

THE TRIBE COSSYPHODINI (COLEOPTERA: TENEBRIONIDAE: PIMELIINAE) OF THE ARABIAN PENINSULA, WITH NOTES ON BIOLOGY AND ECOLOGY

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Abstract.— *Cossyphodes asiricus* sp. nov. is described from an isolated relict mountainous forest in the Asir Mts. in south-western Saudi Arabia. This myrmecophilous species was found in a debris chamber of a *Pheidole* ant nest. It differs from the Palaearctic and adjacent Ethiopian congeners mainly by the development and orientation of the pronotal and elytral keels. *Paramellon sociale* was collected on the eastern side of the Arabian Peninsula in the United Arab Emirates in a completely different, but not isolated, and distinctly drier habitat. Both species are photographed, the localities are mapped, and some notes on biology and ecology are given.



Key words.— Coleoptera, Tenebrionidae, Pimeliinae, Cossyphodini, *Cossyphodes*, *Paramellon*, Emirates, Saudi Arabia, Asir Mountains, new species, ants, myrmecophily.

INTRODUCTION

So far, the tenebrionid tribe Cossyphodini Wasmann, 1899, with exclusively myrmecophilous and highly adapted genera and species, was mentioned from the Arabian Peninsula by a single specimen from the United Arab Emirates (Schawaller 2010), but its detailed taxonomic assignment was not given so far. Shortly after that publication, the senior author was informed by the junior authors of the first finding of this tenebrionid tribe in Saudi Arabia. Thus, we decided to publish these findings in cooperation, treating systematics (Wolfgang Schawaller) as well as biology and ecology (Mostafa R. Sharaf and Abdulrahman S.

Aldawood). The new record from Saudi Arabia turned out to be a new species of *Cossyphodes*. It was collected from the debris chamber in an ant nest of *Pheidole* sp. in an isolated, mountainous arboreal habitat in the Asir Mountains of south-western Saudi Arabia. This mountain range is well-known for its high diversity and endemism in the Arabian Peninsula. The collecting locality of *Paramellon sociale* on the eastern side of the Arabian Peninsula, in the Emirates, lies in a completely different, not isolated, and distinctly drier habitat. For collecting localities see map in Fig. 1, and for habitats see Figs. 4–5.

Since decades, the cossyphodines were classified as subfamily Cossyphodinae Wasmann, 1899 (for example Steiner 1980). The latter also proposed a phylogenetical dendrogram of the three tribes [(Esemphini ((Paramellonini) (Cossyphodini)))]. Recently, the

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former subfamily Cossyphodinae Wasmann, 1899 is considered to be only a tribe of the subfamily Pimeliinae Latreille, 1802 (Matthews *et al.* 2010). The unusual features of this group are mostly secondary adaptations to myrmecophilous habits.

Cossyphodini are speciose in tropical and southern Africa (for example Basilewski 1952, Andreae 1961, Ferrer & Collingwood 1993), single records are known also from the Socotra Archipelago (Schawaller 2006) and from India (Waterhouse 1882, Wasmann 1899). Cossyphodini species are flightless and have usually limited distribution ranges (except for *Paramellon sociale* as stated herein). The species-level taxonomy is still in an unsatisfactory state. Specimens are rarely collected, and most species are known only from their types.

Depositories:

- CRFL – Collection René Fouquè, Liberec, Czech Republic;
 NMP – National Museum (Natural History), Prague, Czech Republic;
 SMNS – Staatliches Museum für Naturkunde, Stuttgart, Germany;

SYSTEMATICS

Cossyphodes asiricus Schawaller sp. nov.

(Fig. 2)

Type material. Holotype (♀): SW Saudi Arabia, Al Baha, Wadi El Zaraeb (= Wadi Kheir), 20°03'N, 41°23'E, 2123 m, 15.V.2010, leg. M. R. Sharaf & A. S. Aldawood, SMNS.

Diagnosis. To be recognized mainly by the development and orientation of the pronotal and elytral keels (Fig. 2). The so far only known species from the Palaearctic (Macaronesian islands), *Cossyphodes wollastoni* Westwood, 1850, has, besides rudimental eyes without ocelli, the pronotum anteriorly with traces of a middle keel, the inner keel of pronotum anteriorly converging towards the middle (straight in *C. asiricus* sp. nov.), and the elytra without any inner keel and with four nearly identical and complete external keels (at base with rudimentary inner keel and external 4 keels extinguishing already in posterior third of elytra in *C. asiricus* sp. nov.). *C. asiricus* sp. nov. differs also from both known Ethiopian species according to Reichensperger (1913) and also the species key in Andreae (1961) by the dorsal keels: *C. raffrayi* Gestro, 1874 has the pronotum with a distinct middle keel (completely missing in *C. asiricus* sp. nov.), and *C. fulvus* Andreae, 1961, has the inner keel of elytra extinguished at base but distinct in posterior part of elytra (inner keel only at elytral base in *C. asiricus* sp. nov.).

