifth segment with ochre apex. Total length 3.0-4.1 mm. Aedeagus (Fig. 13c) ..... **intermedius** (p. 88)  
-- Femurs and tibiae black and ochre, with ochre tarsi. Abdomen black with ochre border. Total length 3.5-5.0 mm. Aedeagus (Fig. 15a) ..... **senescens** (p. 88)

## Chiave delle Specie

1. Antenne composte da 10 segmenti con clava di 6 segmenti (Fig. 4c) ..... 2  
-- Antenne composte da 11 segmenti con clava di 7 segmenti (Fig. 4d, e) ..... 6
2. Capo bruno. Pronoto bruno con una linea mediana bruna o arancio scuro. Elitre brune o bruno chiare, finemente e densamente punteggiate. Femori e tibie ocre o arancio scure .. 3

- Capo nero o bruno scuro. Pronoto nero o bruno scuro con una linea mediana rossastra o bruno rossastra. Elitre nere o bruno scure con punteggiatura grossolana e irregolare e con micropunteggiatura. Femori e tibie nere o bruno rossastre ..... 4
3. Pronoto bruno con bordo laterale, e talvolta con linea mediana, bruno chiaro. Zampe color ocra. Addome bruno con bordo color ocra. Lunghezza totale mm 2,0-3,0. Edeago (Fig. 11a) ..... **flavidus** (p. 84)
- Pronoto bruno con bordo laterale, e frequentemente anche linea mediana, arancio scuro. Zampe arancio scure. Addome bruno scuro spesso con bordo color ocra. Lunghezza totale mm 2,5-3,6. Edeago (Fig. 11c) ..... **obliteratus** (p. 85)
4. Mandibole con apice piuttosto arrotondato ..... 5
- Mandibole con apice piuttosto acuto. Pronoto bruno scuro con bordo laterale e linea mediana bruno rossastre e con punteggiatura fine e densa. Elitre bruno scure con macchie rossastre e senza striature. Femori e tibie bruno rossastre. Lunghezza totale mm 2,2-3,0. Edeago (Fig. 12a) ..... **marmota** (p. 86)
5. Pronoto nero talvolta con bordo laterale e linea mediana rossastre e con punteggiatura grossolana e densa. Elitre nere o bruno scure con macchie ocra e striature evidenti. Femori e tibie nere. Lunghezza totale mm 2,9-3,6. Edeago (Fig. 13a) ..... **hispidulus** (p. 87)
- Pronoto bruno scuro con bordo laterale e linea mediana rossastre e con punteggiatura fine. Elitre bruno scure con macchie rossastre e senza striature evidenti. Femori e tibie bruno chiare. Lunghezza totale mm 2,6-2,9. Edeago (Fig. 14a) ..... **muelleri** (p. 87)
6. Mandibole con parte terminale dritta e apice acuto. Pronoto con punteggiatura fine e densa. Elitre senza strie ..... 7
- Mandibole piuttosto corte e ricurve con apice abbastanza acuto. Pronoto con punteggiatura grossolana (talvolta irregolare) e densa. Elitre con evidenti striature ..... 8
7. Capo bruno scuro. Pronoto con bordo e linea mediana arancio scuro. Elitre bruno scure con macchie ocra e con punteggiatura densa e fine. Zampe arancio scure. Lunghezza totale mm 2,8-3,6. Edeago (Fig. 11b) ..... **sericans** (p. 85)
- Capo nero. Pronoto con bordo laterale e linea mediana bruno rossastre. Elitre nere o bruno scure con macchie rossastre e con punteggiatura grossolana e irregolare. Zampe bruno rossastre. Lunghezza totale mm 2,2-3,4. Edeago (Fig. 12b) ..... **maritimus** (p. 86)
8. Elitre bruno o bruno rossastre. Zampe color ocra. Lunghezza totale mm 3,0-3,5. Edeago (Fig. 12c) ..... **gravidus** (p. 86)
- Elitre nere o bruno scure. Zampe di color bruno o nere e ocra ..... 9
9. Corpo ricoperto da peli molto lunghi e copiosi. Elitre con deboli macchie. Zampe e addome bruni. Lunghezza totale mm 3,0-4,0. Edeago (Fig. 15b) ..... **crinitus** (p. 89)
- Corpo ricoperto da peli meno copiosi e più corti. Elitre con macchie ocra di estensione variabile. Zampe bruno o nere e ocra ..... 10
10. Pronoto bruno scuro con bordo laterale e linea mediana rossastri o bruno rossastri; punteggiatura irregolare e densa. Elitre con strie evidenti. Lunghezza totale mm 3,1-4,0. Edeago (Fig. 13b) ..... **pruinus** (p. 88)
- Pronoto nero con punteggiatura grossolana e densa. Elitre con strie non evidenti ..... 11
11. Femori e tibie neri o bruno scuri con tarsi ocra. Addome nero, quinto segmento con apice ocra. Lunghezza totale mm 3,0-4,1. Edeago (Fig. 13c) ..... **intermedius** (p. 88)
- Femori e tibie neri e ocra, tarsi ocra. Addome nero con bordo ocra. Lunghezza totale mm 3,5-5,0. Edeago (Fig. 15a) ..... **senescens** (p. 88)

3. **Augyles (Augyles) flavidus** (P. Rossi, 1794): 79

*Heterocerus minutus* Kiesenwetter, 1835: 213

*Heterocerus minimus* Kiesenwetter, 1843: 214

*Heterocerus campestris* Motschulsky, 1853: 17

*Heterocerus flavescens* Schaufuss, 1862: 48

*Heterocerus pallescens* Schaufuss, 1862: 48

*Heterocerus albipennis* Kuwert, 1890b: 540

**Description.** Total length 2.0-3.0 mm (Fig. 30). Head brown, whitish pubescence with some longer setae especially on the sides; mandibles dentate with an acute apex; clypeus with fine copious setae; antennae with 10 segments and 6-segmented club.

Pronotum brown with light brown border and occasionally a light brown middle line; narrowing anteriorly and bordered posteriorly; whitish pubescence with some longer setae especially on the sides; finely and densely punctured.

Elytra light brown with ochre markings (Fig. 19a, b); copious pubescence interposed with longer setae; finely and densely punctured; wings membranous, normal. Legs ochre with whitish setae; tibiae with numerous spines.

Abdomen brown with ochre border of varying width; stridulatory arch marked, striae evident; post-metacoxal line complete; copious whitish pubescence with some longer setae. Aedeagus (Fig. 11a). Some males are hypermandibulated.

Larva unknown.

**Distribution and habitat:** Albania, Armenia, Austria, Azerbaijan, Bosnia Herzegovina, Bulgaria, Croatia, Czech Republic, France, Georgia, Germany, Greece, Hungary, Italy, Kazakhstan, Moldova, Russia, Slovenia, Spain, Switzerland, Turkey, Ukraine, Yugoslavia; Algeria, Libya, Morocco, Tunisia; Iran, Iraq, Lebanon, Syria, Turkmenistan, Uzbekistan (AGUILERA *et al.*, 1998; MASCAGNI, 2005b, 2006).

Sandy muddy shores of streams, ponds and marshes.

**Similar species:** *A. sericans* (Kiesenwetter) and *A. obliteratus* (Kiesenwetter).

#### 4. *Augyles (Augyles) sericans* (Kiesenwetter, 1843): 212

*Heterocerus pusillus* Stephens, 1835: 395

**Description.** Total length 2.8-3.6 mm (Fig. 31). Head dark brown, whitish pubescence with long setae especially on the sides; mandibles dentate with acute apex; clypeus with fine copious setae; antennae with 11 segments and 7-segmented club.

Pronotum dark brown with dark orange border and frequently a middle line; narrowing anteriorly and bordered posteriorly; whitish pubescence with some long setae especially on the sides; finely and densely punctured.

Elytra dark brown with ochre markings (Fig. 19c, d); copious pubescence interposed with longer setae; finely and densely punctured; wings membranous, normal. Legs dark orange with whitish setae; tibiae with numerous spines.

Abdomen dark brown, frequently with an ochre border; stridulatory arch marked, striae evident; post-metacoxal line complete; copious whitish pubescence with some longer setae. Aedeagus (Fig. 11b).

Larva unknown.

**Distribution and habitat:** Albania, Austria, Bulgaria, Croatia, Czech Republic, Denmark, France, Germany, Great Britain, Hungary, Italy, Poland, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, The Netherlands, Ukraine; Israel, Syria (AGUILERA *et al.*, 1998; MASCAGNI, 2005b, 2006).

Mainly sandy terrain near rivers and streams.

**Similar species:** *A. flavidus* (P. Rossi) and *A. obliteratus* (Kiesenwetter).

#### 5. *Augyles (Augyles) obliteratus* (Kiesenwetter, 1843): 219

**Description.** Total length 2.5-3.6 mm (Fig. 32). Head brown, whitish pubescence with longer setae especially on the sides; mandibles dentate, with acute apex; clypeus with fine copious setae; antennae with 10 segments and 6-segmented club.

Pronotum brown with dark orange border and frequently a middle line; narrowing anteriorly and bordered posteriorly; whitish pubescence with some longer setae especially on the sides; finely and densely punctured.

Elytra brown with ochre markings (Fig. 20a); copious pubescence interposed with longer setae; finely and densely punctured; wings membranous, normal.

Legs dark orange with whitish setae; tibiae with numerous spines.

Abdomen dark brown, frequently with an ochre border; stridulatory arch marked, striae evident; post-metacoxal line complete; copious whitish pubescence with some longer setae. Aedeagus (Fig. 11c).

Larva unknown.

**Distribution and habitat:** Bulgaria, Georgia, Russia; Iran, Iraq, Kazakhstan, Syria, Turkey (asiatic), Turkmenistan, Uzbekistan (MASCAGNI, 2005b, 2006).

Mainly sandy terrain along rivers and streams.

**Similar species:** *A. flavidus* (P. Rossi) and *A. sericans* (Kiesenwetter).



6. ***Augyles (Augyles) marmota*** (Kiesenwetter, 1850): 224

*Heterocerus unicolor* Dufour, 1851: 333

*Heterocerus funebris* Schaufuss, 1863: 117

*Heterocerus maritimus* Kuwert, 1890b: 523

**Description:** Total length 2.2-3.0 mm (Fig. 33). Head black or dark brown, whitish pubescence with longer setae especially on the sides; mandibles dentate, rather short, with fairly acute apex; clypeus with fine copious setae; antennae with 10 segments and 6-segmented club.

Pronotum dark brown with reddish brown border and middle line; narrowing anteriorly and bordered posteriorly; whitish pubescence with longer setae especially on the sides; densely and finely punctured.

Elytra dark brown with reddish markings of varying size (Fig. 20b); copious pubescence interposed with longer setae; micropunctured and coarsely and irregularly punctured; wings membranous, normal.

Legs: femurs and tibiae reddish brown, tarsi ochre, tibiae with numerous spines.

Abdomen dark brown sometimes with an ochre border; stridulatory arch marked, striae evident; post-metacoxal line complete; copious whitish pubescence interposed with longer setae. Aedeagus (Fig. 12a).

Larva unknown.

**Distribution and habitat:** France, Greece, Italy, Romania, Spain; Algeria, Tunisia; Armenia, Turkey (asiatic) (AGUILERA *et al.*, 1998; MASCAGNI, 2005b, 2006).

Sand and mud at the edge of rivers and streams.

