

ANACLASTOCTEDON (DIPTERA: EMPIDIDAE: HEMERODROMIINAE), A NEW GENUS FROM ASIA AND AUSTRALIA

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ABSTRACT. – *Anaclastoctedon* new genus (Diptera: Empididae: Hemerodromiinae) is described from Asia and Australia. Five species are described: *A. lek* new species, and *A. antarei* new species from Thailand; *A. sano* new species from Nepal; *A. ancistrodes* new species and *A. prionton* new species from Australia. Three further species from Thailand, Vietnam and Australia were characterized but not described as only females are known. The new genus is placed in the tribe Chelipodini and is characterised by: (a) wing with long veins R_{2+3} , R_{4+5} , M and CuA_1 unbranched; (b) antenna with apical stylus lacking basal articles; (c) epandrium separated from hypandrium; (d) male cercus bilobed with upper lobe greatly enlarged and apically broadened. Habitat, biogeography and relationships with other Chelipodini are briefly discussed.

KEY WORDS. – Diptera, Empididae, Hemerodromiinae, *Anaclastoctedon*, new genus.

INTRODUCTION

The Empididae subfamily Hemerodromiinae contains 15 described genera of small predatory flies traditionally classified into two tribal lineages, Hemerodromiini and Chelipodini (Sinclair & Cumming, 2006; Plant, 2007). Immature stages of Chelipodini are probably terrestrial in moist soils in damp shaded biotopes including temperate and tropical forests, waterfall splash zones and in the Southern Hemisphere also in wet tussock habitats, whereas immature stages of Hemerodromiini are adapted to living in lotic and lentic freshwater biotopes. Two genera of Chelipodini are found in eastern Asia, *Achelipoda* Yang, Zhang & Zhang, 2007 which has an exclusively east Asian distribution (Plant, 2009b) and *Chelipoda* Macquart, 1823 which is speciose in the region (Yang & Yang, 2004; Plant, 2009c) but with an almost world-wide distribution excepting the Afrotropical Realm, although the phylogeographic relationships of lineages within the genus are imperfectly understood (Plant, 2007, 2009a, 2009b, 2009c). A third chelipodine genus *Phyllodromia* Zetterstedt, 1837 also occurs in Asia but the single character distinguishing it from *Chelipoda* (loss of crossvein dm-cu) has been interpreted as homoplastic and which has also occurred in other lineages of *Chelipoda* sens. lat. and is of doubtful generic significance. (MacDonald, 1993; Plant, 2005, 2007). The Chelipodini of Australia have been little studied although *Chelipoda* and the closely related and possibly congeneric *Ptilophyllodromia* Bezzi, 1904 are present (Hardy, 1930; Plant, 2007).

The present work describes a new genus of Chelipodini which is considered to be closely related to *Chelipoda* and *Achelipoda* but distinguished from them primarily by characters of the antenna, wing and male genitalia. It has been found Nepal, Thailand, Vietnam and Australia.

MATERIALS AND METHODS

Southeast Asian material used in this study was collected during 2006 and 2007 as part of a three year project (TIGER–Thailand Insect Group for Entomological Research) sampling terrestrial invertebrates in national parks of Thailand. Sampling effort was concentrated in the following mostly northern parks: – Doi Inthanon, Nam Nao, Thung Salaeng Luang, Phu Kradueng, Phu Ruea, Pa Nin Ngam, Phu Phan, Tat Tone, Pha Taem and Khao Yai. A single specimen was also found in samples of Hemerodromiinae from Vietnam. Specimens from Nepal and Australia were sourced from CNC, Canada.

Repository institutions for material were: – CNC, Canadian National Collection of Insects, Ottawa, Canada; IRSNB, Royal Belgian Institute of Natural Sciences, Brussels, Belgium; NMWC, National Museum of Wales, Cardiff, UK; MNHN, Muséum national d'Histoire naturelle, Paris, France; QSBG, Queen Sirikit Botanical Garden, Chiang Mai, Thailand; ZRC, Zoological Reference Collection of the Raffles Museum of Biodiversity Research at the National University of Singapore. Morphological terms of McAlpine (1981) and Stuckenberg (1999) were employed while

