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TWO NEW SPECIES OF *ALAINITES* (EPHEMEROPTERA: BAETIDAE) FROM HONG KONG, CHINA

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Abstract.—Two new species of *Alainites* (Ephemeroptera, Baetidae), *A. acutulus,* NEW SPECIES and *A. lingulatus,* NEW SPECIES are described and illustrated based on larval and adult material from Hong Kong, China.

Key Words.—Insecta, Ephemeroptera, Baetidae, *Alainites,* new species, Hong Kong.

Waltz et al. (1994) established the genus *Alainites* to incorporate those species previously placed in the *Baetis gracilis* group (Müller-Liebenau 1969) in part and the *Baetis muticus* group (Müller-Liebenau 1974, Sartori & Thomas 1991). Recently, Waltz & McCafferty (1997) synonymized *Baetis* (*Acerbaetis*) (Kang et al. 1994) and the *Baetis* (*Nigrobaetis*) *muticus* group (Novikova & Kluge 1994) with *Alainites.* In this paper, we describe two new species of *Alainites* based on larval and adult specimens from Hong Kong, China which have been associated by rearing in the laboratory.

Abbreviations used for deposition of types are as follows: South China Agricultural University, Guangzhou, P. R. China (SCAU); Department of Ecology & Biodiversity, The University of Hong Kong (HKU); Agriculture and Fisheries Department of Hong Kong Government (AFDHK); Florida A & M University, Tallahassee, Florida (FAMU); and, Purdue Entomological Research Collection, West Lafayette, Indiana (PERC).

ALAINITES ACUTULUS TONG & DUDGEON, NEW SPECIES
(Figs. 1–11)

Types.—Holotype: mature male larva; data: PEOPLE'S REPUBLIC OF CHINA. *HONG KONG:* Tai Po Kau Forest Stream, 2 Feb 1999, Xiaoli Tong; deposited: SCAU. Paratypes: PEOPLE'S REPUBLIC OF CHINA. *HONG KONG:* locality and date as holotype, 3 larvae, 2 female adults (wings on slides) (SCAU); Shing Mun, 12 Nov 1996, X. Tong, 1 larva (AFDHK); Ng Tung Chai, near the Scatter Waterfall, 6 Jan 1997, X. Tong, 1 larva (SCAU); Shing Mun, 7 Jan 1997, X. Tong, 3 larvae (HKU); Tai Po Kau Forest Stream, 25 Feb 1999, X. Tong, 2 female adults (wings on slides) (HKU), 8 larvae (3 in FAMU, 5 in PERC).

Description.—Larva. Body length. 4.0–4.7 mm. Cerci 2.4–2.8 mm. General coloration pale brown-green (male) or red-brown (female). *Head.* Coloration brown-green or brown, with no distinct pattern. Antennae gray or light brown, approximately 3.1–3.4× width of head capsule. Labrum (Fig. 1) approximately 1.3× wider than long, with submedial pair of long, fine, simple setae and anterior submarginal row of 2 long, fine, simple setae dorsally. Hypopharynx as in Fig. 2. Left mandibles (Fig. 3) incisors with 6–7 denticles. Right mandible (Fig. 4) incisors with 6–7 denticles. Maxillae (Fig. 5)

