

A new species of the genus *Levigatocreagris* Ćurčić (Pseudoscorpiones: Neobisiidae) from Thailand, with remarkable sexual dimorphism

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Summary

Levigatocreagris hamatus n. sp. is described from Doi Inthanon, Chiang Mai province, Thailand. It is the first species of this family to show sexual dimorphism, the male bearing a heavy spine on the ventral surface of the chelal hand which is associated with a lateral hump at the base of the movable finger. Two species were originally included in this genus; *Microcreagris heros* Beier from Central Asia probably also belongs in this genus.

Introduction

Published accounts of Thai pseudoscorpions are quite rare and date mostly from the beginning of this century; the soil fauna of this country has been neglected for a long time. During the last decade, however, there has been renewed interest in this fauna, and several expeditions have paid special attention to the collection of endogenous and cavernicolous pseudoscorpions. Among the material collected by our colleagues Dr D. Burckhardt and Dr Ivan Löbl (Museum Geneva), Drs L. Deharveng and A. Gouze (University of Toulouse) and Mr Peter Schwendinger (University Chiang Mai-Innsbruck) we found a series of an exciting species we believed at first to belong to an undescribed genus. However, we now place this species in the genus *Levigatocreagris* Ćurčić, 1983, known by two species from Nepal (type species: *gruberi* Ćurčić) and Afghanistan (*lindbergi* (Beier)). Formerly those species had been assigned to the polyphyletic genus *Microcreagris* Balzan, the heterogeneity of which was proved by Mahnert (1974, 1976, 1979) and subsequently by Ćurčić (1983, 1985) who split the genus, in the Palearctic and Oriental regions, into (so far) nine genera.

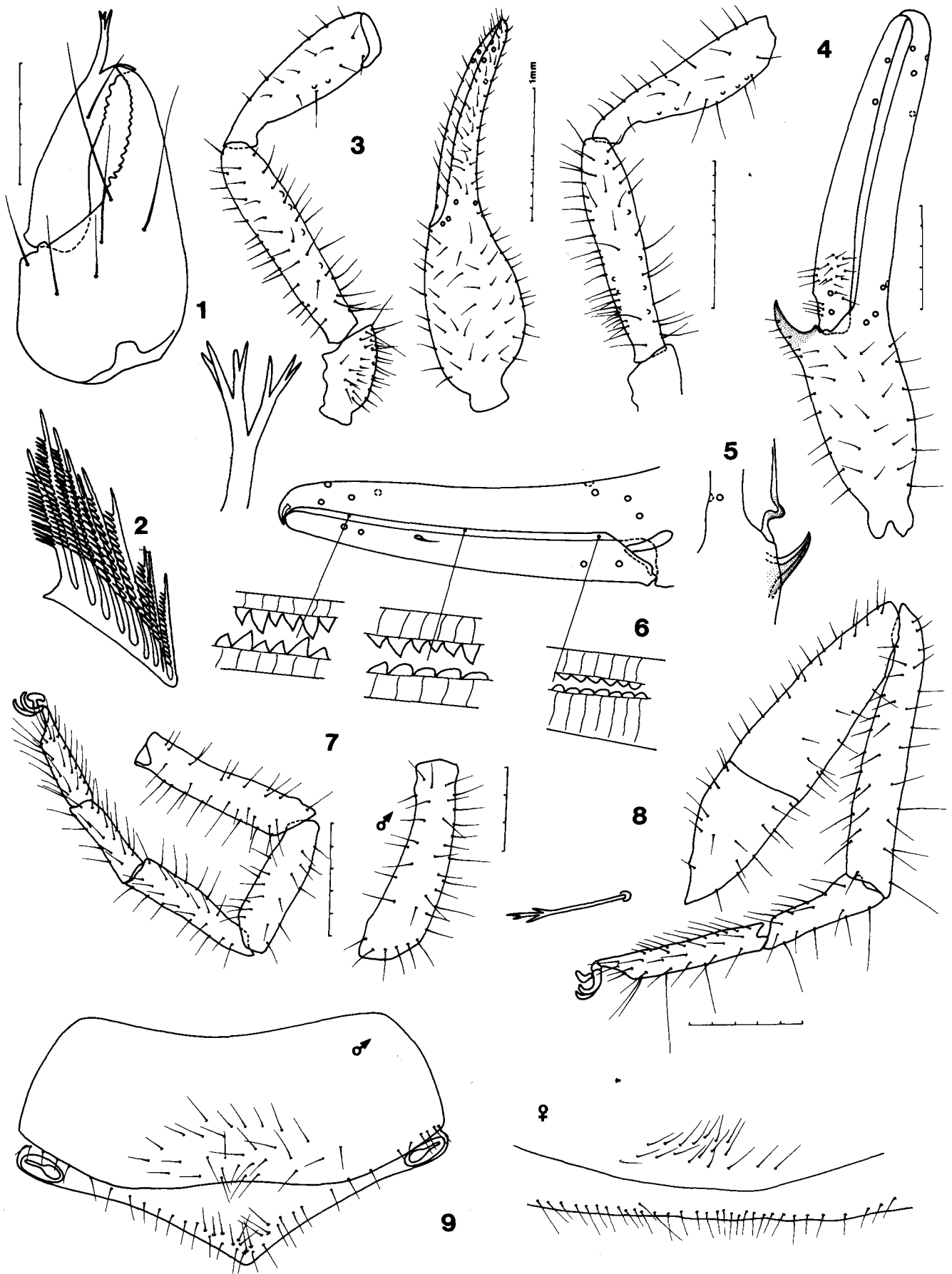
***Levigatocreagris hamatus* n. sp. (Figs. 1-14)**

