ACTA ENTOMOLOGICA MUSEI NATIONALIS PRAGAE
Published 17.xii.2012 Volume 52 (supplementum 2), pp. 303–314 ISSN 0374-1036

Nanocaecus hlavaci gen. & sp. nov. – first record of the tribe Gnathidiini (Coleoptera: Tenebrionidae: Diaperinae) from the Socotra Archipelago*

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Abstract. *Nanocaecus hlavaci* gen. & sp. nov. from Socotra Island is described and figured by SEM. It is the first record of the tenebrionid tribe Gnathidiini, subtribe Anopidiina from the Socotra Archipelago. The closest relatives (genera *Anopidium* Jeannel & Paulian, 1945, *Paranopidium* Dajoz, 1973) live in subterranean habitats of the mountains in eastern Africa. The new genus is very probably an old continental relict element in the island fauna. A key to the genera of the subtribe Anopidiina from Africa including Madagascar, Mauritius, Seychelles and Socotra is provided and a catalogue of the tribe Gnathidiini from that area is added.

Key words. Coleoptera, Colydiidae, Tenebrionidae, Diaperinae, Gnathidiini, Anopidiina, *Nanocaecus*, new genus, new species, taxonomy, description, key to genera, catalogue, Yemen, Socotra

Introduction

So far, darkling beetles (Coleoptera: Tenebrionidae) represent the most diverse and speciose beetle family known from the Socotra Archipelago. Kraatz (1865) was the first author publishing about Socotran Tenebrionidae and describing a new monotypic genus. Larger material was studied by Waterhouse (1881), who recorded ten species, eight of which were described as new, together with two new genera. Later, Gahan (1900) added eight new species and one new genus. The same author redescribed most of the known species (Gahan 1903), and finally Lesne (1915) described one new species. Much later, Koch (1970) summed up the knowledge about taxonomy, zoogeography and ecology of all the 20 species known from the Socotra Archipelago. The most recent comprehensive study on Socotran Tenebrionidae was

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

HÁJEK J. & BEZDĚK J. (eds.): Insect biodiversity of the Socotra Archipelago. *Acta Entomologica Musei Nationalis Pragae* **52 (supplementum 2)**: i–vi + 1–557.

presented by Schawaller (2004), who recorded 39 species (including descriptions of seven new species) from the archipelago. The same author later added a new record of the tribe Cossyphodini (Schawaller 2006). Novák (2007) established a new genus of the subfamily Alleculinae with three new species, and Novák & Purchart (2012) added further four new representatives of this subfamily. One new species was added by Purchart (2009), Lo Cascio & Grita (2011) and Purchart & Schawaller (2012), respectively. Purchart (2012) revised the genus *Deretus* Gahan, 1900 and described several new species. Purchart & Nabozhenko (2012) provided the first description of larva and pupa of the genus *Deretus*. To sum up, the tenebrionid fauna of the Socotra Archipelago presently consists of 53 species.

This paper presents the first record of the tenebrionid tribe Gnathidiini, subtribe Anopidiina from the Socotra Archipelago, being described as a new genus and a new species. The closest relatives of this taxon (genera *Anopidium* Jeannel & Paulian, 1945, *Paranopidium* Dajoz, 1973) live in subterranean habitats of the mountains in eastern Africa. Doyen & Lawrence (1979) listed the world genera of the tribe Gnathidiini (with the two subtribes Gnathidiina and Anopidiina) in the tenebrionid subfamily Diaperinae and their rough distribution in the tropics of the Old and New World. Morphological characters of the tribe were recently also treated by Matthews & Bouchard (2008). Members of this tribe are of small body size (around 2 mm), have usually a hidden, subterranean mode of life in leaf litter and rotten logs, and most species are blind and flightless. Because of several apomorphic characters, *Nanocaecus* gen. nov. is very probably an old continental relict element in the island fauna of Socotra, and not a younger immigrant to the Archipelago.

