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with all my cordial wishes
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***Compsoeuria (Siamoneuria) kovaci* subg. n., sp. n., a new mayfly from northern Thailand
(Insecta, Ephemeroptera, Heptageniidae)**

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Abstract

Compsoeuria (Siamoneuria) kovaci subg. n., sp. n. is described from a male collected at light and a larva at the bank of the small river Nam Lang in northern Thailand. Holotype male deposited in SMF (Senckenberg-Museum, Frankfurt am Main), SMF-Eph. 125. The assignment to the genus *Compsoeuria* EATON 1881 is discussed. A list of other genera of Heptageniidae and families of Ephemeroptera collected at the same location is given. The genus *Trichogenia* BRAASCH & SOLDÁN 1988 is recorded from Thailand for the first time.

Key words: New taxa, new records, *Trichogenia maxillaris*, Oriental region.

Compsoeuria (Siamoneuria) kovaci subgen. n., sp. n., eine neue Eintagsfliege aus Nordthailand
(Insecta, Ephemeroptera, Heptageniidae)

Zusammenfassung: *Compsoeuria (Siamoneuria) kovaci* subg. n., sp. n. wird anhand eines Männchens beschrieben, das am Ufer des kleinen Flusses Nam Lang in Nordthailand am Licht gesammelt wurde. Die am Fundort gefundene Larve wurde in die Beschreibung einbezogen. Der Holotypus (Männchen) ist im SMF (Senckenberg-Museum, Frankfurt am Main) unter der Katalognummer SMF-Eph. 125 deponiert. Die Zuordnung zur Gattung *Compsoeuria* EATON 1881 wird diskutiert. Andere Gattungen der Heptageniidae und Familien der Ephemeroptera, die am gleichen Standort gesammelt wurden, werden aufgelistet. Die Gattung *Trichogenia* BRAASCH & SOLDÁN 1988 wird zum ersten Mal aus Thailand nachgewiesen.

Introduction

The Heptageniidae fauna of Southeast Asia is poorly known. So far, the following genera have been recorded from Thailand: *Thalerosphyrus* EATON 1881 (POLHEMUS & POLHEMUS 1988, SITES et al. 2001), *Afronurus* LESTAGE 1924 (UENO 1961, SITES et al. 2001), *Cinygmina* KIMMINS 1937, *Compsoeuria* EATON 1881, *Epeorus* EATON 1881, *Rhithrogeniella* ULMER 1939 (BRAASCH 1990), *Compsoeuriella* ULMER 1939 (= *Compsoeuria* EATON 1881 sensu BRAASCH & SOLDÁN 1986c) and *Nixe* FLOWERS 1980 (SITES et al. 2001). Recently, SANGPRADUB et al. (2002) have found the genera *Asionurus* BRAASCH &

SOLDÁN 1986a, *Rhithrogena* EATON 1881, *Cinygmina*, *Compsoeuria* and *Thalerosphyrus*. In addition, WANG & McCAFFERTY (2004) mention the genera *Asionurus*, *Dacnogenia* KLUGE 1988, *Ecdyonurus* EATON 1868 and *Rhithrogena*.

The ♂ described in the present paper differs distinctly from other Oriental heptageniid ♂♂ seen by the author and is tentatively placed as subgenus in the genus *Compsoeuria* according to the concept of WANG & McCAFFERTY (2004) in outlining the Heptageniidae tribes and in comparison with the generic scope in KLUGE (2004). Records of the genus

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Compsoeuria so far concern different Asian countries of the Oriental region, i.e. tropical area of Southeast Asia (ULMER 1939: Borneo, Java, Sumatra; BRAASCH & SOLDÁN 1986b: peninsular Malaysia; 1986c: Sumatra; BRAASCH 1990: Thailand; 2005: Sulawesi, in coll. Museum für Naturkunde Ber-

lin; BRAASCH & FREITAG in prep.: Philippines, Palawan). Besides, there exists a disjunct Afrotropical species group of *Compsoeuria* including Madagascar (SARTORI & ELOUARD 1996, MACCAFFERTY 2003). The larvae of *Compsoeuria* are inhabitants of lower reaches of flowing waters.

Systematic account

Genus *Compsoeuria* EATON 1881

(Type species: *Compsoeuria spectabilis* EATON 1881 by original designation.)