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with 4–5 long, fine, simple setae on medial hump; maxillary palpi 3-segmented. Labium (Fig. 7) glossae subequal in length to paraglossae; paraglossae approximately 1.3× width of glossae; glossae with long, stout, simple setae medially and apically; paraglossae broadly rounded apically, with 3 close rows of long, stout, simple setae; labial palpi 3-segmented, segment 1 slightly shorter than segments 2 and 3 combined, segment 2 with row of 3 long, fine, simple setae dorsally. *Thorax.* Coloration uniformly brown or red-brown, with no distinct pattern. Hindwing pads well developed. Legs (Fig. 9) light brown; dorsum of femora with single large, whitish mark proximally; dorsal surface of femora, tibiae and tarsi densely covered with trapezoidal-based scales; femora with row of long, robust, simple setae dorsally and numerous short, sharp, simple setae ventrally; tibiae with row of short, relatively robust, simple setae dorsally and short, sharp, simple setae ventrally; tarsi with row of short, sharp, simple setae ventrally; tarsal claws with row of 9–10 denticles. *Abdomen.* Coloration generally brown-green or red-brown; mature male with brown-green on terga 1–6 and red-brown on terga 7–10; mature female with uniformly red-brown on terga 1–10. Posterior marginal spines absent on terga 1–7 (Fig. 10), only present on terga 8–10 (Fig. 10). Paraprocts (Fig. 6) triangular, with numerous trapezoidal-based scales and pores scattered over surface, inner apical margin with slightly acute prolongation. Gills (Fig. 8) on abdominal segments 2–7, well-tracheated, with single brown band, distinct serrations and long, fine, simple setae marginally. Cerci pale brown, median filament 0.70–0.75× length of cerci.

Female Adult.—Body length 3.8–4.2 mm, forewing length 4.4 mm; caudal filaments 7.5 mm. *Head.* yellow-brown with red-purple markings posteriorly. Antennae approximately 2.0× length of head capsule; flagella gray; pedicels and scapes red-purple. *Thorax.* Pronotum red-brown; meso- and metanota brown to dark brown. Forewings hyaline, longitudinal veins and paired marginal intercalaries brown; pterostigma area with 5–7 slanting veinlets. Hindwings (Fig. 11) pale brown with acute costal process and 3 longitudinal veins, second vein forked at approximately three-fifths distance from base. Forelegs pale yellow-brown, other legs pale. *Abdomen.* Uniformly red-brown; terga 2–10 with paired yellow spots medially; terga 2–7 with pair of oblique yellow dashes anteriorly. Cerci light brown with red-brown annulations at apex of proximal segments.

Male Adult.—Unknown.

Diagnosis.—The larva of *Alainites acutulus* NEW SPECIES resembles that of *A. yehi* (Chang & Yang) from Taiwan. Both have 6 pairs of gills and abdominal terga 1–7 lack posterior marginal spines. *Alainites acutulus* can be distinguished from *A. yehi* by the short, slightly acute prolongation of paraprocts and the presence of long, robust, simple setae on the dorsal margins of femora.

Distribution.—Hong Kong (China).

Etymology.—The epithet *acutulus* is from the Latin meaning slightly acute, and refers to the paraproct which has a slightly acute prolongation.

Material Examined.—See types.

ALAINITES LINGULATUS TONG & DUDGEON, NEW SPECIES (Figs. 12–24)

Types.—Holotype: mature male larva; data: PEOPLE'S REPUBLIC OF CHINA, *HONG KONG:* Pak Ngau Shek, 8 Jan 1999, Xiaoli Tong, (SCAU). Paratypes, PEOPLE'S REPUBLIC OF CHINA, *HONG KONG:* locality and date as holotype, X. Tong, 2 male adults (1 male genitalia and hindwings on slides)(SCAU), 10 larvae (4 in PERC, 3 in FAMU, and 3 in SCAU); Lantau Island, Sam A Shui

