

Axiidea and Gebiidea (Crustacea: Decapoda) of Costa Rica

P. C. Dworschak*

Abstract

Axiidea and Gebiidea housed in the collections of the Museo de Zoología, Universidad de Costa Rica, were studied together with newly collected material. Ninety-one lots were inspected; specimens of eleven lots newly identified; identifications of six lots have been revised. This resulted in twelve new records for Pacific Costa Rica (*Aethogebia gorei*, *Axianassa mineri*, *Axiopsis baronai*, *Calocarides* cf. *quinqueseriatus*, *Coralaxius galapagensis*, *Corallianassa xutha*, *Neocallichirus* cf. *mortenseni*, *Paraxiopsis* cf. *spinipleura*, *Upogebia longipollex*, *Upogebia onychion*, *Upogebia tenuipollex*, and *Upogebia veleronis*), mainly from Isla de Coco, and one new record for Caribbean Costa Rica (*Axiopsis serratifrons*).

Key words: Thalassinidea, Axiidea, Gebiidea, Costa Rica

Introduction

Axiidean and gebiidean shrimps (Crustacea, Decapoda, formerly Thalassinidea) are among the most common macrofauna elements in the intertidal or the shallow subtidal (DWORSCHAK, 2000, 2005). They have received special attention as their burrowing activity greatly influences the chemical and geophysical properties of sediments (ZIEBIS et al. 1996) and have therefore been identified as important ecosystem engineers (BERKENBUSCH & ROWDEN 2003).

The axiidean and gebiidean fauna of Costa Rica has been summarised as part of the decapod fauna (as Thalassinidea) by VARGAS & CORTÉS (1999a) for the Caribbean and by VARGAS & CORTÉS (1999b) for the Pacific coast. They list only two species for the Caribbean and 13 for the Pacific, respectively. VARGAS & WEHRTMANN (2009) presented updated numbers of 3 and 14. The current study provides additions and revisions, which increase the number of species to 5 and 16, respectively.

Material and Methods

The re-investigation is mainly based on material housed in the Museo de Zoología, Universidad de Costa Rica (MZUCR); additional material is deposited in the Naturhistorisches Museum Wien, Austria (NHMW) and in the Museum National d'Histoire Naturelle, Paris (MNHN).

Size (when given) is in total length (tl in mm) and carapace length (cl in mm) in the form (tl/cl).

Synonyms are listed only for the original descriptions, original records relevant to Costa Rica and major revisions. Higher classification follows DE GRAVE et al. (2009), generic placement of the species WoRMS (www.marinespecies.org). In some cases the revision of SAKAI (2011) has been adopted.

* Peter C. Dworschak, Dritte Zoologische Abteilung, Naturhistorisches Museum, Burgring 7, A 1010 Wien, Austria; Peter.Dworschak@nhm-wien.ac.at

Results

Taxonomy

Axiidea DE SAINT LAURENT, 1979

Axiidae HUXLEY, 1879

Axiopsis BORRADAILE, 1903

Axiopsis baronai SQUIRES, 1977

Axiopsis (Axiopsis) baronai SQUIRES, 1977: 1885, 4 text-figs., 1 table.

Axiopsis baronai.—SAKAI & DE SAINT LAURENT, 1989: 78;—SAKAI, 2011: 51.

Material: MZUCR 0807-07, 1 female (80/27.7), Pacific, Golfo de Nicoya, EstBH-1, RV Skimer, 25.I.1981, M. Vitola coll.

Remarks. New record for Costa Rica.

Axiopsis serratifrons (A. MILNE-EDWARDS, 1873)

Axia serratifrons A. MILNE-EDWARDS, 1873: 263, pl. 13.

Axiopsis (Axiopsis) serratifrons.—DE MAN, 1925: 68, 72–80, pl. 6 figs. 12–12i.

Axiopsis serratifrons.—SAKAI & DE SAINT LAURENT, 1989: 76–77.—NGOC-HO, 2005: 53, fig. 3.—KOMAI & TACHIKAWA, 2008: 20–22, fig. 1;—VARGAS & CORTÉS, 1999b: 905;—POORE & COLLINS, 2009: 241;—SAKAI, 2011: 56, figs. 8-9.

Axiopsis hirsutimana.—VARGAS & CORTÉS, 1999a: 882. [not *Calocaris (Calastacus) hirsutimana* BOESCH & SMALLEY, 1972]

Material. MZUCR 0544-02, 1 female (46/20.3), Pacific, Isla San José, Islas Murciélago, Guanacaste, 7.XII.1969, W. Bussing & R.T. Nishimoto coll.; – MZUCR 2006-01, 1 female (34/13.5), Pacific, Punta Esmeralda, Bahía Culebra, 28.VIII.1997, O. Breedy coll.; – MZUCR 2899-01, 1 male (54/20.5), Caribbean, Cahuita, Puerto Vargas, Punta Uva, sandflat with abundant rubble, *Halimeda*, seagrass etc., 1 m, under rocks on sand, 27.XI.2005, A. Anker coll.; – MZUCR 1666-03, 1 female (33/16.1), Caribbean, Isla Uvita, Limón, 50 m al N del muelle, al borde del arrecife, 8 m, 4.X.1970, Bussing, Bussing & Nishimoto coll.

Remarks. Recorded from Pacific Costa Rica by VARGAS & CORTÉS (1999b). New record for Caribbean Costa Rica.

Calocarides WOLLEBAEK, 1908

Calocarides cf. quinqueseriatus (RATHBUN, 1902) (Fig. 1)