The concept of the genus *Compsoeuria* here is understood in the sense of BRAASCH & SOLDÁN (1986b) encompassing *Compsoeuriella* ULMER 1939 as synonym. The main characters of the ♂ adults are: eyes contiguous; ♂♂ with richly differentiated dorsal and lateral abdominal pattern; dorsal faces of femora with many small spots (stippled); fore wings with thickened cross veins shaded; subcosta and radius 1 have a sinuous course in the outer $\frac{1}{3}$ of the wing (GILLIES 1983: 22, fig. 1); fore tarsal segment I is long, usually over $\frac{1}{2}$ of segment II (exception is *C. spectabilis* EATON 1881 with less than $\frac{1}{3}$); penes are stout, apically and medially provided with a tiny hook at inner penis lobe corner and discal spines ventrally, titillators strongly curved. African spp. and 2 undescribed southeast Asian spp. of the genus with more slender penes (GILLIES 1983, BRAASCH & SOLDÁN 1986c, BRAASCH & FREITAG in prep.).

Larvae of *Compsoeuria* are characterized as follows: glossae are elongate and pointed (BRAASCH & SOLDÁN 1986b: 44, fig. 14.2); gills distally obtusely pointed, in several species sharply pointed (BRAASCH & SOLDÁN 1986b, GILLIES 1983, SARTORI & ELOUARD 1986); femora are strikingly stippled (BRAASCH & SOLDÁN 1986b: 45, fig. 14.7); supracoxal spurs are sharply pointed (GILLIES 1983: 23, fig 2); caudal filaments ringled.

Subgenus *Siamoneuria* subg. n.

(Type species: *Compsoeuria (Siamoneuria) kovaci*, n. sp.; gender feminine)

Derivatio nominis: The subgenus name refers to former name Siam of the new species' patria in combination with Greek νεύριον (vein; feminine), like in *Compsoeuria*.

♂ adults: eyes contiguous as in *Compsoeuria*; dorsal pattern in southeast Asian genera of Heptageniidae unique (Fig. 1); dorsal face of femora not stippled (Fig. 3) in contrast to *Compsoeuria*; fore wings similar as in *Compsoeuria* (Fig. 2), with sinuous course but less expressed; fore tarsal segment short, almost as in *C. spectabilis*; penis slender (Fig. 5), similar to penis type of African *Compsoeuria* and some Southeast Asian

representatives but lacking hooked corner and discal spines (BRAASCH & SOLDÁN 1986b: 43, figs. 1, 3, 5), latero-dorsal spines present (Fig. 7) in accordance with *Compsoeuria*; titillators contiguous, attenuate, different from *Compsoeuria*. Caudal filaments ringled like in *Compsoeuria*.

Larva: glossae sessile and not pointed (Fig. 11) unlike those of *Compsoeuria*; gills I–V bluntly pointed, but III–IV somewhat lobate (Figs. 13–14), V–VI with curved acute elongation (Fig. 15–16), VII narrowly lanceolate (Fig. 17), gill set of *Compsoeuria* different, without lobation, hooks and broader 7th gill; femora not stippled (Fig. 18); supracoxal spurs are short and distally rounded unlike in *Compsoeuria*. Cerci probably with ringlets corresponding to *Compsoeuria* but in described larva not visible; paracercus is half width of cerci (Fig. 20) and conspicuously shorter, in *Compsoeuria* of same width.

One species known:

Compsoeuria (Siamoneuria) kovaci sp. n.

