

On remarkable jumping spiders (Araneae: Salticidae)
from Papua New Guinea

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Abstract: Jumping spiders with a remarkable, unique carapace shape are discussed. The genera *Leptathamas* Balogh, 1980 and *Furculattus* Balogh, 1980 are redescribed and illustrated, and the unknown male of *Leptathamas paradoxus* Balogh, 1980 is described for the first time. Comparison is made to other genera with four eye rows (*Leptathamas* Balogh, 1980, *Athamas* O. P. – Cambridge, 1877 and *Bulolia* Zabka, 1996), as they may be related. *Athamas debakkeri* sp. n. is described from New Ireland. New distributional data of the taxa mentioned are presented. With 24 original drawings and 14 photos.

Key words: *Furculattus*, *Leptathamas*, *Athamas*, *Bulolia*, new species, redescription

INTRODUCTION

Péter Balogh described many new jumping spiders (Salticidae) from Papua New Guinea at the early '80s (Balogh 1979, 1980*a, b, c*, 1981*a, b*). Having been deposited in the so-called “Balogh Collection, Budapest” (Balogh 1980*a, b*), type specimens of these taxa were for a long time inaccessible to other specialists for scientific study. However, recently this material became part of the Soil Zoological Collections of the Hungarian Natural History Museum, Budapest. In preparing a catalogue of this collection, I found the types of the monotypic genera *Furculattus* Balogh, 1980 and *Leptathamas* Balogh, 1980, with some other specimens, that belong to these taxa. This included a female of *Furculattus*, which is described and figured as female of *Diolenius minotaurus* (Wanless et Lubin, 1986) and the unknown male of *Leptathamas* Balogh, 1980.

These genera are unique salticids, because their remarkable carapace features. They need to be redescribed, because the original descriptions by Balogh were based only on one sex each. *Leptathamas* seems to be a close relative of the genera *Athamas* O. P. – Cambridge, 1877 and *Bulolia* Zabka, 1996, occupying a “midway” position between them. During the study a new *Athamas* species, *A.*

debakkeri sp. n. was found from New Ireland. Possible phylogenetic relationships and other details about the poorly known genus *Leptathamas* will be discussed in detail. An exhaustive characterisation of the other genera is already present in the literature (Wanless & Lubin 1986, Jendrzejewska 1995, Zabka 1996).

MATERIALS AND METHODS

Methods used were as described by Wanless (1978). The drawings were made with camera lucida. All the measurements are given in millimetres. A Nikon CoolPix900 digital camera, attached to the stereomicroscope, was used for photographing specimens.

All specimens are deposited in the Arachnoidea Collection in the Pedozoological Collections of the Hungarian Natural History Museum, Budapest (curator Dr Sándor Mahunka), except the holotype of *Athamas debakkeri* sp. n., which is deposited in Zoological Museum and University of Copenhagen (curator Dr Nikolaj Scharff).

Abbreviations: AEW = anterior eye width; AME = anterior median eye; HNHM = Hungarian Natural History Museum, Department of Zoology, Pedozoological Collections, Arachnoidea Collection; PEW = posterior eye width; PLE = posterior lateral eye; SALT = Salticidae collection of HNHM; ZMUC = Zoological Museum and University of Copenhagen.

TAXONOMICAL SURVEY

Note: *Furculattus maxillosus*, *Leptathamas paradoxus* and *Bulolia ocellata* are the type species of the genera to which they belong. Therefore the species description also can be used for characterisation of the genera. *Furculattus* and *Leptathamas* are monotypic.

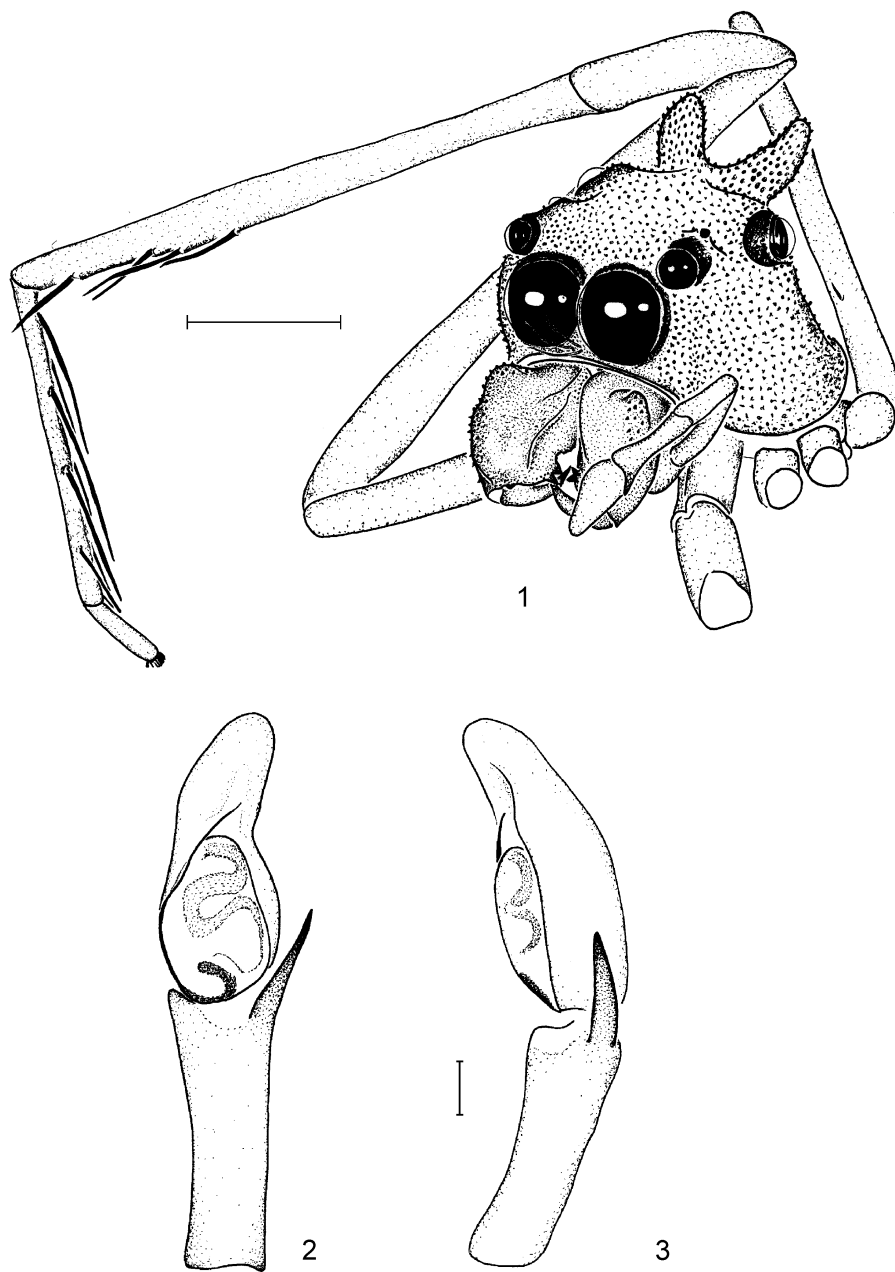
Furculattus maxillosus Balogh, 1980 (Figs 1–8)

Furculattus maxillosus Balogh, 1980: 25–27; Prószyński 1990: 116 (syn. with *D. minotaurus* Wanless et Lubin, 1986), 141.