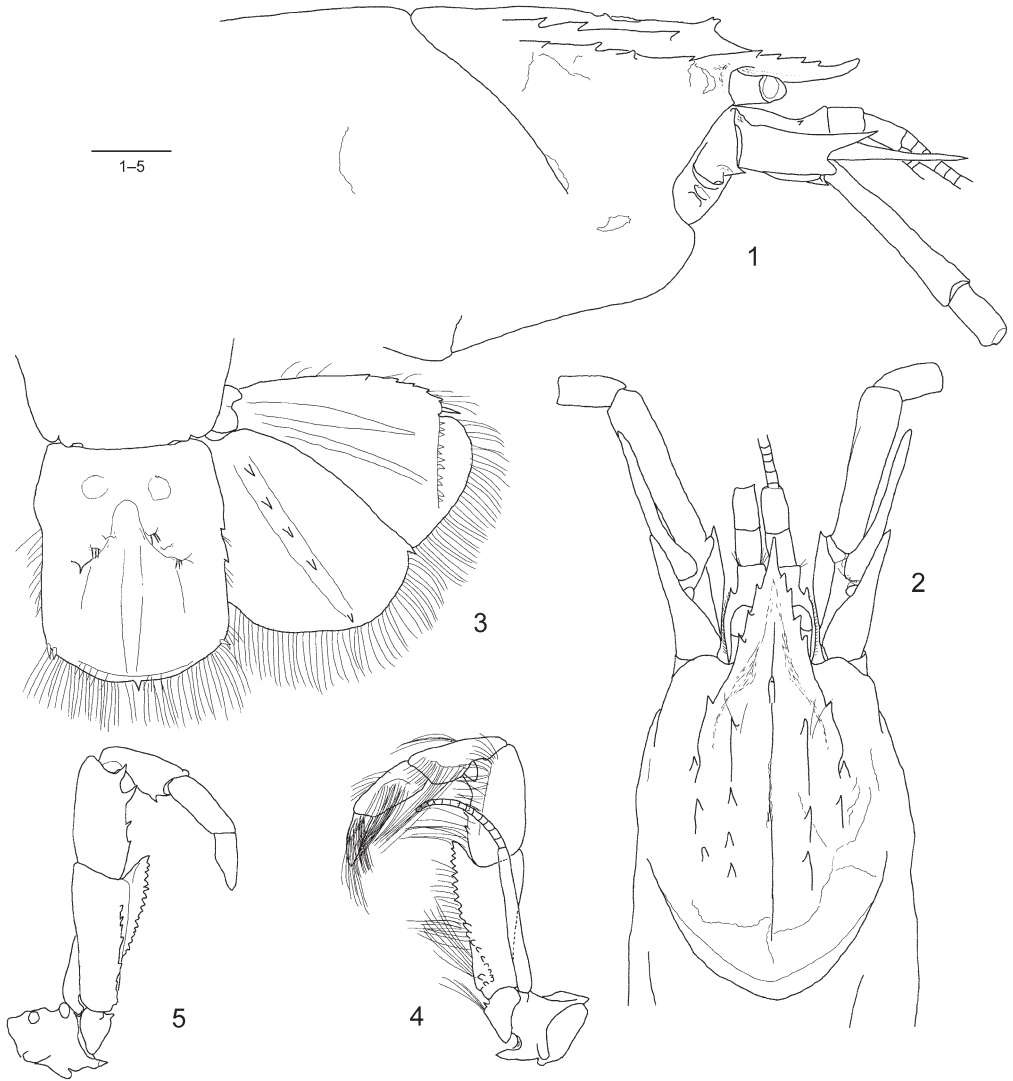
Calastacus quinqueseriatus RATHBUN, 1902: 887.—1904: 151, fig. 91.

Calocarides rostriserratus ANDRADE & BAEZ, 1977: 65, fig. 1;—KENSLEY, 1996a: 64, fig. 6;—SAKAI, 2011: 96.

Calocarides quinqueseriatus.—SAKAI & DE SAINT LAURENT, 1989:79, 103; KENSLEY, 1996a: 61, figs. 4, 5; SAKAI, 2011: 95.

Material. MZUCR 2288-01, 1 male (-/17.7, broken, both P1 missing), Pacific, Frente a península de Osa, Puntarenas, 08°20.2'N 83°41.7'W, 820 m, 23.I.1994, J. Cortés coll., (N. Accesorio VH 2413).

Remarks. Two similar species of *Calocarides* have been reported from the Pacific coast of the Americas, *C. quinqueseriatus* from Oregon to California and *C. rostriserratus* from Panama to Chile (KENSLEY 1996a). SAKAI & DE SAINT LAURENT (1989) and POORE (2012) considered the latter synonymous with the former, KENSLEY (1996a) and SAKAI



Figs 1-5. *Calastacus* cf. *quinqueseriatus* RATHBUN, 1902, MZUCR 2288-01, male, cl 17.7. 1, front, lateral view; 2, front, dorsal view; 3, telson and right uropod, dorsal view; 4, third maxilliped, mesial view; 5, third maxilliped, lateral view (setae omitted). Scale is 2 mm.

(2011) as separate species. The specimen studied is damaged and lacks both chelipeds and most of the pereopods. The spination of the rostrum, the lateral, submedian and median carinae has been demonstrated as very variable in *C. quinqueseriatus* by KENSLEY (1996a), their ranges actually overlapping between the two species. Other differences are the telson spines: one pair of dorsal ones and 3 to 6 lateral ones in *C. quinqueseriatus*, and 2-3 dorsal pairs and 2-3 lateral spines in *C. rostriserratus*. The present material has only one dorsal spine on the left side and two lateral spines on the right side of the telson which represents a mixture of the numbers observed in these two species.

SAKAI (2011) gives as main difference between the two species the proportions of the chelipeds. KENSLEY (1996a), however, mentions a great variation in the spination and proportions of chelipeds in *C. quinqueseriatus*. The specimen from Costa Rica is tentatively assigned to *C. quinqueseriatus* here.

***Coralaxius* KENSLEY & GORE, 1981**

***Coralaxius galapagensis* KENSLEY, 1994**

Coralaxius galapagensis KENSLEY, 1994: 815, figs. 1,2; SAKAI, 2011: 258.

Material. MZUCR 2738-05, 2 juveniles (-/2.87, -/1.9), Pacific, Isla del Coco, Kili Rock, Expedicion National Geografic 905, DeepSub 913, Pilot: S. Blum, 156-205 m, 12.IX.2009, J. Cortés & S. Earle coll.; – MZUCR 2733-01, 1 female (-/5.62), 1 male (-/3.5), Pacific, Isla del Coco, Kili Rock, Expedicion National Geografic 977, DeepSub 931, Pilot: S. Blum, 250 m, con esponjas, fauna asociada a coral negro, frente a la pared (white sponges, associate fauna on black coral branch), 22.IX.2009, E. Widden & B. Robi(n)son coll.

Remarks. New record for Costa Rica.

***Guyanacaris* SAKAI, 2011**

***Guyanacaris caespitosa* (SQUIRES, 1979)**

Axiopsis (Axiopsis) caespitosa SQUIRES, 1979: 1584, figs. 1-3, tabs. 1-2.

Acanthaxius caespitosa.—SAKAI & DE SAINT LAURENT, 1989: 73.

Guyanacaris caespitosa.—SAKAI, 2011: 120.

Material. MZUCR 1665-01, 1 female (ovigerous 114/39.5), Pacific, 8 mi S.E. punta Chayote, Puntarenas, 1.337, 108 m, 18.VII.1969, Nishimoto, R. coll.

Remarks. The studied specimen has more than 3 spines on median carina. New record for Costa Rica.

***Guyanacaris hirsutimana* (BOESCH & SMALLEY, 1972)**

Calocaris (Calastacus) hirsutimana BOESCH & SMALLEY, 1972: 45, figs. 1-9.

Acanthaxius hirsutimanus.—SAKAI & DE SAINT LAURENT, 1989: 73;—BLANCO-RAMBLA, 1995: 62, figs. 11, 12;—HEARD et al., 2007: 18, fig. 10.

Guyanacaris hirsutimana.—SAKAI, 2011: 121, fig. 22A, B.

not *Axiopsis hirsutimana*.—VARGAS & CORTÉS, 1999a: 882. [= *Axiopsis serratifrons* (A. MILNE-EDWARDS, 1873)]

Material. None at MZUCR.

