

## THREE NEW SPECIES OF THE GENUS *GEOCHARIS* EHLERS, 1883 FROM PORTUGAL (COLEOPTERA, CARABIDAE)

A. R. M. Serrano\* & C. A. S. Aguiar\*\*

### ABSTRACT

Three endogean carabid species (Coleoptera: Carabidae, Anillini) from Portugal, *Geocharis fermini* n. sp., *Geocharis bivari* n. sp. and *Geocharis quartai* n. sp. are described. The work provides diagnostic characters of these species, and in particular, the structure of male genitalia. Affinities with closely related species are discussed and ecological data are also included. Faunistic notes on *Geocharis olisipensis* (Schatzmayr, 1937) and a key for the identification of the species occurring in Portugal north of the Tajo River are also given.

**Key words:** Coleoptera, Carabidae, Anillini, *Geocharis*, new species, Portugal.

### RESUMEN

#### Tres nuevas especies del género *Geocharis* Ehlers, 1883 de Portugal (Coleoptera, Carabidae)

Se describen tres nuevas especies de carábidos Anillini endogeos (Coleoptera: Carabidae) de Portugal: *Geocharis fermini* n. sp., *Geocharis bivari* n. sp. y *Geocharis quartai* n. sp. Se destacan los caracteres que las definen y, en particular, la estructura de la genitalia masculina. Se discute la afinidad con las especies más relacionadas y además se aportan datos ecológicos. También se aportan datos faunísticos sobre *Geocharis olisipensis* (Schatzmayr, 1937). Por último se incluye una clave de las especies conocidas en Portugal al norte del Río Tajo.

**Palabras clave:** Coleoptera, Carabidae, Anillini, *Geocharis*, nuevas especies, Portugal.

### Introduction

The taxonomic and faunistic knowledge of the species belonging to the genus *Geocharis* Ehlers, 1883 has notably advanced notably in Portugal in the last years. Eleven species have been described to date for this Iberian country [*G. olisipensis* (Schatzmayr, 1937), *G. femoralis* Coiffait, 1968, *G.*

*grandolensis* Serrano & Aguiar, 1999, *G. monfortensis* Serrano & Aguiar, 2000, *G. portalegrensis* Serrano & Aguiar, 2000, *G. saldanhai* Serrano & Aguiar, 2000, *G. boieiroi* Serrano & Aguiar, 2001, *G. moscatelus* Serrano & Aguiar, 2001, *G. estremozensis* Serrano & Aguiar, 2003, *G. submersus* Serrano & Aguiar, 2003 and *G. sacarraoi* Serrano & Aguiar, 2003 (Schatzmayr, 1937; Coiffait, 1968;

\* Corresponding author. Centro de Biología Ambiental/Departamento de Biología Animal, Faculdade de Ciências da Universidade de Lisboa, R. Ernesto de Vasconcelos, C2, 1º Piso, 1749-016 Lisboa, Portugal. E-mail: aserrano@fc.ul.pt

\*\* Centro de Biología Ambiental Faculdade de Ciências da Universidade de Lisboa, R. Ernesto de Vasconcelos, C2, 1º Piso, 1749-016 Lisboa, Portugal.

Serrano & Aguiar, 1999, 2000a, 2000b, 2001, 2003)]. Among these species only *G. olisipensis* was described north of the Tejo river and near Lisbon (Schatzmayr, *op. cit.*). The remaining species were all recorded south of this river.

The aim of this work is to describe three new species of the genus *Geocharis* from Portugal, all of them located north of the Tejo river. We give additional taxonomic and faunistic information on *G. olisipensis*. A key for the identification of these four species is also provided.

## Material and Methods

Field trips to localities north of Lisbon and to the Serra d'Aire e Candeeiros (both regions belonging to the province of Estremadura, Portugal) allowed us to capture specimens that resulted to belonged to undescribed species. The specimens were sampled by direct hand collecting under stones sunken in grassland pastures (near Lisbon) and in seminatural Mediterranean forests (Serra d'Aire e Candeeiros) dominated by holm-oaks and lentisk bushes (*Quercus coccifera* Linnaeus and *Pistacia lentiscus* Linnaeus). There are also some patches of *Cistus ladanifer* shrubs and *Quercus suber* and *Q. ilex rotundifolia* trees. Additional specimens were obtained from samples of soil taken from the above mentioned localities using Berlese apparatus.

The morphological study of adult specimens was done using a scanning electron microscope JEOL JSM-5200 LV. Measurements and drawings were done with a Wild M5 stereoscopic microscope equipped with a dissecting microscope ocular micrometer and a drawing tube.

## Taxonomic description

### *Geocharis fermini* n. sp.

TYPICAL SERIE: Holotype ♂: Portugal, Murteira (Loures – Ponte de Lousa), U.T.M. coordinates: 29SMD8301, 18.XII.2000; Paratypus: same locality and date of Holotype, 11♂♂ and 26♀♀ (2♂♂ and 2♀♀ gold coated); Valejas

(Queluz), U.T.M. coordinates: 29SMC7788, 15.IV.2003, 4♂♂ and 1♀. Holotype and 40 paratypes are deposited in the collection of the Department of Animal Biology (Faculdade de Ciências da Universidade de Lisboa). Two paratypes (1♂ and 1♀) are deposited in the collection of Museo Nacional de Ciencias Naturales de Madrid (Spain) (Catalogue nº of types of MNCN: 9527).