Material and methods

Material of the new species described in this paper was obtained under the research project implemented by a research team of the Mendel University in Brno (Czech Republic) (for details see Purchart 2012).

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.

The specimens used for the SEM-preparations were air-dried. The mounted material was coated with a Au/Pd layer by an Edwards S150B sputter coater and examined and photographed under a Zeiss Evo LS 15 SEM in SMNS.

Label data are given verbatim. All specimens of the type series bear one printed red label: 'HOLOTYPUS [PARATYPUS], *Nanocaecus hlavaci* gen. & sp. nov., det. W. Schawaller & L. Purchart 2011'.

The specimens studied are deposited in the following collections:

BMNH The Natural History Museum, London, United Kingdom (Maxwell V. L. Barclay);
HNHM Hungarian Natural History Museum, Budapest, Hungary (Otto Merkl);
JBCP Jan Batelka collection, Prague, Czech Republic;
LPCB Luboš Purchart collection, Brno, Czech Republic;
NMPC National Museum, Prague, Czech Republic (Jiří Hájek);
SMNS Staatliches Museum für Naturkunde, Stuttgart, Germany (Wolfgang Schawaller);
ZSMC Zoologische Staatssammlung, München, Germany (Michael Balke).

Taxonomy

Nanocaecus gen. nov.

(Figs. 1–13)

Diagnosis. Within the subtribe Anopidiina, *Nanocaecus* gen. nov. shares with *Anopidium* and *Paranopidium* the antenna with 10 antennomeres including a terminal club of 4 antennomeres, and the small but visible scutellum. For other genera see the key below. *Anopidium* can be separated by the antennomere 3 distinctly prolonged, about two times longer than antennomere 2 (contrary to antennomere 3 equal in length to antennomere 2 in *Nanocaecus* gen. nov. and *Paranopidium*); and by the round shape of pronotum and elytra combined with the pronotum widest at base (contrary to long parallel shape with the pronotum widest in the middle). In *Paranopidium* the last four antennomeres form a fused club with irregular overall setation (contrary to a compact club with terminal setation of each joint in *Nanocaecus* gen. nov.); the clypeal suture is present (absent); pronotum and elytra without any setation (with microsetae); pronotum with sinuated anterior margin and prominent anterior corners (not sinuated with rounded anterior corners); elytra with 8 irregular rows of punctures and with short scutellar striolae (with irregular punctation and without scutellar striolae); base of elytra bordered laterally (completely unbordered); meso-and metaventrite with feeble, nearly invisible punctation (with striking large but not confluent punctation); and first abdominal ventrite with finger-like apophysis between hind coxae (with broad rounded apophysis).

Type species. *Nanocaecus hlavaci* sp. nov. by present designation.

Tribal assignment. According to Doyen & Lawrence (1979) the existence of an exposed and visible membrane between clypeus and labrum, as well as the long and acuminate last maxillary palpomere are synapomorphic characters of the subtribe Anopidiina (members of the subtribe Gnathidiina have no visible membrane between clypeus and labrum, and truncate last palpomere is broadened). Four African genera of the Anopidiina (*Anopidium*, *Paranopidium*, *Peyrierasia* Dajoz, 1974, *Pseudanopidium* Dajoz, 1973) are keyed by Dajoz (1974), mainly using characters of the antennae, scutellum and body shape. However, this key is incomplete because Doyen & Lawrence (1979) subsequently added two other genera with African species to this subtribe (*Paralyreus* Grouvelle, 1918, *Tyrtaeus* Champion, 1913, see the complete key and catalogue below).

