

Two new species of the genera *Zophosis* and *Oxycara*, and a new record of the genus *Freyula* from the Island of Socotra (Coleoptera: Tenebrionidae)*

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Abstract. *Zophosis* (*Septentriophosis*) *novaki* sp. nov. and *Oxycara* (*Symphoxycara*) *malgorzatae* sp. nov. from Socotra Island are described, figured and compared with their relatives. Besides, *Freyula psammarina psammarina* Koch, 1959 is reported from Socotra Island for the first time.

Key words. Coleoptera, Tenebrionidae, Zophosini, Opatrini, *Zophosis*, *Oxycara*, *Freyula*, taxonomy, description, new species, new record, Yemen, Socotra

Introduction

The Socotra Archipelago (Yemen) is the largest, biologically most diverse island group in the Arabian Region, with Socotra as the largest island, and is considered an insular hotspot with exceptionally high marine and terrestrial biodiversity, internationally recognized for its uniqueness (DAMME & BANFIELD 2011).

The tenebrionid fauna (Coleoptera, Tenebrionidae) of Socotra Island represents one of the most species-diverse insect groups and presently comprises 57 species of darkling beetles (PURCHART 2013, 2014), with eight endemic genera (BATELKA 2012). Some of them show distinct radiation on the island, such as *Eusyntelia* Waterhouse, 1881 (six species), *Deretus* Gahan, 1900 (seven species), *Socotralia* Novák, 2007 (seven species), and *Histeromorphus* Kraatz, 1865 (five species). A similar pattern of radiation can also be found on other islands (e.g. Canary Islands – JUAN et al. 1997; Cape Verde Islands – GEISTHARDT 1988). Darkling beetles have adapted to various habitats and environmental conditions of Socotra Island.

* Results of the biodiversity research of darkling beetles on Socotra Island. Part VIII.

This paper presents descriptions of new *Zophosis* and *Oxycara* species and a new record for the genus *Freyula* Koch, 1959 discovered during biodiversity research of the Socotra Island (HÁJEK & BEZDĚK 2012), which was in part focused also on the family Tenebrionidae (e.g. PURCHART 2009, 2012; PURCHART & NABOZHENKO 2012).

In the Socotra Archipelago the genus *Zophosis* Latreille, 1802 was represented by two species, *Z. aequalis* Waterhouse, 1881 and *Z. undulata* Gahan, 1900, so far. The latter species, endemic to Abd el Kuri, belongs to the monotypic subgenus *Gahanosis* Penrith, 1983 and was redescribed by PENRITH (1983a). *Zophosis aequalis* is member of the subgenus *Oculosis* Penrith, 1977 and was redescribed by the same author (PENRITH 1983b). It is distributed throughout Socotra, Samha and Darsa Islands (SCHAWALLER 2004). Presently, thirty two subgenera of the genus *Zophosis* (a single genus in tribe Zophosini) are recognised (PENRITH 1986).

Oxycara Solier, 1835 is a widely distributed genus with most species in the Palaearctic Region (40 species and 1 subspecies), several species in the Afrotropical and one species in the Oriental Region (LÖBL et al. 2008, LILLIG 2009, WAGNER 2013). It comprises three subgenera – *Oxycara*, *Symphoxycara* Koch, 1943 and *Pleuroxycara* Koch, 1959. The latter is represented by one species in Somalia (KOCH 1959). The subgenus *Symphoxycara* was revised by LILLIG (2001) who also provided a key and drawings of male genitalia of all known species. Later, the same author (LILLIG 2009) added three new species from Oman and provided a key to the eastern species of the subgenus *Oxycara* s. str. from Egypt to Tibet. WAGNER (2013) described a further species of *Oxycara* s. str. from Oman and presented a key to the species of that subgenus occurring in Oman. Members of the genus have not been reported from the Socotra Archipelago so far, and the geographically closest representatives are known from Yemen and Oman (LÖBL et al. 2008, LILLIG 2009, WAGNER 2013).

