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Notes on the *Scarodytes savinensis*-complex with the description of two new taxa (Coleoptera: Dytiscidae)

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A b s t r a c t: *Scarodytes antoni* nov.sp. is described from the Croatian and Italian parts of Istria. It is externally similar to *Scarodytes ruffoi* FRANCISCOLO 1961, but the shape of its median lobe is distinctly different. *Scarodytes savinensis cercyrae* nov.ssp. is described as endemic from Corfu, Greece. This subspecies deviates from the mainland nominate subspecies *Scarodytes savinensis savinensis* (ZIMMERMANN 1933) by several external characters and by the shape of the male genitalia. Molecular data of *S. antoni* and *S. savinensis* show their close relationship. So far such data are lacking for *S. ruffoi*. However, all three species share several external morphological characters and, additionally, have a median lobe with rather broad apex, which distinguishes them from all other members of the genus. Thus, the introduction of a *Scarodytes savinensis*-complex for these three species seems to be justified and useful. The lectotype of *Deronectes savinensis* ZIMMERMANN 1933 is designated. Details about the distribution and ecology of the four taxa are provided.

K e y w o r d s: Insecta, Coleoptera, Dytiscidae, *Scarodytes*, new species, new subspecies, DNA, lectotype.

Introduction

We have been attracted to the genus *Scarodytes* since many years by the beautiful colour pattern of its members, which varies only little within largely distributed populations of the different species, and, on the other hand, by the suspicion that several isolated populations should be treated as distinct species.

Three years ago we studied a male *Scarodytes* from Istria (Rabac) and immediately identified it as a new species with a very characteristic shape of the median lobe related to *S. savinensis* and *S. ruffoi*. Investigations in several museums revealed very few additional specimens, but a collecting trip to Istria in June 2007 resulted in a rather large series of that species and induced us to describe it as *Scarodytes antoni* nov.sp.

During preparation of the present publication, all available specimens of *S. savinensis* were intensively studied including a population from Corfu. Already in 1978 one of us (H. Fery) remarked that the *Scarodytes* he collected in Corfu belonged to *S. savinensis* instead of *S. halensis halensis* (FABRICIUS 1787), to his knowledge the only member of the genus recorded from the island at that time. He subsequently found out that *S.*

savinensis had been recorded from Corfu by WEWALKA (1977: 141) and later on published also by SCHAEFLEIN (1983: 36) and PEDERZANI (1990: 50). To our great surprise, we now have found several constant characters which separate mainland and Corfu specimens, which lead us to the description of *S. savinensis cercyrae* nov.ssp.

Material, methods and acknowledgements

The following codens are used for collections from which we have studied specimens:

CFA..... coll. F. ANGELINI, Francavilla Fontana, Italy
 CHF..... coll. H. FERY, Berlin, Germany (property of the NMW)
 CGW coll. G. Wewalka, Vienna, Austria
 CJS coll. J. ŠŤASTNÝ, Liberec, Czech Republic
 MCGE..... Museo Civico di Storia Naturale "G. Doria", Genova, Italy (R. POGGI)
 MCTR..... Museo Civico di Storia Naturale, Trieste, Italy (A. COLLA)
 MNB Museum für Naturkunde, Humboldt-Universität, Berlin, Germany (M. Uhlig, B. JAEGER)
 MNCN Museo Nacional de Ciencias Naturales, Madrid, Spain (I. RIBERA)
 MRTO..... Museo Regionale di Scienze Naturali, Torino, Italy (M. DACCORDI)
 NMW Naturhistorisches Museum Wien, Austria (M.A. JÄCH)
 ZSM..... Zoologische Staatssammlung, München, Germany (M. Baehr, L. Hendrich, M. BALKE)

The following abbreviations are used in the text: hw (handwriting), TL (total length), TL-h (total length without head), and MW (maximum width). The terminology to denote the orientation of the genitalia follows MILLER & NILSSON (2003). Coordinates are given in decimal notation unless cited verbatim from labels. The male and female genitalia of most specimens were dissected, and studied as well as figured in wet condition. Beside various online sources, we used "The Times Atlas of the World, Comprehensive Edition (London, 1997)", "Stielers Handatlas (Gotha, 1928/30)", and "Microsoft Encarta World Atlas 2000" to precise some localities and find their coordinates.

Label data are cited in quotation marks and our comments are given in square brackets. Numbers in curly brackets mark localities and refer to the map in Fig. 29. Several localities are too close; we marked them with a joint number in the map and indicated this by an asterisk in the text.

We thank all colleagues mentioned above for their help and D.S. Boukal (Bergen, Norway) for comments on an earlier version of this work.

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Notes on the genus *Scarodytes* GOZIS 1914

Scarodytes GOZIS (1914: 110) belongs to the subfamily Hydroporinae, tribe Hydroporini.

It was described as a subgenus of *Hydroporus* CLAIRVILLE 1806 and elevated to generic rank by FALKENSTRÖM (1939: 94). The type species of the genus is *Dytiscus halensis* FABRICIUS 1787 by subsequent designation in ZIMMERMANN (1933:188). ÁDÁM (1996: 19) did not accept Zimmermann's designation as valid and created a new genus *Rhiacodytes* with *Dytiscus halensis* as the type species as well. A careful study of ZIMMERMANN's (1933) argumentation shows, however, that Ádám's view is unfounded and *Rhiacodytes* must be treated as a junior objective synonym of *Scarodytes* (see e.g. NILSSON 1998: 1, 2001: 183, 2003: 68).

Scarodytes contains the following seven species (one of them represented by both the nominate and another subspecies): *S. halensis halensis* (FABRICIUS 1787), *S. halensis fuscitarsis* (AUBÉ 1838), *S. malickyi* WEWALKA 1977, *S. margaliti* WEWALKA 1977, *S. nigriventris* (ZIMMERMANN 1919), *S. pederzanii* ANGELINI 1973, *S. ruffoi*, and *S. savinensis*. The description of *S. antoni* and *S. s. cercyrae* raises this number to eight species and two additional subspecies.

The genus is West Palaearctic, being distributed over most of Europe, Turkey, North Africa, the Near East, and Iran in the Middle East. The occurrence of *S. halensis* in China (see FENG 1933: 326 and WU 1937: 210) was strongly questioned by NILSSON (1995: 54). ZIMMERMANN (1933: 187) erroneously attributed *Nebrioporus abyssinicus* (SHARP 1882) from eastern Africa (under the generic name *Deronectes*) to *Scarodytes*, a mistake which was reproduced e.g. in SCHAEFLEIN (1971: 52).

Scarodytes is chiefly characterised by a fine and dense punctation of the dorsal surface, lack of subapical elytral spines, smooth and shiny interspaces between large punctures on the venter, a single longitudinal row of punctures on the metafemora, and conjointly incised hind margins of the metacoxal processes (see Fig. 37 in NILSSON & HOLMEN 1995).

All members of *Scarodytes* are externally very similar. The ground colouration of the dorsal surface is yellowish to reddish, the pronotum usually bears two large black spots, and the elytra possess longitudinal, partly confluent black vittae. In general, *Scarodytes* resembles some representatives of the genera *Nebrioporus* RÉGIMBART 1906 and *Stictotarsus* ZIMMERMANN 1919 (in particular those of the *S. griseostriatus*-complex). However, these genera can be separated easily by the punctation and reticulation of the venter, which is distinctly reticulated between the larger punctures or very densely covered with fine punctures in *Stictotarsus* and most *Nebrioporus*, and thus appears matt. Only *N. kilimandjarensis* (RÉGIMBART 1906) and *N. melanogrammus* (RÉGIMBART 1899) have a shiny venter (M. Toledo, Torrile, Italy; publication in preparation). However, these two species are distributed far away (eastern Africa and China/northern India, respectively) from *Scarodytes*. Some representatives of *Oreodytes* SEIDLITZ 1887 also resemble *Scarodytes* but can be immediately recognised by the presence of distinct sub-lateral longitudinal grooves on each side of the pronotum.

Description of the species

Scarodytes antoni nov.sp. is described in detail below. The description chiefly relates to males, while particular female characters are presented separately. Descriptive notes on the two other species and the new subspecies are kept short by giving chiefly the differences from *S. antoni*.

***Scarodytes antoni* nov.sp.**

Deronectes (Potamonectes) halensis (FABRICIUS); MÜLLER 1926: 292 (partim).

Scarodytes savinensis ruffoi FRANCISCOLO; ANGELINI 1975: 60 (partim), 1978: 89 (partim). - FRANCISCOLO 1978: 176 (partim), 1979: 419 (partim).

Scarodytes ruffoi FRANCISCOLO; NARDI 1998: 75 (partim). - ROCCHI 2000: 13 (partim). - NILSSON 2003: 69 (partim).

Type locality: Hrvatska Republic (= Croatia), Istria, WSW Rijeka, SSW Vranja, N Boljunsko Polje, 45.2992N 14.1286E {16}.

