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NEW TRECHODINAE AND TRECHINAE FROM THE AZORES (COL.: CARABIDAE)

By P. Orsini * & P. A. Borges **

With 6 figures and 1 Table

RESUMO: NOVOS TRECHODINAE E TRECHINAE DOS AÇORES (COL.: CARABIDAE). Três novas espécies de carabídeos (Coléoptera, Carabidae) são descritas: *Thalassophilus azoreus* n. sp. de S. Miguel, *Trechus jorgei* n. sp. de S. Jorge e *Trechus montanherroni* n. sp. do Pico. Todas elas foram encontradas em grutas mas apenas as duas primeiras pertencem ser espécies verdadeiramente troglóbias. Apresenta-se igualmente um chave para as espécies de *Trechus* das Açores. Palavras chave: Trechodinae, Trechinae, cavernícolas, Açores.

AUSTRACT: Three new species of Carabidae from the Azores are described: *Thalassophilus azoreus* n. sp. from São Miguel, *Trechus jorgei* n. sp. from São Jorge and *Trechus montanherroni* n. sp. from Pico. All of them were found in caves, but only the two former species seem to be true troglóbites. A key to the Azorean *Trechus* is provided.

Key words: Trechodinae, Trechinae, cavernicolous, Azores.

Until recently the Subfamily Trechinae was thought to be very poorly represented in the Azorean fauna. Indeed, only a single species was known (SERRANO, 1982) in the archipelago, the very scarce *Trechus torrealsoi* JEANNEL from the island of São Miguel. New sampling techniques, developed primarily for the study

* Depto. Biología Animal, Universidad de La Laguna, 38205 La Laguna, I. Canarias, Espanha.

** Universidade das Açores, Dep. de Ciências Agrárias, Terra Chã, 9702 Angra do Heroísmo Codex - Terceira - Açores - Portugal

of caves and lava flows, provided two new species during a scientific expedition sponsored by the National Geographic Society (USA) in 1987; these were *Trechus picovensis* MACHADO from the island of Pico, and *T. teretivatus* MACHADO from Terceira. However, the underground environment is still poorly known in the Azores, and further exploration quickly revealed the presence of additional new species. A second scientific expedition to the Azores directed by N. P. ASHMOLE (Edinburgh University) and one of the authors (P. OROMI) and again sponsored by National Geographic Society, two expeditions of the speleological team "Os Montanheseiros" (Terceira) to the island of Pico, and a visit of one of the authors (P. BORGES) to the island of São Miguel, provided the specimens here described. The caves where these carabids were collected are briefly described in OROMI *et al.* (in press).

Thalassophilus azoricus n. sp.

Type locality: The Azores, S. Miguel, Gruta de Água de Pau.

Type material: Holotype: 1 male, Gruta de Água de Pau, S. Miguel, 16.IV.90 (P. BORGES leg.). Deposited in the collection of the University of Azores in Terceira (UAT). Paratypes: 1 male, same locality but 27.VII.89 (P. BORGES leg.); 1 female, same data (P. OROMI leg.); 2 males, same data (P. BORGES & P. ASHMOLE leg.); 4 males and 3 females, same locality but 16.IV.90 (P. BORGES leg.). Deposited in the collection UAT and at the Department of Zoology, University of La Laguna, Tenerife, Canary Islands (DZUL).

Diagnosis: Diagnostic for this species is the depigmented integument, the absence of eyes and wings, the subcordiform shaped pronotum (Fig. 1), the oblong, some convex elytra and the structure of male genitalia (Fig. 3).

Size: Body length 2.98 - 3.42 mm (L = 3.15 mm); width 1.02 - 1.19 mm (W = 1.09 mm).

Integument: Body uniformly reddish-testaceous, depigmented, dorsally glabrous; antennae and mandibles also reddish-testaceous; elytra with the apex and in some specimens the lateral margins yellowish; appendages reddish-yellowish.

Head: Ovale. Frontal furrows deep in the anterior part and more superficial near temples; anophthalmous, but with a transversal pigmented scar; temples curved. Labrum with the anterior border very concave; mandibles long (Fig. 2) with apex incurved downwards, the left one bidentate with a complex, robust basal tooth; the right one tridentate, with a basal tooth as on the left and an intermediate small tooth. Maxillary palpi small; the apical segment slender and sharp-pointed; the preapical inflated and a little shorter than the apical. Mentum bifid.

