

## THE ADULT OF CLOEODES LONGISETOSUS (BRAASCH AND SOLDÁN, 1980) AND A REVISED DESCRIPTION OF THE LARVA (EPHEMEROPTERA, BAETIDAE)

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**Abstract** The first description of the adult stage of *Cloëodes longisetosus* (Braasch and Soldán) is provided based on specimens reared in the laboratory from larvae collected from Hong Kong, China. These larvae also are the basis for a revised description of the larval stage of *C. longisetosus*. Study of the larvae confirms the placement of the species in the genus *Cloëodes* Traver, and *C. longisetosus* larvae may be distinguished from larval congeners by their relatively short maxillary palp. Male adults of *C. longisetosus* have a pronounced rectangular median process between the forceps bases that is unique at least among known male adult congeners, and thus indicates that such a feature may or may not be present in *Cloëodes*.

**Key words** Mayfly, *Cloëodes longisetosus*, adult description, larval redescription, Hong Kong.

The genus *Cloëodes* was established by Traver (1938) initially for a species from Puerto Rico. *Cloëodes* is now known to be essentially Pantropical. Most species occur in the Neotropics, but some are also present in southwestern North America in the Western Hemisphere and in the far Eastern Palearctic of the Eastern Hemisphere (Waltz and McCafferty, 1987a, 1987b, 1994; Lugo-Ortiz and McCafferty, 1999a). Based on this distribution pattern and the discovery of fossil material which may represent a precursor of *Cloëodes* from Early Cretaceous Lebanese amber (McCafferty, 1997), the genus clearly appears to be of Gondwanan origin. It is the only baetid genus presently known to occur in both the Neotropical and Afro-Oriental Regions of the world. In recent years, new species and new records of the genus have been reported from Central America (Lugo-Ortiz and McCafferty, 1993), the Caribbean Islands (Kluge, 1991; Hofmann et al., 1999), South Africa (Waltz and McCafferty, 1994; McCafferty and de Moor, 1994), Madagascar (Lugo-Ortiz et al., 1999), South America (Waltz, 1993; McCafferty and Lugo-Ortiz, 1995; Nolte et al., 1996; Lugo-Ortiz and McCafferty, 1999b; McCafferty, 2000; Orth et al., 2000; Lugo-Ortiz et al., 2002), North America (Lugo-Ortiz and McCafferty, 1994; Waltz et al., 1998; Randolph and McCafferty, 2001; McCafferty et al., 2002), and Australia (Lugo-Ortiz and McCafferty, 1998).

Braasch and Soldán (1980) described *Cloëodes longisetosus* (as *Centroptella longisetosa* Braasch and Soldán) based on larval material collected by I. Hrdy from Liu Chui, China in 1959. However, the collection site name Liu Chui cannot be found on current maps of China. In this paper, we redescribe the larval stage of *C. longisetosus* based on material collected from Hong Kong, China, and provide a first description of the adult stage based on specimens reared in the laboratory.

*Cloëodes longisetosus* (Figs. 1-15)

*Centroptella longisetosa* Braasch and Soldán, 1980: 123.

