


First report of *Cheleocloeon* Wuillot & Gillies 1993 (Ephemeroptera: Baetidae) from the Oriental Region

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Abstract

A new species, *Cheleocloeon vaigaiensis* sp. n., is described from Southern India based on larvae, imagines and subimagines of both sexes associated by rearing. This new Oriental species is most closely related to the Afrotropical species *Cheleocloeon clavifolium* Kluge 2016. Formerly, the genus *Cheleocloeon* Wuillot & Gillies 1993 was known only from Africa, Madagascar and Arabia; this is the first report of this genus from the Oriental Region.

Key words: mayflies, systematics, India

Introduction

The genus *Cheleocloeon* Wuillot & Gillies 1993 was originally established for two Afrotropical species, *Ch. yolandae* Wuillot 1993 and *Ch. carinatum* Wuillot 1993, but some other species belonging to this genus were described earlier, being originally placed in the artificial world-wide genus *Centroptilum* Eaton 1869, and later moved to the Afrotropical genus *Afroptilum* Gillies 1990. During a long time some species were confused among *Cheleocloeon* and the Afrotropical genera *Afroptilum*, *Bugilliesia* Lugo-Ortiz & McCafferty 1996a, *Crassabwa* Lugo-Ortiz & McCafferty 1996b and *Susua* Lugo-Ortiz & McCafferty 1998. Recent investigations (Kluge 2016, Kluge *et al.* 2017, Kluge *et al.* 2018) allow a clear separation of these taxa, because *Afroptilum*, *Bugilliesia*, *Crassabwa* and *Susua* belong to the plesiomorphon Protopatellata Kluge & Novikova 2011, while *Cheleocloeon* belongs to the taxon Anteropatellata Kluge 1997, which is characterized by restoration of the patella-tibial suture on fore legs, so that this suture is equally expressed on legs of all three pairs. Internal sclerites (gonovectes) of male imaginal genitalia of *Cheleocloeon* have a characteristic structure, which allows to distinguish representatives of *Cheleocloeon* from all other taxa (Kluge 2016).

Till now, the genus *Cheleocloeon* was known only from Africa, Madagascar and the Arabian Peninsula; in Africa its representatives are found in all parts of the continent, from extreme South (Cape Province) to the North (Morocco, Algeria, Tunisia) (Kluge 2016). Recently, *Cheleocloeon* is reported from Israel and Jordan (Yanai *et al.* 2020; Alhejoj *et al.* 2020). At present, 10 species of *Cheleocloeon* are described (Kluge 2016). Some undescribed species occur in tropical Africa.

Here we describe a new species from south of India, which is the first report of *Cheleocloeon* from the Oriental Region.

Material and methods

Larvae, imagines and subimagines were associated by rearing. For this purpose, subimagines were reared from larvae in containers with stagnant water; imagines were reared from subimagines in a wide glass tubes closed with wet cotton and protected from direct sun light. Dissection was carried out using 2-Ethoxyethanol and slides are made in Canada balsam.

Most part of material is deposited in American College (Department of Zoology), Madurai, India (AMC). One specimen will be deposited in Zoological Institute of the Russian Academy of Sciences, Saint Petersburg, Russia (ZIN); now it is temporarily located in the Department of Entomology of Saint Petersburg State University.

In the lists of material examined, the following arbitrary signs are used: **L**—larva; **S**—subimago; **I**—imago; **L-S-I♂**—male imago reared from larva, with larval and subimaginal exuviae; **L-S/I♂**—male subimago reared from larva and ready to molt to imago, with larval exuviae.

The term «microlepidés» is used according to Kluge (2022); the term «protopteron» according to Kluge (2005); other terms according to Kluge (2004).

Cheleocloeon Wuillot & Gillies 1993

(Figs 1–59)

Type species: *Ch. yolandae* Wuillot (in Wuillot & Gillies) 1993.

General characteristics:

Larva. Bases of antennae widely separated, frons between them flat. Frontal suture nearly semicircular, with angle blunt and arms evenly arched. Labrum of usual form (Fig. 7), usually with submedian pair of long setae and a few (often two) antero-lateral setae on each side (Fig. 6). On both mandibles, incisor and kinetodontium moderately fused; margin between prostheca and mola with dense setae-like processes. Left incisor terminated by 3 denticles, without small ventral distal denticle; left kinetodontium with 1st (most distal) denticle longest, 2nd denticle shorter than 3rd denticle; left prostheca terminated by 3–4 stout short denticles and 2–3 slender longer denticles (Fig. 8). Right incisor terminated by 4 denticles, with or without small ventral denticle; right kinetodontium terminated by 4 denticles gradually getting shorter from most distal to most proximal; right prostheca stick-like, directed medially (Fig. 9). Maxilla of the «*Cloeon*-type», i.e. with long slender canines and dentisetae; 1st dentiseta simple, 2nd and 3rd dentisetæ bifid; 1st and 2nd dentisetæ pressed to canines, 3rd dentiseta separated (Fig. 12). Maxillary palp 2-segmented, with 2nd segment often arched (Fig. 11). Labium usually of «*Cloeon*-type», i.e. glossa and paraglossa of subequal width and length, paraglossa crescent-shaped; glossa with regular median setal row and regular dorso-lateral setal row; ventral side of glossa with irregular setae in proximal part and ventro-median setal row parallel to median margin; paraglossa with row of long latero-apical setae, regular ventro-median row of long, slender, straight setae, regular dorso-median row of thicker setae (Fig. 14; Kluge 2016: figs 4–5). Labial palp of characteristic shape: 2nd segment forming prominent distal-median projection with convex distal margin (Fig. 15).

Legs usually slender (Fig. 16). Outer side of femur with sparse row of small stout setae (Fig. 17), apically terminated by 2 small stout setae located close together. Patella-tibial suture equally developed on all legs, including fore leg (Fig. 18). Claw slender, slightly bent, with 2 rows of denticles, among which minute denticles located close to base of claw and larger denticles, if present, located more distally (Figs 20–21).

Posterior margins of abdominal terga (at least terga II–X) with pointed denticles (Fig. 24). Lateral and posterolateral spines absent on all abdominal segments. Posterior margin of tenth abdominal tergum convex with even denticles (Fig. 27). Paraprocts with pointed denticles (Fig. 28). Abdominal terga, sterna and caudalii with translucent scales in W-shaped sockets (Figs 23–24).

Tergalii with distal margin not bordered by rib (Fig. 39); first tergalium narrower than others, more or less petiolate (Fig. 31). Tergalii capable of rhythmic respiratory movements.

