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A new genus and species of the Afrotropical Platynotina from Tanzania (Coleoptera: Tenebrionidae: Pedinini)

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Abstract. *Paraselinus iwani*, a new genus and species of the subtribe Platynotina (Tenebrionidae: Tenebrioninae: Pedinini) is described from the East African mangroves of Tanzania. The prothoracic skeletal structure of this new taxon is illustrated using X-ray microtomography (microCT). Due to the total wing loss, transverse antennomeres 7–11 and specific prothoracic structure (lack of basal depressions on pronotal disc) *Paraselinus* gen. nov. is similar to *Aberlencus* Iwan, 2002, *Angolositus* Koch, 1955, *Lechius* Iwan, 1995, *Pseudoselinus* Iwan, 2002 and *Upembarus* Koch, 1956. A brief discussion on the generic relationships within the Central African Platynotina is included. An identification key to the *Paraselinus* gen. nov. and related genera is provided.

Key words. Coleoptera, Tenebrionidae, *Ectateus* generic group, *Paraselinus*, darkling beetles, taxonomy, X-ray microtomography, microCT, mangroves, Tanzania, Afrotropical Region

Introduction

According to the results of a cladistic analysis performed by Iwan (2002a) the subtribe Platynotina can be divided into three major evolutionary lineages: the melanocratoid, trigonopoid and platynotoid clades. The distribution of the first two groups seems to be mainly restricted to dry ecoregions in the southern part of the Afrotropical Region (Endrödy-Younga 1988; Iwan 1997b, 2001, 2002a; Iwan & Ferrer 2000; Iwan & Kamiński in press; Kamiński 2011; Kamiński & Raś 2012), while the representatives of the last group inhabit many different ecozones of the World (Afrotropical, Indo-Malayan, Nearctic, Neotropical and Palaearctic) (Iwan 1997a; Iwan & Bečvář 2001; Kamiński 2012, 2013a,b; Raś & Kamiński 2013).

Twenty genera representing the platynotoid lineage are known from the Central African ecosystems (Iwan 2002a,b; Kamiński & Raś 2011). Eighteen of them were classified within the *Ectateus* generic group, which was proposed by Iwan (2002a, 2003, 2004) based on the

simultaneous presence of apophyseal and basal depressions on the pronotal disc. The first of the two remaining genera, *Aberlencus* Iwan, 2002, was considered to be closely related to the previously mentioned generic complex (Iwan 2002b), while the second one, *Zidalus* Mulsant & Rey, 1853, was considered to be a sister taxon to most of platynotoid Platynotina representatives due to the fully developed wings of some of its species (Iwan 2002a).

However, a recent study of the prothoracic skeletal structure of some representatives of the *Ectateus* generic group has provided evidence that the apophyseal and basal depressions on the pronotum should be considered as two separate characters, not as one character system as it was done previously (Raś & Kamiński 2013). Based on this evidence it is possible to assume that the representatives of the Central African platyonotoid lineage forms two monophyletic groups which may be distinguished by the visibility of the basal depressions of the pronotum. Unfortunately, the above mentioned study was conducted only on a small part of the known species and genera of the platynotoid subtribe Platynotina. Therefore, this taxonomic hypothesis should undergo further testing.

During my recent studies of the Afrotropical Platynotina a new species representing a new genus of the platynotiod lineage was found and is described here. Additionally, a few remarks on the generic relationships within the Central African Platynotina are given.

Material and methods

The study was based on material from the Museum National d'Histoire Naturelle in Paris (MNHN) and the Museum für Naturkunde der Humboldt–Universität in Berlin (ZMHB).

Original label data of the analyzed specimens are indicated by quotation marks and separated by double forward slashes (//). Each line of the original label is separated by a single forward slash (/).

Images were taken using a Canon 1000D body with accordion bellows and Industar 61L/3 MC 50 mm f/2.8 lens, Hitachi S-3400N SEM and microCT Skyskan 1172 system at the Museum and Institute of Zoology of the Polish Academy of Sciences.