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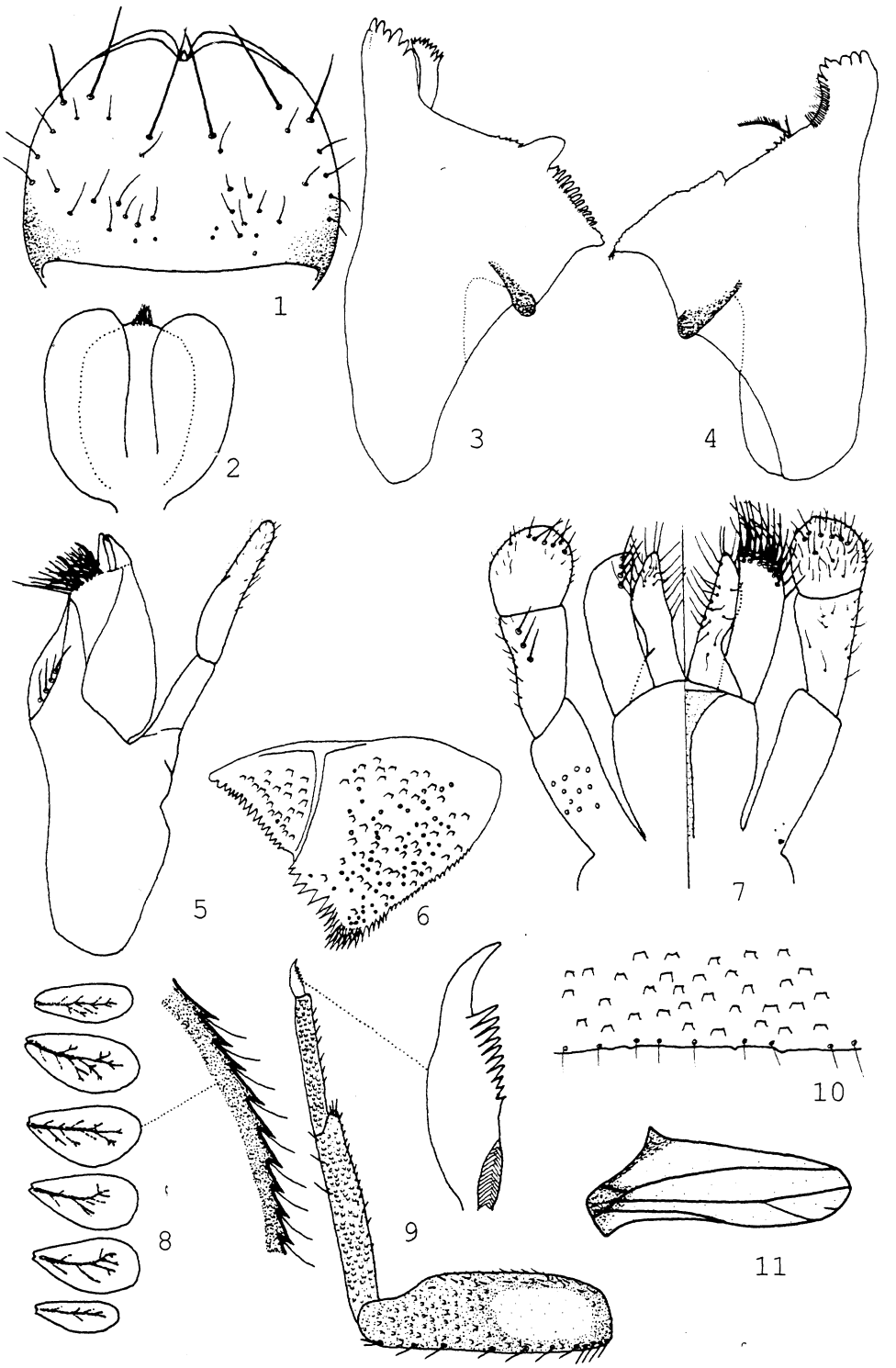
Figures 1–11. *Alainites acutulus,* NEW SPECIES Figure 1. Labrum. Figure 2. Hypopharynx. Figure 3. Left mandible. Figure 4. Right mandible. Figure 5. Maxilla. Figure 6. Paraproct. Figure 