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# OBSERVATIONS ON THE KALLIAPSEUDID TANAIIDACEA (CRUSTACEA: MALACOSTRACA: PERACARIDA) FROM THE NORTHWESTERN ATLANTIC, WITH AN ILLUSTRATED KEY TO THE SPECIES

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**ABSTRACT:** New information for the kalliapseudid Tanaidacea occurring in the northwestern Atlantic is presented and discussed, including data on range extensions and new depth ranges for 4 species. The taxa studied came from the shelf and coastal waters of the southeastern United States, Puerto Rico and Trinidad. The occurrence of *Mesokalliapseudes bahamensis* Sieg is extended from the Bahamas and Belize to the coastal waters of East and Gulf coasts (South Carolina to West Florida). The range of *Psammokalliapseudes granulatus* Brum is expanded northward into the eastern Gulf of Mexico and new locality records for this species are established for Tobago and Puerto Rico. *Mesokalliapseudes brasiliensis* (Băcescu), previously known from the southwestern Atlantic off Brazil, is reported from the coastal waters off Trinidad. The range of *Tanapseudes gutui* Hansknecht, Heard, and Bamber is expanded northward into the eastern Gulf of Mexico. New depth ranges are established for *Alokalliapseudes macsweenyi* (Drumm) (82 m), *M. bahamensis* (52 m), *P. granulatus* (53 m), and *T. gutui* (82 m). An offshore form of *A. macsweenyi* occurs at depths ranging from 10-82 m on the inner and mid continental shelf off the west coast of Florida (Gulf of Mexico); it differs from the coastal form by the shape and dentition of the male and female chelipeds. Synonymies, diagnoses, life history remarks, and an illustrated key to the seven kalliapseudid species known from the NW Atlantic are presented.

## INTRODUCTION

Currently 41 species representing 12 genera and 3 subfamilies comprise members of the tanaidacean family Kalliapseudidae Lang, 1956 (Anderson 2009, Drumm et al. 2009). Kalliapseudids are distributed throughout the world's tropical, subtropical, and temperate coastal waters and with few known exceptions, are restricted to depths of less than 200 m (D.T. Drumm, pers. obser.). Within estuarine and shelf waters of the north Atlantic region the family is presently comprised of 6 nominal species contained in 4 genera and 2 subfamilies.

In an unpublished master's thesis, McSweeney (1968) presented the first well-documented discovery for a kalliapseudid from the NW Atlantic. His detailed and well-illustrated description for "*Kalliapseudes* sp. A" [now *Alokalliapseudes macsweenyi* (Drumm, 2003)] was based on specimens from southeastern Florida. The report of Gardiner (1973) for *Cirratodactylus floridensis* Gardiner, 1973 (now *Psammokalliapseudes granulatus* Brum, 1973) represents the first published record for the family from the region. Since then, descriptions and records for 4 additional kalliapseudids, *Mesokalliapseudes bahamensis* Sieg, 1982, *M. soniadaunae* Bamber, 1993, *M. thalasispeleus* Guțu, 2006; and *Tanapseudes gutui* Hansknecht, Heard and Bamber, 2002 from the northwestern Atlantic region have been published.

This report deals with a review and the presentation of new information on the occurrence of members of the family Kalliapseudidae from the northwestern Atlantic. Besides new range and locality records, we present diagnoses, synon-

ymies, an illustrated key, and remarks on the life histories, ecology and taxonomy for the kalliapseudid species known to occur in the northwest Atlantic region. The information presented here will be invaluable to future studies on the ecology, biogeography and phylogeography of the Kalliapseudidae. This paper was borne partly out of the senior author's dissertation on the systematic revision of the tanaidacean family Kalliapseudidae.

## MATERIALS AND METHODS

The total length (TL) of specimens was measured from the tip of the rostrum to the tip of the pleotelson. Material from the Mississippi-Alabama-Florida Outer Continental Shelf Study (MAFLA) has been retained at the Gulf Coast Research Laboratory (GCRL) Museum, Ocean Springs, MS, USA. Morphological terminology follows Larsen (2003). Synonymies of described species, including references to pages and figures in original descriptions, are listed immediately underneath each species.

Abbreviations for museums, institutions and research programs used: GCRL, Gulf Coast Research Laboratory; MAFLA, Mississippi-Alabama-Florida Outer Continental Shelf Study; MHN, Museum National d'Histoire Naturelle, Grigore Antipa, Romania; MZUSP, Museu de Zoologia, Universidade de São Paulo; NHM, Natural History Museum, London, UK; NMW, National Museum of Wales, Cardiff, UK; SCDNR, South Carolina Department of Natural Resources; SERTC, Southeastern Regional Taxonomic

Laboratory, Charleston South Carolina; USNM: National Museum of Natural History, Smithsonian Institution, Washington DC, USA; ZMK: Zoologisches Museum der Christian-Albrechts-Universität, Kiel, Germany.

## RESULTS AND DISCUSSION

### Systematics

SUBORDER APSEUDOMORPHA SIEG, 1980

FAMILY KALLIAPSEUDIDAE LANG, 1956

SUBFAMILY KALLIAPSEUDINAE LANG, 1956

GENUS ALOKALLIAPSEUDES GUȚU, 2006

*Mesokalliapseudes* Lang, 1956 (in part)

**Revised Diagnosis:** Antenna third article with ventromedial smooth and blunt triangular projection; last peduncle article lacking double row of plumose setae. Mandibular palp terminally with setulate seta shorter than others. Cheliped sexually dimorphic (male propodus more robust and with differing cutting edge dentition compared to female); exopodite absent. Pereopod 1 lacking exopodite. Pereopods 2 and 3 dactylus with thin, proximal digitiform prolongation ending in sensory setae; unguis absent. Pereopods 4 and 5 dactylus short and terminating in tuft of sensory setae; unguis absent. Pereopod 6 dactylus sexually dimorphic (longer in males) and with one subterminal seta. Pleopod exopodite biarticulate. Pleotelson with two terminal long plumose setae. Uropod exopodite with one small round basal article and two larger distal articles.

**Remarks:** Guțu (2006) elevated all four of Lang's (1956) kalliapseudid subgenera to full generic rank and erected the monotypic genus *Alokalliapseudes* to receive *Kalliapseudes* (*Mesokalliapseudes*) *macsweenyi* Drumm, 2003. Guțu (2006) distinguished *Alokalliapseudes* from *Mesokalliapseudes* primarily by the presence of sexually dimorphic chelipeds. The generic status of *Alokalliapseudes* is presently being reevaluated by one of us (DTD) using both morphological and molecular criteria.

*ALOKALLIAPSEUDES MACSWEENYI* (DRUMM, 2003) (Figures 1-3, 14B, D, E)

*Kalliapseudes* (*Mesokalliapseudes*) *macsweenyi* Drumm 2003: 1-12, figures 1-5

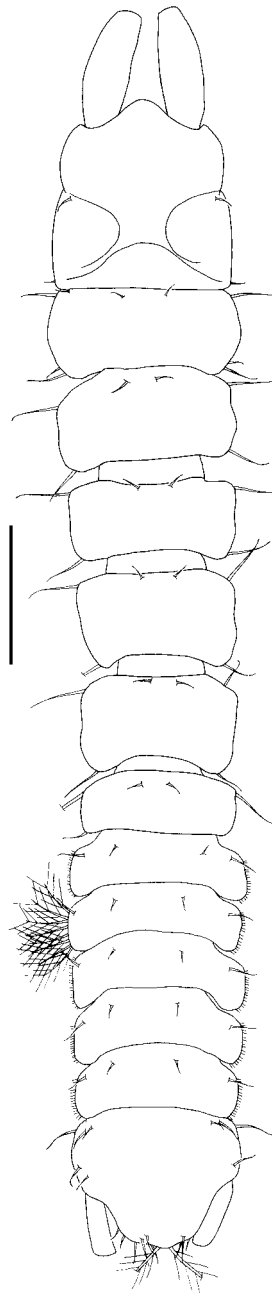
*Kalliapseudes macsweenyi*: Drumm 2004: 137; 2005:203.

*Alokalliapseudes macsweenyi* Guțu 2006: 159, figures 253-261

*Kalliapseudes* sp. A McSweeny 1968: 28-40, figures 1-7.