**Similar species:** *A. maritimus* (Guèrin-Méneville).

7. ***Augyles (Augyles) maritimus*** (Guèrin-Méneville, 1844): 69

*Heterocerus nanus* Gené, 1836: 183

*Heterocerus britannicus* Kuwert, 1890b: 546

*Heterocerus burchanensis* Schneider, 1896: 177

*Heterocerus basalis* Mamitza, 1929: 203

*Heterocerus melitensis* Reitter, *nomen nudum* (MIFSUD & MASCAGNI, 1997)

**Description.** Total length 2.2-3.4 mm (Fig. 34). Head black, whitish pubescence interposed with longer setae especially on the sides; mandibles dentate with acute apex; clypeus with fine copious setae; antennae with 11 segments and 7-segmented club.

Pronotum dark brown with reddish brown border and middle line; narrow anteriorly and bordered posteriorly; whitish pubescence with longer setae especially on the sides; densely and finely punctured.

Elytra black or dark brown with reddish markings of varying size (Fig. 20d, e); copious pubescence interposed with longer setae; micropunctured and coarsely and irregularly punctured; wings membranous, normal.

Legs reddish brown; tibiae with numerous spines.

Abdomen black or dark brown sometimes with an ochre border; stridulatory arch marked, striae evident; post-metacoxal line complete; copious whitish pubescence interposed with longer setae. Aedeagus (Fig. 12b).

Larva unknown.

**Distribution and habitat:** France, Germany, Great Britain, Greece, Ireland, Italy, Malta, Russia, Spain, The Netherlands; Algeria, Morocco, Tunisia; Turkey (asiatic) (CLARKE, 1973; STRIEN, 1980; AGUILERA *et al.*, 1998; MASCAGNI, 2005b, 2006).

Along rivers and streams, at the mouth of rivers and close to the sea.

**Similar species:** *A. marmota* (Kiesenwetter).

8. ***Augyles (Augyles) gravidus*** (Kiesenwetter, 1850): 224

*Heterocerus curtus* Rosenhauer, 1856: 116

*Heterocerus curtulus* Fairmaire, 1868: 477

*Heterocerus curtinigripes* Kuwert, 1890b: 533

*Heterocerus andalusiacus* Breit, 1916: 58

**Description.** Total length 3.0-3.5 mm. Head black, whitish pubescence with longer setae; mandibles dentate, rather short; clypeus with fine copious setae, antennae with 11 segments and 7-segmented club.

Pronotum black or dark brown sometimes with light brown border and middle line; narrowing anteriorly and bordered posteriorly; whitish pubescence with longer setae especially on the sides; coarsely and densely punctured.

Elytra brown or reddish brown with ochre markings (Fig. 20c); copious pubescence interposed with longer setae; coarsely and densely punctured; striations faint; wings membranous, normal.

Legs ochre with whitish setae; tibiae with numerous spines.

Abdomen black or dark brown with ochre border; stridulatory arch marked, striae evident; post-metacoxal line complete; copious whitish pubescence interposed with longer setae. Aedeagus (Fig. 12c).

Larva unknown.

**Distribution and habitat:** France, Italy, Portugal, Spain; Morocco, Tunisia (AGUILERA *et al.*, 1998; MASCAGNI, 2006).

Sand at the edge of rivers and streams.

**Similar species:** *A. hispidulus* (Kiesenwetter) and *A. pruinus* (Kiesenwetter).

### 9. *Augyles (Augyles) hispidulus* (Kiesenwetter, 1843): 211

**Description.** Total length 2.9-3.6 mm (Fig. 35). Head black, whitish pubescence interposed with longer setae; mandibles dentate, rather short with roundish apex; clypeus with fine copious setae; antennae with 10 segments and 6-segmented club.

Pronotum black, sometimes with reddish border and middle line; narrowing anteriorly and bordered posteriorly; whitish pubescence with longer setae especially on the sides; coarsely and densely punctured.

Elytra black or dark brown with ochre markings of varying size (Fig. 21a); copious pubescence interposed with longer setae; micropunctured and coarsely and irregularly punctured; striations evident; wings membranous, normal.

Legs: femurs and tibiae black, tarsi ochre; tibiae with numerous spines.

Abdomen black or dark brown with ochre border; stridulatory arch marked, striae evident; post-metacoxal line complete; copious whitish pubescence interposed with longer setae. Aedeagus (Fig. 13a).

Larva known. Nail and unguis spines Fig. 10a.

**Distribution and habitat:** Austria, Belgium, Bosnia Herzegovina, Croatia, Czech Republic, Denmark, Finland, France, Germany, Great Britain, Hungary, Italy, Kazakhstan, Latvia, Lithuania, Polonia, Romania, Russia, Slovakia, Slovenia, Spain, Sweden, Switzerland, The Netherlands, Turkey, Yugoslavia; Iraq, Israel, Turkey (asiatic), Turkmenistan, Uzbekistan (CLARKE, 1973; STRIEN, 1980; AGUILERA *et al.*, 1998; MASCAGNI, 2005b, 2006).

River banks, sandy shores of streams and rivers, and mud at the edge of pools.

**Similar species:** *A. pruinus* (Kiesenwetter), *A. intermedius* (Kiesenwetter) and *A. curtus* (Rosenhauer).

### 10. *Augyles (Augyles) muelleri* (Breit, 1916): 54

**Description.** Total length 2.6-2.9 mm (Fig. 36). Head dark brown finely punctate, dense pubescence interposed with longer setae; mandibles feebly rounded, without acute apex; clypeus without anterior horns and with fine copious setae; antennae with 10 segments and 6-segmented club.

Pronotum dark brown with reddish border and middle line; narrowing anteriorly and bordered posteriorly; dense pubescence with longer setae especially on the sides; finely punctate.

Elytra dark brown with reddish markings (Fig. 14b); copious pubescence interposed with longer setae; finely and densely punctured; without striations evident; wings membranous, normal. Legs pale brown, protibiae darker laterally; tibiae with numerous spines.

Abdomen dark brown; stridulatory arch marked with striae evident; post-metacoxal line complete; copious pubescence interposed with longer setae.

Aedeagus (Fig. 14a).

Larva unknown.

**Distribution and habitat:** Portugal (MASCAGNI, 2006).

The species is only known from the type locality: Evora (SKALICKÝ, 2003).

**Similar species:** *A. hispidulus* (Kiesenwetter).

11. ***Augyles (Augyles) pruinosus*** (Kiesenwetter, 1851): 286

**Description.** Total length 3.1-4.0 mm (Fig. 37). Head black, whitish pubescence interposed with longer setae; mandibles dentate, rather short, with a fairly acute apex; clypeus with fine copious setae; antennae with 11 segments and 7-segmented club.

Pronotum dark brown with reddish or reddish brown border and middle line; narrowing anteriorly and bordered posteriorly; whitish pubescence with longer setae especially on the sides; densely and irregularly punctured.

Elytra black with ochre markings of varying size (Fig. 21b); copious pubescence interposed with longer setae; coarsely and irregularly punctured; striations evident; wings membranous, normal.

Legs: femurs and tibiae brown or reddish brown, tarsi ochre; tibiae with numerous spines. Abdomen black or dark brown with ochre border; stridulatory arch very marked, striae evident; post-metacoxal line complete; copious whitish pubescence interposed with longer setae.

Aedeagus (Fig. 13b).

Larva unknown.

**Distribution and habitat:** Austria, Bosnia Herzegovina, Bulgaria, Croatia, Czech Republic, France, Georgia, Germany, Greece, Hungary, Italy, Kazakhstan, Polonia, Romania, Russia, Slovakia, Slovenia, Spain, Switzerland; Turkey (asiatic) (AGUILERA *et al.*, 1998; MASCAGNI, 2005b, 2006).

Sand at the edge of marshes, saltwater ponds, freshwater streams and rivers.

**Similar species:** *A. hispidulus* (Kiesenwetter), *A. intermedius* (Kiesenwetter) and *A. curtus* (Rosenhauer).

12. ***Augyles (Augyles) intermedius*** (Kiesenwetter, 1843): 209

*Heterocerus maritimus* Motschulsky, 1845: 353

*Heterocerus motschulsky* Reiche, 1879: 239

**Description.** Total length 3.0-4.1 mm (Fig. 38). Head black, whitish pubescence interposed with longer setae; mandibles dentate, rather short, with a fairly acute apex; clypeus with fine copious setae; antennae with 11 segments and 7-segmented club.

Pronotum black, narrowing anteriorly and bordered posteriorly; whitish pubescence with copious longer setae; coarsely and densely punctured.

Elytra black with ochre markings of varying size (Fig. 21c); copious pubescence interposed with longer setae; coarsely and irregularly punctured; striations faint; wings membranous, normal.

Legs: femurs and tibiae black or dark brown, tarsi ochre; tibiae with numerous spines. Abdomen black, fifth segment apex ochre; stridulatory arch marked, striae evident; post-metacoxal line complete; copious whitish pubescence interposed with longer setae.

Aedeagus (Fig. 13c).

Larva unknown.

**Distribution and habitat:** Bulgaria, Denmark, Finland, France, Germany, Kazakhstan, Latvia, Lithuania, Russia, Sweden, The Netherlands (STRIEN, 1980; MASCAGNI, 2006).

Sand and slime along rivers and streams.

**Similar species:** *A. hispidulus* (Kiesenwetter) and *A. pruinosus* (Kiesenwetter).

13. ***Augyles (Augyles) senescens*** (Kiesenwetter, 1865): 368

*Heterocerus punctatus* Brisout, 1866: 373

**Description.** Total length 3.5-5.0 mm (Fig. 39). Head black, whitish pubescence interposed with very long setae; mandibles dentate, rather short, with acute apex; clypeus with fine copious setae; antennae with 11 segments and 7-segmented club.

Pronotum black, narrowing anteriorly and bordered posteriorly; whitish pubescence with copious longer setae; coarsely and densely punctured.

Elytra black with ochre markings of varying size (Fig. 21d, e); copious pubescence interposed with longer setae; micropunctured and coarsely and irregularly punctured; striations faint; wings membranous, normal.

Legs: femurs and tibiae black and ochre, tarsi ochre; tibiae with numerous spines.

Abdomen black with ochre border; stridulatory arch marked; post-metacoxal line complete; copious whitish pubescence interposed with longer copious setae. Aedeagus (Fig. 15a).

Larva unknown.

**Distribution and habitat:** France, Norway, Portugal, Spain, Sweden (AGUILERA *et al.*, 1998; MASCAGNI, 2006).

Sand and slime at the edge of rivers and streams, at the mouth of rivers and near the sea.

#### 14. *Augyles (Augyles) crinitus* (Kiesenwetter, 1850): 224

**Description.** Total length 3.0-4.0 mm (Fig. 40). Head black, whitish pubescence interposed with very long setae; mandibles dentate, rather short, with a fairly acute apex; clypeus with fine copious setae; antennae with 11 segments and 7-segmented club.

Pronotum black or dark brown, narrowing anteriorly and bordered posteriorly; whitish pubescence with copious very long setae; coarsely and irregularly punctured.

Elytra black or dark brown with faint markings; copious pubescence interposed with very long copious setae; coarsely and irregularly punctured; striations faint; wings membranous, normal.

Legs brown; tibiae with numerous spines.