Type material: Holotype: ♂, "8.6.2007 (HR = Croatia), Istria, WSW Rijeka, SSW Vranja, N Boljunsko Polje", "brook, 137 m, Fery leg., 45°17'57N 14°07'43"E, UTM: VL 31682 16647", "Holotype, *Scarodytes antoni* sp. n., Fery & Štastný det. 2007" [red, printed] {16} (NMW). Paratypes: Croatia: 13♂♂, 16♀♀, same data as holotype (CHF, CJS, XXX). 1♀, same data as holotype, but with additional DNA voucher reference number "MNCN-AC6" (MNCN). 1♂, "Croatia, Rabac, Mór J. 20.6.1996" {17} (CJS). 1♂, "Istr. [= Istria] Quietò [= river Mirna], 21.5.[19]33, Springer", "Tte. [= torrente = brook] Mulaz" [hw ?] {15}; "Mulaz" in Italian = "Mulec" in Croatian, a tributary of river Mirna, SW Krasica, ca. 45.37N 13.67E (MCTR). I t a l y: 1♀, "Prči Dol, bei Triest " [hw J. [G.] Müller]{14}; "Prči Dol" (Slovenian) = "Percedol" (Italian); NE Trieste, between Opicina and Monrupino, ca. 45.72N 13.80E; this should be the specimen cited in MÜLLER (1926: 292) (MCTR). 1♂, "Trieste, 10.8.1935" [hw ?], "Hydroporus halensis F." [hw ?] (MCTR). 1♂, 1♀, "Trieste, 10.8.[1]935 [hw ?]"; both specimens immature, median lobe of male strongly damaged, only apex present, but nevertheless correctly identifiable (MCTR). All paratypes provided with a red printed paratype label.

Additional material studied: Croatia: 1♂, male sex symbol, "Istr. Quietò, 24.4.[19]35, Springer" [printed except date, most probably an original Springer label], "Iugoslavia, Istria, Quietò, 1.IV.1935, leg. Springer" [label made by F. Angelini]; specimen damaged, inner parts of abdomen absent (Dermestids?) (CFA). 1♀, "Iugoslavia, Istria, Quietò, 1.IV.1935, leg. Springer" [label made by F. Angelini]; specimen strongly damaged, inner parts absent (Dermestids?) (CFA).

Description: Habitus: Body elongate oval, more or less evenly vaulted; lateral outline with a slight discontinuity in dorsal view. Dorsal surface yellowish to reddish, with black spots on head and pronotum, and vittae on elytra.

Coloration: Head and pronotum slightly more reddish yellow than elytra. Head next to inner side of each eye with a blackish spot of varying shape; spots reaching anteriorly margin of clypeus and posteriorly fused with black vertex. Pronotum with anterior margin somewhat transparent and thus appearing dark brownish since black vertex of head shining through; posterior margin narrowly blackish; disc with two large black spots, weakly variable in size; lateral rim slightly darkened, in particular posteriorly.

Elytra with suture narrowly darkened over entire length; base of elytra narrowly blackish; each elytron with up to seven dark brown to black, partly fused longitudinal vittae, however, only four of them on disc more or less complete; lateral ones considerably reduced or even absent. Three innermost vittae anteriorly shortened, only fourth vitta reaching base of elytra; second vitta anteriorly longer than first and third, first one distinctly shorter than second and third. Fifth vitta reduced to two longitudinal spots, sixth vitta reduced to a single spot beside anterior one of fourth vitta or totally absent; seventh vitta parallel to elytral margin, usually starting before elytral midlength, posteriorly fused with sixth vitta, apically not fused with ends of first, second and fourth vittae, rarely fused with end of third. First to third vittae fused shortly before and shortly behind middle of elytral length, in some specimens also fused with fourth vitta.

Ventral surface largely black; labrum, gula, sides of prosternum, prosternal process behind middle of procoxae, centre of metasternum and apical part of metacoxal processes

reddish brown; hind margins of abdominal sterna shining through, brownish; last ventrite often lighter in larger extent. Epipleura yellowish; legs predominantly reddish brown, pro- and mesotarsomeres darker brown on upper side; mesotarsomeres darkened apically. Posterior margin of profemora, and anterior margin of meso- and metafemora diffusely darkened; metatibia in posterior half darkened on upper side. Antennomeres progressively darkened apically beginning with sixth antennomere; last palpomeres darkened apically. Epipleuron yellowish in anterior half, behind slightly darkened.

Structure: Clypeus with two impressions between eyes. Base of pronotum as wide as base of elytra or rarely slightly broader; lateral margins almost evenly rounded over entire length; maximum width short before or at posterior angles; posterior angles shortly rounded. Rim at sides of pronotum distinct, broad near anterior angles, becoming smaller in posterior half (Fig. 9). Pronotum with a small and indistinct impression near each anterior angle; in posterior two thirds with a distinct longitudinal impression parallel to each side, broadened and flattened before base; between impression and side broadly bulged. These longitudinal impressions particularly deepened at outer margins of large black spots, often groove-like but never as deep and distinct as e.g. in *Oreodytes*. Elytra slightly constricted near shoulders in dorsal view, sides less rounded in anterior two thirds than behind, maximum width before midlength. Lateral margins weakly ascending to humeral angles in lateral view, epipleura visible but short before shoulders.

Prosternal process weakly vaulted between procoxae but without a distinct transverse ridge; lanceolate, with rather flat longitudinal carina, flat sides and indistinct lateral beading behind procoxae. Metacoxal lines divergent anteriorly, ending shortly before posterior margin of metaventricle (metasternum). Third antennomere slightly shorter than fourth, both shorter than second and fifth. Protibia with outer margin weakly curved outwards apically (Fig. 17), a character which separates *S. antoni* (and *S. ruffoi*) not only from *S. savinensis* but also from *S. halensis*.

Surface sculpture: Head weakly microreticulated, shiny; reticulation interspersed with sparse punctation of two different diameters; coarser punctures sparser on clypeal disc; vertex not punctured.

Surface of pronotum shiny, sides broadly appearing matt due to very strong structure; weak microreticulation present near anterior margin, absent on disc, here shiny; disc densely punctate, diameter of punctures equal to that of coarser ones on head, distance between these at most equal to their diameter; before anterior margin with a row of very coarse punctures; laterally densely punctured and irregularly wrinkled. Centre of pronotal disc in most specimens with short longitudinal scratch.

Elytra on entire surface densely and evenly punctate, punctures slightly smaller than small ones on pronotum, distance between them smaller than their diameter; nevertheless, elytra not matt but with silky shine. Each elytron with rather regular puncture line next to suture, present over entire length of elytron; five additional, mostly rather indistinct lines consisting of irregularly placed punctures: first discal line situated between first and second black vittae but present only in anterior third; second discal line more distinct than others, placed more or less on outer margin of second vitta, present until short before apex of elytron, becoming less impressed posteriorly; third discal line placed on fourth vitta, weakly impressed, disappearing behind elytral midlength; fourth line very irregular and indistinct, consisting of some punctures behind shoulders and some further ones in posterior half, placed between seventh vitta and margin of elytron.

Ventral surface without microreticulation except posterior margins of metacoxae, latter areas variable in extent. Head with gula shiny, anteriorly with some coarse punctures; genae densely covered with very small punctures, not shiny. Pronotal process between anterior margin of prosternum and procoxae very roughly sculptured, matt; behind shiny, punctation absent or indistinct. Rest of ventral surface shiny in large extent, although densely covered with large punctures, distance between punctures mostly somewhat smaller than their diameter; space between punctures smooth; a small area one each side of midline of metasternum not punctured. Punctation on middle of first and second ventrite less dense; last ventrite with particularly dense punctation near anterior margin and apically. Epipleura covered with very dense and fine punctation, appearing matt.

S e t a t i o n: Head without setae. Pronotum and elytra covered with fine, short, rather evenly distributed yellowish setae, less dense on sides of pronotum and becoming somewhat denser and longer near apex of elytra. On ventral side, lanceolate part of prosternal process with some setae beside carina; abdomen covered with indistinct, fine and sparse yellowish setae, becoming denser on last four ventrites; middle of third to fifth ventrite with some particularly long setae.

V a r i a b i l i t y: The variability of *S. antoni* mainly concerns the colouration: the spots on the head are rather variable in size (those on pronotum are surprisingly constant in size and shape); the extent of the elytral vittae towards the base varies; in particular, the lateral vittae vary strongly between (a series of) longitudinal spots and complete absence; the extent of the dark brown parts on the venter is also variable, but this may be due to various maturity stages.

♂♂: Basal three protarsomeres expanded (Fig. 23), underside provided with dense setae; mesotarsomeres expanded less than protarsomeres; protarsal claws (Fig. 26) distinctly prolonged, posterior one longer, slightly sinuate in dorsal view; in lateral view strongly curved near base and provided with a tooth, almost straight in central part and curved again at apex; anterior claw more evenly curved; mesotarsal claws only a little prolonged, evenly curved, both more or less equal in shape. Median lobe of aedeagus (Fig. 1) in ventral view evenly tapering to apex, here broadly rounded; in lateral view sinuate at apex; parameres as in Fig. 5.

♀♀: Brownish areas on ventral side often larger than in males, however, abdomen never totally reddish as e.g. in females of *S. h. halensis*. Pronotum with very weak microreticulation; punctation on elytra somewhat finer and denser, with recognisable traces of reticulation between punctures; thus females appearing slightly duller than males. Punctation on venter less impressed and sparser, particularly on metacoxae, reticulation on posterior margins of metacoxae on average more reduced, often absent. Last four ventrites at least partly with weak reticulation. Protibia somewhat narrower than in males, outer margin apically less curved (Fig. 18). Pro- and mesotarsomeres as well as pro- and mesotarsal claws not modified. Gonocoxosternum and gonocoxae as in Figs 15 and 16.

