

***Biffarius pacificus*, a new species of the Callianassidae
(Crustacea: Decapoda: Thalassinidea)
from northern Chile***

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SUMMARY: Nine specimens of *Biffarius pacificus* sp. nov. were collected with a "van Veen" grab at two sublittoral stations off the northern coast of Chile (Iquique, 22°12'S; Patache, 22°45'S) at depths ranging from 17 to 30 m. This is the first record of the genus *Biffarius* from the southeastern Pacific Ocean off South America. *Biffarius pacificus* sp. nov. is closely allied to *B. poorei* from Tasmanian waters. A detailed differentiation of both species is provided.

Key words: Decapoda, Thalassinidea, Chile, biogeography.

RESUMEN: *BIFFARIUS PACIFICUS*, UNA NUEVA ESPECIE DE CALLIANASSIDAE (CRUSTACEA: DECAPODA: THALASSINIDEA) DEL NORTE DE CHILE. – Nueve especímenes de *Biffarius pacificus* sp. nov., fueron capturados con una draga "van Veen" en dos localidades de la zona norte de Chile (Iquique, 22°12'S; Patache, 22°45'S) en muestras obtenidas en el sublitoral desde los 17 a los 30 m de profundidad. Este es el primer registro para el sudeste del Océano Pacífico de Sudamérica de una especie del género *Biffarius*. *Biffarius pacificus* sp. nov. está cercanamente relacionada con *B. poorei* de las aguas de Tasmania. Se presenta una diferenciación detallada de ambas especies.

Palabras clave: Decapoda, Thalassinidea, Chile, biogeografía.

INTRODUCTION

More than 500 thalassinid taxa have been described so far presenting a sharp latitudinal increase in diversity from high latitudes towards the equator in both hemispheres as well as a depth-related decrease in thalassinid diversity (Dworschak, 2000). Although intensive and continuous investigations in the southwest Atlantic found this region to be one of those with the highest thalassinid diversity on a worldwide scale (Dworschak, 2000; Williams, 1993), marine biolo-

gists still paid relatively little attention to thalassinids from the Pacific coast of South America and the southern Atlantic waters off the coast of Argentina. Only 7 species were previously known to occur along the Chilean and Argentine coasts (compare with Retamal, 1981, Thatje, 2000) and the situation of thalassinid occurrence and distribution along the Pacific coast of northern South American countries still remains uncertain. Most recent descriptions of new species from these waters (Thatje, 2000; Thatje and Gerdes, 2000) from the deeper sublittoral indicate that real species richness in the Thalassinidea from Pacific South America still remains to be discovered.

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The genus *Biffarius* was established by Manning and Felder (1991) on the basis of the redescription of *Callianassa biformis* (Biffar, 1971b) from the western Atlantic Ocean. Distinctive parameters for this genus are the absence of the rostral spine, a sub-terminal and flattened cornea dorsal, and the first antennal peduncle being not longer but stouter than the second antennal peduncle; third maxilliped without endopod, and the ischium-merus operculiform, merus not projecting beyond articulation with carpus; second pair of pleopods lacking or vestigial (Manning and Felder, 1991). At present, the genus *Biffarius* consists of 12 known representatives (for review see, Tudge *et al.*, 2000; Sakai, 1999), which are small in size and mostly of intertidal to sublittoral living (Table 1).

Nine thalassinid specimens were caught with a "van Veen" grab of 0.1 m² sampling surface at two sublittoral stations off the northern coast of Chile (Iquique, 22°12'S; Patache, 22°45'S) at depths ranging from 17 to 30 m. These specimens were previously assigned to *Notiastax brachyophthalma* A. Milne Edwards, 1870 (Ferrari, 1981), but a more detailed morphology study determined this material to belong to the genus *Biffarius*.

A detailed morphological description of *Biffarius pacificus* sp. nov. is provided and compared with the closely allied species *B. poorei* from Tasmanian waters (Kensley, 1974).