Description. Body ferruginous, without colour pattern, only eyes darker. Body length 2.25 mm. Head semicircular, clypeus not separated, clypeal lines indistinct, straight; anterior and lateral margins somewhat bent upwards, frons without impression; surface with regular microgranulation, each granula with light microseta; eyes sickle-shaped, composed by 2 rows of dark and large ocelli, each row with about 6 ocelli; antennae 11-segmented with 2 large apical antennomeres forming club, as usual for the genus. Pronotum 2.2 times broader than median length, posterior corner rectangular and acute, anterior corner rounded; all margins without border; surface with same microgranulation and setation as on head, disc on each side with 3 fine longitudinal keels, without medial keel or traces of a medial keel, direction and distances of these keels see Fig. 2; prosternal process elongate triangular with protruding acute posterior angle. Elytra widest shortly before base, slightly longer than broad; each elytron with 5 keels not reaching base and tip, internal keel 1 only rudimentary at base, external keels vanishing in posterior third of elytra, direction and distances of the keels see Fig. 2; surface with the same microgranulation and microsetation as on head and pronotum; epipleura with adpressed pale microsetae, these denser and longer apically. Abdominal ventrites with regular punctation with adpressed light microsetae, these more dense and longer apically (as microsetae on adjacent epipleures). Legs without peculiarities, tarsal formula 5-4-4 as usual for the genus. Aedeagus unknown, only female available.

Etymology. Named after the Asir Mts. in southwestern Saudi Arabia as assumed distribution area of the new taxon.

Paramellon sociale Waterhouse, 1882

(Fig. 3)

? syn. *Cossyphodinus indicus* Wasmann, 1899.

Type locality. India (Bombay).

New material. India, Rajasthan, E of Pushkar, 26°29'N, 74°33'E, 480 m, 10.–11.VII.2006, leg. Z. Kejval, 2 ex. CRFL, 1 ex. SMNS. – S Iran, Fars prov., 36 km E Gav Bandi, Konardan (locality no. 309), 27°09'N, 53°20'E, 23.–24.IV.1977, Expedition National Museum Prague, 1 ex. NMP. – United Arab Emirates, Sharjah Desert Park, 25°17'N, 55°42'E, 20.X.–24.XI.2007, leg. A. van Harten (no. 8073), 1 female SMNS.

Remarks. Unfortunately, the type is not available for re-examination. So far, no newly collected specimens, neither from the type locality, nor even from India were known. Thus, we consider the new material from Rajasthan, although about 800 km away from the type locality “Bombay” (= Mumbai), as conspecific.