Abdomen brown with ochre border; stridulatory arch marked, striae evident; post-metacoxal line complete; copious whitish pubescence interposed with longer setae. Aedeagus (Fig. 15b).

Larva unknown.

**Distribution and habitat:** Austria, Croatia, Germany, Hungary, Italy, Romania, Slovakia, Slovenia, Switzerland, The Netherlands (STRIEN, 1980; JELINEK, 1993; MASCAGNI, 2005b, 2006).

At the edge of lakes.

**Genus *Heterocerus*** Fabricius, 1792: 262

type species *Apate marginatus* Fabricius, 1787

### Key to Species

1. Pronotum black or dark brown with ochre border. Elytra with ochre or orange markings. Legs brown, black, or black and ochre ..... 2
- Pronotum black with reddish border. Elytra with reddish markings. Legs reddish brown 7
2. Pronotum strongly bordered posteriorly (Fig. 5b) ..... 3
- Pronotum feebly bordered posteriorly ..... 5
3. Pronotum black or dark brown with dark orange border. Elytra black or dark brown with orange markings. Legs dark brown with brown tarsi. Abdomen black or dark brown with orange border. Total length 2.4-3.8 mm. Aedeagi (Fig. 17a, b) ..... *fusculus* (p. 92)
- Pronotum black or dark brown with ochre border. Elytra black or dark brown with ochre markings. Legs with black and ochre femurs and tibiae, ochre tarsi. Abdomen black or dark brown with ochre border ..... 4
4. Elytra with double apical mark, frequent confluent, and double central mark, seldom confluent with marginal mark (band in the form of S). Total length 2.5-5.2 mm. Aedeagus (Fig. 17c) ..... *fenestratus* (p. 93)
- Elytra with single apical mark (always) and central mark generally confluent with marginal mark (band in the form of S). Total length 3.5-5.0 mm. Aedeagus (Fig. 17d) ..... *aragonicus* (p. 94)
5. Male with clypeal horns (Fig. 16c). Total length 4.5-6.2 mm. Aedeagus (Fig. 16b) ..... *fossor* (p. 91)
- Male without clypeal horns ..... 6
6. Mandibles of male with evident dorsal projection (Fig. 16d). Elytra finely and densely punctured. Sexual dimorphism substantial. Total length 4.8-7.6 mm. Aedeagus (Fig. 16e) ..... *parallelus* (p. 92)
- Mandibles of male with tooth fairly pronounced. Elytra finely and densely punctured and micropunctured. Sexual dimorphism scanty. Total length 3.5-5.6 mm. Aedeagus (Fig. 16a) ..... *flexuosus* (p. 91)

7. Mandibles robust. Elytra black or dark brown with reddish markings. Legs brown. Abdomen brown with reddish border, stridulatory arch marked, without evident striae. Total length 4.2-5.8 mm. Aedeagus (Fig. 18c) ..... **obsoletus** (p. 95)  
 -- Mandibles rather short. Elytra black with reddish markings. Legs reddish brown with ochre tarsi. Abdomen black or dark brown with reddish or ochre border, stridulatory arch marked, striae evident ..... 8
8. Mandibles with fairly roundish apex. Pronotum finely and densely punctured. Elytra black with reddish markings (Fig. 24c). Abdomen black with reddish border. Total length 4.0-5.0 mm. Aedeagus (Fig. 18b) ..... **holosericeus** (p. 94)  
 -- Mandibles with acute apex. Pronotum finely and densely punctured and micropunctured. Elytra black with reddish markings (Fig. 24b). Abdomen black or dark brown with ochre border. Total length 3.5-4.2 mm. Aedeagus (Fig. 18a) ..... **marginatus** (p. 94)

### Chiave delle Specie

1. Pronoto nero o bruno scuro con bordo laterale color ocra. Elitre con macchie ocra o arancio. Zampe brune, nere o nere e ocra ..... 2  
 -- Pronoto nero con bordo laterale rossastro. Elitre con macchie rossastre. Zampe bruno rossicce ..... 7
2. Pronoto posteriormente bordato con evidenza (Fig. 5b) ..... 3  
 -- Pronoto posteriormente debolmente bordato ..... 5
3. Pronoto nero o bruno scuro con bordo laterale arancio scuro. Elitre nere o bruno scure con macchie arancio. Zampe bruno scure con tarsi bruni. Addome nero o bruno scuro con bordo arancio. Lunghezza totale mm 2,4-3,8. Edeagi (Fig. 17a, b) ..... **fusculus** (p. 92)  
 -- Pronoto nero o bruno scuro con bordo laterale color ocra. Elitre nere o bruno scure con macchie ocra. Zampe con femori e tibie neri e ocra, tarsi ocra. Addome nero o bruno scuro con bordo ocra ..... 4
4. Elitre con doppia macchia apicale, a volte confluenti, due macchie centrali talora confluenti con la macchia marginale (striscia a forma di S). Lunghezza totale mm 2,5-5,2. Edeago (Fig. 17c) ..... **fenestratus** (p. 93)  
 -- Elitre con macchia apicale singola (sempre) e macchia centrale generalmente confluenta con la macchia marginale (striscia a forma di S). Lunghezza totale mm 3,5-5,0. Edeago (Fig. 17d) ..... **aragonicus** (p. 94)
5. Maschio con corna clipeali (Fig. 16c). Lunghezza totale mm 4,5-6,2. Edeago (Fig. 16b) ..... **fossor** (p. 91)  
 -- Maschio senza corna clipeali ..... 6
6. Mandibole del maschio con evidente processo dorsale (Fig. 16d). Elitre con punteggiatura densa e fine. Evidente dimorfismo sessuale. Lunghezza totale mm 4,8-7,6. Edeago (Fig. 16e) ..... **parallelus** (p. 92)  
 -- Mandibole del maschio con dente debolmente pronunciato. Elitre con punteggiatura fine e densa e micropunteggiatura. Scarso dimorfismo sessuale. Lunghezza totale mm 3,5-5,6. Edeago (Fig. 16a) ..... **flexuosus** (p. 91)
7. Mandibole robuste. Elitre nere o bruno scure con macchie rossastre. Zampe brune. Addome bruno con bordo rossastro, arco stridulatorio ben evidente senza strie marcate. Lunghezza totale mm 4,2-5,8. Edeago (Fig. 18c) ..... **obsoletus** (p. 95)  
 -- Mandibole piuttosto corte. Elitre nere con macchie rossastre. Zampe bruno rossastre con tarsi ocra. Addome nero o bruno scuro con bordo rossastro od ocra, arco stridulatorio ben marcato con evidenti strie ..... 8
8. Mandibole con apice moderatamente arrotondato. Pronoto con punteggiatura densa e fine. Elitre nere con macchie rossastre (Fig. 24c). Addome nero con bordo rossastro. Lunghezza totale mm 4,0-5,0. Edeago (Fig. 18b) ..... **holosericeus** (p. 94)  
 -- Mandibole con apice acuto. Pronoto con punteggiatura densa e fine; presente anche una micropunteggiatura. Elitre nere con macchie rossastre (Fig. 24b). Addome nero o bruno scuro con bordo ocra. Lunghezza totale mm 3,5-4,2. Edeago (Fig. 18a) ..... **marginatus** (p. 94)

15. ***Heterocerus fossor*** Kiesenwetter, 1843: 204

*Heterocerus bifasciatus* Küster, 1849: 37

*Heterocerus parallelus* Dufour, 1852: 456

*Heterocerus rectus* G.W. Waterhouse, 1859: 168

*Heterocerus cincticollis* Rey, 1890: 163

**Description.** Total length 4.5-6.2 mm (Fig. 41). Head black, whitish pubescence with longer setae especially on the sides; mandibles dentate, very robust with acute apex; male with clypeal horns; clypeus with fine copious setae; antennae with 11 segments and 7-segmented club.

Pronotum black with ochre border, narrowing anteriorly and feebly bordered posteriorly; whitish pubescence with longer setae especially on the sides; finely and densely punctured.

Elytra black with ochre markings of varying size (Fig. 22c, d); copious pubescence interposed with longer setae; finely and densely punctured; striations evident; wings membranous, normal.

Legs ochre with whitish setae; tibiae with numerous spines and with black external border.

Abdomen black with ochre border of varying widths; stridulatory arch marked, striae evident; post-metacoxal line incomplete; copious whitish pubescence with longer setae. Aedeagus (Fig. 16b). Some of the males are hypermandibulated.

Larva unknown.

**Distribution and habitat:** Austria, Belgium, Bulgaria, Czech Republic, Finland, France, Germany, Great Britain, Greece, Hungary, Ireland, Italy, Kazakhstan, Portugal, Romania, Russia, Slovakia, Spain, Sweden, The Netherlands; Iran, Turkey (asiatic) (CLARKE, 1973; STRIEN, 1980; AGUILERA *et al.*, 1998; MASCAGNI, 2005b, 2006).

Sandy or clayey river banks, flood detritus, and sea shores.

**Similar species:** *H. flexuosus* Stephens and *H. parallelus* Gebler.

16. ***Heterocerus flexuosus*** Stephens, 1828: 101

*Heterocerus marginatus* Gyllenhal, 1808: 137

*Heterocerus femoralis* Krynický, 1832: 115

*Heterocerus hamifer* Gené, 1836: 182

*Heterocerus arenarius* Kiesenwetter, 1851: 284

*Heterocerus maculosus* Fairmaire, 1868: 476

*Heterocerus fausti* Reitter, 1879: 545

*Heterocerus damryi* Kuwert, 1890b: 542

*Heterocerus dentifasciatus* Kuwert, 1890b: 542

*Heterocerus heydeni* Kuwert, 1890b: 543

*Heterocerus apfelbecki* Kuwert, 1890b: 543

*Heterocerus corsicus* Rey, 1890: 163

*Heterocerus senegalensis* Fairmaire, 1894: 652

*Heterocerus syrcticus* Peyerimhoff, 1924: 159

**Description.** Total length 3.5-5.6 mm (Figs. 42, 43). Head black, whitish pubescence with longer setae especially on the sides; mandibles dentate, with acute apex; clypeus with fine copious setae; male without clypeal horns; antennae with 11 segments and 7-segmented club.

Pronotum black with brown or ochre border, narrowing anteriorly and feebly bordered posteriorly; whitish pubescence with longer setae especially on the sides; finely and densely punctured.

Elytra black with ochre markings (Fig. 22a, b); copious pubescence interposed with longer setae; micropunctures mixed with fine dense punctures; wings membranous, normal.

Legs ochre with whitish setae; tibiae with numerous spines and sometimes with fine black external border.

Abdomen black with ochre border of varying width; stridulatory arch marked, with slight striae; post-metacoxal line incomplete; copious whitish setae with longer setae.

Aedeagus (Fig. 16a). Some of the males are hypermandibulated.

Larva known. Nail and unguis spines (Fig. 10b).

**Distribution and habitat:** Albania, Austria, Azerbaijan, Bulgaria, Croatia, Czech Republic, Denmark, Finland, France, Georgia, Germany, Great Britain, Greece, Hungary, Ireland,

Italy, Kazakhstan, Lithuania, Norway, Romania, Russia, Slovakia, Slovenia, Spain, Sweden, Switzerland, The Netherlands, Turkey, Ukraine; Algeria, Egypt, Morocco, Tunisia; Cyprus, Iran, Israel, Jordan, Turkey (asiatic), Turkmenistan, Uzbekistan (CLARKE, 1973; STRIEN, 1980; AGUILERA *et al.*, 1998; MASCAGNI, 2005a, 2005b, 2006).

