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# A new species of *Callosobruchus* (Coleoptera: Bruchidae) feeding on seeds of *Dunbaria* (Fabaceae), a closely related species to a stored-bean pest, *C. chinensis*

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**Abstract**

A bean beetle, *Callosobruchus utidai* new species, is described based on material from Nepal and Thailand. Morphological analysis indicated that it is most closely related to a widely-distributed stored-bean pest, *C. chinensis*. The larval host plants are the seeds of legumes *Dunbaria rotundifolia* and *D. podocarpa*. This is the first bruchid reported to feed on the seeds of *Dunbaria*. The narrow host range of the species is in contrast to the host range of the pest *C. chinensis*, which is associated with many legume species of the tribe Phaseoleae and with diverse economic legumes in the subfamily Papilionoideae. Comparison of the host ranges suggests that *C. utidai* is not of economic importance at present because of oligophagy on non-economic legumes and limited geographical distribution.

**Key words:** *Callosobruchus utidai*; bruchid seed predator; Leguminosae; *Callosobruchus chinensis*; azuki bean weevil

## INTRODUCTION

The genus *Callosobruchus* Pic is comprised of about 30 species, distributed in warm parts of the Old World, several of which are stored-product pests attacking legume seeds, a few of which are introduced to the New World (Borowiec, 1987; Udayagiri and Wadhi, 1989; Singal and Pajni, 1990). While pest species are well studied, non-pest species of the genus are less well known in Asia. Recently in this genus, new species have been recorded (Pajni and Gupta, 1975; Arora, 1977; Singal and Pajni, 1990; Kingsolver, 1999) and several non-cultivated host plants have been uncovered for Asian *Callosobruchus* species (Tuda et al., 2003). Feeding on seeds by *Callosobruchus* has been reported primarily on economic legumes belonging mainly to the subtribe Phaseolinae (tribe Phaseoleae), e.g., various kinds of beans (64.4%), and the tribe Vicieae, e.g., pea and faba bean (15.6%) (Johnson, 1981). Recently, we have found that another subtribe, Cajaninae (tribe Phaseoleae), is as frequently used under natural conditions as Phaseolinae by *Callosobruchus* species, irrespective of their pest/non-pest status (Tuda et al., 2003).

Here, I describe a new non-pest *Callosobruchus* species from Nepal and Thailand with the record of its novel larval hosts. The possibility of the species achieving a pest status is discussed with respect to economic utility of the host plants. The type series of the new species are deposited in the Entomological Laboratory, Faculty of Agriculture, Kyushu University, Fukuoka, Japan. The plant specimens examined are deposited in the Herbarium of the Biological Institute, Tohoku University, Sendai, Japan (TUS) and in the Herbarium of the College of Education, the University of the Ryukyus, Nishihara, Okinawa, Japan (URO).

## DESCRIPTION

### *Callosobruchus utidai* Tuda, new species

#### Male

*Integument color*

Body black (Fig. 1). Antennae black except basal three segments and apical end of 11th segment dark red. Head black dorsally and dark red laterally. Femora and tibiae black. Fore and mid tarsi yellow. Apical ends of fore and mid tibiae and femora, and last segment of hind tarsi brownish yellow. Pygidium black.

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*Vestiture*

Eyes with medial fringe of white hairs; postocular patch of white hairs; remainder of head with sparse white hairs. Pronotum with a pair of posteromedial callosities covered with brownish white hairs; scutellum densely covered with yellowish white hairs. Pronotum and elytra covered with white hairs in a pattern as in Fig. 1, except posterial 1/4. Pygidium with dense yellowish white hairs. Undersurfaces with sparse white hairs. Appendages with sparse white to brownish hairs.

Fig. 1. *Callosobruchus utidai*, dorsal view.