DIAGNOSIS: Anophtalm; body dorso-ventrally flattened, light brown; integument microreticulate, a thin pubescence mainly on pronotum and elytra. Elytra without striae, humeral region strongly punctured, disk with one anterior pair of setae and a posterior one. Male forelegs with the first tarsomere dilated. Males with a more or less strong median tooth on the internal edge of the metafemora. Meso tibiae with strong pubescence in both edges. Hind tibiae more or less arcuate in the internal edge. Aedeagus (Figs. 17A and B).

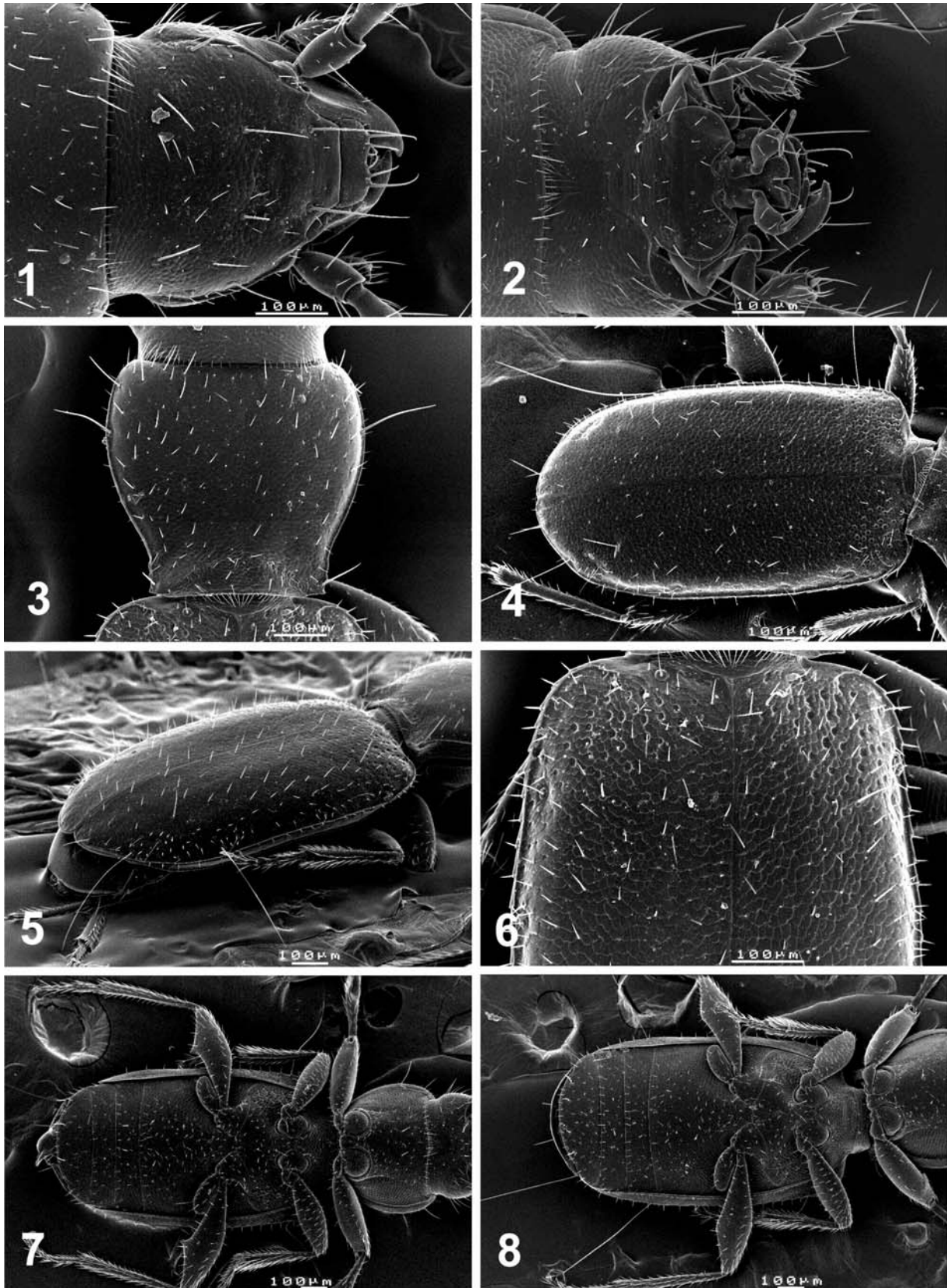
DESCRIPTION. Length of holotype: 1.9 mm. Length of paratypes: 1.7-2.0 mm (males and females).

Head (Fig. 1) more or less as long as wide [length: 0.35-0.42 mm (males), 0.34-0.43 mm (females); width: 0.36-0.43 (males), 0.38-0.42 mm (females)], slightly depressed in the insertion of the front setae; cephalic chaetotaxy (fixed setae): 6 setae on the anterior margin of labrum, which is arcuate; one pair of large clypeal setae, 2 frontal setae, 2 supraocular setae and 2 or 3 additional setae on both sides of tempora. Antennae light brown, the first and second articles longer than the others, the latter subpyriform, the third and the fourth are the shortest ones and subpyriforms, the fifth to the tenth gradually longer and oval-shaped, the last one acuminate. Mouth-parts (Fig. 2) show the general pattern of the genus.

Pronotum cordiform (Fig. 3), about 1.2 times wider than long [length: 0.37-0.44 mm (males), 0.38-0.44 mm (females); width: 0.45-0.56 mm (males), 0.46-0.53 mm (females)]; disk flattened, depressed between the two basal pits, with or without a very superficial central sulcus; anterior margin slightly arcuate, posterior margin slightly emarginate (Fig. 3); lateral margins with two or three denticles just before the posterior angles,

Figs. 1-8.— *Geocharis fermini* n. sp.: 1) head (dorsal view), 2) head (ventral view), 3) pronotum (dorsal view), 4) elytra (dorsal view), 5) right elytron (latero-dorsal view), 6) anterior half of elytra (dorsal view), 7) thorax and abdomen (male, ventral view), 8) thorax and abdomen (female, ventral view).

