

## The genus *Tyrannochthonius* in the eastern United States (Pseudoscorpionida: Chthoniidae).

### Part II. More recently discovered species.

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**Abstract:** Twenty-five new species of *Tyrannochthonius*, mostly cavernicolous, are described from Alabama, Florida, Kentucky, and Tennessee. Their relations are discussed, and a key is given for all species of the genus known from the United States east of the Mississippi River.

#### Introduction

This is the second and final part of a study of the genus *Tyrannochthonius* as it occurs in the United States east of the Mississippi River. Part I (Muchmore and Chamberlin, 1995) provided an emended diagnosis of the genus and supplementary information about *T. floridensis* Malcolm and Muchmore (1985), and described 10 new species from caves in Alabama. The species described in Part I are: *T. aladdinensis*, *T. aralu*, *T. archeri*, *T. avernicolus*, *T. jonesi*, *T. nergal*, *T. osiris*, *T. parvus*, *T. pluto*, and *T. tenuis*, all authored by J. C. Chamberlin. In this part, 25 additional species are described, from both epigeal and hypogean situations, in Alabama, Florida, Kentucky, and Tennessee, and a key to all species of *Tyrannochthonius* in the eastern United States is provided. Throughout the text, "Part I" refers to the paper by Muchmore and Chamberlin (1995).

#### Methods

The specimens dealt with here are in the following depositories: American Museum of Natural History, New York, NY (AMNH); California Academy of Sciences, San Francisco, CA (CAS); Florida State Collection of Arthropods, Gainesville, FL (FSCA); University of California, Davis, CA (UCDC).

All specimens have been dissected, cleared, and mounted in Canada balsam on microscope slides. They were studied and measured under a compound microscope.

Locations and relations of the caves mentioned here were determined, for the most part, by consul-

tation of the large volume on Alabama caves by Varnedoe (1973), and by correspondence with W. Torode, of the National Speleological Society, Huntsville, Alabama.

Through this study, the species are numbered sequentially, numbers 1-11 in Part I, and numbers 12-36 in Part II. These numbers also appear in the key, facilitating reference to the species descriptions.

A few abbreviations are used in the text, as follows: L = length; L/B = ratio, length/breadth; L/D = ratio, length/depth; M = macrodentacles; m = microdentacles; v = vestigial teeth; T = tactile seta. Tergal chaetotaxy is usually given only for tergites 1-8, with the understanding that the numbers for tergites 9-12 are 7:4:T2T:0, as is usually the case (see Part I); where the numbers for tergites 9-12 differ from that, the chaetotaxy is given in full.

#### Genus *Tyrannochthonius* Chamberlin

*Tyrannochthonius* Chamberlin 1929: 74.

A complete synonymy is given and the genus is diagnosed in Part I of this study, to which reference should be made for particulars.

#### 12. *Tyrannochthonius alabamensis*, new species (Fig. 1)

**Type material.** Holotype female (WM 3264.02001) and 5 paratype females from forest litter, 8 km NW of Princeton, Jackson Co., Alabama, 19 May 1972, S. B. Peck; 1 paratype female

from rotten tree roots near Bangor Cave, NE of Bangor, Blount Co., Alabama, 19 March 1966, S. B. Peck; 1 paratype female from log-stump litter outside Horseshoe-Crump Cave, 11 km S of Cleveland, Blount Co., Alabama, 28 June 1967, S. B. Peck and A. Fiske; all mounted on slides, in FSCA.

**Diagnosis.** Representative of *Tyrannochthonius* as outlined in Part I, and with the following particular features. A small species (palpal chela length 0.76-0.84 mm) with 4 eyes. Chelicerae and palps tan, carapace and other parts lighter. Epistome very small or absent. Four distinct eyes, anterior corneate, posterior flat. Tergal chaetotaxy 4:4:4:4-5:6:6:6:6:6-7:4-5:T2T:0. Coxa II with 7-10 coxal spines. Chelicera 0.8-0.9 as long as carapace. Palp as shown in Fig. 1: L/B of trochanter 1.7-1.9, femur 4.7-5.0, patella 1.75-2.0, chela 4.9-5.25; L/D of hand 1.8-1.95; movable finger L / hand L 1.65-1.9. Chelal fingers heterodont, macrodenticles tall, sharp, microdenticles very small, triangular; fixed finger with 19-22M, 10-15m; movable finger with 8-11M, 6-10m, 8-15v. Leg IV rather robust: L/D of femur+patella 2.55-2.75, tibia 4.25-4.5.

**Measurements (mm).** Figures given first for holotype female, followed in parentheses by ranges for the 7 paratypes. Body L 1.59 (1.40-1.52). Carapace L 0.445 (0.435-0.48). Chelicera L 0.37 (0.37-0.41). Palp: trochanter 0.185 (0.185-0.21)/0.105 (0.105-0.12); femur 0.53 (0.52-0.57)/0.11 (0.11-0.12); patella 0.245 (0.22-0.245)/0.12 (0.12-0.125); chela 0.79 (0.76-0.84)/0.15 (0.155-0.16); hand 0.29 (0.28-0.31)/0.15 (0.155-0.16); movable finger L 0.525 (0.495-0.55). leg IV: femur+patella 0.465 (0.46-0.49)/0.18 (0.17-0.19); tibia 0.325 (0.32-0.36)/0.075 (0.075-0.08); basitarsus 0.16 (0.15-0.17)/0.06 (0.055-0.06); telotarsus 0.32 (0.32-0.34)/0.035 (0.035-0.04).

**Etymology.** The species is named for the state of Alabama where it has been found.

### 13. *Tyrannochthonius attenuatus*, new species (Fig. 2)

**Type material.** Holotype female (WM 1658.01001) from Matthews Cave (AL23), 6.5 km E of Madison, Madison Co., Alabama, 22 August 1968, S. B. Peck; mounted on slide, in FSCA.

**Diagnosis.** Representative of *Tyrannochthonius* as outlined in Part I, and with the following particular features. A large species (palpal chela length 1.76 mm) with very slender appendages. Chelicerae light brown, palps tan, carapace and

other parts pale. Epistome small, rounded. No eyes. Tergal chaetotaxy 4:4:4:4:5:6:6:6:6:6:-. Coxa II with 11 or 12 coxal spines. Chelicera as long as carapace. Palp as shown in Fig. 2: L/B of trochanter 2.1, femur 6.6, patella 2.3, chela 7.05; L/D of hand 2.35; movable finger L / hand L 1.95. Chelal fingers heterodont, macrodenticles tall, sharp, microdenticles small, triangular; fixed finger with 27M, 23m; movable finger with 19M, 16m, 5v. Leg IV quite slender: L/D of femur+patella 3.6, tibia 6.2.

**Measurements (mm).** Body L 2.30. Carapace L 0.76. Chelicera L 0.77. Palp: trochanter 0.385/0.185; femur 1.22/0.185; patella 0.48/0.21; chela 1.76/0.25; hand 0.605/0.26; movable finger L 1.17. Leg IV: femur+patella 0.975/0.27; tibia 0.68/0.11; basitarsus 0.31/0.09; telotarsus 0.755/0.06.

**Etymology.** The species is named *attenuatus* in recognition of its very slender appendages.

### 14. *Tyrannochthonius barri*, new species

**Type material.** Holotype female (WM 765.01002) and 2 paratype females from Guffey Cave (AL 317), 1.5 km NW of Grant, Marshall Co., Alabama, 11 February 1961, T. C. Barr, Jr.; mounted on slides, in FSCA.

**Diagnosis.** Representative of *Tyrannochthonius* as outlined in Part I, and with the following particular features. A small species (palpal chela length 0.79-0.805 mm) and with moderately slender appendages. Chelicerae tan, other parts lighter. Epistome small, rounded. No eyes. Tergal chaetotaxy 4:4:4:4:6:6:6:6:6:6:-. Coxa II with 7-8 coxal spines. Chelicera 0.85-0.9 as long as carapace. Palp similar in shape to *T. alabamensis* (Fig. 1): L/B of trochanter 1.6-1.75, femur 4.8-5.0, patella 1.9-1.95, chela 5.1-5.35; L/D of hand 1.8-1.85; movable finger L / hand L 1.8-1.95. Chelal fingers heterodont, macrodenticles tall and sharp, microdenticles distinct on fixed finger, very small on movable finger; fixed finger with 19-22M, 16m; movable finger with 9M, 8m, 11-14v. Leg IV: L/D of femur+patella 2.5-2.7, tibia 4.25.

**Measurements (mm).** Figures given first for holotype female, followed in parentheses by those for the 2 paratype females. Body L 1.63 (1.40, 1.60). Carapace L 0.445 (0.445, 0.45). Chelicera L 0.39 (0.385, 0.41). Palp: trochanter 0.185 (0.18, 0.17)/0.105 (0.105, 0.105); femur 0.54 (0.53, 0.54)/0.11 (0.11, 0.11); patella 0.235 (0.235, 0.235)/0.12 (0.12, 0.125); chela 0.79 (0.80, 0.805)/0.155 (0.15, 0.155); hand 0.29 (0.27, 0.28)/0.155 (0.15, 0.155); movable finger L 0.525 (0.52, 0.53). Leg IV: femur+patella

0.45 (0.46, 0.46)/0.18 (0.17, 0.185); tibia 0.32 (0.32, 0.32)/0.075 (0.075, 0.075); basitarsus 0.155 (0.155, 0.15)/0.05 (0.05, 0.06); telotarsus 0.31 (0.31, 0.31)/0.04 (0.04, 0.04).

**Etymology.** The species is named in honor of Thomas C. Barr, Jr., who collected the types and who has contributed greatly to our understanding of cave faunas.