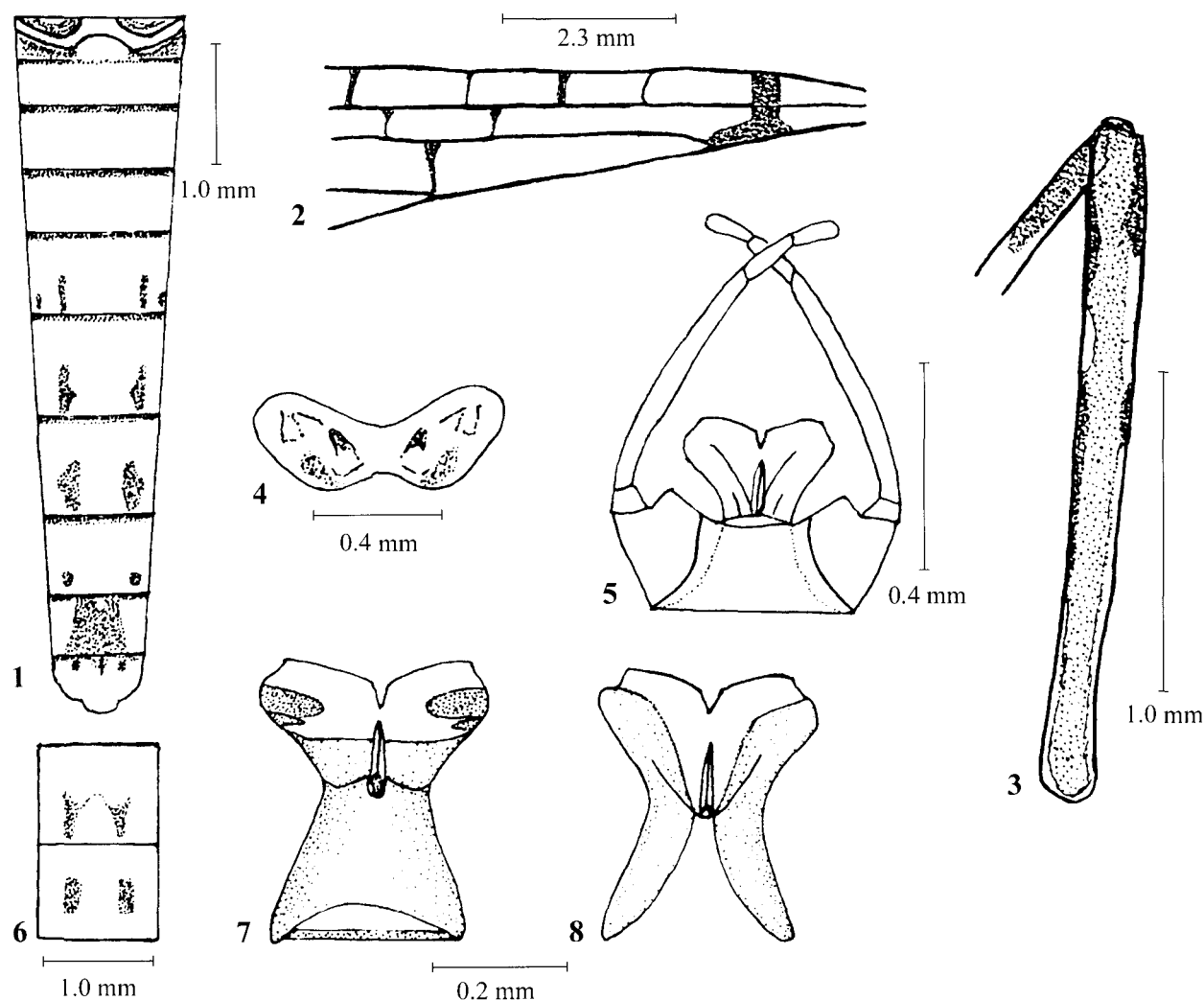
Figs. 1–21

Holotype ♂: North Thailand, Mae Hong Son Province, Pangmapa/Soppong, bank of Nam Lang river, 19°34.447' N, 98°18.727' E, altitude 605 m, 18. VII. 2004, at light in the evening, leg. D. KOVAC, in 70% alcohol. Type deposition: holotype ♂ in Senckenberg-Museum, Frankfurt am Main (SMF-Eph. 125).

Paratypes: 1 ♂, 1 larva: ibidem, 5. v. 2005, at light and by bottom sampling, leg. D. BRAASCH, in 70% alcohol, in coll. BRAASCH, Potsdam.

Derivatio nominis: The name is given in honour of the collector of the species, Dr. Damir KOVAC, Frankfurt am Main. It is a noun in apposition.