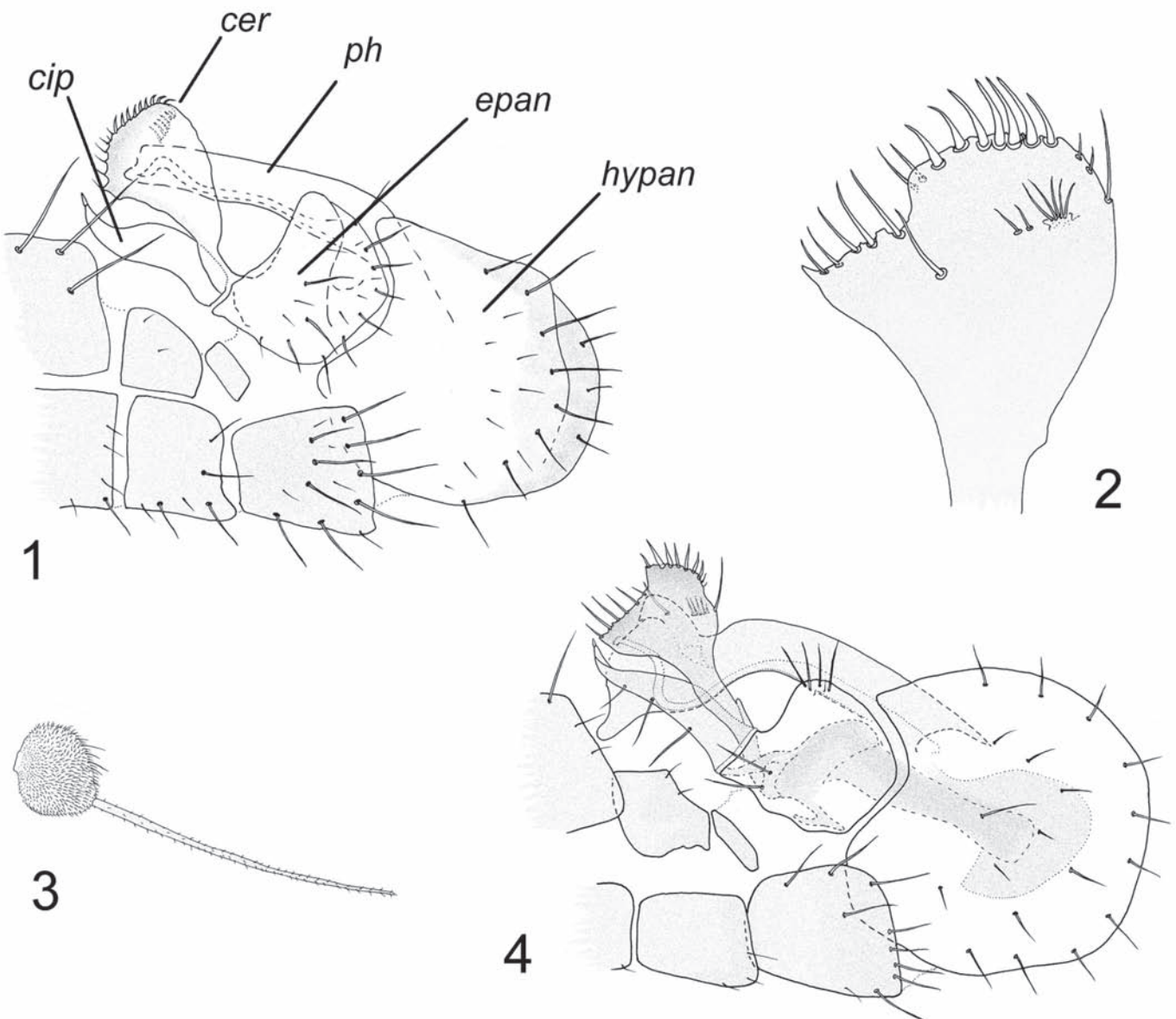
TAXONOMY

Anaclastoctedon new genus

Type species, *Anaclastoctedon lek*, new species
(Figs. 1–12)

interpretation of genitalic homology follows Cumming et al. (1995) and Sinclair (2000). Colour descriptions refer to ground colour (i.e. not colour due to pruinosity) unless stated otherwise. Orientation is denoted by – av, anteroventral; pd, posterodorsal; pv, posteroventral. C_1 , C_2 and C_3 refer to the front, mid and hind coxae respectively; F_1 – F_3 and T_1 – T_3 to the corresponding femora and tibiae. To facilitate observations, male terminalia were macerated in hot 85% lactic acid and examined in glycerol. During the process of identification, Hemerodromiinae were given an alphabetic code and these codes are retained for the three unnamed species (species T X & Y) which are mentioned at the end of the species accounts but not formally described as only females were available. In addition to full locality / date / collector data, labels for material collected by the TIGER Project has a unique data code (prefixed ‘T’) which is quoted on the label and used administratively within the TIGER Project.

Diagnosis. – A characteristic genus of the Empididae subfamily Hemerodromiinae with raptorial forelegs widely separated from the mid legs and fore femur bearing distinct regular rows of setae ventrally. *Anaclastoctedon* is distinguished from other Hemerodromiinae by the combination of (1) all long veins (R_{2+3} , R_{4+5} , M & CuA_1) linear, unbranched; (2) cell br longer than bm; (3) male genitalia strongly reflexed anteriorly over abdomen; (4) epandrium separate from hypandrium; (5) male cercus free, greatly enlarged, anteriorly or vertically projected, spade-like apically, usually with smaller pointed internal process basally; (6) postpedicel of antenna short, almost globular with apical stylus at least 4× as long and lacking basal article.



Figs. 1–4. *Anaclastoctedon* new genus: 1. *A. antarai* new species, male terminalia. 2–4: *A. lek* new species. 2. apex of male cercus, internal face; 3. postpedicel and stylus of male; 4. male terminalia. Abbreviations: cer, major lobe of cercus; cip, internal process of cercus; epan, epandrium; hypan, hypandrium; ph, phallus and parameral sheath; sur, surstylus.

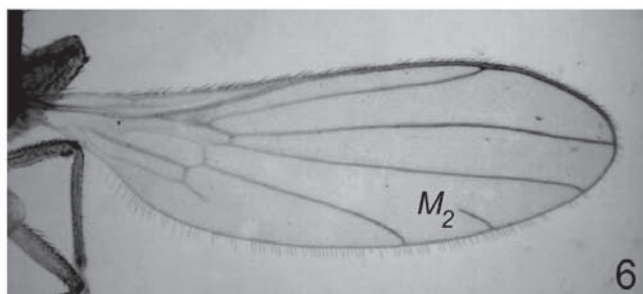
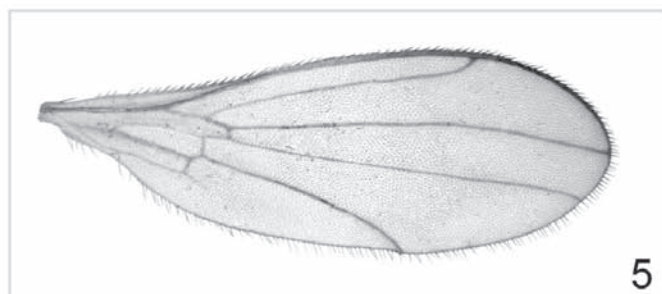
Description. – Head subspherical (Figs. 7, 8), somewhat dorsoventrally flattened with eyes widely separated on frons; narrowly separated on face in both sexes, widening towards mouth; anterior ommatidia slightly enlarged in both sexes. A pair of ocellar setae (usually with a few smaller setulae around ocellar protuberance) and pair of much smaller but distinct frontal setae mid way between prominent ocellar protuberance and base of antennae. One pair of distinct vertical setae situated close to eye margin. Postocular setae stout and erect, uniserial, situated some distance behind eye margin; uppermost postocular seta sometimes placed on slight lateral prominence of vertex between and at same level of verticals; series usually becoming weaker and sometimes 2–3 serial ventrally where sometimes merging into patch of finer setae on lower occiput and behind mouth.

Mouthparts small; proboscis slightly anteriorly directed, no longer than head is deep, apically pointed. Labellum broadly ovate bearing fine setulae posteriorly. Palpus very small, longer than wide with fine but long setulae apically.

Antenna with basal segments as long as wide; scape with distinct dorsal seta; pedicel with circle of setae apically. Postpedicel at most 1.5× long as wide (Fig. 3), almost globular but pointed apically, sometimes appearing rather narrower in lateral view. Stylus much longer than postpedicel (usually at least 4× as long), not obviously swollen basally and rather thread-like, almost bare apart from sparse microscopic pile; basal articles apparently absent.

