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AMPHIZOIDAE
(Coleoptera)

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Abstract

Data on the distribution, morphology and bionomics of the Chinese Amphizoidae (*Amphizoa davidi* LUCAS, 1882 and *A. sinica* YU & STORK, 1991) are presented. New data are presented on habitat preferences of *A. sinica*, based on material collected by the author and by the China Water Beetle Survey (CWBS).

Key words: Coleoptera, Amphizoidae, *Amphizoa*, China

Introduction

Amphizoidae is a monogeneric family. The genus *Amphizoa* LECONTE, 1853 contains five known species. *Amphizoa davidi* LUCAS, 1882 and *A. sinica* YU & STORK, 1991 occur in China. *Amphizoa insolens* LECONTE, 1853, *A. lecontei* MATTHEWS, 1872 and *A. striata*, VAN DYKE, 1927 occur in North America (Colorado to southern California and Alaska) (EDWARDS 1954).

The genus *Amphizoa* has been the focus of considerable interest because of its interesting behavior and morphology. The genus demonstrates a combination of structural characters which appear to be intermediate between those of Caraboidea and Dytiscoidea (KAVANAUGH 1986, BEUTEL 1995). There are many characters similar to those of the Dytiscidae, but the legs, prosternum, and coxal cavities indicate a close relationship with Carabidae.

The following four species were described in this genus but were eventually synonymized: *Dysmathes sahlbergii* MANNERHEIM, 1853 and *Amphizoa josephi* MATTHEWS, 1872 were synonymized with *Amphizoa insolens* by SALLE (1874) and by HORN (1873) respectively; *Amphizoa planata* VAN DYKE, 1927 and *Amphizoa carinata* EDWARDS, 1950 were synonymized with *Amphizoa lecontei* by VAN DYKE (1927b) and by KAVANAUGH (1986) respectively. *Amphizoa kashmirensis* VAZIRANI, 1964, described from the Himalaya, is in fact a dytiscid, belonging to the genus *Hydronebrius* JAKOVLEV (KAVANAUGH & ROUGHLEY 1981, KAVANAUGH 1986).

Material

Material used for this study is deposited in the Chinese Academy of Sciences, Institute of Applied Ecology, Shenyang (CASS) and the Naturhistorisches Museum Wien, Vienna, Austria (NMW).

Amphizoidae were collected at the following China Water Beetle Survey (CWBS) localities (all close to the type locality of *A. sinica*):

CWBS loc. 65 (Fig. 3): **Jilin Province**; Yanbian Korean Autonomous Prefecture; Antu County; Baihe City, Baohujü District; Erdao Bai He (= 2nd White River), near bridge, 10 - 15 m wide, fast flowing, 650 m a.s.l.; 15.VIII.1994; leg. Jäch, Ji & Wang

CWBS loc. 78 (Fig. 4): **Jilin Province**; Yanbian Korean Autonomous Prefecture; Antu County; Changbai Shan Biosphere Reserve; near Hongsi Forest Station, ca. 30 km NE Baihe City; stream, ca. 3 m wide, through primary broadleaf forest, basalt, ca. 650 m a.s.l.; 17.VIII.1994; leg. Jäch, Ji & Wang

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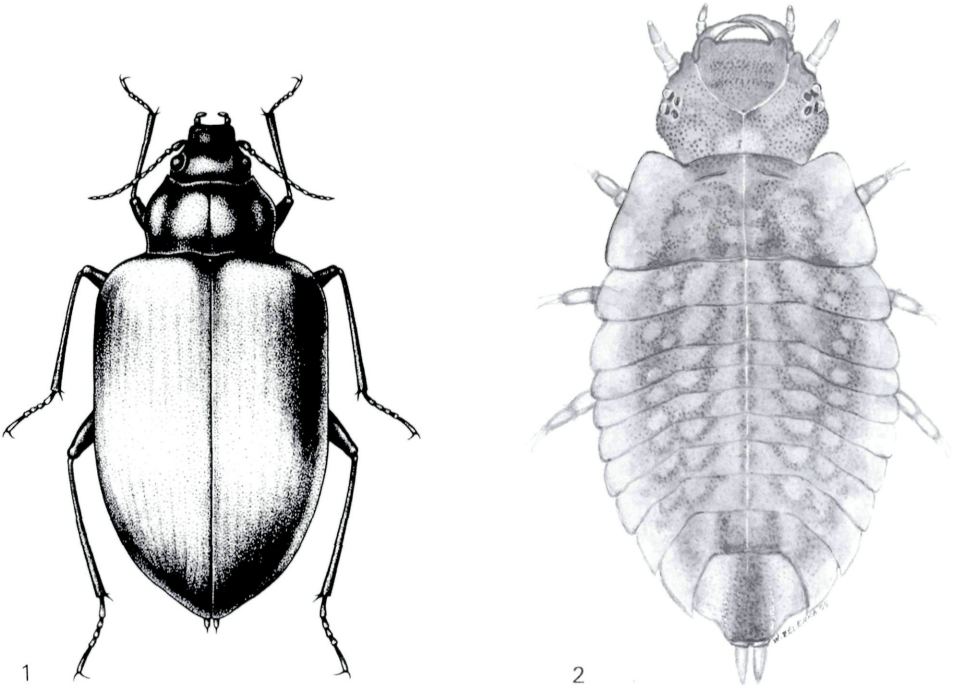