Diolenius minotaurus Wanless et Lubin, 1986: 1211–1220.

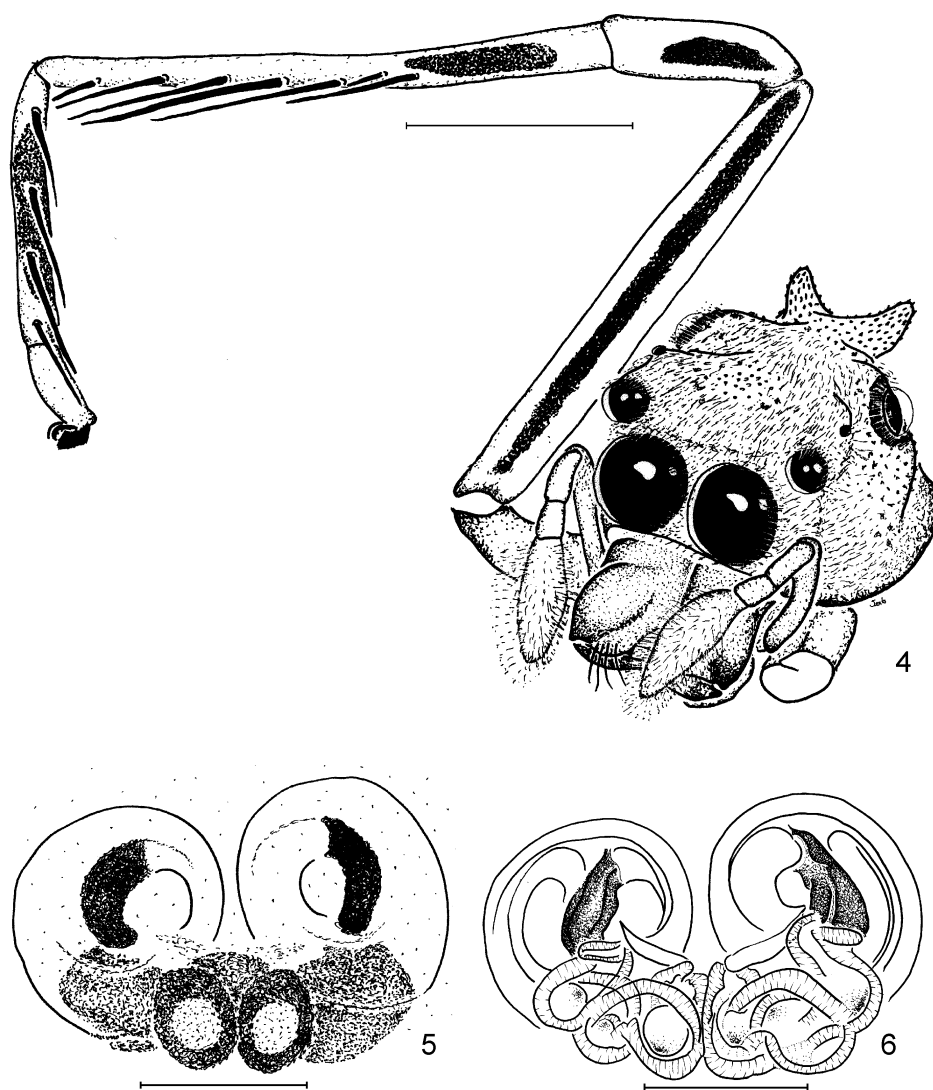
Diagnosis – Carapace with unique shape (Figs 1, 4, 7–8). Thoracic slope with 2 huge “horns”, present on both sexes. Male palp (Figs 2–3) simple, embolus thin, straight. Epigyne (Fig. 5) with a small plate, sperm ducts thick, slightly coiled. Vulva (Fig. 6) with a small accessory gland.

Description – Male holotype (Figs 1–3, 7): Specimen in poor condition, 2 legs present and abdomen missing. Carapace tegument covered with chitinized out-



Figs 1–3. Male holotype of *Furculattus maxillosus* Balogh, 1980 – 1: carapace, frontal-lateral view; 2: copulatory organ, ventral view; 3: same, lateral view. Scale 1 mm for the habitus, 0.1 mm for palps

growths (porebearing papillae – *sensu* Wanless & Lubin 1986), light brown. Thoracic slope with two horns, papillae on horns as well (Figs 1, 7). Eyes (except AME) with black surroundings covered with white hairs. Chelicerae robust, outer ridge of the basal segment with “porebearing papillae” (Fig. 1). Promargin of



Figs 4–6. *Furculattus maxillosus* Balogh, 1980, female – 4: carapace, frontal-lateral view, 5: epigyne, 6: vulva. Scale 1 mm for the habitus, 0.1 mm for epigyne and vulva

chelicerae with two teeth, retromargin with a single tooth. Gnathocoxae and sternum light brown. Legs pale yellow, almost whitish. Leg I like *Diolenius* – trochanter enormously elongated, tibia and metatarsus long, with ventral spines (Fig. 1).

Palp simple. Tibia long, with a single apophysis (Figs 7–8). Bulbus elongate, sperm duct clearly visible.

Dimensions – Holotype: Total length cannot be measured. Carapace 1.89 long, 1.5 wide at PLE, 1.24 high at PLE. AEW 1.16, PEW 1.2, eye field 1.2 long.

Female (Figs 4–6, 8): Smaller than the male. Carapace tegument with papillae, thoracic slope with two horns (Fig. 4). Whole carapace covered with fine white hairs. Black rings around eyes. Chelicerae strong, but less robust than of the male. Abdomen with whitish (cloudy) pattern, with light brown markings (Fig. 8). All legs light brown, with darker sides (Fig. 4).

