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## The costate species of the genus *Deronectes* SHARP (Coleoptera, Dytiscidae)<sup>1</sup>

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The authors revise the costate species of the genus *Deronectes* SHARP. 4 species are recognised as occurring in the Iberian Peninsula, one of which is described as new: *D. bicostatus* (SCHAUM), *D. costipennis* BRANCUCCI, *D. depressicollis* (ROSENHAUER) and *D. ferrugineus* n.sp. The habitus, ground-sculpture, parameres and aedeagus of all these species are illustrated, and a determination key is given to assist with identification.

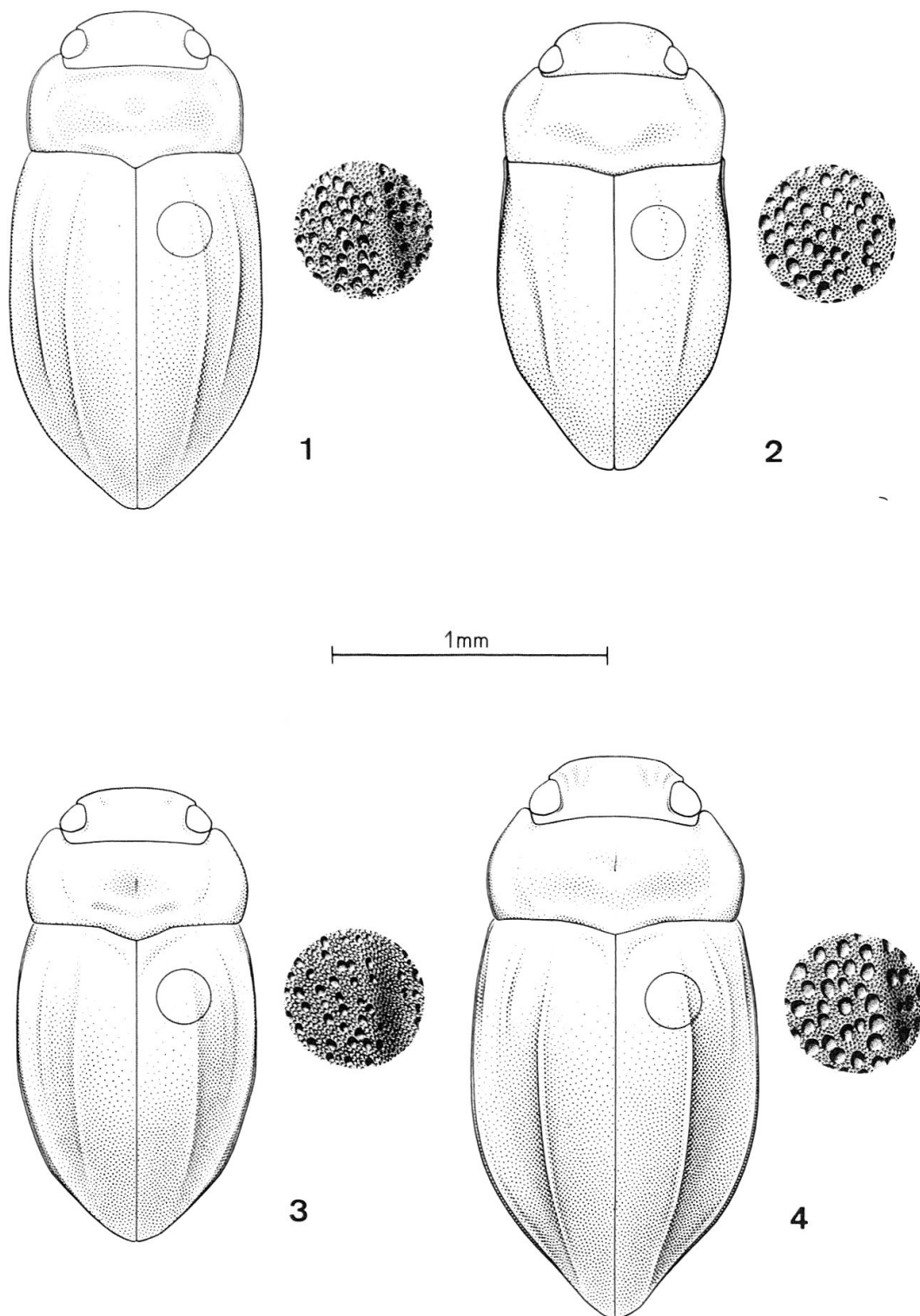
### INTRODUCTION

We have experienced repeated difficulties in studying the costate species of *Deronectes*. The variation found in size, form, puncturation, and even in colour has stimulated us to study this problem more closely. Several collecting trips to different parts of the Iberian Peninsula by the first author has produced sufficient material to enable us to give more details on the known species and to describe 1 new species. This study increases the number of costate species to 4, all from the Iberian Peninsula, since *D. angulipennis* (PEYRON) from Turkey does not have costae as was shown by WEWALKA (1970). Two species were previously known: *D. bicostatus* (SCHAUM) and *D. costipennis* BRANCUCCI, the latter described a few years ago (BRANCUCCI, 1983). A third species, *D. depressicollis* (ROSENHAUER), was actually described in 1856 but has not been recognised subsequently. Its status is clarified here on the basis of the study of the holotype. An additional species, *D. ferrugineus* n.sp., is described as new.

The following abbreviations are used for the collections where material is located:

- HF = coll. Dr. H. FERY, Berlin
- GW = coll. Prof. Dr. G. WEWALKA, Wien
- KD = coll. Prof. Dr. K. DETTNER, Aachen
- LH = coll. L. HENDRICH, Berlin
- MB = coll. Dr. M. BRANCUCCI, in Natural History Museum Basel
- MP = Muséum National d'Histoire Naturelle, Paris (Dr. H. PERRIN)
- MZL = Musée Zoologique, Lausanne (Dr. D. CHERIX)