Material and methods

Terminology and body parts proportions for the description of *Zophosis novaki* sp. nov. follow PENRITH (1980) and for *Oxycara malgorzatae* sp. nov. they partly follow LILLIG (2009).

Stated lengths and widths represent the maximum values of the measured parts. Body length is the distance from the clypeus to the elytral apex with the head in its natural position. Width of the elytra is the combined maximum width of both elytra. EL – elytra length; EW – elytra width; HL – head length; HW – head width; PL – pronotum length; PW – pronotum width.

Label data are given verbatim for the type material. Name of each locality was kept as stated on locality labels and it is therefore recommended to see suggested correct spelling by BEZDĚK et al. (2012) which was also used for spelling of all localities mentioned in the text.

All specimens of the species described as new bear one printed red label: ‘HOLOTYPE [PARATYPE], *Name of species* **sp. nov.**, det. L. Purchart 2014’.

The material studied is deposited in the following collections:

- HNHM Hungarian Natural History Museum, Budapest, Hungary (Ottó Merkli);
- LPCB Luboš Purchart collection, Brno, Czech Republic;
- MNHN Muséum National d'Histoire Naturelle, Paris, France (Antoine Mantilleri);
- NMPC Národní muzeum, Prague, Czech Republic (Jiří Hájek).

The new species of *Zophosis* was compared with the following types of the species of the *Z. leonardii* group:

Zophosis leonardii Kaszab, 1972: PARATYPES: 1 ♂ 1 ♀ (HNHM), labelled: ARABIA MERID., YEMEN, leg. G. Scortecci [white, printed] // Dhamar el Beida, m. 2200, 16. IX. 1965 [white, printed] // Paratypus, 1972, *Zophosis leonardii*, Kaszab [white, red bordered, printed, handwritten].

Zophosis scortecciana Kaszab, 1979 [nom. nov. for *Z. scorteccii* Kaszab, 1972 nom. praeocc.]: PARATYPES: 1 ♂ (HNHM), labelled: ARABIA MERID., YEMEN, leg. G. Scortecci [white, printed] // Dhamar el Beida, m. 2200, 16. IX. 1965 [white, printed] // Paratypus, 1972, ♂, *Zophosis scorteccii*, Kaszab [white, red bordered, printed, handwritten]; 1 ♀ (HNHM): same data, El Siyani, m. 1800, 12. VIII. 1965.

Taxonomy

Zophosis (Septentriophosis) novaki sp. nov.

(Figs 1, 2, 7–10)

Type locality. Yemen, Socotra Archipelago, Socotra Island, Qalansiyah vill. env., northern slopes of Cheyrha Mts., ca. 12°38'50"N, 53°27'45"E, 85–592 m a.s.l.

Type material. HOLOTYPE: ♂ (NMPC): Yemen, Soqatra Is., 2003, 9-10/xii., Qalansiyah env., KHAYRHA mts., N slopes, N 12°38'50" E 53°27'45", 85-592m [GPS], D. Král lgt. [white, printed] // YEMEN - SOQOTRA 2003, Expedition; Jan Farkač, Petr Kabátek & David Král [white, printed]. PARATYPES: 1 ♀ (NMPC): same data as holotype; 2 ♀♀ (NMPC, LPCB): Yemen, Soqatra Is., WADI DENEGHEN, 27.xi.2003, 85 m, N12°36'55" E54°03'49" [GPS], D. Král lgt. [white, printed] // YEMEN - SOQOTRA 2003, Expedition; Jan Farkač, Petr Kabátek & David Král [white, printed].

Description of male holotype. Body length 6.8 mm. Body width 3.3 mm. Shape oblongate (Fig. 1). Integument black, shiny, shagreened.