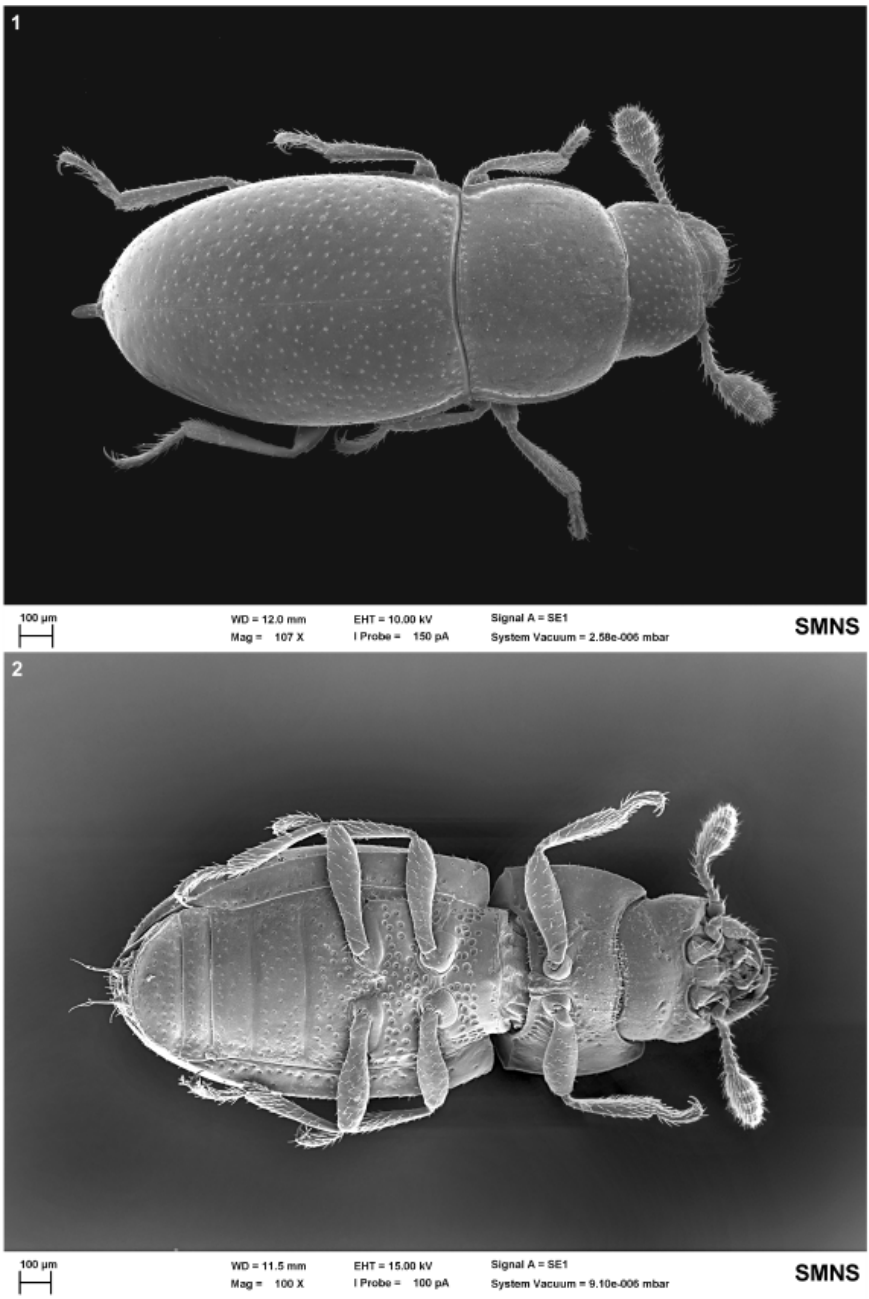
Etymology. The generic name is composed of the Latin words nanus (= dwarf) and caecus (= blind); gender masculine.

Nanocaecus hlavaci sp. nov.