At the edge of brackish puddles, in slime and sand near rivers and lakes.

**Similar species:** *H. fossor* Kiesenwetter and *H. parallelus* Gebler.

17. ***Heterocerus parallelus*** Gebler, 1830: 102

*Heterocerus salinus* Kiesenwetter, 1843: 204

*Heterocerus maxillosus* Motschulsky, 1854: 15

*Heterocerus cornutus* Motschulsky, 1854: 15

*Heterocerus hauseri* Kuwert, 1893: 17

**Description.** Total length 4.8-7.6 mm (Figs. 44, 45). Head black, whitish pubescence with longer setae especially on the sides; mandibles dentate, in the male very robust with a fairly acute apex and dorsal projection and no clypeal horns; in the female small, with a fairly acute apex and no dorsal projection; clypeus with fine copious setae; antennae with 11 segments and 7-segmented club.

Pronotum black with ochre border of varying width, narrowing anteriorly and feebly bordered posteriorly; whitish pubescence with longer setae especially on the sides; finely and densely punctured.

Elytra black with ochre markings of varying size (Fig. 23a, b); copious pubescence interposed with longer setae; finely and densely punctured; wings membranous, normal.

Legs ochre with whitish setae; tibiae with numerous spines.

Abdomen black with faintly ochre border; stridulatory arch marked, without evident striae; post-metacoxal line incomplete; copious whitish pubescence with longer setae.

Aedeagus (Fig. 16e). Some males are hypermandibulated.

Larva known.

**Distribution and habitat:** Austria, Bulgaria, Czech Republic, France, Georgia, Germany, Greece, Hungary, Italy, Kazakhstan, Polonia, Russia, Slovakia, Spain; Lebanon, Turkmenistan, Uzbekistan (JELINEK, 1993; AGUILERA *et al.*, 1998; MASCAGNI, 2005b, 2006; BOUKAL *et al.*, 2007). In sand near fresh water, brackish water and the sea.

**Similar species:** *H. fossor* Kiesenwetter and *H. flexuosus* Stephens.

18. ***Heterocerus fuscus*** Kiesenwetter, 1843: 220

*Heterocerus pulchellus* Kiesenwetter, 1843: 220

*Heterocerus oblongulus* Kuwert, 1890b: 548

*Heterocerus pulchellus* Kuwert, 1890b: 537

*Heterocerus similis* Kuwert, 1890b: 547

*Heterocerus opacus* Rey, 1890: 163

**Description.** Total length 2.4-3.8 mm (Fig. 46). Head black, whitish pubescence with longer setae especially on the sides; mandibles dentate with acute apex; clypeus with fine copious setae; antennae with 11 segments and 7-segmented club.

Pronotum black or dark brown with dark orange border; narrowing anteriorly and bordered posteriorly; whitish pubescence with longer setae especially on the sides; finely and densely punctured.

Elytra black or dark brown with orange markings of varying size (Fig. 23c, d); copious pubescence interposed with longer setae; micropunctures mixed with fine dense punctures; striations very faint; wings membranous, normal.

Legs dark brown with brown tarsi; tibiae with numerous spines.

Abdomen black or dark brown with orange border of varying width; stridulatory arch marked, striae evident; post-metacoxal line incomplete; copious whitish pubescence with longer setae.

Aedeagi (Fig. 17a, b).

Larva known (Fig. 10g). Nail and unguis spines (Fig. 10d).

**Similar species:** *H. fenestratus* (Thunberg).

ssp. ***fuscus*** Kiesenwetter, 1843: 220

Aedeagus shape as in Fig. 17b.

**Distribution and habitat:** Austria, Belarus, Belgium, Bosnia Herzegovina, Croatia, Czech Republic, Finland, France, Germany, Great Britain, Hungary, Italy, Kazakhstan, Latvia, Lithuania, Moldavia, Polonia, Portugal, Romania, Russia, Slovakia, Slovenia, Sweden, Switzerland, The Netherlands, Ukraine, Yugoslavia; Iran, Turkey (asiatic) (CLARKE, 1973; AGUILERA *et al.*, 1998; MASCAGNI, 2005b, 2006).

Mud near rivers and streams and on the banks of freshwater or brackish ponds.

ssp. **etruscus** Mascagni, 1986: 41

Total length 2.8-3.4 mm (Fig. 47).

Aedeagus shape as in Fig. 17a.

**Distribution and habitat:** Tuscany and Latium (Italy) (MASCAGNI, 1986; MASCAGNI & NARDI, 2003).

Mud at the edge of ponds and marshs.

19. **Heterocerus fenestratus** (Thunberg, 1784): 3

*Heterocerus laevigatus* Panzer, 1794: 12

*Heterocerus marshami* Stephens, 1829: 101

*Heterocerus pusillus* Waltl, 1839: 221

*Heterocerus tristis* Mannerheim, 1853: 218

*Heterocerus multimaculatus* Motschulsky, 1854: 18

*Heterocerus siculus* Kuwert, 1890b: 547

*Heterocerus corsicus* Kuwert, 1890b: 538

*Heterocerus croaticus* Kuwert, 1890b: 538

*Heterocerus obscurus* Rey, 1890: 163

*Heterocerus confinis* Rey, 1890: 163

*Heterocerus lanatus* Rey, 1890: 163

*Heterocerus molleri* Varenus, 1891: 22

*Heterocerus beckeri* Kuwert, 1892: 311

*Heterocerus tonkinensis* Grouvelle, 1896a: 5

*Heterocerus latus* Grouvelle, 1915: 134

*Heterocerus asiaticus* Nomura, 1958: 58

*Heterocerus completus* Hatch, 1965: 13

**Description.** Total length 2.5-5.2 mm (Figs 48, 49). Head black, whitish pubescence with longer setae especially on the sides; mandibles dentate, sometimes robust with acute apex; clypeus with fine copious setae; antennae with 11 segments and 7-segmented club. Pronotum black or dark brown with ochre border of varying width; narrowing anteriorly and bordered posteriorly; whitish pubescence with longer setae especially on the sides; finely and densely punctured.

Elytra black or dark brown with ochre markings varying greatly in size (Fig. 2a, b, c, d, e); copious pubescence interposed with longer setae; micropunctures mixed with fine dense punctures; striations faint; wings membranous, normal.

Legs: femurs and tibiae black and ochre, tarsi ochre; tibiae with numerous spines.

Abdomen black or dark brown with ochre border of varying width; stridulatory arch marked, striae evident; post-metacoxal line incomplete; copious whitish pubescence with longer setae.

Aedeagus (Fig. 17c). Some of the males are hypermandibulated.

Larva known. Nail and unguis spines (Fig. 10c).

**Distribution and habitat:** Albania, Armenia, Austria, Belarus, Belgium, Bosnia Herzegovina, Bulgaria, Croatia, Czech Republic, Finland, France, Georgia, Germany, Great Britain, Greece, Hungary, Italy, Kazakhstan, Latvia, Lithuania, Moldavia, Polonia, Portugal, Romania, Russia, Slovakia, Slovenia, Spain, Sweden, Switzerland, The Netherlands, Turkey, Ukraine, Yugoslavia; Algeria, Morocco, Tunisia; Cyprus, Iran, Iraq, Israel, Lebanon, Turkey (asiatic), Turkmenistan (CLARKE, 1973; STRIEN, 1980; AGUILERA *et al.*, 1998; MASCAGNI, 2005a, 2005b, 2006).

Sandy shores of rivers and streams, in slime around lakes and ponds, on the shores of freshwater and brackish ponds, and in flood detritus. It is easily the most habitat adaptable of all the European species.

**Similar species:** *H. fuscus* Kiesenwetter and *H. aragonicus* Kiesenwetter.



20. ***Heterocerus aragonicus*** Kiesenwetter, 1850: 223

*Heterocerus arragonicus* Kiesenwetter, 1850: 223 [unused original spelling]

*Heterocerus pictus* Mulsant & Rey, 1873: 433

*Heterocerus amoenus* Reiche, 1879: 239

*Heterocerus biskrensis* Fairmaire, 1879: 169

*Heterocerus coxaepilus* Kuwert, 1890b: 545

*Heterocerus mendax* Kuwert, 1890b: 545

**Description.** Total length 3.5-5.0 mm (Fig. 50). Head black, whitish pubescence with longer setae especially on the sides; mandibles dentate with a fairly acute apex; clypeus with fine copious setae; antennae with 11 segments and 7-segmented club.

Pronotum black with ochre border; narrowing anteriorly and bordered posteriorly; whitish pubescence with longer setae especially on the sides; finely and densely punctured.

Elytra black or dark brown with ochre markings of varying size (Fig. 24a); copious pubescence interposed with longer setae; micropunctures mixed with fine dense punctures; wings membranous, normal.

Legs: femurs and tibiae black and ochre, tarsi ochre; tibiae with numerous spines.

Abdomen black with ochre border of varying width; stridulatory arch marked, with very evident striae; post-metacoxal line incomplete; copious whitish pubescence with longer setae.

Aedeagus (Fig. 17d).

Larva known (Fig. 10h). Nail and unguis spines (Fig. 10e).

**Distribution and habitat:** France, Germany, Italy, Portugal, Spain; Algeria, Morocco, Tunisia (AGUILERA *et al.*, 1998; MASCAGNI, 2006).

At the edge of rivers and streams, on shores of the sea, at the edge of brackish water, and in flood detritus, in sand and mud.

**Similar species:** *H. fenestratus* Thunberg.

21. ***Heterocerus marginatus*** (Fabricius, 1787): 33

*Heterocerus sulcatus* Kuwert, 1890b: 544

*Heterocerus scutellaris* Guillebeau, 1897: 163

**Description.** Total length 3.5-4.2 mm (Fig. 51). Head black, whitish pubescence with longer setae especially on the sides; mandibles dentate, rather short with acute apex; clypeus with fine copious setae; antennae with 11 segments and 7-segmented club.

Pronotum black, sometimes with a reddish border; narrowing anteriorly and bordered posteriorly; whitish pubescence with longer setae especially on the sides; micropunctures mixed with fine dense punctures.

Elytra black with reddish markings of varying size (Fig. 24b); copious pubescence interposed with longer setae; micropunctures mixed with fine dense punctures; striations evident; wings membranous, normal.

Legs reddish brown, tarsi ochre; tibiae with numerous spines.

Abdomen black or dark brown with ochre border of varying widths; stridulatory arch marked, striae evident; post-metacoxal line incomplete; copious whitish pubescence with longer setae.

Aedeagus (Fig. 18a).

Larva known.

**Distribution and habitat:** Armenia, Austria, Belgium, Bosnia Herzegovina, Bulgaria, Croatia, Czech Republic, Denmark, Finland, France, Georgia, Germany, Great Britain, Greece, Hungary, Italy, Latvia, Lithuania, Norway, Polonia, Romania, Russia, Slovakia, Slovenia, Spain, Sweden, Switzerland, The Netherlands, Ukraine; Algeria (CLARKE, 1973; STRIEN, 1980; AGUILERA *et al.*, 1998; MASCAGNI, 2005b, 2006).

At the edge of rivers, streams, and freshwater and brackish ponds, in sand and mud.