Paracercus as long as cerci (Fig. 4); cerci and paracercus up to the apex with well-developed primary swimming setae; each swimming seta thick in proximal part, contrastingly thinner and colorless in distal part (Fig. 5). Each cercus with sparse longitudinal row of delicate secondary swimming setae on outer side (Figs 5, 30).

Pose of developing subimaginal gonostyli folded under larval cuticle of «*Cloeon*-type», i.e. with 2nd segments diverging laterally (Kluge 2016: figs 95–96).

Microlepidides on subimaginal tarsi. All tarsal segments of all legs of both sexes covered with pointed microlepidides (Fig. 53).

Imago and subimago. Fore wing with no more than one intercalary in each space (in contrast to Baetovectata). Hind wing, if present, of «*Centroptilum*-type»: narrow, with 2 longitudinal veins only, with hooked costal projection (Fig. 48). Females never have hind wings; males either have them, or not.

Genitalia of male imago. Gonovectes of peculiar structure (Figs 55–56; Kluge 2016: figs 98–102, 104–106): movable, wide, well-sclerotized and pigmented, with distal margin strengthened; apex of each gonovectis (where gonoduct is attached) pointed and hooked so that its point is directed cranially (i.e. into the body); protuberance at mid-length of gonovectis (served for attachment of gonovectal muscle) prominent, located at same plane as hooked apex and also directed cranially. Penial bridge slightly sclerotized in lateral parts and membranous medially. Unpaired styligeral muscle well-developed. Bases of unistyligers either contiguous, or narrowly separated, but never widely separated. Gonostylus with 2nd segment widened apically and 3rd segment small and clavate (Figs 54–55, 57).

Egg. Oval, with more or less expressed convex net-like relief (Figs 58–59).

Diagnostic characters of *Cheleocloeon*

Male imagines of *Cheleocloeon* can be distinguished from all other taxa by unique structure of gonovectes (see above). Larvae of *Cheleocloeon* can be distinguished from other taxa by the following combination of characters:

(1) Claws are slightly arched, slender, symmetric, with equally expressed two rows of denticles, which vary from well-developed to lost (Kluge 2016: figs 23–29) (in contrast to Baetungulata, which have claws sharply bent, asymmetric, nearly always with one row of well-developed denticle).

(2) Labial palp with distal-median projection of 2nd segment. Besides *Cheleocloeon*, such projection is present in some Baetungulata [see (1)] and in some Protopatellata, e.g. African *Dabulamanzia*, *Crassabwa* and *Susua*, and Asian *Indocloeon* [see (3)].

(3) Patella-tibial suture is equally developed on all legs, including forelegs (Fig. 18) (that is characteristic for Anteropatellata, in contrast to the plesiomorphon Protopatellata, which have patella-tibial suture on middle and hind legs, but not on fore legs).

Cheleocloeon vaigaiensis sp. n.

(Figs 1–59)

Material. Holotype: L-S-I♂, INDIA, Tamil Nadu state, Madurai, river Vaigai, 30.VII.2022, coll. P. Srinivasan, R. Isack (AMC; new species register number 258). Paratypes: the same locality, and collectors, 28–31.VII.2021: 1 L-S-I♂, 1 L-S♂, 1 L-S-I♀, 4 larvae (AMC; new species register number 259). The same locality, 10.II.2016, coll. N. Kluge, 1 male larva (ZIN).

Etymology. The new species is named after the river Vaigai, in which it was collected.

Descriptions

Larva. CUTICULAR COLORATION. Labrum, clypeus and anterior part of head colorless; frons close to frontal suture darkened, vertex darkened with composite blanks corresponding to attachments of mandibular-cranial adductors (Fig. 1). Pronotum and mesonotum with composite ornament of brown-gray and colorless areas; cuticle of fore protoptera without contrasting stripes along veins, either unicolor light ochre-brownish, or with darker and lighter areas (Figs 1–3). Metanotum brownish with pair of transverse blanks; hind protoptera of male brownish at base and colourless distally. Thoracic pleura brown-gray with colorless blanks, thoracic sterna colorless. Femora colorless, with diffusive brown-gray longitudinal macula in distal part; tibiae and tarsi either nearly colorless, or diffusively darkened on outer side (Fig. 16). Abdominal terga either uniformly colored (Fig. 2), or differentiated,

with tergum VI darker than tergum VII (Figs 1, 3). Anterior and posterior margins of terga bordered by dark brown-gray (Fig. 24). Sterna I–VIII colorless; sternum IX partly darkened laterally (Fig. 25). Caudalii darkened distally (Fig. 4).

HYPODERMAL COLORATION. Not expressed.

SHAPE AND SETATION: Right incisor without ventral denticle, right prostheca narrowed apically (Fig. 9). Ventro-median setal row of glossa consists of few (3–4) setae (Fig. 14). Distal-median projection of 2nd segment of labial palp apically rounded (not pointed), slightly shorter than 3rd segment of labial palp (i.e. $a < b$ in Fig. 15).

Legs slender (Fig. 16). Claw with two rows of minute denticles near base; larger denticles either absent, or represented by few very low and delicate denticles (Fig. 21). Male larva with hind protoptera (Fig. 45); female larva with vestiges of hind protoptera (Fig. 46).

Abdomen without median tubercles (Figs 2–3). Abdominal terga I–X with dense scales in wide sockets; narrower and longer scales located near posterior margin, some attached on posterior margin between denticles (Fig. 24). Posterior margin of tergum I with small, irregular denticles; posterior margins of terga II–X bordered by dark brown-gray band and bear regular row of dark brown-gray pointed denticles separated by spaces subequal to width of denticle (Figs 26–27). Abdominal sterna with scales fewer and smaller than scales on terga; posterior margins of sterna I–IV smooth; posterior margins of sterna V–IX with regular row of denticles, smaller and lighter than denticles on terga, without scales between them (Fig. 23). Paraproct with pointed denticles (Fig. 28).

Tergalii I sharply different from tergalii II–VI (Figs 31–38): Tergalii I slightly longer than others, in proximal half narrowed with concave posterior margin, in distal half greatly widened, with convex posterior margin. Tergalii II–VI widened, widest in proximal half, with sharply convex posterior margin; at base of tergalium III, posterior margin nearly perpendicular to anterior margin. Tergalii VII widest in distal half, with convex anterior margin.

Cerci and paracercus up to the apex with well developed primary swimming setae; each swimming seta thick and darkened in proximal part and contrastingly thinner and colorless in distal part (Fig. 5). Distal part of each cercus with sparse longitudinal row of delicate secondary swimming setae on lateral margin (Fig. 30). Lateral side of each cercus and dorsal side of paracercus with several pointed denticles on posterior margin of each 2nd or 4th segment (Fig. 29).