Material examined: Thailand, Chiang Mai province, Doi Inthanon, 2530 m, pitfall trap, 17 Dec. 1986-16 Feb. 1987, leg. P. Schwendinger: 1♂ (holotype), 1♀ (allotype); same locality, pitfall trap, 23 Oct.-17 Dec. 1986, leg. P. Schwendinger: 2 deutonymphs; same locality, pitfall trap, 2500 m, 18 Apr.-23 May 1987 and 11 June-14 July 1987, leg. P. Schwendinger: 1 deuto-, 2 protonymphs; same locality, pitfall trap, 2300 m, 11 June-14 July 1987, leg. P. Schwendinger: 1 deutonymph; same locality, 2300 m, soil sample, 23 May 1987, leg. P. Schwendinger: 2 protonymphs; same

locality, 1650 m, steep forest slope, sifted vegetation debris, 7 Nov. 1985, leg. D. H. Burckhardt & I. Löbl: 4 tritonymphs; same locality, 2500 m, ravine in moist forest, sifted leaves, rotten wood and mosses, 9 Nov. 1985, leg. D. H. Burckhardt & I. Löbl: 9♂, 3♀, 1 tritonymph (paratypes); same locality, 2500 m, leaf litter, 2 Jan. 1981, leg. L. Deharveng & A. Gouze: 1♂ (paratype); same locality, 2000 m, litter, 9 Jan. 1981, leg. L. Deharveng & A. Gouze: 1♀ (paratype); Chiang Mai prov., Doi Chiang Dao, 2000 m, mosses under forest, 21 Dec. 1980, leg. L. Deharveng & A. Gouze: 1♀ (paratype). Type series deposited in the collection of the Museum of Natural History, Geneva, three paratypes in the collection of the first author.

Derivatio nominis: *hamatus* adj. lat., spine-bearing.