DESCRIPTION OF SPECIES

Biffarius pacificus sp. nov. (Figs. 1 and 2)

Type material: Holotype, male, total length (TL) = 26 mm, deposited in the Museo Nacional de Historia Natural de Santiago, Chile (Reg. No. 12564). Paratypes, male, TL = 20 mm; female, TL = 18 mm, both deposited in the Zoological Museum of the Humboldt University, Berlin, Germany (ZMB 27443).

Other material: Six males, TL = 16 to 20 mm, deposited in the Museo del Mar, Universidad Arturo Prat, Chile, MUAP(CD)-0370. All specimens of *Biffarius pacificus* sp. nov. examined were caught with a "van Veen" grab of 0.1 m² sampling surface at two sublittoral stations off the northern coast of Chile (Iquique, 22°12'S; Patache, 22°45'S) at depths ranging from 17 to 30 m.

Diagnosis: shrimp very small in size, carapace length (CL) = 17-26 mm. Carapace oval in shape, without cardiac prominence (Fig. 1E), cervical groove distinct, rostral spine absent. Merus of both chelipeds with ventral projections (Fig. 2A+B). Inner surface of immobile finger of right first chela armed with a row of seven acute teeth (Fig. 2A). Tel-

son subquadrate, posterior margin of telson bilobed with a mesial spine flanked by a fine row of spinous setae (Fig. 1I).

Description: Carapace smooth with dorsal oval, cervical groove and linea thalassinica well defined. Rostrum wide, and without spine, lateral spine absent, anterior and posterior lateral margins of carapace rounded (Fig. 1E).

Eyestalks conical extending nearly to distal margin of first antennular segment, cornea well developed, as wide as basis of eyestalk. Antennular (A1) peduncle longer and wider than antennal (A2) peduncle. Third antennular segment as long as fourth antennal segment.

Incisor process of mandible with 14-15 acute teeth along margin; molar process bearing a robust distal tooth, palp trisegmented, distal segment longest (Fig. 1B). Maxillule with broad protopodal endites; palp slender, with curved tip (Fig. 1C). Maxilla with protopodal endite bilobed; palp slender and overreaching the middle of the basal endite; exopod uniform, with crenate margins bearing equally-spaced setae, longer on distal margin (Fig. 1D). Mxp1 with broad subrectangular exopod, palp short, as lobe in shape, epipod subquadrate distally; endite lanceolate (Fig. 1F). Mxp2 with 5-segmented endopod, exopod not reaching distal margin of second endopodal segment, three distal segments being shorter than merus (Fig. 1G). Mxp3 with ischium-merus operculiform, ischium 1.5 times wider than long; merus as long as wide, distal internal portion projecting beyond the carpo-meral articulation; carpus as long as propodus, dactylus lanceolate, being half as long as length of propodus (Fig. 1H); inner, mesial surface of ischium without crista dentata. Chelipeds sub-equal in shape and length, both with meral spine, being more pronounced in the left than in the right cheliped (Fig. 2A+B); larger cheliped of male with ischium smooth, unarmed; merus with anterior margin smooth, ventral margin produced into distally directed median spine and with distal portion serrated; carpus about 1.5 times longer than wide; palm shorter than carpus, slightly longer than wide; fingers shorter than palm, gaping; cutting edges minutely serrated; fixed finger armed with seven teeth (left chela) and eleven teeth (right chela) (Fig. 2A+B).

P2 with fingers not gaping, cutting edges straight, smooth; merus 3 times longer than ischium, merus slender, subrectangular in shape; carpus triangular, broadened distally; propodus subquadrate,