Remarks. Recorded from Costa Rica (Golfo Dulce, SW Rio Coto) by SAKAI (2011). The specimen reported as *Axiopsis hirsutimana* by VARGAS & CORTÉS (1999a) under MZUCR 1666-03 was found to be *A. serratifrons* (see above).

SAKAI (2011) erected the genus *Guyanacaris* with *G. hirsutimana* as type species and included also *G. caespitosa*. POORE & COLLINS (2009) already mentioned that these two species differ from other members of the genus *Acanthaxius* in which they had been placed before and that they may well deserve a new genus.

***Paraxiopsis* DE MAN, 1905**

***Paraxiopsis* cf. *spinipleura* KENSLEY, 1996**

Paraxiopsis spinipleura KENSLEY, 1996b: 726, figs. 10-12.

Eutrichocheles spinipleurus.—SAKAI, 2011: 119.

Material. MZUCR 1666-2, 1 female (16/7.1), Caribbean, Isla Uvita, Livado, borde arrecife, 4.X.1970, Bussing, Bussing & Nishimoto coll.

Remarks. New record for Costa Rica. Lost in transit.

***Paraxiopsis defensus* (RATHBUN, 1901)**

Axius defensus RATHBUN, 1901: 95, text-fig. 17.

Eutrichocheles defensus.—SAKAI & DE SAINT LAURENT, 1989: 3, 52, 101; SAKAI, 2011: 111.

Paraxiopsis defensus.—KENSLEY, 1996b: 715, figs. 3, 4.

MZUCR 2899-02, 1 female (15.7/5.3), Caribbean, Cahuita, Pto Vargas, sandflat with seagrass and abundant coral rubble, 1 m, deep under rocks/rubble in sand, 27.XI.2005, A. Anker coll.

Remarks. New record for Costa Rica.

Callianassidae DANA, 1852

***Biffarius* MANNING & FELDER, 1991**

***Biffaris debilis* HERNANDEZ-AGUILERA, 1998**

Biffarius debilis HEMANDEZ-AGUILERA, 1998: 303, fig. 1.

Biffarius fragilis.—VARGAS & CORTÉS, 1999b: 905 [not *Callianassa fragilis* BIFFAR, 1970]

Callianassa debilis.—SAKAI, 2005: 57.

Trypaea debilis.—SAKAI, 2011: 396.

Material. MZUCR 2003-01, 1 male (-/6, poor condition), Pacific, Golfo de Nicoya, 10.VII.1980, H.K. Dean, J. A. Vargas & D. Maurer coll.

Remarks. Previously recorded from Costa Rica as *Biffarius fragilis* by VARGAS & CORTÉS (1999b). Later, HERNANDEZ-AGUILERA (1998) found the Pacific species to be different from the Atlantic *B. fragilis* and described it as a new species.

***Callianassa* LEACH, 1814 (s.l.)**

***Callianassa costaricensis* SAKAI, 2005**

Callianassa costaricensis SAKAI, 2005: 51, figs. 5-10.

Trypaea costaricensis.—SAKAI, 2011: 396.

Material. None at MZUCR.

Remarks: Described from Costa Rica based on a single male (38.0/3.0) from the Gulf of Nicoya (Bahia Herradura, 45 m) by SAKAI (2005).

***Callichirus* STIMPSON, 1866**

***Callichirus seilacheri* BOTT, 1955**

Callianassa seilacheri BOTT, 1955: 47, fig. 7a-g.

Callichirus seilacheri.—MANNING & FELDER, 1986: 439, fig. 3;—VARGAS & CORTÉS, 1999b: 905;—Sakai,

1999: 62, fig. 12a-f;—2005: 129;—2011: 422.

Callianassa garthi RETAMAL, 1975: 178, figs. 1-8.

Material. MZUCR 2246-01, 2 males, 6 females, Pacific, Puerto Caldera, Puntarenas, zona entre mareas, 28.IV.1998, R. Heard, R. Vargas, O. Breedy & E. Ruiz coll.; – MZUCR 2246-02, 32 males, 19 females, Pacific, Puerto Caldera, 28.IV.1998, R. Heard, R. Vargas, O. Breedy & E. Ruiz coll.; – MZUCR 2156-01, 1 male (74/15.6), Pacific, manglar de Tivives, Puntarenas, , IX.1995; – MZUCR 2518-01, 1 male (51/11.6),

Pacific, Costa de Ova, Coyote, Guanacaste, madrigeras en playa, 1.-4.I.2008, R. Vargas coll.; – MZUCR 2753-01, 1 male (49/10), 1 female (72/14.8), Pacific, Palo Seco de Parrita en el estero, 20 cm prof., con bomba, 30.IX.2001, J. C. Vargas coll.; – MZUCR 2900-01, 2 males (82/17.4, 56, 12.2), Pacific, Playa Punta Arenas, , 25.V.2010, D. Peiro, F. Mantelatto, I. Wehrtmann, P. Hernáez & M. Terossi coll.; – MZUCR 2901-01, 1 male (55/11.5), 1 female (56/11.5), Pacific, Playa Pochote, 4.II.2008.

Corallianassa MANNING, 1987

Corallianassa xutha Manning, 1988

Corallianassa xutha MANNING, 1988: 885, fig. 3;—MANNING & FELDER, 1991: 777, figs. 1, 2, 5.

Corallichirus xuthus.—MANNING, 1992: 571, figs. 1,2;—SAKAI, 2011: 424, fig. 65G-H.

Glypturus xuthus.—SAKAI, 1999: 75;—2005: 135.

Material. MZUCR 0479, 1 female (25/6.75), Pacific, Isla del Caño, Puntarenas, 24.III.1970, R. Nishimoto coll.; – MZUCR 2559-03, 1 male (17/4.1), 1 female (25/6.2), Pacific, Isla del Coco, Punta Maria, buceo en rocas, 20 m, 10.IV.2008, J. Sibaja coll.; – MZUCR 2902-01, 1 male (27/6.75), 1 female (23/6.9), Pacific, I. Coco, Lado N.E. Bahía Wafer, fondo piedra y arena, 27.III.1978, W. Bussing & R. Laverberg coll.

Remarks. First record for Costa Rica.

Lepidophthalmus HOLMES, 1904

Lepidophthalmus bocourti (A. MILNE-EDWARDS, 1870)

Callianassa bocourti A. MILNE-EDWARDS, 1870: 95, 101.

Lepidophthalmus bocourti.— MANNING & FELDER, 1991: 778 (partim);—VARGAS & CORTÉS, 1999b: 906 (partim); SAKAI, 1999: 70 (partim), fig. 14c-d;—FELDER, 2003: 431, figs. 1-19;—SAKAI, 2005: 149 (partim);—2011: 447, fig. 67A-B.

