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Seed beetles associated with *Alysicarpus vaginalis* in Vietnam (Coleoptera: Chrysomelidae: Bruchinae)

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Abstract. *Bruchidius alacer* and *B. alysicarpi*, two seed beetle species that develop in the larval stage in *Alysicarpus vaginalis* seeds (Leguminoseae, tribe Desmodieae) are described from Vietnam. They belong to a group of Indian Bruchinae, the hosts of which are presently not identified. *B. alacer* has a second host plant in Vietnam, *Desmodium triflorum*. An Indian species, *B. mussooriensis* Arora, was also reared from *Alysicarpus vaginalis* seeds. A key to these three species is provided.

Key words: entomology, taxonomy, Coleoptera, seed beetle, *Bruchidius*, host plant, *Alysicarpus.*

INTRODUCTION

The small legume genus *Alysicarpus* is a member of the tribe Desmodieae (Leguminoseae, Papilionoideae). ILDIS (2010) recognizes 31 species of *Alysicarpus* in the Old World tropics; a majority of them (27 species) are distributed in South Asia, particularly in the Indian subcontinent; they are non climbing, perennial or annual herbs, sometimes used as forage crops. Three species are restricted to Africa (*A. ferrugineus, polygonoides, quartinianus*), and one to Australia (*A. brownii*). A few species have a very large geographic range and seem to be native of all tropical regions of the Old World: *A. glumaceus, longifolius, monilifer, ovalifolius, rugosus, vaginalis*. The latter has been introduced to French Guyana (Lemée, 1952) and Southern U.S.A. (Isely, 1998). Three species only have been identified in Vietnam (Ho, 2002): *A. bupleurifolius* (L.) DC, *A. rugosus* (Willd.) DC, and A. *vaginalis* (L.) DC.

During the course of a review of the seed beetle fauna of Vietnam (Delobel 2008, 2010), I had the opportunity to collect samples of *A. vaginalis* pods in the southern

part of Vietnam, in the vicinity of Hồ Chí Minh City. *A. vaginalis* is a perennial prostrate herb, common in various types of grasslands, and particularly well adapted to anthropic landscapes. Three seed beetles were bred from these samples, two of which are new to science. I give here the description of these two new species, and provide biological data for the third one.

MATERIAL AND METHODS

Four samples of ripe or ripening pods of *A. vaginalis* were collected during years 2006, 2008, 2009, and 2010 in Bình Khánh (N 10°47'22", E 106°44'24") and Củ Chi (N 10°59'11", E 106°27'25"), both in Hồ Chí Minh City, in Mã Đà (N 11°21'37", E107°09'44", Đồng Nai Province) and in Vũng Tàu (N 10°22'27", E 107°03'57", Bà Rịa - Vũng Tŕu Province), see Table 1 for details. Two additional samples of another Desmodieae, *Desmodium triflorum*, also yielded one of the species obtained from *A. vaginalis*; they were collected in Phú Xuân (N 10°41'48", E 106°44'42") and Nha Bč (N 10°40'25", E 106°44'06"), both in Hồ Chí Minh City. Samples were kept in aerated plastic bags at room temperature until adult emergence. At emergence, adults were killed and kept in 70% ethanol for further study. Photographs of body parts were taken through a stereomicroscope with a hand-held digital camera, and measurements were performed using a photo editing software. Genitalia of selected specimens were dissected, cleared in a 10% solution of potassium hydrochloride and mounted in water-soluble DMHF (dimethyl hydantoin formaldehyde). Photographs of genitalia were similarly taken through a microscope, and drawings were performed with a vector graphics editing sofware using photographs as templates. Botanical specimens were identified using Hô's Flora of Vietnam (Hô, 2002). Abbreviations used: MNHN, Muséum National d'Histoire Naturelle, Paris; CBAD, author's collection.

RESULTS

The number of specimens obtained at each sampling location and on the two host plants is indicated in Table 1. Bình Khánh and Mã Đà samples each harboured a single species, two samples (Củ Chi, 2008 and Vũng Tàu, 2010) harboured the same two species, and one sample (Vũng Tàu, 2010) harboured the three species reviewed

Table 1. Number of specimens of the three *Bruchidius* species obtained from the different host plants and locations; between brackets is the approximate number of seeds per sample.

