REDESCRIPTION OF A RARE HIMALAYAN SPECIES, ARCTODIAPTMUS (HAPLODIAPTMUS) PARVISPINEUS KIEFER 1935 FROM POTATSO NATIONAL PARK, YUNNAN, CHINA (COPEPODA, CALANOIDEA, DIAPTMIDAE)

BY

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ABSTRACT

Arctodiaptomus (Haplodiaptomus) parvispineus Kiefer, 1935, is a rare and incompletely described species, hitherto known from Himalayan glacial lakes in India. It is now recorded from ponds in Potatso National Park, Yunnan, China and redescribed herein. This is the first record of A. (H.) parvispineus from China. In addition to the descriptions, the morphological variations in the specimens found are briefly discussed.

INTRODUCTION

Arctodiaptomus (Haplodiaptomus) parvispineus Kiefer, 1935 was originally described from a pond in Chushol, Ladak, India, West Himalayas (Kiefer, 1935, 1939). After that, only Raina & Vass (1993) recorded this species from glacial lakes of the Himalayas in Jammu and Kashmir, India. They regarded A. (H.) parvispineus as an indicator of oligotrophy in the Kashmir Himalaya, and noticed

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this species developed a characteristic red pigmentation. Further morphological
details of this species were not given after Kiefer (1935, 1939).

During a survey of the wetland plateau in Shangri-la County, Yunnan Province,
China, some specimens of *A. parvispineus* were collected from small ponds in
Potatso National Park, which lies in the east of the Himalayas and to the south of
the Qinghai-Tibet plateau, yielding the first record of *A. (H.) parvispineus* in China.
This contribution supplements Kiefer’s description and clarifies interpopulation
variations in the west and east of the Himalayas.

**DESCRIPTIVE PART**

*Arctodiaptomus (Haplodiaptomus) parvispineus* Kiefer, 1935
(figs. 1-3)

*Arctodiaptomus (Haplodiaptomus) parvispineus* Kiefer, 1935: 115-117, figs. 6-10; Kiefer, 1939:
101-104, figs. 4a-h; Brehm, 1954: 418; Dussart & Defaye, 1983: 88; Raina & Vass, 1993: 295-

Locality data and material examined.— Specimens were collected from two adjacent ponds
(27°52.120′N 99°58.997′E) in Militang pasture, Potatso National Park, 20 August 2011. Altitude
3674 m; water temperature 22.1 and 23.0°C; pH 7.95 and 8.08; conductivity 10 and 20 μS/cm;
3 males and 3 females and 4 permanent slides (3 males and 1 female) of mounted body-parts
deposited in the Kunming Institute of Zoology (KIZ), Chinese Academy of Sciences (CAS).

Adult female (figs. 1, 2).— Total length exclusive of caudal setae 1.83 mm.
Rostral spines strongly developed, obtuse. Body (fig. 1A) somewhat slender
with maximum width near posterior border of the first pediger. Anterior end of
cephalosome narrow and rounded. Fourth and fifth pedigers completely fused
with indentation on each side of fusion, left indentation deep and right shallow or
obsolete. Fifth pediger with moderately developed, asymmetrical wings; left wing
distinctly larger than right, tip roughly squarish, directed lateral, upstretched, with
2 spines in inner corner and 1 apical spine; right wing roughly triangular, directed
more upturned than left wing, with its tip directed posterolaterally, with 2 spines
near tip and 1 apical spine. Prosome about 2.5 times as long as urosome.

Urosome of 3 somites (fig. 1B); genital somite as long as succeeding 2 somites
plus caudal rami; proximal lateral part asymmetrically expanded and armed with
a small spine on each side; right spine arising from short chitinuous lateral projection
and directed posterolaterally; left spine arising from small chitinuous projection and
directed posterolaterally. Second urosomite smallest, with about the proximal 1/4
telescoped into the genital somite. Caudal rami symmetrical, about 2.3 times as
long as wide and with fine hairs along inner margins and sturdy, a spinule on outer
margins. Six caudal setae on the distal half of each caudal ramus.
Fig. 1. *Arctodiaptomus (Haplodiaptomus) parvispineus* Kiefer, 1935. Female. A, habitus, dorsal; B, urosome, dorsal; C, antennule; D, maxilliped; E, maxillula; F, gnathal lobe of mandible; G, mandibular palp; H, antenna; I, maxilla; J, fifth legs, posterior. Scales: A, a; B and D, b; C and E-I, c; J, d. All scale bars are 100 μm.
Antennule 25-segmented, reaching the end of the caudal rami; with 2 setae each on segments 8, 9-11, 12, 22-24, 3 setae on segment 2, 5 setae on segment 25, and 1 seta each on all other segments; seta on the first segment short, not extending beyond third segment. With one aesthetasc each on segments 1-3, 5, 7, 9, 12, 14, 16, 19, 25; complete armature as in fig. 1C.