Figs. 1-8.— *Geocharis fermini* n. sp.: 1) cabeza (vista dorsal), 2) cabeza (vista ventral), 3) pronoto (vista dorsal), 4) élitros (vista dorsal), 5) élitro derecho (vista latero-dorsal), 6) mitad anterior de los élitros (vista dorsal), 7) tórax y abdomen (macho, vista ventral), 8) tórax y abdomen (hembra, vista ventral).



which are right and dentate; Chaetotaxy: surface covered with scattered erect pubescence; one lateral seta on the margin in the broadest part of the pronotum and another one in the posterior angle; 1 or 2 additional setae inserted near the anterior angles.

Elytra (Fig. 4) 1.7-1.8 times longer than wide [length: 0.96-1.12 mm (males), 0.98-1.09 mm (females), width: 0.54-0.64 mm (males), 0.57-0.62 mm (females)], subparallel and oval-shaped posteriorly; dorso-ventrally flattened on the disc, the tegument microsculptured and strongly punctured in the shoulders (Fig. 6); elytra without striae; lateral margin narrow, margins finely serrate from the humeral angles, which are rounded, to the fifth seta of the umbilicate series. Chaetotaxy: part of the pubescence of the disc is arranged in 5-6 irregular lines, these setae are erect and slightly directed anteriorly (Figs. 4, 5); umbilicate series follows the pattern of the genus. The longest setae of this series are the second, the sixth and the ninth with the third, fifth, seventh and eighth, slightly more inserted within the elytral margin; besides these setae there are one basal, two discal (one anterior and one posterior) and one apical seta (Figs. 4, 5).

Male legs with the first protarsomere dilated; first tarsomere in all legs more pigmented (light brown) than the others; meso tibiae with a strong pubescence on both edges; hind femora of males with a more or less strong median tooth on the internal edge (Fig. 7), females without a median tooth on the internal edge of hind femora (Fig. 8).

Aedeagus (Figs. 17A and B) enlarged before the apex, moderately arcuate, apex broadly rounded, basal lobe with apophysis not prominent; internal sac with a tubular sclerite; left paramere with two apical setae, dorso-basal edge expanded (Fig. 17A). Female genitalia follows the pattern of the other species of the genus.

ETYMOLOGY: In a modest homage to his memory, this new species is dedicated to the late Spanish entomologist of the "Museo Nacional de Ciencias Naturales de Madrid" (Spain), Dr. Fermín Martín-Piera, a friend and a reference for the senior author.

### *Geocharis bivari* n. sp.

TYPICAL SERIE: Holotype ♂: Portugal, Alqueidão da Serra (Serra d'Aire e Candeeiros), U.T.M. coordinates: 29SND1785, 29.I.2002; Paratypus: same locality and date of Holotype, 7♂♂ and 8♀♀; Alvados (Serra d'Aire e Candeeiros), U.T.M. coordinates: 29SND1976, 29.I.2002, 3♂♂ and 1♀ (2♀♀ and 1♀ gold coated); Carvalhal (Alcobaça - Serra d'Aire e Candeeiros), U.T.M. coordinates: 29SND0677, 30.I.2002, 2♂♂ and 3♀♀, 6.V.2003, 4♂♂ and 1♀; Teira (Serra d'Aire e Candeeiros), U.T.M. coordinates: 29SND0661, 23.II.2004, 4♀♀; Sourões (Serra d'Aire e Candeeiros), U.T.M. coordinates: 29SND1065, 24.II.2004, 27♂♂ and 22♀♀. Holotype and 27 paratypes are deposited in the collection of the Department of Animal Biology (Faculdade de Ciências da Universidade de Lisboa). Two paratypes (1♂ and 1♀) are deposited in the collection of Museo Nacional de Ciencias Naturales de Madrid (Spain) (Catalogue nº of types of MNCN: 9528).

DIAGNOSIS: Anophtalm; body dorso-ventrally flattened, brown; integument strongly microreticulate, a thin pubescence mainly on pronotum and elytra. Elytra with traces of striae, disc strongly punctured, with one anterior pair of setae and a posterior one. Male forelegs with the first tarsomere dilated. Males without a median tooth on the internal edge of the metafemora. Hind tibiae slightly arcuate in the internal edge. Aedeagus (Figs. 17C and D).