Description (measurements based on 3♂, 3♀): Carapace as long as broad or slightly longer than broad, triangular epistome very small, four well developed corneate eyes, anteriors nearly one diameter from anterior border, with 22 to 26 setae (4-6/4/8-10/4-8), surface of carapace smooth; tergite I with 3-4 setae, II: 6-8, III: 8-12, the following with 10 to 12, last tergite with 4 tactile setae, anal cone with 2 dorsal and ventral setae. Pleural membranes granulostriate. Apex of pedipalpal coxa with 5 (occasionally 4) long setae, pedipalpal coxa: 15-20, coxa I: 9-15, II: 10-14, III: 11-13, IV: 14-23. Genital operculum of male very large, bar-shaped, with approximately 30, that of female with approximately 20 setae (Fig. 9), male genital chamber with 4-5 small setae, genitalia (Fig. 10) with relatively small lateral genital sac, medial genital sac apparently absent, atrium of posterior dorsal gland very large, spinulate; median cribriform plate divided into three parts, lateral cribriform plates elongate (Fig. 11); sternite III of male with approximately 20 marginal setae, 5-6 suprastigmal setae and a central cluster of approx. 13 discal setae, sternite III of female with approx. 30 marginal setae (some central ones placed submarginally) and 5-8 suprastigmal setae, sternite IV with approx. 24 marginal setae and 4-6 suprastigmal setae on each side, the following with approx. 24 decreasing to 12, in male sternites V(VI)-VIII with 5-8 medial discal setae, in female those sternites with only a pair of medial discal setae (in both sexes they are clearly longer than the marginal ones), last sternite with 4-5 setae (2 tactile ones). Sternites IV/V of male slightly divided, VI-VIII with a medial anterior incision. Palm of chelicera (Fig. 1) with 6-7 setae, fixed finger with approx. 18 mostly pointed teeth, movable finger with 5-7 teeth; galea divided into two main branches, each bearing 2-3 smaller ones; serrulae externa and interna with 34-38 lamellae, flagellum with 7-10 blades pinnate anteriorly, first blade dilated at its base (Fig. 2). Palps elongate, smooth in females, indistinctly granulate in males (femur and tibia) (Figs. 3-4); trochanter with a small irregular tubercle, femur slightly club-shaped, with an irregular row of 4-7 tubercles (sense-spots?) on internal face and 3-4 tubercles on basal outer face, 4.3-4.8, tibia with 3-4 tubercles on inner face, 3.6-3.9 (male) vs. 3.3-3.5 (female), hand with pedicel 2.2-2.4 (male) vs. 1.8-2.0 (female) times as long as broad and 1.4 (male) vs. 1.1-1.2 (female) times as long as finger,



Figs. 1-9: *Levigatocreagris hamatus* n. sp. 1 Chelicera of female, and galea drawn at higher magnification; 2 Flagellum; 3 Pedipalp of female; 4 Pedipalp of male; 5 Internal base of movable pedipalpal finger of male, dorsal view; 6 Trichobothrial pattern; 7 Leg I of female, with basifemur of male; 8 Leg IV, and subterminal seta drawn at higher magnification; 9 Sternites II and III of female and male.

chela (including pedicel) 5.2-5.5 (male) vs. 4.0-4.2 (female) times as long as broad; hand of male on ventral surface near base of finger with a thorn-like projection pointing distally downwards, movable finger near its inner base with a hump-like projection pointing laterally; both structures restrict gape of movable finger; fixed finger with about 90-100 pointed teeth of unequal length, movable finger with about 80-90 teeth which are pointed and of slightly unequal length in distal half, rounded and low in basal half; no sensillum at base of teeth, but one on lateral side of finger.