M e a s u r e m e n t s: TL: 4.1-4.5 mm, MW: 2.1-2.3 mm, TL/MW: 1.91-2.05.

M o l e c u l a r d a t a: A fragment of 480 bp of the mitochondrial gene *rrnL* (primers 16SaR - 16Sb, SIMON et al. 1994), obtained from the paratype voucher MNCN-AC6, is deposited in GenBank with accession number: EU156492

D i s t r i b u t i o n: Croatia and Italy (Fig. 29); so far only known from Istria; modern records only from the Croatian part. The locality "Prči Dol" [= "Percedol"] NE Trieste is

less than 5 km apart from the Italian-Slovenian border. Thus, it seems likely that the species occurs also in the Slovenian part of the peninsula.

E c o l o g y: Little is known about the ecology and life history of the new species. The holo- and paratypes from Boljunsko Polje were collected in fine gravel and sand near the water edge in a brook with slowly running water, little submerged vegetation and a maximum depth of ca. 50 cm at the site. It has a maximum width of about 3 m, with the bed situated between larger rocks; it appeared that the brook should have more water in spring but might dry up in summer. The specimens were collected together with *Deronectes moestus inconspicetus* (LEPRIEUR 1876), but no other Hydradephaga were present. The paratype from Rabac was found in the bed of a small brook which runs from Labin to Rabac; at the time of collecting (end of June) this brook was almost dry and consisted of only few isolated pools on limestone (J. Mór, personal communication). The brook was entirely dried-up when the senior author visited it in early June 2007.

The brook near Boljunsko Polje is a tributary of the river Boljunščica, which is seemingly canalised into tubes several kilometres more south, and lead to a power plant at Plomin Luka; the water finally flows into a gulf called "Kvarner". The small brook at Rabac also flows into the "Kvarner", and the Mirna river (= fiume Qieto) flows into the Adriatic Sea at Novigrad (= former Cittanova).

Except one male, all specimens from Boljunsko Polje were fully coloured. However, some specimens were slightly immature and thus not fully sclerotised.

D e r i v a t i o n o m i n i s: The new species is named after Anton Fery, the younger grandson of the senior author.

***Scarodytes ruffoi* FRANCISCOLO 1961**

Deronectes (Potamonectes) halensis (FABRICIUS); MÜLLER 1926: 292 (partim).

Scarodytes savinensis ruffoi FRANCISCOLO 1961: 159. - PEDERZANI 1967: 153. - ANGELINI 1975: 60 (partim). - FRANCISCOLO 1978: 176 (partim), 1979: 419 (partim).

Scarodytes ruffoi FRANCISCOLO; WEWALKA 1977: 142 (new status). - ANGELINI 1978: 89, 1984: 74, 1993: 5. - NARDI 1998: 75 (partim). - ROCCHI 2000: 13 (partim). - ROCCHI & TERZANI 2004: 210. - NILSSON 2001: 184, 2003: 69.

T y p e l o c a l i t y: Italy, Campania, Monte Picentini, Bagnoli Irpino, river Calore, ca. 40.83N 15.07E {7*}.

T y p e m a t e r i a l: Holotype and Paratypes: stored in the Museo Civico di Storia Naturale di Verona, Italy; types not studied, however, material from the locus typicus (see below).

A d d i t i o n a l m a t e r i a l s t u d i e d: I t a l y: 3 ♀♀, "Lucania, Latronico (PZ) [ca. 40.09N 16.02E], m 400, 14/7/[19]73, leg Angelini" {2*} (MNB). 4 exs., idem, (CFA). 2 exs., "Campania, monti Picentini, Bagnoli Irpino [ca. 40.83N 15.07E], m. 620 II-XII-[19]71, leg. Angelini F." {7*} (MRTO). 3 exs., "Monti Picentini, Bagnoli Irpino (AV), f. Calore m. 500, 6-8-[19]72 leg. Angelini F." {7*} (MRTO, CHF). 4 exs., "Lucania, Pescopagano (PZ) [ca. 40.84N 15.40E], lago Saetta m. 1000, 5-8-[19]72 leg. Angelini F." {6*} (CFA). 3 exs., "Parco Naz. d'Abruzzo, Pescasseroli, Fonte Aquarita, 8.VIII.72, m 1250 leg. Angelini F." {9*} (MRTO, CHF). 3 exs., "Abruzzo, Parco nazionale, Pescasseroli, sorg. f. Sangro m. 1300, 8-8-[19]72 leg. Angelini F." {9*} (MRTO, CHF). 3 exs., "Abruzzo, Pescasseroli (AQ) [ca. 41.81N 13.79E], ["F. Sangro" crossed out], 8.VIII.[19]72, m. 1300, I. Angelini F." {9*} (CFA). 3 ♀♀, "Abruzzo, 1270 m, Pescocostanzo [ca. 41.89N 14.07E], 2.VII.[19]72, leg. Angelini" {9*} (CHF). 2 ♂♂, 3 ♀♀, "24.4.[19]84 Italia, Abruzzen, Chieti, Manoppello [ca. 42.26N 14.06E], Bach, Fery leg." {11*}; found together with *S. h. halensis* (CHF). 8 ♂♂, 1 ♀, "23.3.[19]85 Italia, Abruzzen, b. Chieti, Manoppello, Bach, Fery leg."; found together with *S. h. halensis* (CHF). 1 ♂, "5.5.[19]90 Italia, Abruzzen, Chieti, Manoppello, Bach, Fery leg." (CHF).

D e s c r i p t i v e n o t e s: We have not been able to find external characters which would easily separate *S. ruffoi* from *S. antoni*. Usually, the black spots on the pronotum are smaller (Fig. 10) and more variable in size and shape in *S. ruffoi*. The females we have studied have the abdomen not mainly black but more or less dark brown or even reddish brown on the entire surface, and the brownish areas on the metacoxae and metasternum are more extended. The sublateral impressions on the pronotum are weaker, and in several specimens the prosternal process shows a weak but recognisable transversal ridge between the anterior margins of the procoxae. However, at present it is not clear whether these characters hold for all populations of *S. ruffoi*. The protibia is similar to that of *S. antoni* (Fig. 19) as the outer margin is also curved outwards at the apex in both sexes; this feature, allowing an easy separation of both species from *S. savinensis* and *S. halensis*, is reported here for the first time. **N o t e s:** The broad lateral margin of a female pronotum is shown in Fig. 5 of PEDERZANI (1990).

♂♂: Median lobe of aedeagus in ventral view slightly narrowed far before apex and parallel in apical third, apex broadly rounded (Fig. 2); parameres as in Fig. 6. Protarsal claws slightly shorter than in *S. antoni*.

♀♀: Sexual dimorphism as in *S. antoni*. Gonocoxosternum and gonocoxa more or less like in *S. antoni* (compare Figs 15 and 16). **N o t e s:** Single females cannot be separated with certainty from *S. antoni* without considering the locality.

M e a s u r e m e n t s: Neither FRANCISCOLO (1961, 1979) nor other works give morphometric measurements. We provide the following data: TL: 4.2-4.7 mm, MW: 2.15-2.4 mm, TL/MW: 1.87-1.98.

D i s t r i b u t i o n: Italy; the distribution of *S. ruffoi* is restricted to the southern and central Apennines from the Potenza province in the south to the Macerata province in the north (Fig. 29).

N o t e s: In addition to the localities listed above, we also include the following literature data in Fig. 29 (ANGELINI 1975: 60, 1978: 89, 1984: 74; PEDERZANI 1967: 153) (provinces underlined): Potenza: Terranova Pollino (39.98N 16.30E) {1*}, Cersosimo (40.05N 16.35E) {1*}, San Chirico (40.19N 16.08E) {2*}, Laurenzana (40.46N 16.00E) {4*}, Tramutola (40.32N 15.79E) {4*}, Brienza (40.49N 15.63E) {5}, Baragiano (40.68N 15.58E) {6*}, Sarnelli (40.78N 15.76E) {6*}, Muro Lucano (40.75N 15.48E) {6*}, Bella (40.75N 15.54E) {6*}, Possidente (40.74N 15.71E) {6*}; Matera: Caputo (40.32N 16.35E) {3}; Avellino: Pontoromito (40.90N 15.05E) {7*}; Caserta: Gallo (41.47N 14.23E) {8}; Isernia: Pizzone (41.67N 14.03E) {9*}; Aquila: Opi (41.78N 13.83E) {9*}, Villetta Barrea (41.77N 13.95E) {9*}; Chieti: Fara Filiorum Petri (40.25N 14.19E) {11*}; Pescara: Roccamanico (42.11N 14.01E) {10}, Farindola (42.44N 13.81E) {12*}; Teramo: Isola del Gran Sasso (42.50N 13.66E) {12*}; Perugia: Sellano (42.89N 12.93E) {13*}; Macerata: Polverina (43.09N 13.12E) {13*}.

E c o l o g y: The specimens from Manoppello were collected in a slowly running brook of ca. 1.5 m width and not more than 50 cm depth. They were found together with *Agabus biguttatus* (OLIVIER 1795), *Agabus brunneus* (FABRICIUS 1798), *Agabus didymus* (OLIVIER 1795), *Agabus paludosus* (FABRICIUS 1801), *D. moestus inconspectus*, *Hydroglyphus geminus* (FABRICIUS 1792), *Hygrotus inaequalis* (FABRICIUS 1777), *Laccophilus hyalinus* (DE GEER 1774), *Meladema coriacea* LAPORTE 1835, *Nebrioporus sansii* (AUBÉ 1838), and *S. h. halensis*. Surprisingly, females of the latter species had, in contrast to Central European populations, not a reddish but dark brown or black abdo-

men. In addition, this record is in contrast to PEDERZANI (1967: 153) who reported never to have found *S. h. halensis* in the Abruzzi.