The procedures used during an X-ray microtomographic (microCT) analysis follows Raś & Kamiński (2013). Three transverse and one sagittal section places of the pronotum were designated for the result comparisons (Figs 16–17). Measurements of the internal prothoracic structures were restricted to the "B section" (Figs 16, 18B). To visualize the pleural apophyses in a 3D environment CTvox software was used (Figs 19–21). Terminology for the exo- and endoskletal structures follows Doyen (1966).

For examination of internal structures, specimens were dissected and whole abdomens were cleared in 10% cold potassium hydroxide overnight (Iwan 2000).

The distribution of the studied species was illustrated using DIVA-GIS version 7.5 (Hijmans et al. 2012). The raster layer used in Fig. 22 was downloaded from naturalearthdata.com ("Made with Natural Earth. Free vector and raster map data"). The division of Afrotropical Realm into ecoregions was adopted after Olson et al. (2001).

Taxonomy

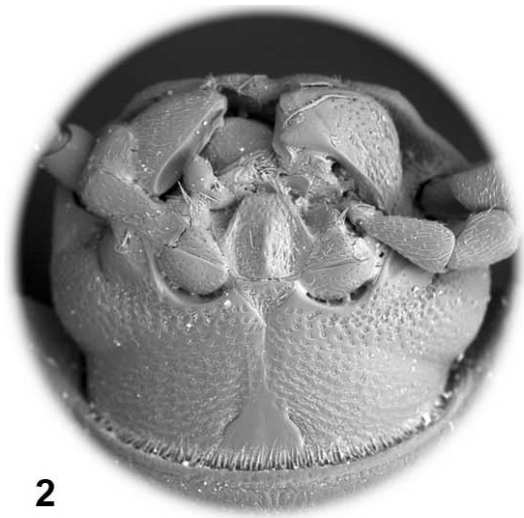
Paraselinus gen. nov.

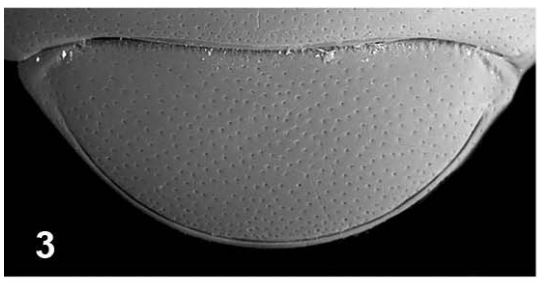
Type species. *Paraselinus iwani* sp. nov., here designated.

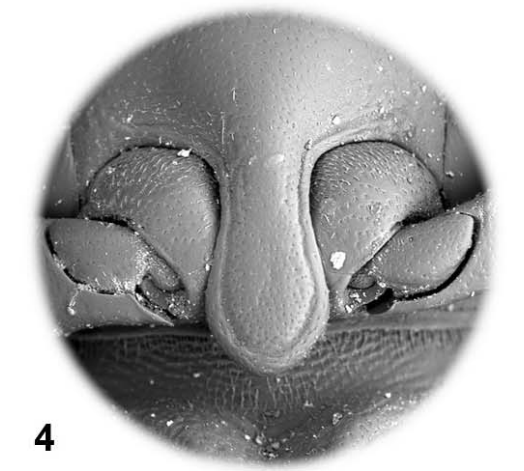
Diagnosis. The gula transformed into a stridulatory organ (Fig. 2) and the aedeagal tegmen with a pair of clavae (Fig. 6) place *Paraselinus* gen. nov. in the subtribe Platynotina.

