

**Two new cavernicolous chthoniids from Australia, with notes on the generic placement of the south-western Pacific species attributed to the genera *Paraliochthonius* Beier and *Morikawia* Chamberlin (Pseudoscorpionida: Chthoniidae)**

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**Summary**

The new species *Lagynochthonius mordor* and *Tyrannochthonius rex* are described from material collected in northern Queensland caves, and the following species are transferred from the genera *Paraliochthonius* Beier or *Morikawia* Chamberlin or returned to the genus *Tyrannochthonius* Chamberlin: *P. caecatus* Beier, *P. cavernicola* Beier, *M. cavicola* Beier, *M. densedentatus* Beier, *T. grimmeti* Chamberlin, *P. horridus* Beier, new status, *P. kermadecensis* Beier, *M. luxtoni* Beier, *M. nana* Beier, *P. norfolkensis* Beier, *M. philippina* Beier, *M. queenslandica* Beier, *M. semihorrida* Beier, *M. trogliphila* Beier, *Chthonius wlassicsi* Daday and *M. zonatus* Beier. The subgenus *Paraliochthonius* (*Pholeochthonius*) Beier is synonymised with *Tyrannochthonius*.

**Introduction**

The chthoniid fauna of Australasia and the south-western Pacific region is dominated by two different elements. The first is a group of unrelated genera with Gondwanan affinities that in Australasia generally occur in southern Australia or New Zealand: *Pseudotyrannochthonius* Beier, *Austrochthonius* Chamberlin, *Maorichthonius* Chamberlin, *Sathrochthonius* Chamberlin and *Sathrochthoniella* Beier. The second is the *Tyrannochthoniini*, a widespread group that is composed of five genera: *Tyrannochthonius* Chamberlin, *Lagynochthonius* Beier, *Paraliochthonius* Beier, *Tyrannochthoniella* Beier and *Troglochthonius* Beier. All except the last have been reported from the region under consideration; *Troglochthonius* occurs in caves in southern Europe. Most Australasian and Pacific tyrannochthoniines have in the past been attributed to either *Paraliochthonius* or its junior synonym *Morikawia* Chamberlin. Recent investigations into the fauna of some caves in northern Queensland, Australia, by Dr F. G. Howarth and his associates from the Bishop Museum, Honolulu, have uncovered a moderately diverse pseudoscorpion community, including two undescribed chthoniids belonging to the genera *Lagynochthonius* and *Tyrannochthonius*. The purposes of this paper are to describe these two species, and to re-examine the generic position of all of the south-western Pacific species attributed to *Paraliochthonius* or *Morikawia*. This review has been prompted by the work of Muchmore (1984) who outlined definite criteria by which the much confused genera *Tyrannochthonius* and *Paraliochthonius* could be distinguished.

**Materials and methods**

Specimens are lodged in the following institutions: Australian Museum, Sydney (AM), Australian National Insect Collection, Canberra (ANIC), British Museum (Natural History) (BMNH), Bernice P. Bishop Museum, Honolulu (BPBM), National Museum of New Zealand, Wellington (NMNZ), Department of Scientific Research, Auckland (DSIR), J. C. Chamberlin collection, Portland University, Oregon (JCC), Naturhistorisches Museum, Wien (NHMW), Queensland Museum, Brisbane (QM), and South Australian Museum, Adelaide (SAM).

Unless otherwise stated, types of each of the species treated here have been examined. Those specimens mounted on slides have been mounted in Euparal.

**Genus *Lagynochthonius* Beier**

*Tyrannochthonius* (*Lagynochthonius*) Beier, 1951: 61. Type species *Chthonius johni* Redikorzev, 1922, by original designation.

**Remarks**

This genus is very similar to *Tyrannochthonius*, but can be easily distinguished by the distally constricted chelal hand and the enlarged basal apodeme of the movable chelal finger. Males of *Lagynochthonius* spp. also possess a distal sensorium near *ds* of the fixed chelal finger (Chamberlin, 1962; Harvey, 1988) that is lacking in males of *Tyrannochthonius*.

***Lagynochthonius mordor*, new species (Figs. 1-9)**

**Types**

Holotype ♂, Tier Cave, North Mordor Tower, Mt Mulgrave Station, Cape York, Queensland, Australia, 9 June 1986, F. G. Howarth and S. Robson (QM, S6094). Paratype: 1 ♀, same data (QM, S6095).

**Etymology**

The specific epithet is a noun in apposition taken from the type locality, North Mordor Tower.