Thorax. Moderately arched ventrally in profile (Figs. 7, 8). Postpronotum strongly developed, protuberant. Scutum with prescutellar depression broad; supraalar area sometimes outwardly produced with outer margin rather triangular in dorsal view. Usually two pairs of dorsocentral setae strongly developed, anterior pair in line with postpronota, other slightly anterior of position of notopleurals; often one or two pairs of minute dorsocentrals posteriorly. Supraalar very strong, postpronotal and upper notopleural present and usually strong. Lower notopleural weak or absent and usually one or more small setae between notopleural and postpronotal areas weaker still. A pair of scutellar setae present. Laterotergite bearing several setae.

Legs with front coxa almost as long as thorax (Fig. 7); linear series of setae anteriorly, weak, becoming longer distally and with a few distinct setae at tip. Mid and hind coxae much shorter bearing a few setae laterally and apically in front. Front femur as long as front coxa, strongly inflated, much stouter than other femora, widest at middle; ventrally with double row of strong setae on distal 0.7 between which is double row of short peg-like denticles; dorsal and posterior faces with fine setae, anterior face almost bare. Front tibia slightly curved, geniculate at extreme base; ventrally with single row of minute adpressed denticles which articulate against corresponding double row of denticles on front femur when limb is reflexed; an apicoventral 'fan' of minute setulae; otherwise with only short fine setulae and scattered perpendicular cilia (minute erect specialised setae of probable



Figs. 5–8. *Anaclastoctedon* new genus: 5. *A. lek*, new species, wing of male; 6. *A. antarai* new species, wing of female; 7. *A. lek*, new species, male habitus; 8. *A. antarai* female habitus. Abbreviation: M₂, apical section of vein M₂.

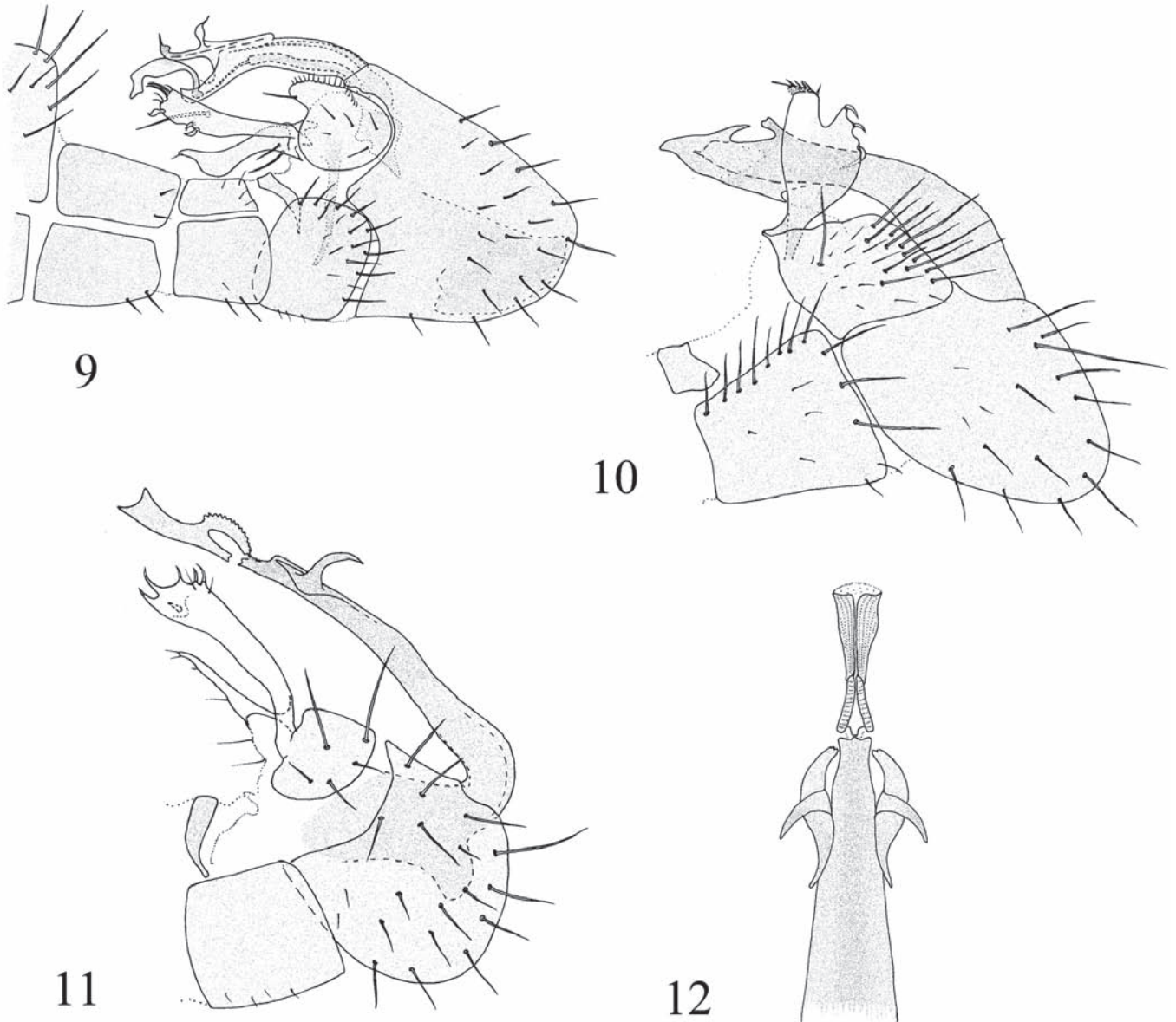
sensory function). Mid and hind femora and tibiae rather short bearing mostly short setae, longest dorsoapically on posterior femur and tibia and on mid tibia. Tarsomeres bearing short setulae; longest and strongest anteroventrally on distal segments of mid and hind legs but sometimes longish on front metatarsus. Front tarsomere 1 hardly longer than tarsomere 2, the segments becoming progressively and gradually shorter distally with tarsomere 5 slightly flattened and enlarged; mid and hind tarsal segments similar but tarsomere 1 longer than tarsomeres 1 and 2 combined.