22. ***Heterocerus holosericeus*** Rosenhauer, 1856: 114

*Heterocerus pustulatus* Schilsky, 1890: 177

*Heterocerus panormitanus* Kuwert, 1890b: 545

*Heterocerus ragusae* Kuwert, 1890b: 546

*Heterocerus lineatus* Kuwert, 1890b: 546

*Heterocerus pustulatus* Schilsky, 1892: 254

*Heterocerus fluviatilis* A. Fiori, 1906: 251

*Heterocerus subfosso* A. Fiori, 1906: 259

*Heterocerus villiger* A. Fiori, 1906: 260

*Heterocerus villosus* A. Fiori, 1908: 239

**Description.** Total length 4.0-5.0 mm (Fig. 52). Head black, whitish pubescence with numerous and longer setae; mandibles dentate, rather short with a fairly roundish apex; clypeus with fine copious setae; antennae with 11 segments and 7-segmented club.

Pronotum black, with reddish border; narrowing anteriorly and bordered posteriorly; whitish pubescence with longer setae especially on the sides; fine dense punctures.

Elytra black with reddish markings of varying size (Fig. 24c); copious pubescence interposed with longer setae; micropunctures mixed with fine dense punctures; striations evident; wings membranous, normal.

Legs reddish brown, tarsi ochre; tibiae with numerous spines.

Abdomen black with reddish border of varying width; stridulatory arch marked, striae evident; post-metacoxal line incomplete; copious whitish pubescence with longer setae. Aedeagus (Fig. 18b).

Larva unknown.

**Distribution and habitat:** Croatia, France, Italy, Portugal, Spain; Algeria, Morocco, Tunisia; Iran, Turkey (asiatic) (AGUILERA *et al.*, 1998; MASCAGNI, 2005b, 2006).

Sand and slime near rivers and in flood detritus.

23. *Heterocerus obsoletus* Curtis, 1828: 224

*Heterocerus marginatus* Marsham, 1802: 400

*Heterocerus quadrimaculatus* Hochhuth, 1873: 319

**Description.** Total length 4.2-5.8 mm (Fig. 53). Head black, whitish pubescence with numerous and longer setae; mandibles dentate and robust with acute apex; clypeus with fine copious setae; antennae with 11 segments and 7-segmented club.

Pronotum black, with reddish border; narrowing anteriorly and bordered posteriorly; whitish pubescence with very longer setae especially on the sides; micropunctures mixed with fine dense punctures.

Elytra black or dark brown with reddish markings of varying size (Fig. 24d); copious pubescence interposed with very long setae; micropunctures mixed with fine dense punctures; striations evident; wings membranous, normal.

Legs brown; tibiae with numerous spines.

Abdomen brown with reddish border of varying width; stridulatory arch marked, without evident striae; post-metacoxal line incomplete; copious whitish pubescence with longer setae.

Aedeagus (Fig. 18c).

Larva known. Nail and unguis spines (Fig. 10f).

**Distribution and habitat:** Austria, Azerbaijan, Belgium, Croatia, Czech Republic, Denmark, Finland, France, Georgia, Germany, Great Britain, Greece, Hungary, Italy, Kazakhstan, Latvia, Lithuania, Polonia, Russia, Slovakia, Spain, Sweden, The Netherlands, Turkey; Iran, Turkey (asiatic), Turkmenistan (CLARKE, 1973; STRIEN, 1980; JELINEK, 1993; AGUILERA *et al.*, 1998; MASCAGNI, 2005b, 2006; BOUKAL *et al.*, 2007).

Slime and sand at the edge of brackish water.

### Extra-European species collected also in the geographic area examined

1. *Augyles niloticus* (Grouvelle, 1896b): 54

Algeria, Egypt, Morocco (MASCAGNI, 2006; MASCAGNI & MONTE, 2008).

2. *Augyles scutellatus* (Motschulsky, 1854): 17

Azerbaijan, Georgia (MASCAGNI, 2006).

3. *Augyles turanicus* (Reitter, 1887): 502

Georgia, Kazakhstan; Algeria; Iran, Iraq, Israel, Syria, Turkey (asiatic), Turkmenistan, Uzbekistan (SKALICKÝ, 2001; MASCAGNI, 2006; MASCAGNI & MONTE, 2008).

4. *Heterocerus dayremi* Peyerimhoff, 1921: 231

Algeria, Tunisia (SKALICKÝ, 2001; MASCAGNI, 2006; MASCAGNI & MONTE, 2008).

5. *Heterocerus hankae* Skalický, 1998: 4  
Iran (MASCAGNI, 2006).
6. *Heterocerus humilis* Guillebeau, 1896: 243  
Algeria (MASCAGNI, 2006; MASCAGNI & MONTE, 2008).
7. *Heterocerus jelineki* Skalický, 1998: 7  
Iran (MASCAGNI, 2006).
8. *Heterocerus medius* Charpentier, 1965: 238  
Egypt (MASCAGNI, 2006; MASCAGNI & MONTE, 2008).
9. *Heterocerus morgani* Grouvelle, 1907: 506  
Iran (MASCAGNI, 2006).
10. *Heterocerus mus* Charpentier, 1965: 257  
Iran, Kazakstan, Tajikistan, Turkmenistan, Uzbekistan (MASCAGNI, 2006).
11. *Heterocerus ottomerkli* Skalický, 2001: 143  
Tunisia (MASCAGNI, 2006; MASCAGNI & MONTE, 2008).
12. *Heterocerus pallidivestis* Guillebeau, 1893: 326  
Algeria (MASCAGNI, 2006; MASCAGNI & MONTE, 2008).
13. *Heterocerus persicus* Mascagni, 1989: 2  
Tunisia; Iran, Iraq (MASCAGNI, 2006; MASCAGNI & MONTE, 2008).
14. *Heterocerus schatzmayri* Mamitza, 1936: 233  
Tunisia (MASCAGNI & MONTE, 2008).
15. *Heterocerus thebaicus* ssp. *thebaicus* Grouvelle, 1896b: 55  
Egypt (MASCAGNI, 2006; MASCAGNI & MONTE, 2008).

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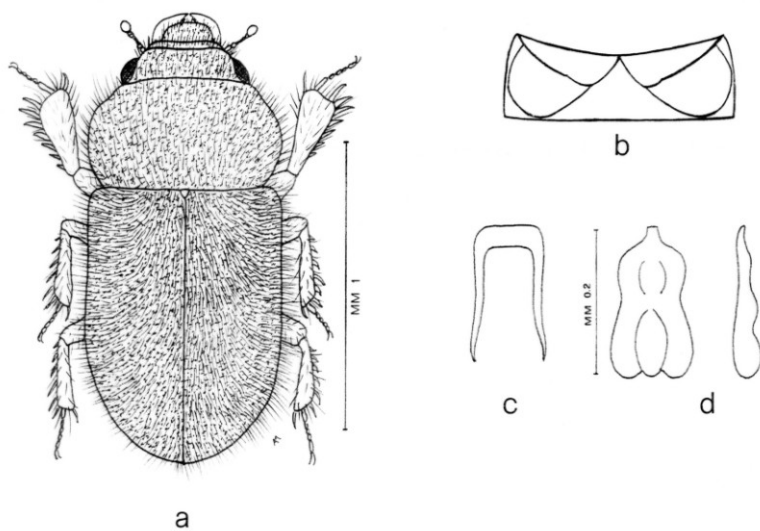
Author's address: Alessandro Mascagni, Museo di Storia Naturale dell'Università degli Studi di Firenze, Sezione di Zoologia "La Specola", via Romana 17, I-50125 Firenze (Italy), pcfmas@tin.it

## Captions

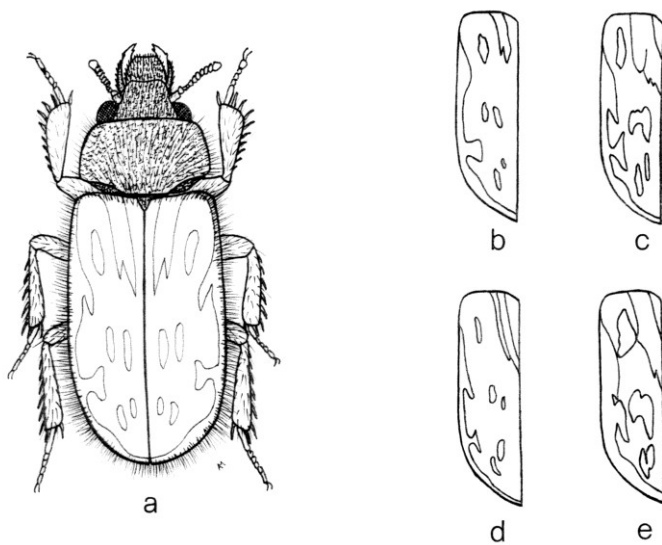
- Fig. 1. *Micilus murinus*. a, habitus; b, first abdominal segment; c, spiculum gastrale; d, aedeagus: dorsal and lateral view.
- Fig. 2. *Heterocerus fenestratus*. a, habitus; b, c, d, e, elytra.
- Fig. 3. a, mandible (adult), dorsal view; b, *Heterocerus aragonicus* (larva): head, ventral view; c, *H. aragonicus* (larva): mandible, ventral view.
- Fig. 4. Antennae. a, *Micilus murinus*; b, *Augyles aureolus*; c, *A. flavidus*; d, *A. intermedius*; e, *A. senescens*; f, gen. *Heterocerus*; g, *H. aragonicus* (larva).
- Fig. 5. a, gen. *Augyles*, ventral view; b, gen. *Heterocerus*, pronotum dorsal view.
- Fig. 6. a, *Heterocerus fenestratus*: elytra; b, *H. marginatus*: elytra; c, *H. flexuosus*: wing.
- Fig. 7. a, *Heterocerus aragonicus*: leg of larva; b, gen. *Augyles*: leg of adult; c, gen. *Augyles*: abdomen, ventral view; d, gen. *Heterocerus*: abdomen, ventral view.
- Fig. 8. Spiculum gastrale. a, tribe Heterocerini; b, tribe Micilini; c, tribe Augyliini.
- Fig. 9. a, penis; b, aedeagus, ventral view; c, aedeagus, dorsal view.
- Fig. 10. Larvae. Nail: a, *Augyles hispidulus*; b, *Heterocerus flexuosus*; c, *H. fenestratus*; d, *H. fuscus*; e, *H. aragonicus*; f, *H. obsoletus*. Habitus: g, *H. fuscus*; h, *H. aragonicus*.
- Fig. 11. Aedeagi. a, *Augyles flavidus*; b, *A. sericans*; c, *A. obliterated*.
- Fig. 12. Aedeagi. a, *Augyles marmota*; b, *A. maritimus*; c, *A. gravidus*.
- Fig. 13. Aedeagi. a, *Augyles hispidulus*; b, *A. pruinus*; c, *A. intermedius*.
- Fig. 14. *Augyles muelleri*: a, aedeagus; b, elytra.
- Fig. 15. Aedeagi. a, *Augyles senescens*; b, *A. crinitus*.
- Fig. 16. Aedeagi. a, *Heterocerus flexuosus*; b, *H. fossor*; e, *H. parallelus*. Head: c, *H. fossor* (male); d, *H. parallelus* (male).
- Fig. 17. Aedeagi. a, *Heterocerus fuscus* ssp. *etruscus*; b, *H. fuscus* ssp. *fuscus*; c, *H. fenestratus*; d, *H. aragonicus*.
- Fig. 18. Aedeagi. a, *Heterocerus marginatus*; b, *H. holosericeus*; c, *H. obsoletus*.
- Fig. 19. Elytra. a, b, *Augyles flavidus*; c, d, *A. sericans*.
- Fig. 20. Elytra. a, *Augyles obliterated*; b, *A. marmota*; c, *A. gravidus*; d, e, *A. maritimus*.
- Fig. 21. Elytra. a, *Augyles hispidulus*; b, *A. pruinus*; c, *A. intermedius*; d, e, *A. senescens*.
- Fig. 22. Elytra. a, b, *Heterocerus flexuosus*; c, d, *H. fossor*.
- Fig. 23. Elytra. a, *Heterocerus parallelus* (male); b, *H. parallelus* (female); c, *H. fuscus* ssp. *fuscus*; d, *H. fuscus* ssp. *etruscus*.
- Fig. 24. Elytra. a, *Heterocerus aragonicus*; b, *H. marginatus*; c, *H. holosericeus*; d, *H. obsoletus*.
- Fig. 25. *Augyles flavidus*: habitus, dorsal view (scanning electron micrographs). *Augyles flavidus*: habitus, dorsal view; b, head and pronotum; c, mandibles and antennae; d, tibia and tarsi; e, setae of elytra; f, habitus, ventral view; g, head and prothorax; h, abdomen, ventral view.
- Fig. 26. *Augyles flavidus*: abdomen, ventral view (scanning electron micrographs).
- Fig. 27. *Heterocerus fenestratus*: anterior leg (scanning electron micrographs).
- Fig. 28. *Augyles flavidus*: setae of elytra (scanning electron micrographs).
- Fig. 29. *Micilus murinus* (Kiesenwetter).
- Fig. 30. *Augyles flavidus* (P. Rossi).
- Fig. 31. *Augyles sericans* (Kiesenwetter).
- Fig. 32. *Augyles obliterated* (Kiesenwetter).
- Fig. 33. *Augyles marmota* (Kiesenwetter).
- Fig. 34. *Augyles maritimus* (Guérin-Méneville).
- Fig. 35. *Augyles hispidulus* (Kiesenwetter).
- Fig. 36. *Augyles muelleri* (Breit).
- Fig. 37. *Augyles pruinus* (Kiesenwetter).
- Fig. 38. *Augyles intermedius* (Kiesenwetter).
- Fig. 39. *Augyles senescens* (Kiesenwetter).
- Fig. 40. *Augyles crinitus* (Kiesenwetter).
- Fig. 41. *Heterocerus fossor* Kiesenwetter.
- Fig. 42. *Heterocerus flexuosus* Stephens (male).
- Fig. 43. *Heterocerus flexuosus* Stephens (female).