Subimago. **CUTICULAR COLORATION.** Head colourless with light brownish markings. Pronotum light brown. Mesonotum very light brownish, with colourless medioparapsidal sutures; parascutellum contrastingly dark brown (Figs 43, 52). Thoracic pleura and sterna with brown and colourless areas. Legs light brownish. Abdominal terga, sterna, gonostyli and caudalii light brown.

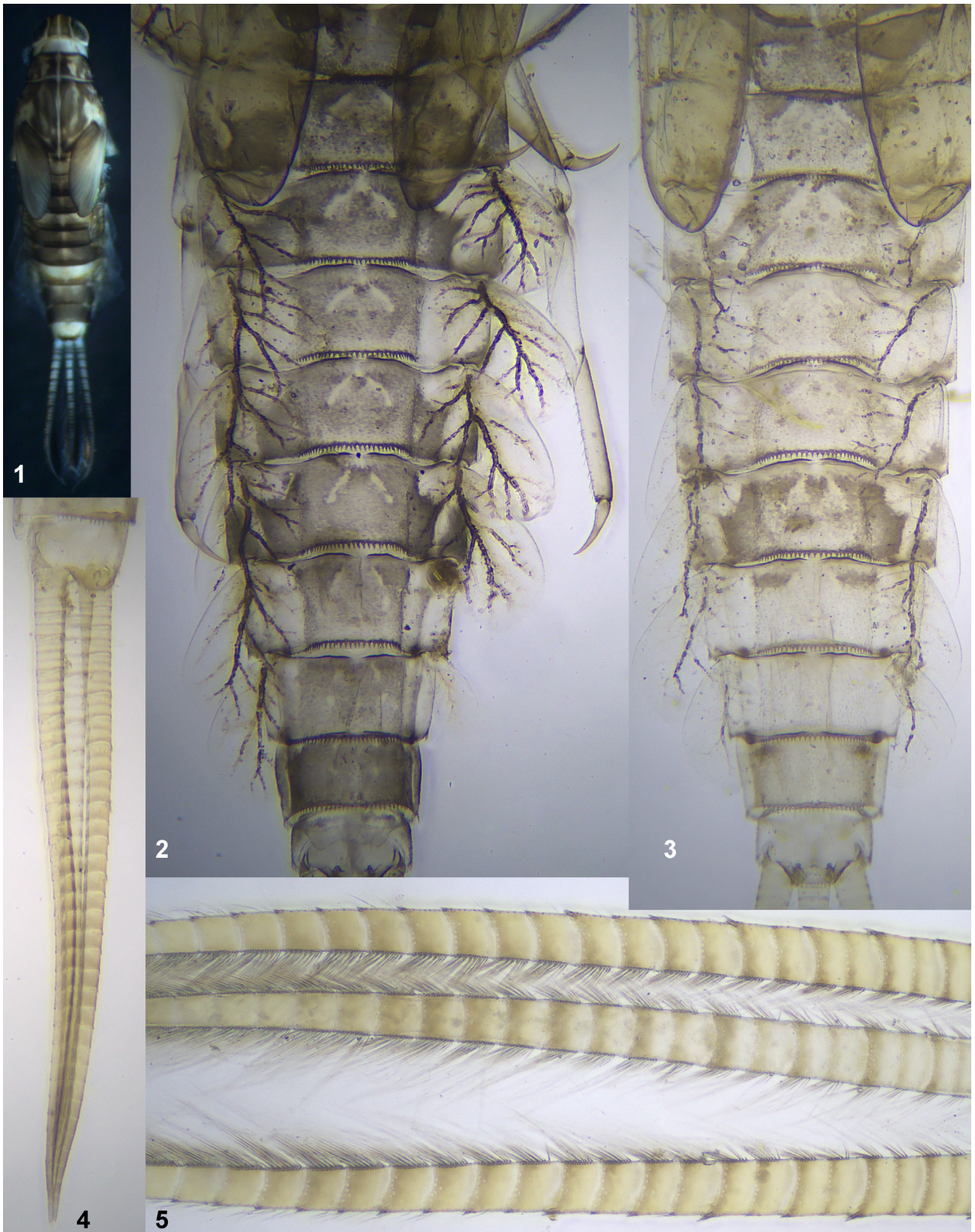
HYPODERMAL COLORATION. Mostly pale ochre; all abdominal terga I–X with uniform coloration consisting of reddish unpaired strip medially and pair of strips sublaterally (Fig. 43).

TEXTURE. All tarsal segments of all legs of both sexes are covered by pointed microlepidies (Fig. 53).