Diagnosis: The species of the genus *Asionurus* are easily distinguishable from the species described here by possessing a ton-like copulatory organ (BRAASCH 2005). Adults of *Atopopus* EATON 1881 are characterised by tinged fore- and hindwings (BRAASCH 2005, WANG & MACCAFFERTY 1995). *Cinygmina* ♂♂ differ from the new species by having untinged wings and laterally expanded, often antler-shaped penes with poorly developed titillators lacking distinct sclerites on their lobular parts and ♂♂ of *Thalerosphyrus* in having rounded, weakly sclerotised penis globes. ♂♂ of *Afronurus* can be differenti-



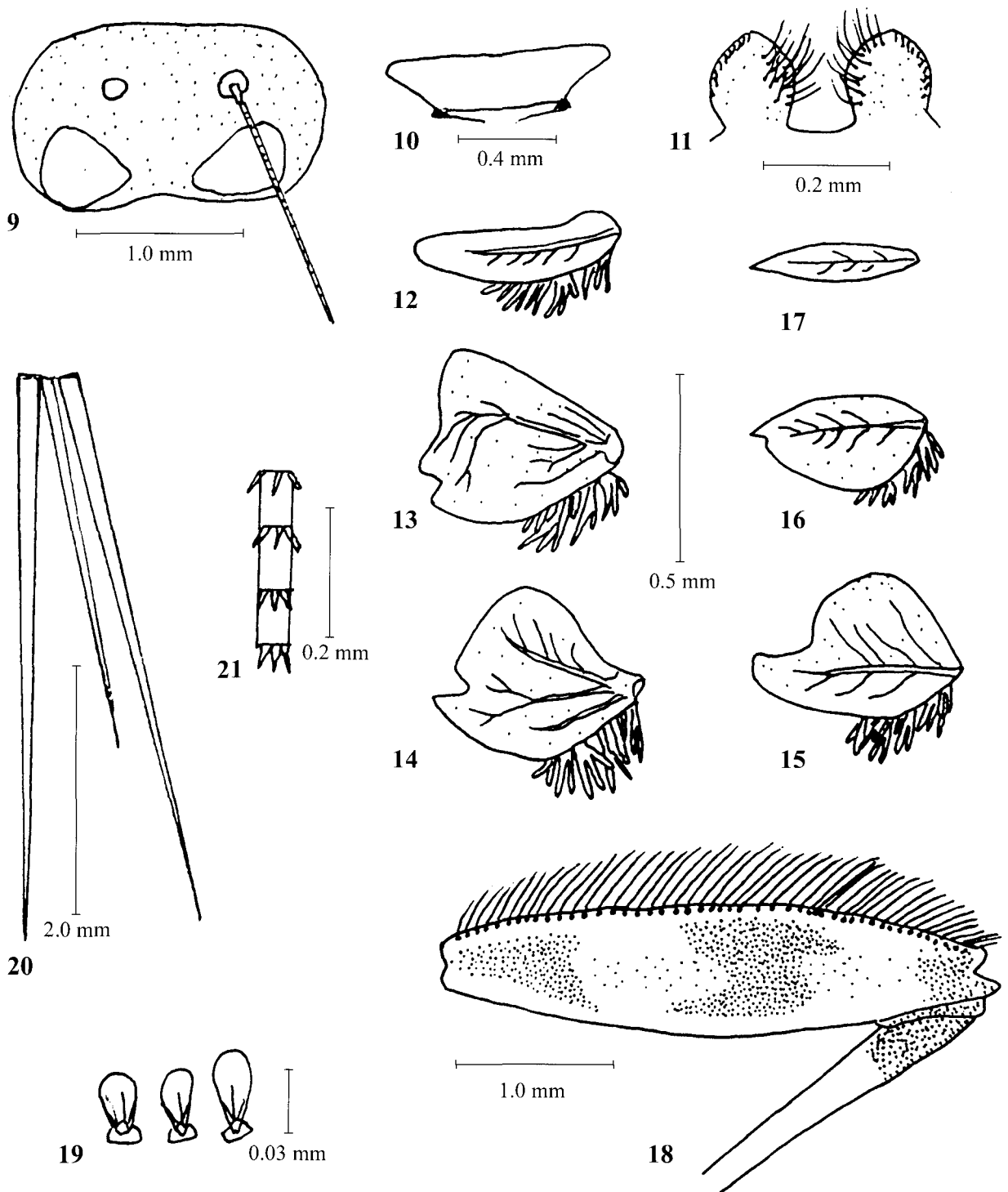
Figs. 1–8. *Compsoneuria (Siamoneuria) kovaci* subg. n., sp. n., holotype ♂ characters. — Fig. 1: Abdomen, dorsal view. Fig. 2: Forewing, anterior basal margin. Fig. 3: Femur and proximal part of tibia, dorsal view. Fig. 4: Pronotum. Fig. 5: Genital segment, ventral view. Fig. 6: Abdomen, sterna VII–VIII. Fig. 7: Penis, ventral view. Fig. 8: Penis, dorsal view.