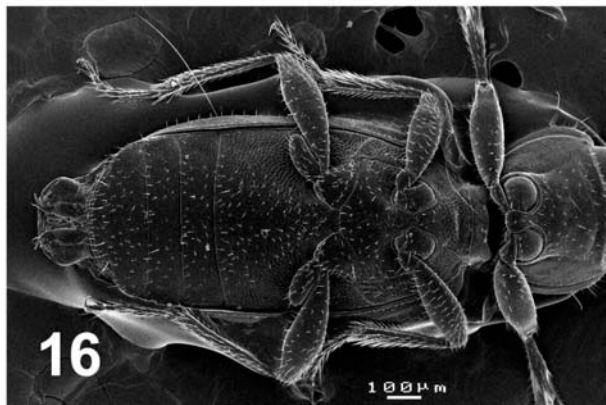
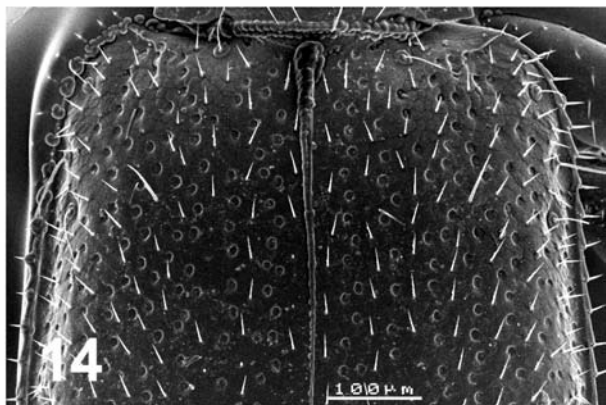
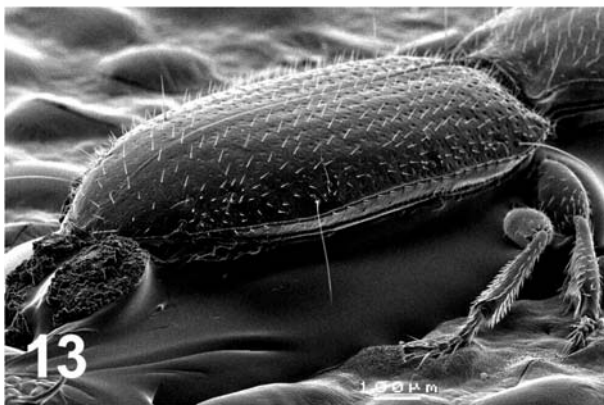
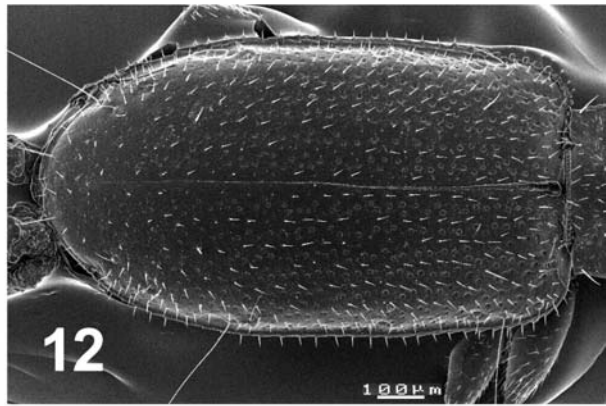
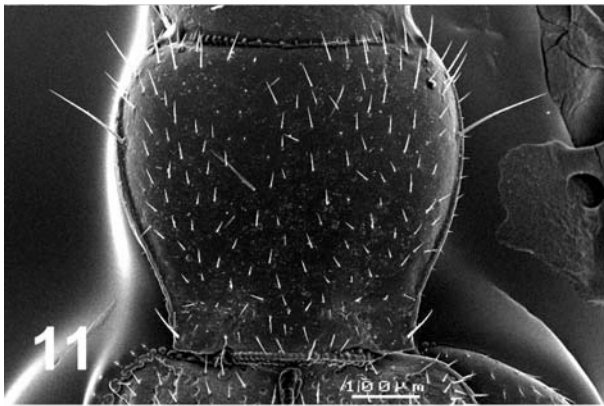
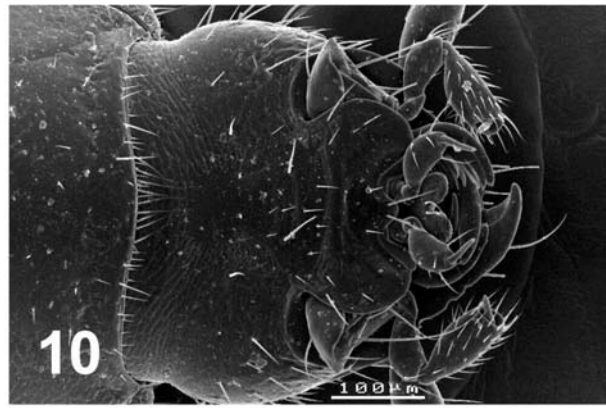
DESCRIPTION. Length of holotype: 1.9 mm. Length of paratypes: 1.8-2.1 mm (males), 1.7-2.1 (females).

Head (Fig. 9) more or less as long as wide [length: 0.37-0.40 mm (males), 0.32-0.42 mm (females); width: 0.37-0.42 (males), 0.34-0.43 mm (females)], slightly depressed in the insertion of the front setae; cephalic chaetotaxy (fixed setae): 6 setae on the anterior margin of labrum, which is slightly arcuate; one pair of large clypeal setae, 2 frontal setae, 2 supraocular setae and 2 or 3 additional setae on both sides of tempora. Antennae light brown, the first and second articles longer than the others, the latter subpyriform, the third and the fourth are the shortest ones and subpyriforms, the fifth to the tenth gradually longer and oval-shaped, the last one acuminate. Mouth-parts (Fig. 10) conformed to the genus pattern.

Pronotum cordiform (Fig. 11), about 1.2 times wider than long [length: 0.38-0.45 mm (males),

Figs. 9-16.— *Geocharis bivari* n. sp.: 9) head (dorsal view), 10) head (ventral view), 11) pronotum (dorsal view), 12) elytra (dorsal view), 13) right elytron (latero-dorsal view), 14) anterior half of elytra (dorsal view), 15) thorax and abdomen (male, ventral view), 16) thorax and abdomen (female, ventral view).