***Scarodytes savinensis savinensis* (ZIMMERMANN 1933)**

Deronectes (Potamonectes) halensis (FABRICIUS); MÜLLER 1926: 292 (partim).

Deronectes (Scarodytes) halensis var. *savinensis* ZIMMERMANN 1933: 189.

Scarodytes savinensis (ZIMMERMANN); GUIGNOT 1957: 92 (new status, new combination). - GUÉORGUIEV 1971: 16. - WEWALKA 1977: 141 (partim). - NILSSON 2001: 184, 2003: 69 (partim).

Scarodytes savinensis savinensis ZIMMERMANN; FRANCISCOLO 1961: 159, 1978: 176, 1979: 420.

Type locality: Montenegro, Savina (monastery), ca. 2 km E Herceg Novi, ca. 42.456N 18.554E {21*}.

Type material: Lectotype (by present designation): ♂, "Savina, Paganetti" [printed], male sex symbol, "Holotypus ♂, *Scarodytes savinensis* Zimm., Zool. Staatsslg. München" [red, hw H. Schaefflein in part; unpublished and invalid designation by H. Schaefflein], "*Scarodytes savinensis* Zimm., det. Schaefflein 5/[19]69" [hw H. Schaefflein in part] "Lectotypus, *Deronectes (Scarodytes) halensis* var. *savinensis* Zimmermann, 1933, Fery des. 2006" [red, printed] (ZSM). Paralectotype: 1♂, "Savina, Paganetti" [printed], male sex symbol, "Paratypus ♂, *Scarodytes savinensis* Zimm., Zool. Staatsslg. München" [red, hw H. Schaefflein in part], "Scarodytes savinensis Zimm., det. Schaefflein 5/[19]69" [hw H. Schaefflein in part], and our red paralectotype label (ZSM).

Additional material studied: Croatia: 22♂♂, 15♀♀, "10.4.1984 (YU) Croatia, NW Herzeg Novi, SE Gruda, ca. 42.50N 18.43E, brook, Fery leg." {21*} (CHF). 1♀, "Dalmatia, Zara [= Zadar; ca. 44.11N 55.24E]" [printed] {19} (CHF). 1♀, "Croatia" (MCTR). 1♀, "Dubrovnik, 6.8.[19]68", on reverse "Zimmerman [sic!]" {20*} (CHF). Montenegro: 13♂♂, 18♀♀, "10.4.1984 (YU) Montenegro, NE Herzeg Novi, on way to Savina, ca. 42.46N 18.54E, brook, Fery leg." {21*} (CHF). 15♂♂, 6♀♀, same data, but "8.4.1985" (CHF). 10♂♂, 14♀♀, "YU. Crna Gora, Hercegnovi 26.5.[19]77, leg Wewalka" {21*} (CGW). 1♀, "Castelnuovo [= Herceg Novi], Holdhaus" [printed] {21*} (MCTR). 1♂, "Castelnuovo, Hummler" [printed] (CGW). 1♂, "10.9.2004 Montenegro, Virpazar, Orahovska river, Pešić leg. (CG12) (ca. 42.25N 19.08E)", "MNCN AC6" [DNA voucher reference number] {23} (CHF). 1♂, "Savina, Paganetti" [printed]; not designated as paralectotype, because it is not clear that Zimmermann actually studied this specimen (CGW). Greece: 1♂, "28.4.2000 GR (20) Bezirk Ioannina, SW Ioannina, W Dodona, Fluss bei Tirio", "39°31,1'N 20°41,3'E, Schillhammer, Komarek & Schönmann leg." {25} (CHF, further specimens in NMW). 3♂♂, 4♀♀, "GR. Preveza, Kanalaki [ca. 39.24N 20.60E] 8.6.[19]77, leg. Wewalka" {26*} (GGW). 6 exs., "23.4.2000 GR (7) Bezirk Ioannina, ca. 20 km NNW Thesprotiko, 3 km W Polistafilo, ca. 200 m", "39°21,5'N 20°43,2'E, Schillhammer, Komarek & Schönmann leg." {26*} (CHF, further specimens in NMW). 2♀♀, "21.4.2000 GR (2), Thesprotia, ca. 25 km SSE Paramithia, Gliki, ca. 100 m", "Quellen des Acherontas, 39°19,7'N 20°37,3'E, Schillhammer, Komarek & Schönmann leg." {26*} (CHF, further specimens in NMW). 4 exs., "23.4.2000 NW GR (6), Preveza, ca. 8 km N Thesprotico, ca. 100 m", "39°18,5'N 20°46,6'E, Fluss [= river] Schillhammer, Komarek & Schönmann leg." {26*} (CHF, further specimens in NMW). 1♂, GR 8, Epiros (PRE), Preveza, Bunà Zalongu, Bach 2 km o. [= E] Mirsini [ca. 39.13N 20.67E] QW, 78 93, 180 m, 20.05.[19]91. leg. CIT & GER. [= Gereckel]" {26*} (CHF). 8 exs., "22.4.2000 NW GR (3), Preveza, ca. 30 km NNW Preveza, ca. 100 m", "ca. 8 km NW Archangelos, 39°08,7'N 20°37,8'E, Schillhammer, Komarek & Schönmann leg." {26*} (CHF, further specimens in NMW). 3 exs., "26.4.2000 NW GR (15), Etolia-Akarnania [= Aitolia-Akarnania], NE Amphilochia, ca. 250 m", "39°01,8'N 21°18,2'E, Schillhammer, Komarek & Schönmann leg." {27} (CHF, further specimens in NMW). 1♂, "Griechenl. 3.5.[19]71, 30 km W Agrinion [ca. 38.36N 21.15E], leg. Wewalka" {28} (CGW). 1♂, "Griechenl. 4.5.[19]71, 30 km S Agrinion [ca. 38.42N 21.40E], leg. Wewalka" {29} (CGW).

Descriptive notes: *S. s. savinensis* is externally very similar to *S. antoni* and *S. ruffoi*. However, according to our studies, even the females can be separated by the shape of the protibiae which have the external side apically not curved outwards but

more or less broadly rounded in both sexes (Fig. 22; compare also Figs 20 and 21). Other characters are not as distinctive: The prosternal process shows a weak elevation between the anterior margin of the procoxae but no distinct transversal ridge. The brownish areas on the venter are in general larger but we have also seen specimens with e.g. totally black metasternum. We found that *S. s. savinensis* is more variable than both other species, perhaps due to its larger area of distribution. Besides the stronger variability of the body length (see Measurements), the black spots on the pronotum are almost as large as in *S. ruffoi* in a few specimens (Fig. 13), but in most specimens smaller than in both other species, and in some cases even as small as in *S. h. halensis* (compare Fig. 14). A few specimens even have four smaller spots similar to for *S. s. cercyrae* (compare Fig. 12). The spots on the head between the eyes are generally narrower than in the other species, and in some specimens only present as diffusely delimited, dark shadows.

N o t e s: ZIMMERMANN (1933: 189) and GUIGNOT (1957: 92) stated that the abdomen of *S. savinensis* females is black in contrast to *S. h. halensis*. WEWALKA (1977: 141) agreed but reported that the last ventrite is reddish. Among our material, however, many females, by no means immature, have the entire abdomen reddish.

Moreover, the following observations can be added:

- we have dissected all males from the localities where *S. savinensis* has been found and no *S. h. halensis* were among them;
- the last ventrite or at least its apex is brownish or even reddish in all males and females; the females from near Savina and Gruda have the rest of the abdomen coloured as follows: ca. 40 % have black ventrites with brownish translucent hind margins; ca. 30 % have black ventrites with hind margins reddish to a larger extent; ca. 10 % have the abdomen at least in part dark brownish, and the remaining 20 % have an entirely reddish abdomen;
- the abdomen becomes gradually paler in specimens stored in collections.

Thus, we conclude that *S. savinensis* and *S. h. halensis* cannot be separated on the basis of the colouration of female abdomen. Other external characters are identical in females with reddish and those with black abdomen.

♂♂: Median lobe of aedeagus (Fig. 4) in ventral view almost parallel-sided with apex sharply truncate, spatula-like; parameres as in Fig. 8. Protibia as in Fig. 22, protarsomeres as in Fig. 25; protarsal claws rather variable but mostly as in Fig. 28.

♀♀: Spots on pronotum on average smaller. Punctures on elytra slightly larger, interspaces with traces of reticulation. Protibia somewhat narrower than in males. Pro- and mesotarsomeres as well as pro- and mesotarsal claws not developed. Gonocoxosternum and gonocoxa more or less as in *S. antoni* (compare Figs 15 and 16).

M e a s u r e m e n t s: Results of morphometric measurements cannot be found in the literature. ZIMMERMANN (1933: 188, 189) gave only indirect data by providing a TL of 4-5 mm for "normal" *S. halensis* and characterising the types from Savina as "the broadest, largest [...] form [of *S. halensis*]". We measured the following values (specimens from all localities): TL: 4.15-4.8 mm, MW: 2.1-2.5 mm, TL/MW: 1.85-2.00. More detailed data for specimens from Savina and Gruda are given in Table 1.