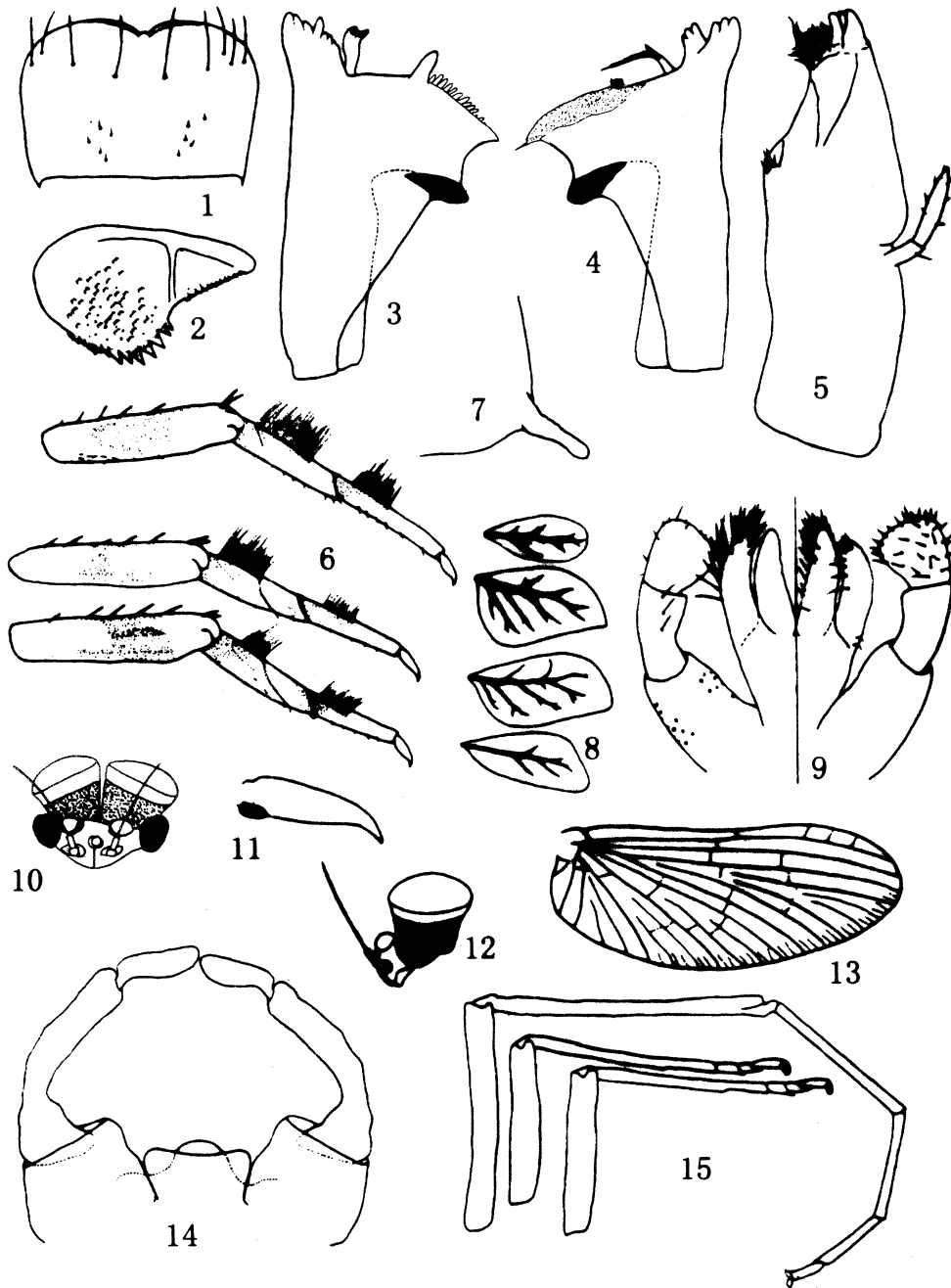
*Cloëodes longisetosus* (Braasch and Soldán): Waltz and McCafferty, 1987a: 177; 1987b: 201.

**Larva.** Body 3.2-4.0 mm long. Cercus 1.4-1.7 mm long. General coloration yellowish brown.

**Head.** Head capsule yellowish brown with cream areas between antennal bases and at base of labrum. Antenna pale, subequal to head capsule in length; pedicel slightly longer than scape. Labrum (Fig. 1) width approximately 1.4 × length, deeply cleft anteromedially, with dorsal submedial pair of long setae and anterior submarginal row of three to four long setae. Incisors of angulate (left) mandible (Fig. 3) fused apically and with total of six denticles. Incisors of planate (right) mandible (Fig. 4) separated apically and each with three denticles. Maxillary palp two-segmented and length approximately one-half that of galealacinia

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Figs. 1-15. Larva and adult of *Cloeodes longisetosus* (Braasch and Soldán). 1. Labrum, dorsal view. 2. Paraproct. 3. Angulate mandible. 4. Planate mandible. 5. Maxilla. 6. Legs of larva (top, foreleg; middle, midleg; low, hindleg). 7. Hindwing pad of larva. 8. Gills (gill 1, 3, 5 and 7 from up to down). 9. Labium (left, dorsal; right, ventral). 10. Head, anterior view. 11. Tarsal claw of foreleg. 12. Head, lateral view. 13. Forewing of male adult. 14. Genitalia. 15. Legs of adult (top, foreleg; middle, midleg; low, hindleg).