Head. Labrum transverse, sparsely and shallowly punctate, anterior margin with long yellowish setae. Epistome plane shallowly emarginate anteriorly, approximately one third of head width. Clypeal sulci complete, posterior margin levels roughly with middle of eyes. Size of eyes moderate, ventral appendix about one third of length of rest of eyes. Supra-orbital edge flat. Genae in dorsal view slightly obtusangular, projecting beyond outer margin of eyes. Genal ridge distinct. Mentum transverse, with median V-shaped apical notch, anterior angles obtuse, anterolateral margins slightly emarginate. Maxillary processes of postgenal margin acute. Head dorsally with fine and dense punctures, distances between these punctures approx. as large as diameter of punctures. Antennae slender; antennomere II nearly as long as antennomere III and longer than antennomere IV; antennomeres VIII–X distinctly widened apically.

Pronotum transverse, completely bordered, punctate with fine and shallow punctures with distances between these punctures 2–3 times larger than their diameter, shagreened; anterior margin strongly sinuate; sides slightly rounded, almost straight, divergent posteriorly; anterior angles about 90°, posterior angles about 60°; pronotal base bisinuate.

Elytra without costae, glabrous, parallel-sided; punctate with punctures approximately twice larger than those on pronotum, distances between punctures 1–2 times larger than their diameter, shagreened; lateral and apical parts of elytra with strioliform granules; elytral suture flat; pseudopleural crest ventral (not visible from above), very weakly sinuate posteriorly; reflected part of elytra about half of pseudopleural width at level of abdominal ventrite II. Apical declivity oblique, weakly caudate. Pseudopleura broad, with strioliform granules, distinctly shagreened, glabrous.

Tab. 1. Differential characters to distinguish *Zophosis novaki* sp. nov. from the other species of *Zophosis leonardii*-group.

<i>Zophosis novaki</i> sp. nov.	<i>Zophosis leonardii</i> Kaszab, 1972	<i>Zophosis scortecciana</i> Kaszab, 1979
habitus of male oblong with distinctly parallel-sided elytra (Fig. 1)	habitus of male ovate with broadly rounded sides (Fig. 3)	habitus of male ovate with broadly rounded sides (Fig. 5)
EL/PL ratio: male – 3.7; females – 3.1–3.3	EL/PL ratio: 1.7–2.3	EL/PL ratio: 2.7–3.1
PW/PL ratio: male – 2.5; females – 2.4–2.5	PW/PL ratio: 1.7–2.3	PW/PL ratio: 1.6–1.9
genae slightly obtusangular	genae rounded	genae distinctly obtusangular
posterior margin of clypeal sulci in males: roughly at level of eye midlength	posterior margin of clypeal sulci in males: roughly at level of eye midlength	posterior margin of clypeal sulci in males: at level of anterior margin of eyes
posterior margin of clypeal sulci in females: roughly at level of eye midlength	posterior margin of clypeal sulci in females: at level of anterior third of eye length	posterior margin of clypeal sulci in females: at level of anterior margin of eyes
clypeal sulcus in males medially not indented	clypeal sulcus in males medially not indented	clypeal sulcus in males medially indented
antennomere II approx. as long as antennomere III and longer than antennomere IV	antennomere II approx. as long as antennomere III and longer than antennomere IV	antennomere II much shorter than antennomere III and approx. as long as antennomere IV
elytral suture flat	elytral suture slightly but distinctly raised especially at apex of elytra	elytral suture flat

Ventral part. Prosternum, hypomeron and prosternal apophysis shagreened, hypomeron wrinkled longitudinally. Prosternal process ovate, sparsely punctate, completely bordered, about one third of procoxal width, apex rounded. Mesoventrite bilevelled, without median impression; length in front of mesocoxa shorter than mesocoxal length; mesoventral apophysis bordered laterally, apex of the latter truncate, narrow, about one fourth of mesocoxal width. Metaventrite approximately as long as abdominal ventrites I and II together, with several very fine punctures; median sulcus slightly longer than one third of metaventral length. Mes- and metepisterna glabrous, inconspicuously punctate. Abdominal ventrites IV and V together about half as long as ventrites I–III; ventrite V subtruncate apically.

