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Two new species of *Bruchidius* feeding on Caesalpinioids in Africa (Coleoptera: Bruchidae: Acanthoscelidini)

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ABSTRACT. The African species of the *Bruchidius rubicundus* group feeding in seeds of Caesalpinioideae are revised. *Bruchidius badjii*, from West and Central Africa (Ivory Coast, Republic of Congo, Democratic Republic of Congo), feed on *Dialium* spp. seeds, and *Bruchidius lerui*, from Kenya, predated upon seeds of *Delonix elata*, are described. *Bruchidius biloboscutus* PIC, 1947, from West Africa (Ivory Coast, Senegal) is redescribed. Relationships between seed-beetles feeding on Mimosoideae and those feeding on Caesalpinioideae are discussed.

Key words: entomology, taxonomy, Coleoptera, Bruchidae, *Bruchidius*, new species, Caesalpinioideae, Mimosoideae, *Dialium*, *Delonix*.

INTRODUCTION

A large majority of Old-World Acanthoscelidini with known biology feed in the larval stage on Leguminous seeds. In 1981, it was estimated that out of approximately 520 Old-World Acanthoscelidini, 28% fed on Mimosoideae, 70% on Papilionoideae, while only a minority was known to feed in Caesalpinioid seeds (JOHNSON 1981). JOHNSON recorded four species of *Bruchidius* feeding on *Gleditsia* and *Cassia*, and two *Tuberculobruchus* on *Dialium*. Several Asian Acanthoscelidini feed on Caesalpinioids: *Megabruchidius dorsalis* (Fahr.) and *M. tonkineus* (PIC) on *Gleditsia*, *Bruchidius cassiae* ARORA and *B. mackenziei* KINGSOLVER on *Cassia*, *Sulcobruchus sauteri* (PIC) and *S. subsuturalis* (PIC) on *Caesalpinia* (ANTON 1999; JERMY et al. 2002; TUDA & MORIMOTO 2004).

Since JOHNSON's major contribution, our knowledge of bruchid host specificity has improved, but African records from native host plants remain scanty. In Ivory

Coast, *Bruchidius ealensis* DECELLE was reared from *Caesalpinia* (*Mezoneuron*) *benthamianum* seeds (GILLON et al. 1992), and an undescribed species of *Bruchidius* (*B.* sp. 893) from seeds of *Dialium guineense*. Other native Cassiae (genera *Cassia* and *Senna*) are exclusive hosts of *Caryedon* (subfamily Pachymerinae) species (DELOBEL et al. 1995, JOHNSON et al. 2003). Other records of Old-World Acanthoscelidini feeding on Caesalpinioids must be regarded with caution. For example, the Mediterranean *Bruchidius tuberculatus* (HOCHHUTH) has been mentioned as feeding on the Caesalpinoid *Ceratonia siliqua*, but is apparently a predator of *Centaurea* spp. seeds (Asteraceae) (CAMPOBASSO et al. 1999). In Ivory Coast, GILLON et al. (1992) mention an undescribed *Bruchidius* species (sp. 955) as a rare occurrence on *Senna hirsuta* (Cassiae), but *S. hirsuta* being native to the New World, this record may well be erroneous (specimens of *Bruchidius* sp. 955 could not be found in CBGP, which presently harbours GILLON's collection). The situation is strikingly different in the New World. According to JOHNSON (1981), several genera of Acanthoscelidini (*Gibbobruchus*, *Penthobruchus*, *Pygionpachymerus*, *Sennius*, *Megasennius*) show a strong preference for Caesalpinioideae; he recorded more than 100 species of Acanthoscelidini as Caesalpinoid-feeders. Some of them, like *Mimosestes mimosae* (F.), or *Pseudopachymerina spinipes* (ERICHSON), were introduced to various parts of the world with their host plant.