Antennae: 1.57 - 1.79 mm long (A = 1.70 mm), reaching backwards for the first third of elytra. 1st segment subcylindrical, longer than the next; 2nd to 6th wider

on the apical portion, the 2nd and 3rd subequal; 7th to 11th cylindrical and more massive than the former five.

Pronotum: Small, transverse (1.28 x as wide as long) and cordiform, with greatest width very slightly before anterior third. Total length: 0.56 - 0.62 mm, LP = 0.60 mm; total width 0.73 - 0.81 mm, WP = 0.77 mm. Anterior sides curved, fore angles rounded; posterior sides slightly straighter or even a little convex, hind angles obtuse and slightly protruding. Disc very convex, with a well marked mid-longitudinal line. Base well emarginated, mainly at both sides; lateral foveae weakly developed. Marginal furrow narrow but well defined.

Elytra: Oblong and subconvex, the shoulders rounded. About 1.58 x longer than wide and 1.42 broader than pronotum (length: 1.62 - 1.86 mm, Le = 1.73 mm; width: 1.02 - 1.19 mm, We = 1.09 mm). Internal striae well marked, the external ones less so; generally deeper in their anterior part. Interstriae more or less convex. 3rd and 4th striae are fused on the first fovea and in some cases on second fovea too. The recurrent stria is connected to the end of the 3rd.

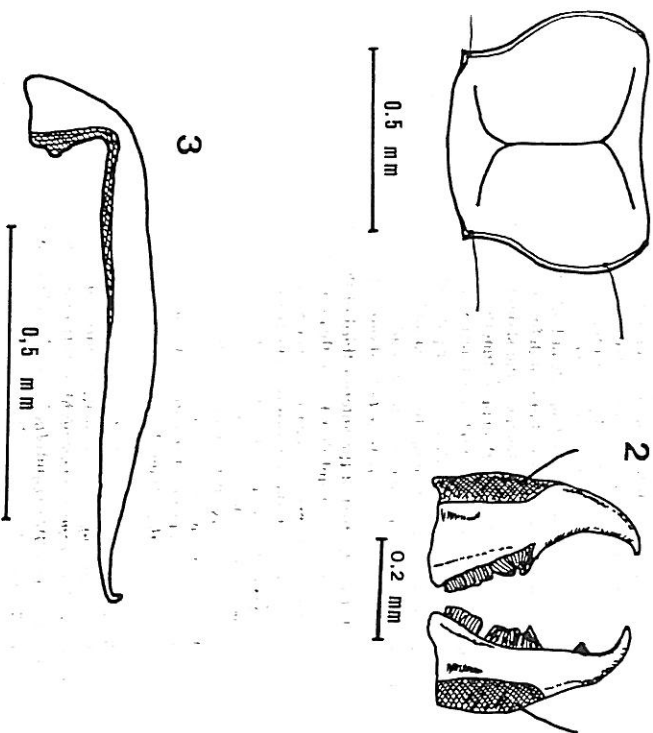
Chaetotaxy: Setae very long. Orbital setae at divergent lines. Two discal setae over 3rd stria, the first at the anterior third of the elytra, closer to their anterior margin than to the second discal seta, this one slanted near the middle of the elytron. Umbilical series normal (4+2+2), some of them very long and slender. Apical setae present, the anterior one closer to the suture than to the apex. Hind angles more or less rounded forming a little notch.

Legs: Long and slender. Proximal tarsomeres 1 and 2 clearly enlarged and spiny in males, the 4th with well developed immediate ventral spines. 1st metatarsomere a slightly longer than the onychium.

Aedeagus: As in Fig. 3 (length: 0.83 mm).

Derivatio nominis: Named after the archipelago where the species was found.