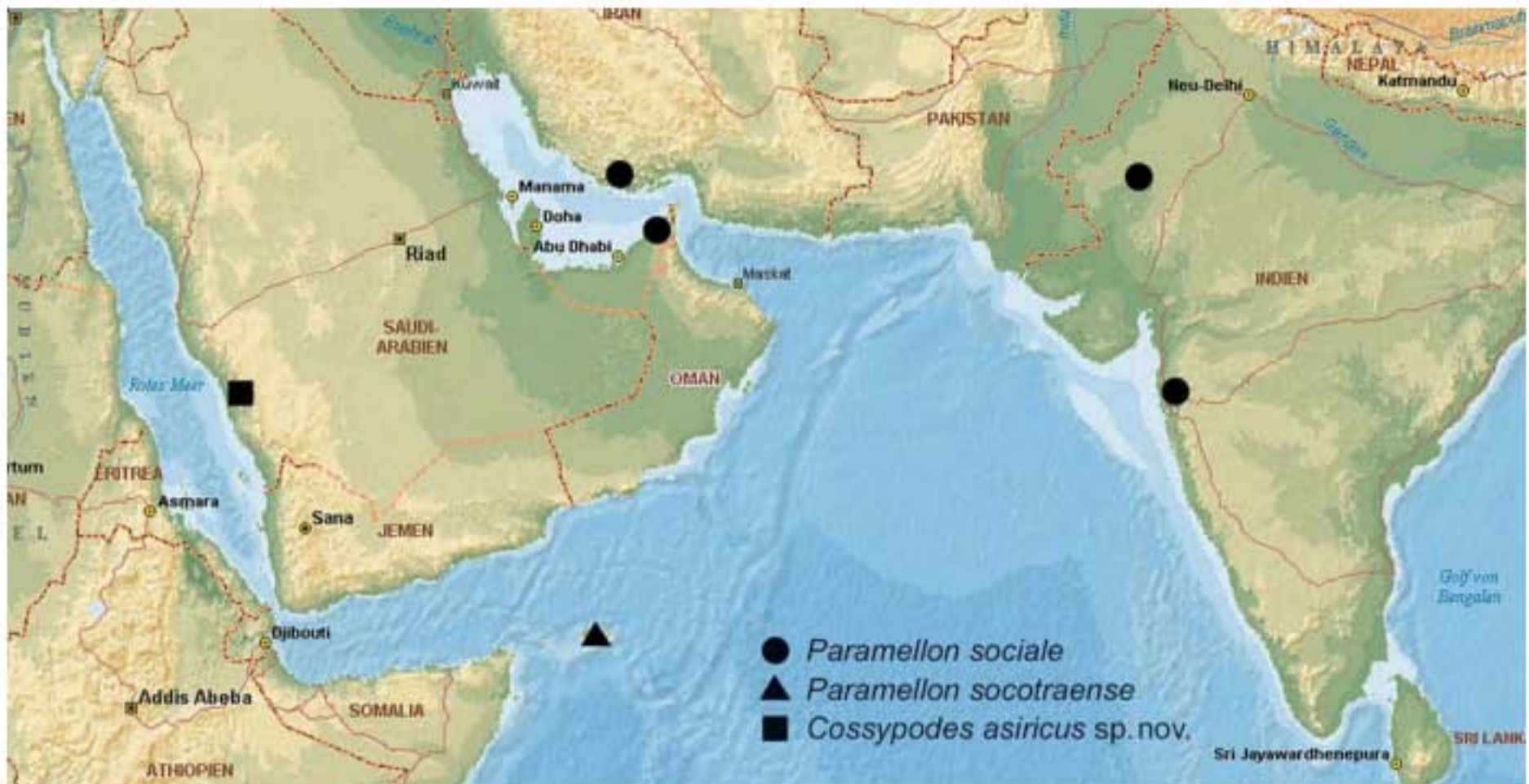
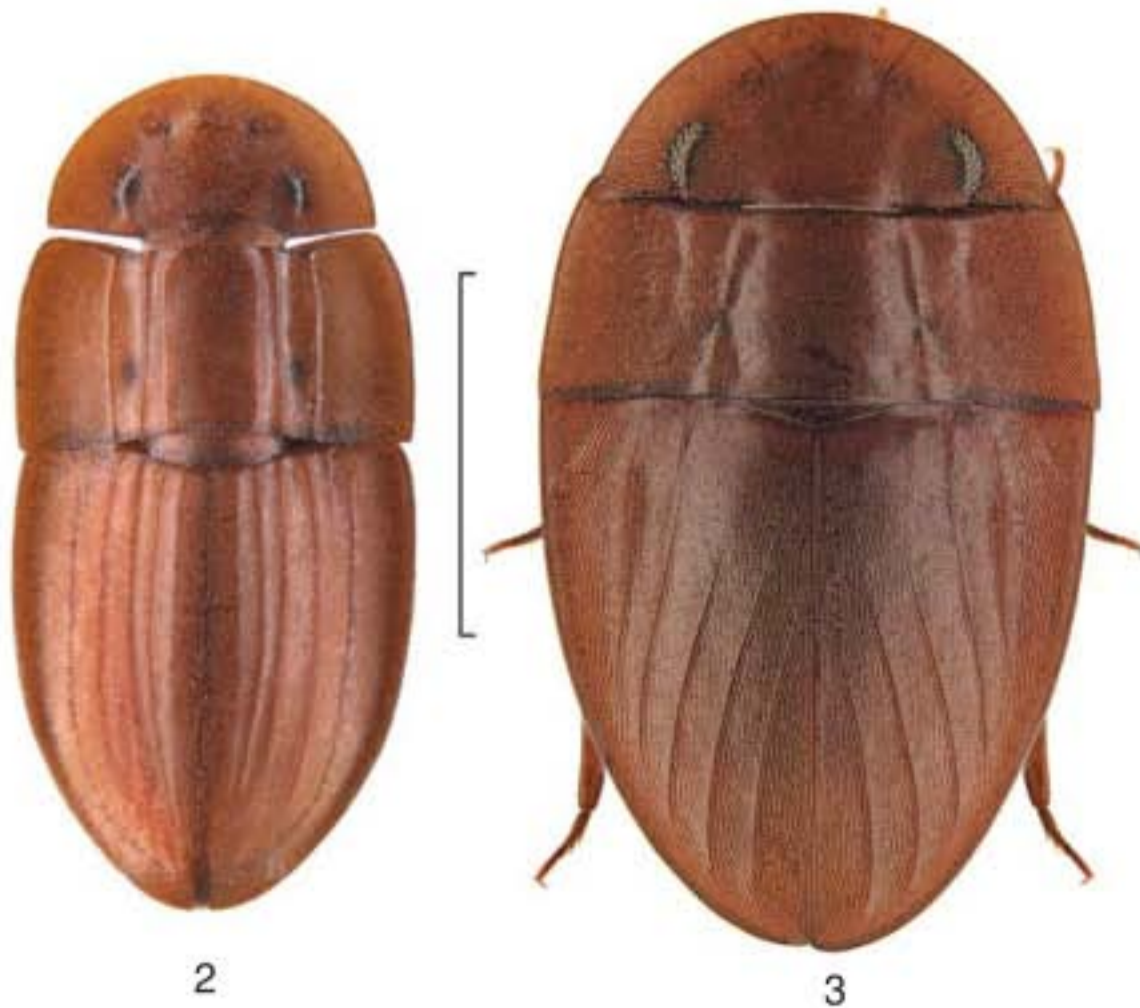