Epigyne simple. Plate wider than long, sperm ducts slightly coiled (Fig. 5). Small accessory gland present (Fig. 6).

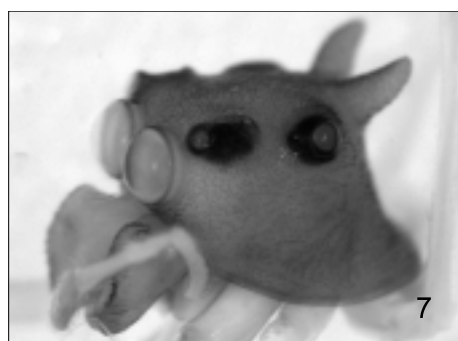
Dimensions – Total length 2.85. Carapace 1.4 long, 1.0 wide at PLE, 0.8 high at PLE. AEW 0.88, PEW 0.84, eye field 0.9 long. Abdomen 1.4 long, 0.7 wide.

Natural History/Habitat – This species lives in the canopy of rain forests (see Wanless & Lubin 1986).

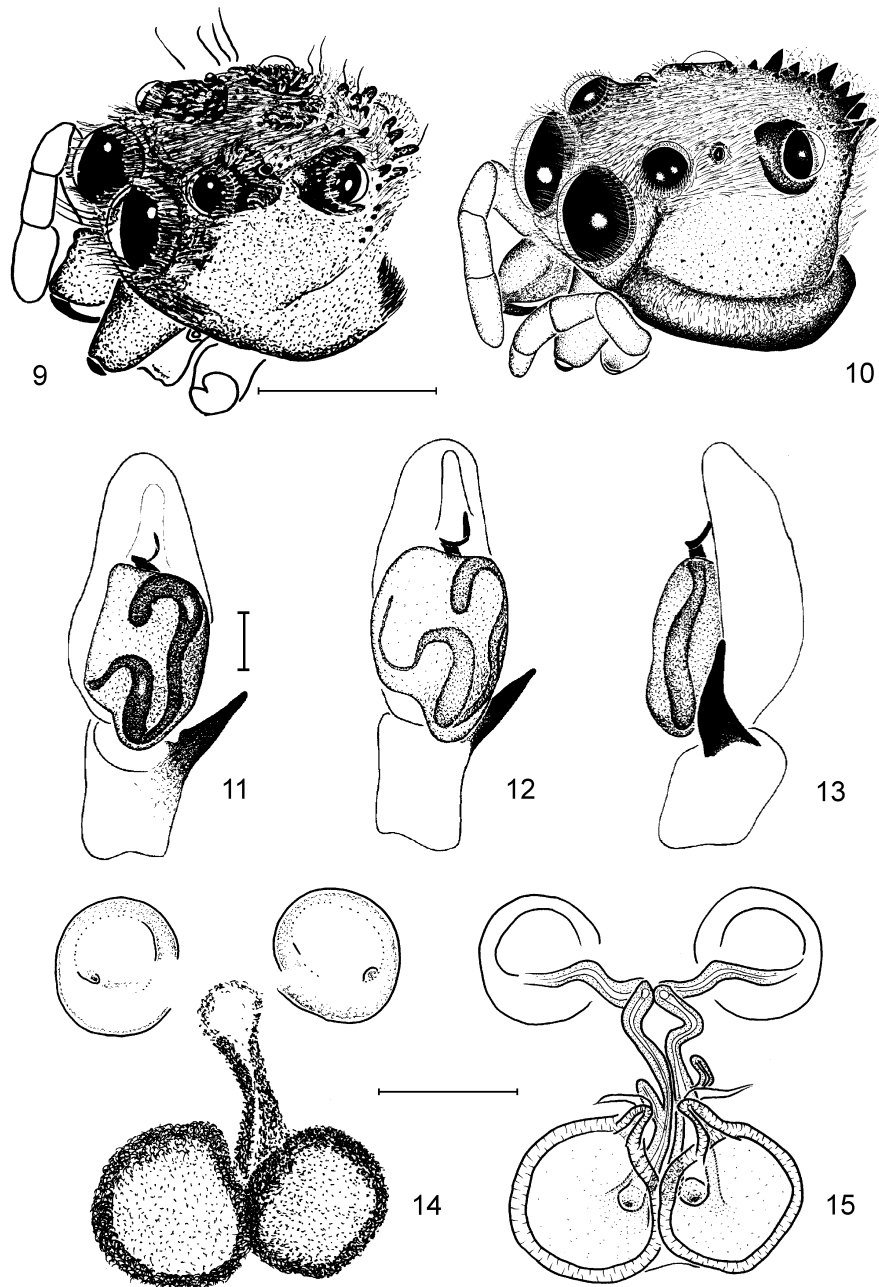
Distribution – Papua New Guinea, New Britain (Gazelle Peninsula).

Material examined – Type material: Holotype male from NEW BRITAIN, Keravat, beaten from trees and brushes, 22–25.XI.1969, leg. J. Balogh, det. P. Balogh (HNHM SALT373). Typed label in the tube: “*Furculattus maxillosus* nov. gen. nov. sp. P. Balogh holotype!”

Other material – PAPUA NEW GUINEA: 1 female from Angoram NGA-U11, (Hung. Soil Exp. 1969), beaten from trees and bushes in rain forest, leg. J. Balogh, det. P. Balogh (HNHM SALT375); 1 juvenile from Lae NGL-C16, (Hung. Soil Exp. 1968), above Bubie, beaten from bushes by a mountain stream, leg. J. Balogh, det. P. Balogh (HNHM SALT374), typed label in the tube: “nov. gen. csodálatos tor, szemek, 1.láb”.



Figs 7–8. Digital photos of *Furculattus maxillosus* Balogh, 1980 – 7: male carapace, frontal-lateral view; 8: female colour pattern, dorsal view



Figs 9–15. *Leptathamas paradoxus* Balogh, 1980 – 9: male carapace, frontal-lateral view; 10: female carapace, frontal-lateral view; 11: male copulatory organ, ventral view; 12: same, lateral-ventral view; 13: same, lateral view; 14: female epigyne, ventral view; 15: vulva, dorsal view. Scale 1 mm for the habitus, 0.1 mm for copulatory organs

Relationships – As indicated by Wanless & Lubin (1986), this species seems to be related to the *diolenid* genera, which includes: *Chalcolecta* Simon, 1884; *Diolenius* Thorell, 1870; *Lystrocteissa* Simon, 1884; *Sobasina* Simon, 1898; *Tarodes* Pocock, 1899; *Udvardya* Prószyński, 1992 and others. The elongated first trochanter (together with other characters) might be a good character to limit these genera to a natural group of jumping spiders. The genera-group comprised by *Diolenius* and related forms requires a revision, which is in progress by Joanna Gardzińska (B. Patoleta *pers. comm.*).