**Diagnosis**

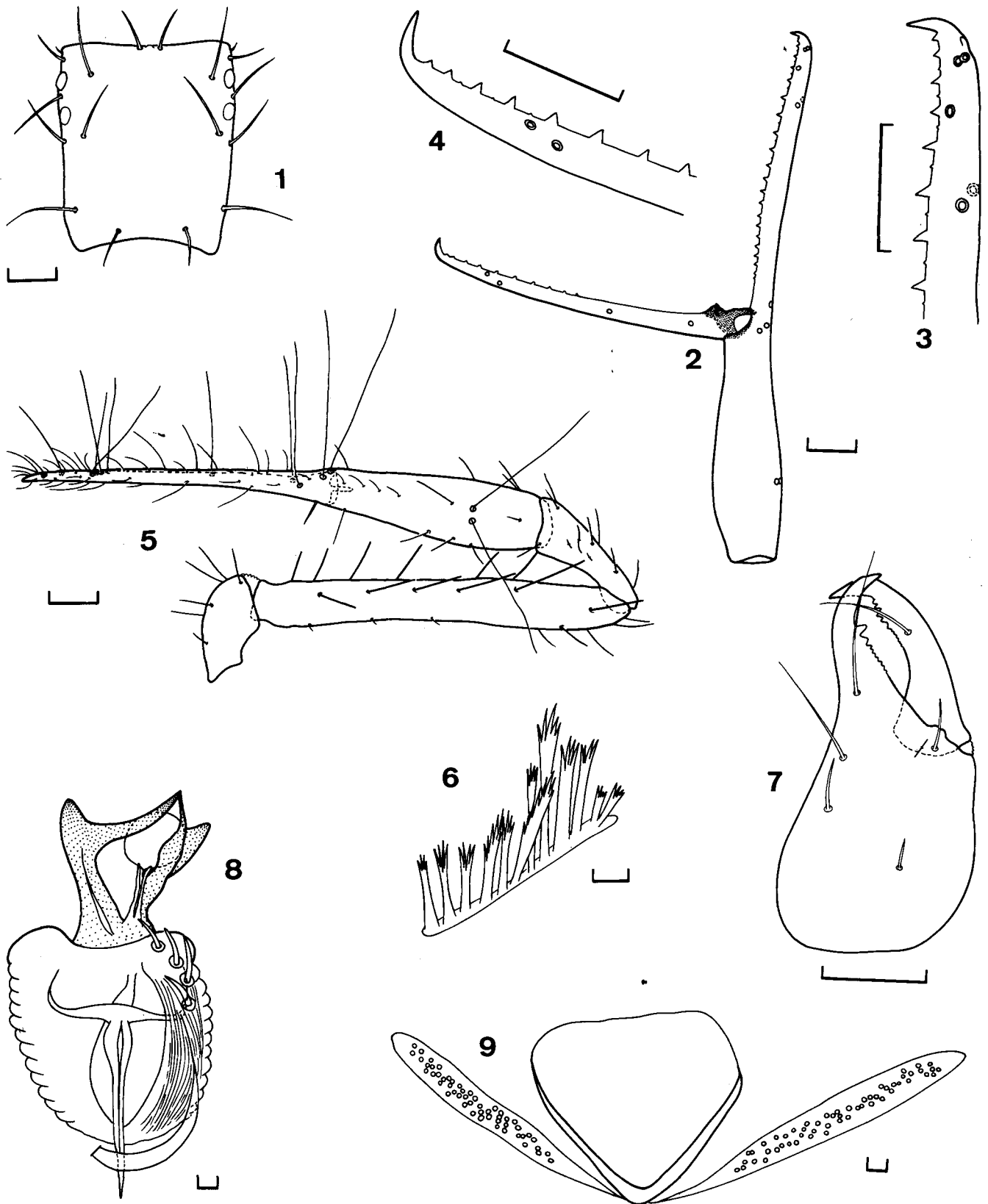
*Lagynochthonius mordor* is the only member of the genus with the following combination of characters: large, slender appendages, and 4 setae on tergites I and II.

**Description**

**Adults:** Colour pale yellow-brown, pedipalps and chelicerae slightly darker. Setae acuminate. Pleural membrane papillostriate. Pedipalp (Fig. 5): trochanter 1.83 (♂), 1.85 (♀), femur 7.70 (♂), 6.75 (♀), tibia 2.64 (♂), 2.38 (♀), chela 7.71 (♂), 6.94 (♀), hand 3.21 (♂), 3.00 (♀) times longer than broad. Fixed chelal finger and hand with 8 trichobothria, movable chelal finger with 4 trichobothria (Fig. 2): *ib* and *isb* on dorsum of hand, *st* close to *t*, *sb* closer to *b* than to *st*. Hand with 1 small, medial acuminate spine-like seta at level of *esb*. Venom apparatus absent. Chelal teeth (Figs. 2-4): fixed finger with 22 (♂), 21 (♀) large, well-spaced, slightly retrorse teeth, plus 12 (♂), 9 (♀) very

small intercalary teeth between anterior teeth; movable finger with 11 ( $\sigma$ ), 12 ( $\phi$ ) well-spaced teeth in anterior half, plus 3 ( $\sigma$ ), 4 ( $\phi$ ) very small intercalary teeth between anterior teeth. Fixed finger of male with distal sensorium near *ds* (Fig. 3). Movable finger longer than

hand; hand constricted distally (Fig. 2); movable chelal finger with large basal apodeme (Fig. 2). Chelicera (Fig. 7) with 5 setae on hand, all acuminate; flagellum composed of 8 bipinnate blades; movable finger with 1 seta; galeal region a very low elevation; fixed finger



Figs. 1-9: *Lagynochthonius mordor*, new species, male holotype unless otherwise stated. 1 Carapace; 2 Left chela, lateral; 3 Detail of distal portion of fixed chelal finger; 4 Detail of distal portion of movable chelal finger; 5 Right pedipalp; 6 Coxal spines of left coxa II, female paratype; 7 Right chelicera; 8 Male genitalia, ventral (slightly distorted); 9 Female genitalia, ventral, female paratype. Scale lines = 0.1 mm (Figs. 1-5, 7), 0.01 mm (Figs. 6, 8-9).