Trichobothrial pattern (Fig. 6): *isb* at same level or slightly distal or proximal of *ib*, *eb* and *esb* separated by about two areole diameters, *ist* near distal group, *est* mostly half-way between *ist* and *it*. Trichobothria *b* and *sb* close together at base, separated by about two diameters, *st* and *t* in distal half of finger. Legs slender; leg I: basifemur of male clearly curved, 3.6-3.8 times as long as broad and 1.2 times as long as telofemur, telofemur 2.7-2.8, tibia 3.8-3.9, basitarsus 3.4-3.7, telofemur 4.2-4.4 times as long as broad and 1.2 as long as basifemur; female; basifemur straight, 4.2-4.3 times as long as broad and 1.3-1.4 times as long as telofemur, telofemur 3.2-3.4, tibia 4.1-4.3, basitarsus 3.3-3.6, telotarsus 3.8-4.2 times as long as broad and 1.0-1.1 as long as basitarsus. Leg IV (both sexes): femur 3.8-4.3, narrowed at level of basi-telofemur separation of male, tibia with one or (more frequently) two tactile setae in distal half, 5.9-6.9, basitarsus with one basal and one subapical tactile seta, 3.8-4.2, telotarsus with two tactile setae, 5.8-6.7 times as long as broad and 1.2-1.3 times as long as basitarsus; subterminal seta finely dentate, arolium shorter than the smooth claws (Figs. 7-8).

Measurements (in mm) (females in brackets): Carapace 1.16-1.32/0.96-1.21. Palps: femur 1.53-1.60/0.32-0.35 (1.58-1.74/0.35-0.39), tibia 1.43-1.52/0.38-0.41 (1.35-1.46/0.39-0.44), hand with pedicel 1.11-1.17/0.47-0.52 (1.31-1.45/0.66-0.76), length of finger 1.58-1.68 (1.53-1.67), length of chela (including pedicel) 2.58-2.71 (2.77-3.00). Leg I: basifemur 0.73-0.75/0.20 (0.77-0.85/0.18-0.20), telofemur 0.61-0.63/0.22-0.23 (0.61-0.65/0.19), tibia 0.57-0.59/0.15 (0.63-0.68/0.15-0.16), basifemur 0.36-0.37/0.10-0.11 (0.40-0.41/0.11-0.12), telotarsus 0.41-0.42/0.09-0.10 (0.42-0.46/0.11). Leg IV (both sexes): femur 1.41-1.64/0.34-0.39, tibia 1.11-1.34/0.18-0.21, basitarsus 0.51-0.58/0.12-0.15, telotarsus 0.66-0.77/0.10-0.13.

Tritonymph (measurements for one specimen): Carapace longer than broad (0.66/0.62), epistome small, chaetotaxy of carapace and tergites as in adults; lobe of pedipalpal coxa with 4 setae, pedipalpal coxa: 13, coxa I: 11, II: 11, III: 8, IV: 10. Sternite II with 4 central setae, III and IV with about 18, on each side 4-5 suprastigmal setae, number on following ones decreasing from 19 to 11, last one with 4 (2 tactile setae), 2 medial discal setae on sternites VI-VIII. Palm of chelicera with 6 setae, galea divided into two main branches, each split into two or three smaller ones (Fig. 12c), serrula externa 30, s. interna 29 lamellae, flagellum six-bladed. Pedipalps: trochanter with small ventral tubercle, femur with 4 tubercles on inner face,

4.0 times as long as broad (0.82/0.20), tibia with 2 or 3 tubercles, 2.8 (0.64/0.23), hand with pedicel 1.8 (0.68/0.37), chela with pedicel 4.0 times as long as broad (length 1.48), finger 1.3 times as long as hand with pedicel; no projection on chela, sexual dimorphism confined to adults; fixed finger with 60 slightly unequal teeth, movable finger with 56 teeth (of unequal length in distal half, low and rounded in basal half of finger), trichobothrial pattern: Fig. 14. Leg I: basifemur 3.7 (0.40/0.11) times as long as broad and 1.3 times as long as telofemur, telofemur 2.9 (0.31/0.11), tibia 3.6 (0.32/0.09), basitarsus 3.0 (0.21/0.07), telotarsus 4.1 (0.28/0.07) times as long as broad and 1.3 times as long as basitarsus. Leg IV: femur 4.4 (0.79/0.19), tibia with two tactile setae, 5.2 (0.58/0.11), basitarsus with two tactile setae, 3.2 (0.28/0.09), telotarsus with a single tactile seta, 4.9 (0.42/0.08) times as long as broad and 1.5 times as long as basitarsus.