**15. *Tyrannochthonius binoculatus*, new species**  
(Fig. 3)

**Type material.** Holotype female (WM 3477.01001) from Two Way Cave (AL1068), 3 km N of Larkinsville, Jackson Co., Alabama, 9 July 1973, S. B. Peck; mounted on slide, in FSCA.

**Diagnosis.** Representative of *Tyrannochthonius* as outlined in Part I, and with the following particular features. A medium-sized species (palpal chela length 1.26 mm) with 2 eyes. Chelicerae and palps tan, carapace and other parts lighter. Epistome small, rounded. Two small, flat eyes. Tergal chaetotaxy 4:4:4:4:6:6:7:7:5:T2T:0. Coxa II with 10 coxal spines. Chelicera 0.85 as long as carapace. Palp as shown in Fig. 3: L/B of trochanter 1.85, femur 5.35, patella 2.1, and chela 5.85; L/D of hand 2.15; movable finger L/hand L 1.75. Chelal fingers heterodont, both macro- and microdentacles large, sharp; fixed finger with 29 M, 22 m; movable finger with 18M, 16m, 11v. Leg IV slender: L/D of femur+patella, 3.3, tibia 5.0.

**Measurements (mm).** Body L 1.93. Carapace L 0.63. Chelicera L 0.52. Palpal trochanter 0.28/0.15; femur 0.83/0.155; patella 0.355/0.17, chela 1.26/0.215, hand 0.46/0.215; movable finger L 0.80. Leg IV: femur+patella 0.69/0.21; tibia 0.465/0.095; basitarsus 0.22/0.075; telotarsus 0.37/0.05.

**Etymology.** The species is named *binoculatus* in recognition of its possession of 2 eyes.

**Remarks.** A chernetid pseudoscorpion, *Hesperochnes* cf. *mirabilis* (Banks), has also been reported from Two Way Cave (Peck 1989a).

**16. *Tyrannochthonius chamberlini*, new species**  
(Fig. 4)

**Type material.** Holotype female (JC-2074.01001) from "Kilgore Cave, near Weaver Station" [probably Little Weaver Cave (AL 20)], Calhoun Co., Alabama, 25 March 1942, W. B. Jones; mounted on slide, in AMNH.

**Diagnosis.** Representative of *Tyrannochthonius* as outlined in Part I, and with the following particular features. A medium-sized species (palpal chela length 1.27 mm), with slender appendages. Palps tan, color of other parts unknown (stained). No epistome, anterior margin of carapace smoothly convex at middle. No eyes. Tergal chaetotaxy 4:4:4:4:6:6:6:6:-. Coxa II with 8 coxal spines. Chelicera longer than carapace. Palp as shown in Fig. 4: L/B of trochanter 1.85, femur 5.65, patella 2.2, chela 6.2; L/D of hand 2.1; movable finger L/hand L 2.05. Chelal fingers heterodont, both macro- and microdentacles relatively tall, sharp; fixed finger with 31M, 22m; movable finger with 18M, 15m, 10v. Leg IV slender: L/D of femur+patella 3.15, tibia 5.15.

**Measurements (mm).** Body L 1.82. Carapace L 0.52. Chelicera L 0.57. Palp: trochanter 0.29/0.155; femur 0.85/0.15; patella 0.355/0.16; chela 1.27/0.205; hand 0.415/0.20; movable finger L 0.85. Leg IV: femur+patella 0.665/0.21; tibia 0.465/0.09; basitarsus 0.22/0.07; telotarsus 0.47/0.045.

**Etymology.** The species is named for Joseph C. Chamberlin, who first recognized the type specimen as different but was uncertain about its exact status.

**Remarks.** The precise location of "Kilgore Cave" is uncertain. This name is not currently applied to any cave in Alabama and it is unknown to contemporary experts on Alabama caves (W. Torode, in litt., 1994). However, the location and date of collection given on the slide strongly suggest that this is the same as, or very near to, Little Weaver Cave (AL 20).

**17. *Tyrannochthonius charon*, new species**

**Type material.** Holotype male (WM859.01001) from Driftwood Cave (AL 176), 1.5 km N of Tupelo, Jackson Co., Alabama, 4 September 1965, S. B. Peck; mounted on slide, in FSCA.

**Diagnosis.** Representative of *Tyrannochthonius* as outlined in Part I, and with the following particular features. A medium-sized species (palpal chela length 1.13 mm), with 4 setae on tergites 1-5 and 5 setae on tergite 6. Chelicerae and palps tan, other parts pale. Epistome obsolete. No eyes. Tergal chaetotaxy 4:4:4:4:5:6:6:-. Coxa II with 11 coxal spines. Chelicera 0.85 as long as carapace. Palp similar in shape to *T. chamberlini* (Fig. 4): L/B of trochanter 1.85, femur 5.55, patella 2.2, chela 6.1; L/D of hand 2.3; movable finger L/hand L 1.8. Chelal fingers heterodont, macroden-

ticles tall, sharp, microdenticles well developed; fixed finger with 33M, 28m; movable finger with 22M, 21m, 9v. Leg IV: L/D of femur+patella 3.5, tibia 5.0.

**Measurements** (mm). Body L 1.78. Carapace L 0.52. Chelicera L 0.445. Palp: trochanter 0.25/0.135; femur 0.78/0.14; patella 0.34/0.155; chela 1.13/0.185; hand 0.415/0.18; movable finger L 0.74. leg IV: femur+patella 0.665/0.19; tibia 0.45/0.09; basitarsus 0.21/0.07; telotarsus 0.48/0.045.

**Etymology.** The species is named for Charon, in Greek mythology the boatman who ferried the dead across the River Styx.

**Remarks.** The neobisiid pseudoscorpion *Lis-socreagris persephone* (Chamberlin) has also been reported from Driftwood Cave (Muchmore 1969, Peck 1989a).

#### 18. *Tyrannochthonius diabolus*, new species (Fig. 5)

**Type material.** Holotype female (WM 1325.01001) from Indian Rock Cave, 5.5 km S of Skyline, Jackson Co., Alabama, 15 August 1967, S. B. Peck and A. Fiske; 1 paratype female from same cave, 7 August 1967, S. B. Peck and A. Fiske; mounted on slides, in FSCA.

**Diagnosis.** Representative of *Tyrannochthonius* as outlined in Part I, and with the following particular features. A medium-sized species (palpal chela length 1.22-1.29 mm), with 4 setae on tergites 1-4. Chelicerae and palps tan, other parts pale. Epistome very low, rounded. No eyes. Tergal chaetotaxy 4:4:4:4:6:6:6:6:-. Coxal area of holotype typical of cavernicolous forms; in the paratype, however, there is a small seta near tip of anteromedial process of coxa I, on right side only! Coxa II with 9-10 coxal spines. Chelicera about 0.9 as long as carapace. Palp as shown in Fig. 5: L/B of trochanter 1.75-1.8, femur 5.6-5.8, patella 2.05-2.1, chela 5.5-5.65; L/D of hand 2.1; movable finger L/hand L 1.70. Chelal fingers heterodont, macrodenticles tall, sharp, microdenticles small, triangular; fixed finger with 30-31M, 23m; movable finger with 21M, 19m, 6-8v. Leg IV: L/D of femur+patella 3.25-3.3, tibia 4.9-4.95.

**Measurements** (mm). Figures given first for holotype female, followed in parentheses by those for paratype. Body L 1.81 (?). Carapace L 0.555 (0.60). Chelicera L 0.52 (0.54). Palp: trochanter 0.25 (0.29)/0.155 (0.16); femur 0.87 (0.895)/0.15 (0.16); patella 0.355 (0.37)/0.17 (0.18); chela 1.22 (1.29)/0.215 (0.235); hand 0.46 (0.48)/0.22 (0.23);

movable finger L 0.785 (0.815). Leg IV: femur+patella 0.69(0.72)/0.21 (0.22); tibia 0.465 (0.495)/0.095 (0.10); basitarsus 0.22 (0.25)/0.075 (0.075); telotarsus 0.49 (0.52)/0.045 (0.045).

**Etymology.** The species is named *diabolus* for the devil, who inhabits the underworld.

**Remarks.** The occurrence of a small seta near the tip of the anteromedial process of one coxa I of the paratype is noteworthy. The only other species to show this feature is *T. floridensis*, where possession of such a seta is normal (see Part I).

#### 19. *Tyrannochthonius erebicus*, new species

**Type material.** Holotype female (WM 3476.01001) from Crossings Cave (AL 310), 1.5 km N of Paint Rock, Jackson Co., Alabama, 7 July 1973, S. B. Peck; allotype male (WM1660.01001) from same cave, 23 August 1968, S. B. Peck; 2 paratype females from Paint Rock Cave (AL 185), Paint Rock, Jackson Co., Alabama, 6 September 1965, S. B. Peck; mounted on slides, in FSCA.

**Diagnosis.** Representative of *Tyrannochthonius* as outlined in Part I, and with the following particular features: a large species (palpal chela length 1.52-1.63 mm) with rather slender appendages. Male smaller than female and with more slender appendages. Chelicerae and palps light brown, carapace tan, other parts lighter. Epistome small, rounded. No eyes. Tergal chaetotaxy 4:4:4:4:4:5:5:6:6:6:6:-. Coxa II with 10-13 coxal spines. Chelicera slightly shorter than carapace. Palp similar in shape to *T. pecki* (Fig. 10): L/B of trochanter 1.7-1.95, femur 5.8-6.3, patella 2.2-2.45, chela 6.25-6.85; L/D of hand 2.25-2.5; movable finger L/hand L 1.75. Chelal fingers heterodont, both macro- and microdenticles rather tall, sharp; fixed finger with 33-36M, 30-34m; movable finger with 24M, 22-23m, 6-8v. Leg IV slender: L/D of femur+patella 3.45-3.65, tibia 5.35-5.6.