	Alysicarpus vaginalis					*D. triflorum*	
Bruchidius	Bình Khánh 20.i.2006	Củ Chi 11.ii.2008	Vũng Tàu 14.iii.2009	Vũng Tàu 09.i.2010	Mã Đà 19.i.2010	Nhà Be 27.i.2008	Phú Xuân 19.ii.2009
alacer		4 (150)	5 (1180)	47 (540)		16 (115)	10 (320)
alysicarpi				37 (540)	2 (210)		
mussooriensis	14 (230)	5 (150)	14 (1180)	3 (540)			

below. Only *B. alacer* emerged from both hosts, *A. alysicarpus* and *D. triflorum*; the other two species developed on *A. vaginalis* alone. Infestation rates per sample varied between 0.4% (*B. alacer* on Vũng Tàu sample of *A. vaginalis*) and 13.9% (*B. alacer* on Vũng Tàu sample of *D. triflorum*). Mean infestation rates of the different samples by *B. alacer, alysicarpi* and *mussooriensis* were 4.0, 5.2, and 1.7%, respectively.

REVIEW OF SPECIES

Bruchidius alacer sp. nov.

Type material

Holotype: Male, VIETNAM, "Province Bà Rịa - Vũng Tàu, Vũng Tàu, Núi Lớn, 09.i.2010, ex *Alysicarpus vaginalis*, H. & A. Delobel coll.", MNHN. Paratypes: 16 males, 9 females, same data as holotype, 1 female dissected (slide 09409); 3 males, 2 females, same data, but 14.iii.2009, 1 male dissected (slide 01509); 2 males, 2 females, Củ Chi, 9.ii.2008, ex *Alysicarpus vaginalis*, H. & A. Delobel coll., 1 male dissected (slide 02408); 11 males, 5 females, Nhà Be, 27.i.2008, ex *Desmodium triflorum*, H. & A. Delobel coll., 1 male dissected (slide 02508); 4 males, 6 females, Phú Xuân, 19.ii.2009, ex *Desmodium triflorum*, H. & A. Delobel coll., 1 male dissected (slide 02009), MNHN, CBAD.

Description

Length (pronotum-pygidium): 1.40-1.56 mm; width: 0.90-0.96 mm.

Body short and thick, pygidium slanted about 80° from vertical. Integument almost entirely black; four basal segments of antennae testaceous, rest brown, with darkened apices and sides; anterior and median legs testaceous, base of femora and sometimes apex of tibiae darkened.

Vestiture made of scaly setae, mainly whitish to pale greyish, with yellowish and brown setae; on pronotum, a mixture of whitish and yellowish setae, whitish denser on midline and on antescutellar lobes; elytra mainly whitish, with dark squarish dots on interstriae 3, 5, 7, and 9 (two dots on interstria 3, two on the other intervals); in some specimens, interstriae 1 and 2 are clearly yellowish; pygidium entirely whitish or mixed with yellowish setae.