Figs. 9-16.— *Geocharis bivari* n. sp.: 9) cabeza (vista dorsal), 10) cabeza (vista ventral), 11) pronoto (vista dorsal), 12) élitros (vista dorsal), 13) élitro derecho (vista latero-dorsal), 14) mitad anterior de los élitros (vista dorsal), 15) tórax y abdomen (macho, vista ventral), 16) tórax y abdomen (hembra, vista ventral).



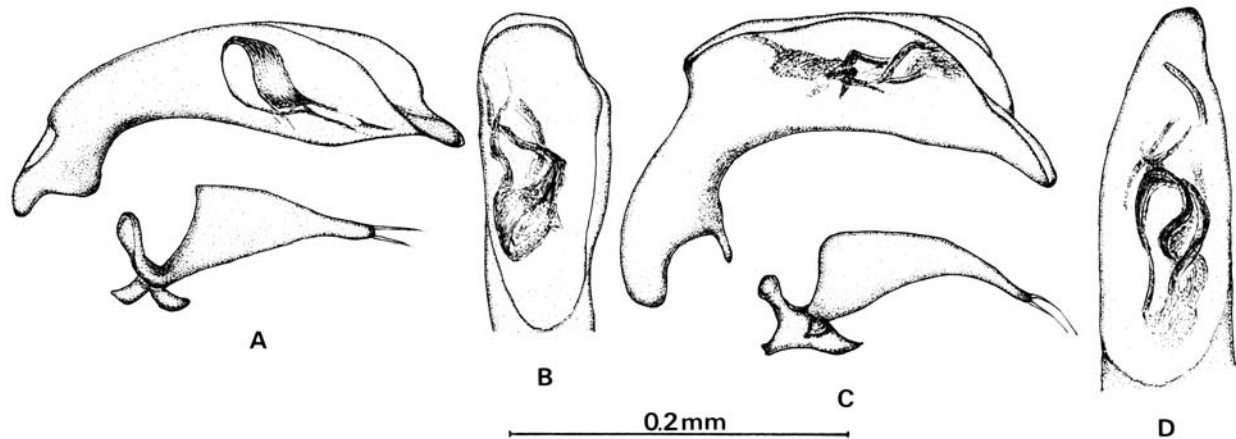


Fig. 17.— *Geocharis fermini* n. sp.: median lobe of aedeagus and left paramere in lateral view (A) and median lobe of aedeagus in dorsal view (B); *Geocharis bivari* n. sp.: median lobe of aedeagus and left paramere in lateral view (C) and median lobe of aedeagus in dorsal view (D).

Fig. 17.— *Geocharis fermini* n. sp.: lóbulo mediano del edeago y parámetro izquierdo en vista lateral (A) y lóbulo mediano del edeago en vista dorsal (B); *Geocharis bivari* n. sp.: lóbulo mediano del edeago y parámetro izquierdo en vista lateral (C) y lóbulo mediano del edeago en vista dorsal (D).

0.35-0.45 mm (females), width: 0.46-0.53 mm (males), 0.43-0.53 mm (females)]; disc flattened, depressed between the two basal pits, with or without a faint central sulcus; anterior margin regularly arcuate, posterior margin straight or slightly arcuate outwards (Fig. 11); lateral margins with three or four denticles just before the posterior angles, which are right and dentate; Chaetotaxy: surface covered with erect pubescence; one lateral seta on the margin in the broadest part of the pronotum and another one in the posterior angle; 2-3 or even more additional setae inserted near the anterior angles.

Elytra (Fig. 12) 1.8 times longer than wide [length: 1.02-1.22 mm (males), 0.98-1.20 mm (females), width: 0.58-0.67 mm (males), 0.54-0.67 mm (females)], subparallel and oval-shaped posteriorly; dorso-ventrally flattened on the disc, the tegument microsculptured and strongly punctate in the disk (Fig. 14); elytra with traces of striae; lateral margin narrow, margins finely serrated from the humeral angles, which are rounded, to the last seta of the umbilicate series. Chaetotaxy: part of the pubescence of the disk is arranged in 6 lines, these setae are erect and slightly directed anteriorly (Figs. 12, 13); umbilicate series follows the pattern of the genus. The longest setae of this series are the second, the sixth and the ninth with the third, fifth, seventh and eighth, slightly more inserted within the elytral margin; besides these setae there are one

basal, two discal (one anterior and one posterior) and one apical seta (Figs. 12, 13).

Male legs with the first protarsomere dilated; first tarsomere in all legs more pigmented (brown) than the others; hind femora of males and females without a median tooth on the internal edge (Figs. 15, 16); hind tibiae slightly arcuate in the internal edge.

Aedeagus (Figs. 17C and D) slightly enlarged before the apex, strongly arcuate, apex rounded, basal lobe with apophysis prominent; internal sac with twisted sclerites; left paramere with two apical setae, dorso-basal edge more or less expanded (Fig. 17C). Female genitalia follows the pattern of the other species of the genus.

ETYMOLOGY: This new species is dedicated to the Portuguese entomologist António Bivar de Sousa, an old friend who has greatly contributed to the taxonomic knowledge of the Dermaptera and Lepidoptera, mainly of Africa and Portugal.

#### *Geocharis quartau* n. sp.

TYPICAL SERIE: HOLOTYPE ♂: Portugal, Carvalhal (Alcobaça - Serra d'Aire e Candeeiros), U.T.M. coordinates: 29SND0677, 30.I.2002; Paratypus: same locality and date of Holotype, 1 ♂ and 5 ♀♀ (1 ♂ and 1 ♀ gold coated), 6.V.2003, 1 ♂ and 1 ♀ (1 ♀ gold coated); Holotype and paratypes are deposited in the collection of the Department of Animal Biology (Faculdade de Ciências da Universidade de Lisboa).