**Measurements** (mm). Female. Figures given first for holotype, followed in parentheses by those for paratypes. Body L 2.37 (2.50, 2.66). Carapace L 0.70 (0.725, 0.74). Chelicera L 0.66 (0.695, 0.725). Palp: trochanter 0.34 (0.33, 0.37)/0.20 (0.185, 0.19); femur 1.07 (1.11, 1.16)/0.185 (0.18, 0.195); patella 0.445 (0.47, 0.495)/0.20 (0.215, 0.22); chela 1.54 (1.61, 1.63)/0.24 (0.25, 0.26); hand 0.555 (0.60, 0.60)/0.235 (0.25, 0.265); movable finger L 0.985 (1.04, 1.04). Leg IV: femur+patella 0.865 (0.91, 0.925)/0.24 (0.25, 0.265); tibia 0.59 (0.62, 0.61)/0.11 (0.11, 0.11); basitarsus 0.265 (0.265, 0.27)/0.09 (0.095, 0.09); telotarsus 0.63 (0.67, 0.68)/0.055 (0.06, 0.06).

Allotype male. Body L 1.81. Carapace L 0.63. Chelicera L 0.615. Palp: trochanter 0.32/0.18; femur 1.04/0.165; patella 0.445/0.18; chela 1.52/0.22; hand 0.555/0.22; movable finger L 0.985. Leg IV: femur+patella 0.83/0.24; tibia 0.58/0.105; basitarsus 0.265/0.08; telotarsus 0.605/0.05.

**Etymology.** The species is named *erebicus*, a denizen of Erebus, a dark place under the earth.

**Remarks.** This species shows some sexual dimorphism, in that the male has more slender palps than the female (e.g. L/B of palpal chela 6.85 in male, but only 6.25-6.4 in female).

A chthoniid pseudoscorpion, *Apochthonius* sp., has also been reported from Paint Rock Cave (Peck 1989a).

## 20. *Tyrannochthonius felix*, new species

**Type material.** Holotype female (WM 1663.01001) from House of Happiness Cave (AL 974), 8 km SW of Scottsboro, Jackson Co., Alabama, 14 November 1968, S. B. Peck; mounted on slide, in FSCA.

**Diagnosis.** Representative of *Tyrannochthonius* as outlined in Part I, and with the following particular features. A medium-sized species (palpal chela length 1.30 mm), with moderately slender appendages and small microdenticles on chelal fingers. Chelicerae light brown, palps tan, carapace and other parts pale. Epistome very small, rounded. No eyes. Tergal chaetotaxy 4:4:4:4:4:6:6:6:-. Coxa II with 11 coxal spines. Chelicera 0.95 as long as carapace. Palp similar in shape to *T. halopotamus* (Fig. 7): L/B of trochanter 1.75, femur 5.95, patella 2.2, chela 5.9; L/D of hand 2.1; movable finger L / hand L 1.80. Chelal fingers heterodont, macrodenticles tall, sharp, microdenticles small, triangular; fixed finger with 27M, 25m; movable finger with 20M, 19m, 7v. Leg IV rather slender: L/D of femur+patella 3.7, tibia 5.3.

**Measurements** (mm). Body L 1.87. Carapace L 0.58. Chelicera L 0.555. Palp: trochanter 0.28/0.16; femur 0.92/0.155; patella 0.40/0.18; chela 1.30/0.22; hand 0.465/0.22; movable finger L 0.835. Leg IV: femur+patella 0.725/0.195; tibia 0.495/0.095; basitarsus 0.245/0.075; telotarsus 0.52/0.05.

**Etymology.** The species is named *felix* (happy) in recognition of its being found in House of Happiness Cave.

## 21. *Tyrannochthonius fiskei*, new species

**Type material.** Holotype male (WM 1341.01001) from Caroline Cove Cave, 9 km SE of Belvidere,

Franklin Co., Tennessee, 11 July 1967, S. B. Peck and A. Fiske; mounted on slide, in FSCA.

**Diagnosis.** Representative of *Tyrannochthonius* as outlined in Part I, and with the following particular features. A medium-sized species (palpal chela length 1.42 mm), with slender appendages. Palps and chelicerae tan, carapace pale tan, other parts lighter. Epistome small, rounded. No eyes. Anterior margin of carapace of this specimen with only 3 setae, one of the epistomal setae absent. Tergal chaetotaxy 4:4:4:4:4:6:6:6:-. Coxa II with 11 coxal spines. Chelicera 0.95 as long as carapace. Palp similar in shape to *T. pecki* (Fig. 10): L/B of trochanter 1.85, femur 6.3, patella 2.15, and chela 6.45; L/D of hand 2.2; movable finger L / hand L 1.9. Chelal fingers heterodont, both macro- and microdenticles rather low, rounded; fixed finger with 30M, 21m; movable finger with 20M, 18m, 10v. Leg IV slender: L/D of femur+patella 3.55, tibia 5.05.

**Measurements** (mm). Body L 2.03. Carapace L 0.59. Chelicera L 0.555. Palpal trochanter 0.31/0.17; femur 0.975/0.155; patella 0.39/0.18; chela 1.42/0.22; hand 0.49/0.22; movable finger L 0.92. Leg IV: femur+patella 0.80/0.225; tibia 0.555/0.11; basitarsus 0.26/0.08; telotarsus 0.615/0.05.

**Etymology.** The species is named for Alan Fiske, who, with S. B. Peck, collected the holotype and many others of the specimens treated in this paper.

## 22. *Tyrannochthonius gnomus*, new species (Fig. 6)

**Type material.** Holotype female (WM 3473.01001) from Gamble Cave (AL 1026), 8 km N of Poplar Springs, Marshall Co., Alabama, 11 July 1973, S. B. Peck; mounted on slide, in FSCA.

**Diagnosis.** Representative of *Tyrannochthonius* as outlined in Part I, and with the following particular features. A small species (palpal chela length 0.915 mm) with moderately slender palps and only 4 setae on tergites 1-6. Chelicerae and palps tan, carapace and other parts pale. Epistome very low, rounded. No eyes. Tergal chaetotaxy 4:4:4:4:4:4:6:6:-. Coxa II with 7 coxal spines. Chelicera 0.82 as long as carapace. Palp as shown in Fig. 6: L/B of trochanter 1.85, femur 5.0, patella 1.9, chela 5.65; L/D of hand 1.8; movable finger L / hand L 1.9. Chelal fingers heterodont, macrodenticles tall, sharp, microdenticles small, sharp; fixed finger with 25M, 18m; movable finger with 12M, 11m, 15v. Leg IV: L/D of femur+patella 2.8, tibia 4.4.

**Measurements** (mm). Body L 1.47. Carapace L 0.50. Chelicera L 0.41. Palp: trochanter 0.215/0.155; femur 0.60/0.12; patella 0.25/0.13; chela 0.915/0.16; hand 0.31/0.17; movable finger L 0.59. leg IV: femur+patella 0.47/0.17; tibia 0.35/0.08; basitarsus 0.16/0.055; telotarsus 0.33/0.045.

**Etymology.** The species is named *gnomus*, a small creature inhabiting the subterranean world.

**Remarks.** The neobisiid pseudoscorpion *Lissocreagris persephone* (Chamberlin) has also been reported from Gamble Cave (Peck 1989a).

**23. *Tyrannochthonius halopotamus*, new species**  
(Fig. 7)

**Type material.** Holotype female (WM1287.01001) from Salt River Cave (AL 221), 2 km W of Gonce, Jackson Co., Alabama, 17 August 1967, S. B. Peck and A. Fiske; mounted on slide, in FSCA.

**Diagnosis.** Representative of *Tyrannochthonius* as outlined in Part I, and with the following particular features. A medium-sized species (palpal chela length 1.27 mm) with moderately slender appendages. Chelicerae light brown, palps tan, other parts very pale. Epistome small, triangular. No eyes. Tergal chaetotaxy 4:4:4:4:6:6:6:6:-. Coxa II with 9 coxal spines. Chelicera 0.95 as long as carapace. Palp as shown in Fig. 7: L/B of trochanter 2.05, femur 5.95, patella 2.15, chela 5.9; L/D of hand 2.2; movable finger L / hand L 1.85. Chelal fingers heterodont, macrodenticles tall, sharp, microdenticles as much as half the height of macrodenticles; fixed finger with 23 M, 21m; movable finger with 17M, 15m, 6v. Leg IV: L/D of femur+patella 3.2, tibia 4.95.

**Measurements** (mm). Body L 1.61. Carapace L 0.585. Chelicera L 0.555. Palp: trochanter 0.31/0.15; femur 0.89/0.15; patella 0.37/0.17; chela 1.27/0.215; hand 0.46/0.21; movable finger L 0.84. Leg IV: femur+patella 0.69/0.215; tibia 0.47/0.095; basitarsus 0.23/0.08; telotarsus 0.51/0.05.

**Etymology.** The species is named *halopotamus* in reference to its living in Salt River Cave (Greek, *hals* = salt, *potamos* = river).

**24. *Tyrannochthonius hypogeus*, new species**  
(Fig. 8)

**Type material.** Holotype male (WM1368.03001) and 1 paratype tritonymph from log-stump litter,

Bruce Hollow, Mammoth Cave National Park, Edmonson Co., Kentucky, 24 August 1967, S. B. Peck and A. Fiske; mounted on slide, in FSCA.

