

DYTISCIDAE:
XII. A new species of *Hydrotrupes* SHARP from China,
an example of Pacific intercontinental disjunction
(Coleoptera)

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Abstract

Hydrotrupes chinensis sp.n. (Coleoptera: Dytiscidae) is described from a single male collected in a stream in Anhui (eastern China). The new species is very similar to the second species of the genus, *H. palpalis* SHARP, 1882, endemic to western North America. The disjunct distribution of the genus is discussed.

Key words: Coleoptera, Dytiscidae, *Hydrotrupes*, China, taxonomy, new species, disjunction.

Introduction

The genus *Hydrotrupes* was erected by SHARP (1882) for a single male from California, the holotype of his *H. palpalis*. SHARP (1882) placed his new genus with the Agabini, a classification accepted by most later authors (e.g. LEECH 1942, BRINCK 1948, and GUÉORGUIEV 1971). Within the Agabini, the genus *Hydrotrupes* is characterized chiefly by the short and robust palpi, especially the subquadrate terminal labial palpomere.

Based on a cladistic analysis of selected larval characters, BEUTEL (1994) came to the conclusion that *Hydrotrupes* is not a member of the Agabini or Colymbetinae, but rather represents a more basal branch of the family Dytiscidae. Following BEUTEL's (1994) conclusions, ROUGHLEY (2000) erected the new subfamily Hydrotrupinae for *Hydrotrupes palpalis*. However, more recent studies of larval (ALARIE et al. 1998) and adult morphology (MILLER 2001) have found evidence for keeping *Hydrotrupes* within the Agabini. MILLER (2001) also gave this tribe the status of a separate subfamily, Agabinae, as recognized also in the recent world catalogue of the Dytiscidae (NILSSON 2001). As different analyses of morphological characters have reached disparate conclusions on the systematic position of *Hydrotrupes*, the study of molecular characters should be encouraged as well as more inclusive analyses based on morphology.

A second species of the genus *Hydrotrupes* now has been found in material made available by the China Water Beetle Survey (JÄCH & Ji 1998). The aim of this paper is to describe the new species.

Acronyms & CWBS locality:

CASS Chinese Academy of Sciences, Institute of Applied Ecology, Shenyang
CWBS China Water Beetle Survey

CWBS loc. 284: **Anhui Province**; Weizhou Prefecture; Huang Shan (= Yellow Mountains) National Park; Qi Yun Shan (= Cloudy Mountains) near Yan Qian, 30 km W Huang Shan City (= Tunxi); stream, < 0.5 m wide, running over conglomerate rock in a gorge, densely shaded, more or less dried out, residual pools, 500 m a.s.l.; 24.X.1997; leg. H. Schönmann & M. Wang.

Hydrotrupes chinensis sp.n.

Type locality: China, Anhui Province, Weizhou Prefecture, Huang Shan National Park, Qi Yun Shan Mts, near Yan Qian, 30 km W Huang Shan City (CWBS loc. 284).

Type material: **Holotype** ♂ (CASS): "CHINA: Anhui, Huang Shan, 30 km W Tunxi, 24.10.1997, Qi Yun Shan, 500 m, leg M. Wang (CWBS 284)".

Diagnosis: The new species is similar to *H. palpalis* in most aspects. The most evident differences are (cf. LARSON et al. 2000): (1) penis narrower in distal half with apex not twisted to left, (2) parameres more strongly setose and slightly asymmetric, (3) body slightly broader, (4) male antennomeres less flattened, and (5) prosternal process slightly longer and narrower.

Description (of male): Body (Figs. 7, 8): length 4.3 mm (without head 4.1 mm), maximum width 2.7 mm; shape broadly oval, length without head/maximum width 1.52; dorsally strongly convex and ventrally more or less flat.

Dorsal side: head with antenna and palpi short and robust (Figs. 1, 2), last labial palpomere subquadrate; eye small with strong anterior excavation; clypeus with marginal linear fovea restricted to anterior angles; pronotum with lateral bead broad, increasing in width anteriad.

Ventral surface: prosternum medially raised with anteromedian protuberance; prosternal process short and more or less flat, laterally beaded (Fig. 4); metaventricle with anteromedian emargination short; metaventral wing short with apical part narrow (Fig. 6), WC/WS 2.65; metacoxal processes broadly rounded with edge thickened and without distinct incisions (Fig. 5); metacoxal lines basally subparallel and almost reaching metaventricle, posteriorly diverging and not fully reaching posterior margin of processes.