Leptathamas paradoxus Balogh, 1980
(Figs 9–15, 25, 28, 31, 34, 37)

Leptathamas paradoxus Balogh, 1980: 25–27.

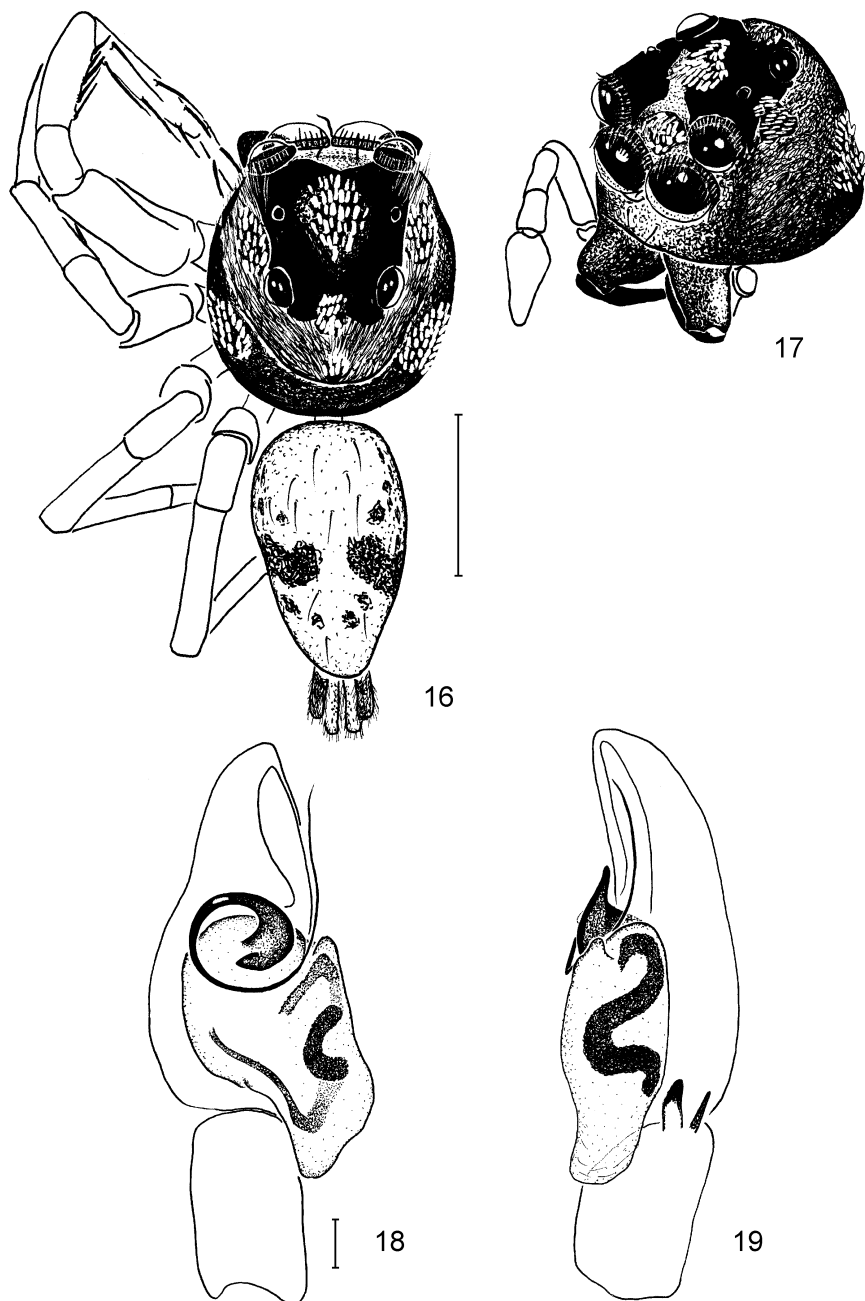
Diagnosis – Carapace with unique shape (Figs 9–10, 28, 34, 37). Posterior slope with a hump (as extension of the ocular area), bearing several (9–14) larger, spine-shaped outgrowth, present on both sexes. Male palp rather simple, embolus thin and twisted. Tibia with a large, retrolateral apophysis (Fig. 25). Epigyne poorly sclerotized (Fig. 14), sperm ducts thick, slightly coiled (Figs 11–13).

Description – Male: Thoracic slope brown and with a hump with 9–14 chitinized spine-like outgrowths. Carapace tegument with punctured reticulate microsculpture in the ocular area, covered with fine white hairs. Posterior edge of carapace with brownish hairs. Eyes (except AME) with black surroundings, which are covered with fine white hairs. Chelicerae rather strong, promargin with two teeth, retromargin with a single tooth. Gnathocoxae and sternum light brown. Abdomen with an unclear pattern. Legs yellowish, basal segments (femora, patellae, tibiae) darker, distal segments (metatarsi, tarsi) almost white. Femur, patella and tibia of leg I with thick brushes (Fig. 25).

Palp simple. Tibia with a long, single apophysis (Fig. 25). Bulbus elongate, sperm duct clearly visible, embolus tightly coiled.

Dimensions (the two known males were measured) – Total length 3.0–3.4. Carapace 1.64–1.72 long, 1.1–1.2 wide at PLE, 1.0–1.05 high at PLE. AEW 0.82, PEW 0.92, eye field 1.1 long. Abdomen 1.2–1.3 long, 0.7–0.9 wide.

Holotype (female): Carapace slope with a hump, tegument with papillae, thoracic slope with numerous spine-like outgrowths. Carapace reddish brown, covered with fine white hairs. Black rings around eyes. Chelicerae less robust than on males. Abdomen whitish, with typical “*Athamas* female-like” dotted pattern. Legs are bleached out, almost white, with no particular pattern.



Figs 16–19. *Athamas debakkeri* sp. n. – 16: male, holotype, habitus, dorsal view; 17: same, frontal-lateral view; 18: copulatory organ, ventral view; 19: same, lateral view. Scale 1 mm for the habitus, 0.1 mm for copulatory organs

Epigyne very simple, weakly sclerotized. Vulva with longer sperm ducts than those of *Athamas*.