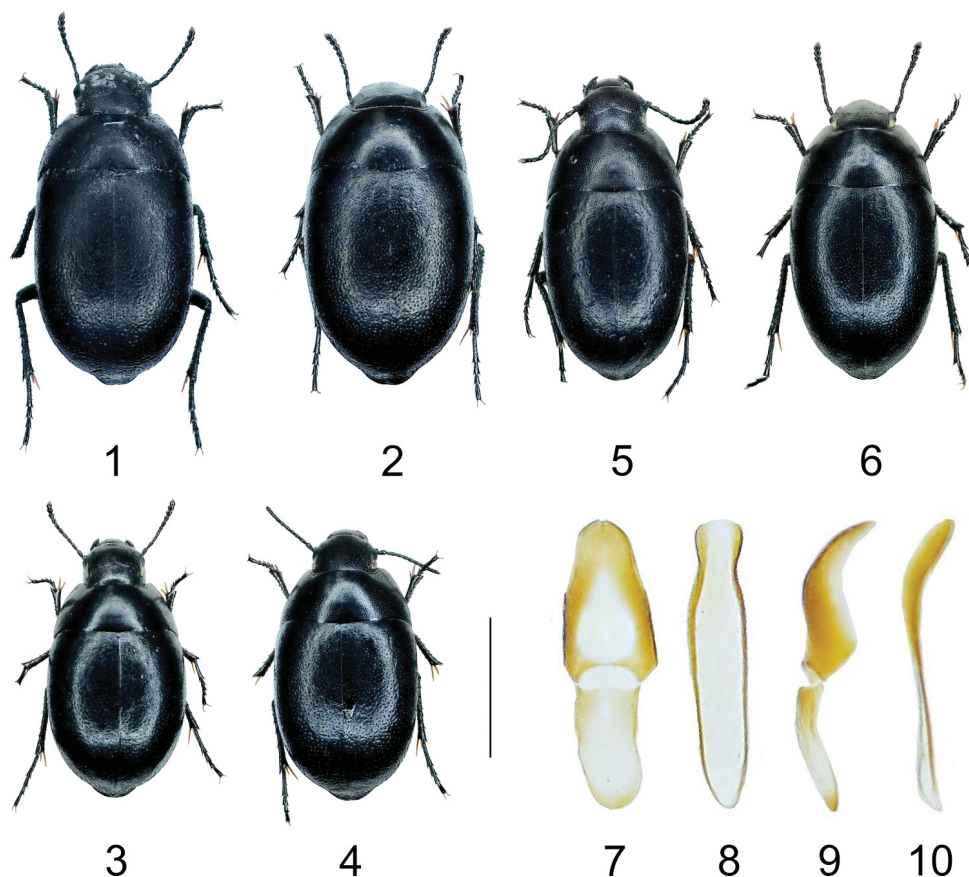
Legs. Metafemur without distinct groove on anterior surface. Protibia weakly expanded apically, outer distal angle slightly produced. Protarsomere II transverse. Calcaria surpassing apex of protarsomere I. Tarsal claws equal.

Aedeagus. Stout, well sclerotized, apex of median lobe expanded (Figs 7–10).

Female. Body length 6.5–6.7 mm. Body width 3.8–3.9 mm. Shape ovate (Fig. 2), convex. Clypeal sulci incomplete, broadly interrupted medially; posterior margin levels roughly with middle of eyes; incurved at level of about midlength of eyes. Protarsomere II not transverse.

Proportions. Male (holotype): HW/HL 1.3; PW/HW 1.7; PW/PL 2.5; EL/PL 3.7; EW/PW 1.1; EL/EW 1.4; females (paratypes): HW/HL 1.3; PW/HW 1.9–2.2; PW/PL 2.4–2.5; EL/PL 3.1–3.3; EW/PW 1.0–1.1; EL/EW 1.2–1.3.