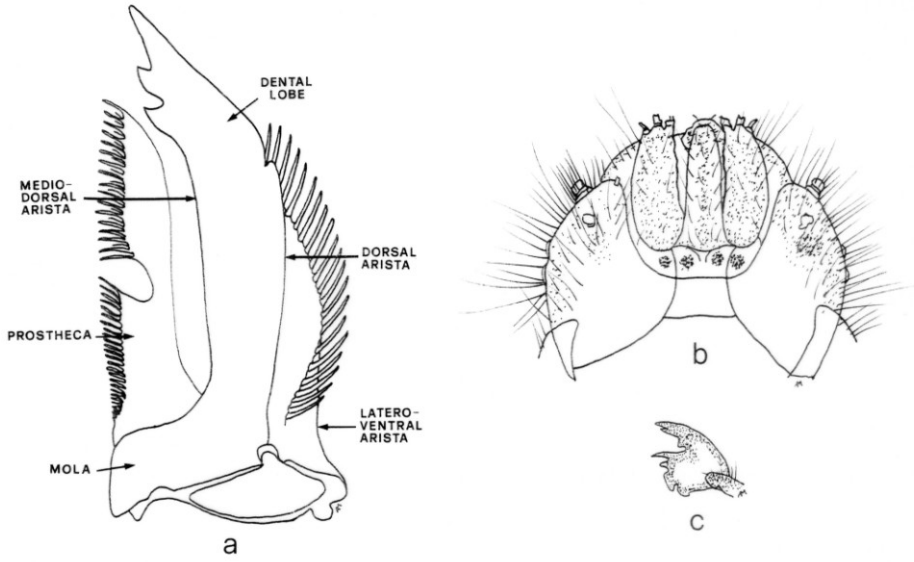
- Fig. 44. *Heterocerus parallelus* Gebler (male).  
Fig. 45. *Heterocerus parallelus* Gebler (female).  
Fig. 46. *Heterocerus fuscus* ssp. *fuscus* Kiesenwetter.  
Fig. 47. *Heterocerus fuscus* ssp. *etruscus* Mascagni.  
Fig. 48. *Heterocerus fenestratus* (Thunberg) (male).  
Fig. 49. *Heterocerus fenestratus* (Thunberg) (female).  
Fig. 50. *Heterocerus aragonicus* Kiesenwetter.  
Fig. 51. *Heterocerus marginatus* (Fabricius).  
Fig. 52. *Heterocerus holosericeus* Rosenhauer.  
Fig. 53. *Heterocerus obsoletus* Curtis.



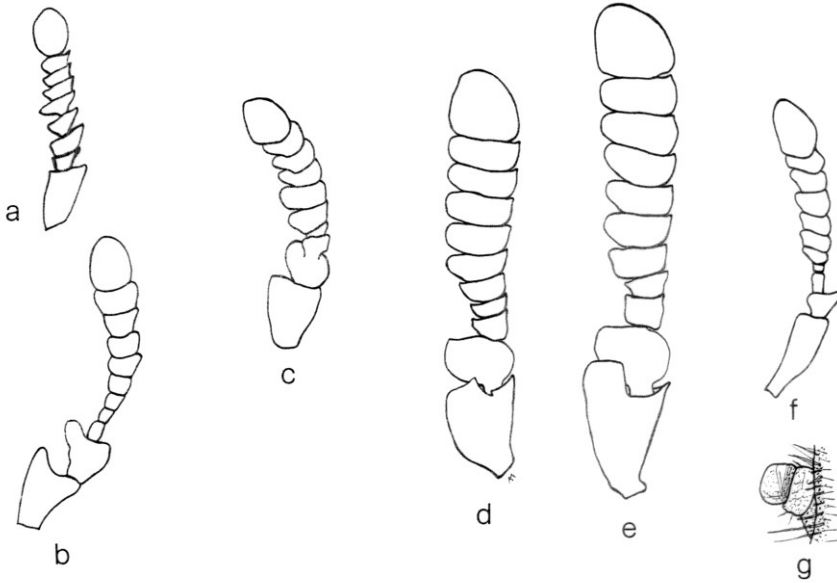
**Fig. 1**



**Fig. 2**



**Fig. 3**



**Fig. 4**

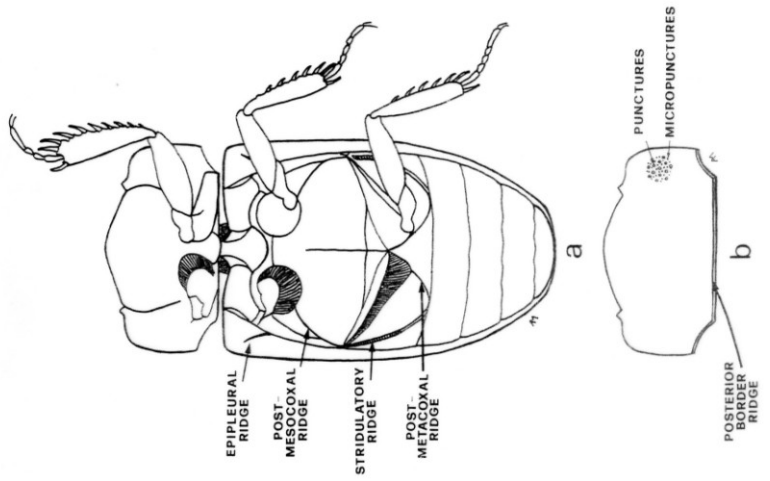


Fig. 5

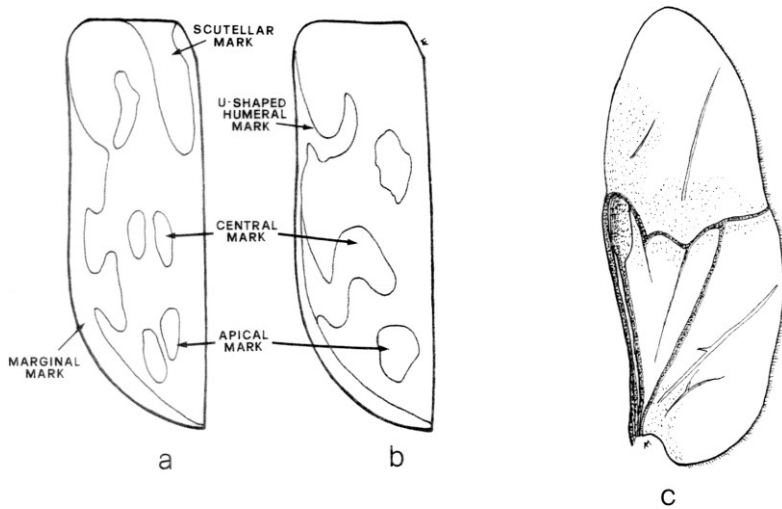
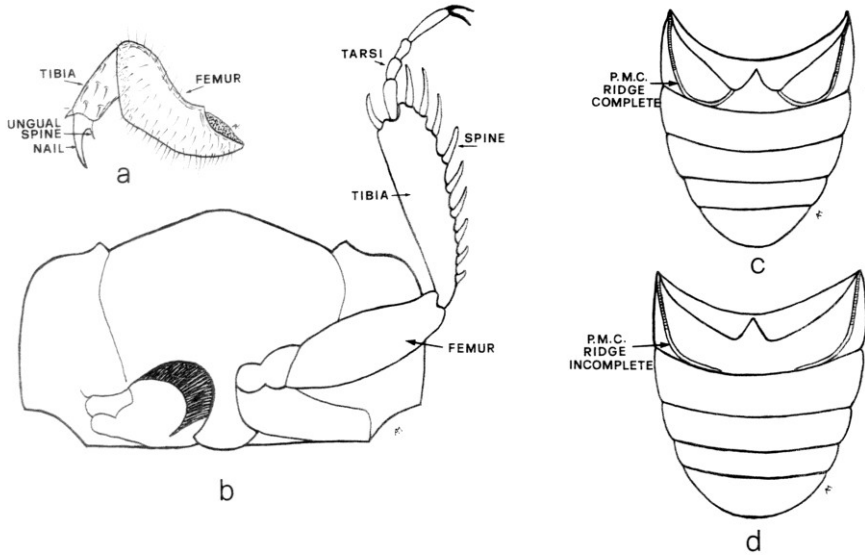
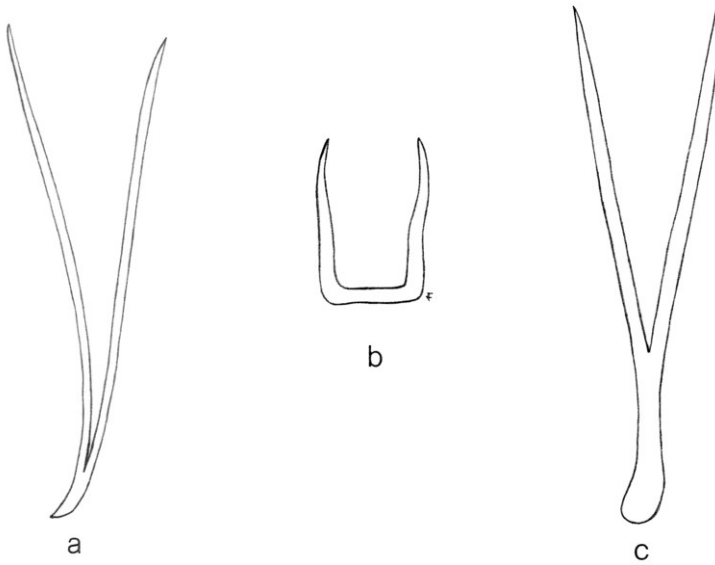