Dimensions – (Holotype was measured) Total length 4.1. Carapace 2.45 long, 1.1 wide at PLE, 0.96 high at PLE. AEW 0.80, PEW 0.88, eye field 0.95 long. Abdomen 1.5 long, 1.05 wide.

Natural history/Habitat – The specimens were collected in primary forest.

Distribution – Papua New Guinea.

Material examined – Type material: Holotype female from PAPUA NEW GUINEA, Kiunga NGK-U3, (Hung. Soil Exp. 1969), beaten in virgin forest. 28–30.XI.1969, leg. J. Balogh, det. P. Balogh (HNHM SALT411). Typed label: “Leptathamas paradoxus nov. gen. nov. spec. P. Balogh holotype!”

Other material – PAPUA NEW GUINEA: 1 female, 1 juvenile from Lae NGL-C15, (Hung. Soil Exp. 1968), above Bubie, beaten from bushes by a mountain stream, 5.VIII.1968, leg. J. Balogh, det. P. Balogh (HNHM SALT412). Typed label: “Fissident n. gen.??”; 2 females Lae NGL-C16, (Hung. Soil Exp. 1968), above Bubie, beaten from bushes by a mountain stream, 5.VIII.1968, leg. J. Balogh, det. P. Balogh (HNHM SALT413). Typed label: “fissidentati nov. gen. Athamas-szemcsoport, hosszú szemnégyzög!”; 2 males from Angoram NGA-U11, (Hung. Soil Exp. 1968), beaten in forest near sunny paths, 13.VIII.1968, leg. J. Balogh, det. P. Balogh (HNHM SALT414).

Relationships – Judging from the eye arrangement this genus might be a close relative of *Athamas* O. P. – Cambridge, 1877 and *Bulolia* Zabka, 1996 as all have four eye rows and because of the similarities of the copulatory organs. From the Philippines, *Gambaquezonina* Barrion et Litsinger, 1995 is a monotypic genus, that seems to be very similar, judging from the drawings of the only known female (Barrion & Litsinger 1995: fig. 49).

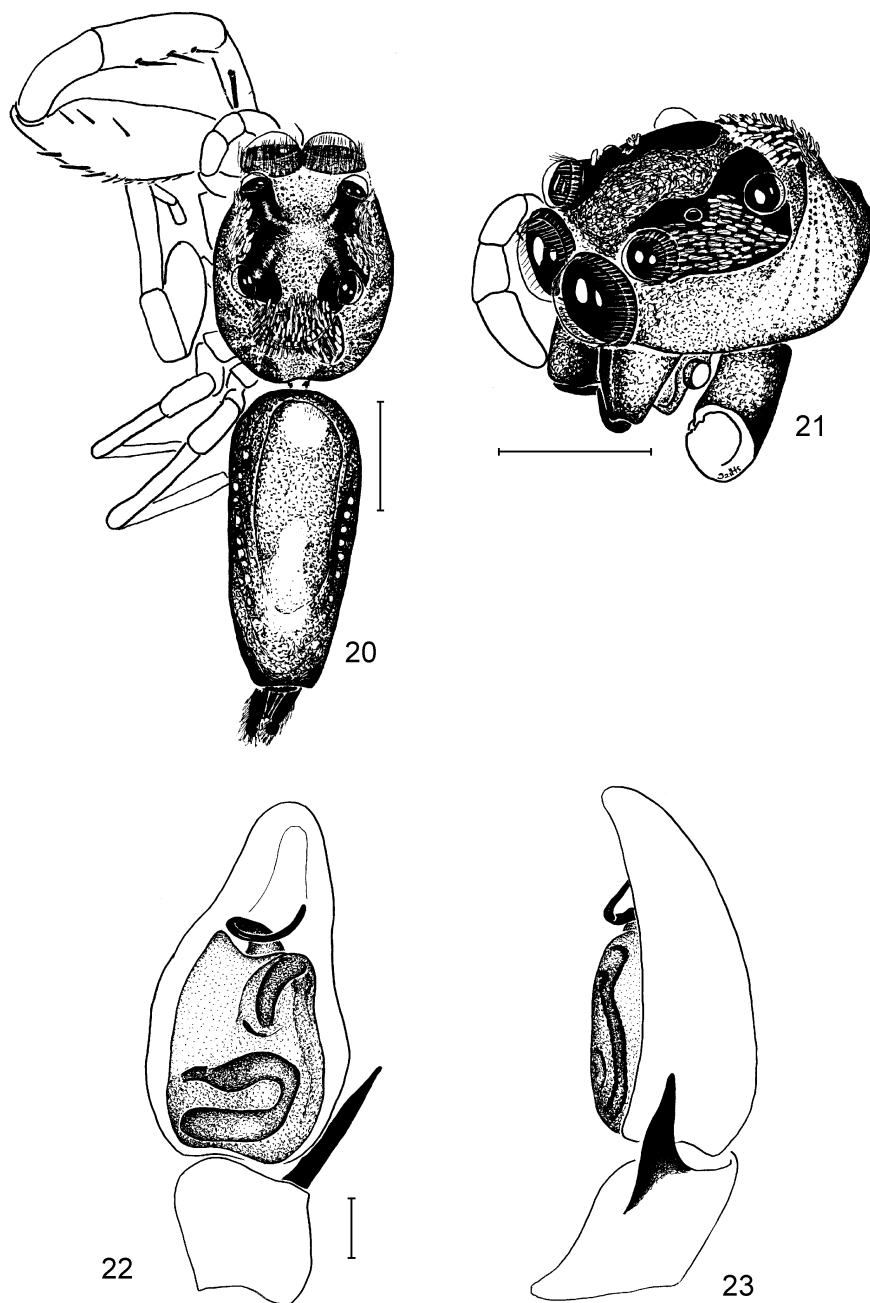
***Athamas debakkeri* sp. n.**

(Figs 16–19, 26, 27, 30, 33, 36)