Differential diagnosis. *Zophosis novaki* sp. nov. is characterised by the following combination of characters: outer angle of protibia simple, not produced or lobiform; plane epistome;



Figs 1–10. 1–6 – habitus of *Zophosis* in dorsal view: 1 – *Z. novaki* sp. nov., male, holotype; 2 – *Z. novaki* sp. nov., female, paratype; 3 – *Z. leonardii* Kaszab, 1972, male, paratype; 4 – *Z. leonardii*, female, paratype; 5 – *Z. scortecciana* Kaszab, 1979, male, paratype; 6 – *Z. scortecciana*, female, paratype. 7–10 – *Zophosis novaki* sp. nov., aedeagus, holotype: 7 – tegmen in ventral view; 8 – median lobe in ventral view; 9 – tegmen in lateral view; 10 – median lobe in lateral view. Scale bar = 3 mm (for habitus only).

normal slender antennae, with elongate and apically widening antennomeres covered with short setae; eyes with distinctly elongate ventral appendix (at least one fourth of length of rest of eyes); genae distinctly projecting beyond outer contour of eyes; elytra without sharp costae or without costiform lateral edge; not microgranulate or shiny gunmetal coloured integument which is uniformly black; dimorphic clypeal sulci (complete in male) with male clypeal area not occupying whole upper surface of head; maxillary processes of postgenal margin symmetrical; granulate and bare pseudopleura; pseudopleural crest ventral, not visible behind humerus and posteriorly in dorsal view; prosternum without median longitudinal sulcus; mesoventrite with distinct median longitudinal basal carina; metaventrite with median

sulcus (more than one fourth of metaventral length) and pair of distinct lateral sulci; intermetacoxal process of metaventrite not strongly produced or narrowed; mes- and metepisterna not reticulate; proepisterna smooth medially; median lobe apically swollen.

Due to the mentioned characters *Z. novaki* sp. nov. belongs to the subgenus *Septentriophosis* Penrith, 1982 and more specifically to the *Z. leonardii* species group. The group occurs in the Arabian Peninsula and so far comprised two species – *Z. leonardii* Kaszab, 1972 and *Z. scortecciana* Kaszab, 1979 (PENRITH 1984).

Etymology. I have great pleasure to name the new species in honour of Dr. Vladimír Novák (Prague, Czech Republic), specialist in Alleculinae, for his extraordinary contribution to the systematic of the family Tenebrionidae.

Remark. *Zophosis leonardii* and *Z. scortecciana* are figured in this paper for the first time (Figs 3–6).

Distribution. So far known only from two localities in northern part of Socotra Island.

***Oxycara (Symphoxycara) malgorzatae* sp. nov.**

(Figs 11–17)

Type locality. Yemen, Socotra Archipelago, Socotra Island.

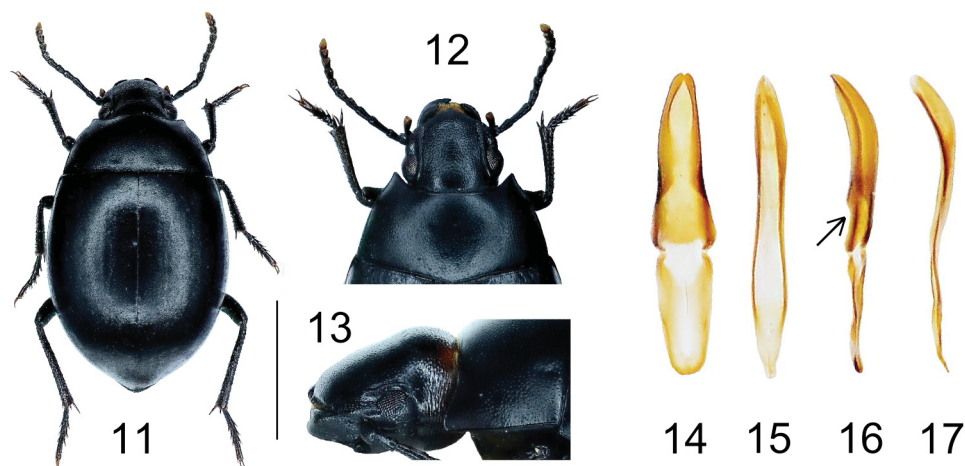
Type material. HOLOTYPE: ♂ (MNHN): Ile de SOCOTRA, 15-XI-1993, Canu Jean-Guy rec. [blue, printed] // Muséum Paris, 2001, Coll. générale [blue, printed]. PARATYPES: 1 ♂ 1 ♀ (MNHN, LPCB): same data as holotype.