7. Labium in dorsal view (left) and ventral view (right). Figure 8. Gills 2–7 (gill 1 absent). Figure 9. Foreleg. Figure 10. Posterior margin of tergum 5. Figure 11. Hindwing.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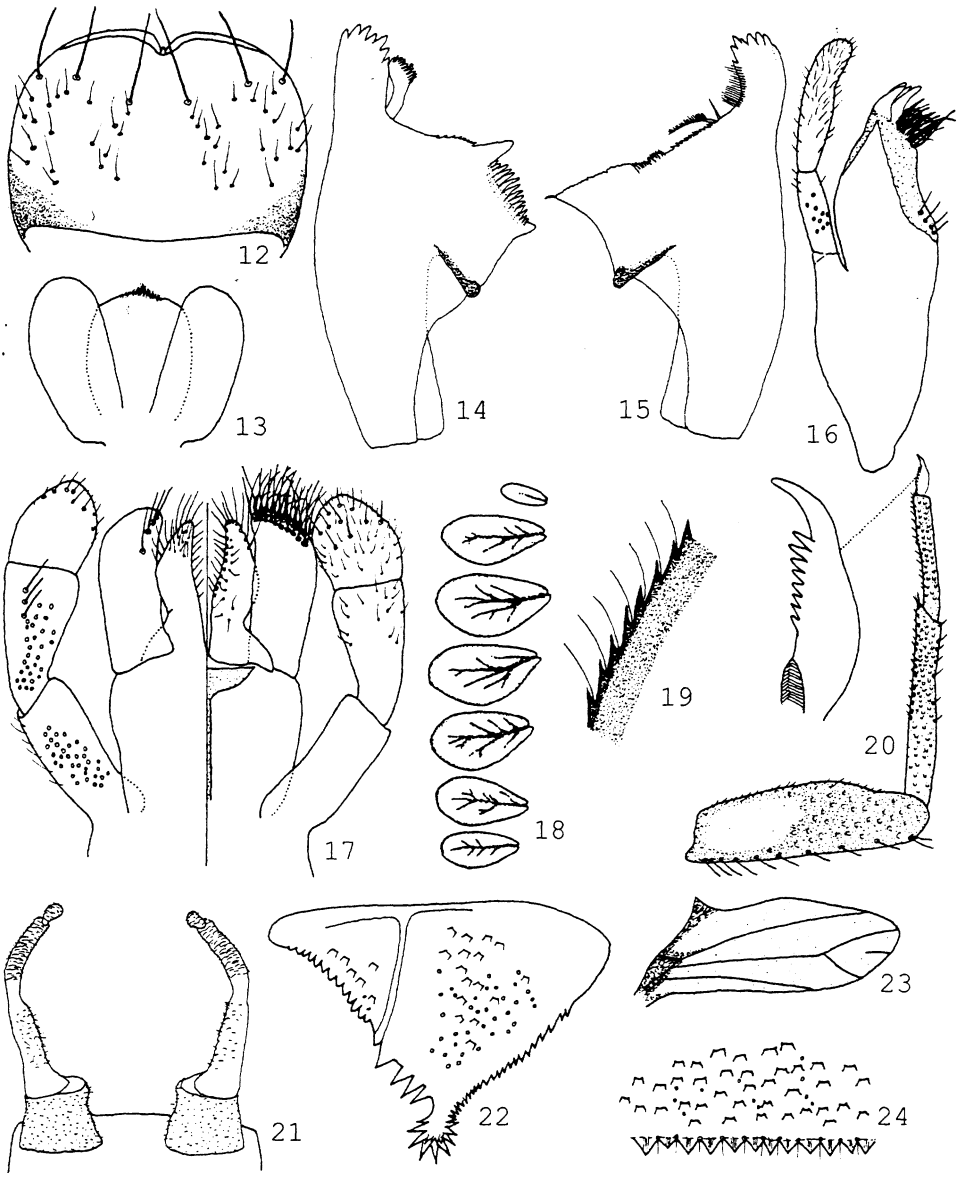