Caesalpinioids are usually assigned a basal position in the family Leguminosae, but recent molecular analyses have demonstrated the paraphyly of Caesalpinioids: *Dialium* is among the most basal genera of Leguminosae (with *Cercis*), whereas *Delonix* and *Caesalpinia*, together with Mimosoideae, belong to a large group which is the brother of the Papilionoid clade (DOYLE et al. 2000, WOJCIECHOWSKI et al. 2004). About 30 species are presently recognized in the genus *Dialium* (ILDIS), the majority of which are ecologically restricted to the guineo-congolian forest. Only two species are known outside Africa, one in Sri-Lanka, one in Central and South America. *Delonix* has only three representatives: *D. regia* (HOOK.) RAF., a native of Madagascar but grown as ornamental all over the world; *D. baccal* (CHIOV.) BAKER f. in East Africa, *D. elata* (L.) GAMBLE, from Egypt to Namibia and Zaire.

To date, four Acanthoscelidini have been reared from seeds of African Caesalpinioids. One of them, *Bruchidius biloboscutus*, was described in 1947 by PIC on a single specimen from Ivory Coast. Specimens of that species were later obtained in Zaire from *Dialium pachyphyllum* seeds (DECELLE 1951). A redescription of the type is given here. Two other species, from West Africa and Kenya, are new to science and are described here. They feed on *Dialium guineense* and *Delonix elata*, respectively. *Bruchidius ealensis* DECELLE, known to feed in seeds of *Caesalpinia benthamianum* in Ivory Coast, was accurately described by DECELLE (1951). It belongs to a distinct group of species and is not treated here. It may be added that *Caryedon dialii* DECELLE is also recorded as a predator of *Dialium guineense* seeds in West Africa (DECELLE, 1973; DELOBEL et al., 1995).

The three species studied here exhibit a high level of uniformity in adult external morphology: body ovate, flattened, pygidium subhorizontal, eyes bulging, antennae short, without obvious sexual dimorphism, elytra with teeth at base of interstriae 3 and 4. They also show a similar morphological type of male genitalia, with tegminal strut narrowed basally, without trace of keel, lateral lobes deeply cleft, with numerous long setae; median lobe not particularly elongated, ventral valve sclerotized, not pointed apically, internal sac without large sclerites, lined with numerous simple or multifid denticles, ostium well sclerotized, circular.

Most of these characters are typical of a large group of African and Asian Bruchids that are predators of Mimosoid seeds. Most species placed by PIC in *Pygobruchidius* (PIC 1951) and by DECELLE in *Tuberculobruchus* (DECELLE 1951; a junior synonym of *Pygobruchidius* according to BOROWIEC 1987) belong to this group of species. The validity of *Pygobruchidius* is however questionable because the main character supposed to separate it from *Bruchidius* (posterior femur with a ventral longitudinal trough) is common to several unrelated bruchids (see discussion by BOROWIEC 1987, ANTON 1999). This view is also supported by molecular data (KERGOAT & SILVAIN 2004, KERGOAT et al. 2005)

Although the present classification of Acanthoscelidini is obviously unsatisfactory due to the paraphyly of *Bruchidius* and *Pygobruchidius*, and pending a rearrangement of the whole Acanthoscelidini tribe, we have chosen to maintain the three species studied here in the *Bruchidius rubicundus* species-group (BOROWIEC 1987: 141). In addition to *B. rubicundus* (FAHRAEUS), *B. cadenati* (PIC), *B. dichrostachydis* DELOBEL & ANTON, and *B. silaceus* (FAHRAEUS), the *rubicundus* species-group comprises quite a number of undescribed species pre-dating upon *Acacia* and *Albizia* seeds in Africa and Asia. Other Acanthoscelidini pre-dating on Mimosoid seeds belong to the *Bruchidius centromaculatus* group as defined by ANTON & DELOBEL 2003.

Abbreviations:

CBGP: Centre de Biologie des Populations, Montpellier (France);
CKWA: Collection K.-W. ANTON, Emmendingen (Germany);
IFAN: Institut Fondamental d'Afrique Noire Cheikh Anta Diop, Dakar (Senegal);
MNHN: Muséum national d'Histoire naturelle, Paris (France).

REVIEW OF SPECIES

***Bruchidius biloboscutus* PIC**

Bruchidius biloboscutus PIC, 1947: 151

Tuberculobruchus biloboscutus (PIC) - DECELLE 1951: 191; 1958: 84; 1973: 602.