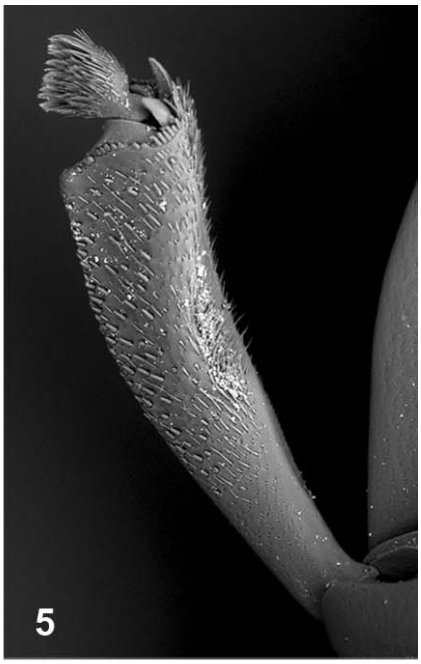
Paraselinus gen. nov. is similar to *Aberlencus*, *Angolositus* Koch, 1955, *Lechius* Iwan, 1995, *Upembarus* Koch, 1956 and *Pseudoselinus* due to total wing loss, transverse antennomeres 7–11 and the specific prothoracic structure (lack of basal depressions on the pronotal disc). It differs from *Aberlencus* and *Upembarus* by having a completely bordered 5th abdominal ventrite (Fig. 3). Moreover, it can be distinguished from *Upembarus* by having the elytral base fused with the humerus (Figs 8, 9). A lack of indentation of the apical part of the mentum (Figs 2, 10), absence of a groove below the ventral margin of the eye (Fig. 12) and lack of

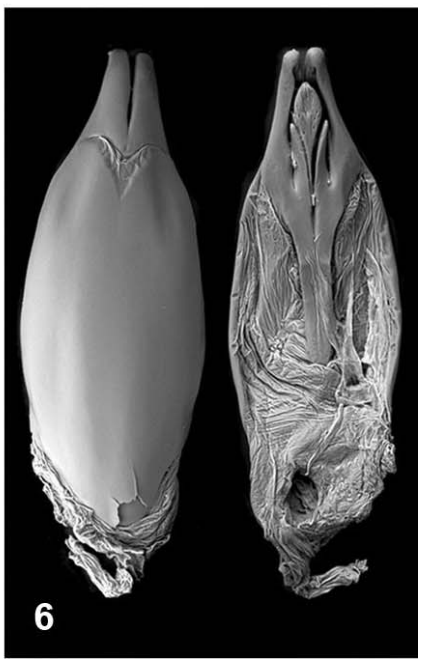
Fig. 1. Habitus of *Paraselinus iwani* gen. & sp. nov.











Figs 2–6. Chosen body elements of *Paraselinus iwani* gen. & sp. nov. 2 – head, ventral view; 3 – 5th abdominal ventrite; 4 – intercoxal process of prosternum; 5 – protibia; 6 – aedeagal tegmen.

sclerites in the bursa copulatrix (Figs 14–15), separates *Paraselinus* gen. nov. from *Angolositus*, *Lechius* and *Pseudoselinus*, respectively (Iwan 2002b, Iwan & Kamiński 2012, Kamiński 2012). Additionally, *Paraselinus* gen. nov. can be easily distinguished from the *Pseudoselinus* by the narrow intercoxal process of the prosternum (Figs 4, 7) and non-elongate mid part of the mentum apically (Figs 2, 11). *Paraselinus* gen. nov. differs from all above mentioned genera by having the basal half of the lateral pronotal margins parallel.

Description. See description for *Paraselinus iwani* sp. nov.

Etymology. A combination of *para-* (meaning "similar to") and *-selinus* (the stem of some generic names within Platynotina), in reference to a morphological similarity of this new taxon to *Pseudoselinus* Iwan, 2002. Gender masculine.

Paraselinus iwani sp. nov.

Type locality. Tanzania, Mikindani, 10°16′48.00″S, 40°6′41.00″E.

Type specimens. Holotype: ♂ (ZMHB): "D. Ostafrica / Mikindani VI.10. / H. Grote S.G.". Paratypes: 2 ♀♀ (MNHN): "TANGA / Afrique orientle Allde // MUSEUM PARIS / COLL. J. CHATANAY 1914"; ♂ (ZMHB): "Ost-Africa / Mikindani / Reimer S. Schultz T."; ♀ (ZMHB): "Ost-Afrika / Mikindani / Reimer S. Schultz T. // 74825", "Hist-Coll. (Coleoptera) / Nr. 74825 / Selinus / Zool. Mus. Berlin".

Diagnosis. See the diagnosis for the *Paraselinus* gen. nov.