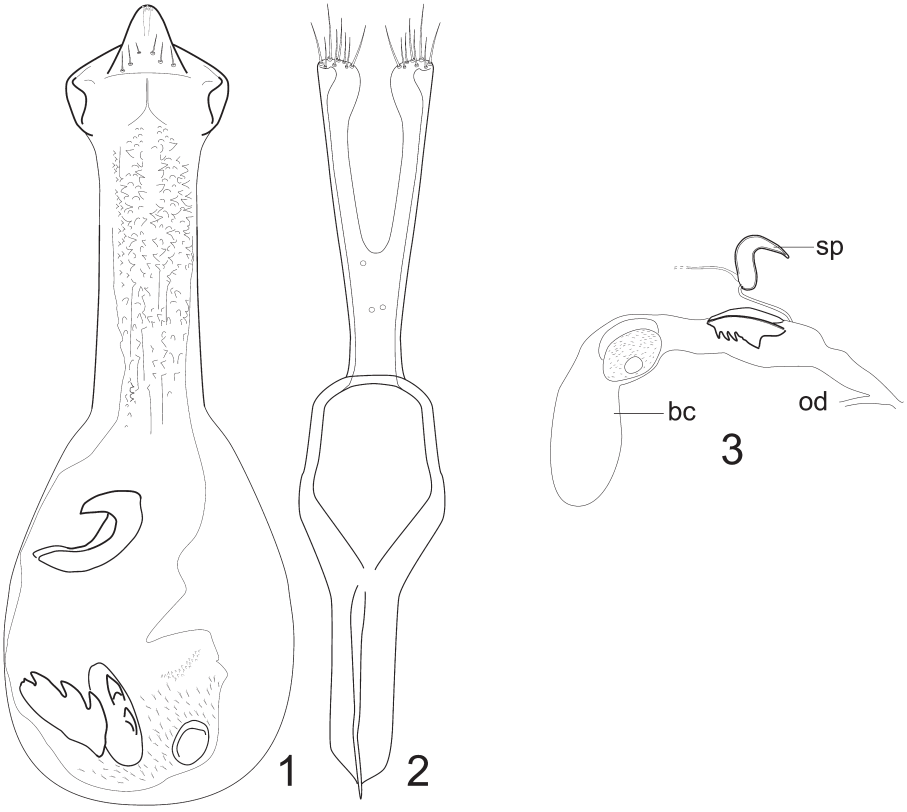
Male. Head transverse; eyes moderately bulging, maximum head width 1.4 times width behind eyes; eyes separated by 0.3 times head width including eyes; face rather wide, with distance between posterior rim of eyes and apex of clypeus / distance between eyes = 2.0; eye deeply cleft, width at bottom of sinus composed of 5-6 ommatidia; maximum width of postocular lobes equal to one third eye width at sinus, with dense white setation; carina on frons ill-defined, shining, interocular tubercule distinct. Punctation of face small, deep and dense, clypeus alutaceous, shining. Antenna short, measuring half body length (excluding head); antennal segments 1 to 4 submoniliform, 2 to 5 of equal length, longer than wide, 4 slightly widened apically, 5-10 wider than long, 11 oval (L/W = 1.5). Length of antennomeres: 1.4; 1.0; 1.1; 1.0; 1.0; 1.3; 1.3; 1.2; 1.3; 1.2; 2.0.

Pronotum campaniform, with greatest width at base (W/L = 1.38), its sides almost straight, not expanded behind eyes; without oblique impression on sides of basal lobe. Pronotum disc with punctures strong, ocellate, almost coalescent, rest of pronotum with less dense, smaller punctures.

Elytra 1.1 times longer than combined width, their sides convex, maximum width near middle; disc not flattened; two minute teeth at base of interstriae 3 and 4, partly hidden in setation. Striae on disc narrow and deep, with strong punctures; interstriae with strong microsculpture and larger punctures.

Hind femora moderately incrassate, at their widest about twice broader than mid femora; mesoventral margin with small preapical denticle; hind tibia apically strongly widened, with dorsomesal and ventral carinae complete, lateral not reaching base; apex of tibia with mucro about as long as width of first tarsomere at base; lateral denticle about 0.6 mucro length, and dorsal denticles acute, less than half as long as lateral denticle. First tarsomere ventrally with small denticle.

Abdomen with ventrite 5 emarginate, about as long medially as sternite 4; ventrite 1 basally with a circular patch of long, dense setae. Last visible abdominal tergite subtriangular, about as wide at base than long, disc strongly convex, apex reflexed.



1-3. male genitalia of *B. alacer*: 1 − median lobe; 2 − lateral lobe and tegminal strut, ventral view; 3 − female genital tract, side view (od: oviduct; sp: spermatheca; ds: dorsal sclerite; bc: bursa copulatrix)

Genitalia: Median lobe (Fig. 1) short and narrow (maximum width excluding basal hood / total length = 0.2), apically widened; basal hood large, ovoid, not emarginate; ventral valve triangular, moderately sclerotized, wide, with apex obtuse, bearing two lateral groups of two or three setae; dorsal valve braced by a wide sclerotized ring; no hinge sclerites; internal sac basally with weakly sclerotized spines, saccus proximally with a large comma-shaped sclerite, distally with two strong plates bearing each a single row of large teeth. Basal strut (Fig. 2) with a long and narrow keel; lateral lobes fused to 40% their length, pubescent; apex of parameres with about 8 setae.

