

PSEUDOSCORPIONS FROM FLORIDA AND THE
CARIBBEAN AREA. 13. NEW SPECIES OF
TYRANNOCHTHONIUS AND *PARALIOCHTHONIUS*
FROM THE BAHAMAS, WITH DISCUSSION OF THE
GENERA (CHTHONIIDAE)

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ABSTRACT

Tyrannochthonius bahamensis and *Paraliochthonius carpenteri* are described, from South Bimini and San Salvador islands, respectively. Diagnostic characters of the genera *Tyrannochthonius* and *Paraliochthonius* are compared.

RESUMEN

Se describen *Tyrannochthonius bahamensis* y *Paraliochthonius carpenteri*, nuevas especies, de las islas South Bimini y San Salvador, respectivamente. Se comparan caracteres diagnósticos de los géneros *Tyrannochthonius* y *Paraliochthonius*.

Though it was reported some time ago that pseudoscorpions occur in the Bahamas (Vaurie 1952), none from that area has been identified until very recently (Muchmore 1984).

Here are reported 2 new species of the family Chthoniidae from the islands of South Bimini and San Salvador.

Genus *Tyrannochthonius* Chamberlin, 1929

TYPE SPECIES: *Chthonius terribilis* With, 1906: 69; from Island of Koh Chang and Lam Ngob, Siam (Chamberlin 1929: 74).

Representatives of *Tyrannochthonius* are apparently found around the world in tropical and subtropical areas. In the Caribbean region 8 species of the genus have been identified: *insulae* Hoff (1946) from Trinidad, *curazavius* Hummelinck (1948) from Curaçao, and *innoxius*, *callidus*, *proximus*, *imitatus*, *fastuosus*, and *lautus*, all described from Jamaica by Hoff (1959). Beier (1976a) reported *proximus* and *imitatus* from the Dominican Republic, and at the same time placed *fastuosus* and *lautus* in the synonymy of *imitatus*. Other as yet undescribed forms are present in the West Indies and in Florida (personal observation). A review of *Tyrannochthonius* is currently being prepared by D. R. Malcolm.

Tyrannochthonius bahamensis Muchmore, NEW SPECIES

MATERIAL: Holotype ♂ (WM 5373.01004) and 10 paratypes (6 ♂, 4 ♀)

from South Bimini Island, BAHAMAS, V-VII-1951, M. A. Cazier and C. and P. Vaurie. Types are in the American Museum of Natural History.

DIAGNOSIS: Much like *T. insulae* Hoff from Trinidad but with 6 setae, rather than 4, on tergites 4-10. In the key to Jamaican species of *Tyrannochthonius* (Hoff 1959: 38), *bahamensis* will key out to couplet 3; but it differs from both *callidus* and *innoxius* in having the movable chelal finger much longer (1.75-1.95) than the hand.

DESCRIPTION: ♂ and ♀ very similar though ♀ usually a little larger. Carapace about as wide as long; epistome small, triangular, closely flanked by 2 setae which are very close to the edge of the carapace (Fig. 1); chaetotaxy d4d-4-4-2-2, the dwarf setae (d) lying anterior and ventral to the eyes; 4 corneate eyes, posterior ones less well developed than anterior. Coxa I medially with a prominent apical projection; coxal chaetotaxy 2-2-1:3-0:2-1-CS:2-3:2-2; each coxa II with a slightly oblique transverse row of 5-6 incised spines (CS) (Fig. 2).

Abdomen typical. Tergal chaetotaxy usually 4:4:4:6:6:6:6:6:6:4:T2T:0, but occasionally only 5 setae on tergite 4; sternal chaetotaxy of ♂ about 9: [4-4]:(3)10-10/8(3):(4)4(4):9:9:8:8:7:6:0:2, that of ♀ similar but posterior operculum with a row of 5-6 setae.

Chelicera about 7/8 as long as carapace; hand with 5 setae; flagellum of 7-8 irregularly pinnate setae; fixed finger with 8-10 teeth graded from large to tiny toward base; movable finger with about 12 small, subequal teeth; galea a low elevation in ♀, barely discernible in ♂.

