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Short Communication

First record of the family Bothrideridae (Coleoptera) in Korea represented by the wood-boring beetle ectoparasite, *Dastarcus helophoroides*

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ABSTRACT

The ectoparasitic beetle, *Dastarcus helophoroides* (Fairmaire), was observed for the first time in Korea as a result of a study of the natural enemies of *Monochamus alternatus* Hope and *M. saltuarius* Gebler, the vector of the pine wood nematode (*Bursaphelenchus xylophilus* (Steiner & Buhner)). Diagnostic illustrations are provided and the biology and host range of *D. helophoroides* (Fairmaire) are reviewed.

Introduction

Bothrideridae is a family of small, lesser-known beetles. It has approximately 38 genera and 400 species worldwide and is divided into four subfamilies (Anommatinae, Bothriderinae, Teredinae and Xylariophilinae) (Lord, 2009). The ectoparasitic Bothriderinae consists of 28 genera worldwide and is divided into two tribes (Deretaphrini and Bothriderini) (Lawrence, 1991). Bothriderini contains 21 genera (Ślipiński et al., 1989) and Deretaphrini contains five genera (Lawrence et al., 1999). Until now, no Bothrideridae species have been recorded in Korea.

Bothrideridae is recognized by the combination of following characteristics: oblong to elongate and subcylindrical to flat body; usually subglabrous, sometimes clothed with decumbent and erect hairs or, rarely (*Dastarcus*), scale-like setae; exposed antennal insertions and a cucujiform or ring-type aedeagus; antenna relatively short, usually with a compact, 1- or 2-segmented club; fronto-clypeal suture usually present; tibia with expanded and spinose apices and sometimes enlarged and unequal tibial spurs; trochantero-femoral articulation strongly oblique so that portion of femora in contact with coxa and, in most species, trochanter reduced and more or less concealed by femoral base (CSIRO, 2010).

Members of this family are ectoparasites or fungal feeders. Many species are found in the galleries and tunnels of wood-boring beetles where they are ectoparasites of coleopteran larvae and pupae. Hosts include species of Anobiidae, Bostrichidae, Mycteridae, Cerambycidae, Platypodidae, Scolytidae and Curculionidae (Philips and Ivie, 2002). Especially, *D. helophoroides* is used to evaluate the efficiency of mortality as the natural enemy of cerambycid beetles, including *Monochamus alternatus* Hope, and is used to study their ecological and physiological features in China and Japan (Ogura et al., 1999; Togashi and Itabashi, 2005; Urano, 2006; Wei et al., 2008, 2009a; Li et al., 2009).

In the present paper, we re-describe *Dastarcus helophoroides* (Fairmaire) based on a Korean specimen and include detailed diagnostic illustrations due to the inadequate original description. The hosts of *D. helophoroides* (Fairmaire) are also reviewed.

Systematic accounts

Family Bothrideridae Erichson, 1845
Subfamily Bothriderinae Erichson, 1845
Tribe Bothriderini Erichson, 1845
Genus *Dastarcus* Walker, 1858
Type species. Dastarcus porosus Walker, 1858

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Diagnosis. Body ranging 4–12 mm long; broadly oblong-elliptical; squamiferous. Antenna eleven segmented with two distal segments clubbed; antennal grooves well developed. Pronotum broad, narrowed to prominent anterior angles; disc and margins with various patches of short and upstanding squamiform setae. Elytra tapered toward apices, outline notched near apices; disc striate-punctate, sutural stria grooved, other striae grooved or not; intervals between striate flat, carinate, or partially carinate, usually punctured. Prosternal process broad, broadly expanded posteriorly and transversely sulcate between coxae. Anterior tibia with short, curved, apico-external tooth and conspicuous, strongly curved apico-internal spine; middle and hind tibiae without external teeth, internal spines small and inconspicuous; tarsi with segments I–III subequal (Ślipiński et al., 1989).

Taxonomic comments. Lord (2009) summarized the changes of classification on Bothrideridae as follows: Most species of Bothrideridae were treated as distinct subfamilies or tribes within Colydiidae (Ivie and Ślipiński, 1990) and often associated with the tribes Cerylini or Cerylonini (now Cerylonidae). The subfamily Anommatinae was once in the family Latridiidae based on their trimerous tarsi but was later transferred to a redefined subfamily within the Colydiidae consisting of the present bothriderid and cerylonid. Despite suggestions by Craighead (1920), researchers continued to treat Bothrideridae as a colydiine subfamily until Lawrence (1985) adopted the family status under the superfamily Cucujoidea.