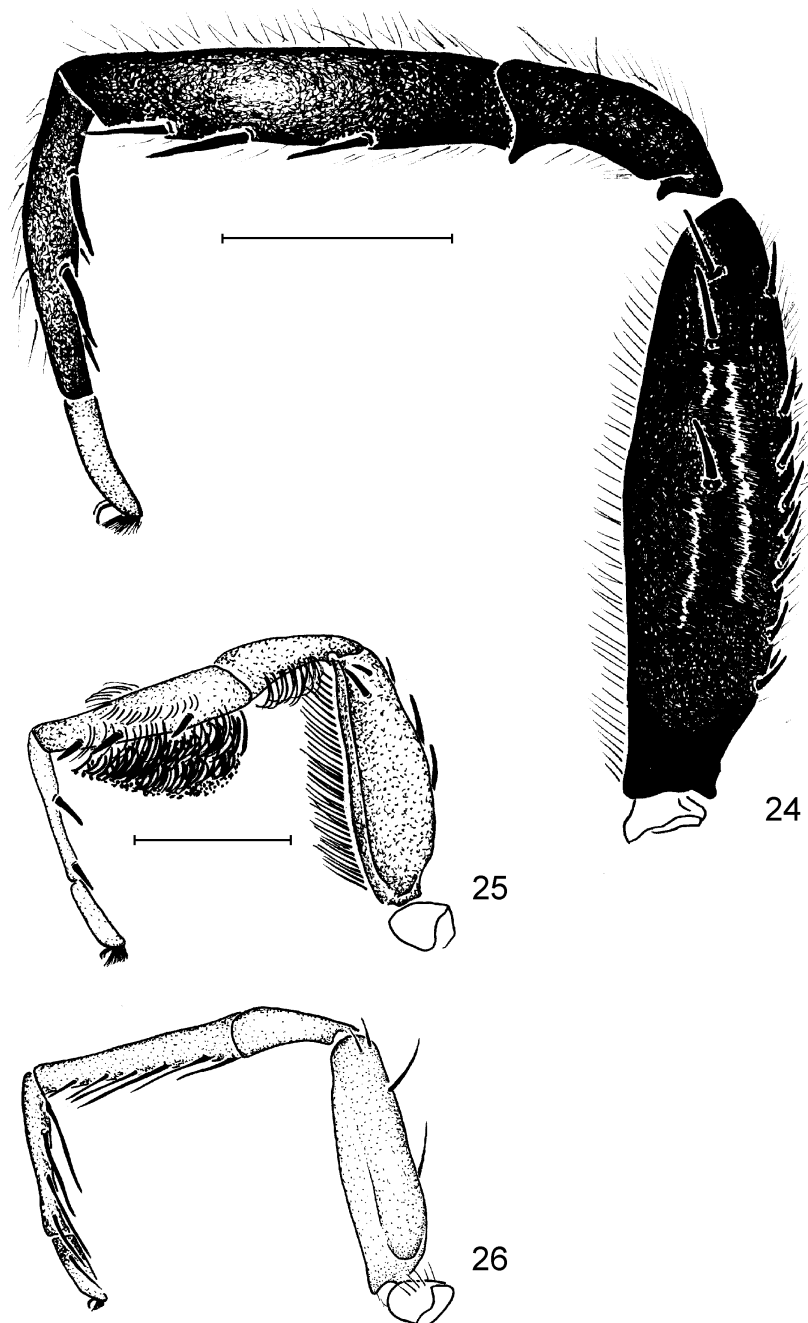
Diagnosis – Carapace typical *Athamas*-like (Figs 17, 27, 30, 33, 36): squat, very high, almost as wide as long, ocular area short. Male palps are recognisable by the long and thin embolus (longest within the genus) and by the two tibial apophyses (Figs 16, 17, 26).

Etymology – This species is dedicated to Domir DeBakker, a Belgian arachnologist and my friend.

Description – Holotype male: Carapace brown, eye field black, with white spots (comprised by white scales). Eye field with three median, thoracic region with 2–2 lateral white spots (Figs 16–17, 27, 30, 33, 36). Thoracic slope sheer.

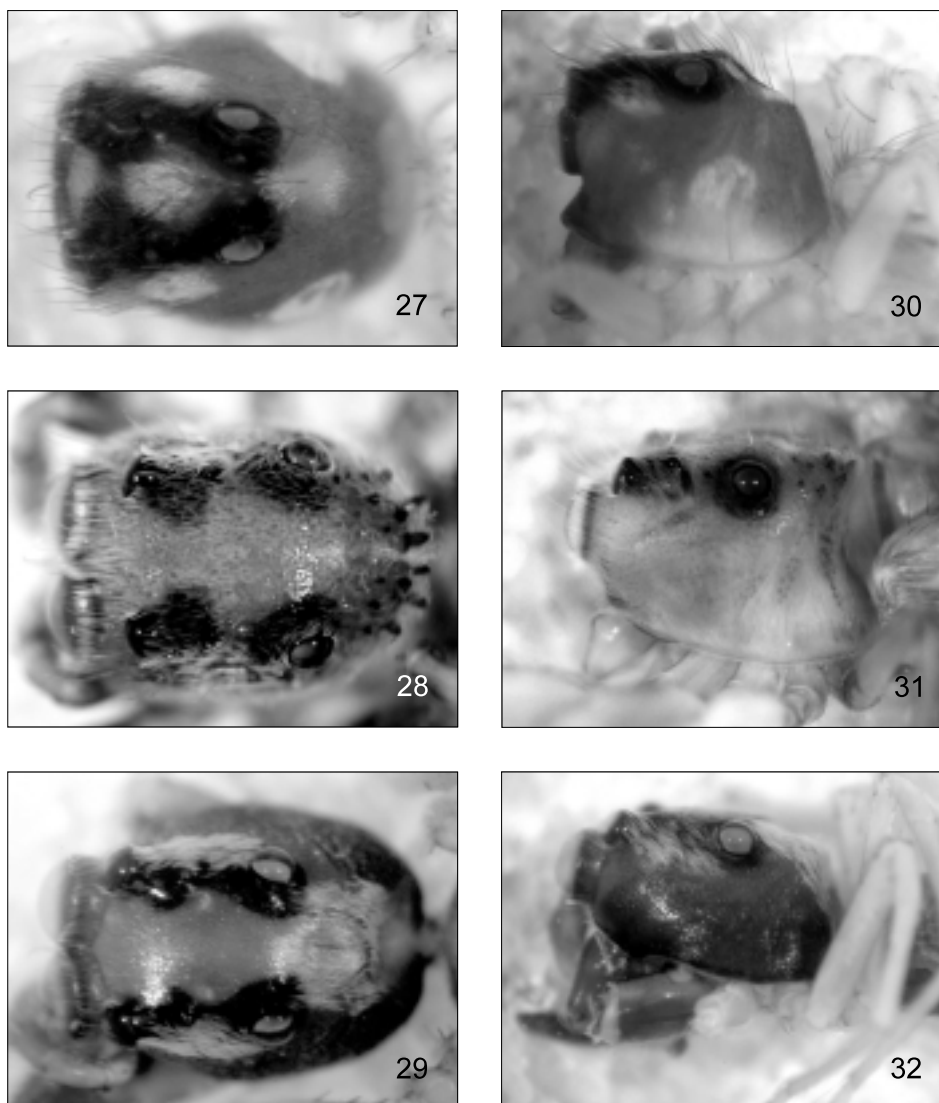


Figs 20–23. *Bulolia ocellata* Zabka, 1996 – 20: male, habitus, dorsal view; 21: same, frontal-lateral view; 22: male copulatory organ, ventral view; 23: same, lateral view. Scale 1 mm for the habitus, 0.5 mm for copulatory organs