- ZSM = Zoologische Staatssammlung, München (Dr. G. SCHERER)

<sup>1</sup> Mr. A. CORAY, Scientific Illustrator, made the illustrations. This was possible by a grant from the Swiss National Science Foundation (request Nr. 3.625-0.84).



Figs. 1–4: Habitus of: 1, *Deronectes bicostatus* (SCHAUM). 2, *D. costipennis* BRANCUCCI. 3, *D. depressicollis* (ROSENHAUER). 4, *D. ferrugineus* n. sp.

## DESCRIPTION OF SPECIES

### *Deronectes bicostatus* (SCHAUM) Figs. 1, 5, 9, 13, 14.

*Hydroporus bicostatus* SCHAUM, 1864, Berl. Ent. Z. 8: 111. – LEPRIEUR, 1876, Bull. Soc. Ent. Fr. 6(5): 121. *Deronectes bicostatus* (SCHAUM), SHARP, 1880–82, Sci. Trans. R. Dublin Soc. 2: 423. – SEIDLITZ, 1887, Verh. Nat. Brünn 25: 50. – ZIMMERMANN, 1920, Col. Cat. 4(71): 118. – DE LA FUENTE Y MORALES, 1921, Bol. Soc. Ent. Esp. 4(4): 64. – ZIMMERMANN, 1932, Koleopt. Rdsch. 28: 99. – BRANCUCCI, 1983, Entomologica Basiliensia 8: 138.

Body black, matt, glabrous, subparallel, slightly curved at sides (Fig. 1). Elytra with a distinct discal costa, a weakly distinct sublateral one, and a lateral swelling.

♂: Head black, the posterior margin somewhat brown. Surface sculpture consisting of small punctures, becoming larger posteriorly; punctures sparse on the median part of the clypeus, very close together on the rest of the surface, closer than their own diameter. Clypeal grooves broad, flat but weakly impressed. Anterior margin of the clypeus rounded, slightly flattened at middle. Antennae ferrugineous-brown, darkened posteriorly from the 5th joint.

Pronotum black, matt, indistinctly brown on the lateral swelling, transverse, broadest just before the middle, depressed on the disc and with deeply impressed sublateral grooves. Lateral margins finely bordered, evenly curved. Posterior angle right-angled and slightly rounded. Surface sculpture consisting of a double puncturation: the very small punctures dense, covering the entire surface; the large ones dense, irregularly distributed, sparser on the disc and actually absent along lateral margins. Setae very short, distinctly visible only in the lateral grooves.