TYPE EXAMINED

Bruchidius biloboscutus: male, „Muséum Paris – Côte d’Ivoire – Réserve du Banco – R. Paulian & C. Delamare” [blue], „Ab 31 – jour” [yellow], *Bruchidius biloboscutus* – ... [?] (Côte d’Ivoire” [Pic’s handwriting], „TYPE” [red], „*Tuberculobruchus biloboscutus* (Pic)” [Decelle’s handwriting], MNHN. Hind tarsi missing except first tarsomere on right leg.

REDESCRIPTION

Length (type): 5.1 mm; width: 2.5 mm. Body ovate, with pygidium large, only feebly slanting from horizontal (Fig. 1). Integument mostly black, with sides of pronotum and pygidium, and posterior part of head, slightly lighter. Ventral side black in the middle, dark brown on sides. Fore and middle legs yellowish-red, except base and last tarsal segments darker. Hind femur dark brown at base, the rest reddish-brown. First 4 or 5 antennal segments yellowish-red, remaining brownish, the last segment slightly paler than segments 6 to 10. Vestiture scaly, dense, completely covering integument, recumbent; on elytra made of straw-coloured scales locally intermixed with dark reddish brown scales, the latter becoming more abundant towards apex. On pronotum and pygidium vestiture slightly lighter and more uniform. Pronotum with a pair of faint light spots on disc sides. Scutellum with very dense, almost white scales. Apical area on ventrites 1-4 less pilose in the middle, appearing as blackish; ventrite 1 with a large whitish patch of denser and shorter setae located at apical 1/5th of ventrite.

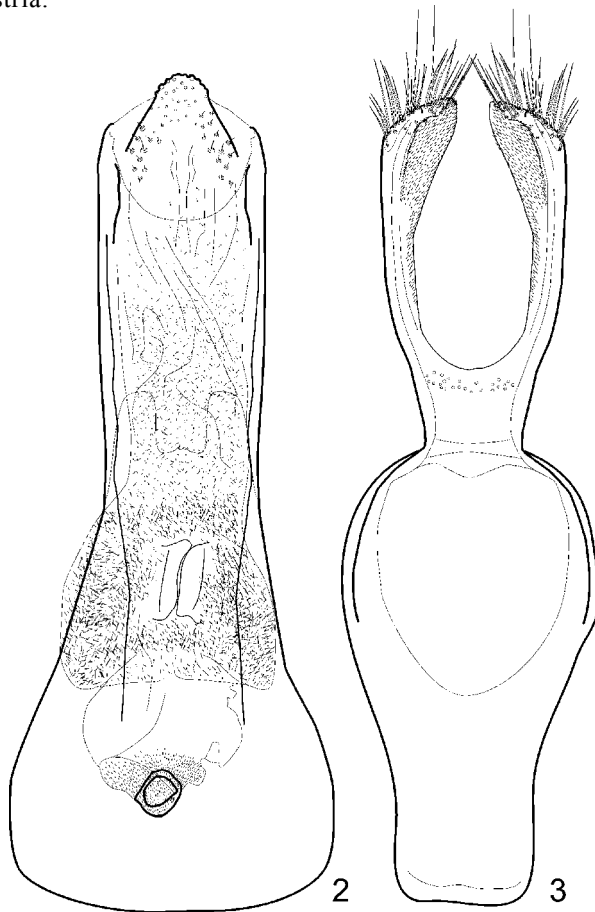


1. *Bruchidius biloboscutus*, habitus of the type

Male: Head short; eyes bulging, maximum head width 1.4 times width behind eyes; eyes separated by 0.36 times head width including eyes; distance between posterior rim of eyes and apex of clypeus / distance between eyes = 1.84; eye cleft to 0.77 of its length, width at bottom of sinus composed of 6 ommatidia; maximum width of postocular lobes equal to half eye width at sinus; carina on frons not marked, but interocular tubercle distinct.

Antenna reaching to pronotal base; antennal segments 1-4 subcylindrical, segment 5 widened at apex, segments 6-10 wider than long, 11 oval. Segment 1 about 1.3 times longer than 2, segment 4 slightly shorter than 2, 5 1.2 times longer than 2, 5 and 6 equal, 7-10 approximately equal, about 1.2 times wider than long, segment 11 about 1.3 times as long as wide.

Pronotum with greatest width at base ($W/L = 1.6$), rapidly narrowing towards apex, not expanded behind eyes; obliquely impressed on sides of basal lobe, opposite 2nd stria.