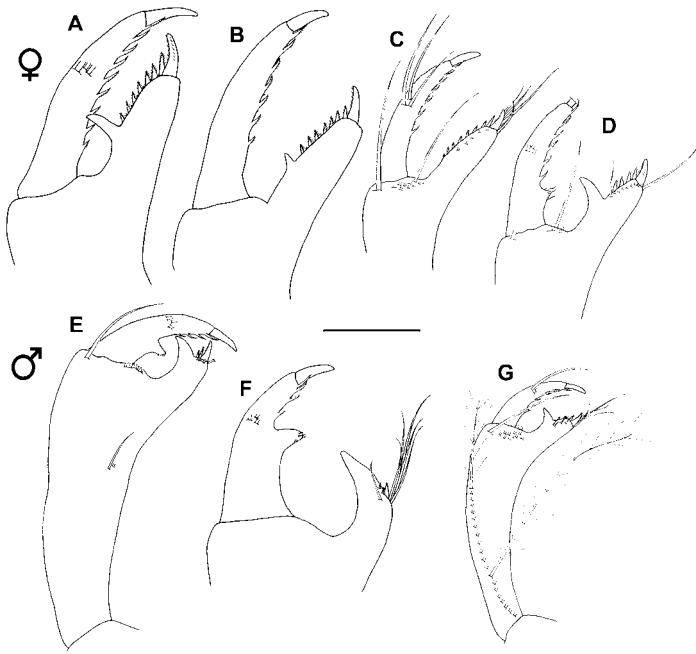
**Diagnosis:** Fully diagnosed and described by Drumm (2003).

**Material Examined:** Coastal and near shore sites; Paratypes (USNM 1016974, 5 females and 5 males), NW Atlantic, John U. Lloyd State Park, Whiskey Creek, Dania Beach, FL, tidal creek draining mangrove habitat running parallel to beach, 26°05'N, 80°06'W, 0.5 m depth; 3 males and 2 females (USNM 107021), Alligator Harbor, Franklin



**Figure 1.** *Alokalliapseudes macsweenyi* 'offshore morph,' dorsal view of adult male (lateral pleonite setae mostly shown only by their bases). Scale bar = 0.5 mm.

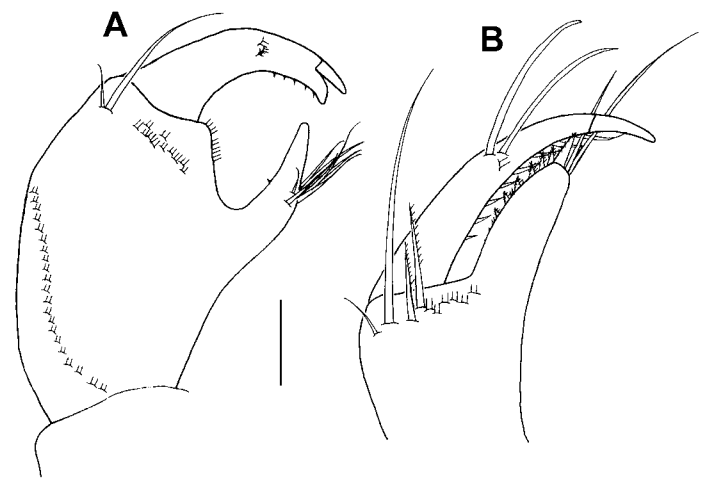
County, FL, littoral sand-mud bar, 6 June, 1960, coll. & ident. C.E. King; several adult males and females were examined in the following locations: Ft. Pierce, FL, 27°30'N, 80°20'W; Long Key, FL, 24°49'N, 80°48'W; Tampa Bay, FL, 27°37.9'N, 82°39.4'W; Panama City, FL, 30°09'N, 85°41'W; Horn Island, MS, 30°15'N, 88°43'W; Petit Bois Island, MS, 30°12'N, 88°25'W. Off shore sites (all from the MAFLA); Adult female with oostegites, Station 2747, 27°24.2'N, 84°07.3'W, 74 m, medium fine sand, September 1977; adult male, station 2211, 27°56'29.5"N, 83°52'59.5"W, 43 m, coarse sand, February 1978; 2 adult females and 1 adult male (4.2 mm TL), station 2640, 29°43'29.3"N, 87°54'30.3"W, 35 m, medium sand, September 1977; 2 adult females and 2 adult males, station 2104-05, 26°25'N, 83°23'00.8"W, 53 m, coarse sand, November 1977; 1 male, 1 female, 2 juveniles, station 2104-06, 26°25'N, 83°23'00.8"W, 53 m, coarse sand, November 1977; 2 males, station 2104-07, 26°25'N, 83°23'00.8"W, 53 m, coarse sand, November 1977; 1 female, 4 males, 3 juveniles, station 2104-08, 26°25'N, 83°23'00.8"W, 53 m, coarse sand, November 1977; 6 females, 1 juvenile, station 2104-10, 26°25'N, 83°23'00.8"W, 53 m, coarse sand, November 1977; 2 females with oostegites, station 2104-11, 26°25'N, 83°23'00.8"W, 53 m, coarse sand, November 1977; 1 male, station 2104-G, 26°25'N, 83°23'00.8"W, 53 m, coarse sand, September 1975; 1 female with oostegites, 1 juvenile, station 2207-3, 27°57'00.4"N, 83°09'00.3"W, 19 m, fine-very fine sand, November 1977; 2 females, station 2207-05, 27°57'00.4"N, 83°09'00.3"W,



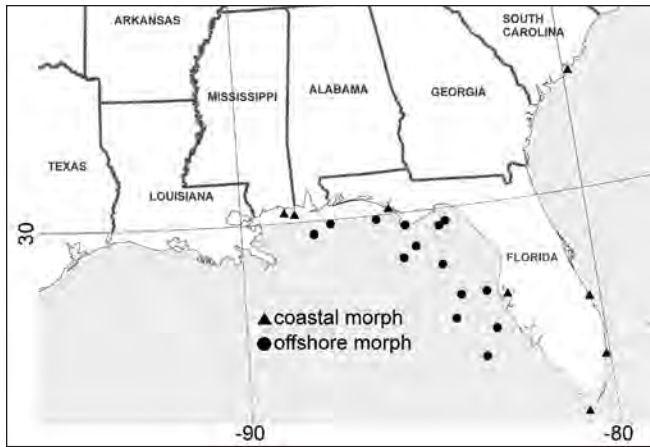
**Figure 2.** Chelipeds of *Alokallipseudes macsweenyi* 'offshore morph' A-C. Female with oostegites. D. Ovigerous female. E, F. Adult male. G. Subadult male. Scale bar = 0.2 mm.

19 m, fine-very fine sand, November 1977; 4 juveniles, station 2207-07, 27°57'00.4"N, 83°09'00.3"W, 19 m, fine-very fine sand, November 1977; 2 males, station 2207-10, 27°57'00.4"N, 83°09'00.3"W, 19 m, fine-very fine sand, November 1977; 1 juvenile, station 2207-11, 27°57'00.4"N, 83°09'00.3"W, 19 m, fine-very fine sand, November 1977; 1 ovigerous female, station 2211-08, 27°56'29.5"N, 83°52'59.5"W, 43 m, coarse sand, February 1978; 1 female with oostegites, station 2316-J, 28°42'00.3"N, 84°20'00.7"W, 35 m, silty fine sand, November 1977; 1 female with oostegites, 1 female with emptied marsupium, 1 male, 3 juveniles, station 2419-C, 29°46'59.8"N, 84°05'00.2"W, 10 m, medium fine sand; 1 female with oostegites, station 2419-D, 29°46'59.8"N, 84°05'00.2"W, 10 m, medium fine sand, February 1975; 2 females, 1 male, 1 juvenile, station 2419-E, 29°46'59.8"N, 84°05'00.2"W, 10 m, medium fine sand, February 1975; 1 female with oostegites, 3 males, 1 juvenile, station 2419-F, 29°46'59.8"N, 84°05'00.2"W, 10 m, medium fine sand, February 1975; 1 ovigerous female, station 2419-Z, 29°46'59.8"N, 84°05'00.2"W, 10 m, medium fine sand, February 1975; 1 ovigerous female, station 2423-A, 29°37'00.8"N, 84°17'00.2"W, 19 m, silty fine sand, 1975; 1 male, station 2423-F, 29°37'00.8"N, 84°17'00.2"W, 19 m, silty fine sand, September 1977; 1 female with oostegites, 1 male, station 2423-G, 29°37'00.8"N, 84°17'00.2"W, 19 m, silty fine sand, February 1975; 1 male, station 2423-H, 29°37'00.8"N, 84°17'00.2"W, 19 m, silty fine sand, 1976; 1 male, 1 juvenile, station 2423-I, 29°37'00.8"N, 84°17'00.2"W, 19 m, silty fine sand, February, 1975; 1 juvenile, station 2423-K, 29°37'00.8"N, 84°17'00.2"W, 19