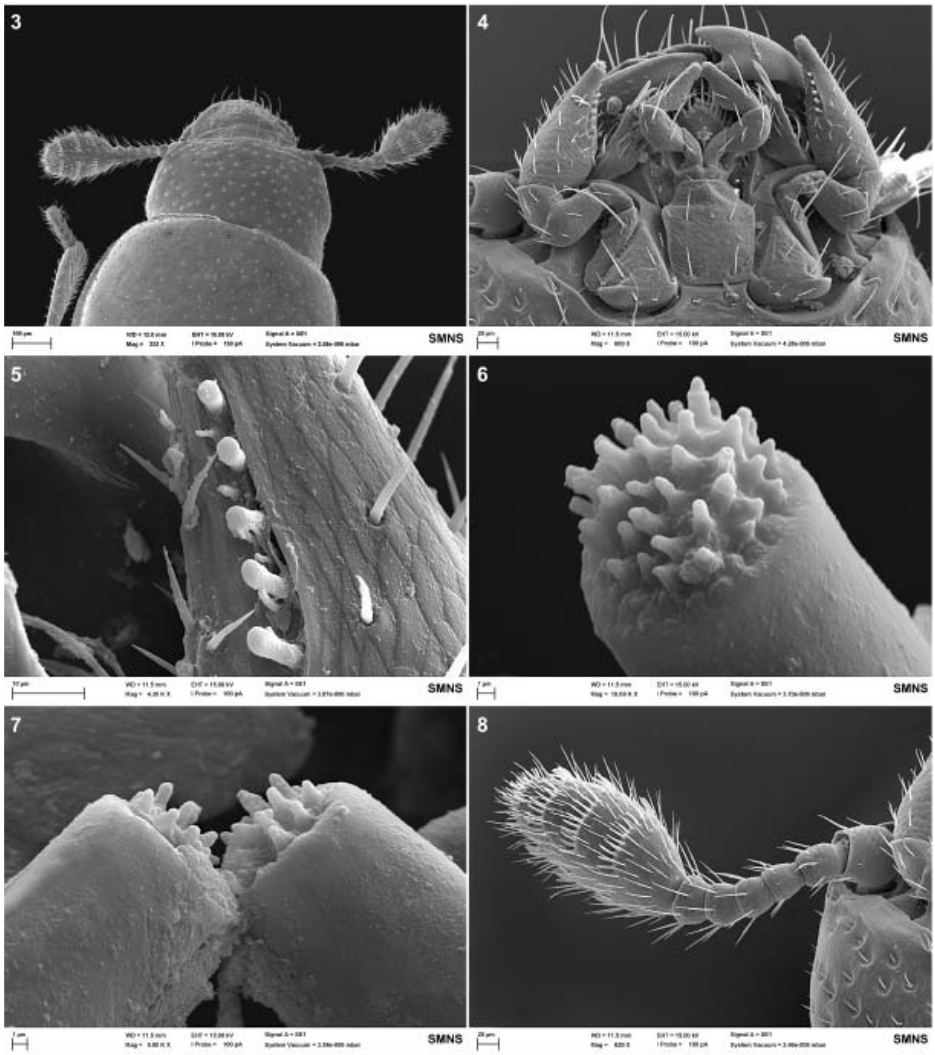
(Figs. 1–13)

Type locality. Yemen, Socotra Island, Al Haghier Mts., Scant Mt. env.

Type material. Holotype: ♂ (NMPC), labelled: YEMEN, SOCOTRA Island, Al Haghier Mts., Scant Mt. env., 1450m, 12°34.6′N, 54°01.5′E, P. Hlaváč leg., 12-13.xi.2010. Paratypes (27 specimens NMPC, 6 SMNS, 6 LPCB, 5 BMNH, 5 HNHM, 5 ZSMC): same data as holotype; (11 NMPC, 2 SMNS, 2 LPCB): same data as holotype, Jiří Hájek leg.; (11 NMPC, 2 SMNS, 2 LPCB): same data as holotype, Jan Bezděk leg.; (4 JBCP): same data as holotype, Jan Batelka leg.