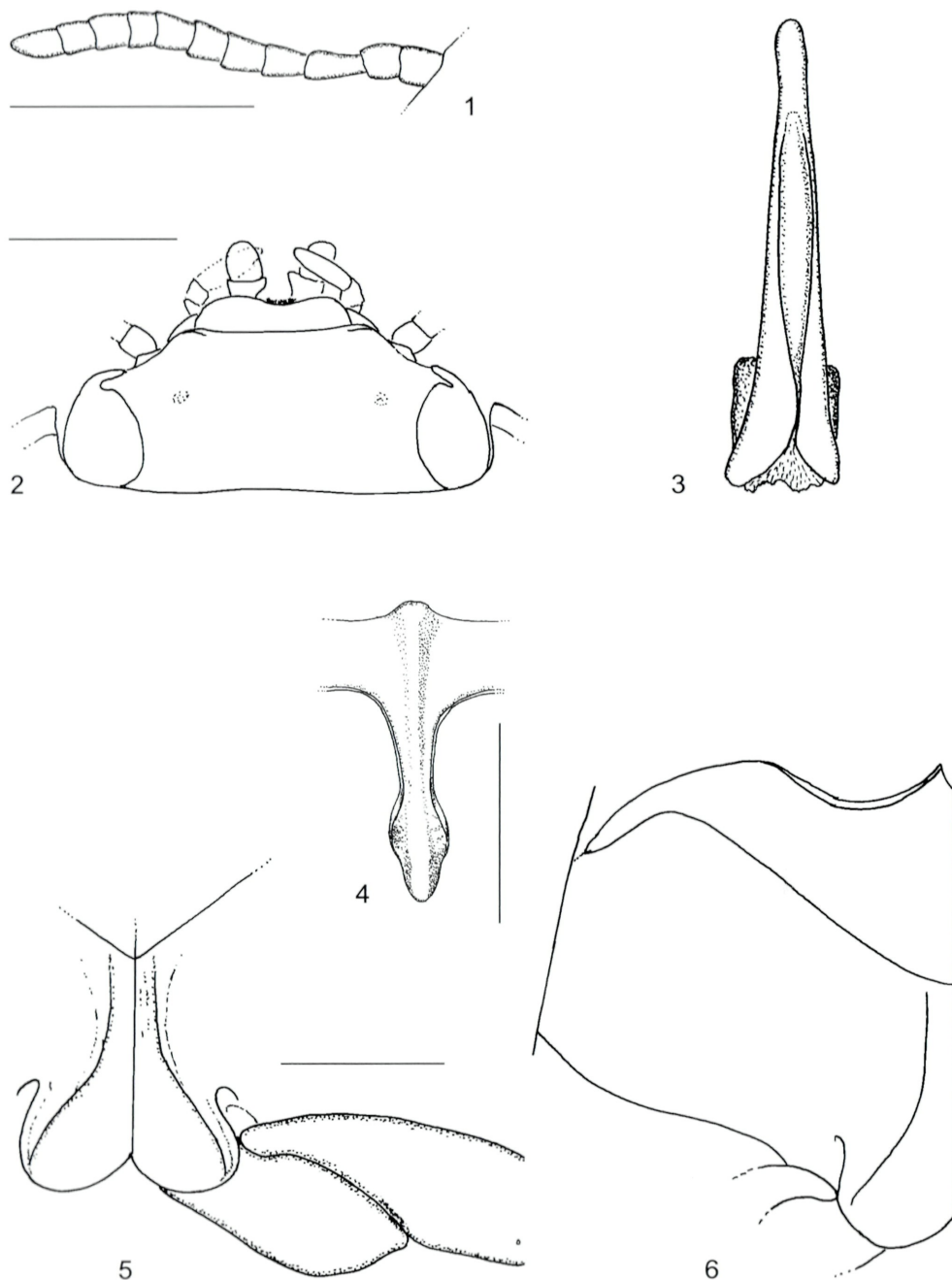
Legs: short and broad; tarsal claws on all legs simple and of equal length; pro- and mesotibiae broadened distally, external margin bearing coarse spine-like setae; pro- and mesotarsomeres 1-3 slightly dilated and provided with adhesive discs (about 12 on each tarsus); metatrochanter long, 2/3 length of metafemur (Fig. 5); metafemur without setal row at posteroapical angle; metatibia and metatarsus with dorsal fringe of natatorial setae, ventral fringe absent; posterior margins of metatarsomeres straight, not lobed.