m, silty fine sand; 1 female with oostegites, station 2424-B, 29°13'00.7"N, 85°00'01.4"W, 27 m, medium sand, 1976; 1 female, station 2424-I, 29°13'00.7"N, 85°00'01.4"W, 27 m, medium sand, February 1975; 1 male, station 2426-E, 28°57'59.4"N, 85°23'00.2"W, 82 m, fine sand, 1975; 2 females with oostegites, station 2528-C, 29°54'58.6"N, 86°04'58.5"W, 37 m, coarse sand; 1 female with oostegites, 1 male, station 2528-J, 29°54'58.6"N, 86°04'58.5"W, 37 m, coarse sand, February 1978; 1 male, station 2533-C, 29°42'59.9"N, 85°15'28.6"W, 67 m, coarse sand; 1 female with oostegites, station 2642-E, 29°40.5'N, 87°37'W, 36 m, medium sand; 2 females, 2 juveniles, station 2747-10, 27°24.2'N, 84°07.3'W, 74 m, medium fine sand, August 1977; 4 males, 2 juveniles, 1 manca, 27°24.2'N, 84°07.3'W, 74 m, medium fine sand, August 1977; 2 females, station 2748-03, 27°37.2'N, 83°53.5'W, 50 m, coarse sand, November 1977; 1 female with oostegites, 1 male, station 2748-05, 27°37.2'N, 83°53.5'W, 50 m, coarse sand, August 1977; 1 female, 1 male, 1 juvenile, station 2748-06, 27°37.2'N, 83°53.5'W, 50 m, coarse sand, August 1977; 1 female with oostegites, 1 male, station 2748-06, 27°37.2'N, 83°53.5'W, 50 m, coarse sand February, 1978; 2 juveniles, station 2748-06, 27°37.2'N, 83°53.5'W, 50 m, coarse sand, November 1978; 1 female, station 2748-07, 27°37.2'N, 83°53.5'W, 50 m, coarse sand, August 1977; 1 male, station 2748-07, 27°37.2'N, 83°53.5'W, 50 m, coarse sand, November 1977; 1 female, station 2748-09, 27°37.2'N, 83°53.5'W, 50 m, coarse sand, November 1977; 1 female with oostegites, 2 males, station 2748-11, 27°37.2'N, 83°53.5'W, 50 m, coarse sand, November 1977; 1 ovigerous female, station 2851, 27°03'25.8"N, 83°01'08.5"W, 36 m, fine sand; 1 male, station 2856-E, 29°54'01.3"N, 87°24'00.2"W, 30 m, fine sand; 1 subadult male, station 2856-F, 29°54'01.3"N, 87°24'00.2"W, 30 m, fine sand, September 1977; 1 male, sta-



**Figure 3.** Chelipeds of *Alokallipseudes macsweenyi* 'coastal morph' from Ft. Morgan, Alabama. A. Adult male. B. Female with oostegites. Scale bar = 0.2 mm.



**Figure 4.** Map showing the distribution of *Alokalliapseudes macsweenyi*. Black circles represent the 'offshore morph' and triangles indicate the 'coastal morph.'

tion 2856-H, 29°54'01.3"N, 87°24'00.2"W, 30 m, fine sand, September, 1977; 1 male, 1 juvenile, station 2856-J, 29°54'01.3"N, 87°24'00.2"W, 30 m, fine sand, September 1977.

**Geographic distribution:** NW Atlantic (South Carolina to Florida Keys), eastern Gulf of Mexico (GOM) (northward to coastal Mississippi), bathymetric range: 0.5–82 m (Figure 4).

**Remarks:** The 'offshore morph' of *A. macsweenyi* can be distinguished from the 'coastal morph' most notably by differences in the male cheliped. The propodus of the male cheliped for the 'coastal morph' (Figure 3A) is much more robust and is short (less than 2 times as long as broad, excluding fixed finger), while the propodus of the 'offshore morph' is long (more than 2 times as long as broad) (Figure 2E). The dactylus cutting edge of the 'coastal morph' does not have a medial tooth as in adult males of the 'offshore morph.' The terminal claw of the fixed finger of the propodus in the 'offshore morph' can either be of regular size (Figure 2E) or reduced (Figure 2F). Subadult males have a propodus shape similar to females (Figure 2G).

The females of both forms are nearly identical; however, the fixed finger cutting edge of the 'coastal morph' (Figure 3B) has rarely been observed to possess a proximal tooth. This tooth can be large (Figure 2A), or small (Figure 2B) in the 'offshore morph.' However, several of the females examined, especially ovigerous females, lacked this tooth (Figure 2C). One 'offshore morph' female with oostegites had a small setose tooth on the dactylus cutting edge (Figure 2D).

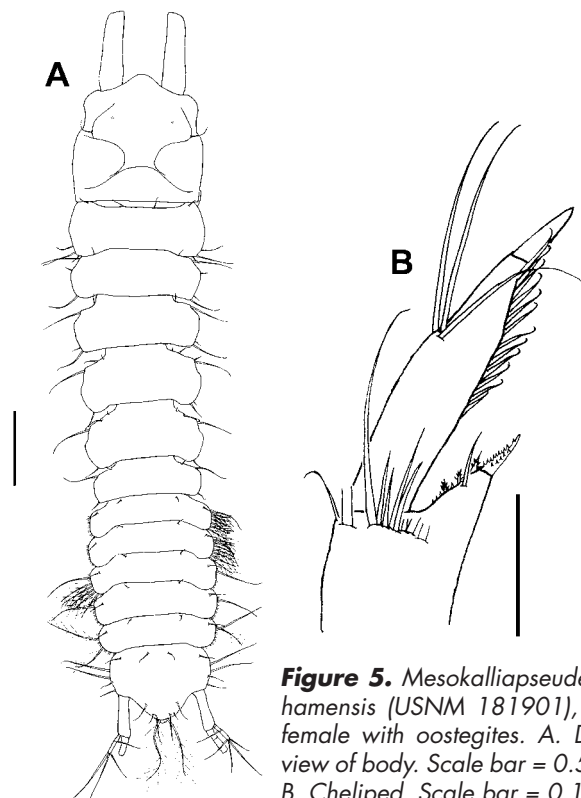
Examination of material from the eastern GOM revealed the presence of a new 'morph' of *Alokalliapseudes macsweenyi*, which generally occurred in offshore sites and greater depths than the inshore 'coastal morph'. The morphs can generally be distinguished by differences in the cheliped. McSweeney (1968) in an unpublished MS thesis noticed that a small percentage of females of *A. macsweenyi* collected in

the Biscayne Bay area of South Florida had a small tooth proximally on the fixed finger cutting edge. However, the senior author has examined numerous specimens of the 'coastal morph' throughout its range and has never seen this tooth on the fixed finger. Since both forms of the female cheliped are apparently represented in offshore and coastal habitats, we are hesitant to call the 'offshore morph' a separate species (although one form is much more common in one region than the other, and vice versa). It is often difficult to quantify variation within a species, hence the reason many biologists are skeptical about the subspecies category. Whether one agrees with subspecies or full species status, it is clear that the 'offshore morph' is distinct enough to suggest specific separation from the 'coastal morph.' It would be interesting to determine whether these phenotypic differences are associated with genetic isolation. This species might be diverging and undergoing incipient speciation. The present pattern suggests that selection is favoring one form over the other in different habitats. The pattern of the adult male cheliped of the 'offshore morph' could be attributed to paedomorphosis (the retention of juvenile characteristics in the adult) because the juvenile males of the 'coastal morph' have a slender cheliped propodus as seen in the adult males of the 'offshore morph.' This warrants further investigation.

GENUS *MESOKALLIAPSEUDES* LANG, 1956

*Kalliapseudes* (*Mesokalliapseudes*) Lang 1956: 216.

*Mesokalliapseudes*: Guțu 2006: 142.



**Figure 5.** *Mesokalliapseudes bahamensis* (USNM 181901), adult female with oostegites. A. Dorsal view of body. Scale bar = 0.5 mm. B. Cheliped. Scale bar = 0.1 mm.

*Diagnosis* (modified after Guțu 2006): Accessory flagellum of antennule with 3 or 4 articles. Antenna peduncle without double row of plumose setae on last article. Cheliped without exopodite; propodus slender and very long, much longer than carpus, fixed finger shorter than dactylus. Pereopod 1 without exopodite. Pereopods 2 and 3 dactylus with long and thin outer proximal digitiform prolongation, with few sensory setae. Pereopods 4 and 5 short and thick with some sensory setae; unguis absent. Pereopod 6 dactylus with subterminal seta. Pleopod exopodite biarticulate. Pleotelson with two terminal long plumose setae. Male with cheliped similar to female.

*Remarks*: The distribution of this genus occurs exclusively in the New World. Four of the 6 species occur in the northwest Atlantic and the other 2 occur in the northeast Pacific (on the west coast of Baja California, Mexico). *Mesokalliapseudes* is characterized from the other genera within the subfamily Kalliapseudinae by the following combination of characters: 1) last peduncle article of antenna lacking double-row of plumose setae, 2) male and female cheliped with very long and slender propodus and with an apparent lack of sexual dimorphism, and 3) absence of exopodites on the cheliped and first pereopod.