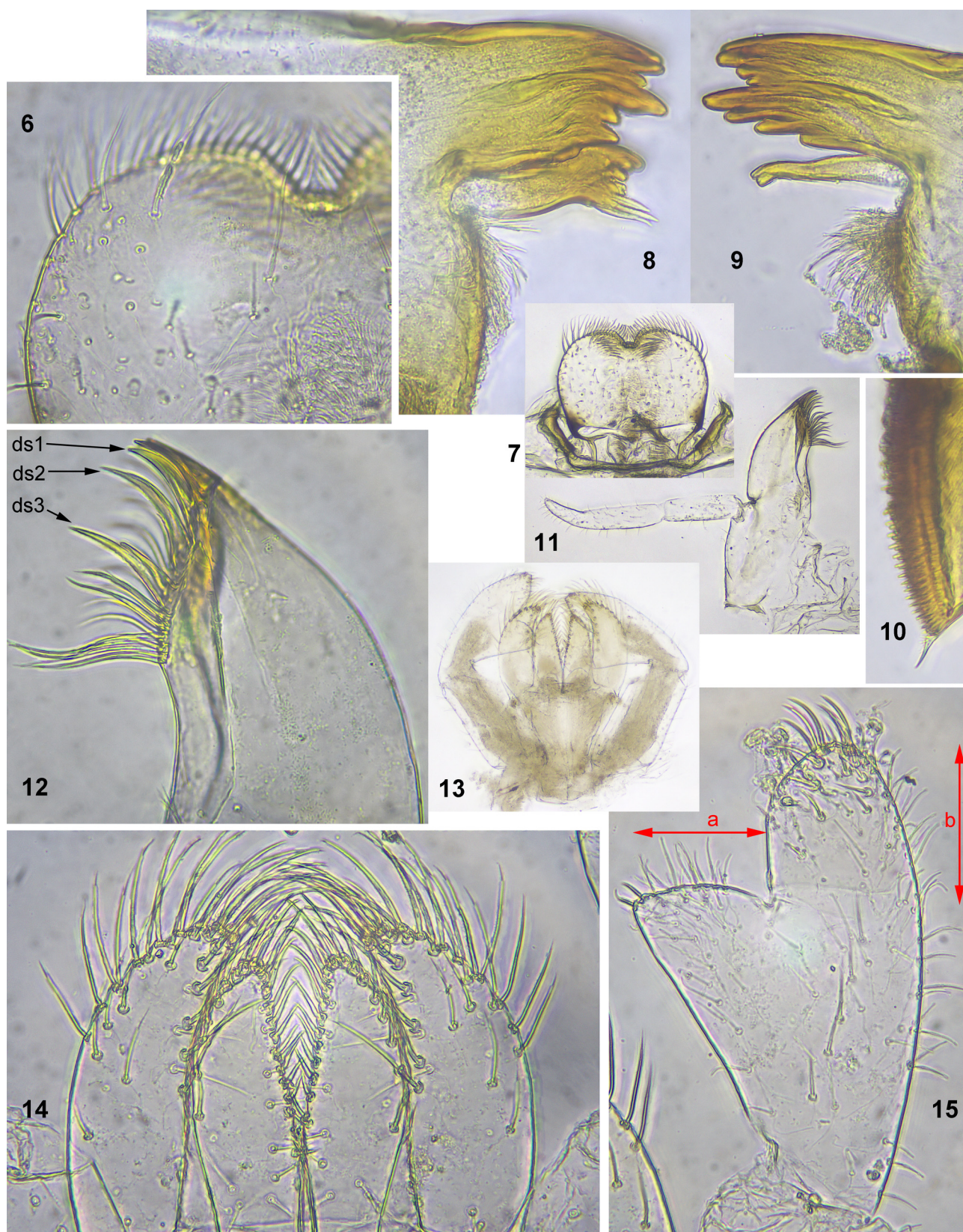
Imago, male (Figs 41–42). Head ochre with brown. Turbinate eyes widened apically; stem ochre, faceted surface orange. Thoracic terga, pleura and sterna with contrasting brown and ochre areas. All legs either unicolor ochre, or femur and apex of tibia of fore leg slightly brownish darkened (Fig. 44). Middle and hind legs with apical spine on 1st+2nd and 3rd tarsal segments (Fig. 51). Fore wing colorless, with veins colorless; pterostigma with 4–5 simple, oblique, complete or incomplete veins (Fig. 47); one cross vein in costal field anterior of pterostigma present or absent. Hind wing narrow, with 2 longitudinal veins and hooked costal projection (Fig. 48). Abdominal tergum I brown; terga I–V light ochre, translucent, with longitudinal reddish markings medially and brown markings laterally; terga VI–X reddish-ochre (Fig. 41). Abdominal sterna ochre, either unicolor, or some anterior sterna with lateral longitudinal diffusive brownish stripes; sternum IX with lateral parts brown (Fig. 42). Gonostyli at most part pale ochre, with brown sclerotized basal margins (Fig. 54). Cerci pale ochre, unicolor.

Genital structure as characteristic for *Cheleocloeon*, with the following peculiarities (Figs 54–57): Unpaired sclerite between unistyligers absent. Unistyligers with distal margins projected medially (Fig. 54). Median side of 1st segment of gonostylus with sharply outlined, concave area nearly reaching midlength of segment (Figs 54–55). Apex of 1st segment moderately narrowed, slightly wider than base of 2nd segment. Gonovectes shallowly bent (Figs 55–56).

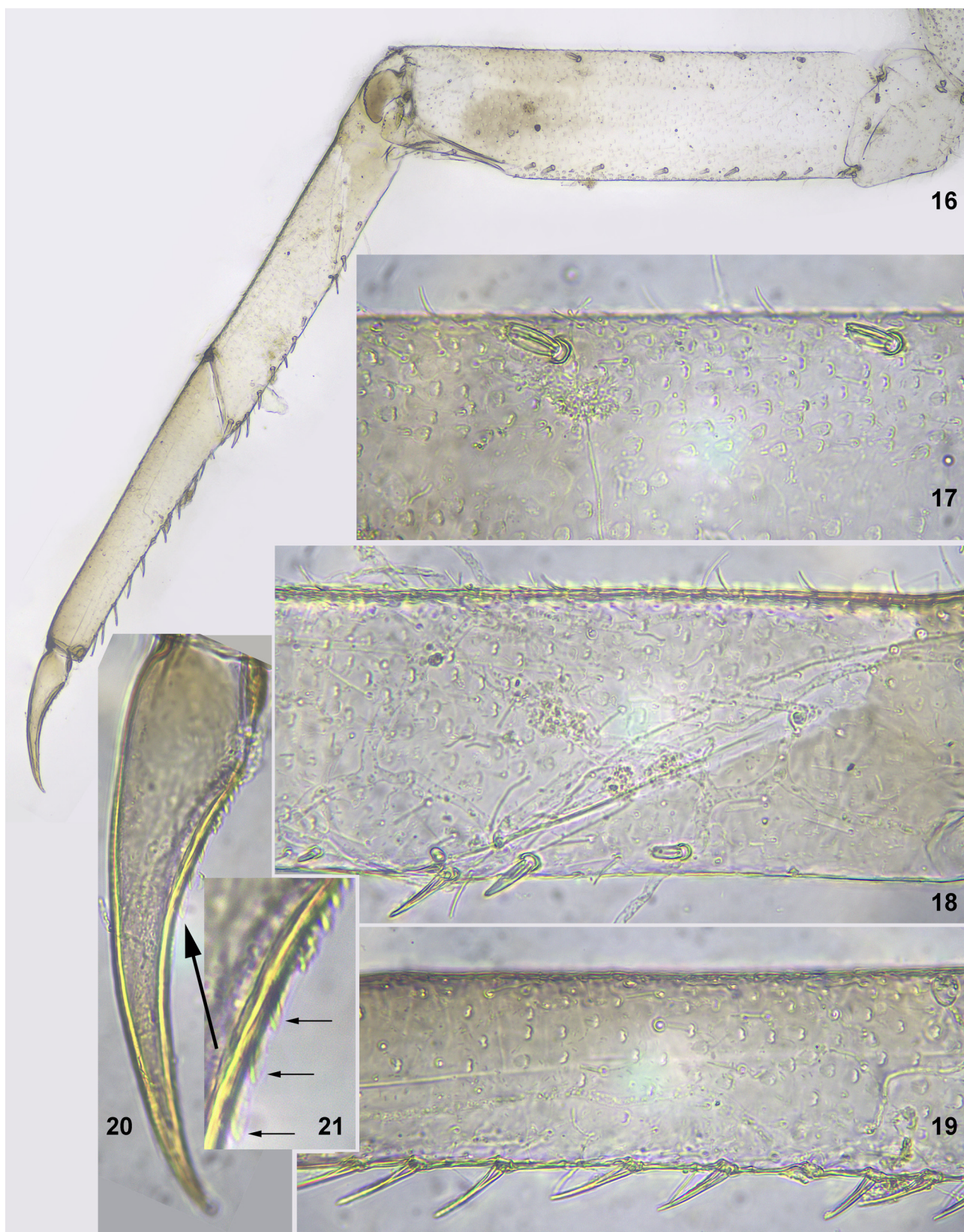
Imago, female. (Fig. 40). Head wide, distance between eyes exceeding eye length; paired ocelli widely separated. Head and thorax ochre with brownish and reddish areas. Abdominal terga ochre, laterally brownish, medially with longitudinal light reddish markings. Vestige of hind wing represented by membranous process (Fig. 49). Fore leg with apical spines on 2nd and 3rd tarsal segments (Fig. 50). Middle and hind legs as in male (as in Fig. 51).