Description. Habitus as in Fig. 1. Body length = 12.5–14.0 mm (Holotype length = 14.0 mm). Elytra wider and longer then pronotum (width ratio elytra / pronotum = 1.1–1.2; length ratio elytra / the middle of pronotum = 2.3–2.4).

Dorsal side of head dull, with conspicuous punctures (0.5–1 diameters apart). Frontoclypeal suture fine. Clypeal emargination relatively deep (clypeal emargination width / depth ratio ca. 3.6). Mentum with median part narrow. Submentum with short base (Fig. 2). Maxillary palp not widened (width of maxillary palp / length of 3rd antennomere = 1.0–1.1). Length of antennae slightly greater then pronotal length (ratio antenna / pronotum from tip of anterior pronotal angle to tip of posterior pronotalangle = 1.1–1.2). 3rd antennomere relatively long (length ratio of antennomere 3rd / 2nd = 2.9–3.1).

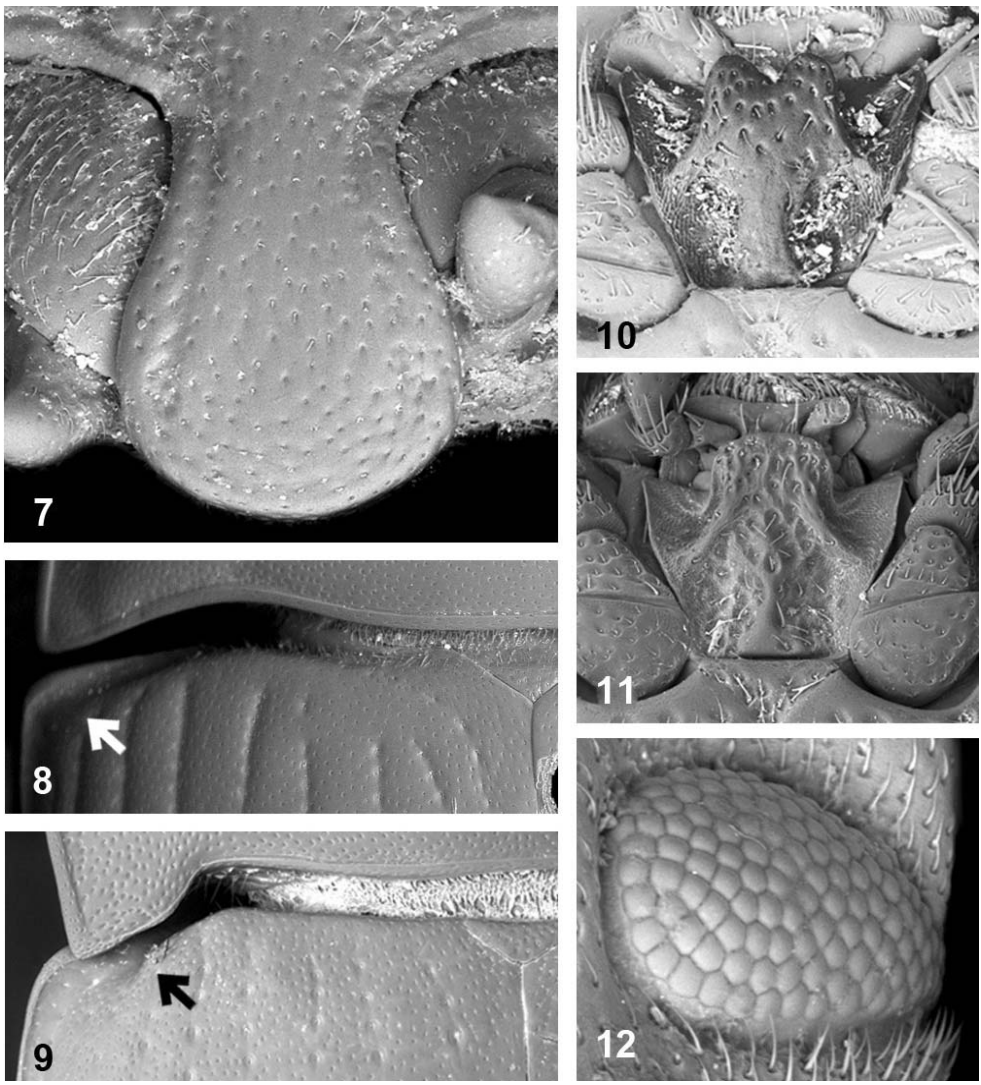
Pronotal disc transverse (middle of pronotum length / width ratio ca. 0.7); dull, with fine punctures (1–2 diameters apart); convex (ratio of the prothoracic total height and total width, measured at the "B section" = 1.6; ratio of the pronotal disc height and total height of pronotum, measured at the "B section" = 0.34; ratio of prothoracic width and disc height, measured at the "B section" = 4.8). Protrochantin fused with pleural apophysis (Fig. 20). The attachments of pleural apophyses to the bottom of notum oriented similarly as in other Platynotina (angle between the middle of pleurites measured at the tip of a prosternal process, measured at the "B section" = 75.6º) (Figs 16–21). Anterior pronotal angles sharp, protruding towards apex. Lateral margins of pronotal disc parallel at the basal half. Pronotal hypomera dull, without punctures.