Elytra black, matt, slightly rounded laterally, broadest at the middle. Discal costa distinct and raised, highest on posterior 2/3. Sublateral costa lower, ending by posterior 2/3. Surface sculpture similar to that on the pronotum; the punctures somewhat smaller on disc; larger punctures absent along suture, on the costae and on the lateral margin; on the rest of the surface, irregularly-distributed, partly coalescent, partly separated by their own diameter. Setae very short, sparse and hardly visible.

Underside black, gula, prosternal process, legs, posterior margins of the 3rd to 6th sternites, and anterior angles and lateral margin of the prothorax dark brown. Surface sculpture consisting of very small and dense punctures, entire underside therefore matt. Sternites III–V indistinctly rugose longitudinally. Prosternal process lanceolate, very narrowly rounded at apex, strongly depressed and with a sharp carina along middle (Fig. 5)

Legs ferrugineous brown, the femora, except the extreme base, and the tibiae dark brown. Claws not developed.

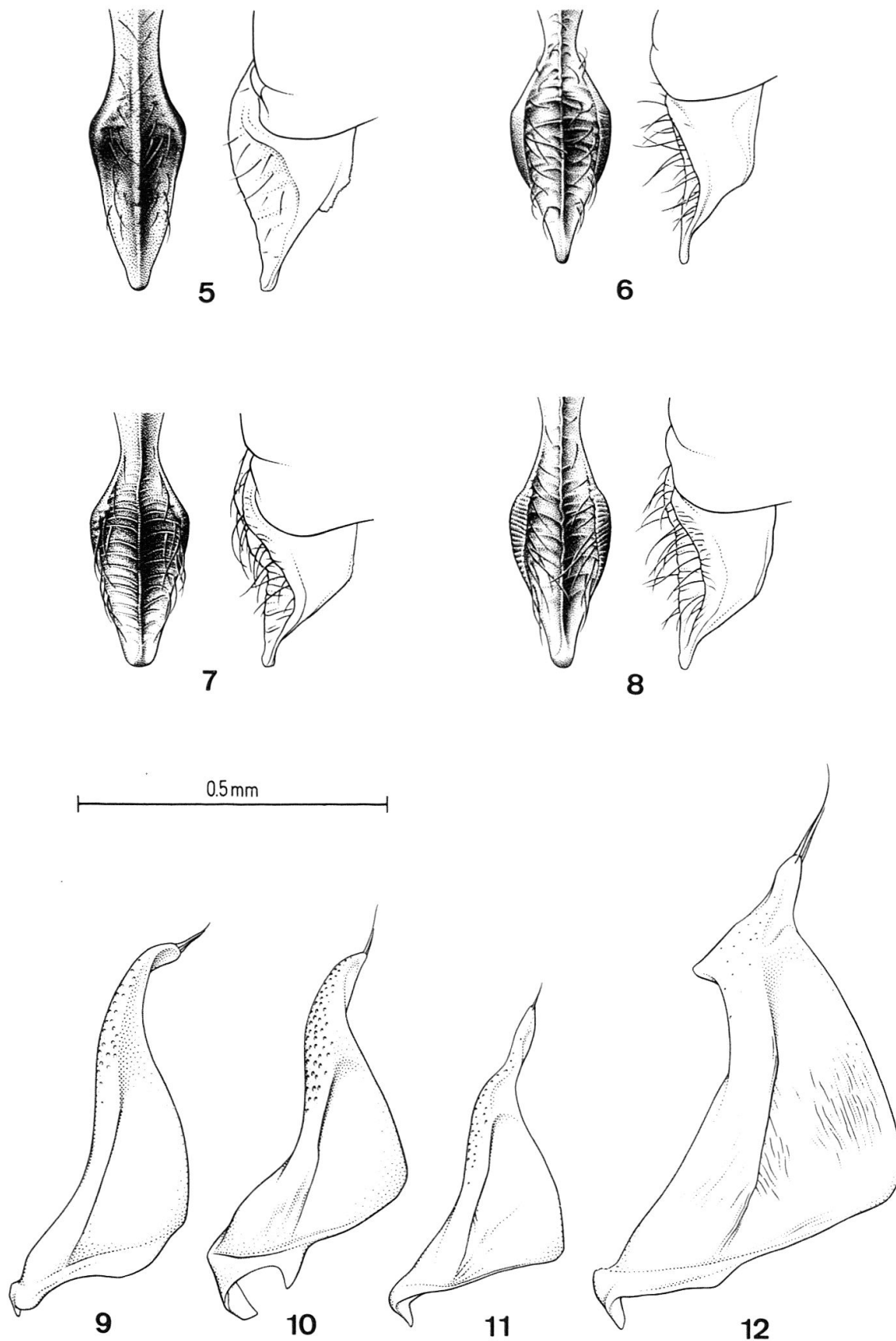
Aedeagus in dorsal view regularly tapered to apex, which ends in a stout point; in lateral view, also evenly tapered from base to apex, somewhat elongated in apical part and stoutly pointed at apex (Figs. 13, 14). Parameres elongate (Fig. 9).