Material. MZUCR 1613-01, 5 males, 6 females (tl 34-55), Pacific, Colorado de Abangares, Guanacaste, escauando en salinas, 14.XII.1981, J. Cortés coll., conocido popularmente como “coloncho”; – MZUCR 1509-01, 3 males, 10 females (tl 22-40), Pacific, Chomes, Puntarenas, estanques de camarones, VI.1991; – MZUCR 2108-03, 1 f (50/13.0), Pacific, boca Guarumal, manglar Térraba-Sierpe, en huecos en paredón, 23.XI.1995, R. Vargas coll. (contained one specimen of *L. eiseni*); – MZUCR 2903-01, 2 females (57/15.0, 40/11.5), Pacific, Colorado de Abangares, 30.X.2007; – MZUCR 2903-02, 2 males (67/15.7, 41/12.0), Pacific, Colorado de Abangares, 30.X.2007; – MZUCR 2783-01, 3 males, 5 females (2 ovigerous), Pacific, El Bajo, Barra de Santiago, en arena lodosa, T=32 °C, 4.V.2006; – MZUCR 2257-01, 1 male (72/17.5), 1 female (71/17.0), Pacific, Estero Aserradero, Estrillos Centro, Puntarenas, extraído con bomba de succión, 9.I.1999, J. M. Montoya coll.

Lepidophthalmus eiseni HOLMES, 1904

Lepidophthalmus Eiseni HOLMES, 1904: 311, pl. 35 figs. 6-13.

Callianassa eiseni.—HOLTHUIS, 1954a: 12-15, fig. 3;—BOTT, 1955: 47, fig.6a-g.

Lepidophthalmus bocourti.—MANNING & FELDER, 1991: 778 (partim);—VARGAS & CORTÉS, 1999b: 906 (partim);—SAKAI, 1999: 70 (partim);—2005: 149 (partim) [not *Callianassa bocourti* A. MILNE-EDWARDS, 1870].

Lepidophthalmus eiseni.—FELDER, 2003: 429, figs. 20-29.

Lepidophthalmoides eiseni.—SAKAI, 2011: 442.

Material. MZUCR 1612-01, 1 male (110/26.4), 2 ovigerous females (108/25.0, 107/23.5), Pacific, estero en Playa Ostional, Guanacaste (label: Playa Ostional, estero seccion norte) 13.X.1982, J.M. Hidalgo; – MZUCR 1491-01, 1 ovigerous female (107/24.3), Pacific, Ostional (label: Ostional, Guanacaste, enterrado en barro en estero), 4.X.1982, J. M. Hidalgo & L. Castilla coll.; – MZUCR 2108-03, 1 female (48/12.0), Pacific, boca Guarumal, manglar Térraba-Sierpe, en huecos en paredón, 23.XI.1995, R. Vargas coll. (with *L. bocourti*).

Remarks. *Lepidophthalmus eiseni* was previously considered a junior synonym of *Callianassa bocourti* until FELDER (2003) showed that the two species differ morphologically. SAKAI (2005) ignored this. Later, SAKAI (2011) recognised also the difference between the two species and considered them to belong to separate genera. He erected the genus *Lepidophthalmoides* with *Callianassa eiseni* HOLMES, 1904 as type species. He was not aware, that this is the type species of the genus *Lepidophthalmus*, which he erroneously (SAKAI 1999, 2005, 2011) attributed to *Callianassa bocourti* A. MILNE-EDWARDS, 1870. The genus *Lepidophthalmoides* SAKAI, 2011 is therefore an objective junior synonym of *Lepidophthalmus* HOLMES, 1904.

Several of the lots listed under *L. bocourti* by VARGAS & CORTÉS (1999b) proved to belong to *L. eiseni*.

***Lepidophthalmus richardi* FELDER & MANNING, 1997**

Lepidophthalmus richardi FELDER & MANNING, 1997: 320, figs. 4a-j, 5a-f, 6a-i, 7a;—SAKAI, 1999: 68;—ANKER, 2008: 788.

Lepidophthalmoides richardi.—SAKAI, 2011: 443.

Material. MZUCR 2420-02, 1 female (47/11), Caribbean, Cahuita, Punta Uva, small mangrove river, coarse sand, depth 10-30 cm, 26.XI.2005, A. Anker, I. Wehrtmann & L. Harris coll. (host fcn 05-120 of *Leptalpheus* cf. *forceps*); – MNHN Th-1627, 1 female (76/17), Caribbean, Cahuita, Punta Uva, small mangrove river, coarse sand, depth 10-30 cm, 26.XI.2005, A. Anker, I. Wehrtmann & L. Harris coll. (host fcn 05-118 of *Leptalpheus* cf. *forceps*); – MZUCR 2904-01, 2 males (58/13.5, 40/10.0), 4 females (68/15, 61/13.7, ovigerous 66/14.6, 39/9.3), Caribbean, Rio Estero Negro, Playa Negro, carretera antes de Cahuita, D. Peiro, I. Wehrtmann & F. Mantelatto coll. (con camaroes simbiosites); – MZUCR 2905-01, 1 ovigerous female (56/13.4), Caribbean, Rio Bananito, Limón, leeward bank on river mouth, 21.II.2011, P. Dworschak & I. Wehrtmann coll.; – MZUCR 2906-01, 1 male (60/14.0), 5 females (51/12.4, 55/12.5, 63/15.3, 70/15.6, 77/16.1), NHMW 25292, 1 male (47/11.9), NHMW 25293, 1 f (61/14.1), Caribbean, Rio Vizcaya, Limón, leeward bank on river mouth, 21.II.2011, P. Dworschak & I. Wehrtmann coll. (one specimen collected with *Leptalpheus* sp.); – MZUCR 2907-01, 2 males (-/16.2, -/15.3) 1 females (-/15.3) (all missing pleon), NHMW 25434, 2 males (55/13.1, 21/4.3), Caribbean, Cahuita, Puerto Vargas, Punta Uva, sandflat near small mangrove creek. 0.5 m, burrow, 26.XI.2005, A. Anker, I.S. Wehrtmann & L. Harris coll.

Remarks. SAKAI (2011) synonymised *Lepidophthalmus manningi* FELDER & STATON, 2000 with *L. richardi*. This is not followed here.

Previously recorded from Costa Rica as host of *Leptalpheus* cf. *forceps* WILLIAMS, 1965 by ANKER (2008).