M o l e c u l a r d a t a: A fragment of 826 bp from the 3' end of the gene *cox1* (primers Jerry - Pat, SIMON et al. 1994) and a fragment of 769 bp spanning the mitochondrial genes *rrnL* - *tRNA_{Leu}* - *NDA1* (primers 16SaR - ND1a, SIMON et al.

1994), obtained from the voucher specimen MNCN-IR135, are deposited in GenBank with accession numbers EU156490 and EU156491 respectively.

D i s t r i b u t i o n: The nominate subspecies seems to be distributed along the coast of the Ionic and Adriatic Sea from western Greece to Montenegro and Croatia until Zadar (Fig. 29). Records from the poorly explored Albania are unknown. Records from Corfu must be attributed to the new subspecies, *S. s. cercyrae*. For a record from Slovenia see the note below.

N o t e s: As in *S. ruffoi*, we have added some previously published records to the map (Fig. 29): GUIGNOT (1957: 92): Montenegro: Cattaro [= Kotor, ca. 42.42N 18.76E] {22}. FRANCISCOLO (1978: 176): Croatia: Baricevici near Zara [N Zadar, ESE Gornje Pazarište, ca. 44.62N 15.27E] {18}; Izvor Vlaha at Kolica, near Komolac ["Izvor Vlaha at Kolica" not found on any map; Komolac is a village ENE Dubrovnik, ca. 42.67N 18.14E] {20*}.

N o t e s: Franciscolo gave a Slovenian locality for *S. savinensis* in several publications. FRANCISCOLO (1961: 159) stated: "[the species has been] described by Zimmermann from a tributary of the Sava". FRANCISCOLO (1978: 176) specified it as "Slovenia, Savinija, Celje" (marked with an asterisk in Fig. 29; the Savinija river is a tributary of the river Sava (= Save)). Later on, FRANCISCOLO (1979: 420) wrote "ciò però non quadra molto con la estrema localizzazione di *savinensis* f. typ. (Savinija, Zara, Sávina) in Balcanica; resta poi inspiegabile il dato del Quieto (= Mirna) scoperto da Angelini per *ruffoi*, quindi a N del Po, a mezza via tra Alpi e Dinaridi" [≈ "this does not fit very well the extremely distributed collecting sites of *savinensis* f. typ. (Savinija, Zara, Sávina) on the Balkans; on the other hand, the record of *ruffoi* given by Angelini remains inexplicable, a locality which is situated N of the river Po, halfway between the Central Alps and the Dinarid Alps"]. Finally, FRANCISCOLO (1983: 258) concluded: "An exclusively Yugoslavian species, *Scarodytes savinensis* Zimm., known from Savinija (Celje), Izvor Vlaha (Komolac) and Savina (Hercegnovi)". We have studied thoroughly all publications of FRANCISCOLO but did not find any other hints on the origin of the Savinija locality and, in particular, not a single remark that any specimens have been collected at this locality (Zimmermann's syntypes are from Savina, a monastery near Herceg Novi in Montenegro). In addition, the Franciscolo collection (kept in the MCGE) contains only three specimens: one from Zara (leg. Müller), one from Kolice (or Kolica) and one from Komolac (latter two leg. Pretner) (personal communication by R. Poggi, MCGE). Moreover, we have never found *S. s. savinensis* in the region around Celje during several collecting trips. Thus, we have strong doubts about the Slovenian record. In our opinion, it is due to a misinterpretation of the name of the locus typicus by FRANCISCOLO (1961: 159).

E c o l o g y: The specimens collected near Savina were found in a broad brook with rather fast running water, together with *D. moestus inconspiculus*, *H. geminus* and *Nebrioporus suavis* (SHARP 1882). Specimens from near Gruda were collected in a small brook on rocky terrain with slowly running water and without any other Hydradephaga.

***Scarodytes savinensis cercyrae* nov.ssp.**

Hydroporus halensis (FABRICIUS); SAHLBERG 1903: 17. - APFELBECK 1904: 372 (partim).

Scarodytes halensis (FABRICIUS); FRANCISCOLO 1979: 417 (partim)

Scarodytes savinensis (ZIMMERMANN); WEWALKA 1977: 141 (partim). - SCHAEFLEIN 1983: 36. - PEDERZANI 1990: 50.

Type locality: Greece, Corfu (Κέρκυρα = Kérkira), ca. 2 km WSW Agheos Mattheos (or Áyios Matthaíos), ca. 39.50N 19.85E {24*}.

Type material: **Holotype:** ♂, "15.4.1984 (GR) Corfu, WSW Agheos Mattheos, kleiner Bach/Lache [= small brook/puddle], ca. 50 m, Fery leg.", "Holotype, *Scarodytes savinensis* ceryrae ssp. n., Fery & Štátný det. 2007" [red, printed] {24*}. **Paratypes:** 5♂♂, 7♀♀, same data as holotype (CHF). 3♂♂, 3♀♀, "2.8.1978 (GR) Corfu, WSW Agheos Mattheos, kleiner Bach/Lache, ca. 50 m, Fery leg." (CHF). 1♂, same data, but "13.8.1978" (CHF). 4♂♂, 3♀♀, "15.8.1979 (GR) Corfu, WSW Agheos Mattheos, kleiner Bach/Lache, Dr. E. Pfeiffer leg." (CHF). 1♂, 6♀♀, "15.4.1984 (GR) Corfu, WSW Agheos Mattheos, gravel brook, Fery leg." (CHF). 7♂♂, 5♀♀, "24.3.1985 (GR) Corfu, WSW Agheos Mattheos, kleiner Bach/Lache, ca. 50 m, Fery leg." (CHF). 6♂♂, 6♀♀, GR. Korfu, E Ag. Georgios, leg Malicky 13.6.[19]77" [ca. 39.60N 19.78E] {24*} (CGW, CHF). 6♂♂, 2♀♀, "Greece - Corfu, Dassia, 8.6.-18.6.2001, JUDr. L. Daněk lgt." [ca. 39.68N 19.83E] {24*}, "*Scarodytes savinensis* Zimm., J. Štátný det." (CJS). 1♂, "GR. Korfu (34), NE Kapschilades, leg. Malicky 24.9.[19]80" [ca. 39.75N 19.73E] {24*} (CGW). 4♂♂, 3♀♀, "GR - Korfu, Ermones, Ropa-Fluß, 10.-15.7.[19]88, leg. Wewalka (K1)" [ca. 39.61N 19.78E] {24*} (CGW). 1♂, "GR - Korfu, Bach, s. Vouniades 12.7.[19]88, leg. Wewalka (K3)" [ca. 39.51N 19.87E] {24*} (CGW). 2♂♂, 3♀♀, "GR - Korfu, Bach, ö. Kastelliani, 13.7.[19]88, leg. Wewalka (4)" [ca. 39.57N 19.87E] {24*} (CGW). 1♀, "Hummler, Corfu" [printed] (MCTR). 1♂, "Apfelbeck, Corfu" [printed] (CGW). 1♀, "Corfu, Paganetti" [printed], "12511", "*Scarodytes* ♀? *savinensis* Zimm., det. Wewalka [19]76" (MNB). 1♂, "Korfu, 5.10.[19]58, lg. Dr. Boness.", "*Scarodytes savinensis* ♂, det. H. Schaefflein", "*Scarodytes savinensis* Zim, [19]77 det. Angelini F" (CFA). **Notes:** This is the specimen cited in WEWALKA (1977: 141) and SCHAEFLEIN (1983: 36) as having been found on the roof of a car parked for one hour in the sun on the plain of Rópa (ca. 39.62N 19.80E) {24*}. All paratypes provided with a red printed paratype label.

Differential diagnosis: The new subspecies is superficially more similar to *S. h. halensis* than to the nominate subspecies *S. s. savinensis* and, thus, records of *S. h. halensis* from Corfu are not surprising (SAHLBERG 1903; APFELBECK 1904). It is characterised as follows:

- the body shape is more or less the same in both subspecies (see the TL/MW and TL-h/MW values in Table 1), however, the body size is on average smaller in the new subspecies (by ca. 6%, see Measurements and Table 1) and has more or less the same range of the TL as *S. h. halensis* (according to NILSSON & HOLMEN 1995: 3.8-4.3 mm; according to SCHAEFLEIN 1971: 4.0-4.5 mm);
- females have a totally reddish abdomen;
- the males have the black pronotal spots on average smaller (Fig. 11 and 12) and resembling typical *S. h. halensis* (compare Fig. 14; specimen from Celle, Germany, not far from the town of Halle, from which the species' name is probably derived); only a very few males of the nominate subspecies have these spots as small as those specimens from Corfu with the largest spots;
- the females from Corfu have the pronotal spots only indistinctly less extended than the males; in the nominate subspecies, however, most females have spots which are distinctly smaller than in the males, some females even as small as in those from Corfu;
- the lateral rim of the pronotum is only slightly broader than in Central European *S. h. halensis* but narrower than in most specimens of the nominate subspecies (for females compare Figs 1 and 4 in PEDERZANI 1990);
- the surface punctation is less prominent and the setation sparser and shorter; thus, the specimens appear more shiny, more or less as in typical *S. h. halensis*;

- the density of the pronotal and elytral punctation is more or less the same in both subspecies; however, in specimens from Corfu, the punctures are distinctly smaller than the distance between them, at least in the anterior half of the elytra;
- females from Corfu have the interspaces between punctures smooth, while traces of reticulation are present in the nominate subspecies;
- the punctures on the protibia are distinctly smaller in both sexes of the Corfu subspecies.