*MESOKALLIAPSEUDES BAHAMENSIS* SIEG, 1982 (Figures 5, 14A, C, G, I)

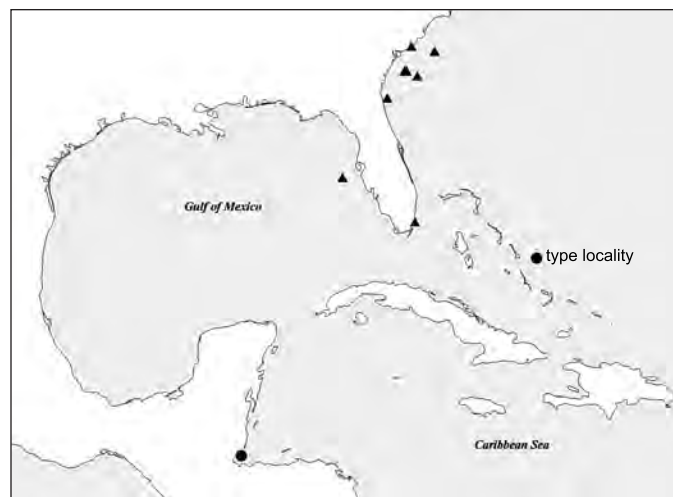
*Kalliapseudes* (*Mesokalliapseudes*) *bahamensis* Sieg 1982: 3–10, figures 1–4; Bamber 1993: 122; Drumm 2003: 2, 11.

*Kalliapseudes bahamensis* Bamber 1993: 128–130, figure 5.

*Mesokalliapseudes bahamensis* Guțu 2006: 142, 148, 150, 151, figures 232–235.

*Type material*: Holotype female (USNM 181707), paratypes (93 juveniles and 69 females, USNM 181901), paratypes (17 juveniles and 14 females, ZMK Tan. 40).

*Material examined*: Paratypes (USNM 181901), San Salvador, Bahamas, inside NW reef, near Dump Reef, 24°08'N, 74°28'W 4 m, 18 December 1979; Kiawah Island, SC, 32°29'6"N, 78°49'18"W, S121, SERTC Invert. Collection, SCDNR, 52.0 m, coll. David Knott, 6 August 1981, 1 ovigerous female (dissected) ~ 6.5 mm, 3 females with emptied marsupium, 3 females with oostegites, 3 subadult females and 1 subadult male; offshore disposal area, Charleston, SC, 32°42'30"N, 79°51'36"W, S98, SERTC Invert. Collection, SCDNR, 8–17 m, coll. David Knott, August 1978, 1 subadult female; off Savannah River, GA, 31°44'6"N, 80°13'0.1"W, S116, SERTC Invert. Collection, SCDNR, 33 m, coll. David Knott, 21 August 1980, 1 female with emptied marsupium and 1 subadult male; off Little Tybee Island, GA, 31°41'6"N, 80°20'48"W, S119, SERTC Invert. Collection, SCDNR, 28 m, coll. David Knott, 10 March 1981, 1 subadult male; off Amelia Island, FL, 30°37'00.12"N, 81°10'41.8"W, S117, SERTC Invert. Collection, SCDNR, 22 m, coll. David Knott, 4 August 1980, 4 subadult males ~ 3.7 mm. 1 adult female; GOM, 27°37'2"N, 83°53'5"W,



**Figure 6.** Map showing the distribution of *Kalliapseudes bahamensis*. Black circles represent previously published records and triangles indicate new distribution locations.

MAFLA, 50 m, 9 August 1977.

*Diagnosis*: (Adult) Rostrum rounded. Pereonites without anterolateral apophyses. Pleotelson broader than long. Third peduncle article of antenna spinulate. Mandibular palp terminally with simple seta. Fixed finger of propodus of cheliped less than one half length of dactylus; cutting edge of dactylus with more than 10 long setae increasing in length distally.

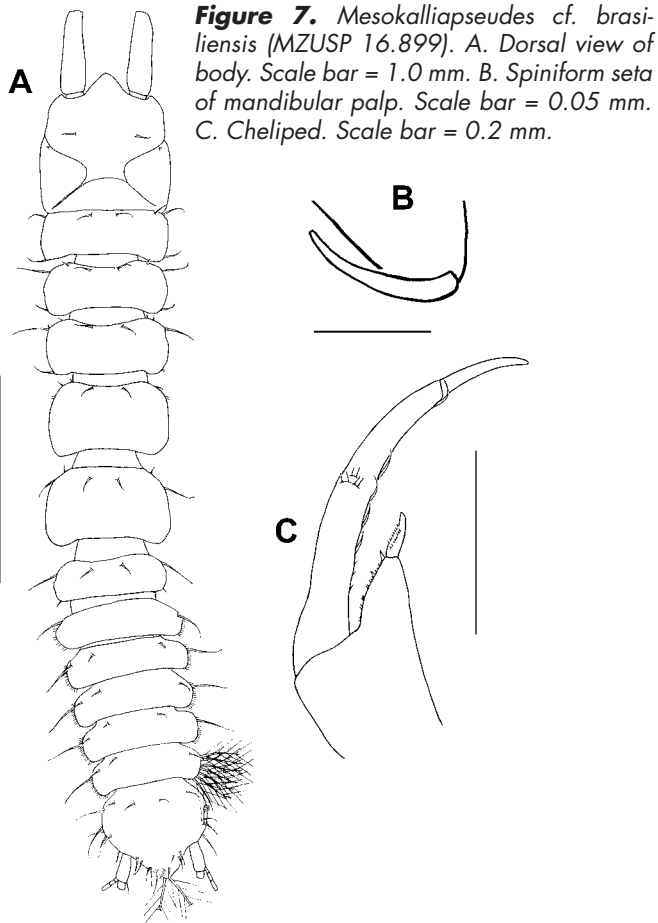
*Type locality*: San Salvador, Bahamas, inside NW reef, near Dump Reef, 24°08'N, 74°28'W (Figure 6).

*Geographic distribution*: NW Atlantic and Gulf of Mexico, from South Carolina to southeast Florida (new locality records), San Salvador Bahamas, Caribbean Sea (Carrie Bow Cay, Belize), bathymetric range: 4–52 m (Figure 6).

*Remarks*: Examination of material from the collections of SERTC confirmed the presence of *M. bahamensis* in the coastal and shelf waters off South Carolina, Georgia, and northeastern Florida. Additional specimens of this species were also made available by Judy Johnson, Nova Southeast University, from shallow water collections made off Ft. Lauderdale on the southeastern coast of Florida. The only major difference found between the SE Florida specimens and those from further north was the larger size of the former (1 ovigerous female from South Carolina was 6.5 mm). Guțu (2006) reported this species off Carrie Bow Cay, Belize which extended its range into the northwestern Caribbean Sea. Examination of material from MAFLA also revealed the presence of *M. bahamensis* at a depth of 50 m, which extends its range into the GOM.

This species can be distinguished from its congeners by its distinct armature of the female cheliped (Figure 5B) and the absence of anterolateral apophyses on the pereonites (Figure 5A).

*MESOKALLIAPSEUDES BRASILIENSIS* (BĂCESCU, 1986) (Figure 7)



**Figure 7.** *Mesokalliapseudes* cf. *brasiliensis* (MZUSP 16.899). A. Dorsal view of body. Scale bar = 1.0 mm. B. Spiniform seta of mandibular palp. Scale bar = 0.05 mm. C. Cheliped. Scale bar = 0.2 mm.

*Kalliapseudes viridis brasiliensis*: Băcescu 1986: 93, 95, 96, figure 2.

*Kalliapseudes* (*Mesokalliapseudes*) *viridis brasiliensis*: Guțu 2006: 142.

*Mesokalliapseudes brasiliensis*: Guțu 2006: 142; Drumm and Heard 2007: 459, 467.

*Type material*:. Holotype female (MHN Grigore Antipa No. 695).

*Material examined*: 7 adult males, 9 females with oostegites and 4 ovigerous females (MZUSP 16.899), Brazil, 23°36'S, 44°46'W, 48 m depth; 5 females with oostegites (1 partly dissected), 3 females with emptied marsupium, 5 adult males (1 partly dissected), Trinidad, sta. 5–1, coll. August 2003.

*Diagnosis*: Rostrum round, tapering anteriorly. Pereonites lacking anterolateral apophyses. Pleotelson broader than long. Inner flagellum of antennule with three articles; first peduncle article about 3.3 times as long as broad. Third article of antenna without distinctive spinulate process. Terminal spiniform seta of mandibular palp naked and stout, approximately seven times as long as broad. Fixed finger of the propodus of cheliped less than one half the length of dactylus. Cutting edge of the dactylus of cheliped with 3 or 4 setae midway and one distal seta near unguis. Pereopod 6 dactylus with one subterminal seta. Last article of uropod exopodite approximately 1.6 times as long as second article.

*Type locality*: East of Port of Tubarão, Brazil, 20°15.5'S, 40°05.3'W, 29 m depth (Figure 8).