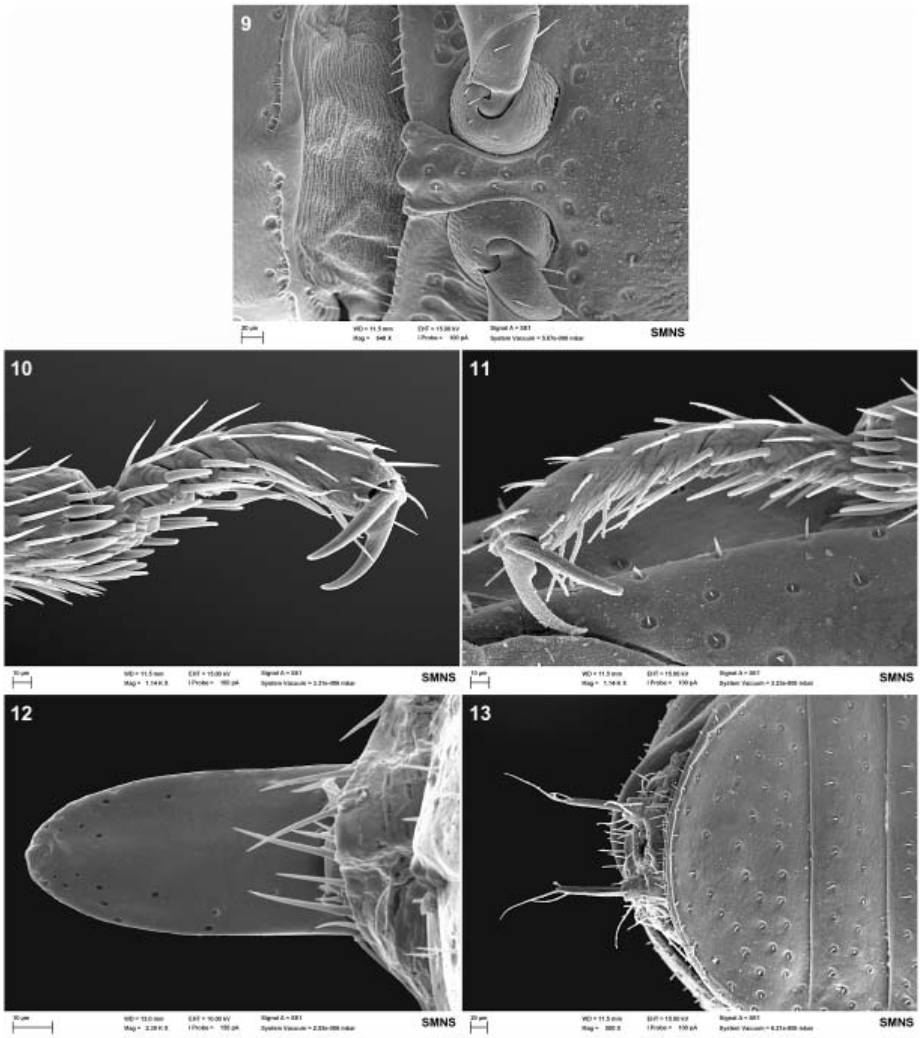


Figs. 1–2. *Nanocaecus hlavaci* gen. & sp. nov., habitus. 1 – dorsal view; 2 – ventral view.



Figs. 3–8. *Nanocaecus hlavaci* gen. & sp. nov. 3 – head, dorsal view; 4 – head, ventral view; 5 – sensillae of maxillary palpus; 6 – tip of maxillary palpus; 7 – tip of labial palpus; 8 – antenna, ventral view.