ated by stout, vertically structured, apically subdivided penes without titillators. *Parafronurus* ZHOU & BRAASCH 2003 possesses titillators, but the penis type resembles *Afronurus*. The titillators of the new species are attenuate and not thick and spindle-shaped as in *Nixe*. Affiliation to *Ecdyonurus* can be excluded by penial structures with hammer-like apical lobes and with highly developed lateral and marginal sclerites (BAUERNFEIND & HUMPECH 2001, KLUGE 2004). ♂♂ of *Electrogena* ZURWERRA & TOMKA 1985 are characterized by penes lobes of tear-drop shape or subtruncate and lacking distal sclerotisation (KLUGE 2004, WANG & MCCAFFERTY 2004).

The species so far listed under *Rhithrogeniella* from Thailand must be assigned to *Nixe* in accordance with MCCAFFERTY (2004: 5), because “a distally extended apical lobule of the penes lobes is generally not developed in *Nixe*” and “a poor development of dorsal penes sclerites” is characteristic for this genus.

Description ♂ (holotype): Eyes dark grey, contiguous; prothorax characteristically marked (Fig. 4); thorax mostly brown, with some longitudinal light stripes; black markings on terga V–X, distally blackish margined (Fig. 1); sterna light with exception of I having a broad black cross band widened in the middle, and VII and VIII with 2 parallel black stripes (Fig. 6). Femur of fore leg 1.9, tibia 2.7 and tarsus 3.4 mm; segments of tarsus 0.4, 1.1, 1.0, 0.6 and 0.3 mm; femur of hind leg 2.0, tibia 1.83, tarsus 1.12 mm, tarsal segments 0.13, 0.15, 0.15, 0.11 and 0.22 mm long. Forelegs with indistinct black-brownish markings on distal femur (Fig. 3), black coloration at proximal and distal ends of tibia; ends of tarsal joints slightly darkened.

Forewings oval, transparent, costa rather straight, in the middle somewhat depressed; costal field with 12 thickened, short, straight, brownish cross veins; other longitudinal vein fields (C, SC, RA) provided with



Figs. 9–21. *Componeuria (Siamoneuria) kovaci* subg. n., sp. n., paratype larval characters. — Fig. 9: head, schematic view. Fig. 10: Labrum, ventral view. Fig. 11: Labium, glossae, ventral view. Fig. 12: Gill I. Fig. 13: Gill III. Fig. 14: Gill IV. Fig. 15: Gill V. Fig. 16: Gill VI. Fig. 17: Gill VII. Fig. 18: Femur with proximal part of tibia, dorsal view. Fig. 19: Femur, bristles on dorsal face. Fig. 20: Caudal filaments, schematic view. Fig. 21: Paracercus, proximal section with whorls of spines.

strengthened cross veins too, veins of third field longer and less thickened; cross veins in lower half of fore wing creating a fine thin network; apparent cross bars as in species of *Componeuria* not evident. Subcosta and radius 1 in last third follow a slightly sinuous course. Fig.

2 shows the conspicuous black mark within the costal bridge of fore wing. Hindwings completely transparent, with blunt angled projection, veins not tinged.

Genital segment (Fig. 5) with relatively short colourless forcipes, curved inwards, brownish styli

at both sides somewhat elevated; penis (Figs. 7, 8) with almost hammerlike head, apical marginal sclerites of penes lacking, lateral sclerites present and strongly expanded medially; titillators slender, not spindle-shaped, attenuated.

Length of body 7 mm, forewing 7.8 mm, hindwing 5.7 mm, cerci 9.5 mm (end broken off).