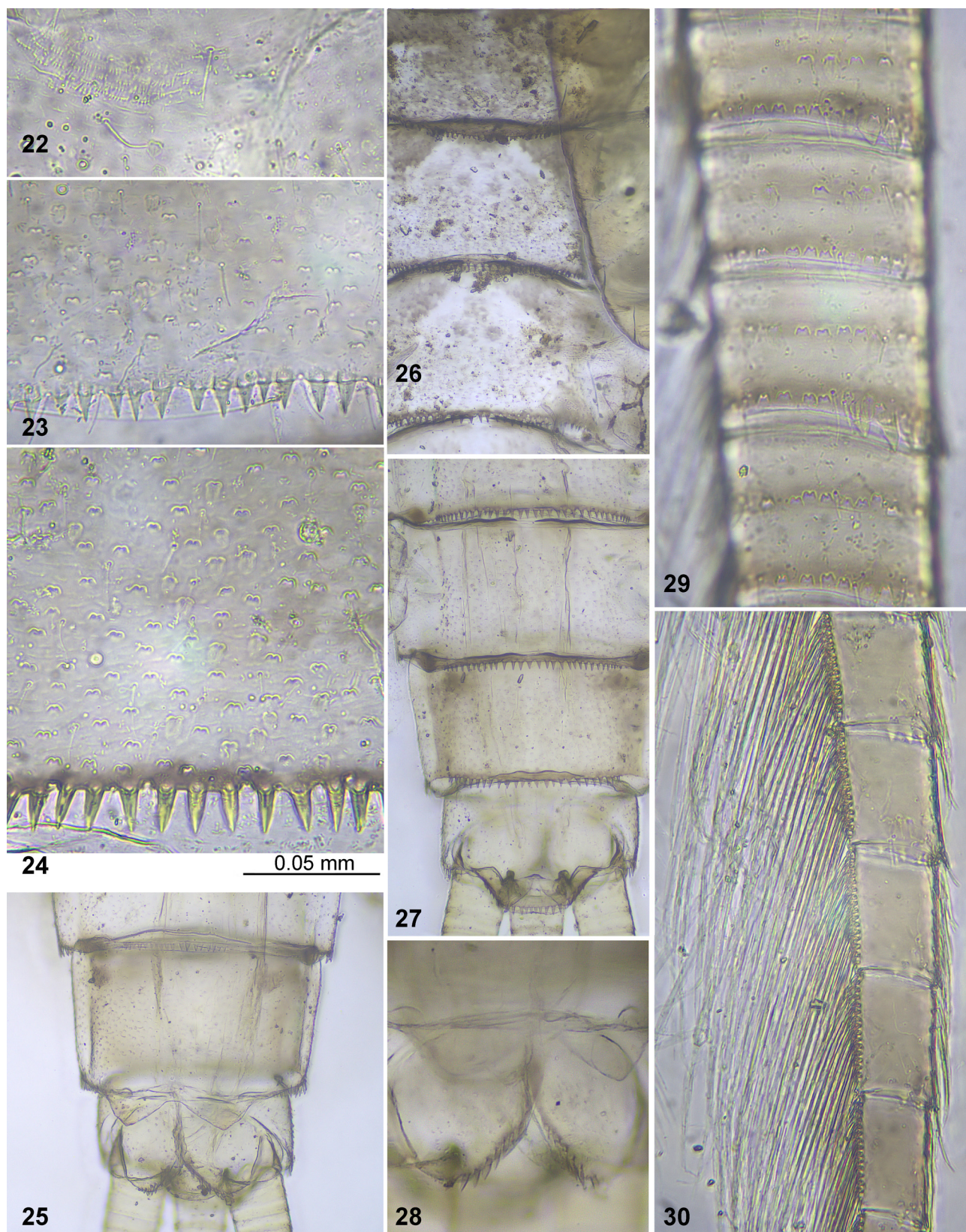
FIGURES 1–5. *Cheleocloeon vaigaiensis* sp. n., larvae. 1, female larva; 2–3, exuviae of two specimens; 4–5, exuviae of caudalii (holotype).