Description. Body length 1.9–2.1 mm, width of elytra 0.6 mm. Surface and all appendages unicoloured shining brown. Head without eyes, frons with regular, fine and separate punctation, each puncture bearing a small acute seta, setae distinctly longer at anterior margin of clypeus, clypeal suture absent; membrane between clypeus and labrum exposed; labrum of semicircular shape; mandibles bifid; last maxillary palpomere long oval with finger-like tip, ventrally with a row of 5 blunt sensillae, tip with field of smaller sensillae; last labial palpomere swollen in



Figs. 9–13. *Nanocaecus hlavaci* gen. & sp. nov. 9 – prosternal apophysis; 10 – protarsus; 11 – metatarsus; 12 – tip of aedeagus, dorsal view; 13 – tip of ovipositor, ventral view.

middle and tip with field of sensillae; mentum hexagonal; without transverse or medial gular impression; antenna with 10 antennomeres, antennomere 3 not prolonged, with apical four antennomeres forming dense but not fused oval club, club apically of each joint with dense and long acute setae. Pronotum with regular, fine punctation and setation similar as on head; disc without impressions, slightly convex until the lateral margin, lateral margin equally rounded and basally wider separated from disc than distally; anterior margin not sinuated and

not protruding in middle, anterior corners rounded; basal (posterior) margin feebly sinuated, basal corners rectangular; all margins unbordered, before basal margin laterally with transverse row of larger punctures; epipleura smooth and unpunctured; prosternal apophysis flat and not projected. Meso- and metaventrite with extraordinary large but not confluent punctation. Scutellum small but visible. Wings completely absent. Elytra long oval, widest before middle, surface with punctures larger than those on pronotum and head, each puncture bearing acute microsetae, punctation irregular, without any rows or traces of rows, also without scutellar striolae; base of elytra completely unbordered; in dorsal view lateral margin visible only in anterior quarter; epipleura broad in anterior three quarters, abruptly narrower in posterior quarter. Abdominal ventrites with regular and separate punctation, punctures of first ventrite as large as punctures of metaventrite, punctures bearing acute microsetae; ventrites 3/4 and 4/5 somewhat more separated than basal ventrites, but membranes between them not exposed; last ventrite of semicircular shape and regularly bordered, without any impressions or other modifications. Femora claviform, tibiae rounded without any keels, tibial spurs short; tarsal formula 5-5-4. Tip of aedeagus see Fig. 12, tip of ovipositor see Fig. 13. No distinct external sexual dimorphism.

Etymology. Named in honour of Peter Hlaváč (Košice, Slovakia), specialist of Pselaphinae and main collector of the type series.

Collection circumstances. The specimens of the type series were sifted from litter under shrubs and trees in high altitudes (above 1400 m) of the Haghier Mountains.

Distribution. So far known only from the type locality in Haghier Mountains, Socotra, Yemen.

Key to the genera of the subtribe Anopidiina from Africa including Madagascar, Mauritius, Seychelles and Socotra

1. Antenna with seven to eight antennomeres including a single terminal broadened antennomere. 2
– Antenna with ten antennomeres including a terminal club of four antennomeres. 5
2. Antenna with eight antennomeres. ..... ***Paralyreus*** Grouvelle, 1918
– Antenna with seven antennomeres. 3
3. Head with prominent or reduced eyes (about 7 ommatides). 4
– Head without any eyes (only Seychelles). ..... ***Peyrierasia*** Dajoz, 1974
4. Head with prominent eyes, body long and parallel (widespread in the tropics including Seychelles). ..... ***Tyrtaeus*** Champion, 1913
– Head with reduced eyes, body short and round (Mauritius). ..... ***Mauritianopidium*** Dajoz, 1977
5. Scutellum invisible. ..... ***Pseudanopidium*** Dajoz, 1973
– Scutellum small but visible. 6
6. Antennomere 3 distinctly prolonged, about twice as long as antennomere 2; shape of combined pronotum and elytra broadly rounded with the pronotum widest at base. ..... ***Anopidium*** Jeannel & Paulian, 1945

– Antennomere 3 equal in length to antennomere 2; shape of combined pronotum and elytra elongated with the pronotum widest in the middle. 7

7. Last four antennomeres forming a fused club with irregular overall setation; clypeal suture present; pronotum and elytra glabrous; elytra with eight irregular rows of punctures and with short scutellar striolae. ..... ***Paranopidium*** Dajoz, 1973