with 8 (♂), 6 (♀) teeth, distal tooth largest, decreasing in size proximally; movable finger with 8 (♂), 7 (♀) equal-sized teeth. Carapace (Fig. 1) 1.15 (♂), 0.80 (♀) times longer than broad; 4 eyes, anterior eyes corneate, posterior eyes represented by eye spots; epistome very low, with 2 closely appressed setae; carapaceal chaetotaxy: m4m: 4: 4: 2: 2. Tergites and sternites undivided. Tergal chaetotaxy: ♂, 4: 4: 4: 4: 4: 5: 6: 5: 4: ? : 0; ♀, 4: 4: 4: 4: 4: 5: 4: 6: 6: 4: 4: 0. Sternal chaetotaxy: ♂, 9: (? )35[8](?) : (? )6(?) : 7: 7: 8: 8: 8: 8: ? : 2; ♀, 9: (3)10(3): (3)7(3): 9: 9: 9: 9: 8: 8: ? : 2. Coxal chaetotaxy: ♂, 3: 5cs: 5: 5; ♀, 3: 4cs: 5: 5; coxae II with 11-12 terminally incised spines set in oblique row (Fig. 6); intercoxal tubercle absent. Genital opercula not unusual. Male genitalia (Fig. 8): ejaculatory atrium small, lateral apodeme meeting in mid-line; lateral margin of thickened roof of median diverticulum crenulate. Female genitalia (Fig. 9): with complete lateral apodeme frame, although anterior margin very faint; lateral diverticulum sparsely covered with cribriform plates. Spiracles with stigmatic helix. Legs: femur IV 2.87 (♂), 2.83 (♀) times longer than broad; heterotarsate; arolium slightly shorter than claws; claws simple.

Dimensions (mm), ♂ (♀): Body length 1.35 (1.53). Pedipalps: trochanter 0.22/0.12 (0.24/0.13), femur 0.77/0.10 (0.81/0.12), tibia 0.29/0.11 (0.31/0.13), chela 1.08/0.14 (1.11/0.16), hand length 0.45 (0.48), movable finger length 0.62 (0.65). Chelicera 0.38/0.18 (0.41/0.20), movable finger length 0.20 (0.22). Carapace 0.39/0.34 (0.40/0.50), diameter of eyes, anterior 0.04 (0.04), posterior 0.04 (0.04). Leg I: basifemur 0.41/0.06 (0.43/0.07), telofemur 0.23/0.06 (0.23/0.06), tibia 0.22/0.04 (0.22/0.04), tarsus 0.44/0.04 (0.45/0.04). Leg IV: entire femur 0.66/0.23 (0.68/0.24), tibia 0.44/0.07 (0.47/0.08), basitarsus 0.21/0.06 (0.21/0.06), telotarsus 0.50/0.03 (0.51/0.04).

#### Remarks

*Lagynochthonius mordor* is only the second cavernicolous species of the genus to be reported; the first was *L. guasirih* (Mahnert) from Sarawak (Mahnert, 1988).

#### Genus *Tyrannochthonius* Chamberlin

*Tyrannochthonius* Chamberlin, 1929: 74. Type species *Chthonius terribilis* With, 1906 by original designation.

*Parachthonius* Caporiacco, 1949: 317. Type species *Parachthonius meneghettii* Caporiacco, 1949 by monotypy. Synonymised by Mahnert, 1985a: 838.

*Paraliochthonius* (*Pholeochthonius*) Beier, 1976: 209. Type species *Paraliochthonius* (*Pholeochthonius*) *cavernicola* Beier, 1976 by original designation. NEW SYNONYMY.

#### Remarks

The genus *Tyrannochthonius* is one of the largest chthoniid genera, and is particularly prominent in tropical and subtropical forest litter and soil. Although the new species described below is only the fifth to be recorded from Australia (with two further species from Lord Howe Island and Norfolk Island), many undescribed species are represented in museum collections. Most of these species are tropical or subtropical, but

several temperate species have been collected, including one from Tasmania (Harvey, unpublished data).

Muchmore (1984) provided diagnostic characters by which this genus could be separated from *Paraliochthonius*. *Pholeochthonius* was erected as a subgenus of *Paraliochthonius* by Beier (1976) for the cavernicolous species *Pa. (Ph.) cavernicola* Beier from Lord Howe Island. As discussed below, this species belongs in the genus *Tyrannochthonius*, and *Paraliochthonius* (*Pholeochthonius*) is thus synonymised with *Tyrannochthonius*.

#### *Tyrannochthonius rex*, new species (Figs. 10-19)

##### Types

Holotype ♂, Royal Arch Cave, Chillagoe, Queensland, Australia, 6 June 1985, F. D. Stone (QM, S6096). Paratypes: 2♀, same data (QM, S6097); 1♀, same data (BPBM).

##### Etymology

The specific epithet refers to the type locality, Royal Arch Cave (*rex*, Latin, king).