*Geographic distribution*: SW Atlantic (Brazil) and NW Atlantic (Trinidad), bathymetric range: 29–48 m (Figure 8).

*Remarks*: Examination of new material extends the range of this species in the northwest Atlantic off Trinidad. *Mesokalliapseudes brasiliensis* was originally considered a subspecies of *M. viridis* (Băcescu 1986); subsequently, Guțu (2006) considered it a valid species based on the different geographical distributions of the species but recognized the very scant original description. Băcescu (1986) described this species as lacking lateral plumose setae on the pleonites, but Guțu (pers. comm., Bucharest “Grigore Antipa” Natural History Museum, Romania) examined the type material and confirmed the presence of plumose setae. Guțu (pers. comm.) compared the type specimen to our illustrations and noted only 2 differences: 1) the number of ventral spiniform setae on the pereopod 1 propodus (3 in our specimen and 2 in the type specimen) and 2) the number of spiniform setae on the pereopod 6 dactylus (2 or 3 in our specimens and 4 in the type specimen). These characters have been shown to vary within species (one ovigerous female we examined had 4 spiniform setae on the pereopod 6 propodus) so they should not be used to diagnose species. One of the most important characters for distinguishing species of *Mesokalliapseudes* is the nature of the cheliped (i.e., setation/spination on the cutting edges and the proportion of dactylus/propodus fixed finger length). The specimens we examined have 3 or 4 setae midway on the cutting edge of the dactylus and one seta distally near the unguis (Figure 7C). Guțu (pers. comm.) examined the type specimen cheliped and did not notice any setae on the cutting edge, but mentioned that this could be due to poor preservation. We have decided to treat this species as conspecific with *M. cf. brasiliensis sensu stricto* rather than give it designation as a new species until further material (topotypic) can be examined.

*MESOKALLIAPSEUDES SONIADAWNAE* BAMBER, 1993 (Figure 14F)

*Kalliapseudes* (*Mesokalliapseudes*) *soniadawnae* Bamber 1993: 122, figures 1–4; Drumm 2003: 2, 11; Guțu 2006: 141.

*Kalliapseudes soniadawnae*: Bamber 1993: 128, 129, 130.

*Mesokalliapseudes soniadawnae*: Guțu 2006: 142, 151.

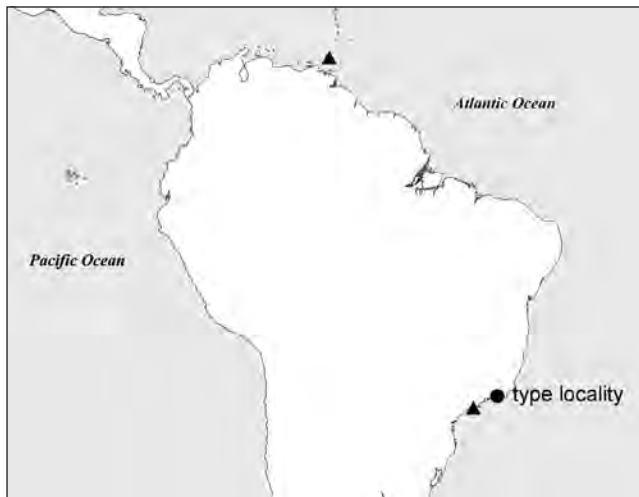
*Type material*: Holotype female (NMW.Z.1991.099.1), 1 paratype male (NMW.Z.1991.099.2).

*Material examined*: None available for study.

*Diagnosis* (from Bamber 1993): Rostrum rounded. Anterolateral apophyses on pereonites 2–6. Pleotelson broader than long. Inner flagellum of antennule with three articles. Third peduncle article of antenna not spinulate. Mandibular palp terminally with long seta. Fixed finger of propodus of cheliped less than one half length of dactylus.

*Type locality*: Caribbean Sea, Trinidad, 10°40'N, 61°35'W, depth 10 m.

*Geographic distribution*: Known only from the type locality.



**Figure 8.** Map showing the distribution of *Mesokalliapseudes cf. brasiliensis*. The black circle represents the previously published record and triangles indicate new distribution locations.

**Remarks:** Attempts to borrow type material from the National Museum of Wales were unsuccessful. Based on Bamber's (1993) description, this species can be distinguished from the other congeners by the following characters: 1) a short stout pectinate spiniform seta on the ventrodistal corner of the pereopod 1 basis, and 2) no spinulate process on the second peduncular article of the antenna.

*MESOKALLIAPSEUDES THALASISPELEUS* GUȚU, 2006 (Figures 14H, J)

*Mesokalliapseudes thalasispeleus* Guțu 2006: 142–151, figures 209–231.

**Type material:** Holotype female with oostegites no. 250.299, 1 allotype male no. 250.300, MHN Grigore Antipa.

**Material examined:** None available for study.

**Diagnosis** (from Guțu 2006): Rostrum rounded. Pereonites lacking anterolateral apophyses. Pleotelson as long as broad. Inner flagellum of antennule with three articles. Third peduncle article of antenna not spinulate. Mandibular palp terminally with short spiniform seta. Fixed finger of propodus of cheliped less than one half the length of dactylus. Female cheliped with less than 10 short spiniform setae on dactylus cutting edge.

**Type locality:** NW Atlantic, Exuma Cays, Bahamas, approximate coordinates: 23°32'N, 75°50'W (exact coordinates unknown).

**Geographic distribution:** Known only from the type locality.

**Remarks:** *Mesokalliapseudes thalasispeleus* is the second known species of *Mesokalliapseudes* identified from the Bahamas, the other one being *M. bahamensis* and can be distinguished from it and the other congeners by two major characters: 1) the shape of the pleotelson (as long as broad; all other species are broader than long), and 2) the short spiniform seta on the mandibular palp terminus. *Mesokalliapseudes thalasispeleus* appears to be unique in having lon-

ger than usual simple setae on the anterior and posterior corners of the pereonites (approximately as long as the associated pereonite).

SUBFAMILY TANAPSEUDINAE BĂCESCU, 1978

GENUS *PSAMMOKALLIAPSEUDES* LANG, 1956

**Diagnosis:** Antennule inner flagellum not reduced. Cheliped and pereopod 1 with exopodite.

*PSAMMOKALLIAPSEUDES GRANULOSUS* BRUM, 1973 (Figures 9, 13E)

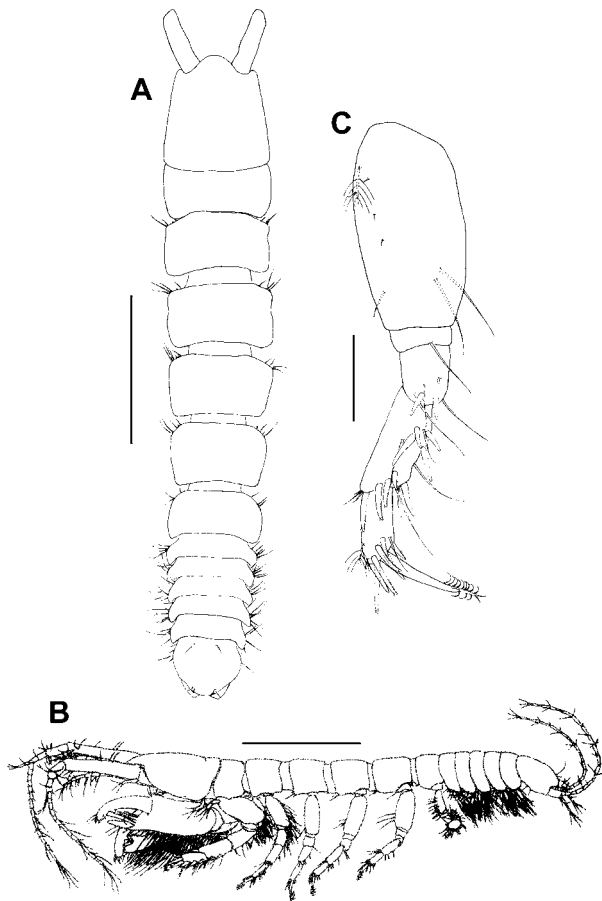
*Psammokalliapseudes granulosis* Brum 1973: 2–3, figure 2; 1974: 4–7, figures 8–26; Băcescu 1979: 3; Băcescu and Absalão 1985: 53.

*Cirratodactylus floridensis* Gardiner 1973: 237, figures 1–6; Băcescu and Absalão 1985: 53; Sieg 1986: 22; Guțu 1996: 70.