– Last four antennomeres forming a compact club with setation near the apex of each segment; clypeal suture absent; pronotum and elytra with microsetae; elytra with irregular punctation and without scutellar striolae. ..... ***Nanocaecus* gen. nov.**

Catalogue of the tribe Gnathidini from Africa including Madagascar, Mauritius, Seychelles and Socotra

Subtribe Gnathidiina Gebien, 1921

***Anommabates* Koch, 1956**

Anommabates griveaudi Dajoz, 1977a	Madagascar
Anommabates kochi Bremer, 1997	Madagascar
Anommabates lucidus Dajoz, 1982	Madagascar
Anommabates pauliani Koch, 1956	Madagascar
Anommabates peyrierasi Dajoz, 1982	Madagascar

***Caecochares* Koch, 1956**

Caecochares comorensis Bremer, 1992	Comoros
Caecochares cephalotes Koch, 1956	Madagascar
Caecochares descarpentriesi Ardoin, 1974	Madagascar
Caecochares endroedyi Bremer, 2000	Madagascar
Caecochares franzi Dajoz, 1972	Madagascar
Caecochares gigas Dajoz, 1972	Madagascar
Caecochares grjebinei Koch, 1956	Madagascar
Caecochares hovanus Bremer, 2000	Madagascar
Caecochares insularis Dajoz, 1977a	Madagascar
Caecochares intermedius Dajoz, 1982	Madagascar
Caecochares janaki Bremer, 2000	Madagascar
ssp. *merinaensis* Bremer, 2000	Madagascar
Caecochares kaszabi Bremer, 2000	Madagascar
Caecochares merkli Bremer, 2000	Madagascar
Caecochares meridionalis Dajoz, 1994	Madagascar
Caecochares milloti Koch, 1956	Madagascar
Caecochares pierrei Dajoz, 1972	Madagascar
Caecochares robinsoni Koch, 1956	Madagascar
Caecochares serripes Koch, 1956	Madagascar
Caecochares subpunctus Koch, 1956	Madagascar
Caecochares tibialis Bremer, 2000	Madagascar

***Gnathidium* Gebien, 1921**

Gnathidium basilewskyi Kaszab, 1956	Congo
Gnathidium cephalotes Gebien, 1921	Principe (São Tomé)
Gnathidium crassicornis Kaszab, 1956	Congo
Gnathidium decellei Bremer, 1992	Congo
Gnathidium geginati Bremer, 1997	Uganda (Ruwenzori)
Gnathidium goliath Kaszab, 1956	Congo
Gnathidium kulzeri Kaszab, 1956	Congo
Gnathidium leleupi Ardoin, 1976	Tanzania
Gnathidium parallelum Kaszab, 1956 = *Gnathidium werneri* Ardoin, 1976	Rwanda
Gnathidium sobrinum Bremer, 1997	Tanzania
Gnathidium szekessyi Kaszab, 1956	Congo
Gnathidium translucidum Ardoin, 1976	Tanzania
Gnathidium ulugurense Ardoin, 1976	Tanzania
Gnathidium zicsii Kaszab, 1969	Congo

Subtribe Anopidiina Jeannel & Paulian, 1945

***Anopidium* Jeannel & Paulian, 1945**

Anopidium conspicuum Bremer, 1998	Congo
Anopidium elgonicum Jeannel & Paulian, 1945	Uganda/Kenya (Mt. Elgon)

***Mauritianopidium* Dajoz, 1977b**

Mauritianopidium oculatum Dajoz, 1977b	Mauritius

***Nanocaecus* gen. nov.**

Nanocaecus hlavaci **sp. nov.**	Socotra Archipelago (Isl. Socotra)

***Paralyreus* Grouvelle, 1918**

Paralyreus scotti Grouvelle, 1918	Seychelles (Isl. Mahé)

***Paranopidium* Dajoz, 1973**

Paranopidium africanum Dajoz, 1973	Tanzania (Kilimanjaro)

***Peyrierasia* Dajoz, 1974**

Peyrierasia sechellensis Dajoz, 1974	Seychelles (Isl. Mahé, Isl. Praslin)

***Pseudanopidium* Dajoz, 1973**

Pseudanopidium punctatum Dajoz, 1973	Kenya (Aberdare Mts.)