**Diagnosis.** Representative of *Tyrannochthonius* as outlined in Part I, and with the following particular features. A small species (palpal chela length 0.80 mm), with no eyes and rather slender palps. Chelicerae and palps light brown, carapace tan, other parts lighter. Epistome small, triangular. No eyes. Tergal chaetotaxy 4:3:4:4:6:6:6:6:-. Coxa II with 6 coxal spines. Chelicera 0.85 as long as carapace. Palp as shown in Fig. 8: L/B of trochanter 1.7, femur 5.0, patella 1.95, chela 6.15; L/D of hand 2.15; movable finger L / hand L 1.9. Chelal fingers heterodont, macrodenticles tall, sharp, microdenticles small, triangular; fixed finger with 27M, 19m; movable finger with 9M, 7m, 15v. Leg IV rather robust: L/D of femur+patella 2.45, tibia 4.2.

**Tritonymph.** Much like adult but smaller and with less slender appendages. Tergal chaetotaxy 4:4:4:4:4:5:6:6:-. Coxa II with 6 coxal spines. Palp: L/B of femur 4.8, patella 1.9, chela 5.2; L/D of hand 1.9; movable finger L / hand L 1.8.

**Measurements** (mm). Holotype male. Body L 1.32. Carapace L 0.43. Chelicera L 0.355. Palp: trochanter 0.185/0.11; femur 0.525/0.105; patella 0.215/0.105; chela 0.80/0.13; hand 0.28/0.13; movable finger L 0.525. Leg IV femur+patella 0.445/0.18; tibia 0.31/0.075; basitarsus 0.15/0.06; telotarsus 0.31/0.04.

**Tritonymph.** Body L 1.06. Carapace L 0.34. Chelicera L 0.30. Palp: femur 0.385/0.08; patella 0.18/0.095; chela 0.57/0.11; hand 0.21/0.11; movable finger L 0.38. Leg IV: femur+patella 0.32/0.125; tibia 0.22/0.06.

**Etymology.** The species is named *hypogeus* for its presumed habitat underground.

**Remarks.** While the specimens were found in log litter, it is probable, from the lack of eyes and the attenuated appendages, that this species is cave-adapted. The locality in Bruce Hollow undoubtedly has access to the Mammoth Cave System below.

This is the northernmost record of a *Tyrannochthonius* species in North America.

**25. *Tyrannochthonius infernalis*, new species**

**Type material.** Holotype male (UCDC #2), allotype female (UCDC #3), and paratype female (UCDC #1) from under rocks in dark zone of Jess Elliot Cave, WNW of Stevenson, Jackson Co., Alabama, 8

April 1961, H. R. Steeves, Jr. and J. D. Patrick; mounted on slides by R. O. Schuster, in UCDC. One paratype male from damp silt bank beside stream in same cave, 12 November 1955, T. C. Barr, Jr.; mounted on slide, in CAS.

**Diagnosis.** Representative of *Tyrannochthonius* as outlined in Part I, and with the following particular features. A medium-sized species (palpal chela length 1.30-1.44 mm) with slender appendages. Chelicerae and palps tan, other parts lighter. Epistome small, triangular. No eyes. Tergal chaetotaxy of holotype 4:4:4:4:6:6:6;-; that of allotype and paratypes varied 2-4:3-4:4:4-6:5-6:6:6;- . Coxa II with 9-11 coxal spines. Palp similar in shape to *T. halopotamus* (Fig. 7): L/B of femur 5.8-5.95, patella 2.05-2.2, chela 5.9 (f) - 6.5 (m); L/D of hand 2.05-2.5; movable finger L/hand L 1.8-1.95. Chelal fingers heterodont, macrodenticles tall, sharp, microdenticles small, triangular; fixed finger with 30-32M, 24-29m; movable finger with 22-25M, 18-20m, 6-9v. Leg IV: L/D of femur+patella 3.2, tibia 5.5.

**Measurements** (mm). Figures given first for holotype male, followed in parentheses by ranges for the allotype and paratypes. Body L 2.10 (1.75-2.15). Carapace L 0.615 (0.55-0.635). Chelicera L 0.63 (0.555-0.64). Palp: femur 0.985 (0.92-1.01)/0.17 (0.155-0.17); patella 0.41 (0.37-0.42)/0.19 (0.18-0.20); chela 1.44 (1.30-1.44)/0.22 (0.20-0.245); hand 0.495 (0.48-0.53)/0.22 (0.19-0.245); movable finger L 0.955 (0.865-0.96). Leg IV: femur+patella 0.82 (0.75-0.83)? (0.235-?); tibia 0.555 (0.525-0.58)? (0.095-?).

**Etymology.** The species is named *infernalis*, as it belongs to the underworld.

**26. *Tyrannochthonius innominatus*, new species**

(Fig. 9)

**Type material.** Holotype male (WM2898.01001) from hardwood litter on No Name Key, Monroe Co., Florida, 5 August 1971, S. B. Peck; mounted on slide, in FSCA.

**Diagnosis.** Representative of *Tyrannochthonius* as outlined in Part I, and with the following particular features. A very small species (palpal chela length 0.45 mm), with only 2 eyes, and 6 setae on tergite 4. Chelicera and palps straw colored, other parts lighter. Epistome small, triangular. Two corneate eyes, in anterior position. Tergal chaetotaxy 4:4:4:6:6:6:6;- . Anteromedial process of coxa I without a seta near apex. Coxa II with 6 coxal spines.

Chelicera 0.85 as long as carapace. Palp as shown in Fig. 9: L/B of trochanter 1.6, femur 4.55, patella 1.7, chela 4.75; L/D of hand 1.65; movable finger L/hand L 2.1. Chelal fingers heterodont, macrodenticles of both fingers tall, sharp, microdenticles of movable finger small, triangular, those of fixed finger larger and acute; fixed finger with 14M, 13m; movable finger with 9M, 7m, 7v. Leg IV robust: L/D of femur+patella 2.4, tibia 3.6.

**Measurements** (mm). Body L 0.90. Carapace L 0.27. Chelicera L 0.235. Palp: trochanter 0.12/0.075; femur 0.295/0.065; patella 0.135/0.08; chela 0.45/0.095; hand 0.15/0.09; movable finger L 0.31. Leg IV: femur+patella 0.28/0.12; tibia 0.18/0.05.

**Etymology.** The species is named *innominatus* in recognition of the type locality, No Name Key.

**Remarks.** This is a litter-inhabiting form, found in this case close to the surface. However, it probably occurs regularly deep in the sandy soil of the coral island, as suggested by its minute size, the loss of the posterior eyes, and the pale coloration. Further, it is significant that only a single individual has been found despite intensive and extensive collecting on the Florida Keys (Peck 1989b).

The relationship of *T. innominatus* to neighboring species of *Tyrannochthonius* is obscure. It does not possess the small preocular setae found in *T. bahamensis* Muchmore (1984) and all known Caribbean species, and it lacks the small seta on the apex of the anteromedial process of coxa I as found in *T. floridensis*. It resembles *T. alabamensis* in many respects and may be a derivative of that generalized epigeal form.

**27. *Tyrannochthonius orpheus*, new species**

**Type material.** Holotype female (WM1323.01002) and allotype male (WM1323.01001) from entrance to Burwell Cave (AL 64), 1.5 km E of Jeff, Madison Co., Alabama, 24 June 1967, S. B. Peck and A. Fiske; mounted on slides, in FSCA.

**Diagnosis.** Representative of *Tyrannochthonius* as outlined in Part I, and with the following particular features. A large species (palpal chela length 1.63-1.67 mm) with slender appendages. Chelicerae and palps light brown, carapace tan, other parts lighter. Epistome small, rounded. No eyes. Tergal chaetotaxy 4:4:4:4:4:6:6;- . Coxa II with 11-13 coxal spines. Chelicera as long as carapace. Palp similar in shape to *T. pecki* (Fig. 10): L/B of trochanter

1.95, femur 6.0-6.2, patella 2.15-2.2, chela 6.3-6.5; L/D of hand 2.35-2.55; movable finger L/hand L 1.65-1.7. Chelal fingers heterodont, macrodenticles tall, sharp, microdenticles medium-sized, triangular; fixed finger with 27-28M, 21-22m; movable finger with 20-23M, 17-20m, 3-6v. Leg IV slender: L/D of femur+patella 3.1-3.2, tibia 5.6-5.75.

**Measurements** (mm). Figures given first for holotype, followed in parentheses by those for allotype. Body L 2.33 (2.39). Carapace L 0.73 (0.73). Chelicera L 0.71 (0.74). Palp: trochanter 0.385 (0.38)/0.20 (?); femur 1.15 (1.14)/0.185 (0.19); patella 0.465 (0.48)/0.215 (0.22); chela 1.63 (1.67)/0.25 (0.265); hand 0.62 (0.62)/0.245 (0.265); movable finger L 1.02 (1.04). Leg IV: femur+patella 0.96 (0.96)/0.31 (0.30); tibia 0.69 (0.67)/0.12 (0.12); basitarsus 0.31 (0.31)/0.10 (0.10); telotarsus 0.72 (0.70)/0.06 (0.06).

**Etymology.** The species is named for Orpheus, the mythical musician who visited the underworld seeking his wife.

**Remarks.** A chthoniid pseudoscorpion, *Apothonius* sp., and a chernetid pseudoscorpion, *Hesperochnes* cf. *mirabilis* (Banks), have also been reported from Burwell Cave (Peck 1989a).