Genitalia: penis gently curved in lateral view (Figs. 13, 14), apically broadly rounded, in dorsal view with groove expanded in distal half (Fig. 3); parameres of slightly different shape, inner margin strongly setose (Figs. 9 - 12).

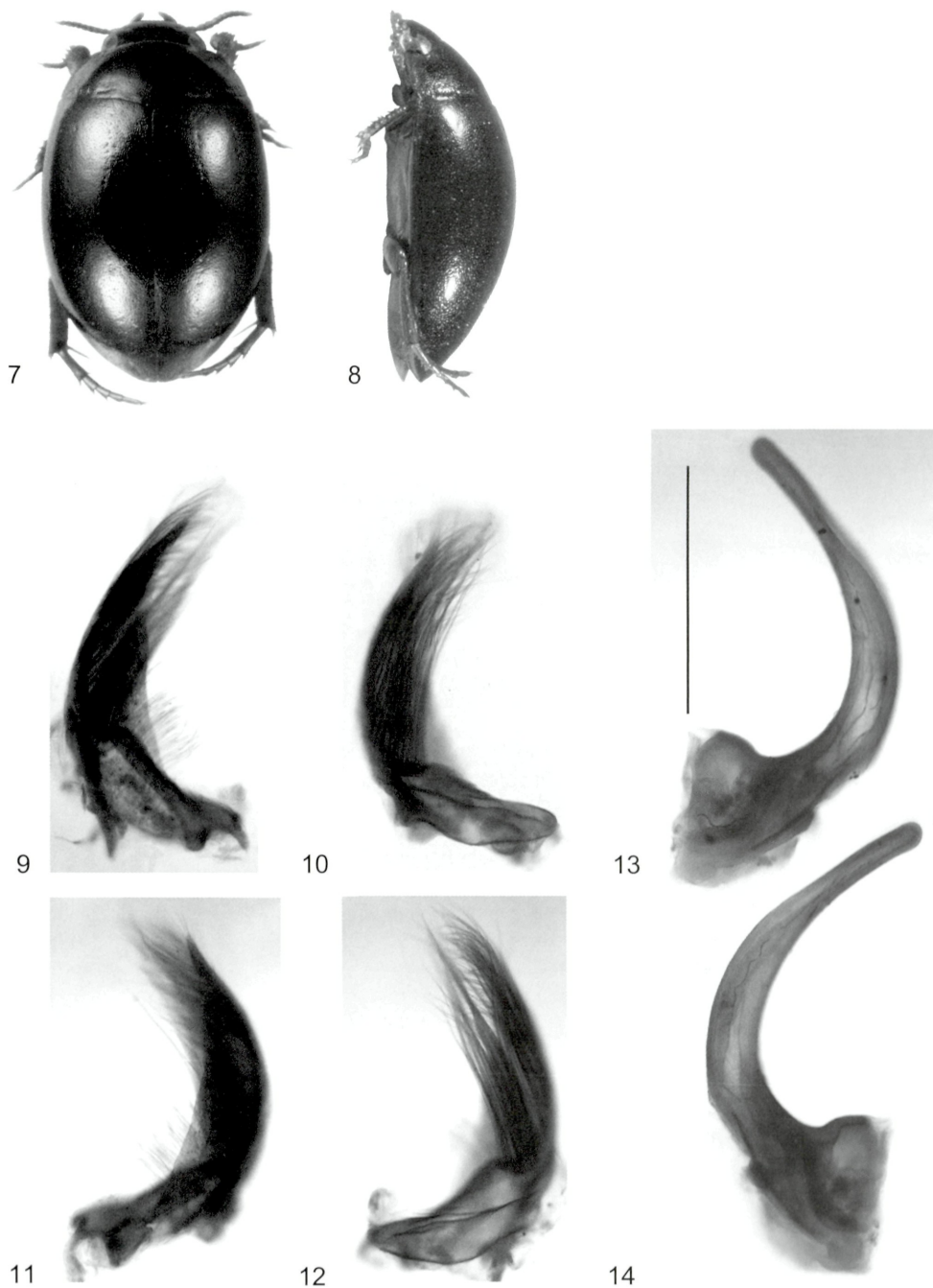
Etymology: The specific epithet is an adjective formed from the geographical name China.