Palp as shown in Fig. 3; femur 3.55-3.8, tibia 1.6-1.8, and chela 4.25-

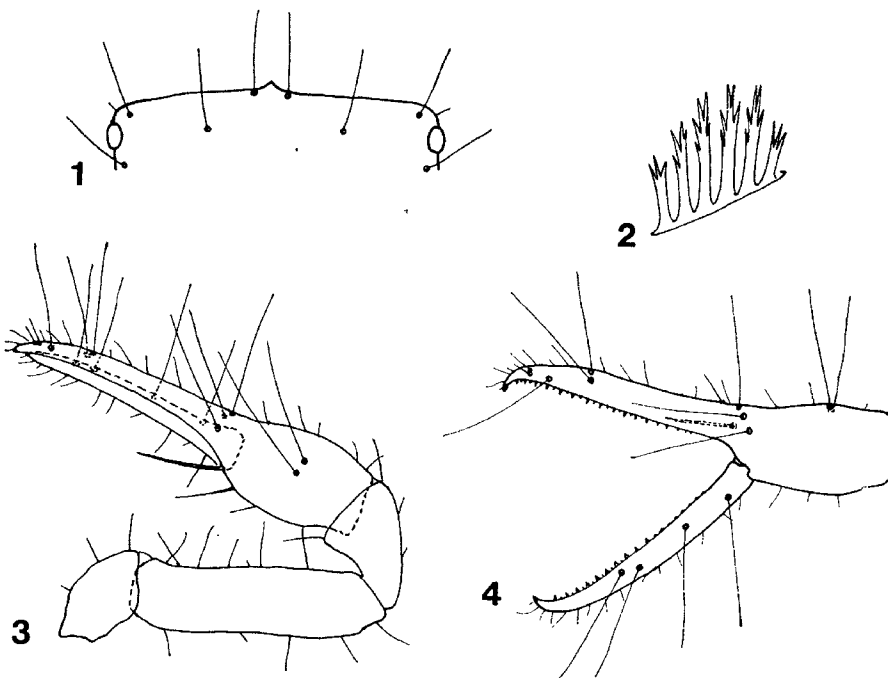


Fig. 1-4. *Tyrannochthonius bahamensis* Muchmore, new species. 1) anterior part of carapace; 2) coxal spines; 3) dorsal view of right palp; 4) lateral view of left chela.

4.65 times as long as wide; hand 1.45-1.7 times as long as deep; movable finger 1.75-1.95 times as long as hand. Trichobothria as shown in Fig. 4; on movable finger *sb* midway between *st* and *b* or slightly nearer to *b*. Hand with 1 large spinelike seta on medial side near base of fingers and 1 or 2 other prominent setae proximad. Fixed finger with 15-17 widely spaced macrodenticles and 10-14 interspersed microdenticles (Fig. 4); movable finger with 10-12 widely spaced macrodenticles distally and 8-10 interspersed microdenticles, and 5-8 very low rounded teeth basally; sensillum on lateral side of movable finger close to dental margin near level of trichobothrium *st*.

Legs robust; leg IV with entire femur 2.2-2.3 times as long as deep. Long tactile setae on tibia, metatarsus, and telotarsus of leg IV.

MEASUREMENTS (MM): Figures given first for the holotype followed in parentheses by ranges for the 10 paratypes. Body length 0.98 (1.0-1.15). Carapace length 0.31 (0.31-0.35). Chelicera 0.27 (0.27-0.31) long. Palpal femur 0.30 (0.315-0.34) by 0.08 (0.085-0.095); tibia 0.16 (0.16-0.18) by 0.095 (0.095-0.105); chela 0.48 (0.47-0.52) by 0.11 (0.105-0.125); hand 0.17 (0.16-0.185) by 0.11 (0.105-0.125); movable finger 0.30 (0.31-0.345) long. Leg IV: entire femur 0.32 (0.31-0.34) by 0.14 (0.14-0.15); tibia 0.215 (0.215-0.235) by 0.06 (0.055-0.065); metatarsus 0.095 (0.10-0.115) by 0.05 (0.045-0.055); telotarsus 0.185 (0.19-0.21) by 0.03 (0.03-0.035).

REMARKS: With reference to Mahnert (1979: 742), *Tyrannochthonius bahamensis* belongs to that group of species within the genus wherein the movable chelal finger does not have a prominent basal apodeme. It seems likely to me that the species with the strongly modified finger base actually belong to the genus (or subgenus) *Lagynochthonius* Beier (1951: see also Chamberlin 1962).

Genus *Paraliochthonius* Beier, 1956

TYPE SPECIES: *Chthonius singularis* Menozzi, 1924: 1; from Italy (Beier 1956: 58).

In the general area of Florida and the Caribbean, 3 species of *Paraliochthonius* have been identified: *insulae* Hoff (1963) from Jamaica, *puertoricensis* Muchmore (1967) from Ramosito Key, Puerto Rico, and *weygoldti* Muchmore (1967) from Big Pine Key, Monroe County (not Dade County), Florida.