##### Diagnosis

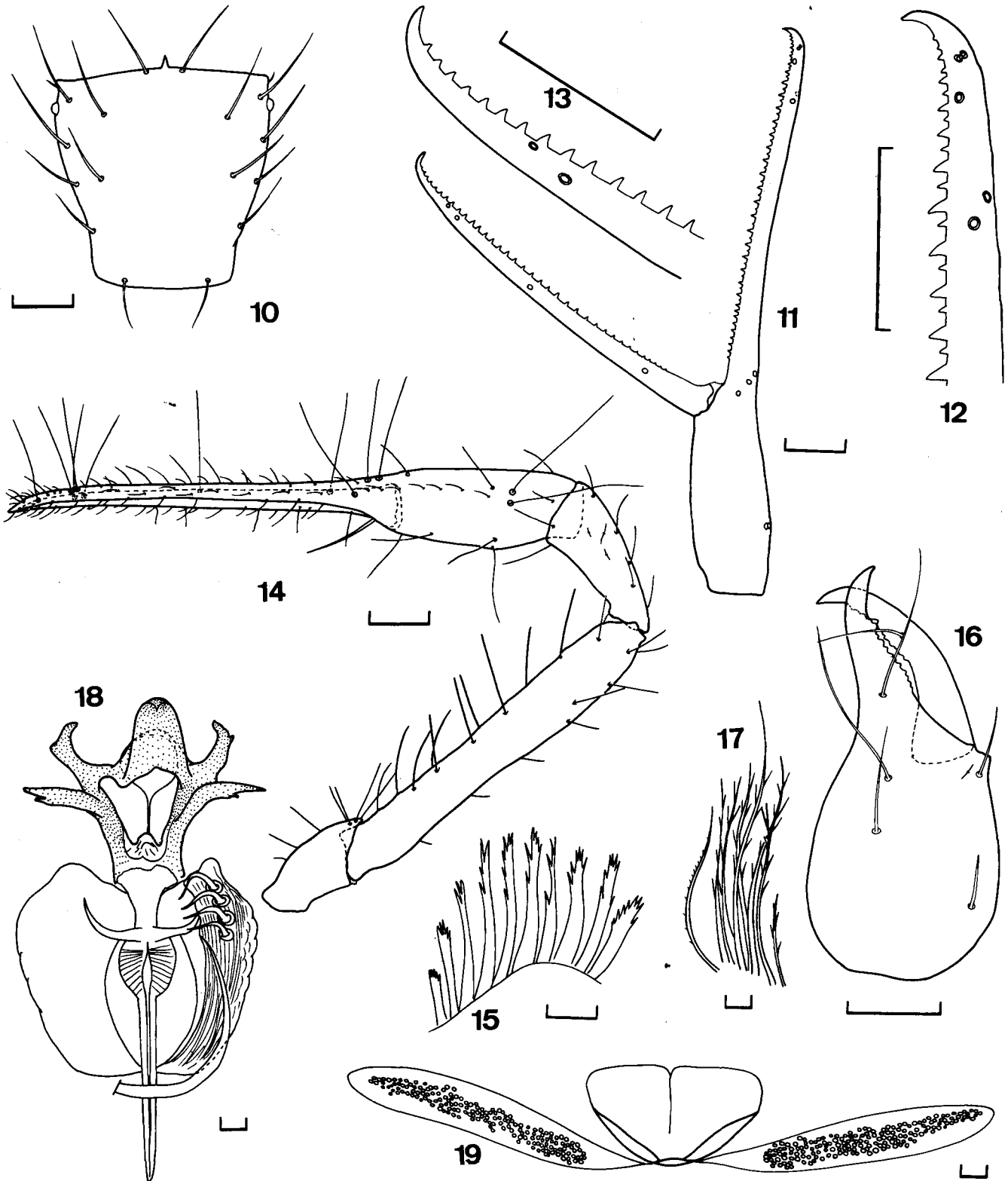
Only four other species of the genus possess a pedipalpal femur of over 1 mm in length, all of which are cavernicolous forms: *T. cavernicola* (Beier), *T. superstes* Mahnert, *T. riberai* Mahnert and *T. troglobius* Muchmore. *Tyrannochthonius rex* differs from *T. riberai* and *T. troglobius* by its homodentate movable chelal finger (heterodentate in *riberai* and *troglobius*), from *T. cavernicola* by its heterodentate fixed chelal finger (homodentate in *cavernicola*), and from *T. superstes* by its smaller size (chela length of *superstes* 2.07-2.31 (♂), 2.32-2.62 mm (♀)).

##### Description

*Adults*: Colour yellow-brown, pedipalps and chelicerae slightly darker. Setae acuminate. Pleural membrane papillostriae. Pedipalp (Fig. 14): trochanter 2.15 (♂), 1.87-2.05 (♀), femur 6.20 (♂), 6.14-6.38 (♀), tibia 2.30 (♂), 2.24-2.29 (♀), chela 7.60 (♂), 7.19-7.37 (♀), hand 2.36 (♂), 2.40-2.41 (♀) times longer than broad. Fixed chelal finger and hand with 8 trichobothria, movable chelal finger with 4 trichobothria (Fig. 11): *ib* and *isb* on dorsum of hand, *st* close to *t*, *sb* closer to *st* than to *b*. Hand with 1 large, medial acuminate spine-like seta at level of *esb*. Venom apparatus absent. Chelal teeth (Figs. 11-13): fixed finger with 32 (♂), 29 (♀) large, well-spaced, slightly retrorse teeth, plus 23 (♂), 18-21 (♀) intercalary teeth; movable finger with 37 (♂), 31-33 (♀) well-spaced teeth extending for almost entire length of finger; intercalary teeth absent. Fixed finger without distal sensorium near *ds* (Fig. 12). Movable chelal finger longer than hand, without large basal apodeme. Chelicera (Fig. 16) with 5 setae on hand, all acuminate; flagellum (Fig. 17) composed of 8 blades, all except anterior blade bipinnate, anterior blade finely denticulate; movable finger with 1 seta; galeal region a