The differences between *S. s. cercyrae* and *S. antoni* as well as *S. ruffoi* are more or less the same as described above for *S. s. savinensis*.

♂♂: Median lobe of aedeagus (Fig. 3) smaller than in nominate subspecies, in ventral view slightly narrower, in lateral view more evenly curved; parameres as in Fig. 7; protibiae (Fig. 20) narrower and shorter, outer margin rounded apically as in nominate subspecies. First three protarsomeres less broadened, fifth one appearing longer than in nominate subspecies, mainly since third tarsomere shorter and covering less of fifth (Fig. 24); anterior claws (Fig. 27) more curved, thinner and shorter though rather variable in length, generally longer than in *S. h. halensis*. Mesotarsomeres at most indistinctly broadened, claws simple as in females.

♀♀: Protibia narrower than in males (Fig. 21). Protarsomeres and protarsal claws not modified. Gonocoxosternum and gonocoxa more or less like those of *S. antoni* (compare Figs 15 and 16).

M e a s u r e m e n t s: TL: 3.85-4.6 mm, MW: 2.05-2.3 mm, TL/MW: 1.88-2.02. More detailed data and a comparison with specimens of the nominate subspecies are given in Table 1.

D i s t r i b u t i o n: Greece, endemic to the island of Corfu (Fig. 29).

N o t e s: We decided conservatively to describe the Corfu population as a subspecies and not as a proper species. The study of possible mainland populations in the region of north-western Greece and Albania as well as molecular studies may prompt a change of the taxon's rank in the future.

E c o l o g y: The specimens collected near Agheos Mattheos have been found in two different brooks, one of them very small with slowly running water, the other one broad but flat, faster-running, and with the ground totally covered with gravel. In the small brook the specimens were collected together with *Agabus dilatatus* (BRULLÉ 1832), *Bidessus delicatulus* (SCHAUM 1844), *D. moestus inconspectus*, *Graptodytes fractus* (SHARP 1882), *Hydroporus jonicus* L. MILLER 1862, *L. hyalinus*, and *Melanodytes pustulatus* (ROSSI 1792). In the broad brook *S. s. cercyrae* was found together with *D. moestus inconspectus* and *G. fractus*.

D e r i v a t i o n o m i n i s: The name of the new subspecies is a noun in the genitive case, derived from Cercyra (in Greece: Κέρκυρα or Κόρκυρα), a river nymph of the Greece mythology after which the island Kérkira (= Corfu in English) has been named.

Molecular methods

The soft tissue from the specimens was digested and the DNA isolated using a standard non-destructive phenol-chloroform extraction in the laboratory of I. Ribera (MNCN,

Madrid), and stored in the DNA collection with ref. No. MNCN-AC6 (*S. antoni*) and MNCN-AI135 (*S. s. savinensis*). The extracted specimens are kept in the MNCN (with the same reference numbers). With the aim to investigate the phylogenetic relationships of the new species, the same mitochondrial genes as in RIBERA et al. (2001) were sequenced: a fragment of ca. 500 bp of 16S rRNA, and a fragment of ca. 800 bp of Cytochrome Oxidase I (COI) (see RIBERA et al. 2001 for details on the primers and sequencing conditions). Sequences were submitted to GeneBank with accession numbers EU156492 (*S. antoni*; MNCN-AC6, rrnL) and EU156490 plus EU156491 (*S. s. savinensis*; MNCN-AI135, cox1 and MNCN-AI135, rrnL respectively). The sequences were manually aligned using published sequences of the genus *Scarodytes*, and using two species of the *Stictotarsus doudecimpustulatus* group as outgroups (RIBERA et al. 2001, RIBERA & VOGLER 2004; see Fig. 30). The data matrix was analysed in PAUP 4.0 (SWOFFORD 2002) using the same procedures as in RIBERA et al. (2001).

Discussion

Scarodytes antoni, *S. ruffoi* and *S. savinensis* are three externally very similar species. The shape of the protibia is useful in separating *S. antoni* and *S. ruffoi* from *S. savinensis*. Nevertheless, the knowledge of the collecting site is rather helpful. The separation of the three species from other *Scarodytes* by external characters is also problematic, but this difficulty applies to all members of the genus. An attempt to solve these difficulties was made by PEDERZANI (1990), who studied the shape of the pronotum of females of Italian *Scarodytes*, in particular the lateral pronotal rim. In general, this rim is smaller in *S. h. halensis* and *S. nigriventris*, and broader in *S. s. savinensis*, *S. ruffoi*, *S. pederzani* and also in *S. antoni*, which was unknown to Pederzani. However, an application of Pederzani's results can sometimes fail since some individuals of all the latter four species can have an intermediate shape of the rim.

On the other hand, males of the three species considered here can be easily separated from each other and also from other members of the genus by the shape of the median lobes, which have a rather broad and very characteristically formed apex in ventral view. Molecular data also support the assumption of a particular complex within the genus (see Fig. 30) and we propose to call it *Scarodytes savinensis*-complex since *S. savinensis* is its oldest member. Males of species that do not belong to this complex have relatively uniformly shaped median lobes with sides more or less evenly tapering to the apex in ventral view (see the figures in WEWALKA 1977: 144). Safe determination of species outside the *S. savinensis*-complex is often problematic and in females sometimes impossible.

According to the known collecting data, the three species of the *savinensis*-complex prefer brooks in mountainous regions, the two eastern ones seemingly of lower altitudes. The distribution of the species complex can be called circum-Adriatic. The area of distribution of each species is well separated from the others (Fig. 29). Besides the Adriatic Sea, the plain of the river Po in northern Italy isolates *S. ruffoi* geographically from the other two species (FRANCISCOLO 1979: 420). However, to our knowledge no obvious geographic feature can explain the gap between the distribution areas of *S. antoni* and *S. savinensis*.

Zusammenfassung

Scarodytes antoni nov.sp. wird von Istrien (Kroatien, Italien) und *Scarodytes savinensis cercyrae* nov.ssp. von der Insel Korfu (Griechenland) beschrieben. Der Lectotypus von *Deronectes (Scarodytes) halensis* var. *savinensis* ZIMMERMANN 1933 wird designiert. Beide Arten gehören zusammen mit *S. ruffoi* zu einem Artenkomplex innerhalb der Gattung mit in ventraler Ansicht apikal relativ breitem Medianlobus. Für diesen Komplex wird in der vorliegenden Arbeit erstmalig der Begriff *Scarodytes savinensis*-Komplex eingeführt. Anhand der Form der Protibien – äußerer Rand apikal leicht nach außen geschwungen – lassen sich *S. antoni* und *S. ruffoi* zwar von *S. savinensis* trennen, ansonsten stimmt die externe Morphologie der Arten jedoch so stark überein, dass sich die Kenntnis des Sammelortes für eine sichere Determination – insbesondere der Weibchen – zumindest als sehr nützlich empfiehlt. Andererseits sind die Männchen aller drei Arten anhand der sehr unterschiedlichen geförmten Apizes des Medianlobus sehr leicht voneinander zu trennen, auch eine Trennung von Männchen der weiteren Arten der Gattung ist ohne weiteres möglich. Für *S. antoni* und *S. s. savinensis* liegen Ergebnisse molekulare Untersuchungen vor, die zusätzlich die Annahme eines Artenkomplexes stützen. Die Verbreitung des Artenkomplexes ist circum-adriatisch, wobei *S. ruffoi* in den zentralen und südlichen Apenninen, *S. antoni* auf der istrischen Halbinsel und *S. s. savinensis* entlang der kroatischen und montenegrinischen Adria-Küste sowie der des ionischen Meeres in Griechenland vorkommen. Die neue Subspezies *S. s. cercyrae* ist endemisch für Korfu. Einige Details über die Lebensweise werden gegeben.