Larva, nearly mature: head subrectangular (Fig. 9), width 1.9 mm, length 1.2 mm, faintly brownish without conspicuous markings, ocelli got lost, antennae 1.7 mm, margin of anterior head plain, unthickened; mouthparts: labrum (Fig. 10) 0.8 mm; mandibles, maxillae and hypopharynx got lost, as checked before corresponding with Ecdyonurinae; glossae stout (Fig. 11) apically rounded. Abdomen dorsally marked as in imago male (Fig. 1), ventrally without any stripes. Femora (Fig. 18) with 3 not sharply expressed cross bands, tibia only with proximal band (Fig. 18), yellowish, tarsus brownish; fore femur 1.96 mm, tibia 1.71 mm and tarsus 0.62 mm, femur bristles spatulate (Fig. 19), supra-coxal spurs rounded, claws with 4 denticles. Gills I–VI with good evolved filamentous tuft; gill I banana-like (Fig. 12), II–V roundish triangular, III–IV apically with emargination (Figs. 13–14), V–VI distally with curved hook (Figs. 15–16) and VII narrowly lanceolate (Fig. 17) without tuft. Caudal filaments (Fig. 20) whitish, with whorls of few small spines lacking setae (Fig. 21), paracercus $\frac{1}{2}$ width of cercus. Length: body 5.9 mm, cerci 8.7 mm, paracercus 6.0 mm.

Habitat and biological notes: The Nam Lang river was about 15 m wide and 0.5–2 m deep at the collecting site in June 2004. Rocks, boulders, stones of different sizes, gravel and sand, floating roots, anchored trees and plants along the banks provided a wide range of different microhabitats. The larva of the new subgenus seems to be an inhabitant of submerge plants and roots of the bank. Although the collecting location was situated in the village of Soppong, the river appeared to be clean. Despite exploitation by the locals small-sized fishes, shrimps, crabs or molluscs were still abundant. The main component of the heptageniid fauna were species of *Cinygmina* (2 spp.), other genera were represented by *Asionurus* (1 sp.), *Compsoeuria* (2 spp.), *Epeorus* (2 spp.), *Nixe* (sub nom. *Rhithrogeniella*) (1 sp.), *Notacanthurus* (1 sp.), *Rhithrogena* (1 sp.), *Thalerosphyrus* (1 sp.) and *Trichogenia* BRAASCH & SOLDÁN 1988. The genus *Trichogenia* (*T. maxillaris* BRAASCH & SOLDÁN 1988: larva) is a new record for Thailand.

Other families of Ephemeroptera recorded from the same location at different times of the year belong to Baetidae (> 20 spp.), Caenidae (5 spp.), Ephemerellidae (5 spp.), Ephemeridae (2 spp.), Isonychiidae (1 sp.), Lep-

tophlebiidae (5 spp.), Neoephemeridae (3 spp.), Palingeniidae (1 sp.), Polymitarcyidae (1 sp.), Potamanthidae (3 spp.), Prosopistomatidae (1 sp.) and Tricorythidae (1 sp.).

Discussion: The genus *Ecdyonurus* is usually characterised by European workers by having paranotalia in the larval stage and hammer-like penes with lateral and apical marginal sclerites in the ♂ (BAUERNFEIND & HUMPEsch 2001, KLUGE 2004, STUDEMANN et al. 1993). WANG & McCAFFERTY (2004) have proposed a broader definition of this genus on account of their cladistic analysis of the Heptageniidae, thus including larvae of different shapes (flanged or rectangular pronota, etc.) or ♂♂ having penis bulbs with spined or unspined, rounded or angular heads. The new species approaches this definition to a certain extent containing both plesiomorphic and apomorphic characters. The described ♂ adult with its medial depression of the mesothoracic furcasternum parallel-sided (apomorphic condition) belongs to Ecdyonurinae ULMER 1920. However, the accessory larva with caudal filaments and lateral setae reduced excludes it from the tribe Ecdyonurini ULMER 1920 (genera *Ecdyonurus*, *Nixe*).