## 28. *Tyrannochthonius pecki*, new species (Fig. 10)

**Type material.** Holotype female (WM874.01001) and 2 paratypes (1 female, 1 tritonymph) from Barclay Cave (AL 55), about 10 km NW of Huntsville, Madison Co., Alabama, 26 July 1965, S. B. Peck; 7 paratypes (5 female, 3 tritonymph) from same cave, 3 August 1965, 17 August 1965, 1 September 1965, 24-25 June 1967, 2 July 1967, 20 August 1967, and 22 August 1968, S. B. Peck and A. Fiske; 1 paratype female from Sinks Cave (AL 102), near Barclay Cave, 15 April 1969, W. Torode; 1 paratype female from Big Spring Cave (AL 57), Huntsville, Madison Co., Alabama, 6 October 1939, W. B. Jones; all mounted on slides, in FSCA.

**Diagnosis.** Representative of *Tyrannochthonius* as outlined in Part I, and with the following particular features. One of the largest species of the genus in Alabama (palpal chela length 1.78-2.03 mm) with quite slender appendages. Chelicerae and palps light brown, carapace tan, other parts lighter. Epistome varied in size, but generally small, rounded. No eyes. Tergal chaetotaxy 4:4:4:4-5:5-6:6:6:-. Coxa II with 11-15 coxal spines. Chelicera about equal in length to carapace. Palp as shown in Fig. 10: L/B of trochanter 1.8-2.0, femur

6.2-6.55, patella 2.15-2.4, chela 6.35-6.55; L/D of hand 2.35-2.65; movable finger L/hand L 1.5-1.65. Chelal fingers heterodont, both macro- and microdenticles relatively tall, sharp; fixed finger with 27-34M, 25-32m; movable finger with 21-25M, 19-23m, 7-11v. Leg IV quite slender: L/D of femur+patella 3.35-3.65, tibia 5.7-6.25.

**Tritonymph.** Similar to adults but smaller, paler and with less slender appendages. Tergal chaetotaxy 3-4:4:4:4:4-6:6:6:-. Coxa II with 8-11 coxal spines. Palp slender: L/B of femur 5.25-5.5, patella 1.9-2.05, chela 5.6-5.9; L/D of hand 2.15-2.4; movable finger L/hand L 1.55-1.7. Chelal fingers heterodont, both macro- and microdenticles tall, sharp. Leg IV slender: L/D of femur+patella 3.0-3.15, tibia 4.9-5.1.

**Measurements** (mm). Female (male unknown). Figures given first for holotype, followed in parentheses by ranges for the 8 paratypes. Body L 2.85 (2.25-3.05). Carapace L 0.815 (0.77-0.85). Chelicera L 0.815 (0.78-0.84). Palp: trochanter 0.43 (0.40-0.45)/0.215 (0.215-0.235); femur 1.35 (1.26-1.44)/0.21 (0.20-0.22); patella 0.55 (0.52-0.58)/0.245 (0.23-0.26); chela 1.94 (1.83-2.03)/0.295 (0.28-0.32); hand 0.74 (0.71-0.785)/0.30 (0.28-0.32); movable finger L 1.23 (1.12-1.27). Leg IV: femur+patella 1.11 (1.05-1.20)/0.32 (0.31-0.33); tibia 0.77 (0.75-0.85)/0.13 (0.125-1.15); basitarsus 0.34 (0.31-0.36)/0.105 (0.105-0.12); telotarsus 0.785 (0.785-0.92)/0.07 (0.06-0.075).

**Tritonymph.** Body L 1.64-2.00. Carapace L 0.52-0.57. Chelicera L 0.49-0.525. Palp: femur 0.75-0.82/0.14-0.16; patella 0.32-0.35/0.16-0.185; chela 1.10-1.22/0.185-0.22; hand 0.43-0.48/0.185-0.215; movable finger L/hand L 1.55-1.7. Leg IV: femur+patella 0.63-0.695/0.21-0.23; tibia 0.445-0.49/0.09-0.10.

**Etymology.** The species is named in honor of Stewart B. Peck, who collected most of the types of this species as well as of other species described in this paper.

## 29. *Tyrannochthonius pholeter*, new species

**Type material.** Holotype female (WM 1296.01001) and 5 paratypes (2 female, 3 tritonymph) from Byrd Spring Cave (AL 606), 8 km S of Huntsville, Madison Co., Alabama, 27 June 1967, S. B. Peck and A. Fiske; allotype male (WM1339.01001) and 1 paratype female from same cave, 5 July 1967, S. B. Peck and A. Fiske; mounted on slides, in FSCA.



**Diagnosis.** Representative of *Tyrannochthonius* as outlined in Part I, and with the following particular features. A large species (palpal chela length of adults 1.60-1.79 mm) with 4 setae on tergites 1-4 and usually 5 setae on tergite 5. Chelicerae light brown, palps tan, other parts pale. Epistome small, rounded. No eyes. Tergal chaetotaxy 4:4:4:4:4:6:6:6:6:-. Coxa II with 13-15 coxal spines. Chelicera about as long as carapace. Palp similar in shape to *T. pecki* (Fig. 10), but a little more robust: L/B of trochanter 1.7-1.95, femur 5.85-6.1, patella 2.1-2.25, chela 5.8-6.05; L/D of hand 2.25-2.45; movable finger L / hand L 1.5-1.6. Chelal fingers heterodont, both macro- and micro-denticles relatively tall, sharp; fixed finger with 26-31M, 2.5-2.8 m; movable finger with 23-24M, 20-23m, 5-7v. Leg IV: L/D of femur+patella 3.0-3.45, tibia 5.75-6.2.

**Tritonymph.** Similar to adults, but smaller and more robust. Coxa II with 8-10 coxal spines. Palp: L/B of femur 5.15-5.3, patella 1.85-2.1, chela 5.4-5.75; L/D of hand 2.2-2.35; movable finger L / hand L 1.5-1.6. Leg IV: L/D of femur+patella 3.05-3.15; tibia 4.5-5.0.

**Measurements (mm).** Female. Figures given first for holotype, followed in parentheses by ranges for the 3 paratypes. Body L 2.31 (2.29-2.59). Carapace L 0.70 (0.75-0.77). Chelicera 0.70 (0.74-0.78). Palp: trochanter 0.36 (0.39-0.42)/0.21 (0.215-0.22); femur 1.16 (1.22-1.25)/0.19 (0.20-0.21); patella 0.48 (0.495-0.525)/0.22 (0.23-0.245); chela 1.65 (1.70-1.79)/0.27 (0.29-0.30); hand 0.66 (0.68-0.72)/0.27 (0.29-0.30); movable finger L 1.03 (1.06-1.12). Leg IV: femur+patella 0.99 (1.03-1.07)/0.29 (0.31-0.32); tibia 0.70 (0.73-0.76)/0.12 (0.12-0.13); basitarsus 0.295 (0.31-0.33)/0.10 (0.105-0.11); telotarsus 0.75 (0.755-0.79)/0.065 (0.065).

**Allotype male.** Body L 2.44. Carapace L 0.665. Chelicera L 0.66. Palp: trochanter 0.355/0.195; femur 1.13/0.19; patella 0.48/0.215; chela 1.60/0.265; hand 0.635/0.265; movable finger L 1.00. leg IV: femur+patella 0.955/0.32; tibia 0.67/0.125; basitarsus 0.28/0.10; telotarsus 0.725/0.06.

**Tritonymph.** Body L 1.45-1.66. Carapace L 0.47-0.50. Chelicera 0.445-0.465. Palp: femur 0.69-0.73/0.13-0.14; patella 0.30-0.33/0.155-0.16; chela 1.00-1.06/0.185; hand 0.41-0.435/0.185; movable finger L 0.635-0.66. Leg IV: femur+patella 0.58-0.615/0.19-0.20; tibia 0.41-0.445/0.09.

**Etymology.** The species is called *pholeter*, a creature which lives in a cave.

### 30. *Tyrannochthonius satan*, new species

**Type material.** Holotype female (WM 1659.01001) from Honeycomb Cave (AL 36), 1 km NE of Guntersville Dam, Marshall Co., Alabama, 24 August 1968, S. B. Peck and A. Dobson; mounted on slide, in FSCA.

**Diagnosis.** Representative of *Tyrannochthonius* as outlined in Part I, and with the following particular features. A rather small species (palpal chela length 0.925 mm) with moderately slender palps. Chelicerae and palps tan, other parts pale. Epistome much reduced, only a slight bulge of the carapacial margin. No eyes. Tergal chaetotaxy 4:4:4:4:5:6:6:6:-. Coxa II with 8 or 9 coxal spines. Chelicera 0.85 as long as carapace. Palp similar in shape to *T. gnomus* (Fig. 6); L/B of trochanter 1.8, femur 5.1, patella 2.05, chela 5.55; L/D of hand 1.9; movable finger L / hand L 1.85. Chelal fingers heterodont, macrodenticles tall, triangular, microdenticles small, triangular; fixed finger with 25M, 15m; movable finger with 13M, 12m, 10v. Leg IV: L/D of femur+patella 2.75, tibia 4.5.

**Measurements (mm).** Body L 1.85. Carapace L 0.52. Chelicera L 0.44. Palp: trochanter 0.215/0.12; femur 0.635/0.125; patella 0.27/0.13; chela 0.925/0.165; hand 0.325/0.17; movable finger L 0.605. leg IV; femur+patella 0.525/0.19; tibia 0.36/0.08; basitarsus 0.18/0.06; telotarsus 0.35/0.04.

**Etymology.** The species is named for Satan, the lord of the underworld.

### 31. *Tyrannochthonius sheltae*, new species

**Type material.** Holotype male (WM 1127.01001) and paratype male from Shelta Cave (AL 4), Huntsville, Madison Co., Alabama, 24 January 1967, S. B. Peck, in FSCA; allotype female (JC-1286.01001) and paratype female from same cave, 23 June 1939, W. B. Jones, in AMNH; all mounted on slides.