Figs 24–26. Comparison of first legs of the males of *Athamas*, *Leptathamas* and *Bulolia*, prolateral view – 24: *Bulolia*; 25: *Leptathamas*; 26: *Athamas*. Scales 1 mm

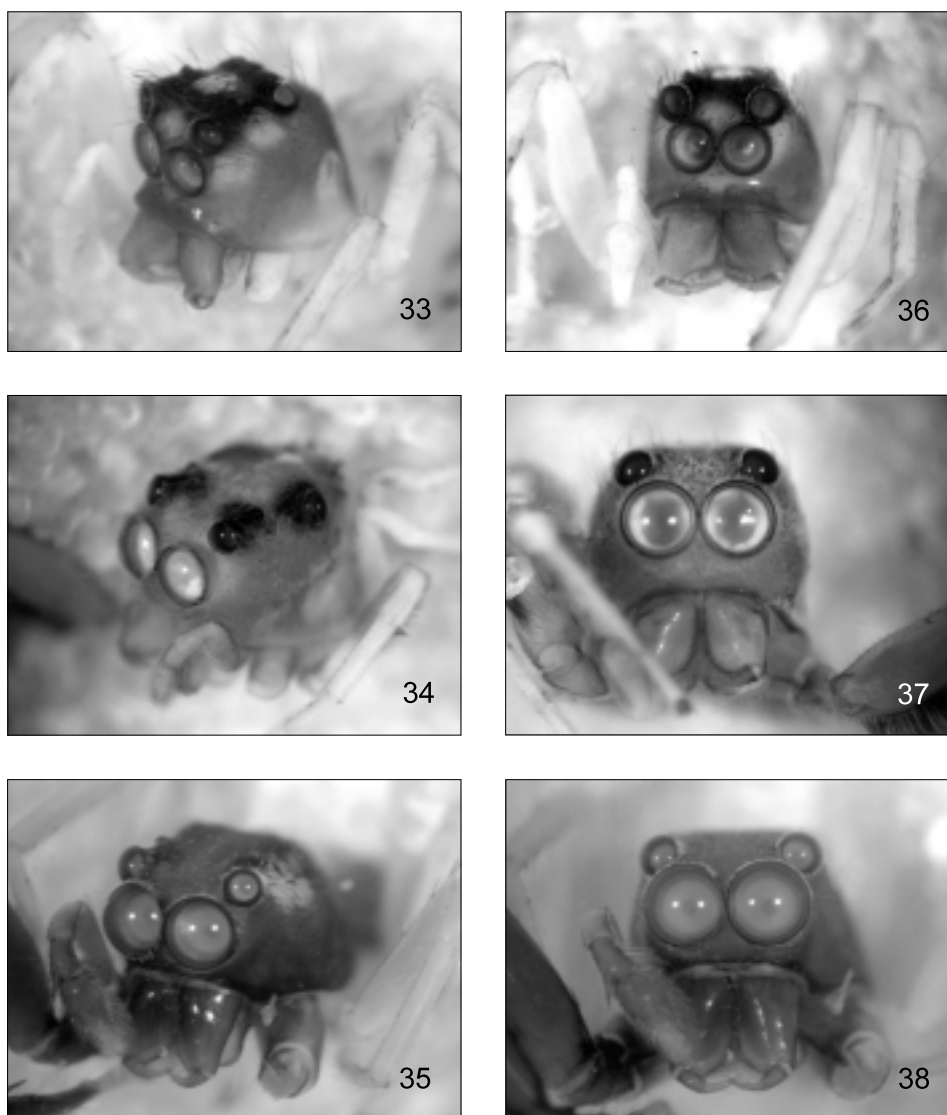
Eyes with black surroundings, covered with fine white hairs. Clypeus high. Chelicerae rather robust. Gnathocoxae and sternum light brown. Abdomen yellowish, with unclear median pattern. Legs yellow, with black markings. Leg I. with *Athamas*-like spination (Jendrzejewska 1995: fig. 4, Patoleta unpublished draw-



Figs 27–32. Comparison of the male carapaces of *Athamas*, *Leptathamas* and *Bulolia* – Dorsal views – 27: *Athamas*; 28: *Leptathamas*; 29: *Bulolia*. Lateral views – 30: *Athamas*; 31: *Leptathamas*; 32: *Bulolia*

ings): tibia, metatarsus with six and four pairs of spines, respectively. Tarsus I. also with a pair of spines, which is characteristic for the genus.

Pedipalp simple, typical for *Athamas*. Tibia with two apophyses (Figs 16–17, 26) which is characteristic for this species. Bulbus elongate, situated more lateral



Figs 33–38. Comparison of the male carapaces of *Athamas*, *Leptathamas* and *Bulolia* – Frontal-lateral views – 33: *Athamas*; 34: *Leptathamas*; 35: *Bulolia*. Frontal views – 36: *Athamas*; 38: *Leptathamas*; 38: *Bulolia*

than on the other *Athamas* species, sperm duct clearly visible. Embolus rather long. Longest known for this genus.

Dimensions – Holotype: Total length 2.65. Carapace 1.36 long, 1.2 wide at PLE, 1.0 high at PLE. AEW 0.8, PEW 0.6, eye field 0.9 long. Abdomen 1.2 long, 0.8 wide.

Female: Unknown

Natural history/Habitat – unknown.

Distribution – Only known from the type locality, New Ireland.

Material examined – Type material: Holotype male from NEW IRELAND, Lemkamin, 20.IV.1962, “Noona Dan[ish] Exp. 61–62”

Comparative material: *Athamas guineensis* Jendrzejewska, 1995 – WEST SAMOA: 1 male, 4 females PW-U.9, (Hung. Soil Exp. 1969), leg. J. Balogh. Det. T. Szűts (HNHM SALT376); AMERICAN SAMOA: 4 males PU-U.10, (Hung. Soil Exp. 1969), leg. J. Balogh. det. T. Szűts (HNHM SALT377); NEW GUINEA: 1 male, tube with handwritten label “Tamara” (HNHM SALT032); 1 male and 1 female from Aitape former Berlinhafen (HNHM SALT033); 1 male, tube with handwritten label “Y. Deslacs”, (HNHM SALT034).