Female. Length (pronotum-pygidium): 1.38-1.74 mm; width: 0.80-0.98 mm.

Similar to male, but antennae slightly shorter, ventrite 1 without patch of setae, ventrite 5 twice longer than ventrite 4; last visible tergite less convex than in male, its disc speculum-like, with very short and thin dark setae, strikinly different from the long and white surrounding setation; antennae only slightly longer than male. Genitalia (Fig. 3): ovipositor short, vagina membranous, dorsal gutter-like sclerotized plate with two or three broad teeth; circular sclerites of the bursa copulatrix well visible; spermathecal body slim, V-shaped, with apical diverticulum thin, pointed or hooked; spermathecal duct opening not protruding, distinct from gland duct opening.

Etymology

From latin adjective *alacer*, lively, which refers to the observed activity of the insect in warm conditions.

Host plants

Larvae develop in *Alysicarpus vaginalis* and *Desmodium triflorum* (L.) DC (Leguminoseae, Fabaceae, Desmodieae) seeds; each larva feeds and develops in a single seed.

Affinities

Most specimens are distinctly more coloured than *alysicarpi*, in some cases however only the colour of posterior legs differentiates the two species; antennal segments are more transverse in *alacer*, so that its antennae are distinctly shorter than in *alysicarpi*. The shape of the ventral valve and of the proximal sclerite of internal sac, and the ornamentation of female genital duct are characteristic of the species.

Distribution

Vietnam.

***Bruchidius alysicarpi* sp. nov.**

Type material

Holotype: Male, VIETNAM, "Province Bà Rịa - Vũng Tàu, Vũng Tàu, Núi Lớn, 09.i.2010, ex *Alysicarpus vaginalis*, H. & A. Delobel coll.", MNHN. Paratypes: 14 males, 22 females, same data as holotype, 2 males (slides 09209 and 09309), 1 female

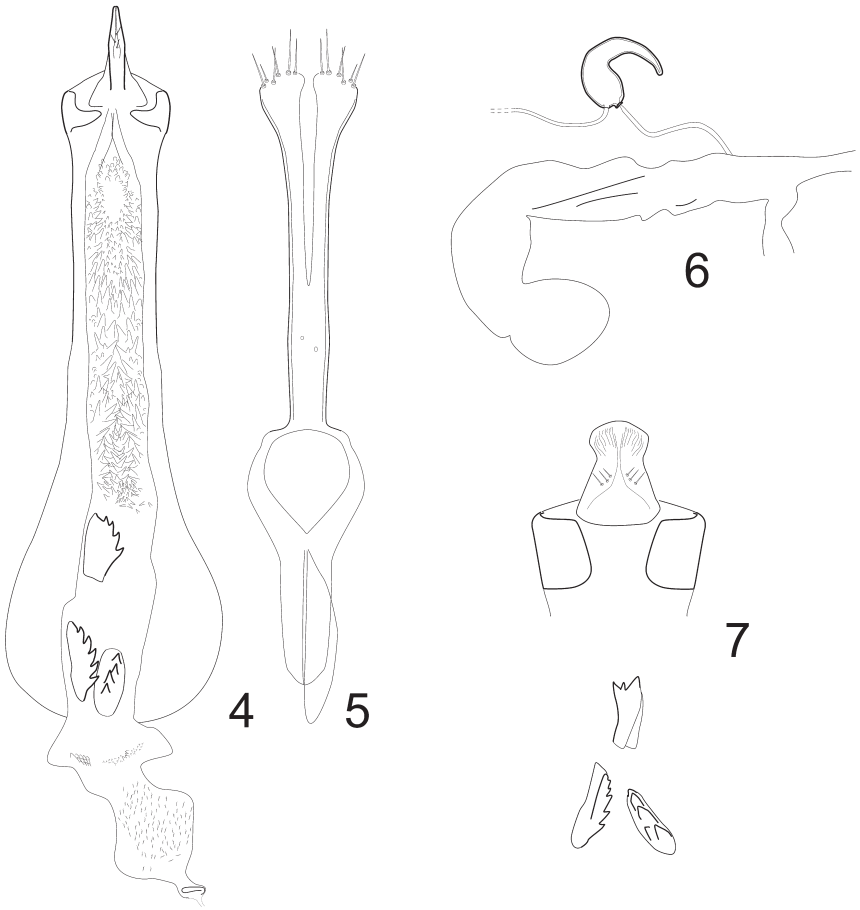
(slide 09509), dissected; 1 male, 1 female, Province Đong Nai, Mã Đà, 19.i.2010, same host, same collectors, MNHN, CBAD.