**DIAGNOSIS:** Anophthalm; body dorso-ventrally flattened, brown; integument strongly microreticulate, a thin pubescence mainly on pronotum and elytra. Elytra without striae, disk strongly punctured, with one anterior pair of setae and a posterior one. Male forelegs with the first tarsomere dilated. Males with a median tooth on the internal edge of the metafemora. Hind tibiae slightly arcuate in the internal edge. Aedeagus (Figs. 26).

**DESCRIPTION.** Length of holotype: 1.9 mm. Length of paratypes: 1.9-2.1 mm (males), 1.8-2.1 (females).

Head (Fig. 18) more or less as long as wide [length: 0.35-0.43 mm (males), 0.37-0.38 mm (females); width: 0.40-0.45 (males), 0.38-0.45 mm (females)], slightly depressed at the insertion of the front setae; cephalic chaetotaxy (fixed setae): 6 setae on the anterior margin of labrum, which is arcuate; one pair of large clypeal setae, 2 frontal setae, 2 supraocular setae and 2 additional setae on both sides of tempora. Antennae light brown, the first and second articles longer than the others, the latter subpyriform, the third and the fourth are the shortest ones and subpyriforms, the fifth to the tenth gradually longer and oval-shaped, the last one acuminate. Mouthparts (Fig. 19) conformed to the genus pattern.

Pronotum strongly cordiform (Fig. 20), about 1.2 times wider than long [length: 0.42-0.47 mm (males), 0.41-0.47 mm (females); width: 0.50-0.56 mm (males), 0.48-0.56 mm (females)]; disk flattened, depressed between the two basal pits, with or without a faint central sulcus; anterior margin almost straight, posterior margin slightly arcuate inwards (Fig. 20); lateral margins with two or three denticles just before the posterior angles, which are right and dentate; Chaetotaxy: surface covered with erect pubescence; one lateral seta on the margin in the broadest part of the pronotum and another one in the posterior angle; 2-3 or even more additional setae inserted near the anterior angles.

Elytra (Fig. 21) 1.7 times longer than wide [length: 1.09-1.23 mm (males), 1.06-1.23 mm (females); width: 0.64-0.70 mm (males), 0.61-0.70 mm (females)], subparallel and oval-shaped posteriorly; dorso-ventrally flattened on the disk, the tegument microsculptured and strongly punctate in the disk (Fig. 23); elytra without striae; lateral margin narrow, margins finely serrate from the humeral angles, which are rounded, to the last seta of the umbilicate series. Chaetotaxy: part of the pubescence of the disk is arranged in 5-6 lines, these setae are erect and slightly directed anteriorly (Figs. 21, 22); umbilicate series follows the pattern of the genus. The longest setae of this series are the

second, the sixth and the ninth with the third, fifth, seventh and eighth, slightly more inserted within the elytral margin; besides these setae there are one basal, two discal (one anterior and one posterior) and one apical seta (Figs. 21, 22).

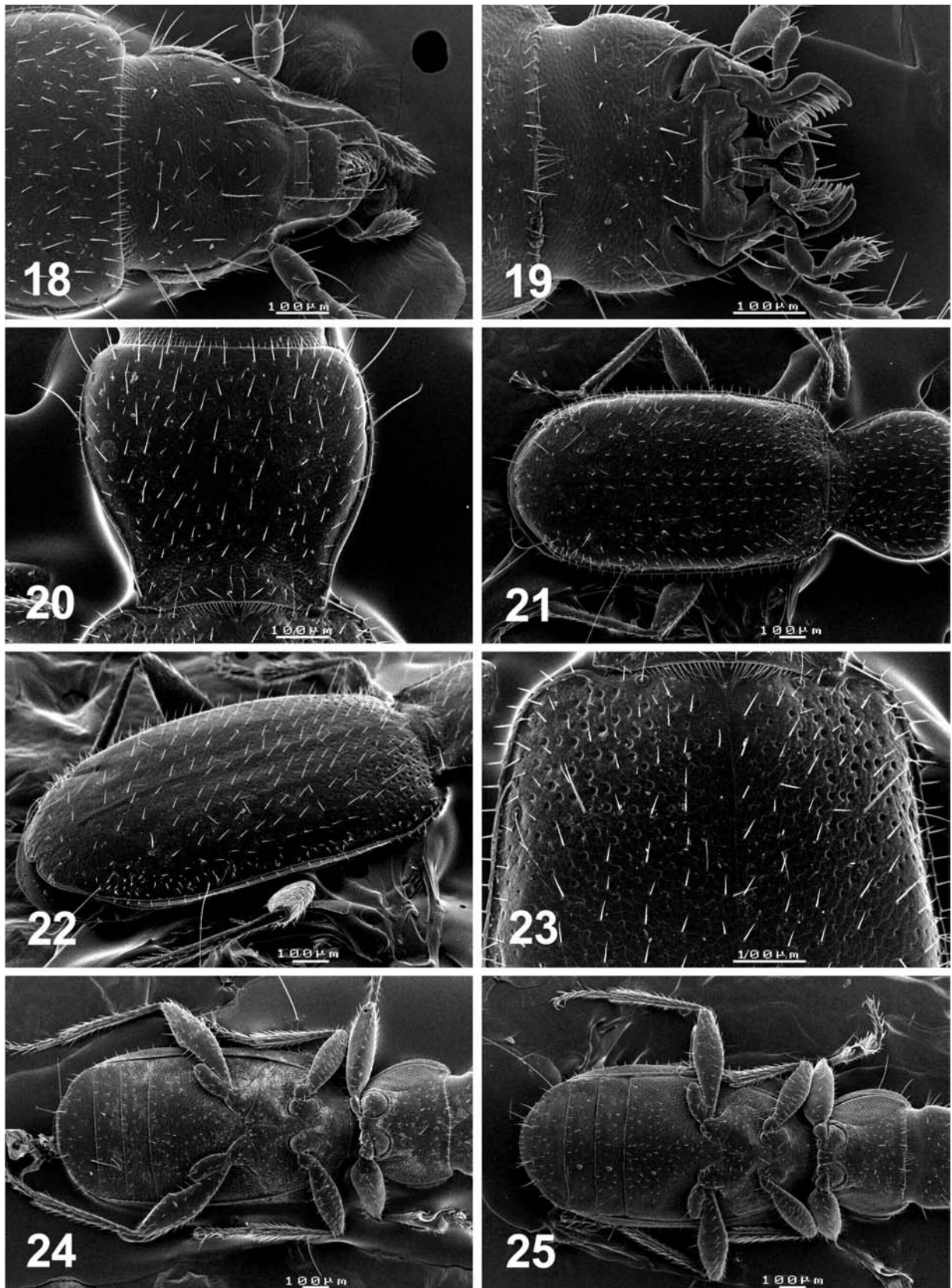
Male legs with the first protarsomere dilated; first tarsomere in all legs more pigmented (brown) than the others; mesotibiae with a strong pubescence on both edges; hind femora of males with a median tooth on the internal edge, females without a median tooth on the internal edge of hind femora (Figs. 24, 25); hind tibiae slightly arcuate in the internal edge.