Description of male holotype. Body length 6.8 mm, body width 4.0 mm. Dorsally black, dull, glabrous. Ventrally, legs and mouth parts pale brown to reddish-brown. Broad, oval (Fig. 11).

Head. Entire surface densely and roughly punctate with distances between punctures approximately as large as their diameter, shagreened (Fig. 12). Eyes slightly projecting from head convexity, not curved with genae; slightly narrowed by genae up to four ommatidia in narrowest spot. Clypeal margin ventrally with row of small teeth along its entire length, clypeal tooth projecting horizontally. Frontoclypeal suture indicated laterally. Gular furrows relatively shallow, parallel. Antennae short, shorter than width of pronotum, sparsely covered with relatively long yellowish setae. Mandibles bifid. Maxillary palpus with apical palpomere slightly widened. Mentum large, transverse, somewhat rounded laterally, apical margin sinuate, punctate with punctures finer than those on head. Submentum transverse, triangular.

Pronotum strongly transverse, approximately twice broader than long, broadest at base. Punctate with punctures finer and shallower than those on head, distances between punctures at least 2–3 times their diameter, distinctly shagreened. Sides of pronotum strongly narrowing anteriorly. Anterior margin deeply and broadly sinuate, anterior corners strongly projecting anteriorly, acute. Posterior margin with oblique sides, posterior corners nearly rectangular. Lateral and posterior margins completely, anterior margin partly bordered, obliterated in middle.

Elytra broad, with broadly rounded sides, elytral disc flat, apical declivity steep (in lateral view). Scutellum very small, triangular. Base of elytra slightly broader than pronotal base. Elytral surface very finely and shallowly punctate, punctures very small, smaller than those on pronotum and much smaller than those on head, distances between punctures at least four times larger than their diameter, shagreened. Epipleura broad, smooth; separated from elytra by complete epipleural file-like edge of elytra, not visible in dorsal view.



Figs 11–17. *Oxycara malgorzatae* sp. nov. 11 – habitus in dorsal view, holotype; 12 – head, dorsal view, holotype; 13 – head, lateral view, paratype; 14 – tegmen in ventral view; 15 – median lobe in ventral view; 16 – tegmen in lateral view (arrow indicates laterally sinuate basal part of apical piece of tegmen); 17 – median lobe in lateral view. Scale bar = 3 mm (for habitus only).

Ventral part. Prosternum, hypomeron, metaventrite and abdominal ventrites glabrous, smooth, shiny, impunctate. Prosternal apophysis narrower than strongly transverse procoxae, slightly widened posteriad, sparsely and shallowly punctate with inconspicuous punctures, hardly projecting procoxae. Mesoventral plate shiny, glabrous, impunctate, parallel-sided, slightly broader than prosternal apophysis and with distinct midlongitudinal furrow along its entire length.

Legs normally developed, without any special characters.

Male genitalia. Aedeagus simple (Figs 14–17), inverted, i.e. tegmen ventral, median lobe dorsal (cf. WATT 1974). Apical piece of tegmen gradually narrowing towards apex (in ventral view); base of apical piece sinuate laterally (visible in lateral view). Basal piece widened towards its base. Median lobe straight in basal two thirds and then moderately curved upwards (in lateral view) in apical third.

Female. Without sexual dimorphism.

Measurements and proportions. Body length 6.1–7.5 mm, body width 3.8–4.2 mm. HW/HL 1.2–1.3; PW/HW 1.7–1.8; PW/PL 2.0–2.1; EL/PL 2.8–3.2; EW/PW 1.4–1.5; EL/EW 1.1–1.2.