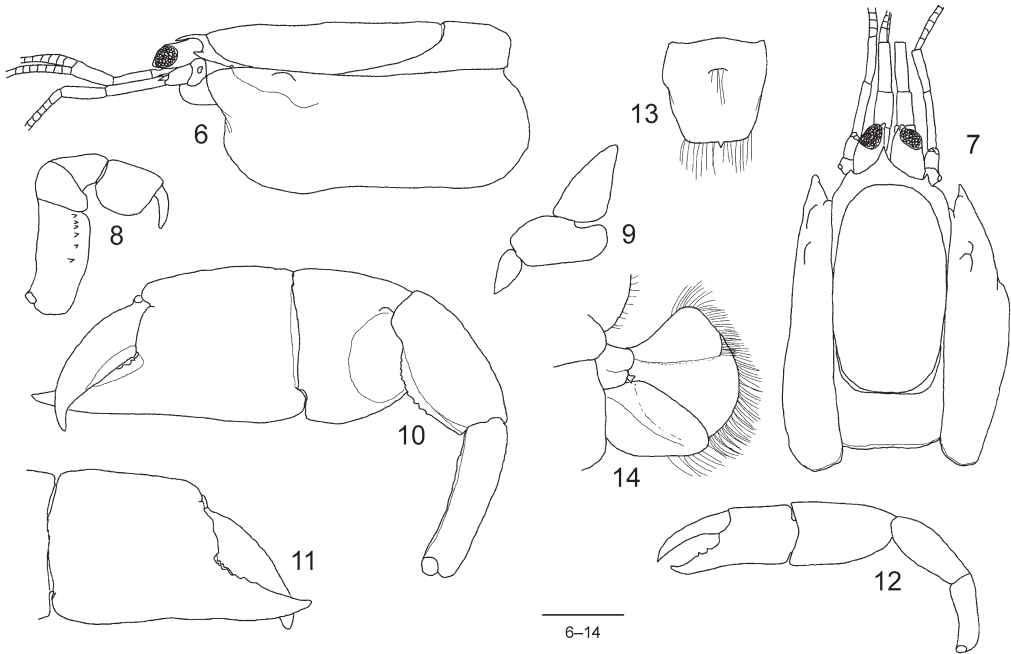
***Neocallichirus* Sakai, 1988**

***Neocallichirus* cf. *mortenseni* SAKAI, 2005 (Fig. 2)**

Neocallichirus mortenseni SAKAI, 2005: 170, figs. 34-36;—2011: 462.

Material. MZUCR 2255-01, 9 juveniles (-/2.75–4.5), Pacific, Isla del Coco, Bahia Wafer, zona rocosa a la derecha, en lodo y arena, marea baja, 15-16.II.1999, R. Vargas coll.

Remarks. The specimens are in poor condition, there are three entire bodies, six anterior body parts, mainly with legs detached, six pleons, dos major right, dos minor right chelipeds. The species was described from a single small (21.0/5.0) female from a small island off northern coast of Taboga, Panama (SAKAI 2005). The present material agrees well with the description and figures for the holotype, except that none showed a spinule at the lateral margin of the uropodal endopod.



Figs 6-14. *Neocallichirus* cf. *mortenseni* SAKAI, 2005, MZUCR 2255-01, female, cl 5.0 mm. Carapace in lateral (6) and dorsal (7) view; third maxilliped (8) and distal articles of third pereopod (9) in lateral view; major cheliped in mesial view (10) and distal articles in lateral view (11); 12, minor cheliped (detached) in mesial view; telson (13) and right uropod (14) in dorsal view. Setation omitted except in 13, 14. Scale is 1 mm.

Callianideidae KOSSMANN, 1880

Callianidea H. MILNE EDWARDS, 1837

Callianidea laevicauda GILL, 1859

Callianidea laevicauda GILL, 1859: 167;—KENSLEY & HEARD, 1991: 499, figs. 3, 4, tab. 1A;—LEMAITRE & RAMOS, 1992: 352—POORE, 1997: 354, fig. 4C;—VARGAS & CORTÉS, 1999b: 906.

Callianidea laevicauda occidentalis SCHMITT, 1939: 10.

Paracallianidea laevicauda.—SAKAI, 1992: 17;—2011: 206, figs. 40F-H.

Material. MZUCR 2020-08, 1 male (-/10.7), Pacific, playa Blanca, Pla Sta Elena A.C.6., Parque Nacional Santa Rosa, zona rocosa, lado norte, marea baja, 16.II.1995, R. Vargas coll.; —MZUCR 1872, 1 female (-/5.7 poor condition), Pacific, Cabo Blanco, Puntarenas, viviendo en grietas entre rocas en zona entre mareas, 9.II.1993, L. Inema coll.; —MZUCR 2552-06, 1 male (-/4.0), 1 ovigerous female (40/10.0), Pacific, Isla del Coco, Bahía Chatham, zona entre mareas en colonias de coral muerte, 0 m > 500 micras, IV.2008, J. Sibaja coll.

Remarks. This species has an amphi-American distribution (KENSLEY & HEARD, 1991).

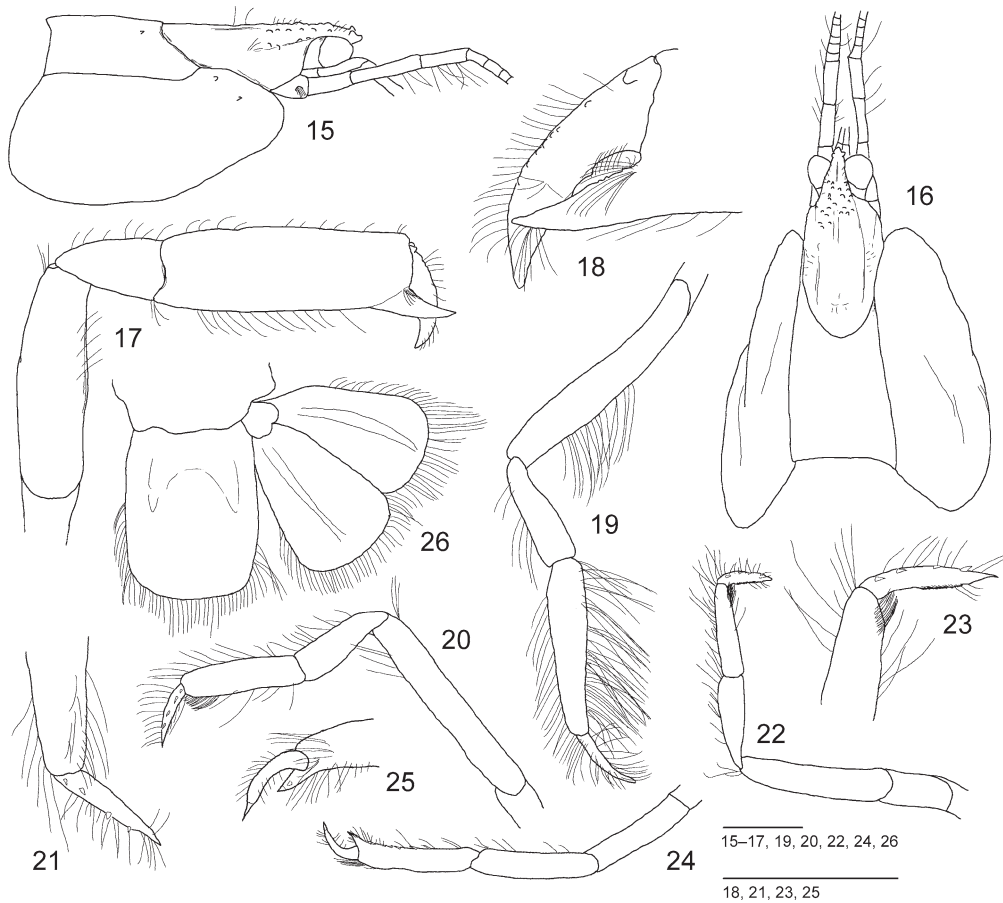
Gebiidea DE SAINT LAURENT, 1979

Axianassidae SCHMITT, 1924a

Axianassa SCHMITT, 1924a

Axianassa mineri BOONE, 1931

Axianassa mineri BOONE, 1931:157, fig. 10;—KENSLEY & HEARD, 1990: 563, fig.4.