Antenna (fig. 1H) with 2 setae and 1 group of minute spines on endopodite segment 1 and 6 terminal and 7 subterminal seta and 1 row terminal spinules on endopodite segment 2. Exopodite of 7 segments.

Mandible (fig. 1F, G). Sympodite with 4 setae. Exopodite 4-segmented with 1, 1, 1 and 3 setae. Endopodite 2-segmented with 4 and 7 setae; dentition of gnathal lobe as illustrated in fig. 1G.

Maxillula (fig. 1E). Exo- and endopodites with 6 and 7 setae; and with small spines on inner margin, other details as illustrated.

Maxilla as in fig. 1I.

Maxilliped (fig. 1D) with 4 well-developed coxal endites with 1, 2, 3 and 4 setae, distalmost seta of third endite slender and nearly twice as long as other seta. Two setae of proximal lobe of first endopodite segment very small. Other details as illustrated.
Natatory legs (P1-P4) (fig. 2) typical of the subfamily Diaptominae, with full complement of setae and spines. P1 with some coarse hairs on inner margin of coxa and five hairs on lateral margin of basis. With 3,4,5,5 setae on 3rd exopodite segment of P1 to P4 each. Middle endopodal segment of P2 with small Schmeil’s lobe. Coxa, basis and 1st exopodite segment of P3 carrying one short sensory seta.

Fifth leg (fig. 1J) almost symmetrical. Coxa roughly conical, armed with sensillum at proximal outer margin, triangular spine at disto-outer corner on posterior surface. A chitinous thickening projecting out of disto-inside border of coxa. Basis smaller than coxa and with a short, delicate, lateral seta. First exopodite segment 1.5 times as long as wide; 2 lateral sensilla occurring on outer margin. Second segment (end claw) slender, both margins with fine spinules, a thick spine near base of third segment, lateral margins generally nearly straight but curved at the end. Third segment small, but distinct, represented by 2 spines, outer spine being bare and about half as long as inner spine with serrations in distal half. Endopodite with a vague cross septum at midlength, apex rounded with a row of short hairs.

Adult male (fig. 3).— Observed specimens 2, total length excluding caudal setae 1.50 and 1.53 mm.
Rostral spines (fig. 3E) smaller than in female. Body widest at posterior border of cephalosome.

Suture separating fourth and fifth pedigers incomplete, limited to left lateral margins (fig. 3A). Lateral wings of fifth pediger asymmetrical, right wing larger than left and posterolaterally-directed, no spine and seta, left wing almost rounded with 1 small apical spine and 1 seta on outer margin.

Urosome of 5 somites, almost straight. Genital somite wider than long, asymmetrical, with 1 tuber on left side; second somite with 1 sensillum on each side; third somite with 2 sensilla on right side and 1 sensillum on left; 1 short, sensory spine on each side; second, third and fifth somites with 1 sensillum on each side; fifth somite nearly symmetrical, dilated apically and no sensilla. Caudal rami roughly rectangular, 3 times as long as median width, with hairy inner margins, outer margins bare. All caudal setae normal.

Left antennule as in female. In right antennule (fig. 3C), spine on segments 8, 10-11,13, relative lengths of spines in decreasing order as follows: 11 > 10 > 8 > 13. No spine or hyaline membrane on antepenultimate segment (fig. 3D).

Structure and armature of antenna, oral parts and natatory legs as in female; second endopodite segment of leg 2 with a small Schmeil’s organ.