**Type material:** None apparently by original designation.

**Material examined:** 3 subadult males (USNM 1011363), ~ 2.9 mm, Ft. Lauderdale, FL, 25°59'14"N, 80°05'25"W, 20 m depth, coll. June 1992, det. David Drumm; 1 female with oostegites (USNM 141481), North Miami, FL, 25°54.7'N, 80°06'W, 15 m depth, sand, coll. May 1964; 2 spec., MAFLA station 2103, 26°25'N, 83°57'W, 33 m, fine sand, coll. 1976, det. Heard and Sieg 1983; 4 spec., MAFLA station 2104, 26°25'N, 83°23'W, 53 m, coarse sand, coll. 1975, det. Heard and Sieg 1983; 2 spec., MAFLA station 2211, 27°56'N, 83°52'W, 43 m, coarse sand, coll. 1975, det. Sieg and Heard 1983; 2 spec., MAFLA station 2315, 28°33'N, 84°20'W, 38 m, silty fine sand, coll. 1975, det. Heard and Sieg 1983; 3 spec., MAFLA station 2317, 28°56'N, 84°05'W, 29 m, silty, very fine sand, coll. 1975, det. Heard and Sieg 1983; 2 spec., MAFLA station 2422, 29°30'N, 84°27'W, 24 m, medium fine sand, coll. 1976, det. Heard and Sieg 1983; 2 spec., MAFLA station 2424, 29°13'N, 85°00'W, 27 m, medium sand, coll. 1975, det. Heard and Sieg 1983; 23 spec., MAFLA station 2425, 29°05'N, 85°15'W, 36 m, medium sand, coll. 1975, det. Heard and Sieg 1983; 3 spec., MAFLA station 2426, 28°57'N, 85°23'W, 82 m, fine sand, coll. 1977, det. Heard and Sieg 1983; 3 spec., MAFLA station 2528, 29°54'N, 86°04'W, 37 m, coarse sand, coll. 1975, det. Heard and Sieg 1983; 3 spec., MAFLA station 2529, 29°55'N, 86°06'W, 38 m, coarse sand, coll. 1975, det. Heard and Sieg 1983; 10 spec., MAFLA station 2530, 29°51'N, 86°06'W, 41 m, medium sand, coll. 1976, det. Heard and Sieg 1983; 2 spec., MAFLA station 2532, 29°46'N, 86°12'W, 45 m, coarse sand, coll. 1975, det. Heard and Sieg 1983; 2 spec., MAFLA station 2748, 27°37'N, 83°53'W, 50 m, coarse sand, coll. 1976, det. Heard and Sieg 1983; 2 spec., MAFLA station 2853, 29°18'N, 84°19'W, 29 m, coarse sand, coll. 1977, det. Heard and Sieg 1983; ~ 35 specimens (adult males, females, juveniles, manca), Culebra Island, Puerto Rico, 28 m, coll. 2003; 1 adult female, Lover's Beach, northeastern edge of Man-O-War Bay, Tobago, 11°18'15"N, 60°31'25"W, April





**Figure 9.** *Psammokalliapseudes granulosus* from Puerto Rico. A. Dorsal view of body of adult female with oostegites. Scale bar = 1.0 mm. B. Lateral view of adult male. Scale bar = 1.0 mm. C. Pereopod 5 of adult female. Scale bar = 0.2 mm.

1992, coll. & id. Richard Heard, 2 m depth, coral sand/rubble.

**Diagnosis (adult):** Rostrum rounded. Pleotelson broader than long. Antennule inner flagellum with two articles. Pereopod 1 dactylus with three ventral teeth associated with a short spinule. Dactylus of pereopods 1–6 with distal recurved sensory setae.

**Type locality:** Ponta dos Calderos e a Ilha Redonda, Brazil (Figure 10).

**Geographic Distribution:** Brazil, Caribbean Sea (Puerto Rico, Tobago), NW Atlantic (South Florida), eastern GOM, bathymetric range: 20–82 m (Figure 10).

**Remarks:** *Psammokalliapseudes granulosus*, originally described from Brazil, was reported as a new genus and species, *Cirratodactylus floridensis* by Gardiner (1973) a few months later from South Florida waters. Gardiner (1973) further designated a new monotypic family Cirratodactylidae Gardiner, 1973 to accommodate it. Băcescu and Absalão (1985) synonymized *C. floridensis* with *P. granulosus*, relegating the genus *Cirratodactylus* and family Cirratodactylidae to junior synonyms of *Psammokalliapseudes* Lang, 1956 and Kalliapseudidae, respectively.

Examination of new material and MAFLA material ex-

tends this species range into the Caribbean Sea (Puerto Rico and Tobago) and the eastern GOM and its depth range is extended to 82 m. This species can easily be distinguished from its only other congener *P. mirabilis* and is unique among tanaidaceans in having curled sensory setae on the dactylus of all of the pereopods (Figure 9C). Examination of manca (postembryological instars with incompletely developed postcephalic appendages) revealed the presence of exopodites on the last two pereopods. This represents the first record of this occurring in the genus *Psammokalliapseudes*.

GENUS *TANAPSEUDES* BĂCESCU, 1978

**Diagnosis:** Antennule inner flagellum reduced. Cheliped and pereopod 1 lacking exopodite.

*TANAPSEUDES GUTUI* HANSKNECHT, HEARD AND BAMBER, 2002 (Figures 11, 13F, G).

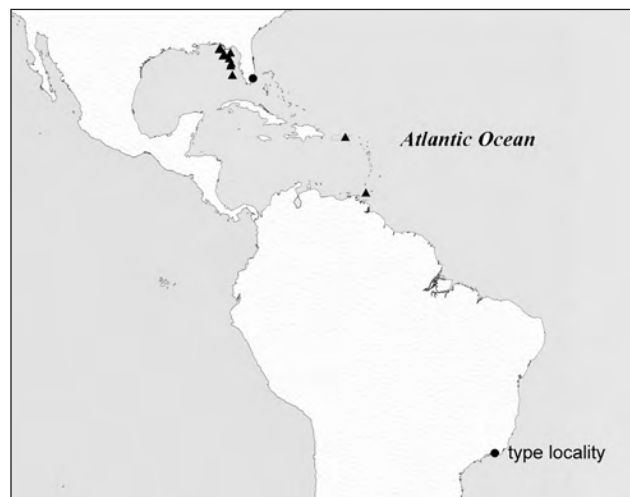
*Tanapseudes gutui* Hansknecht et al. 2002: 67, figures 1–2.

**Type material:** Holotype: adult male (USNM 1001787).

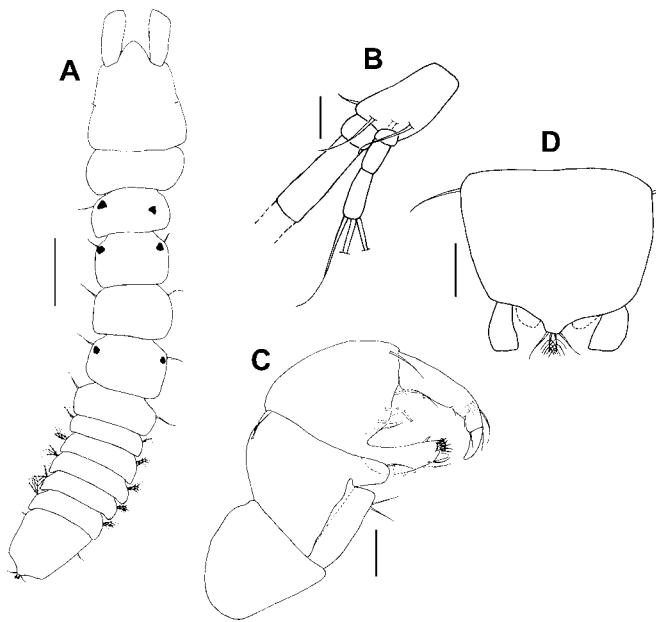
**Paratypes:** 2 males, 1 ovigerous female (USNM 1001788); 1 male, 1 ovigerous female (GCRL 2038); 1 male (MHN Grigore Antipa No. 250.181); 2 ovigerous females (MHN Grigore Antipa No. 250.180); 1 male (NHM 2001.6903); 1 female (NHM 2001.6904).

**Material examined:** Paratypes: 1 ovigerous female, 1 adult male, GCRL 2038, CH2MHill Consultants, Carolina WWTP, Puerto Rico, San Juan Estuary, 18°27.80'N, 65°53.44'W, St. CI-2, 34 m, sandy clay, 30 October 1999. Non-types: 1 adult male, EPA Coastal 2000, 6701, St. PR44, Puerto Rico, id. Tom Hansknecht; 3 males, 1 female and 2 juveniles, MAFLA station 2426, 28°57'N, 85°23'W, 82 m, fine sand, coll. 1977.

**Diagnosis:** Pleonites with only few (3 at most) lateral plumose setae. Pleotelson with very pronounced rounded posterior protuberance. Male pereopod 1 with dorsodistal spiniform



**Figure 10.** Map showing the distribution of *Psammokalliapseudes granulosus*. Black circles represent previously published records and triangles indicate new distribution locations.