Representatives of *Paraliochthonius* are typically found on the sea shore, often in debris in the tidal zone of beaches (Muchmore 1972). A single specimen of *P. singularis* (Menozzi) has been recorded from a cave traversed by a warm spring near the coast in Anatolia (Beier 1963, 1965). *Paraliochthonius strinatii* Beier, reported from a cave in Guatemala, actually belongs in another genus (see below), and the cavernicolous forms from New Zealand assigned by Beier (1976b) to *Paraliochthonius* are in taxonomic limbo. Therefore, it is of interest to report here a genuine cavernicolous species of *Paraliochthonius*, collected by J. H. Carpenter on San Salvador Island, Bahamas.

Paraliochthonius carpenteri Muchmore, NEW SPECIES

MATERIAL: Holotype ♀ (WM 6079.01003) and 4 paratypes (1 ♂, 3 ♀) from Lighthouse Cave, San Salvador, BAHAMAS, 5-VI-1982; 2 ♀ paratypes

from same place, 19-VI-1980; all collected by J. H. Carpenter. The holotype and 4 paratypes (1 ♂, 3 ♀) have been mounted on microscope slides. Unfortunately, the single ♂ is fragmented and most of the appendages are missing. Types are in the Florida State Collection of Arthropods, Gainesville.

DIAGNOSIS: The new species is much larger than its nearest known neighbor, *P. weygoldti* Muchmore from Big Pine Key, Florida, and about the same size as *P. puertoricensis* Muchmore from Puerto Rico. From the latter it may be distinguished by the more slender palpal chela (total $l/w = 4.75-4.9$ and hand $l/d = 1.9$).

DESCRIPTION: With the characters of the genus (Muchmore 1972). Male smaller than ♀. Carapace and palps light brown, other parts much lighter. Carapace slightly narrowed posteriorly; epistome long, slightly dentate, the nearest setae some distance from the base (Fig. 5); chaetotaxy of holotype d4d-4-4-2-2, the setae long and heavy except for the dwarf setae (d) which are short and thin; one paratype ♀ lacking the dwarf setae; 4 corneate eyes present. Coxal area typical; a rounded process on anteriomedial corner of coxa I; coxal chaetotaxy 2-2-1:3-1 (or 0):2-1-CS:2-3:2-3; each coxa II with 5 or 6 irregularly dentate spines (CS) in an oblique row (Fig. 6).

Abdomen typical of the genus; tergal chaetotaxy of holotype 4:4:4:7:7:

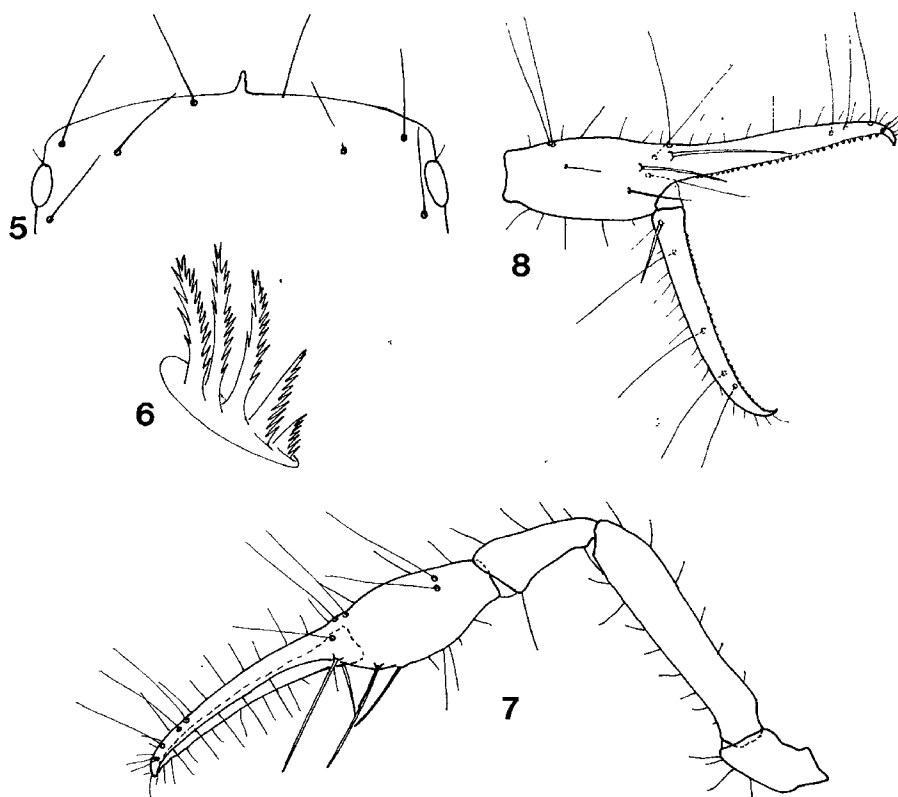


Fig. 5-8. *Paraliochthonius carpenteri* Muchmore, new species. 5) anterior part of carapace; 6) coxal spines; 7) dorsal view of right palp; 8) medial view of left chela.