Likewise ♂♂ cannot be referred to tribe Leucrocutini WANG & McCAFFERTY 2004 by their penes with dorsolateral spines well developed and strongly developed medioapically. Regarding the preceding exclusions, the ♂ adult keys out by its plesiomorphic feature of fore tarsal segment I less than one-half of segment to the tribe Atopopini WANG & McCAFFERTY 2004, including the genera *Afronurus*, *Asionurus*, *Atopopus* and *Thalerosphyrus*. Already in the diagnosis (see above) all foregoing genera have been ruled out to match the species described here. Species of the tribe Notacanthurini WANG & McCAFFERTY 2004 have larvae with maxillary palp segment I lacking setae on inner margin, whereas *Compsoeuria* (*Siamoneuria*) *kovaci* sp. n. does show this (as a plesiomorphic feature). It is not quite clear whether adaptations of the new species (and subgenus) to a currently reduced niche have triggered some features deviating from *Compsoeuria*. The antennae are long, the gill set and the remarkable width and length reduction of the paracercus are most striking to suggest any apomorphies relevant for moving in dense substrate; also the femora are relatively slim, not enlarged for reason of withstanding stronger current, provided with rather long hairs. In evolutionary respect the penes could have undergone a reduction of discal spines. Further studies are needed to comprise possible affinities to other unclear species, for example the Hong Kong "*Heptagenia gni*" (see HSU 1936). *Notacanthurus* Tshernova 1972 larvae have a longitudinal median ridge on terga mostly with a posterior spine (BRAASCH 1986, KLUGE 2004).

References

- BAUERNFEIND, E., & HUMPECH, U. H. (2001): Die Eintagsfliegen Zentraleuropas (Insecta: Ephemeroptera): Bestimmung und Ökologie. — Wien (AV-Druck); 239 pp.
- BRAASCH, D. (1986): Zur Kenntnis der Gattung *Notacanthurus* TSHERNOVA, 1974 aus dem Himalaya (Ephemeroptera, Heptageniidae). — *Reichenbachia*, **23** (21): 117–125; Dresden.
- — — (1990): Neue Eintagsfliegen aus Thailand nebst einigen Bemerkungen zu deren generischem Status (Insecta, Ephemeroptera: Heptageniidae). — *Reichenbachia*, **28** (2): 211–212; Dresden.
- — — (2005): Neue Arten der Gattungen *Atopopus* und *Afronurus* aus Südostasien sowie einige Bemerkungen zur Gattung *Asionurus* von Malaysia (Heptageniidae, Ephemeroptera). — *Entomologische Abhandlungen, Museum für Tierkunde Dresden*, **62** (2): 165–174; Dresden.
- BRAASCH, D., & SOLDÁN, T. (1986a): *Asionurus* n. gen., eine neue Gattung der Heptageniidae aus Vietnam (Ephemeroptera). — *Reichenbachia*, **23** (28): 155–159; Dresden.
- & — (1986b): Die Heptageniidae des Gombak-River in Malaysia (Ephemeroptera). — *Reichenbachia*, **24** (3): 41–52; Dresden.
- & — (1986c): Zur Kenntnis der Gattung *Compsoneuria* EATON, 1881 von den Sunda-Inseln (Ephemeroptera, Heptageniidae). — *Reichenbachia*, **24** (5): 59–62; Dresden.
- & — (1988): *Trichogenia* gen. n., eine neue Gattung der Eintagsfliegen aus Vietnam (Insecta, Ephemeroptera, Heptageniidae). — *Reichenbachia*, **25** (25): 119–124; Dresden.
- EATON, A. B. (1868): Remarks upon the homologies of the ovipositor. — *Transactions of the Entomological Society of London*, **1868**: 141–144; London.
- — — (1881): An announcement of new genera of the Ephemerae. — *Entomologist's Monthly Magazine*, **18**: 21–27; London.
- FLOWERS, R. W. (1980): Two new genera of Nearctic Heptageniidae (Ephemeroptera). — *Florida Entomologist*, **63**: 162–165; Tallahassee.
- GILLIES, M. T. (1983): On the synonymy of *Notonurus* CRASS with *Compsonურიella* ULMER (Heptageniidae). — Pp. 21–25 in: LANDA, V., SOLDÁN, T., & TONNER, M. (eds.), *Proceedings of the Fourth International Conference on Ephemeroptera*. — Czechoslovak Academy of Sciences (CSAV), České Budějovice, 345 pp.
- Hsu Y.-C. (1936): Mayflies of Hong Kong with description of two new species (Ephemeroptera). — *Hong Kong Naturalist* **7**: 233–238; Hong Kong.
- KIMMINS, D. E. (1937): Some new Ephemeroptera. — *Annals and Magazine of Natural History*, **19** (10): 430–440; London.
- KLUGE, N. J. (1988): Revision of genera of the family Heptageniidae (Ephemeroptera). I. Diagnosis trib, rodov I podrodov podsem. Heptageniinae. — *Entomologicheskoe Obozrenie*, **67** (2): 291–313; St.-Petersburg.
- — — (2004): *The phylogenetic system of Ephemeroptera*. — Dordrecht, Boston, London (Kluwer Acad. Publ.); 442 pp.
- LESTAGE, J. A. (1924): Les Ephémères de l'Afrique du Sud. Catalogue critique & systématique des espèces connues et description de trois genres nouveaux et de sette espèces nouvelles. — *Revue Zoologique Africaine*, **12**: 316–352; Brussels.
- McCAFFERTY, W. P. (2003): Note. New nomenclatural applications for certain Heptageniidae (Ephemeroptera). — *Proceedings of the Entomological Society of Washington*, **105** (3): 792–793; Washington.
- — — (2004): Contribution to the systematics of *Leucrocuta*, *Nixe*, and related genera (Ephemeroptera: Heptageniidae). — *Transactions of the American Entomological Society*, **130** (1): 1–9; Philadelphia.
- POLHEMUS, D. A., & POLHEMUS, J. T. (1988): The Aphelocheirinae of tropical Asia (Heteroptera: Naucoridae). — *Raffles Bulletin of Zoology*, **36**: 167–300; Singapore.
- SANGPRADUP, N., HANJAVANIT, C., & BOONSOONG, B. (2002): New records of heptageniid mayflies *Asionurus* and *Thalerosphyrus* (Ephemeroptera, Heptageniidae) from Northeastern Thailand. — *Science Asia*, **28**: 411–416; Khon Kaen.
- SARTORI, M., & ELOUARD, J.-M. (1996): New Heptageniidae (Insecta: Ephemeroptera) from the Réserve Naturelle Intégrale d'Andringitra, Madagascar. — *Fieldiana, Zoology*, **10**: 121–130; Chicago.
- SITES, R. W., WANG, T., PERMKAM, S., & HUBBARD, M. (2001): The mayfly genera (Ephemeroptera) of southern Thailand. — *The Natural History Bulletin of the Siam Society*, **49**: 243–268; Bangkok.
- STUEDEMANN, D., LANDOLT, P., SARTORI, M., HEFTI, D., & TOMKA, I. (1992): *Insecta Helvetica, Fauna 9: Ephemeroptera*. — Fribourg (Mauron + Tinguely & Lachat), 175 pp.
- TSHERNOVA, O. A. (1972): Some new species of mayflies from Asia (Ephemeroptera, Heptageniidae, Ephemerellidae) [in Russian]. — *Entomologicheskoe Obozrenie*, **51**: 604–614; St.-Petersburg.
- UENO, M. (1961): Mayflies of Thailand. — *Nature and Life in Southeast Asia*, **1**: 207–208.