very low elevation; fixed finger with 12 ( $\sigma^7$ ), 11 ( $\text{♀}$ ) teeth, distal tooth largest, others subequal in size; movable finger with 10 ( $\sigma^7$ ), 13 ( $\text{♀}$ ) equal-sized teeth. Carapace (Fig. 10) 1.04 ( $\sigma^7$ ), 0.99-1.00 ( $\text{♀}$ ) times longer than broad; 2 small, corneate eyes; epistome

large, triangular, with 2 closely appressed setae; carapaceal chaetotaxy: m4m: 4: 4: 2: 2. Tergites and sternites undivided. Tergal chaetotaxy:  $\sigma^7$ , 4: 4: 4: 3: 4: 6: 6: 6: 6: 4: ? : 0;  $\text{♀}$ , 4: 4: 4: 4: 4-5: 6: 6: 6: 7: 4: 4: 0. Sternal chaetotaxy:  $\sigma^7$ , 13: (3)54[8](3): (4)6(4): 8: 7: 7:



Figs. 10-19: *Tyrannochthonius rex*, new species, male holotype unless otherwise stated. **10** Carapace; **11** Left chela, lateral; **12** Detail of distal portion of fixed chelal finger; **13** Detail of distal portion of movable chelal finger; **14** Right pedipalp; **15** Coxal spines of left coxa II; **16** Right chelicera, female paratype; **17** Flagellum; **18** Male genitalia, ventral; **19** Female genitalia, ventral, female paratype. Scale lines = 0.2 mm (Figs. 10-14, 16), 0.02 mm (Figs. 15, 17-19).

7: 7: 7: ? : 2; ♀, 10-12: (4)7-8(4): (4)6-8(4): 6-8: 6-7: 6-8: 7: 8: 8-9: ? : 2. Coxal chaetotaxy: ♂, 4: 3cs: 5: 5; ♀, 4: 3cs: 5: 5; coxae II with 9-11 terminally incised spines set in oblique row (Fig. 15); intercoxal tubercle absent. Genital opercula not unusual. Male genitalia (Fig. 18): ejaculatory atrium small, lateral apodeme meeting in mid-line; lateral margin of thickened roof of median diverticulum slightly crenulate. Female genitalia (Fig. 19): with complete lateral apodeme frame, although anterior margin very faint; lateral diverticulum sparsely covered with cribriform plates. Spiracles with stigmatic helix. Legs: femur IV 3.19 (♂), 3.33-3.41 (♀) times longer than broad; heterotarsate; arolium slightly shorter than claws; claws simple.

Dimensions (mm), ♂ (♀): Body length 2.09 (2.23-2.54). Pedipalps: trochanter 0.43/0.20 (0.43/0.21-0.23), femur 1.24/0.20 (1.29-1.34/0.21), tibia 0.53/0.23 (0.55-0.56/0.24-0.25), chela 1.90/0.25 (1.94-1.99/0.27), hand length 0.59 (0.65), movable finger length 1.30 (1.27-1.28). Chelicera 0.83/0.35 (0.86-0.89/0.41), movable finger length 0.44 (0.45-0.46). Carapace 0.73/0.70 (0.77-0.79/0.77-0.80), diameter of anterior eye 0.05 (0.04). Leg I: basifemur 0.73/0.11 (0.73-0.75/0.11), telofemur 0.41/0.09 (0.40-0.42/0.10), tibia 0.38/0.07 (0.36/0.07), tarsus 0.75/0.06 (0.76-0.78/0.06-0.07). Leg IV: entire femur 1.15/0.36 (1.16-1.20/0.34-0.36), tibia 0.81/0.13 (0.81-0.84/0.13), basitarsus 0.34/0.11 (0.35/0.11), telotarsus 0.87/0.07 (0.85-0.86/0.07).

#### Remarks

Cavernicolous members of the genus *Tyrannochthonius* have been recorded several times in the literature from such disparate areas as Mexico and U.S.A. (Chamberlin & Malcolm, 1960; Muchmore, 1969, 1973, 1986), Hawaii (Muchmore, 1979, 1983), Peru (Mahnert, 1985b) and the Canary Islands (Mahnert, 1986). The cavernicolous species described here, along with the three cave-dwelling species transferred to the genus below (from New Caledonia, Lord Howe Island and New South Wales, Australia), indicate that a diverse cavernicolous *Tyrannochthonius* fauna exists in Australasia, and further species will no doubt be found as other cave systems are explored.

Muchmore (1984) noted that trichobothrium *sb* was situated midway between *b* and *st* in most species of *Tyrannochthonius*, in contrast to species of *Paraliochthonius* where *sb* is closer to *st*. While this is true of the smaller, usually epigeal, species of *Tyrannochthonius*, within the larger, cavernicolous species *sb* is situated closer to *st* (e.g. Fig. 11). Perhaps during the evolution of elongate appendages within a species, there is differential growth along the length of the chela, such that the area between *b* and *sb* extends further than that between *sb* and *st*. Gabbutt (1969, 1972) has shown that there are growing and non-growing regions of the chelal fingers during the post-embryonic development of several species of Neobisiidae and Chernetidae. Study of the nymphal stages of cavernicolous species of *Tyrannochthonius* in relation to their epigeal relatives could yield very interesting results.