♀: Similar to ♂. Clypeal grooves somewhat more distinct, with impressed puncturation. The upper side is covered with short and distinct setae.

Total length: 4.2–5.0 mm; width: 2.3–2.6 mm.

Types: Not located.

Material studied: Portugal: without locality (4 ex., GW); San Martinho (1 ex., GW); Lusitania (1 ex., GW); Beira Alta, Guarda Distr., Serra da Estrêla,



Figs. 5–12: 5–8. Prosternal process of: 5, *Deronectes bicostatus* (SCHAUM). 6, *D. costipennis* BRANCUCCI. 7, *D. depressicollis* (ROSENHAUER). 8, *D. ferrugineus* n. sp. 9–12. Parameres of: 9, *Deronectes bicostatus* (SCHAUM). 10, *D. costipennis* BRANCUCCI. 11, *D. depressicollis* (ROSENHAUER). 12, *D. ferrugineus* n. sp.

Sameiro, mountain streamlet, 600 m, 9. VIII. 1984, H. FERY (6 ex., HF; 2 ex., GW; 5 ex., MB); idem, 27. III. 1986, H. FERY (36 ex., HF); Beira Alta, Guarda Distr., Serra da Estrêla, nr. Penhas Douradas, mountain streamlet, 1150 m, 14. VIII. 1985, H. FERY (11 ex., HF); Beira Alta, Guarda Distr., Serra da Estrêla, nr. Sabugeiro, mountain streamlet, 1400 m, 14. VIII. 1985, H. FERY (1 ex., HF); Minho, Viana do Castelo Distr., Serra de Soajo, nr. Merufe, mountain streamlet, 700 m, 28. III. 1986, H. FERY (4 ex., HF); Duoro Litoral, Porto Distr., nr. Recarei (northern), mountain streamlet, 800 m, 28. III. 1986, H. FERY (19 ex., HF); idem, southern, 28. III. 1986 (40 ex., HF). Spain: without locality or with illegible labels (3 ex., coll. CL. MÜLLER, ZSM); Escorial (1 ex., coll. MÜLLER, ZSM).

Affinities: This species is closely related to *D. ferrugineus* n.sp. It can easily be distinguished by its smaller size (4.2–5 mm), by the black colour, and by the protarsal claws of the male which are not elongate. From the other two species, it can be distinguished by its slender body and by the strong discal costae.

Ecology: This species occurs particularly in mountain streamlets between 500 and 1400 m. It is often accompanied by *Potamonectes carinatus* (AUBÉ), *Agabus brunneus* (F.), *Agabus bipustulatus* (L.), *Agabus dettneri* FERY, *Hydroporus discretus* (FAIRM.), *Stictonectes* spec., etc.

Distribution: Spain and Portugal.

*Deronectes costipennis* BRANCUCCI Figs. 2, 6, 10, 15, 16.

*Deronectes costipennis* BRANCUCCI, 1983, Entomologica Basiliensia 8: 138.

For a complete description, see BRANCUCCI (1983). The following additional features were found in a large series of specimens recently examined.

Elytra black, slightly brown at sides. In dorsal view, slightly rounded at sides, broadest somewhat before middle, almost flat between costa and suture (Fig. 2). Setae very short and often absent.

Underside black, head, pronotum, epipleura and metatrochanters ferrugineous-brown. Prosternal process lanceolate, carinate along middle, with weak and fine transverse carinae and with a row of long setae on each side of the longitudinal carina and stoutly pointed at apex (Fig. 6).

Legs ferrugineous brown, metafemora darkened on the ventral surface. Protarsal claws elongate, the inner one slightly shorter and more curved.

Aedeagus in dorsal view broad and strongly tapered in basal third, very thin in apical part and pointed at apex; in lateral view, very broad at base and shortened in apical half (Figs. 15, 16). Parameres short (Fig. 10).