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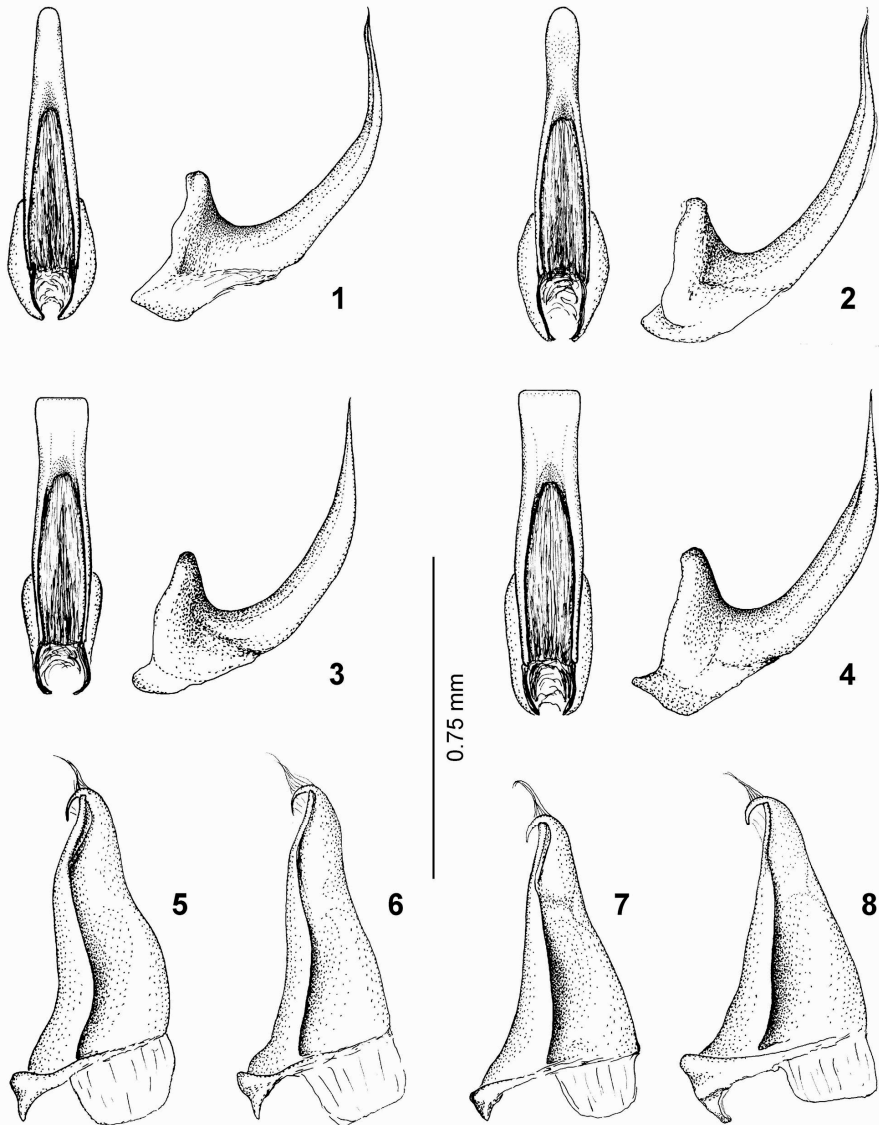
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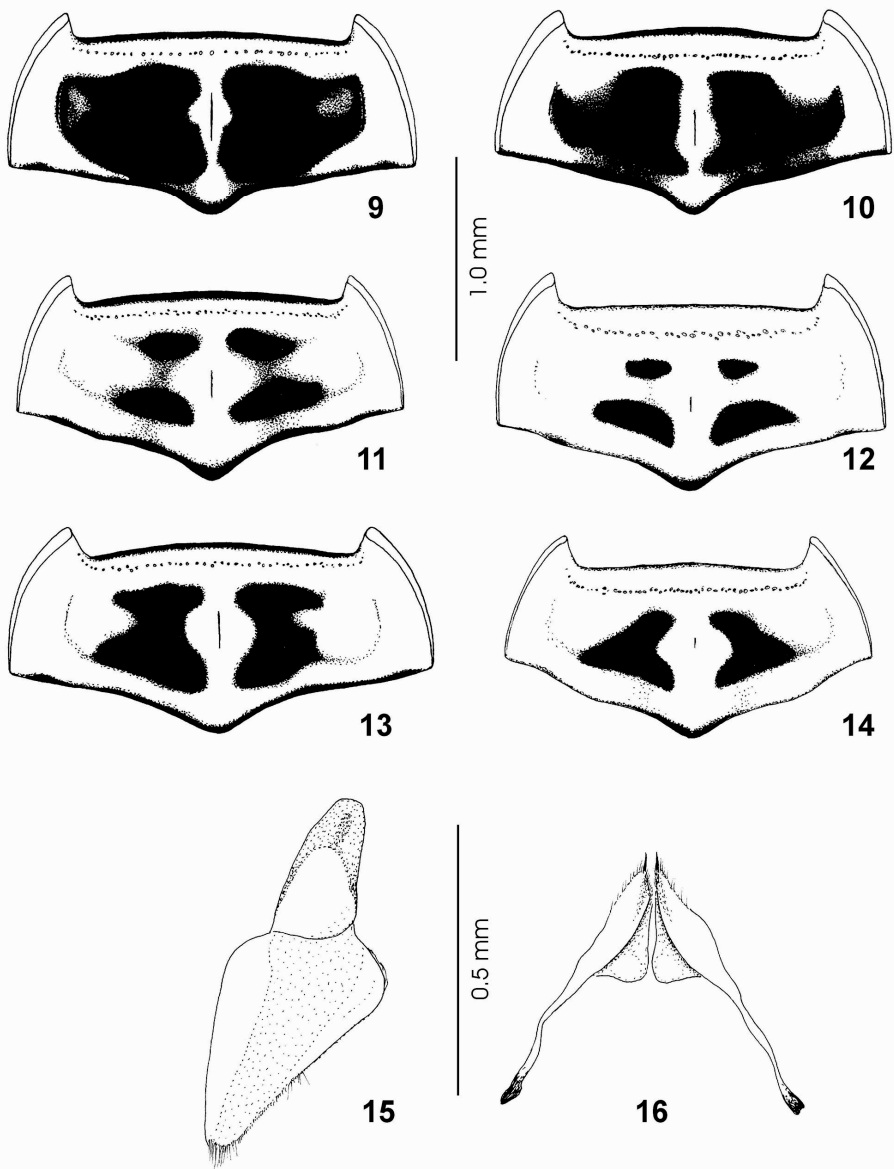
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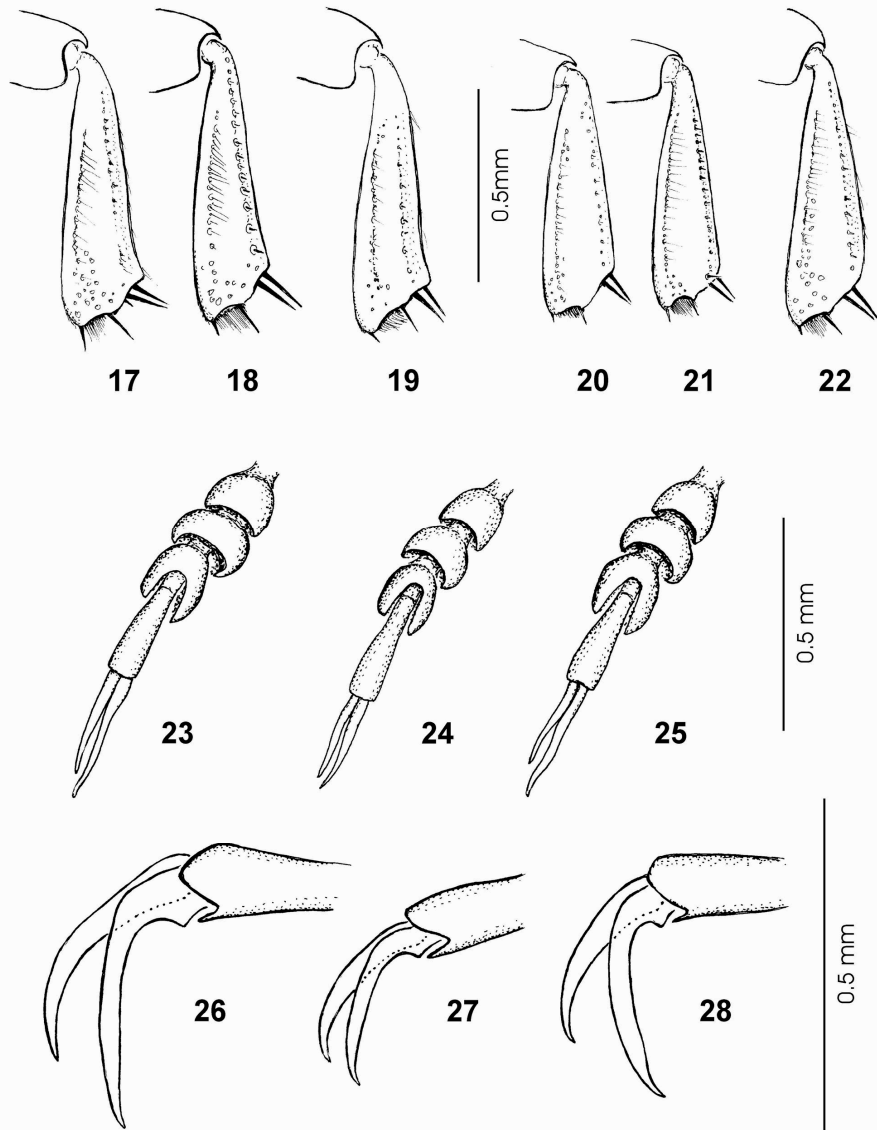
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Figs 1-4: Median lobe of aedeagus of: (1) *Scarodytes antoni* nov.sp. (holotype), (2) *S. ruffoi*, (3) *S. s. cercyrae* nov.ssp. (holotype), (4) *S. s. savinensis*. **Figs 5-8:** Parameres of: (5) *Scarodytes antoni* nov.sp. (holotype), (6) *S. ruffoi*, (7) *S. s. cercyrae* nov.ssp. (holotype), (8) *S. s. savinensis*.



Figs 9-14: Pronotum of: (9) *Scarodytes antoni* nov.sp. (holotype), (10) *S. ruffoi*, (11) *S. s. cercyae* nov.ssp. (holotype), (12) *S. s. cercyae* nov.ssp. (variant, spots reduced), (13) *S. s. savinensis*, (14) *S. h. halensis*. **Figs 15-16:** *Scarodytes antoni* nov.sp.: (15) Gonocoxosternum, (16) Gonocoxa.