Figs. 1 - 2: *Amphizoa sinica*, habitus, 1) adult, 2) larva.

CWBS loc. 81: **Jilin Province**; Yanbian Korean Autonomous Prefecture; Antu County; Changbai Shan Biosphere Reserve; near Baihe City; Erdao Bai He, below the power plant dam, ca. 4 m wide, degraded primary forest, ca. 650 m a.s.l.; 17.VIII.1994; leg. Jäch, Ji & Wang

Taxonomy

Amphizoa davidi LUCAS

Amphizoa davidi LUCAS 1882: LCVII. - REGIMBART 1899: 192. - ZIMMERMAN 1920: 326. - WU 1933: 335. - EDWARDS 1950: 322. - KAVANAUGH 1980: 289. - KAVANAUGH & ROUGHLEY 1981: 269. - LEECH & CHANDLER 1956: 301. - YU & STORK 1991: 253. - YU, XIE & LIN 1993: 107.

TYPE LOCALITY: "Mou-pin" [= Baoxing Xian, N of Ya'an], Central Sichuan, China.

TYPE MATERIAL: **Lectotype** ♂, "Museum Paris, Mou-pin, A. David 1870"/"398"/"774 70"/"Amphizoa davidis, Lucas" (label double-pierced by pin, hence vertical on pin)/"Type" (red)/"Museum Paris"/"Lectotype Amphizoa davidi Lucas designated by D.H. Kavanaugh 1983" (red) (KAVANAUGH 1986).

We have not examined the lectotype which is deposited in the Muséum national d'Histoire naturelle, Paris, France. A photograph, drawings and additional information about the lectotype was published by KAVANAUGH (1986).

DIAGNOSIS: Body form narrow, about 11.4 mm long; body colour piceous, with antennae, maxillary and labial palpi, and tarsi rufopiceous. Head finely and densely punctate; pronotum coarsely and densely punctate, with area between punctures convex, granulate in appearance. Elytra finely and densely punctate, slightly rugose at base and in lateral one-fourth. Pronotum

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broadest at base, with lateral margins arcuate at middle, markedly sinuate anterior to basal angles, not crenulate, median longitudinal impression present but faintly impressed; prosternal intercoxal process short and rather rounded. Elytra evenly convex; elytral striae complete but faintly impressed and finely punctate. Front tibia with posterodorsal groove present on apical three-fourths, with fringe setae in groove very short and restricted to apical half.

AEDEAGUS: Male median lobe with shaft slender at middle, evenly arcuate ventrally, apex slightly deflected ventrally; left paramere narrow basally, with hairs restricted to apical fourth.

DISTRIBUTION: So far known only from the type locality.

Amphizoa sinica YU & STORK

Amphizoa sinica YU & STORK 1991: 254. - YU, XIE & LIN 1993: 107.

TYPE LOCALITY: China: Jilin Province: Changbai Shan Biosphere Reserve; near Baihe City; Erdao Bai He, 740 m a.s.l., fast flowing river, flowing through broadleaf Korean Pine mixed forest.

TYPE MATERIAL: **Holotype** ♂, "People's Republic of China, Chang bai shan (42°N, 128°E), Jilin Province, 740 m, 24 July 1987 (Yu Peiyu)". **Allotype** ♀, locality as holotype, 5 July 1982, leg. S. Liao; **Paratypes**: 14 ♂♂ and 15 ♀♀, same locality data and collector as holotype.

Holotype and allotype are deposited in the Institute of Zoology, Academia Sinica, Beijing. Paratypes are deposited in the same institute and the Natural History Museum, London" (YU & STORK 1991).