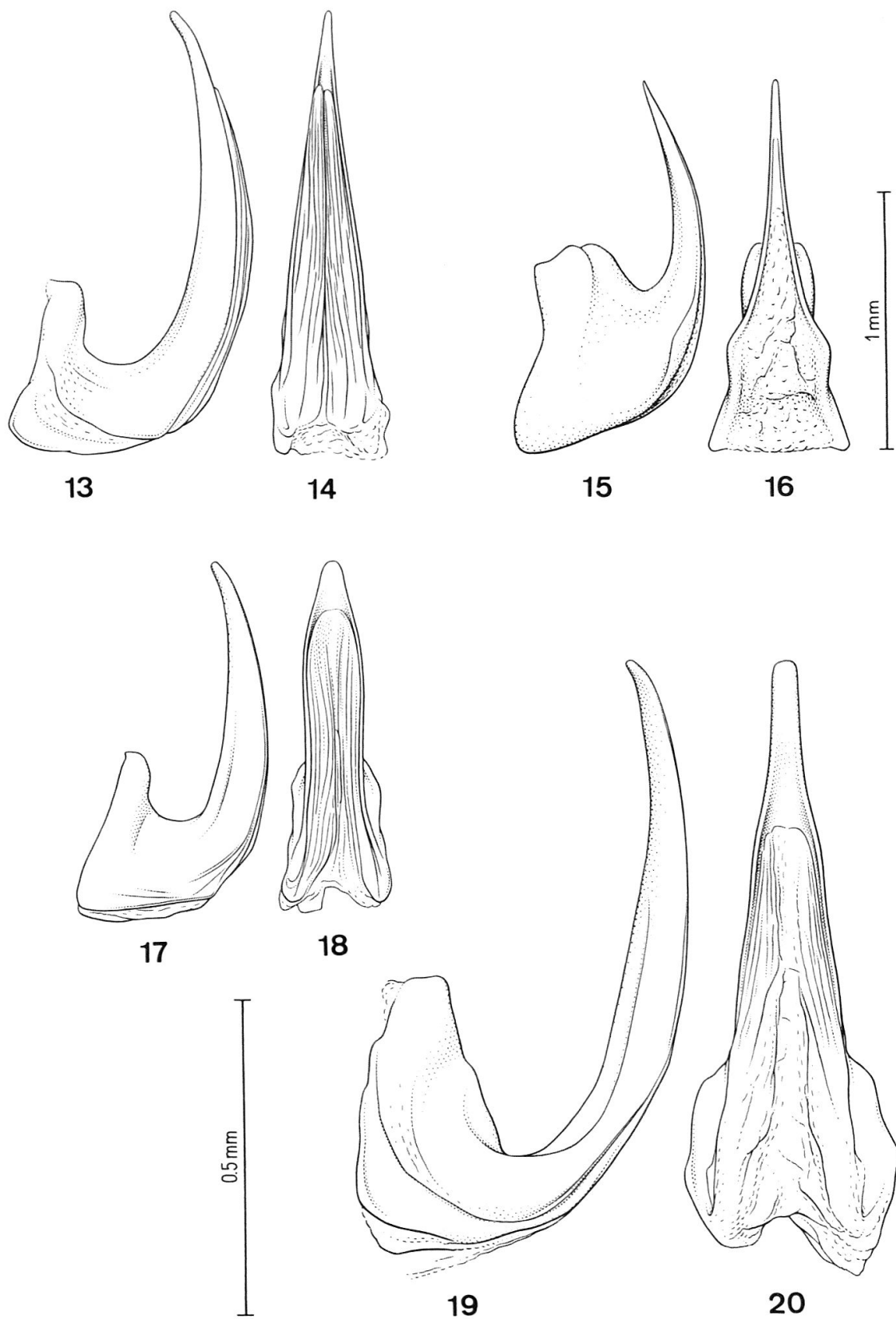
♀: Similar to ♂. Underside with the larger punctures almost completely absent on the 1st and 2nd sternite. Protarsal claws not developed.

Total length: 4.0–4.3 mm; width: 2.1–2.3 mm.

Type: Holotype ♂ (MZL): Locality: Portugal, Serra da Estrêla, Penhas Douradas, 1600–1700 m, mountain streamlet, VI. 1959, J. AUBERT.