Description

Length (pronotum-pygidium): 1.32-1.48 mm; width: 0.84-0.98 mm.

Body stout, rather thick, pygidium almost vertical. Integument almost entirely black; antennae (except last segment darkened apically), anterior and median legs (except coxae and femoral bases black) testaceous.

Vestiture mainly made of whitish scaly setae; white setae are denser behind eyes, on a longitudinal pronotal line, on prescutellar lobes, on scutellum, and form a short fascia in middle of elytral interstriae 3 and 7, and a long triangular area at base of last



4-7. genitalia of Bruchinae: 4 − *B. alysicarpi,* median lobe, ventral view; 5 − *B. alysicarpi,* lateral lobe and tegminal strut; 6 − *B. alysicarpi,* female genital tract, side view; 7 − *B. mussooriensis*, ventral valve and sclerotized plates, ventral view

visible tergite; brownish (or copper-coloured) setae are thinner, they form dark areas on pronotum disc, and three ill-defined transverse bands on elytra.

Male. Head transverse; eyes moderately bulging, maximum head width 1.4 times width behind eyes; eyes separated by 0.21 times head width including eyes; face moderately long, with distance between posterior rim of eyes and apex of clypeus / distance between eyes = 3.17; eye cleft to 0.7 its length, width at bottom of sinus composed of 6-7 ommatidia; maximum width of postocular lobes equal to one fourth eye width at sinus, with dense white setation; carina on frons well defined, shining, interocular tubercule distinct. Punctation of face shallow and irregular, clypeus alutaceous, with anterior rim smooth. Antenna long, measuring 0.7 times body length (excluding head); antennal segments 1 to 3 submoniliform, 4 slightly widened apically, as wide as long, 5-10 subtriangular, moderately eccentric, 6-10 slightly longer than wide, 11 oval (L/W = 2.1). Length of antennomeres: 1.9; 1.0; 1.4; 1.6; 1.8; 2.0; 2.2; 2.0; 2.0; 2.1; 3.5.

Pronotum campaniform, with greatest width at base (W/L = 1.41), its sides slightly bulging in centre, not expanded behind eyes; with shallow oblique impression on sides of basal lobe. Sculpture of pronotum made of strong, regular, coalescent, ocellate punctures, becoming smaller on sides.

Elytra 1.1 times longer than combined width, their sides convex, maximum width near middle; disc not flattened; a pair of minute teeth at base of interstriae 3 and 4; striae on disc shallow and narrow, with large, deep punctures; interstriae narrow, with strong micropunctation.

Hind femora moderately incrassated, at their widest 2.1 times wider than mid femora; mesoventral margin with small preapical denticle; hind tibia apically strongly widened, with ventral carina complete, lateral not reaching base; apex of tibia with mucro slightly longer than width of first tarsomere at base; lateral denticle about one fourth mucro length, and dorsal denticles very short. First tarsomere ventrally with blunt denticle.

Abdomen with ventrites 2-5 strongly shortened and contracted; ventrite 1 basally with a small patch of dense, long setae; ventrite 5 emarginate, its length medially about half sternite 4. Last visible abdominal tergite (pygidium) subtriangular, slightly narrower at base than long, rather strongly bulbous on disc, but apex not reflexed.

Genitalia: Median lobe (Fig. 4) of moderate length, wide, stout (maximum width excluding basal hood / total length = 0.15), subcylindrical ; basal hood small, not emarginated; ventral valve acutely triangular, moderately sclerotized, elongated, bearing a central group of 3 or 4 setae; dorsal valve braced by a moderately sclerotized ring; no hinge sclerites; internal sac lined basally with densely packed, weakly sclerotized tubercles; saccus proximally with a short gutter-like sclerite bearing three or four strong teeth on its free part, and distally two strong plates with two rows of teeth; gonopore flattened. Basal strut (Fig. 5) with large keel; lateral lobes fused on 40% of their length, pubescent; apex of parameres with five or six setae.