Figs 15–26. *Aethogetia gorei* WILLIAMS, 1993, MZUCR 2681-04, male, cl 3.9 mm. Carapace in lateral (15) and dorsal (16) view; 17, right cheliped; 18, left cheliped, detail of chela; 19, left second pereopod, lateral view; 20, left third pereopod, lateral view; 21, same, detail; 22, right fourth pereopod, lateral view; 23, same, detail; 24, left fifth pereopod, dorsal view; 25, same, detail; 26, telson and right uropod in dorsal view. Scale is 1 mm.

Material. MZUCR 2552-06, 1 male (-/3.8), 2 females (ovigerous -/3.75, -/3.0), Pacific, Isla del Coco, Bahía Chatham, zona entre mareas en colonias de coral muerta, 0 m > 500 micras, IV.2008, J. Sibaja coll.; – MZUCR 2253-01, 1 male (24/5.6), 1 ovigerous female (15/3.75), Pacific, Isla del Coco, Bahía Chatham, en desembocadura Río Sucio, bajo rocos recubiertas con verne tides, marea baja, 2.II.1999, R. Vargas coll.; – MZUCR 2397-08, 1 ovigerous female (-/5.0), Pacific, Isla del Coco, Chatham Bay, sobre rocas o pozos de marea zona entre mareas, 2.XII.2001, J. M. Montoya coll.

Remarks. First record for Costa Rica.

Upogebiidae BORRADAILE, 1903

***Aethogetia* WILLIAMS, 1993**

***Aethogetia gorei* WILLIAMS, 1993 (Fig. 3)**

Aethogetia gorei WILLIAMS, 1993b: 7, fig. 4;—SAKAI, 2006: 20.

Material. MZUCR 2681-04, 1 male (13.2/3.9), Pacific, I. Coco, I. Ulloa, 3 m rocas coral, 28.V.2008, R. Vargas coll.

Remarks: This species has been described from a single specimen collected in Florida, off Key Largo, inside coral rubble in 3 m depth (WILLIAMS, 1993). It differs from all other Upogebiidae by its strap-shaped rostrum, an anterior gastric region not flanked on each side by furrow or lateral ridge, and very slender pereopods. A second specimen was collected at the Caribbean coast of Panama (DWORSCHAK & ANKER, in prep.). Both the specimen from Panama and the one from Pacific Costa Rica differ from the type specimen with respect to length/height relation of pereopods and wider telson and uropodal endopod (Table 1). As this might well fall within the range of intraspecific variation, the specimens from Panama and Costa Rica are tentatively assigned to *Aethogebia gorei*.

Pomatogebia WILLIAMS & NGOC-HO, 1990

Pomatogebia cocosia (WILLIAMS, 1986)

Upogebia cocosia WILLIAMS, 1986: 7 (key), 55, fig. 20.

Pomatogebia cocosia.—VARGAS & CORTÉS, 1999b: 906;—SAKAI, 2006: 36, fig. 9B.

MZUCR 1735-01, 1 male, Pacific, Isla del Coco, 1988, J. M. Montoya coll.; – MZUCR 1932-03, 1 female, Pacific, Isla del Coco, III.1989, J. M. Montoya coll.; – MZUCR 2644-16, 3 males, 1 ovigerous female, Pacific, I. Coco, I. Ulloa, en rocas coralinas, 12 m, 23.V.2008, R. Vargas coll.; – MZUCR 2678-09, 2 males, 1 ovigerous female, Pacific, I. Coco, Bahía Chatham, en rocas coralinas, 8 m, 25.V.2008, R. Vargas coll.; – MZUCR 2676-27, 2 males, 2 ovigerous females, Pacific, I. Coco, Bajo Silverado, en rocas coralinas, 25.V.2008, R. Vargas coll.; – MZUCR 2683-09, 1 male, 1 ovigerous female, Pacific, I. Coco, I. Manuelita, en rocas coralina, 7.5 m, R. Vargas coll.; – MZUCR 2559-01, 1 male, Pacific, I. Coco, Punta María, buceo en rocas, 20 m, 10.IV.2008, J. Sibaja coll.; – MZUCR 2502-12, 7 males, 8 females (5 ovigerous), Pacific, Isla del Coco, Punta Ulloa, sobre rocas, 12-15 m, 14.X.2007, J. Sibaja coll.; – MZUCR 2684-22, 1 male, 1 female, Pacific, I. Coco, Bahía Chatham, en rocas coralinas, 14 m, 29.V.2008, R. Vargas coll.; – MZUCR 2616-01, 4 males, 3 females (1 ovigerous), Pacific, I. Coco, I. Ulloa, en rocas coralinas, 28.V.2008, R. Vargas coll.; – MZUCR 2691-01, 5 juveniles (cl 2.1, 2.1, 1.8, 1.2, 1.06), Pacific, Playa Matapalo, Guanacaste, arrecife de coral 6-14 m, po do litos, 3.X.2008, J. Sibaja coll.; – MZUCR 1533-05, 2 males (-/5.6, -/3.5), Pacific, Punta Sabana, Conchal, Guanacaste, , 4.III.1995.

Pomatogebia operculata (SCHMITT, 1924b)

Upogebia (*Gebiopsis*) *operculata* SCHMITT, 1924b: 91, pl. 5 figs. 1-4.

Pomatogebia operculata.—WILLIAMS & Ngoc-HO, 1990: 614, fig. 1a-c;—WILLIAMS, 1993b: 10, fig. 5;—VARGAS & CORTÉS, 1999a: 882;—SAKAI, 2006: 34, fig. 9A.

MZUCR 1080-01, 1 female, Caribbean, Puerto Vargas, Cahuita, Limón, en roca coralina, 7.X.1984.

Table 1: Measurements of the three known specimens assignable to *Aethogebia gorei*.

	holotype Florida	Caribbean Panama	Pacific Costa Rica
carapace length [mm]	4.2	3.1	3.9
P1 propodus L/H	2.66	3.55	2.93
P2 propodus L/H	6.25	6.57	4.69
telson L/W	0.89	1.35	1.23
uropod endopod L/W	1.2	1.72	1.62
source	WILLIAMS (1993: fig. 4)	DWORSCHAK & ANKER (in prep.)	this study: Fig. 3

***Pomatogebia rugosa* (LOCKINGTON, 1878)**

Gebia rugosa LOCKINGTON, 1878: 300.

Upogebia rugosa.—WILLIAMS, 1986: 7 (key), 58, fig. 21.

Pomatogebia rugosa.—WILLIAMS & NGOC-HO, 1990: 616;—VARGAS & CORTÉS, 1999b: 906;—SAKAI, 2006: 37.