Thalassophilus azoricus is the first member of the Trechodinae recorded from the Azores, although this subfamily is represented in Macaronesia by seven more species: *Spelaeovulcania canariensis* MACHADO, *Canaribia oronni* MACHADO, *Canaribia chusquea* MACHADO and *Thalassophilus subterraneus* MACHADO in the Canary Islands, *Thalassophilus coecus* JEANNEL and *Thalassophilus pieperi* (ERBER, 1990) in Madeira and *T. whitei* WOLLASTON in both archipelagos. Except the last, all the above mentioned species are troglobitic, with more or less marked adaptations to hypogean life such as depigmentation, reduction or even complete disappearance of eyes, elongation of appendages and setae, etc. (see MACHADO, 1987 and 1989). Some more species of cave dwelling beetles have been found on the Azores, all belonging to the genus *Trechus* (see below and MACHADO, 1988); but none of them is so well adapted for subterranean life as *T. azoricus*, the only completely cycless



Figs. 1 to 3. *Thalassophilus azoricus* n.sp. 1: Pronotum. 2: Mandibles. 3: Aedeagus.

ST. JOSE DE BOCA DO FOGO, AZORES (AZORES ISLANDS), PORTUGAL
 AZORES ISLANDS. AZORES ISLANDS, PORTUGAL. BOCA DO FOGO, BOCA DO FOGO ISLAND.

species. It was found in a lava tube only 5 or 6 m above sea level and covered by some 70 m of overburden. After six hours of careful searching and two periods of intensive trapping made in July and December 1989, only four specimens were collected (and several remains of dead specimens). In a new expedition, carried out by one of the authors (P. BOKRUIS) in April 1990, ten more specimens (7 males and 3 females) were collected after four hours of intensive searching.

Trechus jorgensis n. sp.

Type locality: Azores, S. Jorge, Algar das Bocas do Fogo.

Type material: Holotype 1 female, Algar das Bocas do Fogo, S. Jorge, 7-11.VIII.89 (P. OROMÍ *leg.*). Deposited in the collection at the University of La Laguna, Tenerife (DZUL).

Diagnosis: Integument depigmented, dull and granulated; antennae not very long with the 2nd antennomere almost as long as 3rd; eyes small and very flat; clytra with apical angles almost straight.

Size: Body length: 3.05 mm; width: 1.23 mm.

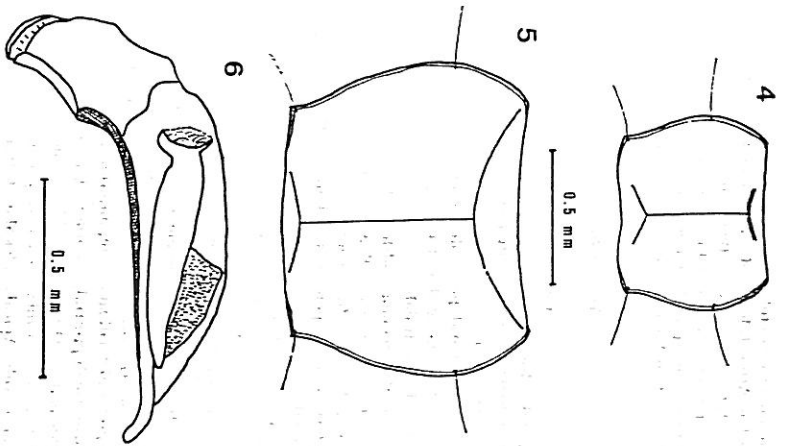
Integument: Dorsal surface dull, at least less shining than the other Azorean species; microreticulation isodiametric (though not very precise) and granulated. Depigmented, testaceous; appendages and apex of the elytra more yellowish.

Head: Normal, ovate, frontal furrows deep and curved; frons convex as in the other Azorean species, but the orbitale flatter in their anterior part; eyes small, clearly reduced, very flat, the diameter shorter than temples; the latter curved (more than in *T. plicocoxis* MACHADO and *T. montiverrum* n.sp.). Mandibles as in other Azorean *Trechus* species. Labrum not so concave as in *T. tectranus*. Antennae 1.61 mm long, normal, reaching backwards for the first third of elytra; 2nd antennomere almost as long as 3rd; 1st to 7th antennomeres 2 to 2.6 x longer than wide, 8th to 10th 1.2 to 1.5 x longer than wide, 11th 1.9 longer than wide.