Figure 1. The known collecting localities of Cossyphodini on the Arabian Peninsula and adjacent regions (modified Microsoft map).

The specimens from southern Iran and the Arab Emirates are completely identical in all external characters with the small series from India. Generic characters of *Paramellon* Waterhouse, 1882 are the

articulation of the antenna (9-segmented with one large round apical antennomere as a club), and the number of tarsomeres (tarsal formula 5-5-4) identical in all above listed specimens.



Figures 2–3. Dorsal view of Arabian Cossyphodini. (2) *Cossypodes asiricus* sp. nov., ♀ holotype; (3) *Paramellon sociale*, ♀ non-type Emirates. Scale line: 1.0 mm.

Very probably, *Cossyphodinus indicus* Wasmann, 1899, is a junior synonym of *Paramellon sociale* Waterhouse, 1862. In the Natural History Museum Budapest a single specimen from India (Maharashtra State, Ahmednagar, leg. P. J. B. Heim) is housed, which was identified by P. Basilewsky 1960 as *Cossyphodinus indicus* Wasmann, 1899. Heim collected in India as missionary 1898–1903. This specimen from or close to the type locality of *Cossyphodinus indicus* is identical with the specimen of *Paramellon sociale*, figured herein in Fig. 3 (O. Merkl by letter).

Paramellon socotraense Schawaller, 2006, from Socotra Island was described by a single specimen. The holotype (SMNS) is quite similar externally and further specimens might confirm a synonymy with *Paramellon sociale*. At present, we consider this isolated insular species still as different from the species with, probably conjunct, "Sindo-Irano-Arabian" distributional pattern.

Distribution. NW India (type locality), S Iran (new record), United Arab Emirates (Schawaller 2010).

Mimocossyphus minor Pic, 1923

Type locality. Egypt (without detailed data).

Remarks. It is a doubtful taxon and very probably not belonging to the Cossyphodinae. Basilewski (1952) wrote about it: "Bien qu'il n'indique pas la famille où il situe ce genre, il le compare à *Cossyphodes* Westwood,, mais la description montre assez clairement que cet insecte n'appartient pas à cette famille. Je n'ai pas vu le type, qui se trouve dans la collection Alfieri, mais Mr. Pic m'écrit qu'il ne s'agit pas d'un Hétéromère, mais bien d'un Clavicorne. Ce n'est donc pas, par conséquent, un Cossyphodide".

Distribution. Egypt.

BIOLOGY AND ECOLOGY

Of *Cossyphodes asiricus* sp. nov. two individuals were collected from the debris chamber in an ant nest of *Pheidole* sp. (probably undescribed species) found under a stone. Unfortunately, one of them was broken during examination. The other specimen (the holotype) was sent to the senior author for description. The type locality lies in a neglected wadi in the El Zaraeb forest in an altitude of about 2100 m, one of several lush cloud forests in higher altitudes of the Asir Mountains. Although Al Baha is one of the most densely populated provinces in Saudi Arabia, this valley has a very low degree of environmental disturbance, because it is situated in a nearly isolated region of the rugged Asir Mountains. The habitat has an arboreal character with the most dominant tree *Juniperus procera*, associated with few scattered trees of *Olea europaea*, *Erica arborea*, and *Acacia origena* (Fig. 4).