Male abdomen with tergites 2–6 broad, tergites 7 and 8 reduced. All segments with scattered fine setae and longer setae on tergite 5. Genitalia (Figs 1, 2, 4, 9–12) strongly reflexed forward (Fig. 7). Hypandrium greatly enlarged, broader than preceding segments of abdomen, with keel-like posterior margin, hypandrial lamellae partially separated posteriorly by narrow micropilose membrane; epandrium smaller, lamellae not fused posteriorly or with hypandrium.

Cerci free, greatly enlarged, anteriorly or vertically projected, spade-like apically (Figs. 1, 2, 4, 9–11); usually with smaller pointed internal process basally (much reduced in *A. sano* new species). Phallus slender, strongly anteriorly directed; parameral sheath rather broad, often with complex hooked structures apically (Figs. 4, 9–12).

Female abdomen with setae sparser and weaker. Cerci moderately long, dorsoventrally flattened (Fig. 8), appearing narrower in lateral view; bearing some short setae and some longer ones apically. Spermatheca spherical.

Wing (Figs. 5, 6) narrow basally with axillary angle hardly developed. Vein C circumambient but weak beyond tip of R_{4+5} . Vein Sc fading apically; R_1 rather short, joining C just beyond end of basal cells. Radio-cubital praefurca short, linear, not fading basally at junction with R_1 . Cell br longer than cell bm; cell bm quadrate apically with crossvein bm-cu usually perpendicular (rarely somewhat acute); cell cup



Figs. 9–12. *Anaclastoctedon* new genus: 9. *A. ancistrodes* new species, male terminalia; 10. *A. sano* new species, male terminalia; 11–12. *A. prionton* new species; 11. male terminalia; 12. apex of parameral sheath, dorsal aspect.

quadrate apically, slightly shorter than bm. Vein A_1+CuA_2 short, continuing beyond posteroapical margin of cell cup but terminating well before wing margin. Crossvein dm-cu absent (cell dm absent). Long veins (R_{2+3} , R_{4+5} & CuA_1) linear, reaching wing margin; vein M usually linear, but occasionally vestige of M_2 present at wing margin but completely absent basally (Fig. 6). Marginal cilia short along costa, longer on posterior margin. Stigma absent. Basal costal seta present.

Etymology. – The name derives from *anaclostos* (Greek) meaning reflexed and *ctedon* (Greek) meaning comb; ‘reflexed comb’ in reference to the form of the front leg.

Key to genera of Hemerodromiinae from Eastern Asia

The following key should enable recognition of east Asian genera of Hemerodromiinae. The Australian genera are unstudied and poorly understood and are excluded from the key.

1. Thorax distinctly elongate; mesonotum usually with only weak setae dorsally. Laterotergite without setae. Stylus seldom longer than postpedicel. Male terminalia not reflexed anteriorly over abdomen [Hemerodromiini] 2
- Thorax rather quadrate; mesonotum usually with strong setae, at least anteriorly. Laterotergite with setae. Stylus always longer than postpedicel. Male terminalia reflexed anteriorly over abdomen [Chelipodini] 3
2. Cell dm present *Chelifera* Macquart
- Cell dm absent *Hemerodromia* Meigen
3. Vein M linear. Antenna with stylus lacking basal article. Male cercus greatly enlarged *Anaclastotedon*, new genus
- Vein M forked. Antenna with basal article to stylus. Male cercus not greatly enlarged 4
4. Anal vein absent; CuA_2 reaching (or almost reaching) margin; cells br and bm more or less equal in length, quadrate apically with crossveins r-m and bm-cu in line or nearly so *Achelipoda* Yang, Zhang & Zhang
- Anal vein present (if sometimes weak); CuA_2 not reaching margin; cell br distinctly longer than bm, crossveins closing them not in line and bm produced posteroapically 5

5. Cell dm open (crossvein dm-cu absent) *Phyllodromia* Zetterstedt
- Cell dm closed (crossvein dm-cu present) *Chelipoda* Macquart

Key to species of *Anaclastotedon* new genus

1. Very small blackish species (≤ 1.9 mm); head distinctly dorsoventrally flattened, with dense pile on lower occiput behind mouth [Thailand] *A. lek* new species
- Larger blackish or yellowish species (≥ 2.0 mm); head slightly dorsoventrally flattened, with at most only scattered setulae on lower occiput behind mouth 2
2. Ground colour of thorax blackish, (never appearing yellowish from any viewpoint); T_2 with distinct apicoventral seta, clearly stronger than surrounding setulae; parameral sheath with strong recurved dorsal processes 3
- Ground colour of thorax yellowish (sometimes appearing blackish from certain viewpoints); T_2 without distinct apicoventral seta; parameral sheath lacking strong recurved dorsal processes 4
3. Legs dark yellow; lower postocular setae blackish, weak; wing membrane and veins brownish; parameral sheath with two recurved sharply pointed apical processes [Australia] *A. ancistrodes*, new species
- Legs pale yellow; lower postocular setae yellowish, strong; wing membrane and veins yellowish; parameral sheath with one sharply pointed apical process [Australia] *A. prionton*, new species
4. Scutum clear yellow, with sublateral brown stripes posteriorly [Thailand] *A. antarai*, new species
- Scutum dirty yellowish, sometimes appearing variably blackish in certain lights, without darker sublateral stripes [Nepal] *A. sano* new species

Note. – Three species designated T, X and Y are known only from females and although brief descriptions of these are provided to facilitate future recognition, they are excluded from the key.

Anaclastotedon lek, new species

(Figs. 2–5, 7)

Material examined. – **Holotype.** Male, THAILAND: Chiang Mai, Doi Inthanon National Park, Kew Maepan Trail, $18^{\circ}33.162'N$, $98^{\circ}28.810'E$, 2,200 m, Malaise trap, 9–16 Feb.2007, coll. Y. Areluck (T1795, QSBG).