Deutonymph: Carapace slightly longer than broad (0.59/0.52), epistome low and triangular, 22 setae (6/4/8/4); tergal chaetotaxy: 4/6/6/8/8/10/9/10/9/8/7, 4 tactile setae on X/XI. Lobe of pedipalpal coxa with 3 setae, pedipalpal coxa: 6, I: 6, II: 5, III: 4, IV: 7; sternite II without setae, III about 6, IV: 10, 2 suprastigmal setae on each side, following sternites with 14 to 11, last one 4 (2 tactile setae), on sternites VI to VIII one pair of medial discal setae. Palm of chelicera with 5 setae, galea with two main branches (one bifurcated apically) (Fig. 12b), serrula externa and interna 27 lamellae, flagellum six-bladed. Pedipalps: trochanter with small tubercle, femur smooth, with 4 internal tubercles, 4.2 (0.78/0.19), tibia 2.9 (0.61/0.21), hand with pedicel 2.0 (0.67/0.33), chela with pedicel 4.4 (length 1.44) times as long as broad, finger 1.2 as long as hand with pedicel (length 0.82), fixed finger with 58 unequal teeth, movable finger with 52 teeth which are of unequal length only in distal quarter of finger. Trichobothrial pattern: Fig. 14. Leg I: basifemur 4.0 (0.40/0.10) times as long as broad and 1.4 times as long as telofemur, telofemur 2.7 (0.28/0.10), tibia 3.4 (0.29/0.08), basitarsus 2.4 (0.18/0.08), telotarsus 3.7 (0.27/0.07) times as long as broad and 1.5 times as long as basitarsus. Leg IV: femur 4.1 (0.74/0.18), tibia with two tactile setae, 4.1 (0.52/0.13), basitarsus with two tactile setae, 3.0 (0.26/0.08), telotarsus with one tactile seta (TS = 0.76) and one slightly longer sub-basal seta, 5.5 (0.41/0.07) times as long as broad and 1.6 times as long as basitarsus.