Distribution: This species seemingly is restricted to east China, and known only from the type locality.

Habitat: The holotype of *H. chinensis* was collected in a 0.5 m wide stream running over conglomerate rock in a densely shaded gorge at 500 m a.s.l. During time of collecting the stream was more or less dried out, and the specimen was found in a residual pool (JÄCH & Ji 1998).



Figs. 1 – 6: *Hydrotrupes chinensis*, male holotype; 1) antenna; 2) head, anterodorsal view; 3) penis, dorsal view; scale bars: 0.5 mm: 1, 3 (upper), and 2 (lower). 4) prosternal process; 5) metacoxal processes, left metatrochanter and metafemur; 6) right metacoxa and right half of metaventrete; scale bars: 0.5 mm: 4, 6 (horizontal), and 5 (vertical).



Figs. 7 – 8: *Hydrotrupes chinensis*, male holotype; 7) habitus (dorsal view); 8) same, lateral view.
 Figs. 9 - 14: 9 - 12) paramere; 9) left, internal view; 10) right, external view; 11) right, internal view;
 12) left, external view; 13 - 14) penis; 13) right view; 14) left view. Scale bar: 1 mm.

Discussion

The morphological differences observed between the two species of *Hydrotrupes* generally are small and covered by the description of the subfamily Hydrotrupinae (see ROUGHLEY 2000). Only two characters in the description need slight modification: the shape of the prosternal process and the slight asymmetry of the parameres found in *H. chinensis*.

The presence of a species of *Hydrotrupes* in China reveals a disjunct distribution of the genus (and the subfamily Hydrotrupinae, if accepted as valid). This disjunction, that is paralleled by other water beetle genera, such as *Amphizoa* LECONTE (Amphizoidae), *Ametor* SEMENOV (Hydrophilidae), and *Optioservus* SANDERSON (Elmidae) (see JÄCH & JI 1995), represents a trans-Beringian distribution (SANMARTIN et al. 2001). As the trans-Beringian land bridge had a long continuous existence (100 - 3.5 Myr), the question of when it most recently was available for these beetles depends entirely upon climatic reconstructions. Following SANMARTIN et al. (2001) the Beringian bridge may have undergone two different phases: (1) before the Eocene-Oligocene boundary at about 35 Myr it was covered by boreotropical forest admitting access for temperate taxa; (2) a subsequent change towards more boreal conditions culminating in taiga forest from 14 Myr and onwards. More recent re-establishments of the land bridge (1.5 - 1.0 Myr) permitted only dispersal of tundra forms. Thus it seems reasonable to think that the two *Hydrotrupes* species have been isolated from each other some 14 - 35 Myr. A more exact dating would depend on the study of genetic distance applying the molecular clock. Accepting this great age for the split of the two *Hydrotrupes* species, makes their morphological similarity notable.

NILSSON (1997) suggested that the *Agabus optatus* species group (presently placed in *Platambus*, see NILSSON 2000, 2001) displays the eastern Asia plus eastern North America disjunction, documented in many groups of plants (WEN 1999). These disjunct distribution patterns are best viewed as relicts of the maximum development of the temperate forests in the Northern Hemisphere during the Tertiary.

It is tempting to argue that the disjunct (and therefore old) distribution pattern displayed by the genus *Hydrotrupes* provides support for its status as a separate subfamily. However, as a similar disjunction has been documented within a species-group of a genus of Agabini (NILSSON 1997), the evidence provided by geographic distribution by no means is conclusive.

As the habitat of *H. palpalis* is hygropetric or madicolous (HYNES 1970, LARSON et al. 2000), this is most probably the case also in *H. chinensis*. This habitat often is found at the edges of stony streams (HYNES 1970), like the type locality of *H. chinensis*. Other hygropetric representatives of the Dytiscidae include the genus *Hydrotarsus* FALKENSTRÖM (Hydroporini), the genus *Africophilus* GUIGNOT (Laccophilinae), and in Agabinae the Mediterranean *Agabus aubei* PERRIS (BALKE et al. 1997). As all these taxa have been characterized by some supposingly primitive features, the question is whether these features represent true plesiomorphies, restricting the species to low competition habitats, or derived adaptations to a specialized habitat. Once phylogenies are better known, comparative studies of character evolution will help us find the answer.

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