Material. MZUCR 1081-01, 1 female, Pacific, Punta Uvita, Puntarenas, 24.II.1994, J. Cortés coll.;—MZUCR 1925-01, 1 female, Pacific, isla del Caño, camarón viviendo en cámaras en coral, 1988, J. Cortés coll.;—MZUCR 2200-01, 1 male, 2 females, Pacific, Sándalo, Golfo Dulce, viviendo en *Porites*, 16.III.1996, J. Cortés coll.;—MZUCR 1770-01, 1 male (-/7.1), 2 females (-/7.5, ovigerous -/6.4), Pacific, Punta Islotes, golfo Dulce, in *Porites lobata* vivo, 12.III.1989 (det A.B. Williams).

Upogebia* LEACH, 1814**Upogebia acanthura* (COÊLHO, 1973)**

Upogebia (Calliadne) acanthura COÊLHO, 1973a: 344.

Upogebia synagelas WILLIAMS, 1987: 590, figs. 1-3.

Upogebia acanthura.—WILLIAMS, 1993b: 16, figs. 6-7;—SAKAI, 2006: 62.

Material. None in MZUCR.

Remarks. Reported from one ovigerous female from the Caribbean, E of Limón, 10°01.3'N, 82°50'W, R/V Pillsbury sta P-1319, IKMT at 25 m (bottom 677-730 m), 27 Jan 1971, R/V Pillsbury by WILLIAMS (1993).

***Upogebia burkenroadi* WILLIAMS, 1986**

Upogebia burkenroadi WILLIAMS, 1986: 8 (key), 12, fig. 4;—VARGAS & CORTÉS, 1999: 906;—SAKAI, 2006: 72.

Material. MZUCR 1708-01, 1 male, 2 females, Pacific, punta Pitahaya, Guanacaste, 15.VI.1991, J. Cortés coll.

***Upogebia cortesi* WILLIAMS & VARGAS, 2000**

Upogebia cortesi WILLIAMS & VARGAS, 2000: 13, fig. 1;—SAKAI, 2006: 72.

Material. MZUCR 2220-06, 1 male (paratype), Pacific, Reserva Absoluta de Cabo Blanco, lado noreste de la isla, dragado paralela a la costa, Taller Molluscos, INBio 1998, 30-40 m, 16.-17.V.1998, R. Vargas coll.

Remarks. Reported previously by WILLIAMS & VARGAS (2000).

***Upogebia dawsoni* WILLIAMS, 1986**

Upogebia dawsoni WILLIAMS, 1986: 10 (key), 14, fig. 5;—VARGAS & CORTÉS, 1999b: 906;—SAKAI, 2006: 72.

Material. MZUCR 2816-01, 2 males (37/12.2, 36/11.5) 5 females (ovigerous 30/9.4, 33/11.1, ovigerous 36/11.4, ovigerous 35/11.1, ovigerous 34/10.0), Pacific, Leon, La Penita, Isla Juan Venado, Reserva Natural, UPM 498615/1365615, en playón dentro del manglar, marea baja, 10.X.2009, W. Mendoza coll.

Remarks. Previously recorded from Golfo de Nicoya by WILLIAMS (1986).

***Upogebia jonesi* WILLIAMS, 1986**

Upogebia jonesi WILLIAMS, 1986: 10 (key), 19, fig. 7;—VARGAS & CORTÉS, 1999b: 906;—SAKAI, 2006: 73.

Material. None in MZUCR.

Remarks. Recorded from Golfo de Nicoya by WILLIAMS (1986)

***Upogebia longipollex* (STREETS, 1871)**

Gebia longipollex STREETS, 1871: 242.

Upogebia longipollex; WILLIAMS, 1986: 8 (key), 24, fig. 9;—SAKAI, 2006: 73.

Material. MZUCR 2567-01, 2 males, 2 females, Pacific, shrimp farm DIAMASA, 3.VIII.1996, I. Cedeno coll.; – MZUCR 2402-02, 1 male (22/8), Pacific, Islotes, Golfo Dulce, Puntarenas, arrecife de vermetidos, muestra #3, 1.III.1997, J. Cortés & A. Fonseca coll.

Remarks. First record for Costa Rica.

***Upogebia maccraryae* WILLIAMS, 1986**

Upogebia maccraryae WILLIAMS, 1986: 8 (key), 27, fig. 10;—VARGAS & CORTÉS, 1999b: 907;—SAKAI, 2006: 74.

Material. MZUCR 2142-06, 1 male, 1 female, Pacific, estero punta Morales, raíces de *Rhizophora mangle*, 1995, H. Büttner coll.; – MZUCR 2037, 1 female (-/10.8), 2 males (-/6.7, -/5.6), Pacific, Estero Pailón, 300 m arriba de Boca Río Sierpe, Prov. Puntarenas, 9.IV.1995, D.W. Taylor coll.

***Upogebia omissa* GOMES CORRÊA, 1968**

Upogebia omissa GOMES CORRÊA, 1968: 98, figs. 1-15, 28, 29;—WILLIAMS, 1993b: 54, fig. 24;—SAKAI, 2006: 67.

Material. MZUCR 2155-01, 1 male (18/6.8), 1 female (18/7.3), Caribbean, Parque Nacional Cahuita, Limón, en cámaras de arena recubiertas con lodo, sobre estructuras artificiales, cresta interna del arrecife, 9.X.1995, J. Cortés coll. (original ID as *U. spinigera* by A.B. Williams).

Remarks. First record for Costa Rica.

***Upogebia onychion* WILLIAMS, 1986**

Upogebia onychion WILLIAMS, 1986: 8 (key), 33, fig. 12;—SAKAI, 2006: 74

Material. MZUCR 1707, 2 ovigerous females (22/8.0, 18/7.8), Pacific, Punta Cóncava, Guanacaste (cerca de la punta), 10 m, 14.VI.1991, J. Cortés coll.

Remarks. First record for Costa Rica.

***Upogebia spinigera* (SMITH, 1871)**

Gebia spinigera SMITH, 1871: 92

Upogebia (Upogebia) sturgisae BOONE, 1931: 161, fig. 11.

Upogebia spinigera.—HOLTHUIS, 1952: 3 (part.), figs. 1-2;—WILLIAMS, 1986: 8 (key), 10 (key), 41, fig. 15;—VARGAS & CORTÉS, 1999b: 907;—SAKAI, 2006: 76.