Additional material studied: Portugal, Guarda Distr., Serra da Estrêla, nr. Penhas Douradas, mountain streamlet, 1250 m, 14. VIII. 1985, H. FERY (34 ex., HF; 5 ex., MB); idem, 1250 m, 27. III. 1986, H. FERY (14 ex., HF); idem, nr. Sabugeiro, mountain streamlet, 1400 m, 14. VIII. 1985, H. FERY (2 ex., HF).

Ecology: This species was captured in a shaded part of flowing mountain streamlets. Associated fauna: *Deronectes bicostatus* (SCHAUM), *Potamonectes carinatus* (AUBÉ), *Agabus brunneus* (F.), *Agabus bipustulatus* (L.), *Stictonectes*



Figs. 13–20: Aedeagus in lateral and dorsal view of: 13 and 14, *Deronectes bicostatus* (SCHAUM). 15 and 16, *D. costipennis* BRANCUCCI. 17 and 18, *D. depressicollis* (ROSENHAUER). 19 and 20, *D. ferrugineus* n. sp.



spec., *Hydroporus pubescens* (GYLL.), *Hydroporus discretus* (FAIRM.), *Hydroporus tessellatus* (DRAP.), and *Graptodytes varius* (AUBÉ).

Affinities: *D. costipennis* BRANCUCCI is characterised by its short body, by the broad pronotum, and by the aedeagus which is short and slender in dorsal view.

Distribution: Portugal (Serra da Estrêla).

*Deronectes depressicollis* (ROSENHAUER) Figs. 3, 7, 11, 17, 18.

*Hydroporus depressicollis* ROSENHAUER, 1856, *Thiere Andal.*: 50. – LEPRIEUR, 1876, *Bull. Soc. Ent. Fr.* 6(5): 121.

*Deronectes depressicollis* (ROSENHAUER), SHARP, 1880–82, *Sci. Trans. R. Dubl. Soc.* 2: 792. – MARSEUL, 1882, *L'Abeille* 20: 64. – SEIDLITZ, 1882, *Verh. Nat. Ver. Brünn* 25: 50. – ZIMMERMANN, 1920, *Col. Cat.* 4(71): 118. – DE LA FUENTE Y MORALES, 1921, *Bol. Soc. Ent. Esp.* 4(4): 64. – ZIMMERMANN, 1932., *Koleopt. Rdsch.* 18: 99.

Body black, strongly matt, subparallel, somewhat rounded laterally (Fig. 3). Elytra with a discal and 2 weak lateral costae and a lateral swelling.

♂: Head black, strongly matt. Anterior margin broadly and posterior margin narrowly ferrugineous. Surface sculpture uniform, consisting of dense medium-sized punctures that are not separated by their own diameter; on the disc the punctures somewhat larger. Clypeal grooves broad and deep. Anterior margin of the clypeus slightly truncate. Antennae ferrugineous, darkened posteriorly from the 6th joint.

Pronotum black, strongly matt, rugulose, slightly ferrugineous on the margins, transverse, broadest at middle, indistinctly depressed on the disc and along posterior margin. Lateral grooves shallow. Lateral margins evenly curved, hardly bordered. Posterior angles rounded. Surface sculpture double, consisting of very dense minute punctures and of shining, large and irregularly-distributed ones; the latter sparse and separated by their own diameter on the disc, dense, close together in the grooves and absent along lateral margins.

Elytra black, matt, slightly rounded laterally, broadest somewhat before middle. Discal costa, almost reaching apex. Lateral costae both poorly distinct, visible particularly at the middle of their length, disappearing in posterior 2/3. Lateral swelling particularly distinct by the middle. Suture somewhat raised. Shoulders pronounced. Surface sculpture similar to that of pronotum, the large punctures indistinctly larger; the latter absent along suture and lateral margin, sparser on costae.

Underside black, densely puncturate, matt. Head, thorax, middle part of the metasternum and posterior margin of sternites III–VI reddish-brown. Prosternal process lanceolate, rounded at apex, longitudinally carinate with weak and fine transverse carinae on each side of the main carina (Fig. 7). Metacoxae additionally with large and sparse punctures. Middle part of sternites I and II with dense large punctures. Sternites III–VI somewhat rugose longitudinally.

Legs reddish-brown except the discal part of the femora. Metafemora coarsely punctured. Protarsal claws not developed.