Aedeagus (Fig. 26A and B) enlarged before the apex, slightly arcuate, apex rounded (Fig. 26 b), basal lobe with posterior apophysis prominent; internal sac with twisted sclerites; left paramere with two apical setae, dorso-basal edge expanded (Fig. 26 A). Female genitalia follows the pattern of the other species of the genus.

**ETYMOLOGY:** This new species is dedicated to Professor José Alberto Quartau, who has greatly contributed to the taxonomic knowledge of the Homoptera, mainly of Africa and Portugal, and become a remarkable academic reference to the senior author.

#### Taxonomic remarks

The new species are akin to most species of *Geocharis* because they possess on the elytral disk one anterior and one posterior pair of setae. Only *G. cordubensis* (Dieck, 1869) (three pairs of diskal setae) and *G. olisipensis*, *G. falcipenis* Zaballo & Jeanne, 1987 and *G. ruiztapiadori* Zaballo, 1996 (one or two pairs of setae: A posterior one only, or both a median and a posterior ones) are different from the new species concerning this character. *G. bivari* n. sp. is close to *G. julianae* Zaballo, 1989, *G. massinissa* (Dieck, 1869) and *G. korbi* (Ganglbauer, 1900) by the presence of superficial striae on elytra. The new species differ from *G. leoni* Zaballo, 1998, among other features in the left paramere, which does not bear any lamellar and membranous scales in the apex (Zaballo, 1998). *Geocharis leoni*, *G. grandolensis*, *G. boieiroi*, *G. portalegrensis*, *G. saldanhai*, *G. estremoensis*, and *G. sacarraoi* share with *G. fermi* n. sp. and *G. quartai* n. sp. the presence of a tooth on the internal edge of the hind femora of males. However, all these species are very well separated from the new species by the shape of the aedeagus. The new species are easily separated among





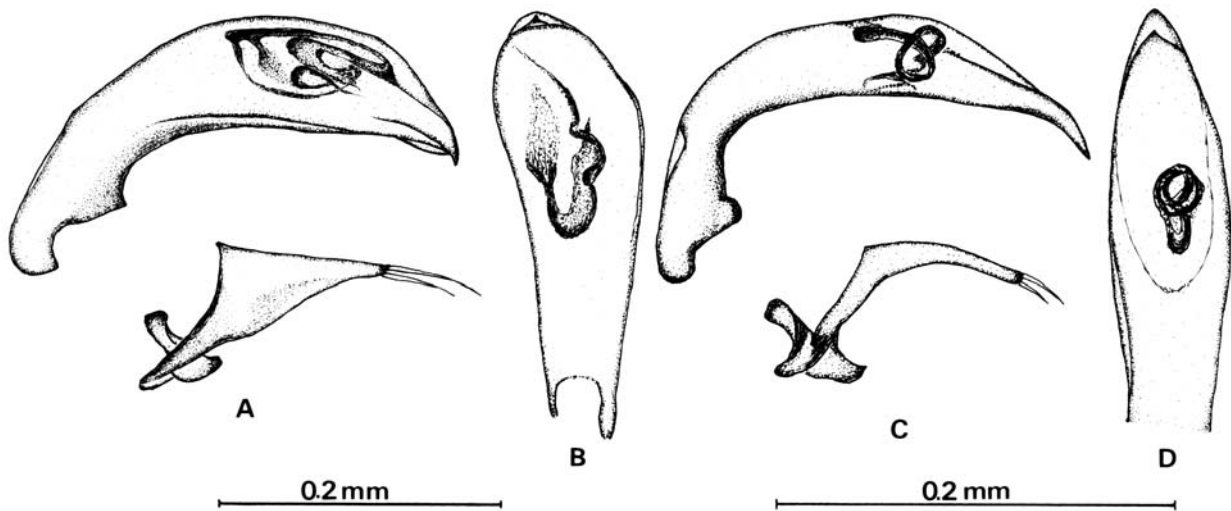


Fig. 26.— *Geocharis quartai* n. sp.: median lobe of aedeagus and left paramere in lateral view (A) and median lobe of aedeagus in dorsal view (B); *Geocharis olisipensis*: median lobe of aedeagus and left paramere in lateral view (C) and median lobe of aedeagus in dorsal view (D).