Material. MZUCR 1976-08, 2 males, 2 females, Pacific, Estero Guarumal, Reserva Forestal Terraba-Sierpe, Puntarenas, en fango del manglar, 5.-6.XII.1993, F. Chicas coll., [different location (Cabo Blanco) and date (27.X.1992) in Vargas & Cortés (1999b)]; – MZUCR 1710-01, 1 males, 3 females, Pacific, Punta Morales, islote frente al laboratorio, entre rocas, 3.V.1991, J. A. Vargas coll.; – MZUCR 0952-01, 1 female, Pacific, N. shore, Punta Morales, Golfo de Nicoya, 21-II-1980, R. C. Brusca don., M. Wicksten det.; – MZUCR 1060-03, 1 female, Pacific, Punta Morales, 11.VIII.1984; – MZUCR 2142-05, 2 females, 1 juvenile, Pacific, Punta Morales, 1995, H. Büttner coll.; – MZUCR 2196-01, 1 female, 1 juvenile, Pacific, Punta Morales, canal principal, 2.VIII.1996, J. A. Vargas, R. Vargas & G. Jones coll.; – MZUCR 2195-01, 1 male, 2 females, Pacific, Punta Morales, canal principal, marea baja, 24.V.1997, J. A. Vargas coll.; – MZUCR 2108-01, 11 males, 16 females, Pacific, Boca Guarumal, manglar Terraba-Sierpe, marea baja, en huecos en pared de manglar, 23.XI.1995, R. Vargas coll.; – MZUCR 1727-01, 1 female, Pacific, Mogos, península de Osa, 18.XII.1990; – MZUCR 2194-01, 2 females, Pacific, Puerto Jiménez, viviendo en madrigeras hechas en madera podrida, 31.I.1997, I. Wehrtmann coll., [missing catalogue number in VARGAS & CORTÉS (1999b)]; – MZUCR 1976-07, 1 female (37/13.4), Pacific, Estero Guarumal, Reserva Forestal Terraba-Sierpe, en barro y raíces de mangle, 5.-6.XII.1993, F. Chicas coll., (reexamination of this female in July 1994 shows it to be

Upogebia spinigera. There are small spines on edge of pleura of abd. segment 1.- A.B. Williams); – MZUCR 2908-01, 1 ovigerous female (50/13.0), 1 male (44/12.8), NHMW 25433, 1 ovigerous female (57/14.4 bopyrid right), Pacific, Punta Morales near marine station, mangroves under rocks in mud, 22.XI.2005, A. Anker coll.

***Upogebia tenuipollex* WILLIAMS, 1986**

Upogebia tenuipollex WILLIAMS, 1986: 7 (key), 45, fig. 16;—SAKAI, 2006: 77.

Material. MZUCR 1709, 2 females (25/8.4, 24/7.8), Pacific, Pta Judas Esterillos, Quepos, dentro de lutita (claystone and sand), 26.VIII.1991, A. Kastner coll.

Remarks. First record for Costa Rica.

***Upogebia vargasae* WILLIAMS, 1997**

Upogebia vargasae WILLIAMS, 1997b: 620, fig. 2;—VARGAS & CORTÉS, 1999b: 907;—SAKAI, 2006: 78.

Material. MZUCR 2108-02, 3 males, 13 females, 1 juvenile, Pacific, manglar de Térraba-Sierpe, Puntarenas, en huecos en paredón del manglar, marea baja, asociados con *U. spinigera*, 23.XI.1995, R. Vargas coll.; – MZUCR 2108-02-01, 2 males, 3 females (paratypes), Pacific, manglar de Térraba-Sierpe, Puntarenas, 23.XI.1995, R. Vargas coll.

***Upogebia vasquezi* NGOC-HO, 1989**

Upogebia vasquezi NGOC-HO, 1989b: 866, figs. 1-2;—WILLIAMS, 1993b: 67, figs. 30-31;—SAKAI, 2006: 69.

Material. None in MZUCR.

Remarks. This species is widely distributed in the Caribbean and western Atlantic (WILLIAMS, 1993b). It was also recorded from Pacific Costa Rica (Bahia Ballena, Golfo de Nicoya, 20 m) by SAKAI (2006), however, among the western Atlantic species of *Upogebia* and without mention of the material in the distributional records. This record is doubtful.

***Upogebia veleronis* WILLIAMS, 1986**

Upogebia veleronis WILLIAMS, 1986: 8 (key), 50, fig. 18;—SAKAI, 2006: 78.

Material. MZUCR 2464-01, 1 male (-/4.75), Pacific, al sur de Carillo a la largo de la costa, 9°45.04'-9°45.95'N 85°28.35'-85°29.46'W, R/V Urraca, Arrastre#30, 11.VII.2005, Y. Camacho coll.

Remarks. First record for Costa Rica.

Discussion

The species of Axiidea and Gebiidae are summarised according to oceans in Table 2. There are much more species recorded from the Pacific than from the Caribbean. This is in line with the species numbers of several benthic marine groups as summarised in the book on Costa Rican biodiversity edited by WEHRTMANN & CORTÉS (2009). Several reasons are responsible for this difference between the two coasts (see WEHRTMANN & CORTÉS 2009): the Caribbean coast is only 212 km long, rectilinear and consists mainly of high energy beaches, showing some coral reefs and very small mangrove stands in the south, whereas the Pacific coast is much longer (1254 km) and irregular, has two gulfs, estuaries, beaches of different types of sediments, mud flats, 99% of Costa Rica's mangroves and includes an offshore island (CORTÉS & WEHRTMANN 2009). As axiidean and gebiidean shrimp are predominantly burrowing and found in more sheltered habitats

(DWORSCHAK, 2000), such environments are rare at the Caribbean coast when compared to the Pacific. Moreover, the Caribbean is undersampled: VARGAS & WEHRTMANN (2009) report for decapod crustaceans a lack of offshore and deep water samples along this coast. From here, certainly additional species of Axiidea and Gebiidea have to be expected.

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Table 2: List of axiidean and gebiidean species from Costa Rica according to ocean

CARIBBEAN

Axiidea, Axiidae

- Axiopsis serratifrons* *
- Paraxiopsis* cf. *spinipleura* *
- Paraxiopsis defensus* *

Axiidea, Callianassidae

- Lepidophthalmus richardi*

Gebiidea, Upogebiidae

- Pomatogebia operculata*
- Upogebia acanthura*
- Upogebia omissa* *

PACIFIC

Axiidea, Axiidae

- Axiopsis baronai* *
- Axiopsis serratifrons*
- Calocarides* cf. *quinqueseriatus* *
- Coralaxius galapagensis* *
- Guyanacaris caespitosa* *
- Guyanacaris hirsutumana*

Axiidea, Callianassidae

- Biffaris debilis*
- Callianassa costaricensis*
- Callichirus seilacheri*
- Corallianassa xutha* *
- Lepidophthalmus bocourti*
- Lepidophthalmus eiseni*
- Neocallichirus* cf. *mortenseni* *

Axiidea, Callianideidae

- Callianidea laevicauda*

Gebiidea, Axianassidae

- Axianassa mineri* *

Gebiidea, Upogebiidae

- Aethogebia gorei* *
- Pomatogebia cocosia*
- Pomatogebia rugosa*
- Upogebia burkenroadi*
- Upogebia cortesi*
- Upogebia dawsoni*
- Upogebia jonesi*
- Upogebia longipollex* *
- Upogebia maccroryae*
- Upogebia onychion* *
- Upogebia spinigera*
- Upogebia tenuipollex* *
- Upogebia vargasae*
- Upogebia vasquezi* §
- Upogebia veleronis* *

* new record for Costa Rica, § doubtful record

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