Pronotum: (Fig. 4) Convex, transverse (1.28 x as broad as long). Side margins curved, with a prebasal small sinuation; anterior angles obtuse and rounded; hind angles obtuse with small protruding corners. Base emarginated; lateral foveae not very evident. Side marginal furrow narrowly canalculated. Median impression fine.

Elytra: Ovate, convex, with shoulders very rounded. 1.61 x wider than pronotum and 1.36 x as long as wide. Apical angles almost straight, notch not very conspicuous. All striae conspicuous and well marked; interstriae convex. Setae very long and slender.

Chaetotaxy: Preapical setae closer to the suture than to the apex. The remaining setae are as in *Trechus* s.str. Umbilical setae normal.



Figs. 4 to 6 - 4 - *Trechus jorgensis* n. sp.; pronotum; 5 - Pronotum of *Trechus montanhelorum* n. sp.; 6 - Aedeagus of *T. montanhelorum* n. sp.

Legs: Dorsally pigmented but not apically elongated, protibiae not enriched but with a conspicuous pilosity on its inner face. 1st metatarsome 1.3 - 1.4 x as long as onychium.

Aedeagus: Unknown.

Derrivatio nominis: Named after the island of Sho Jorge, where the specimen was found.

T. jorgensis n.sp. is very easy to distinguish from the other Azorean *Trechus* by its smaller size and the greater reduction of eyes.

This species was collected in a complex, 50 m deep volcanic pit whose internal vault is in penumbra but never in complete darkness. A single specimen was found, but probably a search for this carabid in a better place such as the volcanic pit Algar do Montoso, or the mesocavernous shallow stratum (MSS, see OROMI *et al.*, 1986) in the same island of Sho Jorge, would provide some more specimens.

Trechus montanhelorum n. sp.

Type locality: The Azores, Pico, Gruta dos Montanhelos.

Type material: Holotype: 1 male, Gruta dos Montanhelos, Pico, 25.V.89 (P. BORGES & F. PEREIRA *leg.*). Deposited in the collection at the University of the Azores, Terceira (UAT).

Paratypes: 1 Gruta dos Montanhelos, Pico 6-10.VIII.87 (P. OROMI *leg.*); 1 male and 2 females, same locality, 25. V. 89 (P. BORGES & F. PEREIRA *leg.*); 3 males and 8 females, same locality but 6-18.III.90 (P. BORGES *leg.*); 2 males and 1 female, same locality but 6.III.90, 15 paratypes are deposited in coll. UAT and 6 in coll. University of La Laguna, Tenerife (DZUL).

Diagnosis: Dark pigmentation; normal and convex eyes; antennae long with the 3rd segment only 1.12 x as long as the 2nd; wingless; aedeagus with the apical portion curved downwards in profile.

Size: Large size, total length 4.27 - 4.88 mm (L = 4.64 mm.), maximum width 1.71 - 2.04 mm (W = 1.88 mm).

Integument: Rather well pigmented, although much less than *T. torrezasovi*; reddish-brown with discal parts darker, appendages testaceous but the anterior part of coxae darker; subnudos but brighter than the other troglolithic Azorean *Trechus*, and as bright as *T. torrezasovi*; microreticulation in head and pronotum isodiametric, but transverse and feebler in the clytra, as in *T. picoensis* MACILADO.

Head: Almost 1.2 x as wide as long, a little larger and wider than that in *T. picoensis* (less than 1.1 x as wide as long); narrower than prothorax; eyes well developed, convex; temples shorter, curved and with microchaetae. Frons convex,

the frontal furrow deep and curved, nearly round. Anterior margin of labrum concave. Mandibles strong, elongate and not as sharp as in *T. picoensis* and, as in the latter, with a trifurcinate rollinculium and two visible large teeth (see MACIADDO, 1988, page 3, fig. 2C). Maxillary palpi long and slender as in *T. picoensis*, but labial palpi not as long as in that species.

Antennae: 2.5-2.8 mm long ($\lambda = 2.7$ mm.), surpassing by five antennomeres the base of pronotum; the 3rd antennomere slightly longer than the 2nd (1.12 x).