**Figure 11.** *Tanapseudes gutui*, adult male. A. Dorsal view of body. Scale bar = 0.3 mm. B. Uropod. Scale bar = 0.05 mm. C. Cheliped. Scale bar = 0.01 mm. D. Pleotelson. Scale bar = 0.1 mm.

seta on propodus reduced or lacking. Male cheliped carpus with ventrodorsal rounded protuberance. Pereopods 2–5 with ventral margins of merus and carpus heavily setose. Uropod basal article lacking inner distal spiniform projection.

*Type locality:* San Juan, Puerto Rico, 18°27.80'N, 65°53.44'W, 3–34 m depth (Figure 12).

*Geographic distribution:* Caribbean Sea (Puerto Rico, Tobago) and eastern GOM, bathymetric range: 3–82 m depth (Figure 12).

*Remarks:* Examination of MAFLA material extends this species range into the eastern GOM and its depth range is extended to 82 m. Hansknecht et al. (2002) described and illustrated the uropod exopodite of *T. gutui* as being biarticulate. However, examination of type material revealed the presence of 3 articles (1 small round basal article, Figure 11B). They also mention that the adult male cheliped has a tooth midway on the cutting edge of the dactylus; we did not see this tooth on the paratype male we examined (Figure 11C).

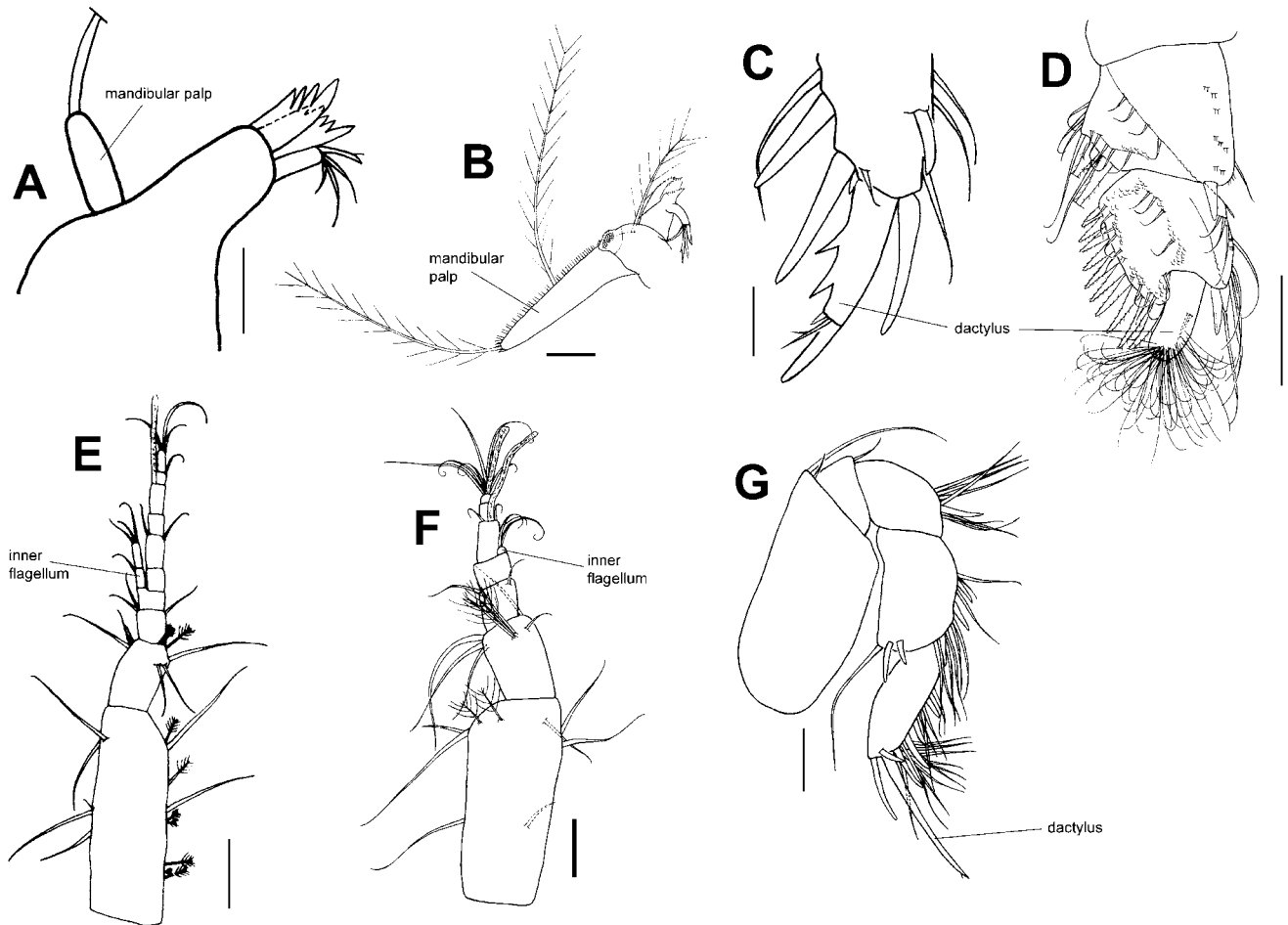
*Tanapseudes gutui* can be distinguished from the other congeners by the male pereopod 1 propodus, which has a reduced dorsodistal spiniform seta and the male cheliped, which has a carpal process (Figure 11C). Guțu and Angsupanich (2005) describe this pattern in specimens collected from the Andaman Sea in Thailand which they attribute to *T. ormuzana*. Their specimens likely represent a new species because these characteristics were not evident in the material examined by us, Hansknecht et al. (2002) or in the original description (Băcescu 1978). The location of their material (Thailand) is also distant from the type locality (Puerto Rico). The posterior protuberance of the pleotelson (Figure 11D) of *T. gutui* also seems to be more pronounced and pereopods 2–5 more setose than in the other species.

### Key to genera and species of Kalliapseudidae presently known in the northwest Atlantic

1. Mandibular palp uniaarticulate and short, with one terminal seta (Figure 13A) ..... 2  
Mandibular palp uniaarticulate and long, with a row of long, plumose setae (Figure 13B) ..... 3
2. Pereopods with dactylus having curled sensory setae at tip (Figure 9C); antennule with inner flagellum biarticulate (Figure 13E) .....  
..... *Psammokalliapseudes granulosus* Brum, 1973  
Pereopods with dactylus lacking curled sensory setae at tip (Figures 13C, G); antennule with inner flagellum vestigial, uniaarticulate (Figure 13F) .....  
..... *Tanapseudes gutui* Hansknecht, Heard and Bamber, 2002
3. Chelipeds not sexually dimorphic; antenna with third peduncle article lacking large triangular tooth (Figure 14C) ..... 4  
.....  
Chelipeds showing strong to moderate sexual dimorphism; antenna with third peduncle article having large triangular tooth (Figure 14D) .....  
..... *Alokalliapseudes macsweenyi* (Drumm, 2003)
4. Pereonites lacking apophyses (Figure 14E) ..... 5  
.....  
Pereonites 2–4 with anterolateral apophyses (Figure 14F) .....  
..... *Mesokalliapseudes soniadaunae* Bamber, 1993
5. Mandibular palp armed distally with single spiniform seta (more than 6 times as long as broad) spiniform seta (Figure 7B) .....  
..... *Mesokalliapseudes brasiliensis* (Băcescu, 1986)
- Mandibular palp armed distally with either a single long seta or a single short spiniform seta (less than 6 times as long as broad) spiniform seta ..... 6
6. Pleotelson broader than long (Figure 14G); mandibular palp armed distally with a long simple seta (Figure 14I) .....  
..... *Mesokalliapseudes bahamensis* Sieg, 1982  
Pleotelson as broad as long (Figure 14H); mandibular palp armed distally with a short spiniform seta (Figure 14J) .....  
..... *Mesokalliapseudes thalasispeleus* Guțu, 2006



**Figure 12.** Map showing the distribution of *Tanapseudes gutui*. Black circles represent previously published records and the triangle indicates a new distribution location.



**Figure 13.** Plate 1 for the illustrated key to the NW Atlantic kalliapseudids. A. *Tanapseudes ormuzana*, left mandible. Scale bar = 0.03 mm. B. *Kalliapseudes magnus*, left mandible. Scale bar = 0.1 mm. C. *T. ormuzana*, distal end of pereopod 1. Scale bar = 0.05 mm. D. *Kalliapseudes mauritanicus*, distal end of pereopod 1. Scale bar = 0.1 mm. E. *Psammokalliapseudes granulosis*, antennule. Scale bar = 0.1 mm. F. *Tanapseudes gutui*, antennule. Scale bar = 0.05 mm. G. *T. gutui*, pereopod 3. Scale bar = 0.05 m.