**Diagnosis.** Representative of *Tyrannochthonius* as outlined in Part I, and with the following particular features. A medium-sized species (palpal chela length 0.90-1.15 mm) with moderately slender appendages; female distinctly larger than male. Chelicerae tan, palps straw-colored, carapace and other parts paler. Epistome small, rounded. No eyes. Tergal chaetotaxy 4:4:4:4:6:6:6:6:-. Coxa II with 7-10 coxal spines. Chelicera about as long as carapace. Palp similar in shape to *T. chamberlini* (Fig. 4); L/B of trochanter 1.8-2.0, femur 5.65-5.75, patella 2.1-2.15, chela 5.8-6.0; L/D

of hand 2.1-2.15; movable finger L/hand L 1.85-1.95. Chelal fingers heterodont, macrodenticles tall, sharp, microdenticles small, triangular; fixed finger with 23-24M, 15-18m; movable finger with 13-15M, 12m, 5-6v. Leg IV: L/D of femur+patella 2.8-3.0, tibia 5.0-5.25.

**Measurements** (mm). Male. Figures given first for holotype, followed in parentheses by those for paratype. Body L 1.33 (1.32). Carapace L 0.46 (0.43). Chelicera L 0.43 (0.40). Palp: trochanter 0.23 (0.21)/0.11 (0.11); femur 0.65 (0.60)/0.115 (0.105); patella 0.28 (0.26)/0.13 (0.125); chela 0.955 (0.90)/0.16 (0.155); hand 0.33 (0.325)/0.155 (0.15); movable finger L 0.64 (0.615). Leg IV: femur+patella 0.50 (0.48)/0.17 (0.17); tibia 0.35 (0.35)/0.07 (0.065); basitarsus 0.155 (0.155)/0.06 (0.05); telotarsus 0.35 (0.355)/0.045 (0.04).

**Female.** Figures given first for allotype, followed in parentheses by those for paratype. Body L 1.73 (?). Carapace L 0.54 (0.50). Chelicera L 0.525 (0.52). Palp: trochanter 0.265 (0.26)/0.15 (0.14); femur 0.80 (0.75)/0.14 (0.13); patella 0.325 (0.325)/0.155 (0.155); chela 1.13 (1.15)/0.19 (0.19); hand 0.41 (0.40)/0.19 (0.19); movable finger L 0.755 (0.76). Leg IV: femur+patella 0.615 (0.605)/0.21 (0.21); tibia 0.42 (0.41)/0.08 (0.08); basitarsus 0.21 (0.19)/0.08 (0.08); telotarsus 0.445 (0.435)/0.045 (0.045).

**Etymology.** The species is named *sheltae* for the type locality, Shelta Cave, which in turn was "named for Shelta Fuller, daughter of the owner in 1888" (Varnedoe 1973).

### 32. *Tyrannochthonius skeletonis*, new species

**Type material.** Holotype female (WM 1274.01002), allotype male (WM1274.01003), and paratype male from Out Cave entrance to Gross-Skeleton Cave (AL 224), 14.5 km SW of Scottsboro, Jackson Co., Alabama, 13 August 1969, S. B. Peck and A. Fiske; mounted on slides, in FSCA.

**Diagnosis.** A representative of *Tyrannochthonius* as outlined in Part I, and with the following particular features. A medium-sized species (palpal chela length 1.12-1.13 mm) with relatively slender palps but rather robust legs. Chelicerae and palps tan, other parts pale. Epistome small, rounded. No eyes. Tergal chaetotaxy of holotype and allotype 4:4:4:4:6:6:6:-, that of paratype 4:4:3:6:5:6:6:-. Coxa II with 10-12 coxal spines. Chelicera nearly as long as carapace. Palp similar in shape to *T. binoculatus* (Fig. 3): L/B of trochanter 1.85-1.95, femur 5.15-5.45, patella 2.1-2.2, chela 5.9-5.95; L/D of hand

2.2-2.25; movable finger L/hand L 1.72-1.74. Chela heterodont, macrodenticles tall, sharp, microdenticles small, triangular; fixed finger with 27-30M, 20-24m; movable finger with 15-16M, 14m, 9-10v. Leg IV rather robust: L/D of femur+patella 2.65-2.8, tibia 4.3-4.6.

**Measurements** (mm). Figures given first for holotype female, followed in parentheses by those for allotype male and paratype male. Body L 2.04 (1.60, 1.85). Carapace L 0.555 (0.525, 0.58). Chelicera L 0.54 (0.52, 0.53). Palp: trochanter 0.26 (0.25, 0.27)/0.14 (0.135, 0.14); femur 0.76 (0.77, 0.805)/0.15 (0.14, 0.15); patella 0.325 (0.33, 0.35)/0.155 (0.155, 0.16); chela 1.12 (1.13, 1.13)/0.19 (0.19, 0.19); hand 0.415 (0.42, 0.43)/0.19 (0.185, 0.19); movable finger L 0.72 (0.73, 0.74). Leg IV: femur+patella 0.615 (0.615, 0.66)/0.22 (0.22, 0.25); tibia 0.41 (0.46)/0.095 (0.095, 0.10); basitarsus 0.20 (0.20, 0.21)/0.075 (0.075, 0.075); telotarsus 0.42 (0.445, 0.435)/0.045 (0.045, 0.045).

**Etymology.** The species is named *skeletonis* in recognition of its being found in Gross-Skeleton Cave.

### 33. *Tyrannochthonius steevesi*, new species

**Type material.** Holotype female (UCDC #2) and allotype male (UCDC #1) from Pratt Cave, NW of Byrdstown, Pickett Co., Tennessee, 18 November 1961, H. R. Steeves, Jr.; cleared, stained, and mounted on slides by R. O. Schuster, in UCDC.

**Diagnosis.** Representative of *Tyrannochthonius* as outlined in Part I, and with the following particular features. A rather small species (palpal chela length 0.85-0.895 mm) with moderately slender palps. Color unknown due to stain. Epistome small, triangular. No eyes. Tergal chaetotaxy 4:4:4:4:6:6:6:-. Coxa II with 6-8 coxal spines. Chelicera nearly as long as carapace. Palp similar in shape to *T. gnomus* (Fig. 6): L/B of femur 5.0-5.3, patella 1.9-1.95, chela 5.25-5.65; L/D of hand 1.9-2.0; movable finger L/hand L 1.8-1.9. Chelal fingers heterodont, macrodenticles tall, sharp, microdenticles very small; fixed finger with 21-22M, 12m; movable finger with 11-13M, 10m, 10v. Leg IV: proportions not determinable.

**Measurements** (mm). Figures given first for holotype female, followed in parentheses by those for allotype male. Body L 1.55 (1.40). Carapace L 0.435 (0.42). Chelicera L 0.43 (0.40). Palpal trochanter ? (0.20)? (0.11); femur 0.59 (0.58)/0.12 (0.11); patella 0.245 (0.235)/0.13 (0.12); chela 0.895

(0.85)/0.17 (0.15); hand 0.32 (0.30)/0.17 (0.15); movable finger L 0.58 (0.57). Leg IV (not determinable).

**Etymology.** The species is named for Harrison R. Steeves, Jr., who collected the type specimens.

#### 34. *Tyrannochthonius stygius*, new species

**Type material.** Holotype female (WM1346.01001) from Reece Cave (AL 439), 6.5 km ESE of Stevenson, Jackson Co., Alabama, 3 August 1967, S. B. Peck and A. Fiske; mounted on slide, in FSCA.

**Diagnosis.** Representative of *Tyrannochthonius* as outlined in Part I, and with the following particular features. A medium-sized species (palpal chela length 1.07 mm) with moderately slender appendages. Chelicerae light brown, palps tan, other parts pale. Epistome very small, triangular. No eyes. Tergal chaetotaxy 4:4:4:4:5:4:6:6:-. Coxa II with 8 coxal spines. Chelicera 0.85 as long as carapace. Palp similar in shape to *T. diabolus* (Fig. 5): L/B of trochanter 1.9, femur 5.35, patella 1.85, chela 5.65; L/D of hand 2.0; movable finger L / hand L 1.8. Chelal fingers heterodont, macrodenticles tall, sharp, microdenticles of fixed finger better developed than those of movable finger; fixed finger with 30M, 26m; movable finger with 17M, 12m, 7v. Leg IV: L/D of femur+patella 3.05, tibia 4.7.

**Measurements** (mm). Body L 1.67. Carapace L 0.555. Chelicera L 0.48. Palp: trochanter 0.235/0.125; femur 0.725/0.135; patella 0.28/0.15; chela 1.07/0.19; hand 0.385/0.19; movable finger L 0.70. Leg IV: femur+patella 0.585/0.19; tibia 0.42/0.09; basitarsus 0.20/0.065; telotarsus 0.42/0.045.

**Etymology.** The species is named in reference to Styx, the underworld.

**Remarks.** A chthoniid pseudoscorpion, *Apochthonius* sp., has also been reported from Reece Cave (Peck 1989a).

#### 35. *Tyrannochthonius tartarus*, new species

**Type material.** Holotype female (WM 1263.01001) from Kellers Cave (AL 326), 4 km S of New Hope, Marshall Co., Alabama, 26 June 1967, S. B. Peck and A. Fiske; mounted on slide, in FSCA.

**Diagnosis.** Representative of *Tyrannochthonius* as outlined in Part I, and with the following particular features. A medium-sized species (palpal chela length 1.46 mm), with very slender appendages, and tiny microdenticles on movable finger. Chelicerae light brown, palps tan, carapace and other parts pale. Epistome small, triangular. No eyes.