#### *Tyrannochthonius caecatus* (Beier), new combination

*Paraliochthonius caecatus* Beier, 1976: 208, fig. 9.

#### Types

Holotype ♀, Bridgewater, South Island, New Zealand, pumped from 4 m depth in Livingston's well during drought, 21 February 1973, G. Kuschel (DSIR). Paratypes: 1♀ (torso only), same data, not examined; 1♀, Wairaki Stream, Lynfield, Auckland, North Island, New Zealand, in 60 cm deep pitfall trap in a gully of native bush, 25 May 1975, G. Kuschel (DSIR), not examined.

#### Remarks

Although the anterior carapaceal setae are slightly removed from the epistome, and the coxal spines are deeply incised for nearly their entire length, this species is considered to belong to the genus *Tyrannochthonius* as it possesses only a single medial spine-like seta on the chela, and *sb* is situated midway between *b* and *st* (Beier, 1976: fig. 9). The vial containing the holotype also contained a tritonymph that was apparently overlooked by Beier (1976). This specimen is not considered to hold type status.

#### *Tyrannochthonius cavernicola* (Beier), new combination

*Paraliochthonius* (*Pholeochthonius*) *cavernicola* Beier, 1976: 209, fig. 10; Harvey, 1985: 138.

#### Type

Holotype ♂, station 3 (North Bay), Lord Howe Island, Australia, in cave in total dark zone, 23 August 1972, L. S. Hall and G. A. Holloway (AM, KS21).

#### Remarks

The holotype possesses a single medial, chelal spine-like seta, coxal spines that are mostly terminally incised, even though the incisions extend to the base on the more lateral spines, and a pair of carapaceal setae closely appressed to the epistome, and *T. cavernicola* is thus considered a member of the genus *Tyrannochthonius*. It differs from many other species of the genus in the position of *sb* which is closer to *st* than to *b* (see Remarks under *T. rex*), and in the homodentate chelal fingers (Beier, 1976: fig. 10). In this last respect it is similar to the type species of *Tyrannochthonius*, *T. terribilis*, which possesses homodentate chelae (With, 1906). *Paraliochthonius cavernicola* is the type species of the subgenus *Pholeochthonius* which is here synonymised with *Tyrannochthonius*.

#### *Tyrannochthonius cavicola* (Beier), new combination

*Morikawia cavicola* Beier, 1967a: 199, fig. 1.

*Paraliochthonius cavicola* (Beier): Harvey, 1981: 240; Harvey, 1985: 138.

#### Types

Holotype ♂, allotype ♀, The Grill Cave, Bungonia, New South Wales, Australia, in guano, 6 February 1965, B. Dew (SAM, N1966165-1966166). Paratype: 1♂, same data (NHMW).

**Remarks**

Specimens of this species possess a pair of carapaceal setae that are closely appressed to the epistome, terminally incised coxal spines, a single medial, chelal spine-like seta, and *sb* that is midway between *b* and *st* (Beier, 1967a: fig. 1), and it is therefore transferred to the genus *Tyrannochthonius*.

***Tyrannochthonius densedentatus* (Beier), new combination**

*Morikawia densedentata* Beier, 1967b: 287, fig. 7.

*Paraliochthonius densedentatus* (Beier): Beier, 1976: 205, fig. 5.

**Type**

Holotype ♂, Omahuta Forest, North Auckland, North Island, New Zealand, ex Kauri (*Agathis australis*) litter, 30 June 1965, M. Luxton (NMNZ).

**Remarks**

The holotype of this species possesses a single medial, chelal spine-like seta, anterior carapaceal setae that are closely appressed to the epistome, and *sb* that is midway between *b* and *st* (Beier, 1967b: fig. 7). Although the coxal spines are incised for nearly their entire length on one side of each spine, the species is here transferred to the genus *Tyrannochthonius*.

***Tyrannochthonius grimmeti* Chamberlin**

*Tyrannochthonius grimmeti* Chamberlin, 1929: 76; Beier, 1932: 64.

*Morikawia grimmeti* (Chamberlin): Beier, 1966b: 365, fig. 3; Beier, 1967b: 288.

*Paraliochthonius grimmeti* (Chamberlin): Beier, 1976: 206.

**Type**

Holotype ♂, Day's Bay, Wellington Harbour, North Island, New Zealand, under log in beech forest, 20 November 1920, R. E. R. Grimmet (JCC, JC-04.01001), not examined.

**Remarks**

Although the holotype has not been available for study, the descriptions by Chamberlin (1929) and Beier (1966b) indicate that it belongs to the genus *Tyrannochthonius*.

***Tyrannochthonius horridus* (Beier), new status, new combination**

*Paraliochthonius luxtoni horridus* Beier, 1976: 207, fig. 7.

**Types**

Holotype ♂, allotype ♀, Waipoua State Forest, North Island, New Zealand, litter, 20 October 1967, J. C. Watt (DSIR).