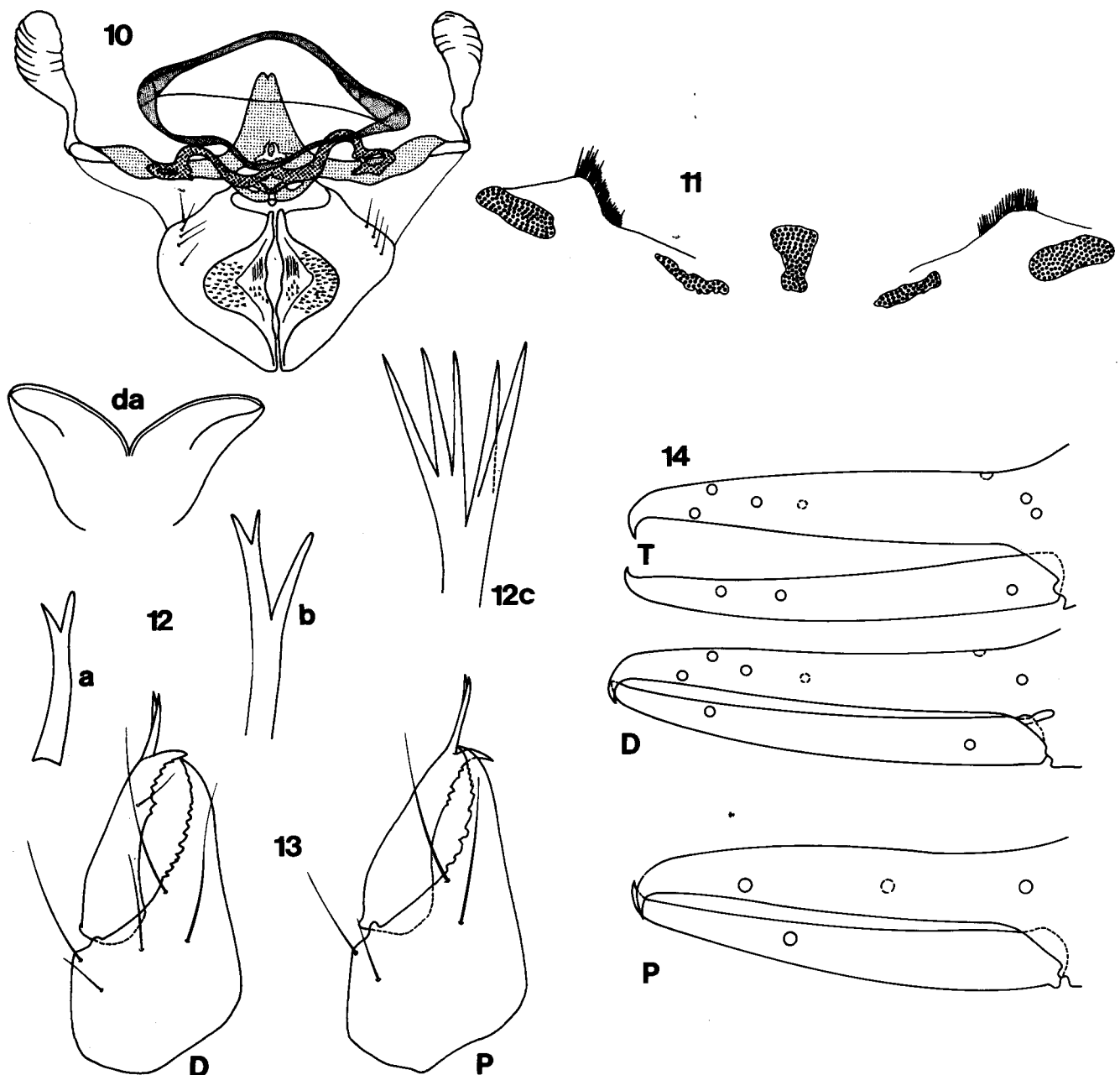
Protonymph: Carapace nearly as long as broad (0.52/0.50), epistome low triangular, 18 setae (4/4/6/4), eyes well developed; tergite I 4 setae, II-X 6, XI 4 (4 tactile setae); lobe of pedipalpal coxa: 2 setae, pedipalpal coxa: 4, coxae I-IV: 2, sternite III: 2, IV: 4, one suprastigmal seta on each side, following sternites mostly with 6 setae, XI: 2 tactile setae, on VI to VIII a pair of submarginally placed setae. Palm of chelicera with 4 setae, subterminal seta on movable finger lacking, galea long bifurcate apically (Fig. 12a), serrula externa and interna with 22 lamellae, flagellum four-bladed. Pedipalps: trochanter without tubercle, femur with two distal tubercles on inner face, 4.1 (0.53/0.13), tibia 2.5 (0.41/0.16), hand with pedicel 2.3 (0.50/0.21),

chela with pedicel 4.6 (length 1.00) times as long as broad, finger 1.1 times as long as hand with pedicel; fixed finger with 41 teeth of nearly equal length, movable finger with 6 pointed distal teeth, followed by 30 low and rounded ones. Trichobothrial pattern: Fig. 14. Leg I: basifemur 3.5 (0.28/0.08) times as long as broad and 1.4 times as long as telofemur, telofemur 2.6 (0.20/0.08), tibia 3.0 (0.21/0.07), basitarsus 2.5 (0.15/0.06), telotarsus 3.3 (0.19/0.06) times as long as broad and 1.3 times as long as basitarsus. Leg IV: femur 4.4 (0.53/0.12), tibia with three tactile setae (TS = 0.22, 0.59, 0.92), 4.7 (0.38/0.08), basitarsus with two tactile setae (TS = 0.15, 0.82), 3.0 (0.19/0.06), telotarsus with one tactile seta (TS = 0.54), 4.6 (0.29/0.06) times as long as broad and 1.5 times as long as basitarsus.