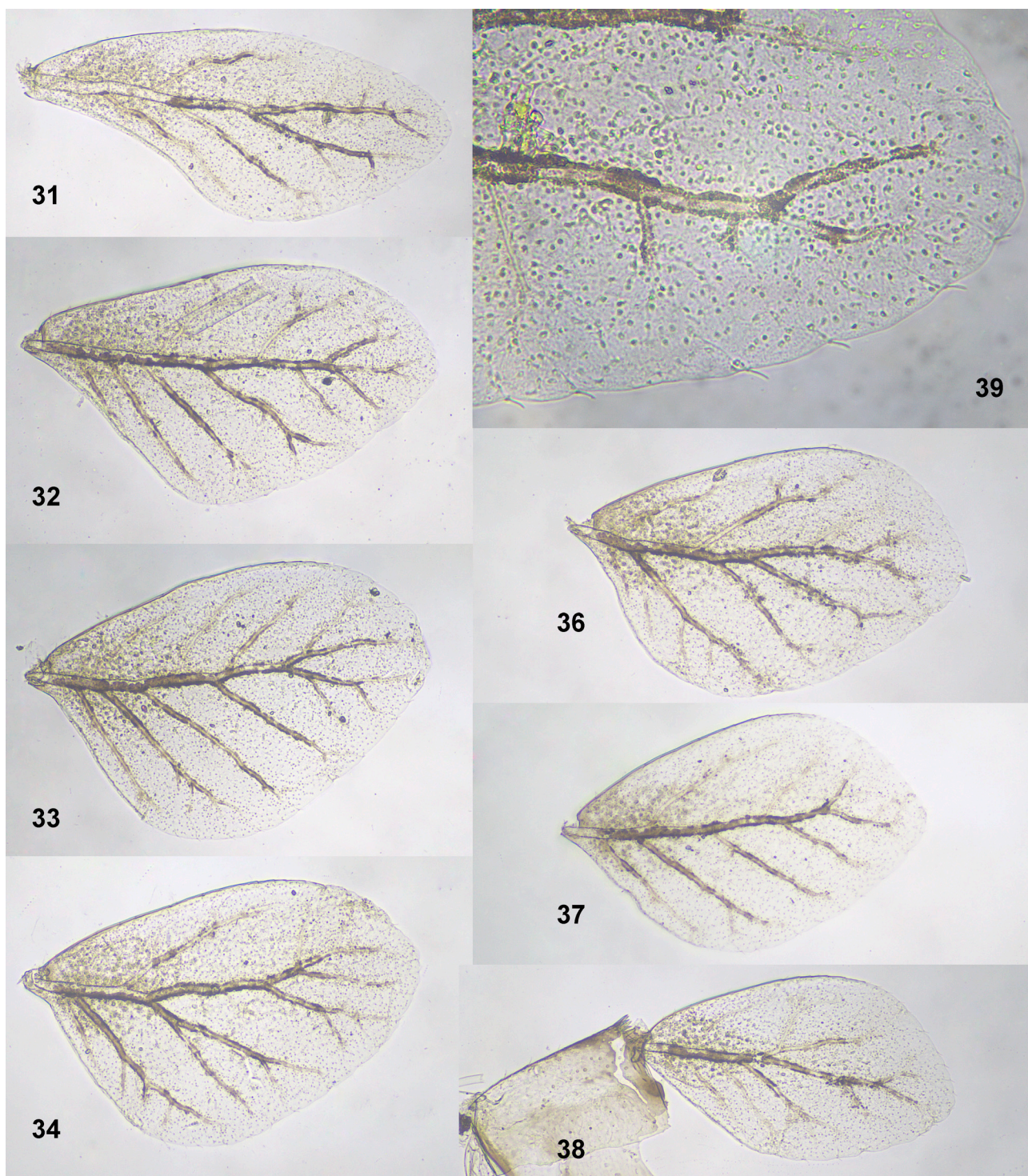
FIGURES 6–15. *Cheleocloeon vaigaiensis* **sp. n.**, larvae. 6–7, labrum; 8–9, apices of left and right mandibles; 10, mola of right mandible; 11–12, maxilla; 13–15, labium (6–7, 11–12, holotype). Abbreviations: ds1, ds2, ds3, dentisetae.



FIGURES 16–21. *Cheleocloeon vaigaiensis* **sp. n.**, fore leg of larval exuviae (holotype). 16, anterior view; 17, outer margin of femur; 18, patella-tibial suture; 19, tarsus; 20, claw; 21, enlarged portion of claw (thin arrows show larger denticles).



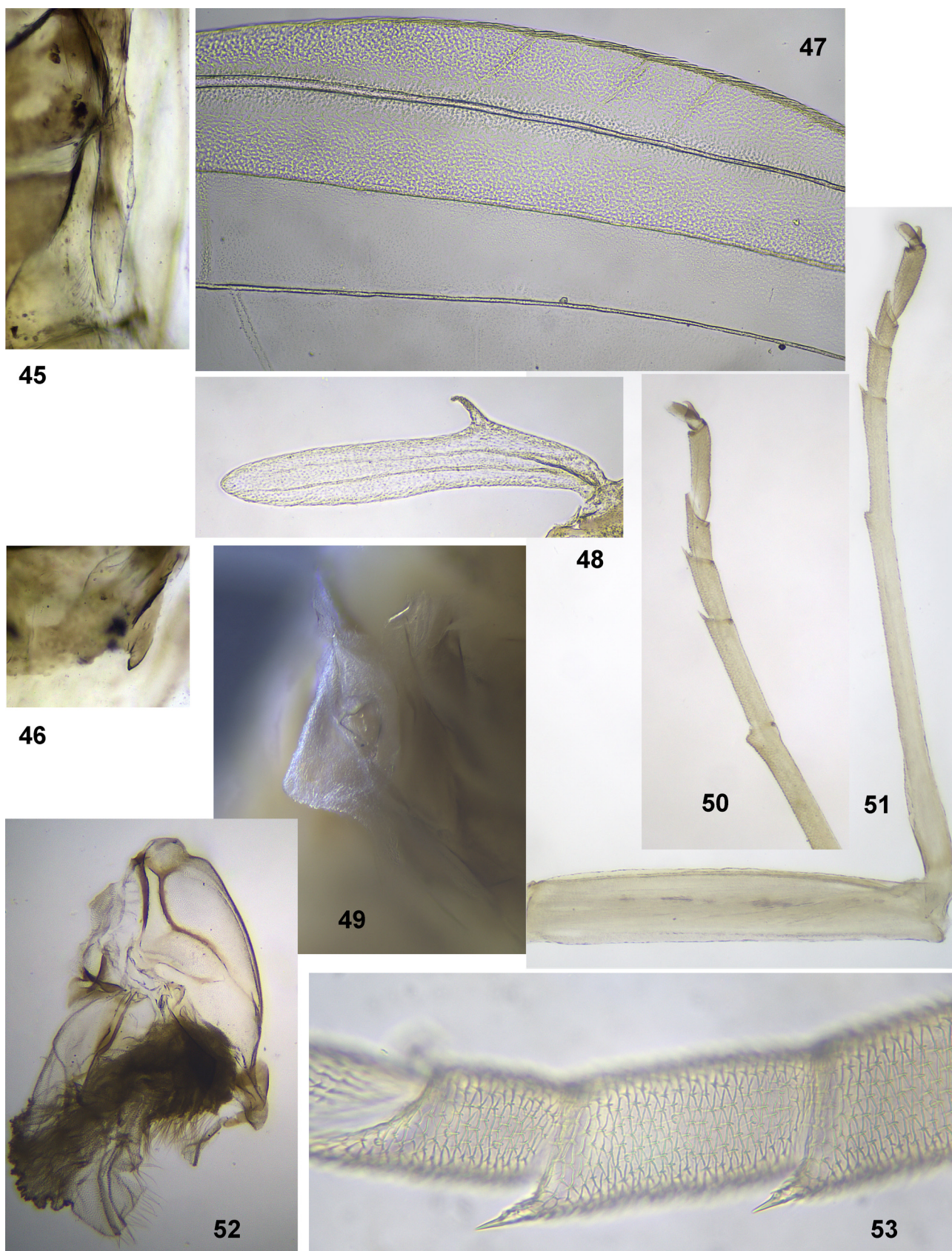
FIGURES 22–30. *Cheleocloeon vaigaiensis* sp. n., exuviae of larval abdomen. 22, anterior portion of sternum VI; 23, posterior portion of sternum VI; 24, posterior portion of tergum VI; 25, apex of male abdomen, ventral view; 26, terga I–III; 27, terga VIII–X; 28, paraprocts; 29, middle portion of cercus; 30, distal portion of cercus (22, 24–30, holotype).