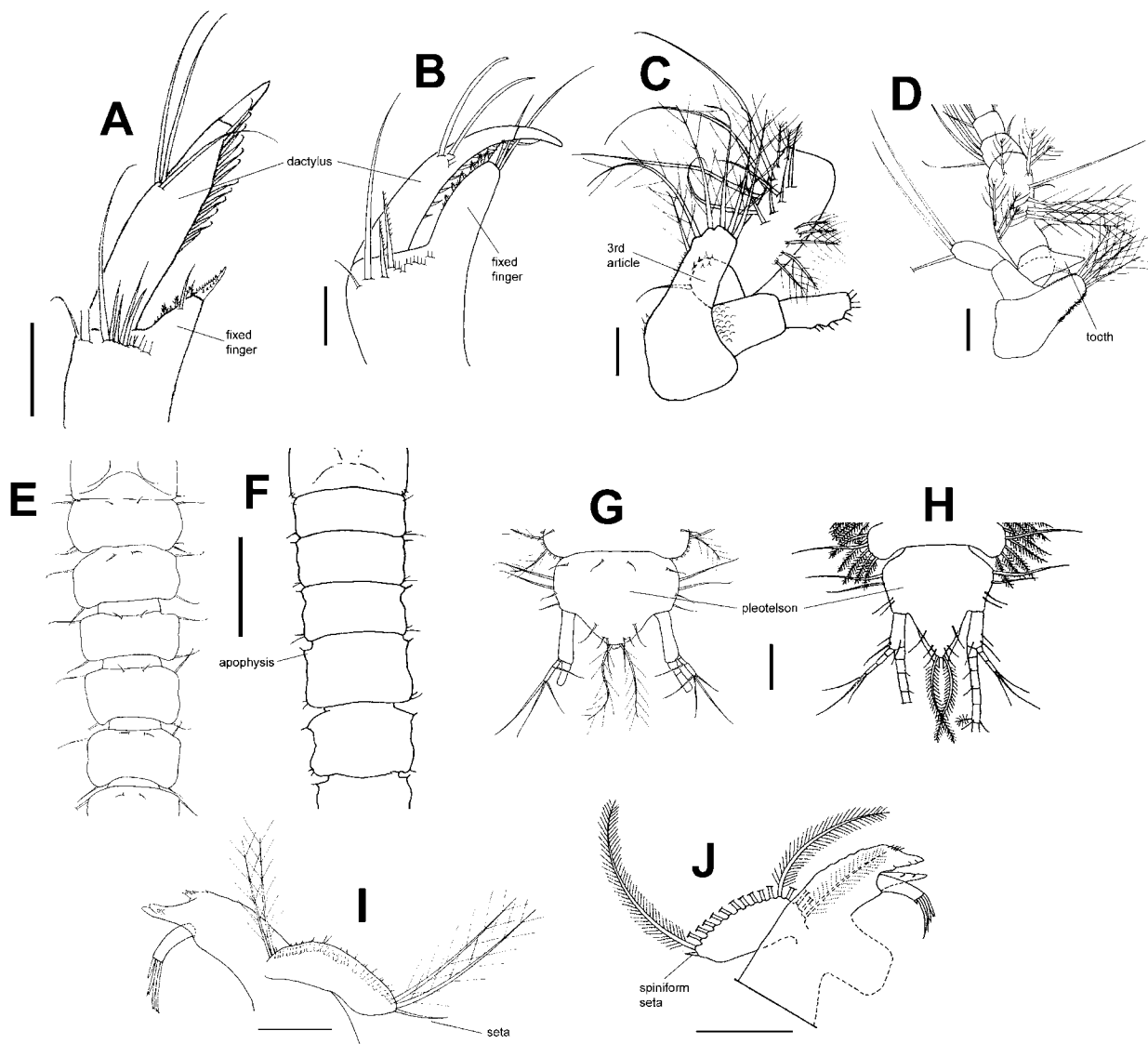
### Family Characteristics

The family Kalliapseudidae is currently defined by the combination of the absence of a palp on the maxillule and the presence of sensory setae on the dactylus of the pereopods. The presence of exopods on pereopods 4 and 5 of the manca (one or more postembryological instars with incompletely developed postcephalic appendages) might be another synapomorphy of the family. The senior author recently confirmed the presence of this character in a species of *Hemikalliapseudes*, constituting the first report of this occurring in the Hemikalliapseudinae. The only exception is the report of the apparent lack of exopodites for the manca stage of *Psammokalliapseudes mirabilis* (Lang 1956). Lang's (1956) observations need further confirmation, since exopods have been reported for all other known mancas for the 3 subfamilies. The only other group of tanaidaceans reported to exhibit this character are members of the sphyrapoid subfamily Pseudosphyrapodinae Guțu, 1980 (see Guțu 2006), a mostly deep-water group with apseudid affinities and not closely related to the Kalliapseudidae. For undetermined reasons, the presence of exopods appear to have been independently retained within these 2 disparate groups.

The sensory setae on the dactylus of the pereopods is a very confusing character and we do not think it should be included in the family's diagnosis or in phylogenetic studies. It is only through theories of homology that phylogenetic analysis can proceed. Position (similarity of topographical relationships) is one key assumption of homology. Some kalliapseudids have terminal sensory setae and some have sub-terminal setae. The structures the setae are attached to are likewise suspect. Members of the Kalliapseudinae definitely have a unique structure: numerous setae attached to a short and thick dactylus. The lack of positional and structural similarities across the subfamilies violates the assumption of homology. The presence of sensory setae on the dactylus of the pereopods is found in the parapseudid genus *Thaicungella* (Guțu and Angsupanich 2004) and resembles the setae found in some species of the kalliapseudid subfamily Hemikalliapseudinae, so this character should be used with caution.

### Ecology

Little is known of the biology and ecology of most members of Kalliapseudidae. The feeding behavior of two spe-



**Figure 14.** Plate 2 for the illustrated key to the NW Atlantic kalliapseudids. A. *Mesokalliapseudes bahamensis*, female cheliped. Scale bar = 0.1 mm. B. *Alokalliapseudes macsweenyi*, female cheliped. Scale bar = 0.2 mm. C. *M. bahamensis*, antenna peduncle. Scale bar = 0.05 mm. D. *A. macsweenyi*, antenna peduncle. Scale bar = 0.05 mm. E. *A. macsweenyi*, pereonites. Scale bar = 0.5 mm. F. *Mesokalliapseudes soniadaewnae*, pereonites modified after Bamber (1993). Scale bar = 0.5 mm. G. *M. bahamensis*, pleotelson. Scale bar = 0.2 mm. H. *Mesokalliapseudes thalasispeleus*, pleotelson modified after Guțu (2006). Scale bar = 0.2 mm. I. *M. bahamensis*, right mandible. Scale bar = 0.1 mm. J. *M. thalasispeleus*, left mandible modified after Guțu (2006). Scale bar = 0.1 mm.

cies [*P. granulatus* (subfamily Tanapseudinae) and *A. macsweenyi* (subfamily Kalliaseudinae)], which distinctly differ in mouthpart morphology, was described by Drumm (2005). Based on the observations of Drumm (2005), *A. macsweenyi* constructs “tubes” in soft sediments using mucus secretions and feeds by filtering detritus and diatoms with plumose setae attached to the chelipeds and maxillipeds. In contrast *P. granulatus*, which lacks a permanent domicile, appears to be fossorial and feeds by scraping the organic material (e.g. microflora) off sand particles (Drumm 2005).

Although a vast majority of the species within the suborder Apseudomorpha are fossorial, (e.g., Apseudidae, Sphyrapidae) or epibenthic (e.g., some Pagurapseudidae and Metapseudidae), some members of the families Kalliapseudidae, Parapseudidae Guțu, 1981, and possibly the

small and poorly known Numbakullidae Guțu and Heard, 2002 appear to occupy permanent or semipermanent tubes or burrow domiciles. Members of the parapseudid genera *Discapseudes* Băcescu and Guțu, 1975 and *Halmyrapseudes* Băcescu and Guțu, 1974 construct well-developed tubes (Băcescu and Guțu 1974, 1975, R. Heard, pers. obser.). However, there can be different interpretations of whether or not members of the subfamily Kalliapseudinae are tube or burrow dwellers, or both. Based on the authors’ personal observations and those of Drumm (2005), we consider *A. macsweenyi* to be a tube dweller *sensu lato*. When the sediments surrounding its vertically oriented domicile are flushed away, a soft mucus “tube” remains; however, it may be a matter of semantics whether this constitutes a true tube or a mucus burrow-lining that remains intact. Members of

the Kalliapseudinae appear to be suspension or filter feeders occupying permanent domiciles in soft-bottom substrata (e.g., sand, sand-silt, mud). In contrast, members of the sub-

families Hemikalliapseudinae and Tanapseudinae, which are also known from soft-bottom habitats, appear to be fossorial deposit feeders that lack permanent domiciles.

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