Aedeagus in dorsal view concave in basal third, tapered in apical part and rounded at apex; in lateral view, straight as far as the apex where it is slightly bent ventrally (Figs. 17, 18). Parameres short (Fig. 11.).

♀: Similar to ♂. Large punctures on sternites I and II less numerous.

Total length: 4.0–4.9 mm; width: 2.1–2.6 mm.



Variation: Some of the specimens, in particular the holotype and about 25 % of the material studied, have the dorsum reddish in colour.

Note: In his description, ROSENHAUER (1856) mentioned a suture that was developed like a costa. In the type specimen the suture is indeed slightly raised, but in other specimens only indistinctly so.

Type: Thanks to close collaboration by the staff of the Paris Museum, we were able to locate the holotype of *D. depressicollis* (ROSENHAUER). It is a ♂. Locality: Algeciras, Thiere Andalusiens, ROSENHAUER, ex. WEHNCKE, in coll. OBERTHÜR.

Additional material studied: Spain: Andalusia, Almeria Prov., Sierra Nevada: Umgeb. Laujar, Paterna del Rio, Rio de Alcolea (mountain streamlet), 1000 m, 4. VIII. 1985, H. FERY (8 ex., HF; 5 ex. MB); Umgeb. Laujar, nr. Bayarcal, mountain streamlet, 1800 m, 4. VIII. 1985, H. FERY (5 ex., HF); Umgeb. Laujar, nr. Bayarcal, Rio Bayarcal (mountain streamlet), 1000 m, 17. III. 1986, H. FERY (10 ex., HF); Granada Prov., Sierra Nevada, nr. Capileira, mountain streamlet, 1700 m, 2. X. 1985, L. HENDRICH (13 ex., LH); Granada Prov., Sierra Nevada, nr. Ugijar, above Mecina Bombaron, mountain streamlet, 5.–7. V. 1981, P. ZWICK (1 ex., KD).

Ecology: This species was collected in moderately rapid mountain streams at altitudes of 1000 to 1800 m. Species captured in the same biotope were: *Potamonectes clarki* (WOLL.), *Agabus conspersus* (MARSH.), *Agabus brunneus* (F.) and *Agabus didymus* (OL.).

Affinities: This species is very distinct from the other three costate species. The small size, the coarsely-sculptured body, the presence of 3 costae on the elytra and the aedeagus which is rounded at apex in dorsal view allow an easy determination.

Distribution: Spain, Andalusia (Sierra Nevada).

*Deronectes ferrugineus* n.sp. Figs. 4, 8, 12, 19, 20.

Body subparallel, somewhat rounded at sides, rather convex, reddish-brown, matt. Each elytron with 2 distinct costae and with a weak lateral swelling (Fig. 4).

♂: Head reddish-brown, with an indistinct brown patch between eyes. Surface sculpture microreticulate and densely puncturate; punctures small and not closely set together on clypeus and on disc, larger and coalescing laterally and posteriorly. Clypeal grooves large, prolonged up to the posterior half of head, limited on outer side by a small swelling. Anterior margin of the clypeus distinctly flattened. Antennae reddish-brown, hardly darkened.

Pronotum reddish-brown, indistinctly lighter along lateral and anterior margins, transverse, broadest at middle, weakly depressed on disc, strongly so along base, with weakly impressed sublateral grooves. Lateral margins finely bordered, slightly but evenly curved, somewhat flattened on anterior 1/3. Anterior angles broadly rounded. Posterior angles rounded and right-angled. Surface sculpture consisting of small and very dense minute punctures, and of irregularly-distributed large punctures; the latter not very deep and shining, dense in the grooves and along base, sparser on the disc where they are separated by their own diameter and absent only along lateral margins. Setae short, yellow, very often absent.

Elytra dark brown, somewhat paler along base, matt, rounded laterally, broadest at middle. Discal costa strongly raised, reaching almost to apex of elytra;

sublateral costa weak and short, distinct only on basal 1/3. Lateral swelling weak but visible almost on anterior 2/3. Space between discal costa and suture raised and flattened. Surface sculpture similar to that of pronotum, consisting of dense minute punctures and of irregularly-distributed large punctures; the latter not very deep, shining, absent along costae and lateral margins and on shoulders, smaller along suture. Setae short, yellow and very often absent.