2, 3. *Bruchidius biloboscutus*: 2 - median lobe, 3 - tegmen, ventral view

Elytra 1.11 times longer than combined width, their sides convex; disc regularly convex; at base of interstriae 3 and 4 two large hooked teeth that are an expansion of the basal carina of elytron; teeth much closer to elytral base than to each other. Striae on disc thin but well defined; interstriae flat, with micropunctuation and irregular lines of punctures.

Legs. Hind femora moderately incrassate, at their widest 1.3 to 1.4 times wider than mid femora; mesoventral margin with small preapical denticle; hind tibiae simple with dorsomesal carina complete, lateral and ventral carinae not reaching base; apex of tibia with strong mucro about as long as width of tarsomere 1, lateral denticle slightly shorter, and dorsal denticles less than half as long as lateral denticle; first tarsomere ventrally produced into a small point.

Abdomen simple; ventrite 5 not emarginate, medially longer than ventrite 4; pygidium large, about as wide as long, slightly convex in first half, convexity steadily increasing towards apex.

Genitalia (Figs 2, 3): Median lobe of moderate length (maximum width excluding basal hood / total length = 0.2); ventral valve subtriangular, moderately sclerotized, with rounded tip, bearing numerous sensillae and on each side a row of 12 to 15 setae; cylindrical part of internal sac with numerous small slim spines, becoming denser towards base; pouch-like part with dense spines and a very faintly sclerotized plate. Basal strut without keel. Lateral lobes cleft to 0.8 their length; apex of parameres with two small expansions, each bearing a group of long setae.

Female: Unknown.

AFFINITIES

Bruchidius biloboscutus is distinguished from the closely related and externally very similar *B. badjii* by its larger size and the presence of a patch of modified setae on the first ventrite.

HOST PLANTS

Reared from *Dialium pachyphyllum* (= *D. yambataense*) (Caesalpinioideae) (DECELLE 1951) in former Belgian Congo.

DISTRIBUTION

Ivory Coast (Réserve du Banco), Republic of Congo (Dimonika), Democratic Republic of Congo (Equateur, Eala, Yangambi).

***Bruchidius badjii* n. sp.**

Bruchidius sp. 893 – GILLON et al. (1992)

Bruchidius dialii – KERGOAT & SILVAIN (2004); KERGOAT et al. (2005), nomen nudum

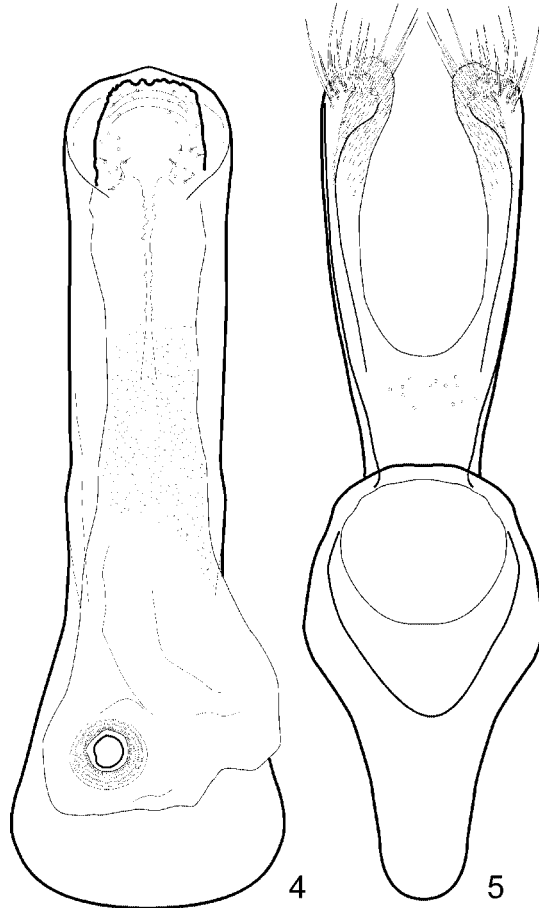
TYPE MATERIAL

Holotype: Male, „Sénégal région Ziguinchor – Nialor 20 avril 1996 – ex fruits *Dialium guineense* – Bakari Badji coll.”, „Holotype” [red], „*Bruchidius badjii* n. sp. – A. Delobel des. 2006”, MNHN. Paratypes: 38 males, 27 females, same data as holotype, MNHN, IFAN, CBGP, CKWA.