Discussion: This extraordinary new species is

characterised by its surprising sexual dimorphism unique within the family Neobisiidae. The thorn-like ventral projection on the male chelal hand might be compared with similar structures found in the gymnobisiid genera *Mirobisium* Beier and *Beierobisium* Vitali-di Castri (both from the neotropical region). In these genera this hook is situated more or less in the middle of the (ventral or dorsal) side of the hand, without evident association with the movable finger (Vitali-di Castri & di Castri, 1970), as is the case in *L. hamatus*. A comparative study of behaviour of these three taxa would be an interesting exercise in functional morphology.

The species agrees well (except for the mentioned dimorphism) with the definition of the genus *Levigatocreagris* Čurčić, 1983 which includes the



Figs. 10-14: *Levigatocreagris hamatus* n. sp. **10** Male genitalia, and dorsal apodeme (da) drawn at higher magnification; **11** Female genitalia; **12** Galea of proto- (a), deuto- (b) and tritonymph (c); **13** Chelicera of deuto- (D) and protonymph (P); **14** Trichobothrial pattern of trito- (T), deuto- (D) and protonymph (P).

species *gruberi* Ćurčić, 1983 (from Nepal; type species) and *lindbergi* (Beier, 1959) (Afghanistan). A third species might belong to this genus, namely "*Microcreagris*" *heros* Beier, 1943 from "Central Asia", known only from one female (the type specimen is untraceable in the collections of the Zoologische Staatssammlung Munich or the Naturhistorisches Museum Vienna, nor are details of the locality number 1098, Expedition Dr Zugmayer, available). Relationships between these four species are difficult to define, since only *hamatus* is sufficiently known. The type species *gruberi* is described from one male and one female, *lindbergi* is known only from tritonymphs, and *heros* only from one female. From the three already described species *hamatus* is easily distinguishable by its smaller size, the clearly distal insertion of trichobothrium *ist*, and less slender pedipalps. If *lindbergi* seems to be well characterised by its very slender pedipalps (femur 5.4 times as long as broad), *gruberi* on the other hand seems to be separated from *heros* only by slightly smaller size (length of pedipalpal femur of female 2.13 mm vs. 2.23 mm). Without additional material it is not possible at present to comment on the real status of those two species.

The postembryological development of most characters follows the general pattern known already from other Neobisiidae, but it is notable that the sternal discal setae are already recognisable in the protonymph (as is the case also in *Acanthocreagris gallica* (Beier) and *Roncocreagris cambridgei* (L. Koch)), underlining the importance of this character. The number of setae in the opercular row on the carapace and on tergite I is not modified during development, and the posterior row on the carapace may remain unchanged from protonymph to adults. The trichobothrial pattern during postembryological development does not differ from that of other studied Neobisiidae.

It is interesting to point out that all the collecting sites of *L. hamatus* are situated above 1500 m, the species is absent in the numerous samples taken at lower altitudes, and that the uplands of Doi Inthanon

and Doi Chiang Dao mountains carry faunas with many species showing clear palearctic affinities (e.g. Deharveng, 1986, for Collembola). It is evident that the new species does not belong to the lowland tropical fauna.

Acknowledgements

We thank our colleagues Dr Ivan Löbl, Dr Daniel H. Burckhardt (Museum of Geneva) and cand.phil. Peter Schwendinger (University of Innsbruck/Chiang Mai) for their efforts during the field work to collect this highly interesting pseudoscorpion material. The first author expresses his thanks to the Thai authorities, especially the National Research Council of Thailand, who enabled his field work and to Dr Louis Deharveng and Dr Alain Gouze for providing their collections. We thank Dr Egon Popp (Munich) and Dr Jürgen Gruber (Vienna) for information.

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