**Remarks**

Originally described as a subspecies of *Morikawia luxtoni*, *T. horridus* is here raised to full specific status on the basis of the differing number of teeth on the movable finger (compare Beier, 1967b: fig. 8 with Beier, 1976: fig. 7). The types of this species possess a

single medial, chelal spine-like seta, a pair of anterior carapaceal setae that are closely appressed to the epistome, terminally incised coxal spines, and *sb* midway between *b* and *st* (Beier, 1976: fig. 7). It is therefore transferred to the genus *Tyrannochthonius*.

***Tyrannochthonius kermadecensis* (Beier), new combination**

*Paraliochthonius kermadecensis* Beier, 1976: 205, fig. 6.

*Paraliochthonius* (*Paraliochthonius*) *kermadecensis* Beier: Harvey, 1985: 138.

**Types**

Holotype ♀, Meyers Island, Kermadec Islands, New Zealand, from deserted nest of *Turdus merula*, 25 January 1967, D. V. Merton (DSIR). Paratype: 1 ♀, station 20 (King Point), Lord Howe Island, Australia, on foliage, M. R. Gray (AM, KS12743).

**Remarks**

The holotype of this species possesses a single medial, chelal spine-like seta, a pair of anterior carapaceal setae that are closely appressed to the epistome, terminally incised coxal spines, and *sb* midway between *b* and *st* (Beier, 1976: fig. 6). Therefore, *P. kermadecensis* is transferred to the genus *Tyrannochthonius*. The paratype from Lord Howe Island differs slightly from the holotype in certain respects and may represent a distinct species. Further material (in better condition) is needed before a firm decision can be made.

***Tyrannochthonius luxtoni* (Beier), new combination**

*Morikawia luxtoni* Beier, 1967b: 289, fig. 8.

*Paraliochthonius luxtoni luxtoni* (Beier): Beier, 1976: 206.

**Types**

Holotype ♂, Whakatane, North Island, New Zealand, ex Rewarewa (*Knightia excelsa*) litter, 10 October 1965, M. Luxton (NMNZ). Paratype: 1 ♀, same data (NHMW).

**Remarks**

This species possesses a single large, medial chelal spine-like seta, anterior carapaceal setae that are closely appressed to the epistome, terminally incised coxal spines, and *sb* that is midway between *b* and *st* (Beier, 1967b: fig. 8), and is thus transferred to the genus *Tyrannochthonius*.

***Tyrannochthonius nanus* (Beier), new combination**

*Morikawia nana* Beier, 1966c: 135, fig. 2.

**Types**

Holotype ♀, Dala, Malaita Island, Solomon Islands, litter, 16 February 1965, P. Greenslade (BMNH, 1978.1.17.35). Paratypes: 3 ♂, 3 ♀, 1 adult (anterior portion only), Vella Lerella, New Georgia Island, Solomon Islands, 17 June 1965, P. Greenslade (BMNH, 1978.1.17.36-7).

**Remarks**

Members of this species possess a single medial, chelal spine-like seta (Beier, 1966c: fig. 2), anterior carapaceal setae that are closely appressed to the epistome, terminally incised coxal spines, and *sb* slightly closer to *b* than to *st*. It is therefore transferred to the genus *Tyrannochthonius*. Beier (1966c) listed further paratypes that I have not examined.

***Tyrannochthonius norfolkensis* (Beier), new combination**

*Paraliochthonius norfolkensis* Beier, 1976: 207, fig. 8.

*Paraliochthonius (Paraliochthonius) norfolkensis* Beier: Harvey, 1985: 138.

**Types**

Holotype ♂, Mt Pitt, 275 m, Norfolk Island, Australia, from litter, 30 October 1967, G. Kuschel (ANIC, Type no. 9998). Allotype ♀, same data (ANIC). Paratypes: many specimens from Norfolk Island and New Zealand.

**Remarks**

Apart from the primary types, I have also examined many specimens of this species collected from Norfolk Island lodged in ANIC. It possesses the characters of the genus *Tyrannochthonius*, including a single spine-like seta on the chelal hand, a pair of carapaceal setae closely appressed to the epistome and terminally incised coxal spines.

***Tyrannochthonius philippinus* (Beier), new combination**

*Morikawia philippina* Beier, 1966a: 340, fig. 1.

**Type**

Holotype ♀, Mt Katanglad, 1480 m, Bukidnon, Mindanao, Philippines, 27-31 October 1959, L. Quate and C. Yoshimoto (BPBM, 6728).

**Remarks**

The holotype of this species possesses a single medial, chelal spine-like seta, anterior carapaceal setae that are closely appressed to the epistome, terminally incised coxal spines, and *sb* midway between *b* and *st* (Beier, 1966a: fig. 1); it is thus transferred to the genus *Tyrannochthonius*.

***Tyrannochthonius queenslandicus* (Beier), new combination**

*Morikawia queenslandica* Beier, 1969: 174, fig. 3.

*Paraliochthonius queenslandicus* (Beier): Beier, 1976: 206; Harvey, 1981: 240.

*Paraliochthonius (Paraliochthonius) queenslandicus* (Beier): Harvey, 1985: 138.

**Types**

Holotype ♂, allotype ♀, Mt Tamborine, Joalah National Park, Queensland, Australia, litter, 16 August 1966, B. Cantrell (lost). Paratypes: 4♂, 2♀, same data (lost); 4♂, 2♀ (NHMW).