Paratypes. – Same data as holotype, 8 males, 20 females (QSBG, NMWC); 1 male, 22–29 Dec.2006 (QSBG, T1888); 1 female, 5–12 Jan.2007 (QSBG, T1928); 6 males, 12–19 Jan.2007 (QSBG, T1931); 2 males, 4 females, 23 Feb. –2 Mar.2007 (NMWC, T1771); 4 males, 5 females, 2–9 Mar.2007 (NMWC, T1777); 11 males, 10 females, 16–23 Mar.2007 (NMWC, IRSNB, MNHN, ZRC, T1929); 1 male, 2 females, 16–23 Mar.2007 (NMWC, T1813); 1 male, 2 females, 23 Mar. – 1 Apr.2007 (QSBG, T1819); 2 females, 1–8 May.2007 (QSBG, T1824); Checkpoint 2, $18^{\circ}31.554'N$, $98^{\circ}29.940'E$, 1,700m, 1 male, 22–29 Dec.2006 (QSBG, T1891); 1 male, 29 Dec.2006–5 Jan.2007 (QSBG, T1897); 2 females, 5–12 Jan.2007 (QSBG, T1913); 1 male, 7 females, 2–9 Feb.2007 (QSBG, T1793); 2 females, 16–23 Feb.2007 (QSBG, T1805); 1 female, 23 Feb. –2 Mar.2007 (QSBG, T1775). Loei, Phu Kradueng National Park, $16^{\circ}53.092'N$,

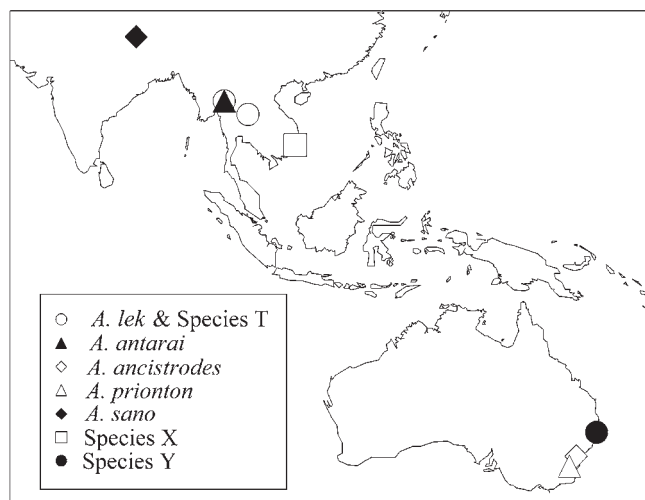


Fig. 13. Known distribution of species of *Anaclastotedon* new genus.

101°47.413'E, savannah in pine forest, 1,257 m, coll. T. Srisa-ad, 16 females, 9–16 Jan.2007 (NMWC, IRSNB, MNHN, ZRC, T1226); 14 females, 16–23 Jan.2007 (QSBG, T1229); savannah near waterfall, 16°53.443'N, 101°46.946'E, 1,247 m, coll. S. Gongla-sae, 1 male, 4 females, 28 Dec.2006–3 Jan.2007 (NMWC, T1221).

Diagnosis. – A small species with thorax entirely black. The head is distinctly dorsoventrally flattened with dense pale pile ventrally. The antenna almost entirely yellow in male but postpedicel black in female.

Description. – **Male.** Length 1.6–1.9 mm. Head distinctly dorsoventrally compressed (Fig. 7); black, face paler, all setae whitish yellow; pile behind mouth and on lower occiput long and dense. Mouthparts small, pale; proboscis much shorter than head is deep, apically darkened. Antenna yellow with only apical 0.3 of stylus darkened. Stylus 4× as long as postpedicel (Fig. 3).

Thorax blackish brown, setae yellow; postpronotal setae almost as long as anterior dorsocentral, posterior dorsocentral smaller; upper notopleural and supraalar very large.

Legs yellow with apical tarsomeres blackish. All setae yellow excepting double row of black denticles ventrally on F_1 and single row of black denticles beneath T_1 . F_1 with 4–5 av and 5–6 pv setae, all stout, basal seta of av series sometimes slightly displaced ventrally towards median line and positioned immediately basal of double row of 11–14 av and 9–11 pv denticles.

Abdomen blackish brown; all setae yellowish, longest dorsally on pregenital tergites. Genitalia (Fig. 4) blackish with phallus and parameral sheath yellow. Major lobe of cercus (Figs. 2, 4) petiolate basally, much broader apically, with stout spine-like setae and finer bristles apically; smaller basal lobe apically narrow with small apical spine. Phallus strongly curved apically.

Wing (Fig. 5) membrane clear, veins yellowish.

Female. – Length 1.8–2.3 mm. Similar to male but postpedicel and stylus entirely blackish. F_1 with 4–5 av and 5–6 pv setae between which are 11–17 av and 10–12 pv denticles. Abdomen blackish brown, becoming rather paler and with longer setae apically.

Etymology. – The specific epithet *lek* (Thai) means small and refers to the small size of this species.

Remarks. – Known only from northern Thailand on the upper slopes of Doi Inthanon, Chiang Mai Province above 1,700 m and from about 1,200 m on the mesa sandstone mountain Phu Kradueng in Loei Province. The Doi Inthanon sites were hill evergreen and moist hill evergreen forests while at Phu Kradueng, the habitat was 'thung' (savannah grassland) mixed with *Pinus*. Capture dates range from late December to early May with peak adult activity in February and March coincident with cool dry becoming hot dry general climatic conditions although the high elevation and forest

cover of the capture sites probably ensures moist rather cool conditions throughout the year. An apical remnant of vein M_2 is sometimes present at the wing margin, especially in examples from Loei. The cercus of the single male from Loei is of slightly different colour and shape to specimens from Chiang Mai but the differences are considered too small to warrant specific separation of the Chiang Mai and Loei populations.

***Anaclastoctedon ancistrodes*, new species**
(Fig. 9)

Material examined. – **Holotype.** Male, AUSTRALIA: NSW, Blue Mountains N.P., Blackheath, Govetts Leap [approx. 33°37'S 150°17'E], ex. dry scler. / creek, 4 Apr.1994, coll. B. J. Sinclair (CNC).

Paratypes. – Same data as holotype: 8 males, 2 females (CNC).

Diagnosis. – Black species, larger than *A. lek* new species and with head only moderately dorsoventrally flattened; distinguished from *A. prionton* new species primarily by having wings distinctly brownish, a dark halter and distinctive male genitalia.

Description. – **Male.** Length 2.5mm. Head moderately dorsoventrally compressed, black, face dusted paler. All setae black, lower postocular setae strong with weaker row in front close to eye margin, only minute setulae behind mouth. Proboscis blackish, palpus yellow with black seta apically. Basal antennal segments yellow; postpedicel blackish, yellowish below; stylus 4–5× long as postpedicel.

Thorax black, dusted bluish grey; all setae black, dorsocentrals, postpronotal, upper notopleural and supraalar similarly strong.