Figures 12–24. *Alainites lingulatus,* NEW SPECIES Figure 12. Labrum. Figure 13. Hypopharynx. Figure 14. Left mandible. Figure 15. Right mandible. Figure 16. Maxilla. Figure 17. Labium in dorsal view (left) and ventral view (right). Figure 18. Gills 1–7. Figure 19. Gill margin. Figure 20. Foreleg. Figure 21. Genital forceps. Figure 22. Paraproct. Figure 23. Hindwing. Figure 24. Posterior margin of tergum 5.

Tsuen, 27 Feb 1997, X. Tong, 1 larva (AFDHK); Chung Lung, 20 Jan 1998, X. Tong, 1 larva (HKU); Hok Tau, 18 Oct 1998, X. Tong, 2 larvae (SCAU).

Description.—Larva. Body length 5.0–5.3 mm; Cerci 2.5–2.8 mm; median filament approximately 0.75× length of cerci. General coloration medium brown. *Head.* Coloration medium brown, without distinct pattern. Antennae pale brown, approximately 3.0–3.4× width of head capsule. Labrum (Fig.

12) approximately 1.5× wider than long, with submedial pair of long, fine, simple setae and anterior submarginal row of 2 long, fine, simple setae dorsally. Hypopharynx as in Fig. 13. Mandibles (Fig. 14, 15) incisors with 7 denticles. Maxillae (Fig. 16) with 4 long, fine, simple setae on medial hump; maxillary palpi 3-segmented, segment 3 subequal in length to segments 1 and 2 combined. Labium (Fig. 17) with paraglossae slightly longer than glossae; paraglossae approximately 1.6× width of glossae; glossae medially and apically with long, stout, simple setae; paraglossae broadly rounded apically, with 3 close rows of long, stout, simple setae; labial palpi 3-segmented, segment 2 with row of 2–3 long, fine, simple setae dorsally. *Thorax.* Coloration brown, without distinct pattern. Hindwing pads well developed. Legs (Fig. 20) light brown; dorsum of femora with single large, whitish mark proximally; dorsal surface of femora, tibiae and tarsi densely covered with trapezoidal-based scales; femora with row of long, relatively robust, simple setae dorsally and numerous short, sharp, simple setae ventrally; tibiae with row of short, robust, simple setae dorsally and short, sharp, simple setae ventrally; tarsi with row of short, sharp, simple robust setae ventrally; tarsal claws with row of 8–11 denticles. *Abdomen.* Coloration light brown to brown. Mature male abdominal terga 1–6 light brown and terga 7–10 brown; mature female all terga uniformly brown. Terga 2–10 with triangular posterior marginal spines (Fig. 24). Paraprocts (Fig. 22) with tongue-like prolongation and numerous trapezoidal-based scales and pores scattered over surface. Gills (Fig. 18) on abdominal segments 1–7, well-tracheated, with single brown band, distinct serrations and long, fine, simple setae marginally (Fig. 19). Cerci light brown, medial caudal filament approximately 0.75× length of cerci.

Male Adult.—Body length 4.0 mm, forewing length 4.4 mm, cerci 8.4 mm. *Head.* Brown. Antennae approximately 2.0× length of head capsule; flagella pale brown; pedicels red-brown; scapes brown. Upper portion of compound eyes red-brown with dark brown basally; lower portion black. Ocelli whitish with basal black rings. *Thorax.* Dark brown. Forewings hyaline, with longitudinal veins and paired marginal intercalaries pale yellow-brown, pterostigma areas with 4–5 slanting veinlets. Hindwings (Fig. 23) hyaline, with basal portion and costal process tinted with light brown; costal process acute; 3 longitudinal veins, second vein forked approximately two thirds from base. Legs pale; length of foreleg segments: femora 0.88 mm, tibiae 1.52 mm, tarsal segments 0.06 mm, 0.50 mm, 0.38 mm, 0.23 mm and 0.13 mm. *Abdomen.* Terga 2–6 white, opaque, with a single transverse light purple streak subposteriorly; segments 7–10 brown. Genital forceps (Fig. 21) whitish, arched. Cerci light yellow-brown with pale purple annulations at apex of each segment.

Female Adult.—Unknown.

Diagnosis.—The larva of *Alainites lingulatus,* NEW SPECIES is closely related to that of *A. clivosus* (Chang & Yang) from Taiwan: both have 7 pairs of gills, and triangular spines on the posterior margins of the abdominal terga 2–10. *Alainites lingulatus* can be distinguished from *A. clivosus* by the long, tongue-like prolongation of the paraprocts and tarsal claws with row of 8–11 denticles.

Distribution.—Hong Kong (China).

Etymology.—The epithet *lingulatus* is from the Latin meaning tongue-like and referring to the tongue-like prolongation of the paraproct.

Material Examined.—See types.

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