(Fig. 5). Labium (Fig. 9) with glossa and paraglossa subequal in length; glossa with nine or ten long, stout, inner marginal setae; paraglossa with six to eight ventral inner marginal setae; labial palp three segmented, segment 2 with row of three long, somewhat robust dorsal setae apicomediaally.

Thorax. Coloration uniformly tan with few pale spots on pro- and mesothorax. Hindwingpad present (Fig. 7). All legs (Fig. 6) cream with dark brown markings; densely covered with trapezoidal scales; femur dorsally with single, large, pale brown mark medially, with row of long, stout clavate setae, and ven-

trally with numerous short, robust, lanceolate setae; tibia cream shading to dark brown proximally and distally; dorsally with row of long, fine setae, and ventrally with row of short, robust setae; tarsus cream shading to dark brown proximally; dorsally with row of long, fine, nearly transparent setae, and ventrally with row of short, robust setae; claw (Fig. 11) adenticulate.

Abdomen. Terga uniformly yellowish brown with few pale spots; posterior marginal spines present on terga 2-10. Paraprocts (Fig. 2) with numerous trapezoidal scales on surface. Paired gills (Fig. 8) present on segments 1-7, well tracheated, with anterior marginal serrations. Cercus pale brown; medial caudal filament slightly shorter than cercus.

Male adult. Body length 3.5-4.0 mm. Forewing 3.7-4.0 mm long. Cercus 7.5-8.5 mm long. Antenna length approximately 1.5 × length of head capsule; flagellum pale, pedicel and scape pale brown; pedicel slightly longer than scape. Turbinate eye (Figs. 10, 12) borne on stalk; stalk light purple apically and dark brown basally. Mesonotum cream, shaded yellowish brown laterally and anteriorly. Forewing (Fig. 13) hyaline, with paired marginal intercalaries; pterostigmal areas with three or four veinlets. Legs as in Fig. 6; length of segments of foreleg (mm): femur 0.90; tibia 1.06; tarsal segments 1-5 0.10, 0.63, 0.42, 0.29, and 0.14. Abdominal segments 1-6 off white and translucent; segments 7-10 opaque and light yellowish brown. Genitalia (Fig. 14) off white with a rectangular protuberance between forceps bases, terminal segment elongate, length approximately 3 × width. Cercus off white.

Female adult. Body 3.8-4.2 mm long. Forewing 4.0-4.4 mm long. Cercus 6.5 mm long. Vertex off white to cream, without pattern. Antenna as in male. Thorax cream. Abdominal segments 1-10 pale brownish pink when eggs present. Cercus as in male.

Distribution. China (Liu Chui and Hong Kong).

Material examined (in alcohol, all adults are reared specimens). Paratype: male larva, People's Republic of China, Liu Chui, Kuj Fon Shan River, 11 Dec. 1959, coll. HRDY, I., from the collection of T. Soldán, PERC. Other specimens: China, Hong Kong: four larvae, Lantau Is, Sam Tsuen, nr Tai O Road, 18 June 1997, coll. TONG Xiao-Li; two larvae, Wu Kau Tang, 26 June 1997, coll. TONG Xiao-Li; one female adult, Lam Tsuen River, Channeled section, upstream of Pak Ngau Shek, 16 Oct. 1997,

coll. TONG Xiao-Li; 11 larvae, four male adults and two female adults, Lam Tsuen River, Ma Po Mei section, nr Lam Kin Road, 29 Oct. 1997, coll. TONG Xiao-Li; six larvae, two male adults, Tan Shan River, nr Ng Uk, 13 Feb. 1998, coll. TONG Xiao-Li; one larva, Tan Chuk Hang, 18 Mar. 1998, coll. TONG Xiao-Li; one female adult, Ho Chung River, Sai Kung, 31 Mar. 1998, coll. TONG Xiao-Li; two larvae, Sha Lo Tung, 8 Nov. 1998, coll. TONG Xiao-Li; four larvae, Tai Po Kau Forest Stream, 25 Feb. 1999, coll. TONG Xiao-Li; three larvae, Ma On Shan, Tai Shui Hang, 27 Apr. 1999, coll. TONG Xiao-Li.