*Structure*

Body short, thick dorsoventrally (Figs. 1 and 2). Head broader toward posterior end, densely punctulate; frons with glabrous median carina, eyes bulbous, ocular sinus 0.6 eye length, frons half eye width. Antennal segment 1 clavate, 2 moniliform, 3 conical, 4–11 serrate to strongly serrate or pectinate (Fig. 3A). Pronotum campaniform, with a pair of callosities posteromedially. Scutellum squarish, bifid posteriorly. Elytra together as wide as long, quadrate; striae moderately impressed, punctate, strial intervals punctulate; striae subequal at base; humeral callosities well developed; callosities at the bases of 3rd and 4th striae. Humerus and undersurfaces with minute punctations. All of hind coxa punctate. Hind femora constricted basally and apically, expanded medially to about width of coxa; bicarinate ventrally, each carina bearing subapical tooth, outer tooth larger and blunt, inner tooth narrow and acute at about 0.3 from the apex, inner carina with 3 minute denticles up to 1/2 from base (Fig. 3B). Hind tibia with ventral, lateroventral, lateral and dorsomesal glabrous longitudinal carinae, lateroventral carina extending from base only to about 0.7 as long as tibial length, mucro about 0.2 as long as tarsomere 1; tarsomere 1 with ventral, lateral and mesal glabrous longitudinal carinae. Abdominal sternum 5 deeply emarginate at apex; Pygidium punctate, slightly convex in lateral view.

Fig. 2. *Callosobruchus utidai*, lateral view.

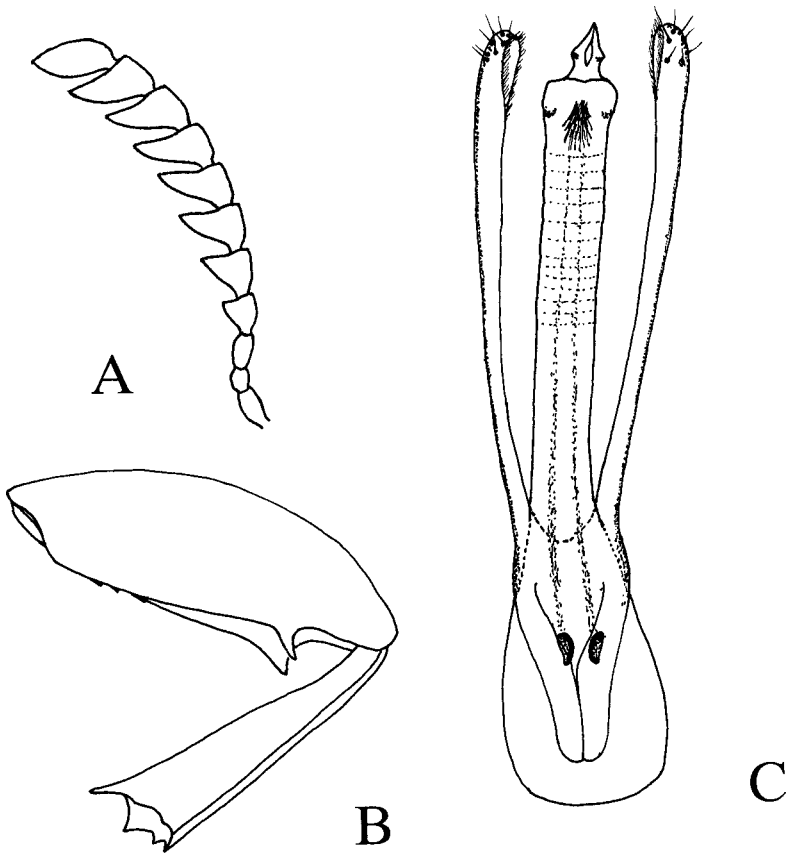


Fig. 3. *Callosobruchus utidai*. A. Antenna; B. Right hind femur and tibia; C. Male genitalia.

*Body length*

2.5–2.7 mm from pronotum to elytra. Width: 1.7–1.8 mm.

*Genitalia*

Median lobe long, narrow, 14 times as long as wide at middle (Fig. 3C). Exophallic valve acuminate. Parameres long, cleft for about 0.95 their length. Endophallus with two sclerotized plates at apex.

**Female**

Body dark red. Pygidium densely covered with white and golden setae, its apex narrower than that of male.

**Type material**

*Holotype: male*

Choyang—Poluwa Khola, Nepal, ex *Dunbaria rotundifolia* (Lour.) Merr., Y. Tateishi (9 Nov. 1981, plant #8523, TUS).

*Paratypes*

Eleven males and 1 female, same data as holotype; 1 ex., Mt. Doi Inthanon, Chiang Mai, Thailand, ex *Dunbaria podocarpa* Kurz, Y. Tateishi and M. Tuda (15 Dec. 1999, plant #52192, URO).

**Etymology**

*Callosobruchus utidai* is dedicated to the renowned population ecologist Prof. Emer. Syunro Utida (Kyoto University), for his invaluable contributions to studies on laboratory population dynamics of *C. chinensis* and *C. maculatus* and their interaction with their parasitoids.