Additional material: Ivory Coast, 6 specimens, Lamto – RCI – 5°03W, 6°13N – 26.1 -> 29.3.82 or 17.2.82 – *Dialium guineense* (labelled *Bruchidius* n.sp. 893, CBGP.

DESCRIPTION

Length (pronotum-pygidium): 3.2-4.0 mm; width: 1.8-2.0 mm. Body ovate, with pygidium large, only feebly slanting from horizontal. Integument usually black, with legs and antennae reddish-brown. Black areas more or less reduced in



4-5. *Bruchidius badjii*: 4 - median lobe, 5 - tegmen, ventral view

lighter specimens; abdomen colour variable, from entirely red to entirely black, with ventrite margins reddish; sometimes only base of ventrite 1 black, rest of abdomen red; pygidium often reddish, especially laterally; even in darker specimens, sides of head behind eyes and lower part of face reddish-brown. Vestiture scaly, rather dense, though not completely covering integument, recumbent except a few scattered erect hairs on central part of ventrites 1-3; dorsally composed of dirty yellow scales, with the apical 1/5th of elytra darker; on pronotum a pair of faint whitish spots on disc sides, the base and a longitudinal line of pygidium with dense and white scales. On ventral side, scales whitish on upper part of thoracic and abdominal sternites, straw-coloured or golden yellow on rest of sternites.

Male. Head short; eyes bulging, maximum head width 1.4 times width behind eyes; eyes separated by 0.38 times head width including eyes; distance between posterior rim of eyes and apex of clypeus / distance between eyes = 1.9; eye cleft to 0.68 of its length, width at bottom of sinus composed of 7-8 ommatidia; maximum width of postocular lobes equal to 1/5th eye width at sinus; carina on frons absent, interocular tubercule indistinct. Antenna reaching to pronotal base; antennal segments 1-4 subcylindrical, with 2-4 almost equal in length, segments 5-7 widened at apex, segments 8-9 square, 10 wider than long, 11 oval (L/W = 1.6). Length of antennomeres: 1.6 : 1 : 1.1 : 1.1 : 1.25 : 1.4 : 1.2 : 1.1 : 1.2 : 1.1 : 1.8.

Pronotum with greatest width at base (W/L = 1.72), rapidly narrowing towards apex, not expanded behind eyes; without oblique impression on sides of basal lobe.

Elytra 1.06 times longer than combined width, their sides convex; disc flattened; at base of interstriae 3 and 4 two more or less distinct teeth, about 2 times closer to each other than to elytral base. Striae on disc well defined; interstriae flat, with micropunctuation and irregular lines of punctures.

Legs. Hind femora moderately incrassate, at their widest 1.6 times wider than mid femora; mesoventral margin with small preapical denticle; hind tibiae simple with dorsomesal and ventral carinae complete, lateral carina visible only to half length; apex of tibia with mucro about as long as width of tarsomere 1, about 1/7th of tarsomere length; lateral denticle about 2/3 of mucro length, and dorsal denticles about 1/3 of lateral denticle; first tarsomere ventrally produced into a thin point.

Abdomen with ventrite 5 emarginate, its length medially about 2/3 of ventrite 4; pygidium large, slightly longer than wide, slightly convex in first half, becoming very convex towards apex.

Genitalia (Figs 4, 5): Median lobe of moderate length (maximum width excluding basal hood / total length = 0.2); ventral valve subrectangular, moderately sclerotized, with broad rounded tip, bearing numerous sensillae and on each side a row of 6 to 8 setae; cylindrical part of internal sac with a few small spines, pouch-like part virtually without ornamentation. Basal strut without keel. Lateral lobes cleft to 0.7 their length; apex of parameres with numerous long setae.

Female. Similar to male, but antenna shorter, last abdominal ventrite not emarginate, pygidium uniformly convex. Middle of ventrite 1 with a few erect setae.

AFFINITIES

Male immediately distinguished from *B. biloboscutus* by the absence of patch of setae at base of first ventrite. Distinguished from *B. lerui* by its darker colour.