Remarks. Larvae of *C. longisetosus* are easily distinguished from other known *Cloëodes* larvae by their short maxillary palp (Fig. 5) which is only about one-half the length of the galealacinia. Male adults of relatively few species of *Cloëodes* have been described in detail; however, the adults of *C. longisetosus* differ from those that are known by the presence of a well-developed rectangular protuberance between the genital forceps bases (Fig. 14).

Waltz and McCafferty (1987a, 1987b) described the male adult of the genus *Cloëodes* has not having a median protuberance or process between the forceps bases. That description was based on very few known male adults, and the presence of a rectangular process in *C. longisetosus*, along with the presence of other processes in some other *Cloëodes* species that have been placed in that genus since 1987, indicate that this character is variable at the genus level. *Cloëodes penai* (Moriyama and Edmunds), possesses a broad convexity in this area, and *C. venezuelensis* (Traver), for example, possesses a short, narrow, pointed process in this area. It is not entirely without precedent that the development of the basal area between the forceps is variable within a baetid genus. For example, it is highly variable in the also geographically widespread baetid genus *Pseudocloëon* Klapálek, and somewhat variable in the genus *Centroptilum* Eaton. Braasch and Soldán (1980) had not mentioned the presence of a row of long, fine setae on the larval tarsi. Examination of a paratype held at the Purdue Entomological Research Collection, however, indicates that these setae are indeed present in the type series.

## REFERENCES

- Braasch, D. and Soldán, T. 1980. *Centroptella* n. gen., eine neue Gattung der Eintagsfliegen aus China (Baetidae, Ephemeroptera). *Reichenbachia*, 18: 123-127.