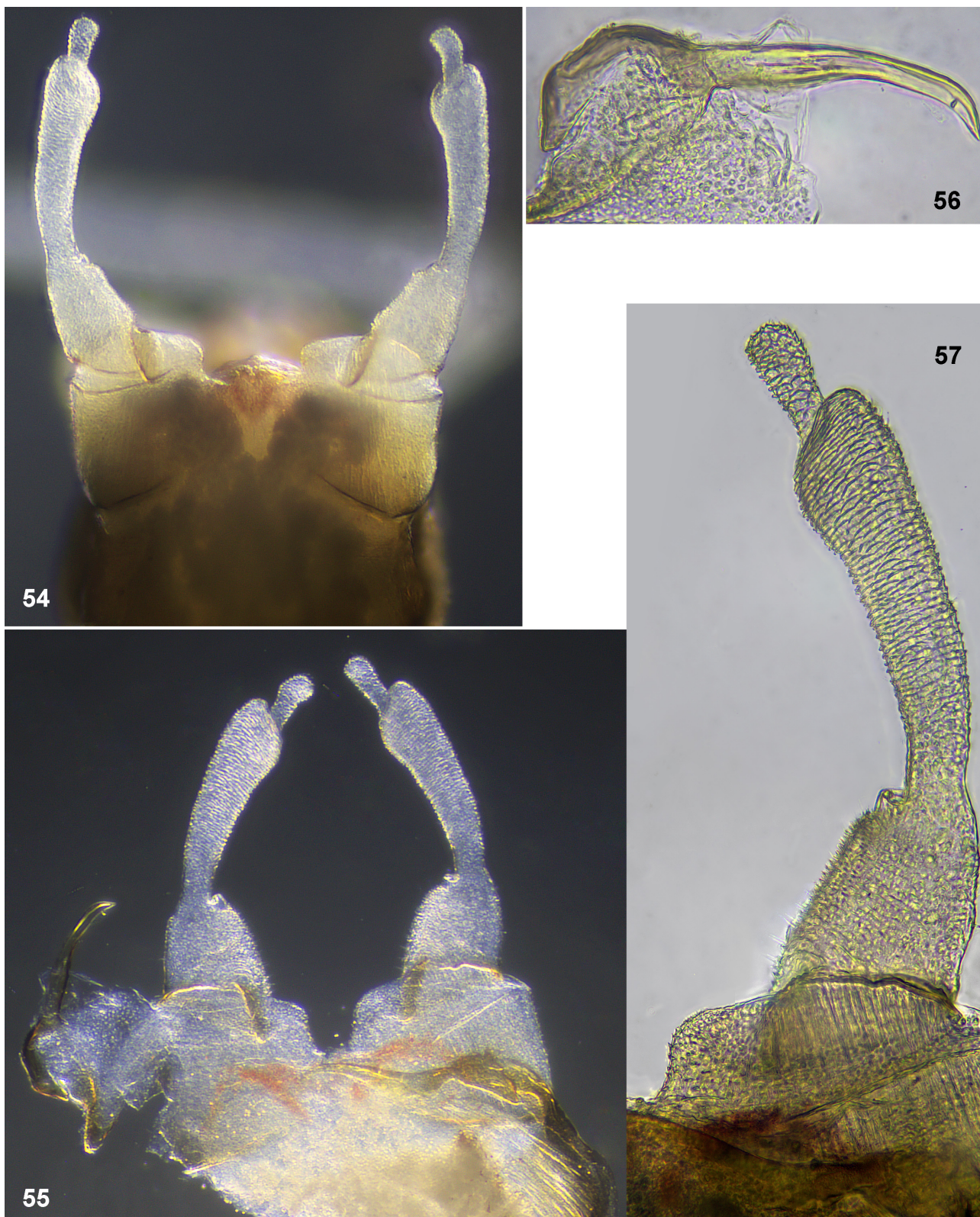
FIGURES 31–39. *Cheleocloeon vaigaiensis* sp. n. (holotype). 31–38, tergalii I–VII; 39, distal margin of tergalium I.



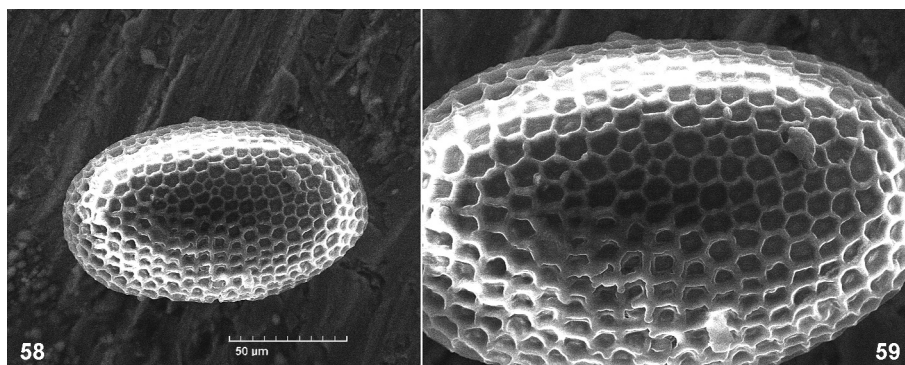
FIGURES 40–44. *Cheleocloeon vaigaiensis* sp. n. 40, female imago; 41–42, male imago; 43, male subimago; 44, fore leg of male imago (41–42, 44, holotype).



FIGURES 45–53. *Cheleocloeon vaigaiensis* **sp. n.** 45, hind protopterite of male larva; 46, vestige of hind protopterite of female larva; 47, pterostigma of fore wing of male imago; 48, hind wing of male imago; 49, vestige of hind wing of female imago; 50, fore tarsus of female imago; 51, hind leg of male imago; 52, subimaginal exuviae of mesonotum; 53, subimaginal exuviae of middle leg of male subimago (47–48, 51–53, holotype).



FIGURES 54–57. *Cheleocloeon vaigaiensis* **sp. n.**, genitalia of male imago (holotype). 54, intact genitalia, ventral view; 55, dorsal view (left gonovectis detached and turned to left, right gonovectis in natural position; 56, detached gonovectis; 57, gonostylus.



FIGURES 58–59. *Cheleocloeon vaigaiensis* sp. n., egg.

Egg. Oval, about 0.1 mm length. Chorion with even and regular net-like relief (Figs 58–59).