Legs brownish yellow, setae black; coxae, F_1 dorsally and tibiae obscurely darker; distal tarsomeres brown. F_1 very stout, about 5 av and 4–5 pv strong black setae between which are rows of about 17 av and 20 pv denticles; dorsal fringe of setae distinct, longest near base. T_2 with strong apicoventral seta.

Abdomen brown, rather paler below; sparsely setate, tergite 5 with fan of strong dark setae. Epandrium and hypandrium (Fig. 9) dark brown, bearing distinct short setae. Epandrium almost circular with short ad lobe bearing regular series of small setulae dorsally. Cercus with major lobe elongate, slightly broader apically, stout spines and strong setae distally; basal lobe smaller, broadened subapically. Parameral sheath broad with two recurved pointed processes subapically and inverted U-shaped apical process. Phallus dark basally, abruptly yellowish distally.

Wing membrane vaguely brownish, veins brown; vein M_2 completely absent. Halter greyish-brown.

Female. – Length 2.6–2.8mm. Similar to male but postpedicel uniformly dark and tergite 5 without fan of strong setae. Cercus brownish.

Etymology. – The specific epithet *ancistrodes* (Greek) means barbed and refers to the recurved pointed processes on the parameral sheath.

Remarks – This species is described from the Blue Mountains National Park, New South Wales in eastern Australia during April. The habitat at the type locality is predominantly dry sclerophyll forest at about 1,000 m with localised seepages and moisture associated vegetation.

***Anaclastoctedon antarai*, new species**
(Figs. 1, 6, 8)

Material examined. – **Holotype.** Male, THAILAND: Chiang Mai, Doi Inthanon National Park, Checkpoint 2, 18°31.559'N 98°29.941'E, 1,700 m, Malaise trap, coll. Y. Areeluck, 2–10 Nov.2006 (QSBG, T389).

Paratypes. – Same data as holotype, 18°31.554'N, 98°29.940'E, 1 female, 24 Nov. –1 Dec.2006 (NMWC, T1870); pan trap, 1 female, 16–17 Nov.2006 (QSBG, T1907).

Diagnosis. – A larger species with thorax yellow bearing dark sublateral stripes posteriorly. The head is only slightly dorsoventrally flattened with only a few setae ventrally. Antenna with basal segments yellow and postpedicel blackish in both sexes.

Description. – Length 2.3–2.4 mm. **Male.** Head moderately dorsoventrally compressed (Fig. 8). Black, somewhat shining; face dusted paler. All setae whitish yellow, only a few setae behind mouth and on lower occiput. Mouthparts yellowish, proboscis as long as head is deep. Antenna with basal segments yellow, postpedicel blackish, stylus 4–5× as long as postpedicel.

Thorax clear yellow with scutellum and mediotergite brownish. Scutum posteriorly with two sublateral brown stripes commencing dorsal to notopleural area, continuing to posterior margin; anteriorly with two narrower brownish stripes inside line of dorsocentrals, very narrowly separated by median yellow area. Anepisternum posteriorly and katepisternum obscurely brownish. All setae yellow, 2 pairs of dorsocentrals, a postpronotal, upper notopleural and supraalar all strong; irregular line of fine setulae between notopleural and postpronotal areas.

Legs yellow; T_1 distally and tarsomeres 1–5 brownish; mid and posterior tarsomeres 5 darkened. All setae yellow except double row of denticles beneath F_1 and single row of denticles beneath T_1 . F_1 dorsally with linear series of rather erect fine setae; 4–5 av and 4 pv setae, all stout, basal seta of av series slightly displaced ventrally towards median line; a double row of 19–21 av and 14 pv denticles positioned between the large av and pv setae. T_2 anteroapically with a few long hairs. Front tarsomeres 1–2 with a few short straggling hairs,

especially ventrally. Mid tarsomere 1 with line of minute erect setulae ventrally.

Abdomen brownish yellow, paler ventrally, sparsely covered with yellow hairs; tergite 5 with stronger yellow setae. Male genitalia (Fig. 1) yellow, hypandrium posteriorly and cercus apically black. Epandrium and hypandrium bearing longish hairs. Major lobe of cercus petiolate basally, much broadened apically, with fine yellow hairs and stout incurved spine-like setae apically; smaller basal lobe apically narrow with strong black apical spine. Phallus with short loop apically.

Wing (Fig. 6) membrane clear, veins yellow (one wing of the holotype has short isolated section of vein M_2 present at margin but absent in other wing). Halter greyish yellow.

Female. Similar to male but lacking two narrow stripes on scutum anteriorly and with dark markings on pleura fainter. Abdomen short pubescent, yellow; tergites 2–5 brown. Cercus contrastingly dark brown. Mid tarsomere 1 with short decumbent setulae ventrally. F_3 with a few stronger setae dorsally near base. Wing with short isolated section of vein M_2 present at margin. Halter whitish.

Etymology. – The specific epithet *antarai* (Thai) means dangerous, in reference to the fierce raptorial appearance of the front legs.

Remarks. – Known only from northern Thailand at 1,700 m on the upper slopes of Doi Inthanon, Chiang Mai Province.

***Anaclastoctedon prionton*, new species**
(Figs. 11, 12)

Material examined. – **Holotype.** Male, AUSTRALIA: ACT, Canberra, Black Mountain, CSIRO, 35° 16'S, 149° 06'E, 20 Nov.–6 Dec.1998, coll. G. Gibson YPT (CNC).

Paratypes. – Same data as holotype: 1 male; 1 male, 22–29 Nov. –1998, coll. G. Gibson MT; 1 female 2–8 Nov.1998 (all in CNC).

Diagnosis. – Black species, similar to *A. ancistrodes* new species, distinguished primarily by having wings yellowish, halter pale and distinctive male genitalia.

Description. – **Male.** Length 2.5mm. Head moderately dorsoventrally compressed, black, dusted greyish; face yellowish. Ocellar, vertical and upper postocular setae black, strong; Lower postocular setae yellowish, strong (particularly below), with weaker row in front close to eye margin. Proboscis yellowish brown, palpus pale with black seta apically. Antenna with scape black, pedicel yellowish brown or black, postpedicel black; stylus 5× long as postpedicel.

Thorax black, dusted greyish, setae blackish.