***Tyrtaeus* Champion, 1913**

Tyrtaeus singularis Grouvelle, 1918	Seychelles (Isl. Mahé)

Gnathidiini *incertae sedis*

***Betschia* Dajoz, 1980**

Betschia minuta Dajoz, 1980 Madagascar

Remarks. *Betschia* was established by Dajoz (1980) as a new genus of the family Colydiidae for *Betschia minuta* Dajoz, 1980 (by monotypy). Ivie & Ślipiński (1990) transferred the genus *Betschia* from the family Colydiidae to the Tenebrionidae. *Betschia*, along with its associated family-group name Betschiini Dajoz, 1980 were included under Tenebrionidae *incertae sedis* in Bouchard et al. (2011). The latter authors mentioned that its systematic placement could be close to Gnathidiini. Members of the tribe Gnathidiini possess the tarsal formula 5-5-4 or 4-4-4 (Mathews & Bouchard 2008) while the genus *Betschia* has the tarsal formula 3-3-3. Therefore its placement remains uncertain, and for this reason it is considered here as *incertae sedis* as well.

***Mireanopidium* Dajoz, 1977b**

Mireanopidium camerunensis Dajoz, 1977b Cameroon
Mireanopidium montanum Dajoz, 1977b Cameroon
Mireanopidium distinctum Dajoz, 1977b Cameroon

Remarks. Dajoz (1977b) described two genera: the genus *Mauritianopidium* Dajoz, 1977b with species *Mauritianopidium oculatum* Dajoz, 1977b, and the genus *Mireanopidium* Dajoz, 1977b based on three species – *Mireanopidium camerunensis* Dajoz, 1977b (type species of the genus), *M. montanum* Dajoz, 1977b and *M. distinctum* Dajoz, 1977b, and placed them in the tribe Anopidiini of the family Colydiidae. The tribe Anopidiini is presently recognised as the subtribe Anopidiina of the tribe Gnathidiini in the family Tenebrionidae. While *Mauritianopidum* undoubtedly belongs to Tenebrionidae, *Mireanopidium* does not. The main reason to exclude the latter genus from Tenebrionidae is the fact that it possesses 10-segmented antenna with 3-segmented club and the tarsal formula 4-4-3. We believe that it might be a member of the family Colydiidae as originally placed by Dajoz. However, the genus was not mentioned in the catalogue of this family presented by Ivie & Ślipiński (1990), so its systematic placement is uncertain. Therefore it is considered here as *incertae sedis*.

Generic assignment unclear

Anopidium errans Pope, 1962 Tanzania (Kilimanjaro, Mt. Meru)

Remarks. The species *Anopidium errans* described by Pope (1962) was provisionally retained in the genus *Anopidium* by Bremer (1998), although he suggested, based on several morphological characters, that for this species a new genus should probably be established. To this date, no record of a transfer of *A. errans* to another (new) genus has been found in the literature, therefore this species is considered here as *incertae sedis*.

Acknowledgements

We cordially thank Karin Wolf-Schwenninger (SMNS) for technical help with the SEM and also two referees – Patrice Bouchard (Canadian National Collection of Insects, Ottawa, Canada) and Dariusz Iwan (Museum and Institute of Zoology Polish Academy of Sciences, Warszawa, Poland) for review and improving the work. This work was supported by grant of the Ministry of Education, Youth and Sport of the Czech Republic No.: LA10036/MSMT and partly also by the Research Plan of the Czech Ministry of Education MSM 6215648902.

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