Elytra oblong (elytra length / width ratio = 1.2–1.3). Elytral striae with conspicuous punctures (1 diameter apart), most visible on elytral disc. Intervals dull, with relatively small punctures (4–5 diameters apart). Elytral base slightly sinusoidal. Elytral humeri rounded, not protruding laterad. Wings absent. Scutellum triangular; relatively narrow.

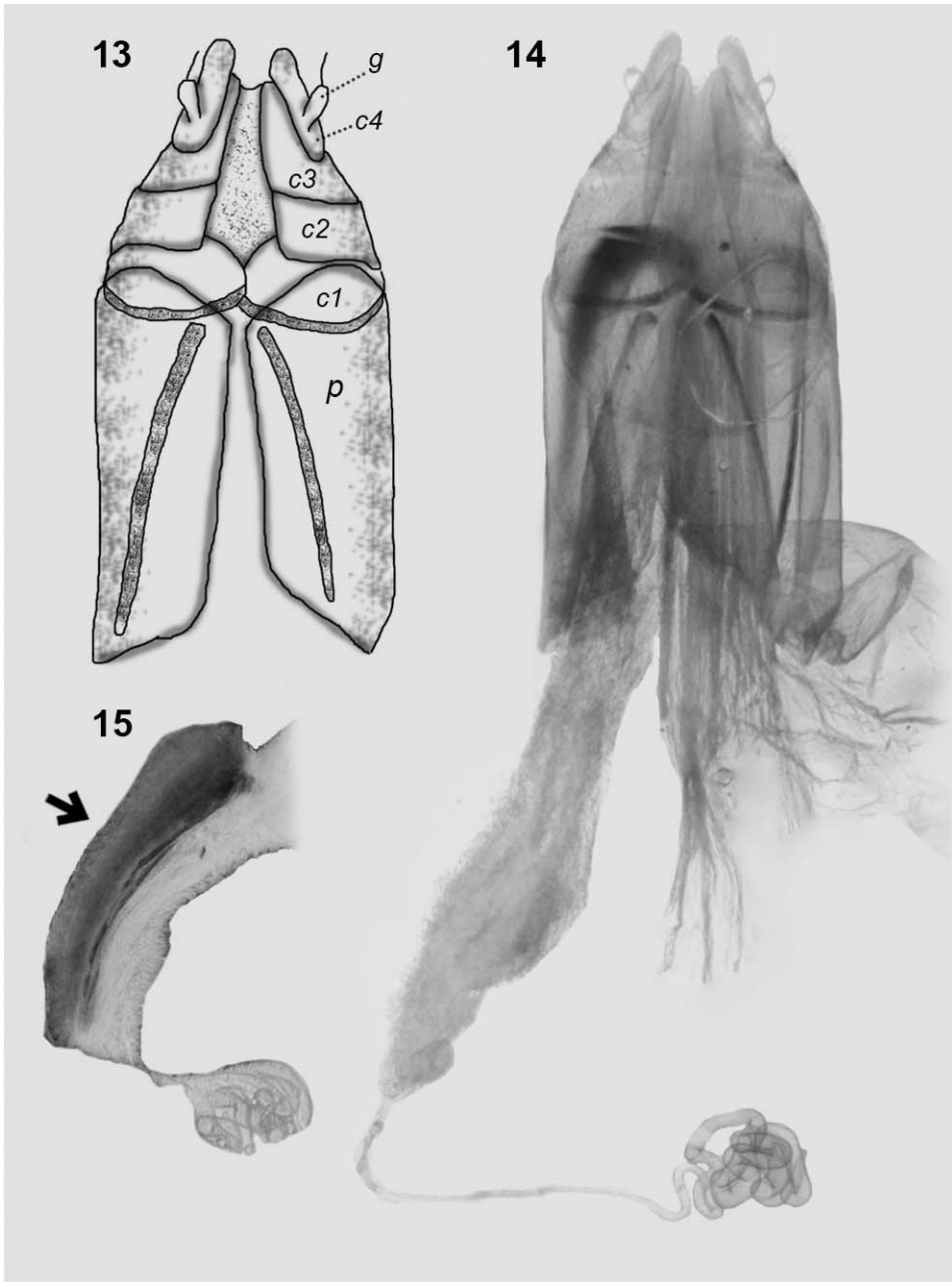
Intercoxal process of prosternum straight with complete bordering (Fig. 4). Metaventrite reduced (length ratio cavity of hind coxa / metaventrite between the insertions of mid and hind