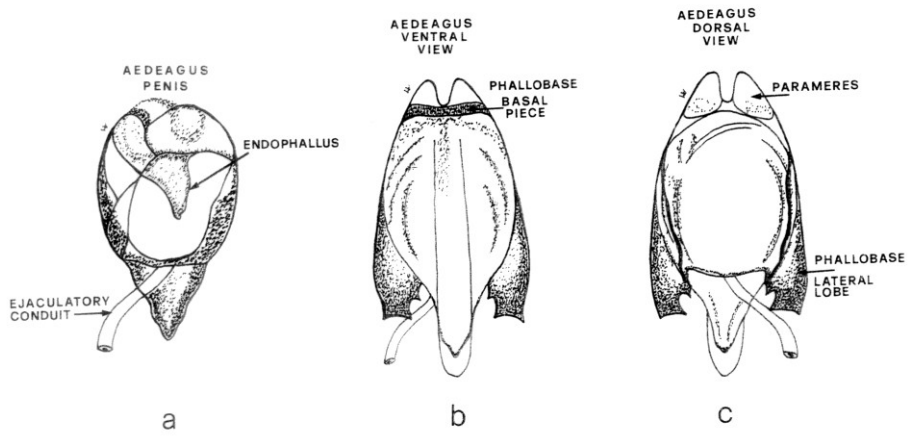
Fig. 6



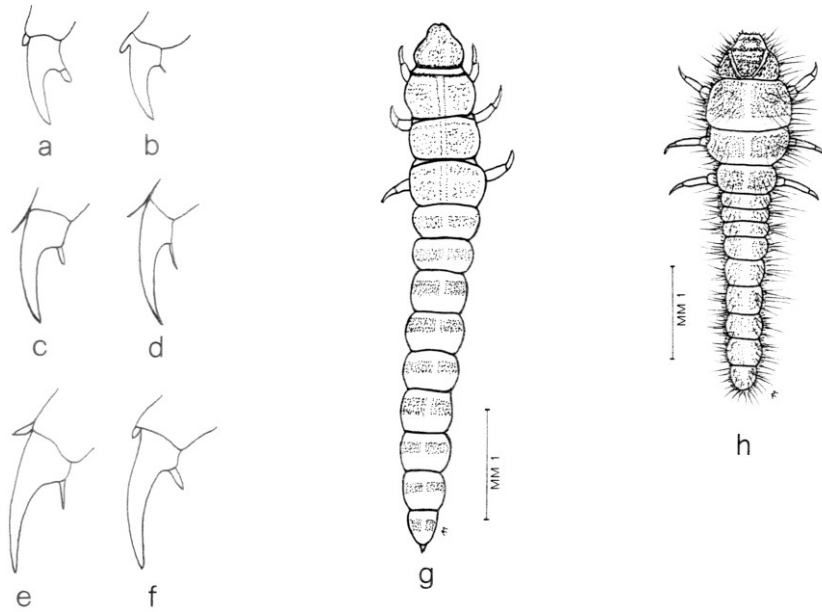
**Fig. 7**



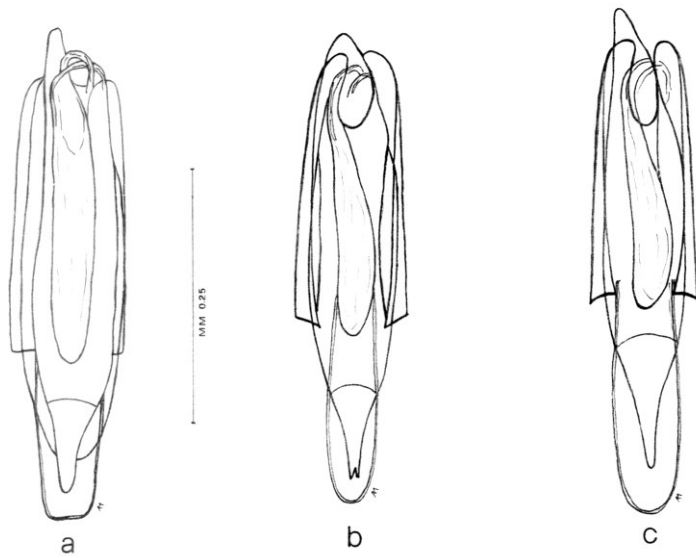
**Fig. 8**



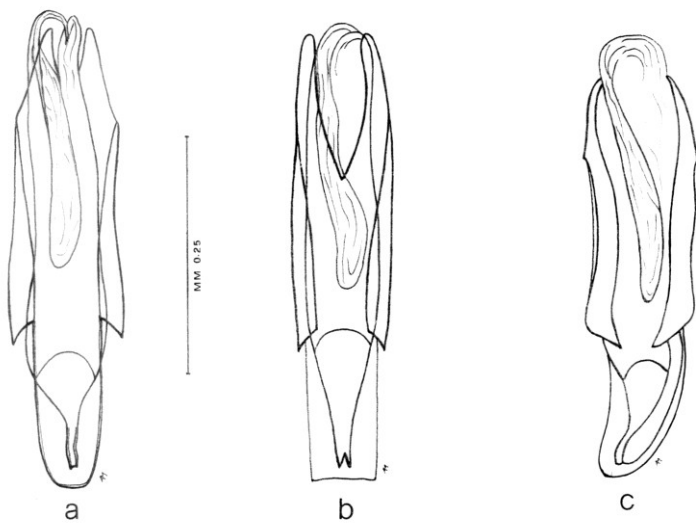
**Fig. 9**



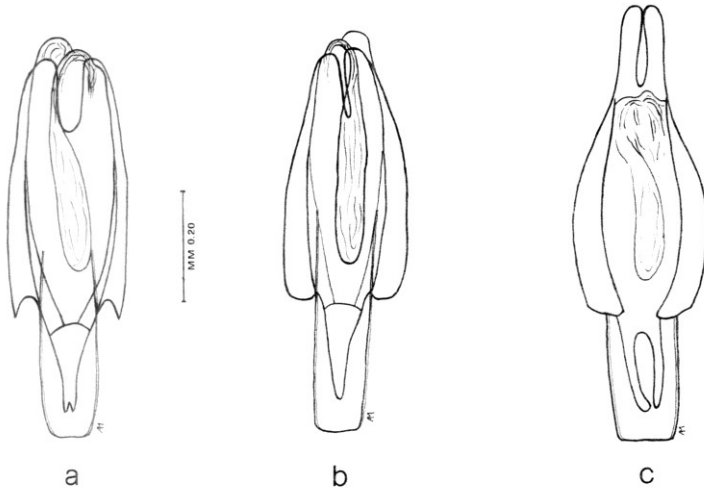
**Fig. 10**



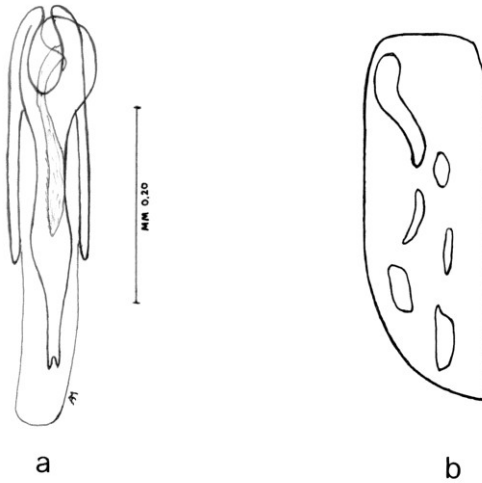
**Fig. 11**



**Fig. 12**

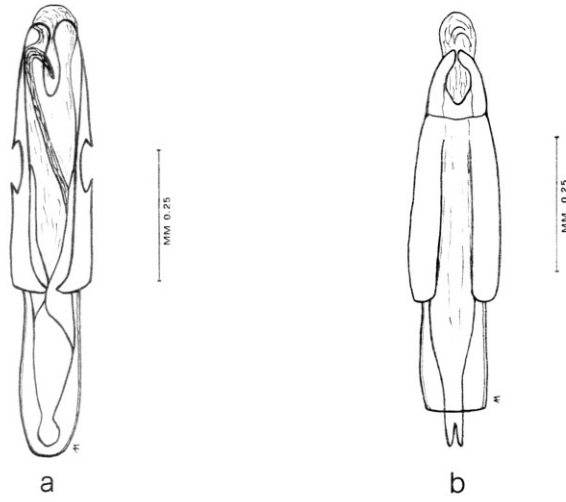


**Fig. 13**

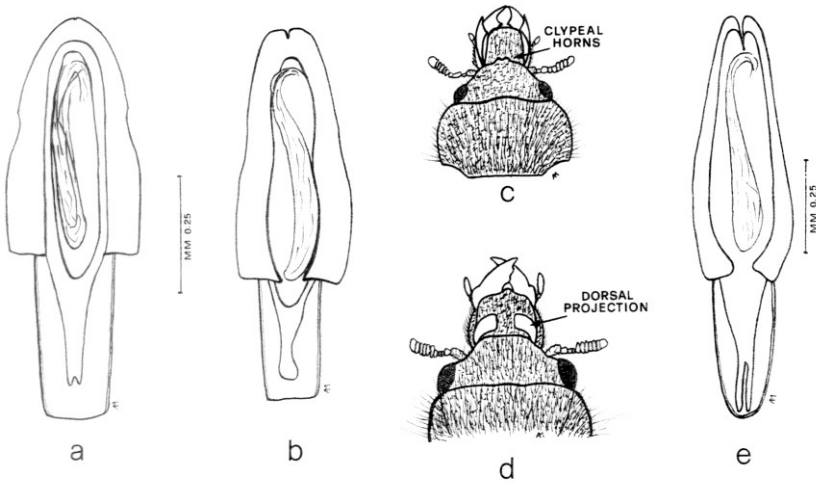


**Fig. 14**

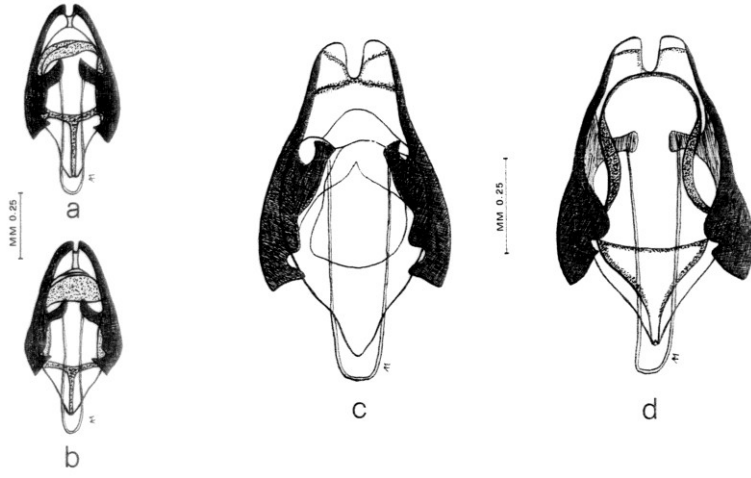




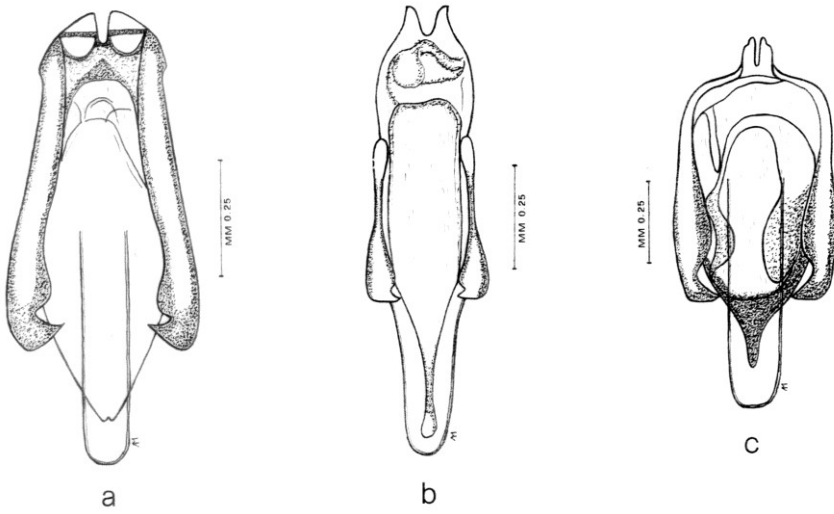
**Fig. 15**



**Fig. 16**



**Fig. 17**



**Fig. 18**

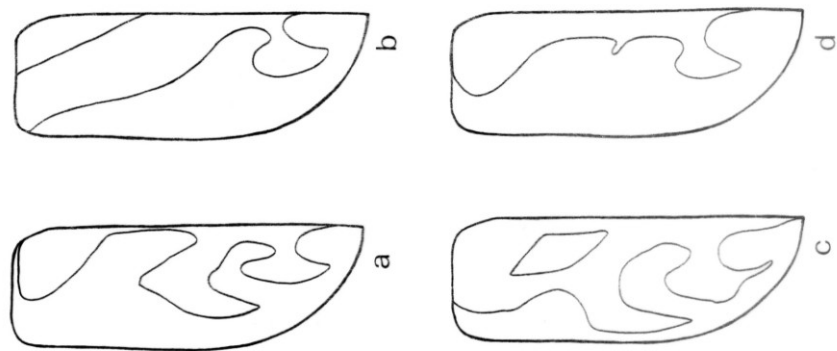


Fig. 19

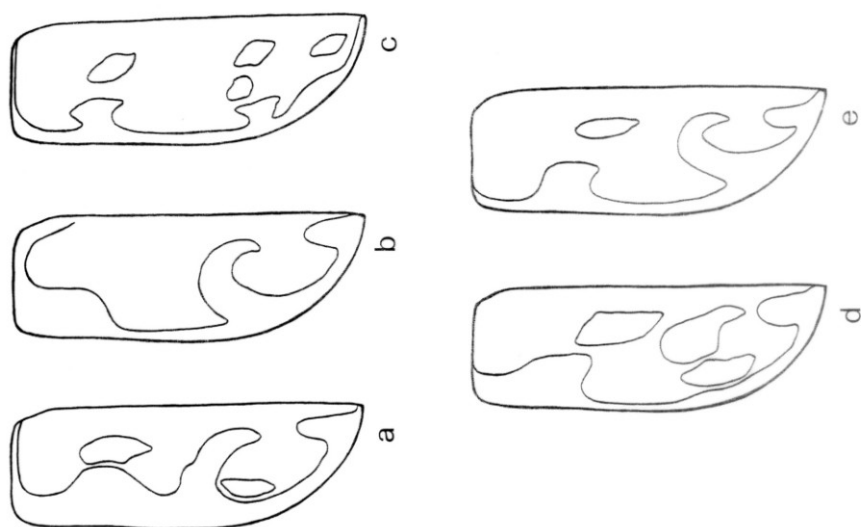


Fig. 20

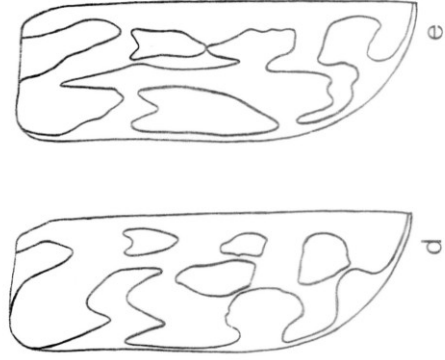
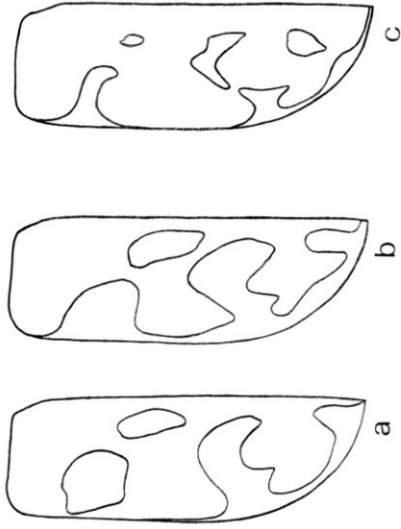