Fig. 26.— *Geocharis quartai* n. sp.: lóbulo mediano del eedeago y parámtero izquierdo en vista lateral (A) y lóbulo mediano del eedeago en vista dorsal (B); *Geocharis olisipensis*: lóbulo mediano del eedeago y parámtero izquierdo en vista lateral (C) y lóbulo mediano del eedeago en vista dorsal (D).

them selves by differences in the shape of median lobe, the sclerite(s) of the internal sac, left parameres, the pronotum, the elytral microsculpture and the tooth (present or absent) of hind femora. All the new species are very well separated from *G. olisipensis*, the only species of the genus *Geocharis* known to date north of the Tejo River. *G. olisipensis* is only known through two specimens collected near Lisbon (Schatzmayr, 1937; Zaballos & Jeanne, 1987). After some efforts to locate this species we finally found it in the outskirts of Lisbon [Valejas (Queluz), U.T.M. coordinates: 29SMC7788, 15.IV.2003, 3♂♂ and 1♀; Fanhões, U.T.M. coordinates: 29SMD8605, 25.II.2004, 13♂♂ and 10♀♀]. It is interesting to notice that all the specimens collected (length: 1.8-1.9 mm) present only one pair of discal setae on elytra (the posterior one), the median pair is absent. However, Zaballos (1997) indicated that this species has one median pair and one posterior pair on the disk

of elytra. This means that probably *G. olisipensis* is polymorphic in what concerns this feature. The hind femora of males and females are similar, without a median tooth on the internal edge. The aedeagus (Fig. 26 C and D) is falciform (lateral view) and the apex of median lobe pointed (Fig. 26 D). The internal sac presents a rolled sclerite. The left paramere bears two apical setae and the dorso-basal edge is not expanded (Fig. 26 C). The majority of the morphological characters of *G. olisipensis* clusters this species with *G. falcipennis* Zaballos & Jeanne, 1987.

#### Ecological remarks

The new species are endogean, like the others of the genus *Geocharis*, living in the soil at different depths of the B-horizon. Their presence at a particular depth is probably connected with some abio-

◀ Figs. 18-25.— *Geocharis quartai* n. sp.: 18) head (dorsal view), 19) head (ventral view), 20) pronotum (dorsal view), 21) elytra (dorsal view), 22) right elytron (latero-dorsal view), 23) anterior half of elytra (dorsal view), 24) thorax and abdomen (male, ventral view), 25) thorax and abdomen (female, ventral view).

Figs. 18-25.— *Geocharis quartai* n. sp.: 18) cabeza (vista dorsal), 19) cabeza (vista ventral), 20) pronoto (vista dorsal), 21) élitros (vista dorsal), 22) élitro derecho (vista latero-dorsal), 23) mitad anterior de los élitros (vista dorsal), 24) tórax y abdomen (macho, vista ventral), 25) tórax y abdomen (hembra, vista ventral).

tic factors such as pore volume, soil moisture, soil ventilation and soil temperature. The occurrence of these insects in the lower surface of sunken stones, where usually they form aggregates of two to five individuals, or even more, is very interesting. Some of the supracited abiotic factors, chemical communication, and the presence of prey (e.g. Acarini, Diplura, Collembola) are factors that may be involved in this behaviour. As it happens with other pairs of species of this genus (e.g., *G. moscatelus* and *G. boieiroi*) (Serrano & Aguiar, 2001), *G. fermini* n. sp. and *G. olisipensis* were found together in the same locality (Valejas). We found also together *G. bivari* n. sp. and *G. quartau* n. sp. at Carvalhal. However, this does not mean that these species are obligatory syntopics. For instance, *G. fermini* n. sp. was found alone at Murteira and the same happened with *G. bivari* n. sp. at Alqueidão da Serra, Alvados, Teira and Sourões.

#### Key to species of *Geocharis* north of Tejo river (Portugal)

1. Disk of elytra with one or two pairs of setae, one posterior or one median and one posterior. Internal edge of male hind femora inerm. Aedeagus as in figures 26C and D ..... *G. olisipensis*
- 1'. Disk of elytra with two pairs of setae, one anterior and one posterior. Internal edge of male hind femora inerm or dentate ..... 2
2. Internal edge of male hind femora inerm. Elytra with tegument strongly punctured in the disk, with the presence of superficial striae. Aedeagus as in figures 17C and D ..... *G. bivari*
- 2'. Internal edge of male hind femora dentate ..... 3
3. Elytra with tegument punctured only near the shoulders, the disk without striae. Aedeagus as in figures 17A and B ..... *G. fermini*
- 3'. Elytra with tegument strongly punctured in the disk, without striae. Aedeagus as in figures 26A and B ..... *G. quartau*

#### Acknowledgments

We thank António Bivar de Sousa for assistance in the field. We are grateful to Luisa Ganço, Telmo Nunes and Sónia Proença for photographic assistance. We appreciate the suggestions of two referees that helped to improve the manuscript. This work was partially financed by Centro de Biologia Ambiental (CBA).

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Recibido, 14-XI-2003  
Aceptado, 16-IV-2004  
Publicado, 25-VIII-2004