We have not seen the types, but numerous specimens which were collected at the type locality have been examined.

MATERIAL EXAMINED (CASS, NMW): **adults**: type locality, 15.-18.VII.1988, leg. Yang; 5.-10.VIII.1989, leg. Ji & Yang; 12.VII.1992, leg. Ji & Yang; 27.VI.-20.VII.1993, leg. Yang; CWBS loc. 65; CWBS loc. 81; **larvae**: CWBS loc. 78; CWBS loc. 81.

DIAGNOSIS (Fig. 1): Body 11.0 - 13.5 mm long. Colouration yellowish brown to black. Head finely and densely punctate. Pronotum broadest at base, with lateral margin arcuate in middle, (similar to that of *Amphizoa davidi*), but anterior corner strongly angulate in *A. sinica*; surface with coarse and sparse punctures, lateral margins slightly crenulate, median longitudinal impression strongly visible. Elytra broad and convex, but median area flattened, rather slightly concave paralaterally in anterior half, with completely punctate striae; intervals finely and densely punctate. Prosternum slanting down to space between coxal cavities, prosternal intercoxal process moderately elongate (more rounded in *A. davidi*), hardly depressed, with fine punctures. Front tibia with posterodorsal groove extended along entire length, with fringe setae in groove generally restricted to apical third.

AEDEAGUS: Median lobe long, nearly same length as parameres (much longer than parameres in *A. davidi*), with shaft distinctly thickened at middle (slender at middle in *A. davidi*), ventral margin slightly bulged, apex slightly deflected ventrally. Left paramere not narrow dorsally, with vestiture extending beyond apical third.

The larva of *Amphizoa sinica* (Fig. 2) was described by YU, XIE & LIN (1993).

DISTRIBUTION: So far only known from the Changbai Shan in northeastern China.

Bionomics of *Amphizoa*

DARLINGTON (1929) indicated that *Amphizoa* species occur chiefly in two kinds of running water habitats, either in gravel at water level along the banks of streams, or in masses of floating trash which have gathered against obstructions. In the second case specimens nearly always are found at the side of an eddy or at a curve in the stream, or where for some reason the current is throwing up detritus.

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Figs. 3 - 4: Habitat of *Amphizoa sinica*, 3) CWBS loc. 65, L. Ji (in front) and M. Wang (behind), 4) CWBS loc. 78.

EDWARDS (1950) reported that *Amphizoa* species occur in cold mountain streams where they crawl about on submerged stones and logs in swift currents, or cling to driftwood in eddies, apparently feeding upon dead or sluggish insects which come in contact with them. They often become encrusted with debris or precipitates from the water. When agitated they emit an odor somewhat like that of decaying plant material.

The larvae occur with the adults in swift, cool water of mountain streams. Although living under water they stay near the surface and must expose at least the eighth abdominal segment to the air in order to obtain oxygen. They are unable to swim and if dislodged will sink helplessly to the bottom and crawl ashore. Their general behavior is very similar to that of the imago. When full-grown they evidently pupate underground along streams, since newly emerged adults are usually thickly coated with mud.

EDWARDS (1954) observed the beetles living submerged beneath the icy water of mountain streams, being most abundant on driftwood floating in frothy eddies, or along the banks of streams where grass roots of the undercut banks drag in the water. He also noticed that after surfacing briefly, the beetles carried down a large air bubble at the tip of their body when they submerged. The air bubble surrounded the tips of the elytra but was mostly held beneath the elytral apex.

The bionomics of the aquatic larva of *Amphizoa sinica* was studied by YU, XIE & LIN (1993). They found the first instar larvae and adults overwintering. Larval growth and development depend mainly on temperature. In general, the first instar lives for about 9 - 10 months, hatches in July, feeds for a short time, and overwinters. The 2nd instar larvae develop in the last ten days of April, and the 3rd instar larvae develop during May and June. Pupation probably occurs during June to July. The larvae of *A. sinica* feed on either adults or larvae of drowned insects, such as Trichoptera, Plecoptera, Hymenoptera, Diptera, Odonata, Ephemeroptera, etc.

In the Changbai Mountains the larvae and adults of *Amphizoa sinica* live in swift currents on large rocks and on hard logs which are partly submerged, and along the margins (especially undercut banks) of these streams. We never found *A. sinica* on fully submerged rocks or logs.

The beetles can be collected by cleaning the surface of these rocks and logs and by placing a collecting net in the current behind or by sweeping the margins (submerged grass or roots) of these streams with a water beetle net.

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