## DISCUSSION

This species' character states are consistent with those of *Callosobruchus*: (1) base of pronotum with a pair of callosities in middle, (2) lateral margins without tooth; humeral callosities well developed, (3) hind femora channelled ventrally, with a subapical tooth on both the outer and inner carinae, (4) parameres of male genitalia deeply cleft, and (5) endophallus with toothed sclerotized plates.

*C. utidai* belongs to a species group which is characterized by long male genitalia, comprising *C. chinensis* (Linnaeus, 1758), *C. cajanis* Arora, 1977, *C. indica* Pajni and Gupta, 1975, *C. imitator* Kingsolver, 1999, *C. theobromae* (Linnaeus, 1767), *C. rhodesianus* (Pic, 1902) (Kingsolver, 1999) and *C. latealbus* (Pic, 1926) (Tuda, unpublished). *C. cajanis* is described as having body dark brown, antennae serrate, testaceous, endophallus of male genitalia with a pair of sclerotized plates in middle. *C. indica* has antennae serrate, pygidium with a median narrow band of white setae in both sexes (Pajni and Gupta, 1975). *C. rhodesianus* (Pic) has endophallus of male genitalia with three pairs of sclerotized plates at apex (Kingsolver, 1999). I compared specimens of the following species to that of *C. utidai*; *C. imitator* has body dark red to piceous, antennae in both sexes yellow and serrate, fore- and mid-legs yellow, median lobe of male genitalia 8 times as long as its width at middle, with a pair of sclerotized plates at apex. *C. theobromae* has body brown, frons about 1/6 as wide as eye, antennae brown and serrate, legs brown, median lobe of male genitalia 12–14 times as long as wide at middle, endophallus with a pair of sclerotized plates in middle. *C. latealbus* has antennae serrate, brown with 3rd to last segments black at base, fore- and mid-legs brown, elytra black densely covered with white setae except about 1/2 post-laterally and about 1/3 posteriorly, median lobe of male genitalia 7.5–9 times as long as wide at middle, endophallus lined with sclerotized spicules in two columns at apical 1/2, with a pair of sclerotized plates at apex; lateral lobes with pigmentation on lateral margins.

*C. utidai* is most closely allied to *C. chinensis*, based on the following character states: (1) pectinate antenna, (2) squarish elytra, (3) characteristic tooths of the hind femora, (4) slender male genitalia, and (5) endophallus with two sclerotized plates. *C. utidai* is, however, easily distinguishable from *C. chinensis* by its black, larger body and stouter hind femora, uniformly blackish elytra partially covered with white hairs, antenna pectinate in both sexes, and less pectinate than that of male *C. chinensis* (Fig. 4). The apex of median lobe and exophallic valve of *C. utidai* are wider and the genitalia is more sclerotized than those of *C. chinensis*.

The larval host plants of *C. utidai* are the seeds of non-economic legumes *Dunbaria rotundifolia* and *D. podocarpa*. This is the first bruchid reported to feed on the seeds of species of *Dunbaria* (C. D. Johnson, pers. comm.). The pest *C. chinensis* is associated with the legume tribe Phaseoleae and under storage conditions with diverse economic legumes of the subfamily Papilionoideae. The association of *C. chinensis* with cultivated legumes allowed its global geographical distribution (Johnson, 1981; Udayagiri and Wadhi, 1989). The contrasting ecology of the two closely related bruchid beetles suggests that the oligophagy on non-economic legumes and the limited geographical distribution have kept *C. utidai* at a non-pest status.

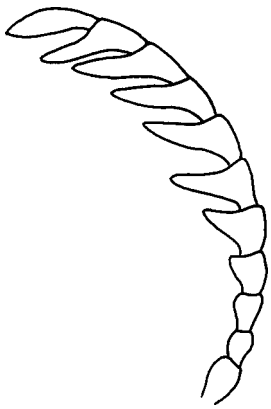

Fig. 4. *Callosobruchus chinensis*. Male antenna, modified from Ministry of Health and Welfare (1993).

*D. rotundifolia* and *D. podocarpa* are cultivated for local medical use (Kondo et al., 1987). When the legumes become economically important in more regions, *C. utidai* may become a pest on the stored seeds. It is necessary to examine the biology of the species, in particular the ability to use dried stored seeds, in the future.

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