Fig. 21

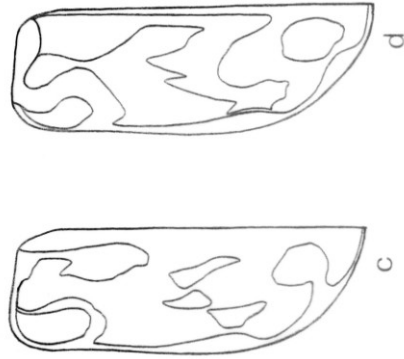
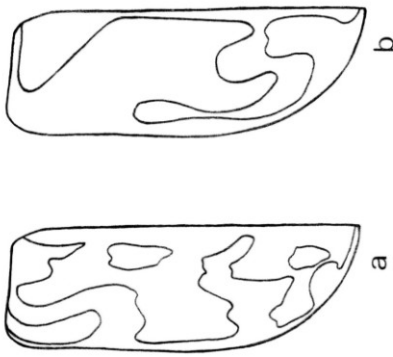


Fig. 22

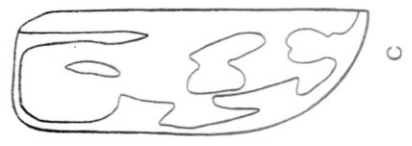
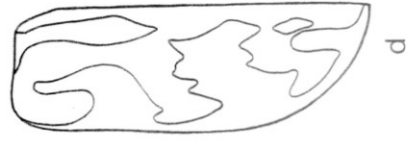
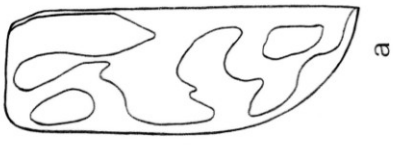
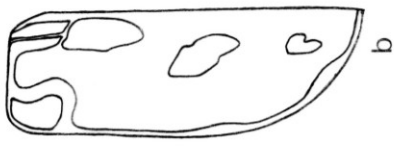


Fig. 23

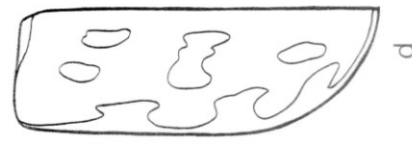
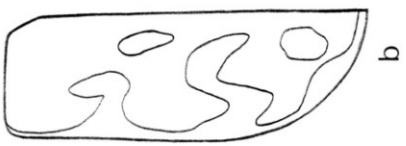


Fig. 24

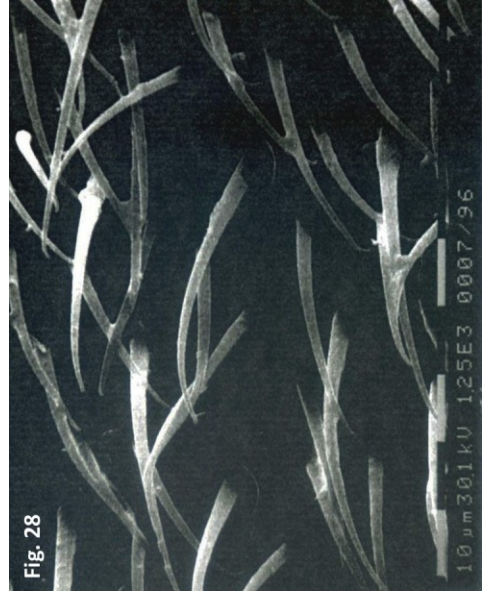
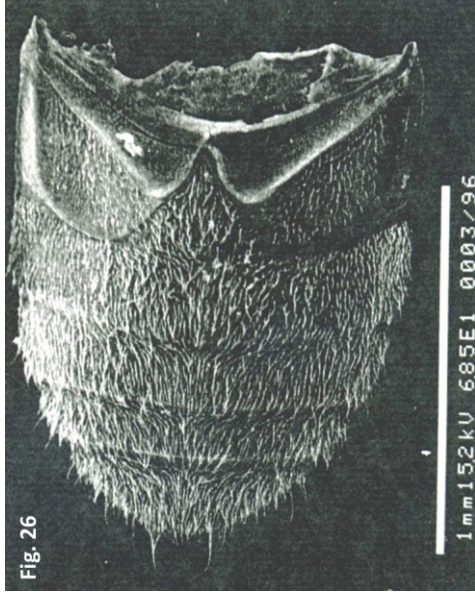
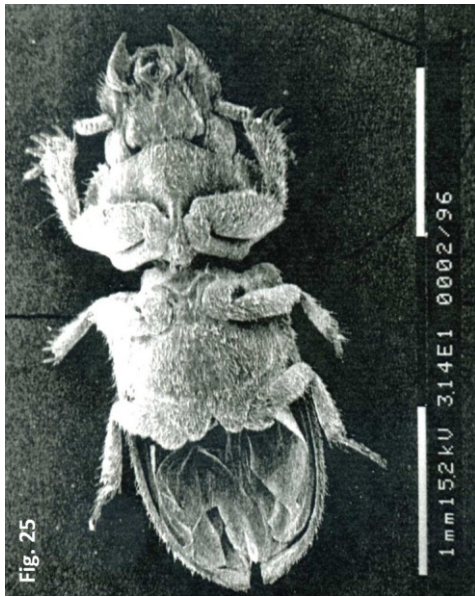




Fig. 29



Fig. 30



Fig. 31



Fig. 32



Fig. 33



Fig. 34



Fig. 35



Fig. 36



Fig. 37



Fig. 38



Fig. 39



Fig. 40



Fig. 41



Fig. 42



Fig. 43



Fig. 44



Fig. 45



Fig. 46





Fig. 47



Fig. 48



Fig. 49



Fig. 50



Fig. 51



Fig. 52



Fig. 53