ETYMOLOGY

Species dedicated to Bakari Badji, who collected the fruit of *Dialium guineense* („solom” in wolof) in the village of Nialor, Ziguinchor region, in Southern Senegal (12°51'N 16°12'W).

HOST PLANTS

Material from Southern Senegal was reared from fruits of *Dialium guineense* (Caesalpinioideae), together with *Caryedon dialii* Decelle. It may be noted that *D. guineense* fruit collected in north-western Senegal (Fas-Boye, 15°16'N 16°11'W) did harbour *C. dialii*, but never yielded any specimen of *B. badjii*. Reared from the same host in Ivory Coast (under the name *Bruchidius* sp.893, GILLON et al. 1992).

DISTRIBUTION

Senegal, Ivory Coast

REMARK

This species is recorded as *B. dialii*, without author's name (KERGOAT & SILVAIN 2004; KERGOAT et al. 2005). The description of *B. dialii* was not published; this name is therefore a *nomen nudum*. We describe the species under a new name, *B. badjii*, to avoid confusion.

***Bruchidius lerui* n. sp.**

TYPE MATERIAL

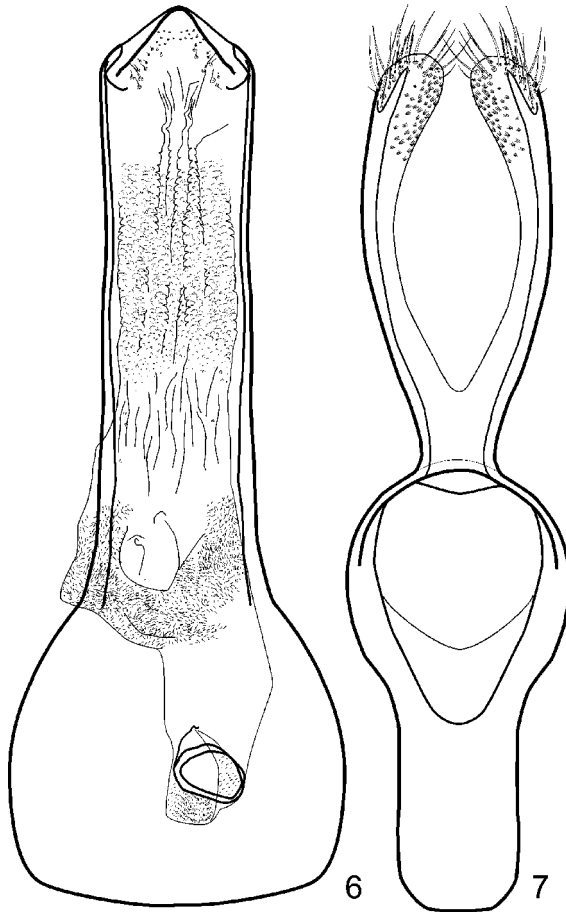
Holotype, „Kenya - Kyuso – ex graines *Delonix elata* – 0°28,181'S 38°15,876'E 978m – janv. 2002 B. Le Ru coll.”, „Lame – Delobel 02802”, „Holotype” [red], „*Bruchidius lerui* n. sp. – A. Delobel des. 2005”, MNHN.

DESCRIPTION

Length (pronotum-pygidium): 4.4 mm; width: 2.2 mm. Body ovate, with pygidium large, only feebly slanting from horizontal. Integument reddish-brown, with legs and antennae paler (orange), and a few zones darker, almost black: humerus, elytral suture, apex of last tarsomeres. Vestiture scaly, rather dense, though not completely covering integument, recumbent except small erect hairs at apical 1/5th of ventrite 1; dorsally composed of whitish scales on pronotum, scutellum and base of elytra; on rest of elytra, scales thinner and shorter, dirty yellow. On ventral side, scales whitish and dense on upper part of thoracic and abdominal sternites, yellowish on rest of sternites. A small area in apical half of ventrite 1 with smaller and less dense setae. Pygidium with very uniform vestiture of small whitish scales.