7:7:8:6:4:T2T:0; sternal chaetotaxy 11:(3)7(3):(3)8(3):10:9:8:9:9:9:0:2.

Chelicera about 7/8 as long as carapace; hand with 5 setae; flagellum of 7 or 8 pinnate setae, the distal one curved; fixed finger with 1 medium and 4-6 smaller, rounded teeth; movable finger with 5-6 small, irregular teeth; galea represented by a very low elevation of the finger margin.

Palp rather slender for the genus (Fig. 7); femur 4.75-4.9, tibia 2.2-2.35, and chela 4.65-4.8 times as long as wide; hand 1.9 times as long as deep; movable finger 1.51-1.57 times as long as hand. Trichobothria as shown in Fig. 8; on movable finger *sb* closer to *st* than to *b*. Chelal hand with 3 heavy spinelike setae on medial side near base of fixed finger and a more slender one near the middle; movable finger with a heavy seta on medial side near base. Fixed chelal finger with 28-30 spaced, acute teeth; movable finger with 36-38 teeth, retroconical distally, but becoming low, sharp denticles proximally. Movable finger with a small sensillum on lateral side about midway between trichobothria *st* and *sb*.

Legs rather slender: leg IV with entire femur 2.8-3.0 and tibia 4.5-4.6 times as long as deep. Leg IV with long tactile setae on tibia and both tarsi.

MEASUREMENTS (MM): Figures given first for the holotype followed in parentheses by ranges for the 3 mounted ♀ paratypes. Body length 2.0 (2.0-2.1). Carapace length 0.63 (0.63-0.66). Chelicera 0.55 (0.55-0.59) long. Palpal femur 0.785 (0.74-0.83) by 0.16 (0.155-0.175); tibia 0.40 (0.39-0.435) by 0.18 (0.17-0.19); chela 1.14 (1.125-1.21) by 0.245 (0.235-0.26); hand 0.46 (0.445-0.49) by 0.245 (0.235-0.26); movable finger 0.72 (0.69-0.74) long. Leg IV: entire femur 0.68 (0.66-0.73) by 0.23 (0.22-0.26); tibia 0.48 (0.475-0.51) by 0.105 (0.105-0.11); metatarsus 0.215 (0.20-0.215); telotarsus 0.465 (0.43-0.48) by 0.055 (0.05-0.06).

ETYMOLOGY: The new species is named for Jerry H. Carpenter who collected the specimens and brought them to my attention.

ECOLOGY: Lighthouse Cave is in the northeastern corner of San Salvador, about 1 km from the ocean. Though it is not obviously connected to the sea, its lower passages are flooded with saltwater, which is tidal. The pseudoscorpions were found under small sandstone chips on an island in the water passage of Hydrology Hall in the southern section of the cave in complete darkness; about 40 m from the entrance. In the same area of the cave were found 3 species of terrestrial isopods and a blind terrestrial snail (Carpenter 1981 and personal communication).

REMARKS: While *P. carpenteri* is not strikingly adapted for life in the cave, it is larger and has more slender palps than the other species reported from the West Indies.

COMPARISON OF *Tyrannochthonius* AND *Paraliochthonius*

In spite of the effort of Chamberlin (1962), the genera of the tribe Tyrannochthoniini have not been clearly defined, except for *Troglochthonius* Beier which is known from only 2 cavernicolous relicts in southern Europe. *Morikawia* Chamberlin (1962) has been shown to be synonymous with *Paraliochthonius* Beier (Muchmore 1972) and *Lagynochthonius* Beier has been both loosely used and neglected.