Dimension. Fore wing length 3.8 mm (in male) to 4.2 mm (in female).

Comparison. The new Indian species *Ch. vaigaiensis* sp. n. is very similar to the African species *Ch. clavifolium* Kluge 2016; larvae of both these species differ from most other species of *Cheleocloeon* by widened tergalii, among which tergalium I is sharply widened in distal part, and tergalii II–VI are sharply widened at base (Figs 31–38; Kluge 2016: figs 30–36); male imagines of both species have distal-median projections on unistyligers and conic first segment of gonostylus with long concavity on median side (Fig. 54; Kluge 2016: figs 98–100, 104–106). Larva of *Ch. vaigaiensis* sp. n. can be distinguished from *Ch. clavifolium* by shape of labial palp: in *Ch. vaigaiensis* sp. n. its 3rd segment is somewhat longer than the apical projection of the 2nd segment (Fig. 15), while in *Ch. clavifolium* the 3rd segment is somewhat shorter than this projection (Kluge 2016: figs 4–5). Male imago of *Ch. vaigaiensis* sp. n. differs from *Ch. clavifolium* by coloration of abdominal terga II–V, which are translucent and have median reddish strip (in contrast to uniformly brownish in *Ch. clavifolium*). Gonovectes of *Ch. vaigaiensis* sp. n. are bent less sharply than in *Ch. clavifolium* and other species.

The only species of *Cheleocloeon* known so far from Asia, is *Ch. soldani* Gattolliat & Sartori 2008, distributed on the Arabian Peninsula; male imaginal genitalia of this species (Gattolliat & Sartori 2008: fig. 7) are similar to that of *Ch. vaigaiensis* sp. n., but its larva well differs from *Ch. vaigaiensis* sp. n. by strong and sharply pointed denticles on the claw (Kluge 2016: fig. 24) and narrower tergalii (Gattolliat & Sartori 2008: figs 4, 19).

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References

- Alhejoj, I., Sartori, M. & Gattolliat, J.-L. (2020) Contribution to the mayflies (Insecta, Ephemeroptera) of Jordan. *Check List*, 16 (2), 237–242.
<https://doi.org/10.15560/16.2.237>
- Eaton, A.E. (1869) On *Centropitilum*, a new genus of the Ephemeridae. *Entomologist's Monthly Magazine*, 6, 131–132.
- Gattolliat, J.-L. & Sartori, M. (2008) Order Ephemeroptera. *Arthropod Fauna of the UAE*, 1, 47–83.
- Gillies, M.T. (1990) A revision of the African species of *Centropitilum* Eaton (Baetidae, Ephemeroptera). *Aquatic Insects*, 12 (2), 97–128.
<https://doi.org/10.1080/01650429009361395>
- Kluge, N.J. (1997) Classification and phylogeny of the Baetidae (Ephemeroptera) with description of the new species from the Upper Cretaceous resins of Taimyr. In: Landolt, P. & Sartori, M. (Eds.), *Ephemeroptera & Plecoptera. Biology-Ecology-Systematics. Proceedings of the 8th International Conference on Ephemeroptera and 12th International Symposium on Plecoptera, August 1995, Lausanne*. Mauron+ Tinguely & Lacht SA, Fribourg, pp. 527–535.
- Kluge, N.J. (2004) *The phylogenetic system of Ephemeroptera*. Kluwer Academic Publishers, 456 pp.
<https://doi.org/10.1007/978-94-007-0872-3>

- Kluge, N.J. (2005) Larval/pupal leg transformation and a new diagnosis for the taxon *Metabola* Burmeister, 1832 = Oligoneoptera Martynov, 1923. *Russian Entomological Journal* (2004), 13 (4), 189–229.
- Kluge, N.J. (2016) Redescription of the genus *Cheleocloeon* Wuillot & Gillies 1993 (Ephemeroptera: Baetidae) with descriptions of three new species from Zambia and Uganda. *Zootaxa*, 4067 (2), 135–167.
<https://doi.org/10.11646/zootaxa.4067.2.2>
- Kluge, N.J. (2022) Taxonomic significance of microlepidies on subimaginal tarsi of Ephemeroptera. *Zootaxa*, 5159 (2), 151–186.
<https://doi.org/10.11646/zootaxa.5159.2.1>
- Kluge, N.J., Gattolliat, J.-L. & Salles, F.F. (2017) Redescription of the Afrotropical genus *Crassabwa* Lugo-Ortiz & McCafferty 1996 (Ephemeroptera: Baetidae: Protopatellata). *Zootaxa*, 4350 (3), 401–435.
<https://doi.org/10.11646/zootaxa.4350.3.1>
- Kluge, N.J., Gattolliat, J.-L., Salles, F.F. & Novikova, E.A. (2018) Revision of the Afrotropical genus *Susua* Lugo-Ortiz & McCafferty 1998 (Ephemeroptera: Baetidae: Protopatellata). *Zootaxa*, 4434 (1), 1–28.
<https://doi.org/10.11646/zootaxa.4434.1.1>
- Kluge, N.J. & Novikova, E.A. (2011) Systematics of the mayfly taxon *Acentrella* (Ephemeroptera, Baetidae), with description of new Asian and African species. *Russian Entomological Journal*, 20 (1), 1–56.
<https://doi.org/10.15298/rusentj.20.1.01>
- Lugo-Ortiz, C.R. & McCafferty, W.P. (1996a) The *Bugilliesia* complex of African Baetidae (Ephemeroptera). *Transactions of the American Entomological Society*, 122 (4): 175–197.
- Lugo-Ortiz, C.R. & McCafferty, W.P. (1996b) *Crassabwa*: A new genus of small minnow mayflies (Ephemeroptera, Baetidae) from Africa. *Annales de Limnologie. (International Journal of Limnology)*, 32 (4), 235–240.
<https://doi.org/10.1051/limn/1996022>
- Lugo-Ortiz, C.R. & McCafferty, W.P. (1998) The *Centroptiloides* complex of Afrotropical small minnow mayflies (Ephemeroptera: Baetidae). *Annals of the Entomological Society of America*, 91 (1), 1–26.
<https://doi.org/10.1093/aesa/91.1.1>
- Wuillot, J. & Gillies, M.T. (1993) *Cheleocloeon*, a new genus of Baetidae (Ephemeroptera) from West Africa. *Revue d'Hydrobiologie Tropicale*, 26 (3), 213–217.
- Yanai, Z., Sartori, M. & Gattolliat, J.-L. (2020) Contribution to the mayflies (Insecta, Ephemeroptera) of Israel and the Palestinian Authority. *Check List*, 16 (2), 229–236.
<https://doi.org/10.15560/16.2.229>