coxae ca. 2). In both sexes abdominal process without tubercle; relatively narrow (process of 1st abdominal ventrite / process of metaventrite = 2.1–2.2). 5th abdominal ventrite with complete bordering (Fig. 3); punctures 1–2 diameters apart.

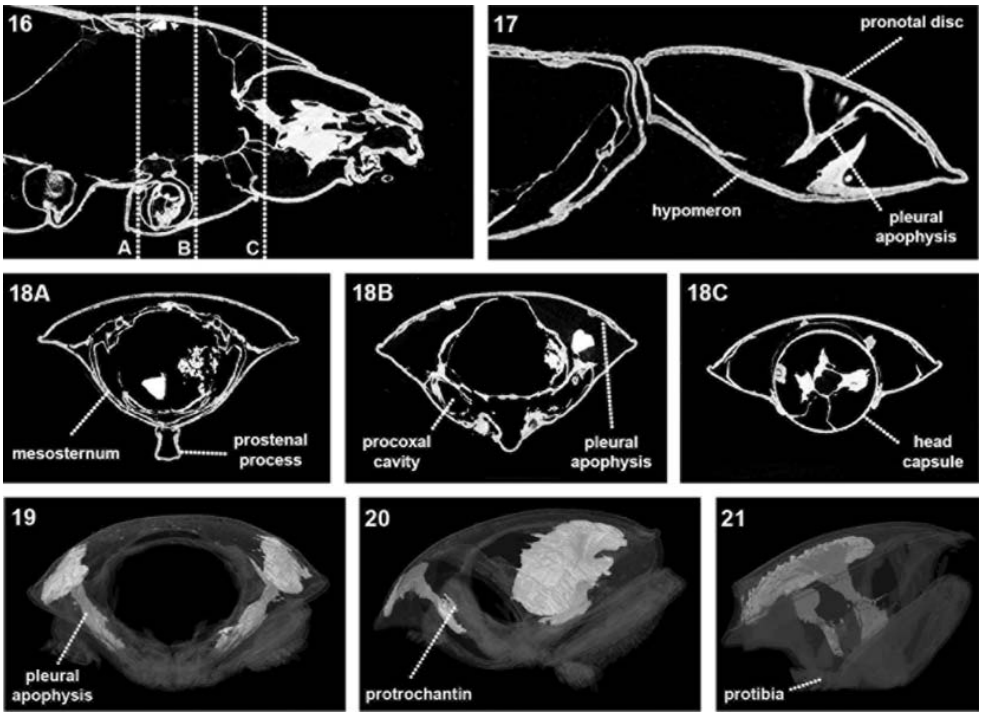
Male legs. Protarsi slightly widened; protibiae (protibiae length / width ratio ca. 4.0) as in Fig. 5. Mesotibiae simple. Meso- and metafemora with fringe of hairs. 1st metatarsomere elongated (length ratio metatarsomere 1st / 2nd ca. 2.0.).