- ULMER, G. (1920): Übersicht über die Gattungen der Ephemeropteren, nebst Bemerkungen über einzelne Arten. — Stettiner Entomologische Zeitung, **81**: 97–144; Stettin.
- & — (1939): Eintagsfliegen (Ephemeropteren) von den Sunda-Inseln. — Archiv für Hydrobiologie, **Supplement 16**: 443–692; Stuttgart.
- WANG, T., & McCAFFERTY, W. P. (1995): First larval description, new species, and evaluation, of the Southeast Asian genus *Atopopus* (Ephemeroptera, Heptageniidae). — Bulletin de la Société d'Histoire Naturelle de Toulouse, **131**: 19–25; Toulouse.
- & — (2004): Heptageniidae (Ephemeroptera) of the world. Part I: Phylogenetic higher classification. — Transactions of the American Entomological Society, **130** (1): 11–45; West Lafayette.
- ZHOU C.-F. & BRAASCH, D. (2003): Eine neue Gattung und Art der Heptageniidae aus dem östlichen China (Ephemeroptera). — Entomologische Nachrichten und Berichte, **47** (3/4): 147–151; Dresden.
- ZURWERRA, A., & TOMKA, I. (1985): *Electrogena* gen. nov., eine neue Gattung der Heptageniidae (Ephemeroptera). — Entomologische Berichte Luzern, **13**: 99–104; Luzern.

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