Legs rather pale yellow, distal tarsomeres darker, all setae black. F_1 very stout; about 3–5 av and 5–6 pv strong black setae between which are rows of about 14–15 av and 10–12

pv denticles. F_1 and F_3 with distinct dorsal fringe of setae. T_2 with strong apicoventral seta.

Abdomen brownish yellow, sternites 4–6 sometimes darker. Tergite 5 with fan of strong dark setae. Epandrium and hypandrium rather paler than rest of abdomen, bearing distinct setae; parameral sheath darker, black apically; cercus yellow. Epandrium subcircular, smaller than hypandrium (Fig. 11). Cercus with major lobe gradually broadened distally, 6–7 stout black spines apically; basal lobe smaller, narrow. Parameral sheath (Figs. 11, 12) long, conspicuously free for most of its length, subapically with curving flattened plate-like lateral process from which projects dorsal recurved sharply pointed process; apical process almost detached from basal part, minutely serrate dorsally about base, broadening at tip.

Wing membrane faintly yellowish, veins brownish-yellow; vein M_2 completely absent. Halter yellowish white.

Female. Similar to male but abdomen darker brown, postpedicel darker and apicoventral seta on T_2 shorter. F_1 with denticles rather more numerous, about 15 in pv row.

Etymology. – The specific epithet prionton (Greek) means serrate and refers to serrate apical process of the parameral sheath.

Remarks – This species is known only from Black Mountain in Australian Capital Territory in Eastern Australia during November and December. The habitat at the type locality is apparently dry sclerophyll forest (G. Gibson via B. Sinclair, pers. com.).

Ananclastoctedon sano, new species

(Fig. 10)

Material examined. – **Holotype.** Male, NEPAL: between Ghopte and Thari Pati [Thare Pati], [approx. 28°01'N 85°29'E], 3,200 m, 26 Apr.1985, coll. A. Smetana (CNC).

Paratypes. – Four males, 1 female, same data as holotype; 1 male Nuwakot Dis., betw. Ghopte and Thare Pati 3,200 m, 23–26 Apr.1985, coll. A. Smetana; 1 male, Bagmati bel. Thare Pati, 3,300 m, 13 Apr.1981, coll. Löbl & Smetana (all in CNC).

Diagnosis. – Species with dirty yellowish thorax, appearing darker in some lights but lacking obvious dark stripes on the scutum and with distinctive male genitalia.

Description. – **Male.** Length 2.0mm. Head moderately dorsoventrally compressed, black, dusted yellowish grey, face whitish grey. Setae black with yellowish reflections; ocellars conspicuously long, fine; lower postoculars 3–4 serial, fine. Proboscis brownish yellow, palpus yellow with darker apical seta. Antenna yellow with dark stylus 3× as long as postpedicel which is obscurely darkened, sometimes appearing blackish.

Thorax ground colour rather variable, usually dirty yellowish, paler on pleura, heavily dusted greyish, appearing almost black in certain light. Setae yellowish black; dorsocentrals, postpronotal, upper notopleural, supraalar and scutellars strong; lower notopleural developed, 0.3× long as upper.

Legs rather pale yellow, apical tarsomeres hardly darker. F_1 stout, about 5 av and 5 pv strong yellow setae between which are rows of about 13–15 av and 11–12 pv black denticles; dorsal fringe of setae distinct.

Abdomen yellowish brown, tergite 5 with fan of fine longish setae. Genitalia (Fig. 10) brown; epandrium smaller than hypandrium, subquadrate with long setae posteriorly. Cercus with major lobe petiolate basally, broad and bifid distally with stout spines posteroapically and fine setulae anteroapically; basal lobe greatly reduced, inconspicuous. Parameral sheath broadly pointed apically.

Wing membrane distinctly yellowish, veins yellow, basal coastal seta strong. Halter pale yellowish white.

Female. Similar to male but abdomen paler yellowish.

Etymology. – The specific epithet sano (Nepalese) means small and refers to the small size of this species.

Remarks – This species is known only from a single locality in the Nepalese Himalaya at 3,200–3,300 m during April. The habitat at the type locality is apparently conifer forest merging into alpine scrub (I. Juettnner, pers. com.).

Species T

Material examined. – THAILAND: Chiang Mai, Doi Inthanon National Park, Checkpoint 2, 18°31.554'N 98°29.940'E, 1,700 m, Malaise trap, coll. Y. Areeluck, 1 female 23 Feb.–3 Mar.2007 (NMWC, T1775); Phu Kradueng National Park, Loei, Malaise trap, coll. T. Srisa-ad, savannah near waterfall, 16°53.443'N 101°46.946'E, 1,247 m, 1 female, 3–9 Jan.2007 (NMWC, T1224); 2 females, 16–23 Jan.2007 (NMWC, T1230); hill evergreen forest at Wang Gwang forest unit, 16°53.362'N 101°47.286'E, 1,262 m, 2 females, 3–9 Jan.2007 (NMWC, T1222); 4 females, 16–23 Jan.2007 (NMWC, T1228).

Diagnosis and Description. – This species resembles *A. antaral* new species from which it differs primarily by having scutum mostly blackish with black setae. It is only known from females and only a brief description is provided here to facilitate recognition. Length approximately 2 mm. Head black with basal segments of antenna and mouthparts yellow; vertical, ocellar and upper postocular setae black; lower occiput with 2–4 strong erect yellow setae behind much weaker lower postoculars. Thoracic dorsum black with notopleuron and lateral margins of scutum yellow. Pleura yellow, katepisternum obscurely darker. All setae black.

Legs yellow with tarsomeres 4–5 darker; dorsal ciliation prominent on F_1 and on F_3 basally. F_1 with approximately 4 av and 5 pv strong setae between which is a double row

of 22 av and 11 pv denticles. Setae and denticles black except basal pv seta which is yellowish. Abdomen brown dorsally, paler ventrally, with sparse short setae; cercus brown, moderately long. Wing with pale membrane and brownish veins; short section of vein M_2 present at margin but otherwise completely absent.

Remarks. – Known from 10 females taken at Phu Kradueng (Loei) and Doi Inthanon (Chiang Mai) in northern Thailand in January and March.

Species X

Material examined. – VIETNAM: Lam Dong Province, Bidoup – Nui Ba National Park, Hòn Giao Station, near primary rain forest, 12°11'11.3"N 108°42'53.6"E, 1,626 m, light trap, coll. C. Daugeron, 1 female, 12 Jun.2008, (MNHN, locality code 2008VIE019).