- Hofmann, C., Sartori, M. and Thomas, A. 1999. Les Ephéméroptères (Ephemeroptera) de la Guadeloupe (petites Antilles françaises). Mem. Soc. Vaudoise Sci. Nat., 20 (1): 1-96.
- Kluge, N. 1991. Cuban mayflies of the family Baetidae (Ephemeroptera) I. Genera Callibaetis, Cloëodes, and Paracloëodes. Zoologischer Zhurnal, 12: 128-136.
- Lugo-Ortiz, C. R. and McCafferty, W. P. 1993. Genera of Baetidae (Ephemeroptera) from Central America. Entomol. News, 104: 193-197.
- Lugo-Ortiz, C. R. and McCafferty, W. P. 1994. New records of Ephemeroptera from Mexico. Entomol. News, 105: 17-26.
- Lugo-Ortiz, C. R. and McCafferty, W. P. 1998. First report and new species of the genus Cloëodes (Ephemeroptera: Baetidae) from Australia. Entomol. News, 109: 122-128.
- Lugo-Ortiz, C. R. and McCafferty, W. P. 1999a. Global diversity of the mayfly family Baetidae (Ephemeroptera): a generic perspective. Trends Entomol., 2: 45-54.
- Lugo-Ortiz, C. R. and McCafferty, W. P. 1999b. Revision of South American species of Baetidae (Ephemeroptera) previously placed in Baetis and Pseudocloëon Klapálek. Ann. Limnol., 35: 257-262.
- Lugo-Ortiz, C. R., McCafferty, W. P. and Gattolliat, J. L. 1999. The small minnow mayfly genus Cloëodes Traver (Ephemeroptera: Baetidae) in Madagascar. Proc. Entomol. Soc. Wash., 101: 208-211.
- Lugo-Ortiz, C. R., Salles, F. F. and Furieri, K. S. 2002. First records of small minnow mayflies (Ephemeroptera: Baetidae) from the state of Espírito Santo, southeastern Brazil. Lundiana, 3: 79-80.
- McCafferty, W. P. 1997. Discovery and analysis of the oldest mayflies (Insecta, Ephemeroptera) known from amber. Bull. Soc. Hist. Nat. Toulouse, 133: 77-82.
- McCafferty, W. P. 2000. Notations on South American Baetidae (Ephemeroptera). Entomol. News, 111: 375-379.
- McCafferty, W. P. and de Moor, F. C. 1994. South African Ephemeroptera: problems and priorities. In: Corkum, L. and Ciborowski, J. (eds.), Proceedings of the Seventh International Conference on Ephemeroptera. Sandhill Crane Press, Gainesville, Florida.
- McCafferty, W. P. and Lugo-Ortiz, C. R. 1995. Cloëodes hydration n. sp. (Ephemeroptera: Baetidae): an extraordinary, drought tolerant mayfly from Brazil. Entomol. News, 106: 29-35.
- McCafferty, W. P., Meyer, M. D. and Lester, G. T. 2002. Significant range extensions for southwestern Nearctic mayflies (Ephemeroptera: Baetidae). Entomol. News, 113: 211-214.
- Nolte, U., Tietböhl, R. S. and McCafferty, W. P. 1996. A mayfly from tropical Brazil capable of tolerating short-term dehydration. J. N. A. Benthol. Soc., 15: 87-94.
- Orth, K., Thomas, A., Dauta, C., Horeau, V., Brosse, S. and Ademmer, C. 2000. Les éphéméroptères de la Guyane Française. 1. Premier inventaire géographique, à but de biosurveillance [Ephemeroptera]. Ephémère, 2: 25-38.
- Randolph, R. P. and McCafferty, W. P. 2001. New species and records of Ephemeroptera (Insecta) from central Mexico. Dugesiana, 8: 15-21.
- Traver, J. R. 1938. Mayflies of Puerto Rico. J. Agric. Univ. P. R., 22: 5-24.
- Waltz, R. D. 1993. Cloëodes binocularis (Ephemeroptera: Baetidae), a new combination for a Neotropical species of Pseudocloëon s. auctt. Entomol. News, 104: 233-234.
- Waltz, R. D. and McCafferty, W. P. 1987a. Generic revision of Cloëodes and description of two new genera (Ephemeroptera: Baetidae). Proc. Entomol. Soc. Wash., 89: 177-184.
- Waltz, R. D. and McCafferty, W. P. 1987b. Revision of the genus Cloëodes Traver (Ephemeroptera: Baetidae). Ann. Entomol. Soc. Am., 80: 191-207.
- Waltz, R. D. and McCafferty, W. P. 1994. Cloëodes (Ephemeroptera: Baetidae) in Africa. Aquat. Ins., 16: 165-169.
- Waltz, R. D., Ode, P., and Lee, J. 1998. Cloëodes excogitatus (Ephemeroptera: Baetidae) in northern California. Entomol. News, 109: 215.

## 短须滑爪蜉成虫的首次描述及其稚虫的重新描述 (蜉蝣目, 四节蜉科)

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**摘要** 首次描述了来自中国香港的短须滑爪蜉 *Cloëodes longisetosus* (Braasch and Soldán) 的成虫形态及重新描述了该种的稚虫形态。所有成虫标本由稚虫在实验室内饲养而成。对于短须滑爪蜉稚虫的研究进一步明确了该种在滑爪蜉属 *Cloëodes* 中的地位。短须滑爪蜉的稚虫与同属其它种类的主

**关键词** 蜉蝣, 短须滑爪蜉, 成虫描述, 稚虫重新描述, 香港。  
**中图分类号** Q969.212.1

要区别是下颚须极短。短须滑爪蜉雄性成虫外生殖器的尾铗基部具有一块近长方形的突起, 这一特征在同属其它已知成虫中是很独特的。这也表明类似这种特征在滑爪蜉属中也许存在或不存在。