Tergal chaetotaxy 4:4:4:4:4:5:6:6:-. Coxa II with 11 or 12 coxal spines. Chelicera nearly as long as carapace. Palp similar in shape to *T. pecki* (Fig. 10), but a little more slender: L/B of trochanter 1.85, femur 6.2, patella 2.2, chela 6.65; L/D of hand 2.35; movable finger L / hand L 1.9. Chelal fingers heterodont, macrodenticles tall, sharp, microdenticles small on fixed finger, obsolescent on movable finger; fixed finger with 24M, 20m; movable finger with 16M, 13m, 8v. Leg IV slender: L/D of femur+patella 3.65, tibia 5.7.

**Measurements** (mm). Body L 1.84. Carapace L 0.62. Chelicera L 0.60. Palp: trochanter 0.30/0.16; femur 0.99/0.16; patella 0.41/0.185; chela 1.46/0.22; hand 0.50/0.215; movable finger L 0.955. Leg IV: femur+patella 0.79/0.215; tibia 0.54/0.095; basitarsus 0.25/0.075; telotarsus 0.585/0.05.

**Etymology.** The species is named for Tartarus, the underworld.

**Remarks.** The neobisiid pseudoscorpion *Lissocreagris persephone* (Chamberlin) has also been reported from Kellers Cave (Peck 1989a).

#### 36. *Tyrannochthonius torodei*, new species

**Type material.** Holotype female (WM 1685.01001) from Fern Cave (AL 597), Nat Mountain, Jackson Co., Alabama, 12 December, 1968, W. Torode; mounted on slide, in FSCA.

**Diagnosis.** Representative of *Tyrannochthonius* as outlined in Part I, and with the following particular features. A medium-sized species (palpal chela length 1.21 mm) with moderately slender appendages. Chelicerae light brown, palps tan, carapace and other parts pale. Epistome not determinable (damaged). No eyes. Tergal chaetotaxy 4:4:4:4:4:6:?:?:-. Coxa II with 9 coxal spines. Chelicera 0.95 as long as carapace. Palp similar in shape to *T. diabolus* (Fig. 5): L/B of trochanter 1.7, femur 5.55, patella 1.85, chela 5.25; L/D of hand 2.05; movable finger L / hand L 1.6. Chelal fingers heterodont, macrodenticles tall, sharp, microdenticles small, pointed; fixed finger with 26M, 22m; movable finger with 19M, 18m, 6v. Leg IV slender: L/D of femur+patella 3.55, tibia 4.85.

**Measurements** (mm). Body L 1.81. Carapace L 0.55. Chelicera L 0.52. Palp: trochanter 0.27/0.16; femur 0.87/0.155; patella 0.38/0.18; chela 1.21/0.23; hand 0.47/0.23; movable finger L 0.755. Leg IV: femur+patella 0.73/0.21; tibia 0.50/0.105; basitarsus 0.25/0.08; telotarsus 0.495/0.06.

**Etymology.** The species is named for William Torode, who collected the type specimen and who

has otherwise contributed greatly to our knowledge of Alabama caves.

**Remarks.** Fern Cave (The Morgue entrance) is also the type locality of the neobisiid pseudoscorpion, *Microcreagris mortis* Muchmore (1969). That species has subsequently been placed in the genus *Lissocreagris* Curcic by Peck (1989a) (per WBM), and in *Alabamocreagris* Curcic by Curcic (1989) (see Harvey 1991).

**Key to species of *Tyrannochthonius* in the United States east of the Mississippi River**

1. A small seta near tip of anteromedial process of coxa I; epigeal, Florida and Alabama 1. *floridensis*  
— No seta on anteromedial process of coxa I ..... 2
- 2.(1) Eyes present ..... 3  
— No eyes; cavernicolous ..... 5
- 3.(2) Four distinct eyes; epigeal, Alabama .....  
..... 12. *alabamensis*  
— Two eyes ..... 4
- 4.(3) Eyes corneate; very small species, palpal chela L < 0.5 mm; epigeal, Florida Keys .....  
..... 26. *innominatus*  
— Eyes small, flat; larger species, palpal chela L 1.25 mm; Two Way Cave, Jackson Co., AL .....  
..... 15. *binoculatus*
- 5.(2) Small species, palpal chela L < 1.0 mm ..... 6  
Medium-sized species, chela L 1.0-1.5 mm ..... 12  
Large species, chela L > 1.5 mm ..... 26
- 6.(5) Tergites 1-6 with 4 setae; Gamble Cave, Marshall Co., AL ..... 22. *gnomus*  
— Tergites 1-4 with 4 setae ..... 7
- 7.(6) Larger species, palpal chela L > 0.9 mm ..... 8  
— Smaller species, palpal chela L < 0.9 mm ..... 9
- 8.(7) Appendages slender, L/B of chela 5.8-6.0; Shelta Cave, Madison Co., AL ..... 31. *sheltae*  
— Appendages more robust, L/B of chela 5.55; Honeycomb Cave, Marshall Co., AL ..... 30. *satan*
- 9.(7) Palp slender, L/B of chela 6.15; hypogean, Mammoth Cave Nat. Pk., KY ..... 24. *hypogaeus*  
— Palp less slender, L/B of chela < 5.7 ..... 10
- 10.(9) Chelal fingers long, movable finger 2.07 times as long as hand; Ingram Cave, Blount Co., AL .....  
..... 9. *parvus*  
— Chelal fingers shorter, movable finger less than 1.95 times as long as hand ..... 11
- 11.(10) Chelicera nearly as long as carapace; Pratt Cave, Pickett Co., TN ..... 33. *steevesi*  
— Chelicera 0.85-0.9 as long as carapace; Guffey Cave, Marshall Co., AL ..... 14. *barri*
- 12.(5) Tergites 1-5 with 4 setae ..... 13  
— Tergites 1-4 with 4 setae ..... 21
- 13.(12) Palp slender, L/B of chela 6.1 or greater ..... 14  
— Palp less slender, L/B of chela 5.9 or less ..... 17
- 14.(13) Epistome absent; Driftwood Cave, Jackson Co., AL ..... 17. *charon*  
— Epistome present ..... 15
- 15.(14) Microdenticles of chelal fingers well developed, sharp pointed; Cave Stand Cave, Jackson Co., AL ..... 8. *orcinus*  
— Microdenticles small ..... 16
- 16.(15) Epistome very small, rounded; Caroline Cove Cave, Franklin Co., TN ..... 21. *fiskei*  
— Epistome distinct, triangular; Kellers Cave, Marshall Co., AL ..... 35. *tartarus*
- 17.(13) Chelal fingers rather short, movable finger < 1.6 times as long as hand ..... 18  
— Chelal fingers longer, movable finger 1.7 or more times as long as hand ..... 19
- 18.(17) Smaller species, palpal chela L 1.07 mm; Bangor Cave, Blount Co., AL ..... 6. *jonesi*  
— Larger species, chela L 1.21 mm; Fern Cave, Jackson Co., AL ..... 36. *torodei*
- 19.(17) Legs slender, L/D of femur+patella IV 3.7; House of Happiness Cave, Jackson Co., AL .. 20. *felix*  
— Legs more robust, L/D of femur+patella IV 2.9 or less ..... 20
- 20.(19) Smaller species, palpal chela L 1.05 mm or less; Eudy and Line Point Caves, Marshall Co., AL .....  
..... 5. *avernicolus*  
— Larger species, chela L > 1.12 mm; Out Cave, Jackson Co., AL ..... 32. *skeletonis*
- 21.(12) Chelicera distinctly shorter than carapace .. 22  
— Chelicera as long as or longer than carapace ..... 24
- 22.(21) Smaller species, palpal chela L 1.07 mm; Reece Cave, Jackson Co., AL ..... 34. *stygius*  
— Larger species, chela L > 1.2 mm ..... 23
- 23.(22) Epistome distinct, triangular; Salt River Cave, Jackson Co., AL and Franklin Co., TN .....  
..... 23. *halopotamus*  
— Epistome very small, rounded; Indian Rock Cave, Jackson Co., AL ..... 18. *diabolus*

- 24.(21) Epistome absent; Kilgore Cave, Calhoun Co., AL ..... 16. *chamberlini*  
 — Epistome distinct ..... 25
- 25.(24) Microdenticles on chelal fingers very small; Cave Spring Cave, Morgan Co., AL ..... 4. *archeri*  
 — Microdenticles tall, sharp, especially on fixed finger; Jess Elliot Cave, Jackson Co., AL ..... 25. *infernalis*
- 26.(5) Tergites 1-7 with 4 setae; Eudy Cave, Marshall Co., AL ..... 10. *pluto*  
 — Tergites 1-6 with 4 setae; Burwell Cave, Madison Co., AL ..... 27. *orpheus*  
 — Tergites 1-5 with 4 setae ..... 27  
 — Tergites 1-4 with 4 setae ..... 30
- 27.(26) L/B of male palpal chela 6.8 or more; Cave Spring Cave, Madison Co., AL ..... 11. *tenuis*  
 — L/B of palpal chela 6.75 or less ..... 28
- 28.(27) Chelal fingers rather short, movable finger < 1.6 times as long as hand; Twin Caves, Madison Co., AL ..... 3. *aralu*  
 — Chelal fingers longer, movable finger 1.65 or more times as long as hand ..... 29
- 29.(28) Darker in color, chelicerae and palps light brown; Natural Well (cave), Madison Co., AL ..... 7. *nergal*  
 — Lighter in color, chelicerae and palps tan; Aladdin Cave, Madison Co., AL ..... 2. *aladdinensis*
- 30.(26) Palpal chela very slender, L/B in female > 7.0; Matthews Cave, Madison Co., AL ..... 13. *attenuatus*  
 — Palpal chela less slender, L/B in female 6.6 ..... 31
- 31.(30) Chelal fingers longer, movable finger 1.75 times as long as hand; Crossings and Paint Rock Caves, Jackson Co., AL ..... 19. *erebicus*  
 — Chelal fingers shorter, movable finger 1.65 or less times as long as hand ..... 32
- 32.(31) Smaller species, palpal chela length < 1.8 mm; Byrd Spring Cave, Madison Co., AL ..... 29. *pholeter*  
 — Larger species, chela length > 1.8 mm; Barclay and Sinks Caves, Madison Co., AL ..... 28. *pecki*

### Discussion

*Tyrannochthonius alabamensis*, rather than *T. floridensis*, appears to represent the ancestral epigean form from which the cave adapted species have developed. It, together with the cavernicolous species, lacks both the small seta on the anteromedial process of coxa I (found regularly in *T. floridensis*) and the preocular, dwarf setae on the carapace

(found regularly in Caribbean species of the genus and often in *T. floridensis*).