Pronotum: (Fig. 5) Convex, more transverse than that of *T. picoensis*, 1.26 as broad as long; side margins deeply curved; anterior angles slightly rounded, hind angles protruding and sharp; basal border emarginated and sinuated; lateral furrows broad and emarginated and lateral fovea slightly developed as in *T. picoensis*.

Elytra: Ovale with rounded shoulders, 1.6 x wider than prothorax and 1.4 x as long as broad; apex rounded, lateral furrows canalculated but not so large as in *T. torrefassoi*. Striae conspicuous with the external ones more superficial, interstriae slightly convex but less than in *T. teretianus*. Recurrent stria connected to the 5th. Chaetotaxy: Elytral setae as in *Trechus* s. str., but one specimen has a supernumerary puncture at the anterior part of the 5th interstria. Preapical setae closer to the apex than to the suture, as in *T. picoensis*. Unibifid setae normal.

Legs: Long but not so slender as in *T. picoensis*, femora rather thin; protibiae not so carinated with pilosity on its inner face; protarsal segments 1 and 2 clearly enlarged and spiny in males, segment 4 with well developed lamellated ventral appendage.

Aedeagus: as in Fig. 6; length 1.12 mm; apical portion of penis slightly curved downwards in profile.

Derivatio nominis: all the specimens were found in Gruta dos Montanhelros, a lava tube so named after "Os Montanhelros", the most active speleological group on the Azores.

T. montanhelrorum n. sp. is doubtless very close to *T. picoensis*, of which it is probably the ancestor. Some of the more evident differences between the two species are those relating to adaptation to cave life (eye reduction, depigmentation) which are more marked in *T. picoensis*; some other like those of the male genitalia and the chaetotaxy have probably evolved without relation to the hypogean environment. The more evident differences between the two species are presented in Table I. Although both the species have been found in the same cave (see MACIADDO, 1988), it is worth pointing out that *T. montanhelrorum* was always collected just beneath the entrance and never in darker parts, where *T. picoensis* occurs. Although it has some ability to colonize the entrances of caves, we can assume that the new species is an epigeic form; but this cannot be definitively demonstrated until a specimen has been collected from outside a cave.

The differences between *T. montanhelrorum* and the other two cave dwelling species on the Azores (*T. teretianus* and *T. jorgeensis*) are clear enough to make a misidentification unlikely (see MACIADDO, 1988 and the key below).

	<i>T. picoensis</i>	<i>T. montanhelrorum</i>
Colour	Depigmented, reddish- testaceous	Pigmented, reddish-brown to dark-brown
Head	1.1 x as wide as long	1.2 x as wide as long
Eyes	Small, flat	Bigger, convex
Antennae	3rd segment 1.4 x as long as 2nd	3rd segment only 1.2 x as long as 2nd
Pronotum	Transverse (index W/L = 1.16)	More transverse (index W/L = 1.26)
Preapical	Closer to the suture	Closer to the apex than to the suture
Aedeagus	Apical portion straight in profile	Apical portion curved downwards in profile

Table I. Morphological differences between *Trechus picoensis* Machado and *T. montanhelrorum* n. sp.

KEY TO THE AZOREAN SPECIES OF *TRECHUS*

- 1 - Apical angle of elytra rounded 2
- Apical angle of elytra not rounded 4
- 2 - Length 4.3 - 5.4 mm; lateral margins of pronotum markedly sinuated before the base 3
- Length 3.0-3.2 mm; lateral margins of pronotum hardly sinuated before base *torrefassoi* JEANNEL
- 3 - Depigmented; 3rd antennomere longer than 2nd (1.4 x); eyes small and flat; pronotum transverse (index W/L=1.16) *picoensis* MACHADO
- Pigmented; 3rd antennomere a little longer than 2nd (1.12 x); eyes bigger and convex; pronotum more transverse (index W/L=1.26) *montanhelrorum* n. sp.
- 4 - Apical angle of elytra sharp (though sometimes notched), forming a small protruding point; size 3.6 - 4.3 mm. *teretianus* MACHADO
- Apical angle of elytra bright (not at all very conspicuous); size 3.05 mm. *jorgeensis* n. sp.

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