Dastarcus helophoroides (Fairmaire 1881) (Figs. 1–7)

Pathodermus helophoroides Fairmaire 1881. *Annls. Soc. Entom. France*, (6) 1: 79–88.

Dastarcus longulus Sharp 1885. *Biol. J. Linn. Soc.* 19 (109): p. 76. plate 3. Fig. 9.

Redescription. Body 9–10 mm long. Body blackish brown with brown suberect scales. Head blackish brown except maxillary and labial palpi brown. Basal half of mandible with brown scales laterally. Clypeus with dense yellow hairs apically. Frons and vertex strongly punctuate. Vertex with scales stronger than those of frons. Antenna inserted between clypeus and compound eye. Compound eye 0.52 mm in width maximum, oval, 1.2× as long as wide. Antenna 11-segmented, moniliform and last two segments of antenna clavate distally; scape oval, 1.3× as long as wide, flagellomere I 1.5× as long as wide; flagellomere VIII and IX flattened with dense yellow pubescences apically, 0.6× and 0.5× as long as wide, respectively. Pronotum 0.8× as long as wide with brown scales; lateral margin convex in dorsal view; anterior and posterior margin convex in middle and concave on each side; one pair of longitudinal carina along with lateral carinae; one pair of longitudinal carinae in middle; posterior half of disc slightly elevated. Prosternum, mesosternum, metasternum, and sternites smooth with yellow hairs in each punctation, combined mesepisternum and mesepimeron, metepisternum without hairs. Metepimeron absent. Sternite I depressed along basal margin and as long as combined length of following three sternites in mid line. Legs with blackish brown scales and each tibia with outer two rows of strong scales; foreleg with two tibial spurs apically; middle and hind tibia without apical spurs. Fourth tarsal segment as long as 2nd and 3 rd tarsal segment combined. Scutellum round without hairs. Elytra 1.8× as long as wide; first two elytral strioles clearly connected with linear groove; scales of interval dense; each lateral side of apex constricted and slightly concave.

Specimens examined. 1 female, Mt. Seorak, Buk-myeon, Inje-gun, Gangwon province, Korea, 15.viii.2006, H. Y. Oh leg.; 1 female, Sanggye-ri, Okgye-myeon, Gangreung-si, Gangwon province, Korea, 27.viii. 2002, T. W. Kim et al. leg.

Distribution. Korea (GW; first record), China, and Japan.

Biology. Adult females can lay eggs twice per year (Lei et al. 2003; Qin and Gao 1988) on the outer surface of the bark near the host's entrance hole, frass-extrusion hole, or around the host larval tunnel walls (Qin and Gao 1988). Once eggs hatch, first instar larvae can actively move to search for hosts. The eggs, larval, and pupal periods are 12.7, 8.4, and 25.6 days, respectively, at 21 ± 1 °C (Lei et al. 2003).

Figs. 1-7. *Dastarcus helophoroides* (Fairemaire) (female).1, habitus in dorsal view; 2, *ditto* in lateral view; 3, mid tibia; 4, head in frontal view; 5, antenna; 6, sternites in ventral view; 7, pronotum in dorsal view (scale bars: 0.2 mm for 5; 0.5 mm for 3–4; 1.0 mm for 6–7; 2.0 mm for 1–2).

Remarks.Dastarcus helophoroides (Fairmaire) is a natural enemy of longhorn beetles, including *Monochamus alternatus* Hope, the vector of pine wood nematode (Table 1). Other biological information is available from several studies (Gao and Li, 2001; Gao et al., 2003; Lei et al., 2003; Li et al., 2007; Miura et al., 2003; Ogura et al., 1999; Qin and Gao, 1988; Urano, 2003; Wang et al., 1999; Wei et al., 2007, 2009b; Zhang and Yang, 2006).

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Table 1
Host insects of *Dastarcus helophoroides* (Fairmaire).

Family	Species	References
Cerambycidae	*Massicus raddei* (Blessig)	Gao et al., 2001
Cerambycidae	*Anoplophora glabripennis* Motchulsky	Zhou et al. 1985
Cerambycidae	*Monochamus alternatus* Hope	Ogura et al., 1999
Cerambycidae	*Apriona germari* (Hope)	Qin and Gao 1988
Cerambycidae	*Apriona swainsoni* (Hope)	Qin and Gao 1988
Cerambycidae	*Batocera horsfieldi* (Hope)	Qin and Gao 1988

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