Female. Length (pronotum-pygidium): 1.26-1.60 mm; width: 0.78-1.00 mm.

Similar to male, but last visible tergite almost flat over its entire surface, its setation showing two small elongated areas (sometimes ill-defined) of short and thin dark setae on each side of a median longitudinal line of dense white setae; ventrites

without particular arrangement of setae; ventrite 5 about twice longer than ventrite 4; antennae shorter than male. Genitalia (Fig. 6): ovipositor short, vagina membranous, without dorsal sclerotized plate, circular sclerites of the bursa copulatrix indistinct; spermathecal body U-shaped, with apical diverticulum thin, pointed; spermathecal duct opening briefly protruding, distinct from gland duct opening.

Etymology

Latin genitive (masculine) of the host plant generic name.

Host plants

Larvae develop in *A. vaginalis* seeds (Leguminoseae, Fabaceae, Desmodieae); each larva feeds in a single seed.

Affinities

Closely related with *alysicarpi* (see above).

Distribution

Vietnam.

Bruchidius mussooriensis Arora

Bruchidius mussoriensis Arora, 1980: 54.

I was unable to examine the type of this species, but Arora's description (1980) is sufficiently detailed and his illustrations adequate. It may be distinguished from the other two species by its dorsal vestiture, almost homogeneously whitish; posterior legs are entirely black. Male genitalia (Fig. 7) are quite distinctive, with ventral valve rounded apically and widened; the surface of the saccus bears three sclerotized plates, as in the two species described above, but the basal plate is subrectangular, with three apical teeth. *B. mussooriensis* was present in four samples of *A. vaginalis* collected in Vietnam (see Table 1). It is presently known from India and Vietnam.

DISCUSSION

The three Asian species now known to develop in *Alysicarpus* seeds belong to a relatively large and poorly known group of species, most of which were described by Arora (1980). These species are small-sized (less than 2.5 mm), mostly black, their host plants are described as "obscure", and were "collected from flowers, leaves or grass" (key, p. 12-17). At the time of Arora's publication, the group consisted of *B. obscurus* Arora, 1977, *B. compositus* Arora, 1977, *B. vulgaris* Arora, 1977, and 13 species described in the same article. My own samplings of Desmodieae such as *Christia, Dendrolobium, Desmodium, Uraria,* indicate that a number of these Indian

species are associated with Desmodieae pods and seeds; they will be dealt with in a forthcoming review of Vietnamese seed beetles.

The three species reared from *Alysicarpus* have quite similar morphologies. They may however be distinguished on the base of mere external features. The following key is based on integument and vestiture colour; it is valid only for specimens reared from *Alysicarpus* seeds.

1. Posterior legs mainly reddish brown, with femoral base black. Elytral vestiture whitish and yellowish, with usually well defined dark spots. Antenna short, segments 6-11 reddish-brown, each with apex slightly darkened …..... *alacer* sp. nov.
–. Posterior legs entirely black ……..……. 2.
2. Elytral vestiture variegated, with whitish areas and dark brown or copper-coloured spots. Antenna reddish-brown …….....…..…… *alysicarpi* sp. nov.
–. Elytral vestiture almost uniformly whitish, with only faint and diffuse darker areas. Antenna black, except basal segments partly reddish …..... .....…… *mussooriensis* Arora

B. alacer appears as the only species of the group having two hosts belonging to two distinct genera within tribe Desmodieae. Data remain far too scanty to draw any clear trend in infestation rates among the different samples collected. It should be mentioned here that *A. vaginalis* has no known seed beetle predator in Africa; samples of *A. vaginalis* collected in Senegal (unpublished data) did not yield any seed beetle. This indicates that radiation of *Bruchidius* species on *A. vaginalis* occurred in Asia rather than in Africa, possibly because the host plant is in fact a native of Asia, and spread posteriorly to other parts of the Old World tropics without its insect predators. African seed beetles presently known to be associated with Desmodieae are much less numerous than in Asia; they belong to a different group of species, of which *B. dilaticornis* (Pic) is the sole described member.

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