Figs 7–12. Body parts of selected Platynotina. 7–8, 11 – *Pseudoselinus punctatostriatus* (Gerstaecker, 1854); 9 – *Upembarus saegeri* Koch, 1956; 10 – *Angolositus lidiae* Kamiński, 2012; 12 – *Lechius aalbui* Iwan & Kamiński, 2012. Body parts: 7 – prosternal process; 8–9 – base of elytron; 10–11 – mentum; 12 – eye. Arrows indicate the ending of the upper edge of the elytral base.



Figs 13–15. Female genitalia. 13–14 – *Paraselinus iwani* gen. & sp. nov.; 15 – *Pseudoselinus raposoi* (Koch, 1956). 13 – drawing of the ovipositor; 14 – photograph of the ovipositor, bursa copulatrix and spermatheca; 15 – bursa copulatrix. Arrow indicates the sclerite in bursa copulatrix.



Figs 16–21. X-ray cross-sections of analyzed prothorax (16–18) and three-dimensional models of pleural apophyses (19–21) of *Paraselinus iwani* gen. et sp. nov. 16 – scheme of used transverse section places; 16 – sagittal section of prothorax adjacent to a pleural apophyses; 18 – transverse sections of prothorax: prior to procoxae (A), posterior to procoxae (B), posterior to the tip of prosternum (C); 19–20 – views of prothoracic 3D models: frontal (19), fronto-lateral (20) and lateral (21) .

Female legs. Protarsi not widened. Legs simple.

Male genitalia. Parameres slightly widened at the base; narrowed towards apex; length equal to the 0.2 of the rest of aedeagal tegmen. Clavae strait (Fig. 6).

Female genitalia. Paraproct longer then coxites. First two coxites wide and short; coxites 3rd and 4th narrow and long (Figs 13, 14). Bursa copulatrix without a sclerite. Spermatheca as in Fig. 14.

Etymology. This new species is dedicated to Dariusz Iwan (Museum and Institute of Zoology of the Polish Academy of Sciences), an outstanding entomologist and a specialist in Tenebrionidae.

Distribution. All of the five known specimens of this new species were collected in the East African mangroves of Tanzania (Fig. 22). This ecoregion exists under some extreme abiotic conditions (e.g. high salinity, extreme tides, strong winds, high temperatures and muddy soils) which might be limiting for several groups of organisms (Kathiresan & Bingham 2001). This is the second published record of Platynotina species in this ecosystem (Iwan & Kamiński 2012 Kamiński 2012, 2013a,b; Kamiński & Iwan 2013).

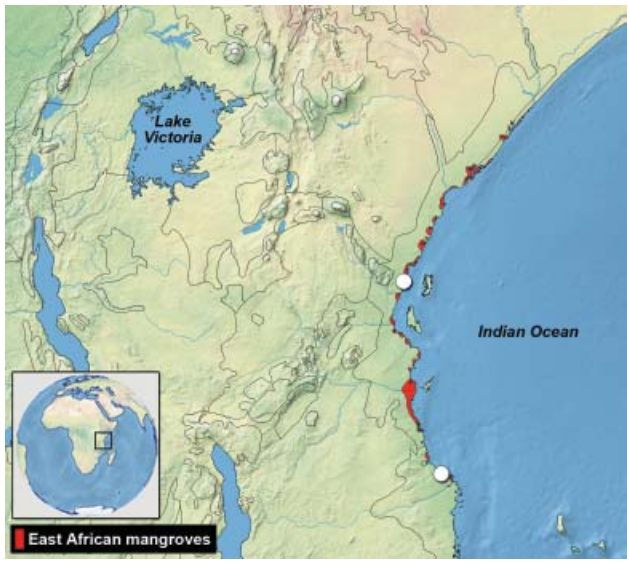


Fig. 22. Map of known collection sites of *Paraselinus iwani* gen. & sp. nov. The division of Afrotropical Realm into ecoregions was adopted after Olson et al. (2001).