Right fifth leg (fig. 3B, F). Coxa wider than long, equipped with 2 sensilla at outer margin, a roughly triangular lobe on posterior face, with a small hyaline spine. Basis trapezoid, 1.5 times as long as wide, with 1 sensory seta at outer margin, a chitinous hump near proximal inner margin, and a hyaline lobe on the posterior face and distal margin each. First exopodite segment 2.5 times as wide as median length, drawn into generally small triangular spinose process at disto-outer angle and bearing crescentic hyaline lobe near disto-inner corner. Second exopodite segment reniform, about 1.6 times as long as wide at middle, proximal part gradually expanding up to origin of lateral spine and then attenuating distally, outer margin slightly convex, inner margin almost straight, a large, lunate chitinous lobe on posterior surface, higher than lateral spine, width more than half of segment width at middle. Lateral spine shorter, about 0.75 times as long as its segment, almost straight, smooth and acuminate, directed outward and located in middle of segment. End claw long, slender, curved and gradually tapering to acuminate point; armed with small spinules along distal 1/2 inner margin. Endopodite 1-segmented, broad; apex oblique, with hairs.

Left fifth leg (fig. 3B) short, reaching posterior border of first expodite segment of right leg. Coxa as long as wide and with large, semicircular hyaline lobe on distal margin. Basis almost trapezoid, sensory seta at disto-outer corner, 3 hyaline lamella outgrowths on posterior surface: (i) small, hyaline lobe on upper surface and directed to coxa; (ii) long, narrow hyaline lamella along inner margin; (iii) wide, triangular hyaline lamella along bottom margin and the end of hyaline lamella.
reaching beyond half of endopodite. First exopodal segment conical, about 1.2 times as long as wide, with 1 setose lobe at inner margin. Second exopodal segment small, almost rounded, and with 1 hairy lobe along 1/2 proximal inner margin, 2 terminal processes: (i) finger-like spinose process on outer side, sturdy and blunt, with sensory seta along 1/4 proximal inner margin and wide serrate at other inner margin, (ii) outcurved setiform process on inner side, slightly longer than spinose process, serrate along 1/2 proximal inner margin and sensory seta along 1/2 distal inner margin. Endopodite 1-segmented and small, reaching midlength of second exopodite segment; apex rounded with minute spines.

REMARKS

The type locality of *A. parvispineus* was designated by Kiefer (1935) as “a pond at Chushol, south of Panggong Tso, alt. 4491 m, Ladak, India”, which lies in the west of the Himalayas. Potatso National Park lies in the northwest of Yunnan province, P.R. China, which is in the east of the Himalayas. The new record locality is more than 2000 km away from the type locality, and there is the Qinghai-Tibet plateau between the two areas. According to the recent research, the Potatso National Park is regarded as a refuge for plant and wildlife because this area was not covered by ice in the Tertiary. This area is now regarded as a centre of forming new species and preserving ancient species (Zhou & Chen, 2006). It implies that the origin of *A. parvispineus* is perhaps earlier than the rise of the Qinghai-Tibet plateau.

Our specimens agree well with Kiefer’s (1935, 1939) descriptions and figures of *A. parvispineus* because of the following characters: in female (1) lateral wings of fifth pediger are large and asymmetrical; in male, (2) a strikingly short spine emerges on 13th segment of grasping antennule; (3) antepenultimate segment without spinose process and (4) endopodite of leg 5 is 1-segmented in male.

But our specimens differs from the original descriptions of *A. parvispineus* in the following characters: in female, (1) the endopodite of leg 5 with 2 segments vs. 1 in Kiefer’s description; in male, (2) suture separating fourth and fifth pedigers is incomplete vs. completely separated in Kiefer’s (1935, 1939) illustration; (3) the hyaline lobe occurs on the middle of the basis of right P5 and bottom margin of the basis of left P5 each vs. both absent from Kiefer’s description.

The subgenus *Haplodiaptomus* includes 5 species, distributed from Nepal to Alaska, U.S.A. (Chen & Hu, 1989; Ranga Reddy, 1994). Shen (1979) inferred that *A. parvispineus* and the subgenus *Haplodiaptomus* may also be distributed in China, for it was recorded from Chushol, which lies just south of Lake Bangong in Tibet. This conjecture is confirmed by our research.
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REFERENCES


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