Male: Head rather long, with face narrow; eyes bulging, maximum head width 1.5 times width behind eyes; eyes separated by 0.30 times head width including eyes; distance between posterior rim of eyes and apex of clypeus / distance between eyes = 2.3; eye cleft to 0.6 or 0.7 of its length, width at bottom of sinus composed of 8-9 ommatidia; maximum width of postocular lobes equal to 1/4th eye width at sinus; carina on frons absent, interocular tubercle indistinct. Antenna small, not reaching to pronotal base; antennal segments 1-4 subcylindrical, with 2-4 almost equal in length, segments 5-7 gradually widened, 6-11 rectangular, wider than long. Length of antennomeres: 1.8 : 1 : 1 : 1 : 0.75 : 0.8 : 0.8 : 0.9 : 0.85 : 0.85 : 0.9.

Pronotum with greatest width at base ($W/L = 1.56$), regularly rounded towards apex, not expanded behind eyes; with distinct oblique impression on sides of basal lobe.



6-7. *Bruchidius lerui*: 6 - median lobe, 7 - tegmen, ventral view

Elytra short, 1.01 times longer than combined width, their sides well rounded before middle; disc flattened, even slightly concave behind scutellum; at base of interstriae 3 and 4 two very distinct black teeth, about 3 times closer to each other than to elytral base. Striae on disc thin and deep, well defined, with small regular punctures; interstriae wide and flat, without noticeable lines of stronger punctures.

Legs. Hind femora moderately incrassate, at their widest 1.6 times wider than mid femora; mesoventral margin with small preapical denticle, deeply channelled apically; hind tibiae simple with dorsomesal and ventral carinae complete, lateral visible only to basal third; apex of tibia with mucro equalling width of tarsomere 1, about 1/6th of tarsomere length; lateral denticle almost equal to mucro length, and dorsal denticles about 1/3 of lateral denticle; first tarsomere ventrally with a mucro that is shorter than tarsomere width.

Abdomen with ventrite 5 moderately emarginate, slightly longer medially than ventrite 4; pygidium large, 1.05 times longer than wide, rounded, flattened in first half, becoming very convex towards apex.

Genitalia (Figs 6, 7): Median lobe of moderate length (maximum width excluding basal hood / total length = 0.17); ventral valve triangular, moderately sclerotized, with rounded tip, bearing numerous sensillae and on each side a row of about 10 setae; cylindrical part of internal sac with multifid denticles in its basal part, pouch-like part with numerous spines and a slightly sclerotized plate. Basal strut without keel. Lateral lobes cleft to 0.8 their length; apex of parameres with numerous long setae.

Female: Unknown.

AFFINITIES

Distinguished from the two former species by its lighter colour. It shows much similarity to *Acacia*-feeding species such as *B. rubicundus*.

ETYMOLOGY

Species dedicated to its discoverer, my friend and former colleague Bruno LE RU.

HOST PLANTS

The type was reared from seeds of *Delonix elata* (Caesalpinioideae) collected in the village of Kyuso, Mwingi district of Eastern Kenya.

DISTRIBUTION

Kenya.

CONCLUSION

Morphological evidence shows that the three species feeding on *Dialium* and *Delonix* have much in common with species predated on Mimosoideae. This is confirmed by molecular data in the case of *B. badjii* (KERGOAT et al 2005). In the

phylogeny published by these authors, *B. badjii* (as *B. dialii*) appears as the sister species of *B. auratopubens* DECELLE *in litt.* This view is supported in part by morphological data, in particular by general body shape and structure; male genitalia are however rather dissimilar in *badjii* and *auratopubens*, especially because the tegminal strut of the latter has a strong perpendicular keel. This keel is quite similar to that observed in the oriental genus *Sulcobruchus* (ANTON 1999). The size of the tegminal carina seems however to be a rather variable character, probably of little phylogenetic value (see for example its variation in the *Bruchidius dilaticornis* species-group, DELOBEL 2006).

Host shift and radiation on Caesalpinioideae is most probably quite recent, and further investigation is needed to identify its importance. Our knowledge of seed-eaters predated on the numerous species of *Dialium* is very scanty, and seed samples originating from the guineo-congolian-sudanian forests and their transitional zones would be very informative in this respect. Similarly fruits of *Delonix baccal* from eastern Africa and *D. regia* from its native area, Madagascar, should be sampled. It is worth mentioning, however, that seeds of *D. regia* collected in various parts of continental Africa have always been found devoid of infestation by bruchids.

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