Differential diagnosis. Due to the file-like epipleural edge which serves as stridulatory organ, *O. malgorzatae* sp. nov. belongs to the subgenus *Symphoxycara*. On the contrary, in the subgenus *Pleuroxycara* a short file-like carina is present between epipleural and elytral edge, and in the subgenus *Oxycara* the epipleural edge is smooth, without any stridulatory organ (KOCH 1959; LILLIG 2001, 2009).

Oxycara malgorzatae sp. nov. can generally be distinguished by laterally sinuate (visible in lateral view) basal part of apical piece of tegmen (Fig. 16), which is not sinuate in

any of the known species of the subgenus *Symphoxycara* (for figures of male genitalia of all species see LILLIG 2001). Besides, from its geographically closest congeners it differs also as follows: from *O. grande* Kaszab, 1981 and *O. schawalleri* Lillig, 2001 mainly in having only four ommatidia in the narrowest part of eyes, while in the two previous species the number of ommatidia ranges between 6–9. From *O. gallagheri* Lillig, 2001 it can be distinguished by punctuation of elytra being distinctly finer than that on pronotum, while in the former species the punctuation on pronotum and elytra is identical. *Oxycara subcostatum* Guérin-Ménéville, 1962 differs from *O. malgorzatae* sp. nov. in apical piece of tegmen being almost parallel-sided, while in the new species the apical piece of tegmen is gradually narrowing towards the apex. In *O. evae* Lillig, 2001 and *O. hansbremeri* Lillig, 2001 the part where eye is in contact with tempora is angled, while in *O. malgorzatae* sp. nov. it is rounded. From *O. grimmi* Lillig, 2001 it differs in its larger size (body length more than 7.5 mm) and gradually narrowing apex of tegmen, while in the former species the apex is distinctly parallel and body length less than 7.5 mm.

Etymology. Named in memory and honour of the late colleague Małgorzata Banaszkiewicz (Warszawa, Poland).

Distribution. Yemen, Socotra Island.

New records

Freyula psammarina psammarina Koch, 1959

(Fig. 18)

Material examined (21 spec.). **YEMEN: SOCOTRA ISLAND:** Noked plain, sand dunes, N 12°2'09" E 53°01'47", 11 m, 6.–7.xii.2003, 5 spec., D. Král leg. (NMPC); Halla area, Arher, freshwater spring in sand dune, N 12°33'00", E 54°27'36", 5 m, 9.–10. + 15.vi.2012, 11 spec., L. Purchart leg. (LPCB); same data, 5 spec., J. Hájek leg. (NMPC).



Fig. 18. *Freyula psammarina psammarina* Koch, 1959, habitus in dorsal view. Scale bar = 1 mm.

Comments. The genus *Freyula* was described by KOCH (1959) from Somalia with *F. psammarina* as the type species (by monotypy). Later, KOCH (1960) added a new subspecies *F. psammarina gravitrix* Koch, 1960 from the same country. I did not study the types of *F. p. gravitrix* but I had the opportunity to compare the specimens collected on the Island of Socotra with the type series of *F. p. psammarina* deposited in the Natural History Museum in London. I found no distinct differences between the Socotran population and the nominotypical subspecies, except for the body length which is somewhat higher in specimens from Socotra (2.5–2.8 mm compared to 1.5–2.0 mm in nominotypical subspecies). Furthermore, I compared specimens from Socotra with the original description of

F. p. gravitrix and found differences between those populations that were identical with the differences described by KOCH (1960) between *F. p. gravitrix* and *F. p. psammarina*. I therefore refer specimens from Socotra to the nominotypical subspecies.

Collection circumstances. Specimens of this psammophilous species were collected on the seashore in sand between roots of halophilous plants together with members of the genera *Trachyscelis* Latreille, 1809 and *Philhammus* Fairmaire, 1871. This observation fully agrees with that of KOCH (1959) for the Somali population.

Distribution. Somalia. New record for the genus and species from the Socotra Archipelago.

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