Diagnosis and Description – This species is very similar to *A. antarai* new species, from which it differs mainly in thoracic colour and chaetotaxy. Its true identity awaits the discovery of associated males and only a brief description is provided here to facilitate recognition. Length approximately 2 mm. Head black, all setae black, only sparse short pile behind mouth. Mouthparts yellow, proboscis much shorter than head is deep. Basal antennal segments whitish yellow. Thorax entirely clear yellow, setae black; anterior dorsocentral strong, posterior dorsocentral (in line with notopleuron) very small. Legs yellow, front tarsomeres 1–5, mid and hind tarsomeres 4–5 dark. F_1 with double row of black denticles between double row of 4–5 strong yellow setae.

Wing membrane tinged yellowish, veins yellow; cell bm with outer angle rather acute.

Abdomen brownish-yellow, paler ventrally; cercus yellow, moderately long.

Remarks. – Known from a single female captured in the mountains of southern Vietnam in June.

Species Y

Material examined. – AUSTRALIA: NSW, Moonee Beach, 12 km N. Coffs Harbour [approx. 30°18'S 153°08'E] ex dune vegetation, 1 Apr.1995, coll. B. J. Sinclair (CNC).

Diagnosis and Description – This species is known only from a single female and a brief description is provided to facilitate future recognition. Length approximately 2.2mm. Head black with basal segments of antenna yellow and mouthparts brownish yellow; all setae black, lower postocular setae weakly developed. Thorax brownish yellow dusted greyish, somewhat paler on pleura, more clearly yellowish on postpronotal lobe and propleuron; scutum with narrow darker median stripe; two dorsocentrals, postpronotal, upper notopleural supraalar and scutellar setae strong, black. Legs yellowish with distal tarsomeres darker; F_1 strongly inflated, ventral spines and denticles black. Abdomen yellowish

brown, cerci darker. Wing membrane faintly tinged brown, veins brown. Halter yellowish.

Remarks – Known only from a coastal sand dune location in New South Wales on the eastern seaboard of Australia.

DISCUSSION

The systematic position of *Anaclastoctedon* new genus in the tribe Chelipodini is demonstrated by a relatively short and distinctly arched thorax with strong setae on the scutum, presence of setae on the laterotergite and male terminalia reflexed anteriorly over the abdomen. The antennal morphology is rather aberrant in *Anaclastoctedon* in that the postpedicel is extremely short and the stylus apparently lacks a basal article usually present in Chelipodini but probably absent in most Hemerodromiini. However as emphasised by Ulrich (1991) and Sinclair & Cumming (2006) the presence and number of basal articles is subject to homoplasy within Empidoidea but its absence in *Anaclastoctedon* is a unique apomorphy in Chelipodini.

Anaclastoctedon has similar wing venation to females of the sexually dimorphic genus *Monodromia* Collin, 1928 from New Zealand which also has all veins unforked and no discal cell. However, in *Monodromia* cells bm and cup are posteroapically pointed rather than apically quadrate as in *Anaclastoctedon* and there are abundant characters of the head, thorax and male genitalia which may be used to separate the two genera (Plant, 1993).

An isolated apical remnant of vein M_2 is sometimes present in *Anaclastoctedon* although it never extends more than a short distance basally from the wing margin and M is never actually forked (as is the case in *Achelipoda* which also has otherwise linear long veins and no discal cell but has differently proportioned basal cells). Wing venation is notoriously plastic in some Hemerodromiinae (Plant, 2007) and the intermittent and sometimes even asymmetrical presence of a marginal remnant of M_2 may indicate that *Anaclastoctedon* is actively in process of losing the fork in M.

The enlarged keel-like structure of the hypandrium is very similar to the condition found in the Indo Malayan genus *Achelipoda* and northern hemisphere forms of *Chelipoda* (MacDonald, 1993; Plant, 2007; 2009c) suggesting a close relationship between them and *Anaclastoctedon*. However in both *Achelipoda* (Plant, 2009b) and most northern hemisphere species currently attributed to *Chelipoda* the hypandrium is closely fused with the epandrium whereas in *Anaclastoctedon* the plesiomorphic condition in which the two are clearly separate is present [exceptions being two Nearctic species of *Chelipoda* where separation of epandrium and hypandrium is probably a reversal of the fused condition and in some southern hemisphere lineages of uncertain relationship with *Chelipoda sensu stricto* (Plant, 2007; 2009a)].

Although bilobed male cerci are present in a few species of Chelipodini, for example in *Chelipoda flavida* Brunetti and

C. laisoma Plant, a bilobed cercus in which the upper lobe is greatly enlarged and spade-like apically appears to be a unique apomorphy of *Anaclastoctedon*. The lower cercal lobe is usually long and apically pointed although in *A. sano* it is greatly reduced and hardly discernable.

Two species groups are tentatively recognized in *Anaclastoctedon*: (1) an Asian group comprising *A. antarai*, *A. lek* and *A. sano* in which the upper lobe of the male cercus is petiolate basally, the parameral sheath lacks dorsal recurved, pointed processes and the mid tibia lacks an apicoventral seta, and (2) an Australian group comprising *A. ancistrodes* and *A. prionton* in which the upper cercal lobe is elongate and not basally petiolate, the parameral sheath has conspicuous recurved pointed processes dorsally and the mid tibia has a strong apicoventral seta, clearly distinguished from surrounding apical setulae.

Asian *Anaclastoctedon* species are known from montane locations between 1,200 m and 3,300 m in moist forest biotopes in Nepal, Thailand and Vietnam (Fig. 13) with a preponderance of records during the dry season. The Australian species have a Bassian southeastern temperate distribution with *A. ancistrodes* and *A. prionton* present in dry sclerophyll forest on mountains and Species Y on coastal dune vegetation. Possibly the Australian species are an Old Northern Element (Heatwole, 1987) which immigrated from Asia as the Australian continent drifted northwards during the Tertiary. Such elements characteristically have penetrated southwards along the eastern Australian ranges (Yeates, et al., 2009) and have typically become isolated in montane forest refugia, perhaps becoming adapted to increasingly arid conditions during the post-Miocene drying. Alternatively, the plesiomorphic separation of the epandrium and hypandrium is a condition associated with most southern hemisphere Chelipodini and only rarely found in northern hemisphere taxa suggesting a southern temperate origin of *Anaclastoctedon* with later extension northwards into Asia.

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