Relationships – Judging from the male palp, the species seems to be a close relative of *Athamas nitidus* Jendrzejewska, 1995 and *Athamas* sp. from Pulo Anna island (Berry *et al.* 1996: fig. 14). However, it differs from those two species by having two tibial apophyses, which is a unique phenomenon within *Athamas*.

Bulolia ocellata Zabka, 1996
(Figs 20–23, 24, 29, 32, 35, 38)

Bulolia ocellata Zabka, 1996: 701–707.

Diagnosis – Males can be recognized by their long and low carapaces. The long and numerous femoral spines of leg I and palp are also characteristic (Zabka 1996: 14). Palpal segments have unique shape (Zabka 1996: figs 3, 8), tibia with one apophysis, embolus twisted. Females unknown.

Description – Male: Carapace low, tegument with granulate microsculpture, dark brown, eye field lighter, with iridescent green shine. Eye field with two lateral, thoracic region with one median white spot comprised by fine white hairs (Figs 20, 21, 29, 32, 35, 38). Thoracic slope with hump, covered with white hairs (Fig. 21). Eyes with black shiny surroundings, covered with fine white hairs. Chelicerae dark brown. Gnathocoxae and sternum brown. Abdomen dark, with an abdominal scutum. Two median (aproximal and distal) light spots present on dor-

sum. Legs dark yellow, without black markings. Leg I dark brown, femur with many dorsal spines.

Pedipalp simple, more similar to *Leptathamas* than to *Athamas*. Tibia with a single apophysis (Fig. 24). Bulbus elongate, sperm duct clearly visible, embolus twisted.

Dimensions – Male: Total length 4.7. Carapace 1.7 long, 1.28 wide at PLE, 0.9 high at PLE. AEW 0.84, PEW 0.88, eye field 1.1 long. Abdomen 2.2 long, 0.8 wide.

Female – Unknown.

Natural history/Habitat – unknown.

Distribution – Papua New Guinea, Wau Island.

Material examined – NEW GUINEA: *Bulolia ocellata* Zabka, 1996, 1 male from Wau Island (Hung. Soil Exp. 1965), McArthur Park, 18–21.IV.1965, leg. J. Balogh & J. Szent-Ivány, det. T. Szűts; 1 male from Wau Island, NG-WU33, (Hung. Soil Exp. 1969), beaten from trees, leg. J. Balogh, det. T. Szűts; *Bulolia excentrica* Zabka, 1996, 2 males from Lae, NG-LC16, (Hung. Soil Exp. 1965), beaten from bushes, leg. J. Balogh & J. Szent-Ivány, det. T. Szűts.

Relationships – Judging from the male palp, the species seems to be a relative of *Leptathamas paradoxus* Balogh, 1980.

DISCUSSION

A unique feature of all these genera is that they have four eye rows. This is not common within the family Salticidae. However, it is known for various unrelated taxa (e.g. Lyssomaninae, *Viciria* Thorell, 1877, etc.) and does not seem to be a character that is sufficient for delimiting a natural group. The genus *Furculattus* appears to be related to other genera with long trochanter. Therefore despite having four eye rows, it is unlikely to be close to the other three genera.

Simon's group Athameae was comprised by only one genus *Athamas*. *Athamas* together with the genera *Bulolia* and *Leptathamas*, might be closer to each other than previously appreciated, as all have a remarkable hump on the thoracic slope of carapace (the genus *Gambaquezonina* Barrion et Litsinger, 1995, which is known by a single female, seems to have also a similar hump, but I have not been able to study any specimens of the genus). As females are unknown from *Bulolia*, I had focused only on males.

I compared both somatic- and copulatory characters, to illustrate the differences among taxa. For comparison of the genera, the characters used are listed in Table 1.

Table 1. Comparison of *Athamas*, *Leptathamas*, *Bulolia*. Carapace length (CL) and diameter of AME were used by relative somatic dimensions

	<i>Athamas</i>	<i>Leptathamas</i>	<i>Bulolia</i>
Carapace relative height	75% of CL	61% of CL	52% of CL
Carapace relative width	88% of CL	71 % of CL	73% of CL
Eye field relative length	54% of CL	69% of CL	61% of CL
Clypeal height	46% of AME	45% AME	16% of AME
Relative size of ALE	69 % of AME	45 % AME	41% of CL
Spines of first tibia	6 pairs	3 pairs	3 pairs
Spines of first femur	Three dorsal	Three dorsal	Numerous dorsal
Spines of first tarsus	Present	Missing	Missing
Embolus	Twisted/coiled	Twisted	Twisted

With these metric data I only tried to circumscribe the obvious differences (see Figs 27–38). This was all that was justified by the limited material I had. Type species were used to characterise the genera, except *Athamas*. All the specimens of *Athamas* deposited in the HNHM belong to *Athamas guineensis*. The rationale for using *Athamas guineensis*, instead of the type species, *Athamas whitmeei*, for characterising somatically the genus was that there are only minor interspecific differences in the genus *Athamas* (Berry *et al.* 1996)

There is an evident gradient from *Athamas* (high and wide carapace, short eye field, high clypeus, many tibial-, but few femoral spines) to *Bulolia* (low and narrow carapace, long eye field, low clypeus, 3 pairs of tibial-, many femoral spines) or *vice versa* (Table 1), *Leptathamas* occupies an intermediate position. However, the male copulatory organ of *Leptathamas* shows more affinities with that of *Bulolia* than that of *Athamas*. Since there are no females known from *Bulolia*, grouping together the three genera merits further study, but the shape of the carapace suggests a significant degree of relationship of these.

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Acknowledgements – I would like to thank to Drs Sándor Mahunka, Nikolaj Scharff, Wanda Wesolowska and Csaba Csuzdi for their valuable comments and helpful advice concerning taxonomy. Barbara Patoleta gave access to her high quality unpublished drawings of all known *Athamas* species, which I highly appreciate. I am indebted to Nikolaj Scharff for loaning material from the Zoological Museum, Copenhagen and Dr Péter Balogh for additional information about the localities of the specimens of *Leptathamas* and *Furculattus*. This study was supported also by a grant from the European Commission's programme "Transnational Access to Major Research Infrastructures" to COBICE (Copenhagen Biosystematics Center). I am grateful to Robert R. Jackson and Domir Debakker for their comments on the manuscript.

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(Received: 28th June, 2003)

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