Underside reddish-brown, metacoxae as well as parts of the abdomen darker, densely puncturate, matt. 3rd to 6th sternites indistinctly wrinkled. Prosternal process lanceolate, longitudinally carinate along middle, with fine transverse carinae, narrowly rounded at apex and with a row of long setae on each side of the carina (Fig. 8).

Legs reddish-brown, hardly darkened. Protarsal claws elongate, almost straight; the inner one indistinctly shorter and more curved at apex.

Aedeagus in dorsal view evenly tapered, ending in a stout point; elongate in lateral view, slightly tapered, and weakly bent ventrally just before the apex, the latter narrowly rounded (Figs. 19, 20). Parameres broad (Fig. 12).

♀: Similar to ♂. The lateral margins of the pronotum weakly rounded on posterior 2/3, straight-truncate on anterior third. Anterior angles raised and narrowly rounded.

Total length: 4.7–5.3 mm; width: 2.6–2.7 mm.

Types: Holotype ♂ and 29 paratypes (9 ♂ and 17 ♀, HF; 1 ♂ and 2 ♀, MB); locality: Portugal, Guarda Distr., Beira Alta, Serra da Estrêla, nr. Penhas Douradas, mountain streamlet, 1150 m, 14. VIII. 1985, H. FERY. 4 paratypes (2 ♂, HF; 1 ♂ and 1 ♀, MB); locality: idem, 1250 m, 14. VIII. 1985, H. FERY. 19 paratypes (11 ♂ and 8 ♀, HF); locality: idem, 1000 m, 14. VIII. 1985, H. FERY. 6 paratypes (4 ♂ and 2 ♀, HF); locality: idem, 27. III. 1986, H. FERY. 6 paratypes (2 ♂ and 4 ♀, HF); locality: idem, nr. Sabugeiro, mountain streamlet, 1400 m, 14. VIII. 1985, H. FERY. 1 paratype ♀ (MZL); locality: Serra da Estrêla, Penhas Douradas, VI. 1959, J. AUBERT. 1 paratype ♀ (MZL); locality: idem, streamlet on Gourcia, VI. 1959, J. AUBERT. 2 paratypes (1 ♀, MZL; 1 ♀, MB); locality: idem, streamlet on Loriga, VI. 1959, J. AUBERT.

Derivation: Reddish-brown in colour.

Affinities: *D. ferrugineus* n. sp. can easily be distinguished from all the other species by its reddish-brown colour, by its size, by the aedeagus which is slender in dorsal view, and by the parameres which are truncate at apex. It is most closely related to *D. bicostatus* (SCHAUM).

Ecology: This species was collected in various mountain streams at altitudes between 1000 and 1400 m, in the same biotope as described for *D. costipennis* BRANCUCCI.

Distribution: Portugal (Serra da Estrêla).

#### KEY FOR THE IDENTIFICATION OF THE COSTATE *DERONECTES*

1. Size: 4.2–5.3 mm. Elytra with more than one costa. ♂. Aedeagus in dorsal view not needle-shaped in apical half ..... 2
- Size: 4.0–4.3 mm. Elytra with only one costa. ♂. Aedeagus in dorsal view strongly tapered basally, needle-shaped in apical half .....  
..... *Deronectes costipennis* BRANCUCCI
2. Size: 4.2–4.9 mm. Body flattened. Colour mostly black. Clypeus completely puncturate or microreticulate between punctures. Larger punctures on pro-

- notum and elytra not shining, often more or less sculptured on their inner parts. ♂. Protarsal claws not developed. .... 3
- Size: 4.7–5.3 mm. Body convex. Colour mostly reddish-brown, at least on the pronotum. Clypeus shining between punctures. Large punctures on pronotum and elytra shining. ♂. Protarsal claws elongate. *Deronectes ferrugineus* n. sp.
  - 3. Elytra with 2 costae. Punctuation of the head sparse on clypeus and frons; punctures separated by more than their own diameter. Microreticulation distinct. ♂. Aedeagus in dorsal view evenly tapered and pointed at apex ..... *Deronectes bicostatus* (SCHAUM)
  - Elytra with 3 more or less distinct costae. Punctuation of the head dense and very closely placed. Reticulation visible but not distinct. ♂. Aedeagus in dorsal view tapered only in apical part and rounded at apex ..... *Deronectes depressicollis* (ROSENHAUER)

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