Figs 17-22: Left protibia of: (17) *Scarodytes antoni* nov.sp. ♂, (18) *S. antoni* nov.sp. ♀, (19) *S. ruffoi* ♂, (20) *S. s. cercyrae* nov.ssp. ♂, (21) *S. s. cercyrae* nov.ssp. ♀, (22) *S. s. savinensis* ♂. **Figs 23-25:** Left protarsus of: (23) *Scarodytes antoni* nov.sp. ♂, (24) *S. s. cercyrae* nov.ssp. ♂, (25) *S. s. savinensis* ♂. **Figs 26-28:** Claws of left protarsus of: (26) *Scarodytes antoni* nov.sp. ♂, (27) *S. s. cercyrae* nov.ssp. ♂, (28) *S. s. savinensis* ♂ (posterior claw in front).

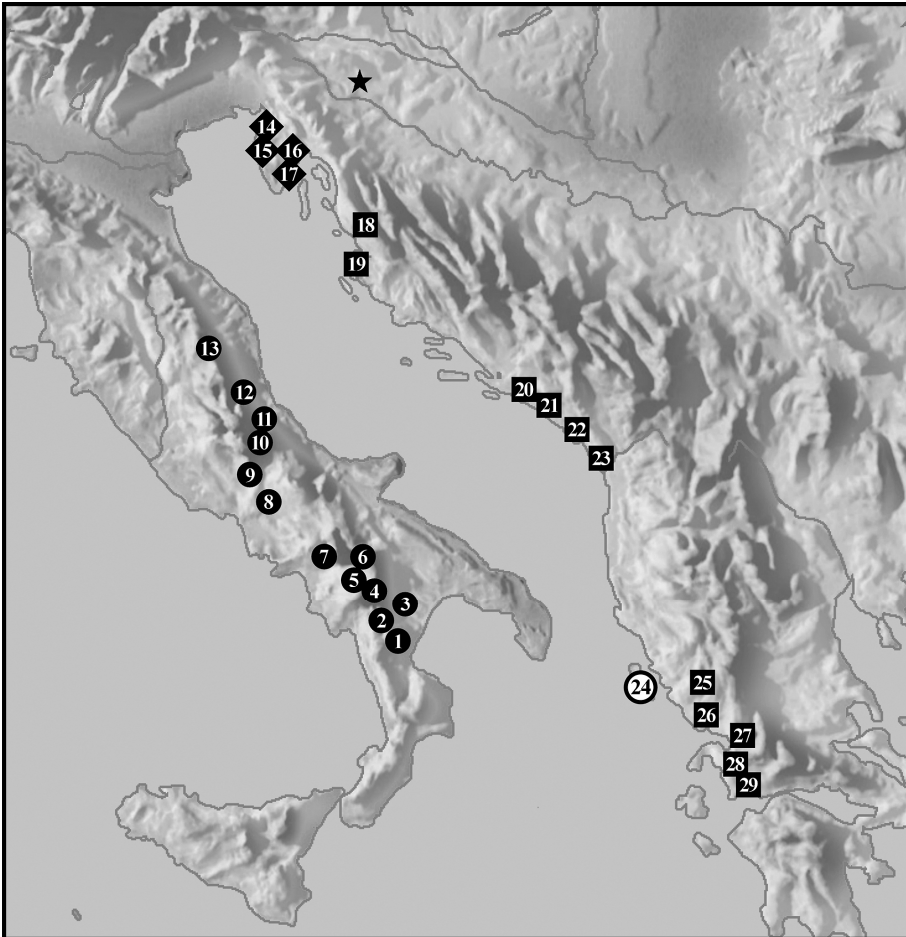


Fig. 29: Known records of *Scarodytes antoni* nov.sp. (◆), *S. ruffoi* (●), *S. s. savinensis* (■), and *S. s. cercyae* nov.ssp. (○), for the asterisk (★) see the text under *S. s. savinensis*.

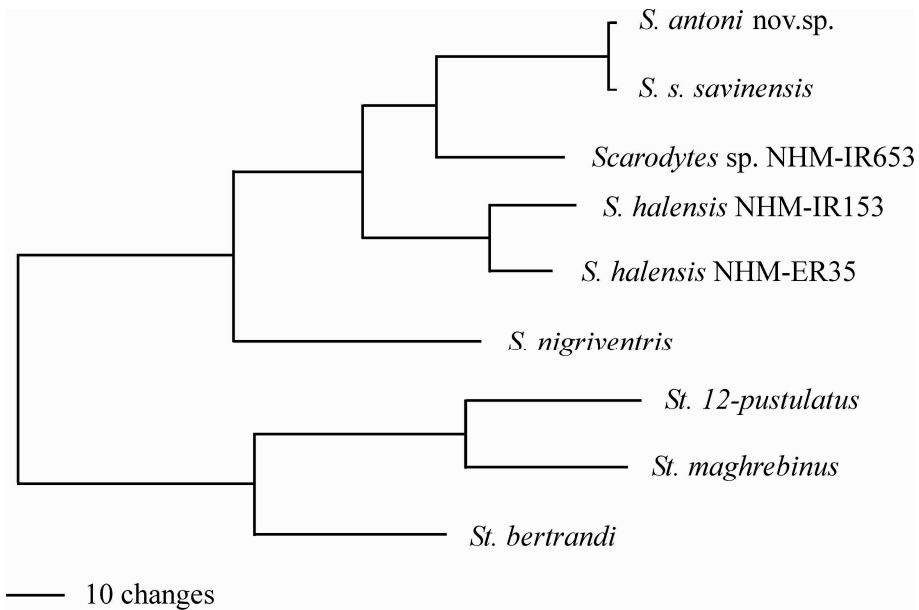


Fig. 30: Single tree obtained by parsimony analysis of the combined *cox1* and *rrnL* sequences (see Table 2).

Table 1. Morphometric characteristics of *S. s. savinensis* and *S. s. cercyrae* (given as mean \pm standard deviation with total range in brackets; **TL** = total length, **TL-h**: total length without head, **MW** = maximum width, **n** = number of specimens measured)

/	TL	TL-h	MW	TL/MW	TL-h/MW	n
Corfu (♂♂)	4.26 \pm 0.13 mm (4.0-4.5 mm)	3.85 \pm 0.13 mm (3.65-4.05 mm)	2.18 \pm 0.06 mm (2.1-2.3 mm)	1.95 \pm 0.03 (1.91-2.02)	1.77 \pm 0.02 (1.72-1.82)	22
Corfu (♀♀)	4.21 \pm 0.18 mm (3.85-4.6 mm)	3.78 \pm 0.14 mm (3.55-4.0 mm)	2.17 \pm 0.09 mm (2.05-2.3 mm)	1.94 \pm 0.03 (1.88-2.00)	1.75 \pm 0.03 (1.71-1.79)	25
Savina (♂♂)	4.49 \pm 0.12 mm (4.15-4.7 mm)	4.04 \pm 0.11 mm (3.75-4.25 mm)	2.29 \pm 0.07 mm (2.1-2.4 mm)	1.96 \pm 0.02 (1.91-2.00)	1.76 \pm 0.03 (1.70-1.82)	20
Savina (♀♀)	4.54 \pm 0.13 mm (4.3-4.75 mm)	4.10 \pm 0.10 mm (3.85-4.20 mm)	2.34 \pm 0.07 mm (2.2-2.4 mm)	1.94 \pm 0.03 (1.87-2.00)	1.76 \pm 0.02 (1.73-1.80)	20
Gruda (♂♂)	4.50 \pm 0.13 mm (4.3-4.75 mm)	4.07 \pm 0.14 mm (3.8-4.3 mm)	2.30 \pm 0.08 mm (2.15-2.4 mm)	1.96 \pm 0.03 (1.88-2.00)	1.77 \pm 0.02 (1.71-1.82)	20
Gruda (♀♀)	4.48 \pm 0.13 mm (4.3-4.8 mm)	4.11 \pm 0.16 mm (3.95-4.6 mm)	2.34 \pm 0.08 mm (2.2-2.5 mm)	1.92 \pm 0.03 (1.85-1.96)	1.76 \pm 0.05 (1.71-1.92)	15

Table 2. Specimens included in molecular analyses, with voucher reference and GenBank accession numbers (see Fig. 30).

Voucher ref.	species	country	leg.	rrnL	cox1
MNCN-AC6	<i>Scarodytes antoni</i> nov.sp.	Croatia, Istria	H. Fery	EU156492	—
MNCN-AI135	<i>Scarodytes s. savinensis</i>	Montenegro	V. Pesic	EU156491	EU156490
NHM-IR653	<i>Scarodytes</i> sp.	Iran, Fars	K. Elmi & H. Fery	AY250939	AY250978
NHM-IR153	<i>Scarodytes halensis</i>	Finland	T. Berendonk	AY250937	AY250976
NHM-ER35	<i>Scarodytes halensis</i>	Spain, Barcelona	H. Fery	AF309248	AF309305
NHM-IR157	<i>Scarodytes nigriventris</i>	France, Corsica	I. Ribera & A. Cieslak	AY250938	AY250977
NHM-IR42	<i>Stictotarsus duodecimpustulatus</i>	Spain, Cádiz	I. Ribera	AF309247	AF309304
NHM-IR236	<i>Stictotarsus maghrebinus</i>	Morocco, Tioulit	I. Ribera	AY250947	AY250985
NHM-IR30	<i>Stictotarsus bertrandi</i>	Spain, León	I. Ribera	AY250946	AY250984