The Asir Mountain range is the highest land in the Arabian Peninsula, which tilts from west to east. The mountains are composed mainly of sedimentary rocks (limestones, sandstones, and shales) of Jurassic, Cretaceous and lower Tertiary periods. These overlie a basement complex of Pre-Cambrian granitic igneous rocks. The climate of the region varies considerably depending on altitude, aspect and season. The highlands receive variable rainfall caused by the south-western monsoon, which brings damp oceanic winds. These winds are uplifted by the mountains and trigger thunderstorms, particularly during the summer, with most rain falling in April/May and July/August. Annual average rainfall in the Escarpment Mountains is 600–800 mm, rising to over 1000 mm in the wettest areas. The high plateau receives 300–500 mm, dropping rapidly to below 100 mm in the east. Temperatures in the

highlands are highest in the summer, reaching 20–25°C, and lowest in winter with a mean temperature of 10°C, although frosts can occur above 2000 m, and snow occasionally falls on the highest peaks (Miller 1994).

The Asir Mountain region biogeographically belongs to the Afrotropical region (Bodenheimer 1937, Nayman 1972) and the biodiversity and endemism are very high there. The flora and fauna of south-western Arabia have strong affinities with parts of Africa, particularly East Africa. Over 2000 plant species were recorded from there, 170 of which are endemics. *Juniperus procera*, found above 2000 m in the Asir Mountains, is also very abundant in, and characteristic of the East African highlands. There, it is a dominant plant in some montane or subalpine vegetation communities. According to Zohary (1973), this cloud forest type is well known in Eritrea, Somalia, Ethiopia, Kenya, and Tanzania at almost the same higher altitudes. This obviously coincides with the distributional patterns of *Cossyphodes* species, probably evolved and endemic in the isolated areas. Moreover, it is important to pay attention of the effect of the ant fauna on the occurrence and distribution of this beetle group.

The collecting locality of *Paramellon sociale*, on the eastern side of the Arabian Peninsula in the United Arab Emirates, lies in a completely different, but not isolated, and distinctly drier habitat (Fig. 5). This species has a wider distribution from north-western India to southern Iran and the Arab Emirates. The single specimen was collected by a light trap, to where it got probably by phoretic behaviour (the beetle itself is flightless). The Sharjah Desert Park (besides museum and zoo) is a considerable area of sand dunes in low altitudes near the city of Sharjah. Its sparse and fragile sand vegetation with single shrubs of *Calotropis procera* is protected since about 10 years by a fence. Otherwise this area would have been grazed by camels and goats as the surroundings. Annual average rainfall is scarce and irregular, the park area receives only 50–100 mm in winter months (December to March). Temperatures in the coastal plain reach a maximum with above 40°C in July/August.

Regularly, cossyphodines were collected under stones in a habitat, where ants of different taxa were quite abundant, but no close association with ants could be observed. The occurrence of *Cossyphodes asiricus* sp. nov. in the debris chamber of the *Pheidole* confirms Steiner's (1980) conclusion, that cossyphodines probably do not have any close association with the ants themselves (no trichomes, excavations for appendages), but are associated with the accumulated debris that the ants leave in or around their nests (flat body as armament, excavation only for the antennae).



Figures 4–5. Habitats of Arabian Cossyphodini. (4) Wadi El Zaraeb, locus typicus of *Cossyphodes asiricus* sp. nov., photo by Mostafa R. Sharaf; (5) Sharjah Desert Park, collecting locality of *Paramellon sociale*, photo by Christel Griffioen.

The type specimen of *Paramellon sociale* Waterhouse, 1882, was collected in India (Bombay), together with “ant”; that of the probable synonym *Cossyphodinus indicus* Wasmann, 1899 in India (Ahmednagar Distr. E Bombay) together with the ant *Pheidole* sp. Reichensberger (1913) recorded *Cossyphodes raffrayi* (Gestro, 1874) from nests of *Acantholepis capensis* in Ethiopia, and *Cossyphodinus beccarii* (Gestro, 1872), also in Ethiopia, with different ants as *Camponotus maculatus*, *Acantholepis capensis*, *Monomorium afrum*, and *Messor barbarus*. Other cossyphodines were collected in Africa together with ants of the genera *Bothroponera*, *Camponotus*, *Dorylus*, *Messor*, *Plagiolepis*, and *Platythyrea* (Andreae 1961, Ferrer & Collingwood 1993).

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