Key to the Central African Platynotina

1 Pronotal disc with a pair of basal depressions. ..... see Iwan's (2002a: 47) identification key, couplet 42
– Pronotal disc evenly convex 2
2 Anterior margin of mentum emarginate medially (Fig. 10). 3
– Anterior margin of mentum straight (e.g. Figs 2, 11). 4
3 5th abdominal ventrite bordered on its posterior margin. ..... ***Angolositus*** Koch, 1955
– 5th abdominal ventrite without bordering. ..... ***Aberlencus*** Iwan, 2002
4 A groove below ventral margin of eye present (Fig. 12). Distribution: Madagascar. ..... ***Lechius*** Iwan, 1995
– A groove below ventral margin of eye absent. Distribution: continental Africa only. 5
5 Upper edge of elytral base disappearing before humerus (Fig. 9). 5th abdominal ventrite without bordering. ..... ***Upembarus*** Koch, 1956
– Upper edge of elytral base reaching the humerus (Fig. 8). 5th abdominal ventrite bordered on its posterior margin (Fig. 3). 6
6 Intercoxal process of prosternum narrow (Fig. 4). Mentum with middle part not projecting anteriad (Fig. 2). Basal half of lateral pronotal margins parallel. Bursa copulatrix without sclerites (Fig. 14). ..... ***Paraselinus* gen. nov.**
– Intercoxal process of prosternum wide (Fig. 7). Mentum with middle part projecting anteriad (Fig. 11). Basal half of the lateral pronotal margins rounded. Bursa copulatrix with longitudinal sclerite (Fig. 15). ..... ***Pseudoselinus*** Iwan, 2002

Discussion

In the key to the World genera of the subtribe Platynotina (Iwan 2002a), *Paraselinus* gen. nov. would run to *Pseudoselinus* and *Upembarus,* inter alia due to the specific structure of the head (mentum with mid part narrowing anteriorly, submentum with short base, anterior margin of clypeus without horns and with a shallow median emargination, the ventral margin of eyes without a groove below, eyes undivided by the wide genal canthus), pronotum (lateral and basal border present, lack of basal and apophyseal depressions on the pronotal disc), elytra (intervals without tubercles, each elytron with 9 rows), wings (completely reduced) and legs (fore tibia slender).

The reason why the morphological similarity of *Paraselinus* gen. nov., with *Angolositus* and *Lechius* postulated in this paper is not reflected in the above mentioned identification key is because the latter genera are separated at the beginning of the key by Iwan (2002a) on the basis of their significant autapomorphies (*Angolositus* – eye completely divided by the epistomal canthus; *Lechius* – a groove below the ventral margin of the eye present). Nevertheless, they share most of the aforementioned diagnostic characters for *Pseudoselinus* and *Upembarus* (Iwan & Kamiński 2012, Kamiński 2012). Additionally, *Abrelencus* was described after the publication of the key to the World genera of the subtribe Platynotina and was therefore not included. However, this monotypical genus was considered to be closely related to *Angolositus*, *Upembarus*, *Pseudoselinus* by Iwan (2002b).

The anatomical evidence gathered in this study (Figs 17–21) shows that the structure of the prothoracic skeletal structure of *Paraselinus* gen. nov. most closely resembles those reported for *Lechius*, *Pseudoselinus* and *Synquadrideres* Iwan, 2003 (Raś & Kamiński 2013). However, the latter might be distinguished from all aforementioned genera by the different body shape (elytral sides parallel) and the presence of basal pronotal depressions (Iwan 2003).

Analyzed morphological and anatomical data suggest that *Paraselinus* gen. nov. might form together with *Aberlencus*, *Angolositus*, *Lechius*, *Pseudoselinus* and *Upembarus* a group of closely related genera (an identification key is provided above). Besides many of the above mentioned key features this group can be defined by the following unique character combination: total wing loss, transverse antennomeres 7–11 and specific prothoracic structure (lack of basal depressions on pronotal disc). Nevertheless, this taxonomic hypothesis needs to be tested by a comprehensive cladistic analysis containing all Central African Platynotina genera.

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