**Remarks**

The paratypes of this species possess a single medial, chelal, spine-like seta, anterior carapaceal setae that are closely appressed to the epistome, terminally incised coxal spines, and *sb* midway between *b* and *st* (Beier, 1969: fig. 3). This species is thus transferred to the genus *Tyrannochthonius*. The bulk of the type specimens of this species, including the holotype, were apparently dispatched by M. Beier to Monash University, the institution from where the specimens were originally sent to Beier. Unfortunately these specimens (along with the holotype of *M. semihorridus*) could not be located in this institution and are presumed to be lost.

***Tyrannochthonius semihorridus* (Beier), new combination**

*Morikawia semihorrida* Beier, 1969: 176, fig. 4.

*Paraliochthonius semihorridus* (Beier): Harvey, 1981: 240.

*Paraliochthonius (Paraliochthonius) semihorridus* (Beier): Harvey, 1985: 138.

**Type**

Holotype ♀, Mt Nebo, Queensland, Australia, litter, 28 March 1967, J. B. Williams (lost).

**Remarks**

Even though the holotype is lost (see 'Remarks' under *T. queenslandicus*), I have examined many specimens of this species (lodged in ANIC) and they conform to the current diagnosis of *Tyrannochthonius*.

***Tyrannochthonius troglophilus* (Beier), new combination**

*Morikawia troglophila* Beier, 1968: 758, fig. 2.

**Type**

Holotype ♀, Grotte de Ninrin-Reu, near Poya, New Caledonia, 26 December 1965, E. Hamilton-Smith (SAM, N196829).

**Remarks**

The holotype of this species possesses a single medial, chelal, spine-like seta, anterior carapaceal setae that are closely appressed to the epistome, distally incised coxal spines, and *sb* midway between *b* and *st* (Beier, 1968: fig. 2), and it is therefore transferred to the genus *Tyrannochthonius*.

***Tyrannochthonius wlassicsi* (Daday)**

*Chthonius wlassicsi* Daday, 1897: 479, figs. 1-4, 8, 9; With, 1906: 73.

*Tyrannochthonius wlassicsi* (Daday): Beier, 1932: 66.

*Morikawia wlassicsi* (Daday): Beier, 1965: 760, fig. 4.

*Paraliochthonius wlassicsi* (Daday): Beier, 1982: 43.

**Types**

Syntypes: 4 specimens from near Friedrich-Wilhelmshafen (now Madang), Papua New Guinea, not examined; 8 specimens from near Lemien, Berlinhafen, Papua New Guinea, not examined.

### Remarks

Even though the type specimens have not been available to me, Daday's diagram of two coxal spines (Daday, 1897; fig. 9) clearly indicates that they are terminally incised, and Beier's figure of the chela (Beier, 1965; fig. 4) indicates that a single medial, chelal spine-like seta is present, and that *sb* is slightly closer to *b* than to *st*. Therefore, the species is returned to the genus *Tyrannochthonius*.

### *Tyrannochthonius zonatus* (Beier), new combination

*Morikawia zonata* Beier, 1964: 403, fig. 1.

Genus? *zonatus* Beier: Tenorio & Muchmore, 1982: 382.

### Types

Holotype ♂, Mt Koghi, New Caledonia, berlese funnel collection, 26-30 January 1963, N. L. H. Krauss and C. M. Yoshimoto (BPBM, 3645). Paratype: 1♂, same data (NHMW).

### Remarks

Both of the types of *Morikawia zonata* possess a single medial, chelal spine-like seta (Beier (1964) figured two such setae, but the most proximal is simply a large seta), anterior carapaceal setae closely appressed to the epistome, terminally incised coxal spines, and *sb* midway between *b* and *st* (Beier, 1964: fig. 1). The species is thus transferred to the genus *Tyrannochthonius*. The paratype was labelled as a male by Beier, but incorrectly referred to as a female by Beier (1964).

### Genus *Paraliochthonius* Beier

With the removal of all of the south-western Pacific species previously attributed to either *Paraliochthonius* or *Morikawia*, the genus *Paraliochthonius* is left with only 10 species, all of which are found on the foreshore or in areas such as caves connected to the sea. This habitat is not exploited by any other members of the Tyrannochthoniini, with the sole exception of *Lagynochthonius thorntoni* Harvey which has been collected from under the bark of a log situated on the seashore in south-western Java (Harvey, 1988). Other species attributed to the genera *Paraliochthonius* or *Morikawia* have been treated by Mahnert (1979, 1985a) and Muchmore (1984). Those species belonging to *Paraliochthonius* are listed here:

- P. azanius* Mahnert, 1985a (Kenya)
- P. canariensis* Vachon, 1961 (Canary Islands)
- P. carpenteri* Muchmore, 1984 (Bahamas)
- P. hoestlandi* Vachon, 1960 (Madeira)
- P. hoestlandi giustii* Lazzeroni, 1970 (Italy)
- P. insulae* Hoff, 1963 (Jamaica)
- P. johnstoni* (Chamberlin, 1923) (Mexico)
- P. mexicanus* Muchmore, 1972 (Mexico)
- P. puertoricensis* Muchmore, 1967 (Puerto Rico)
- P. singularis* (Menozi, 1924) (Italy)
- P. takashimai* (Morikawa, 1958) (Japan)
- P. weygoldti* Muchmore, 1967 (Florida, U.S.A.)

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