Tyrannochthonius and *Paraliochthonius* have been much confused in recent years, but I now find that they can be distinguished easily in spite

of basic similarities. As Chamberlin (1962) pointed out, they are both in the chthoniid tribe Tyrannochthoniini, having trichobothria *ib* and *isb* transversely paired in a median or subbasal position on dorsum of chelal hand, marginal teeth of chelal fingers acute and spaced, no intercoxal tubercle, and coxal spines present only on pedal coxae II. They may be separated by considering the following characters:

- 1) Epistome—In *Tyrannochthonius* this is usually small and triangular and is closely flanked by the 2 central anterior carapacial setae, as is illustrated by With for the type species, *Chthonius terribilis* (1906: Text Fig. 10).

In *Paraliochthonius* the epistome is usually long and pointed and the 2 central carapacial setae are placed at some distance from its base, as shown by Menozzi for the type species, *Chthonius singularis* (1924: Fig. 1) and by Beier (1965: Fig. 2).

- 2) Coxal spines—In *Tyrannochthonius* these are mainly long, clavate blades which are terminally incised, sometimes with additional sub-terminal incisions or spinules (see With 1906: Tab. I, Fig. 1h).

In *Paraliochthonius* the coxal spines are usually spinose on both sides nearly to the base ("beiderseits gefiederten", according to Beier 1964: 77).

- 3) Chelal teeth—In *Tyrannochthonius* these are usually heterodentate on both fingers, at least in the distal halves; that is, the tooth row consists of alternating large, pointed macrodenticles and small, sometimes rudimentary, microdenticles. Microdenticles are not shown by With for *C. terribilis* (1906: Text Fig. 11); however, With might have overlooked tiny microdenticles, which are sometimes difficult to see except under high magnification of favorably oriented material.

In *Paraliochthonius* the chela is truly homodentate; that is, the dental row consists of a series of conical or retroconical teeth which do not alternate in size or shape, even though they may differ from one end of the row to the other. This feature is clearly shown for *P. singularis* by Beier (1965: Fig. 2).

- 4) Spinelike or guard setae on the chela—in *Tyrannochthonius* there is at most one large heavy seta on the medial side of the chelal hand near the base of the fixed finger; sometimes this seta is reduced or absent (none is shown or mentioned by With 1906); and sometimes, as in *T. bahamensis* above, there may be other setae which are larger than most vestitural setae but distinctly smaller than the major spinelike seta.

In *Paraliochthonius* there are usually 3 or 4 very heavy setae on the medial side of the chelal hand and usually a similar seta on the base of the movable finger. This is clearly shown for *P. singularis* by Menozzi (1924: Fig. 1) and Beier (1965: Fig. 2).

- 5) Trichobothria of movable chelal finger—In *Tyrannochthonius* trichobothrium *sb* is located midway between *st* and *b* or a little nearer to *b* (see With 1906: Text Fig. 11).

In *Paraliochthonius* *sb* is located nearer to *st* than to *b*, usually more distinctly so than is shown for *P. singularis* by Beier (1965: Fig. 2).

It is not within the purview of this paper to review the numerous species

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assigned to *Tyrannochthonius*, *Paraliochthonius* and *Morikawia*. However, the following species can be dealt with easily.

Tyrannochthonius strinatii (Beier), NEW COMBINATION

Paraliochthonius strinatii Beier, 1974: 101.

The holotype and allotype from Cueva Chirrepeck, Alta Verapaz, GUATEMALA, have been examined. It is obvious that this species belongs in *Tyrannochthonius* as defined above. Features seen here, characteristic of *Tyrannochthonius*, are: the very small epistome with closely adjacent setae; the heterodentate chelal fingers; the occurrence of only 1 short, spinelike seta on the chelal hand; the placement of trichobothria on the movable chelal finger; and the inland location of the collection site. In all these and other general features it closely resembles *T. troglobius* and *T. pallidus* from caves in Mexico (Muchmore 1969, 1973), but it is much smaller and more robust than those species and has 4 eyes rather than 2.

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EFFECT OF SEXUAL EXPERIENCE ON MALE MATING SUCCESS IN A LĚK FORMING TEPHRITID *ANASTREPHA SUSPENS*A (LOEW)¹

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ABSTRACT

Recently mated *Anastrepha suspensa* (Loew) males are less likely to copulate than virgin rivals when placed in competition. This effect is lost after 2 h. Mated males are as active as virgins in sexual advertising and the lack of mated male success appears to be due to female rejection. Females may be discriminating against males made relatively infertile through exhaustion of accessory gland fluids. Postcopula male unattractiveness

¹Diptera: Tephritidae.

²Employed through a cooperative agreement between the Department of Entomology and Nematology, University of Florida and the Insect Attractants, Behavior, and Basic Biology Research Laboratory, Gainesville.