As Chamberlin and Malcolm (1960) pointed out clearly, cavernicolous species are usually much larger and have more attenuated palps than epigean species of the same genus. This observation is generally borne out in the present study, though the differences between cave and litter dwelling forms is not always so great as they imply by their figure 1 (1A and 1B represent *T. floridensis* and *T. aladdinensis*, respectively). As an example, *T. parvus* is only about the same size and proportions as *T. alabamensis*, while *T. pecki* is a real giant, with much more slender palps in comparison to *T. alabamensis*.

The development of numerous species of *Tyrannochthonius* in caves in the southeastern United States is similar to the radiations of the genera *Chthonius* C. L. Koch and *Neobisium* Chamberlin in caves of southern Europe and of *Kleptochthonius* Chamberlin in southeastern United States (see Beier 1963, Barr and Holsinger 1985, Harvey 1991). After troglomorphic species have colonized caves, they have been isolated somehow from surface populations and have adapted to the subterranean environment, independently and uniquely in each cave or cave group. In a rich karst area such as the eastern Mississippian Plateau in northern Alabama, this has resulted in a multitude of species, each in its own small territory. (For an up-to-date discussion of adaptation and evolutionary biology of cave animals, see Culver et al. 1995).

*Tyrannochthonius* is the predominant genus of troglitic pseudoscorpions in caves of northern Alabama, where at least 30 species are known to occur. A few other pseudoscorpion genera are represented here, also, but with relatively few known species, namely: *Lissocreagris* Curcic with 6 species, *Apochothonius* Chamberlin and *Aphrastochthonius* Chamberlin, each with 2 species, and *Hesperochernes* Chamberlin with a single species.

It is interesting to compare the distributions of the genera *Tyrannochthonius* and *Kleptochthonius* in the southeastern United States. Troglitic species of *Tyrannochthonius* and *Kleptochthonius* (subgenus *Chamberlinochthonius* Vachon) appear to be mutually exclusive. The former is concentrated in northeastern Alabama, with 2 species just over the border in southern Tennessee and 2 distant outliers in northern Tennessee and central Kentucky; no epigean form is known north of Alabama. On the other hand, *Kleptochthonius* has not been found in any cave in Alabama (Peck 1989a);

personal records), though it is the most common cavernicolous genus in Tennessee, Kentucky, Virginia, and West Virginia, and epigeal species occur in Alabama as well as the surrounding states (Hoff 1958; Harvey 1991). The nearest known cavernicolous *Kleptochthonius* are in Dry Cave, Franklin County, Tennessee (Muchmore 1966) and in Johnson Crook Cave, Dade County, Georgia, and Mt. Cove Farm Cave, Walker County, Georgia (unpublished records); the former location is about 25 km NNE of Caroline Cove Cave, type locality of *T. fiskei*, the northernmost representative of the main body of *Tyrannochthonius*; the latter are some 25-30 km SE of Reece Cave, type locality of *T. stygius*, the easternmost of the Alabama species of *Tyrannochthonius*. Apparently, each has a competitive advantage over the other in its own territory, although each occasionally lives together with (in the same cave as) representatives of other genera.

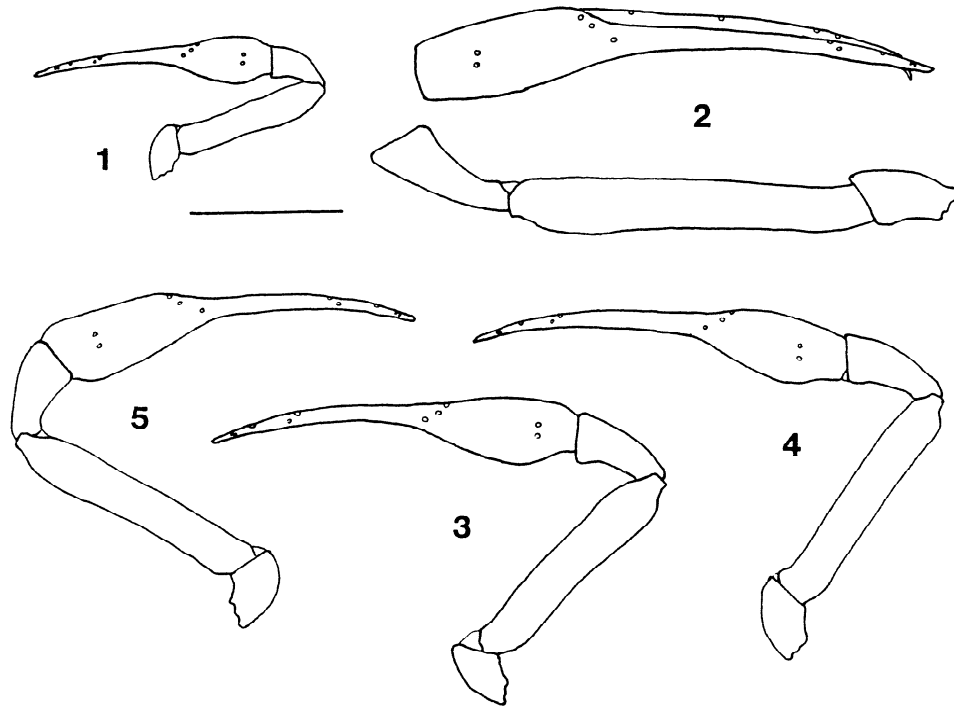
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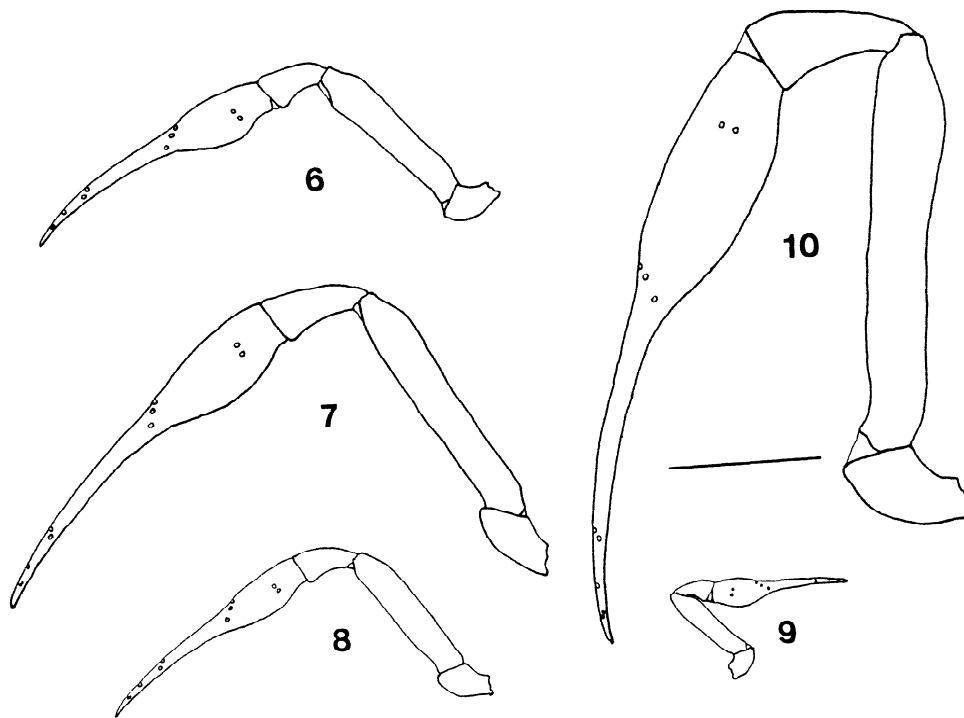
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*Corrigendum* for Part I (Muchmore and Chamberlin 1995: 185). In Figure 10, the 3 trichobothria shown on the medial side of the base of the fixed chelal finger should be directly opposite, on the lateral side of the finger, as for the other species illustrated.



Figures 1-5: Outlines of palps, dorsal views. 1. *Tyrannochthonius alabamensis*. 2. *T. attenuatus*. 3. *T. binoculatus*. 4. *T. chamberlini*. 5. *T. diabolus*. All drawn to same scale; line = 0.5 mm.



**Figures 6-10:** Outlines of palps, dorsal views. 6. *Tyrannochthonius gnomus*. 7. *T. halopotamus*. 8. *T. hypogeus*. 9. *T. innominatus*. 10. *T. pecki*. All drawn to same scale; line = 0.5 mm.