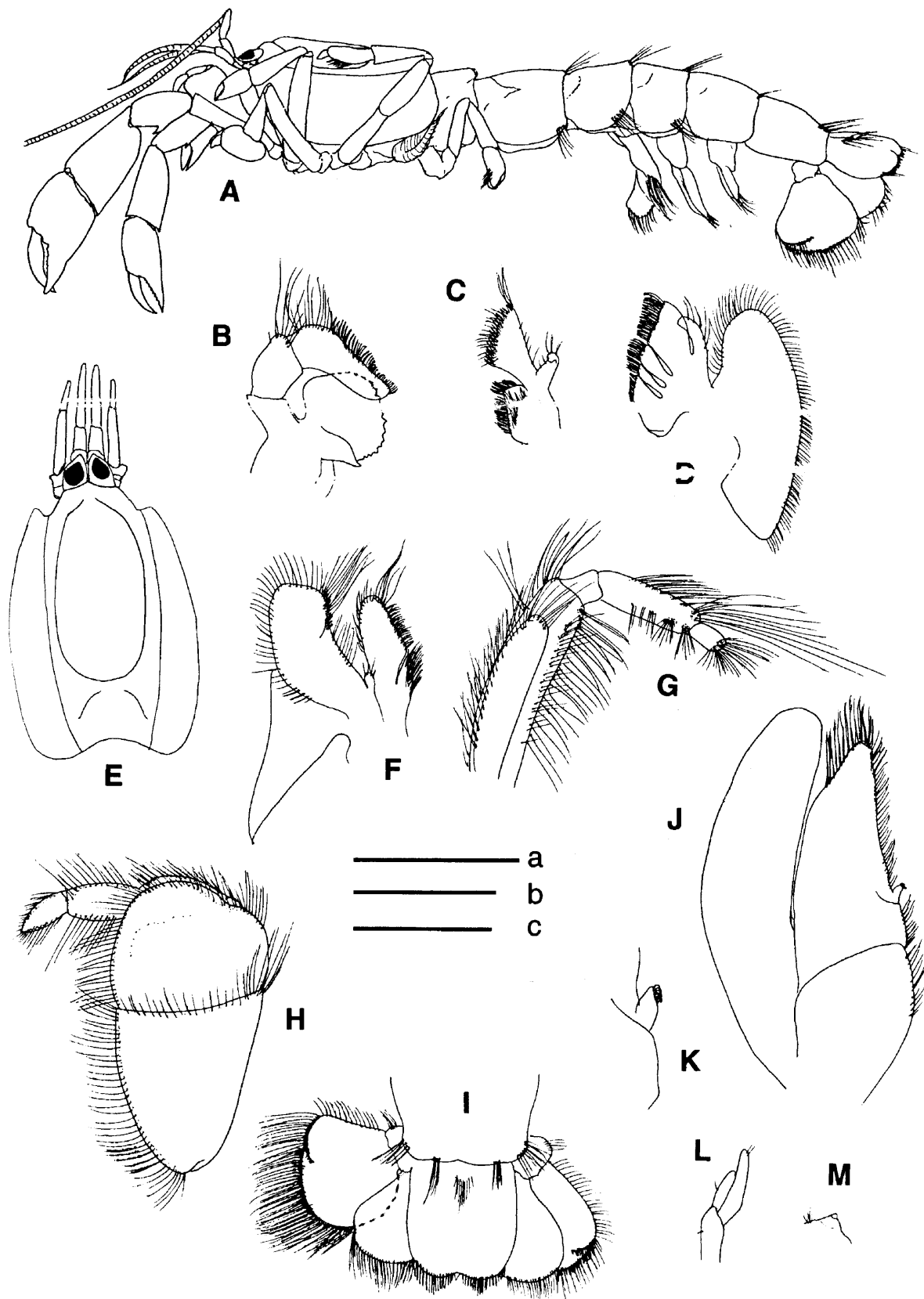


FIG. 1. – *Biffarius pacificus* sp. nov. A, male holotype, lateral view; B, Mandible; C, Maxillule; D, Maxilla; E, Carapace and anterior appendages, dorsal view; F, Mxp 1; G, Mxp 2; H, Mxp 3; I, Telson and uropods; J, Plp 3, K, Appendix interna on Plp 3; L, Plp 2, female; M, Plp 1, female. A, E, I, male holotype, TL = 26 mm; B-D, F-H, J-K, male paratype, TL = 20 mm; L-M, female paratype, TL = 18 mm. Scale bars: a = 2 mm (A); a = 1.5 mm (E, I); b = 2 mm (C, D, F-H, J); c = 1 mm (B, K-M).

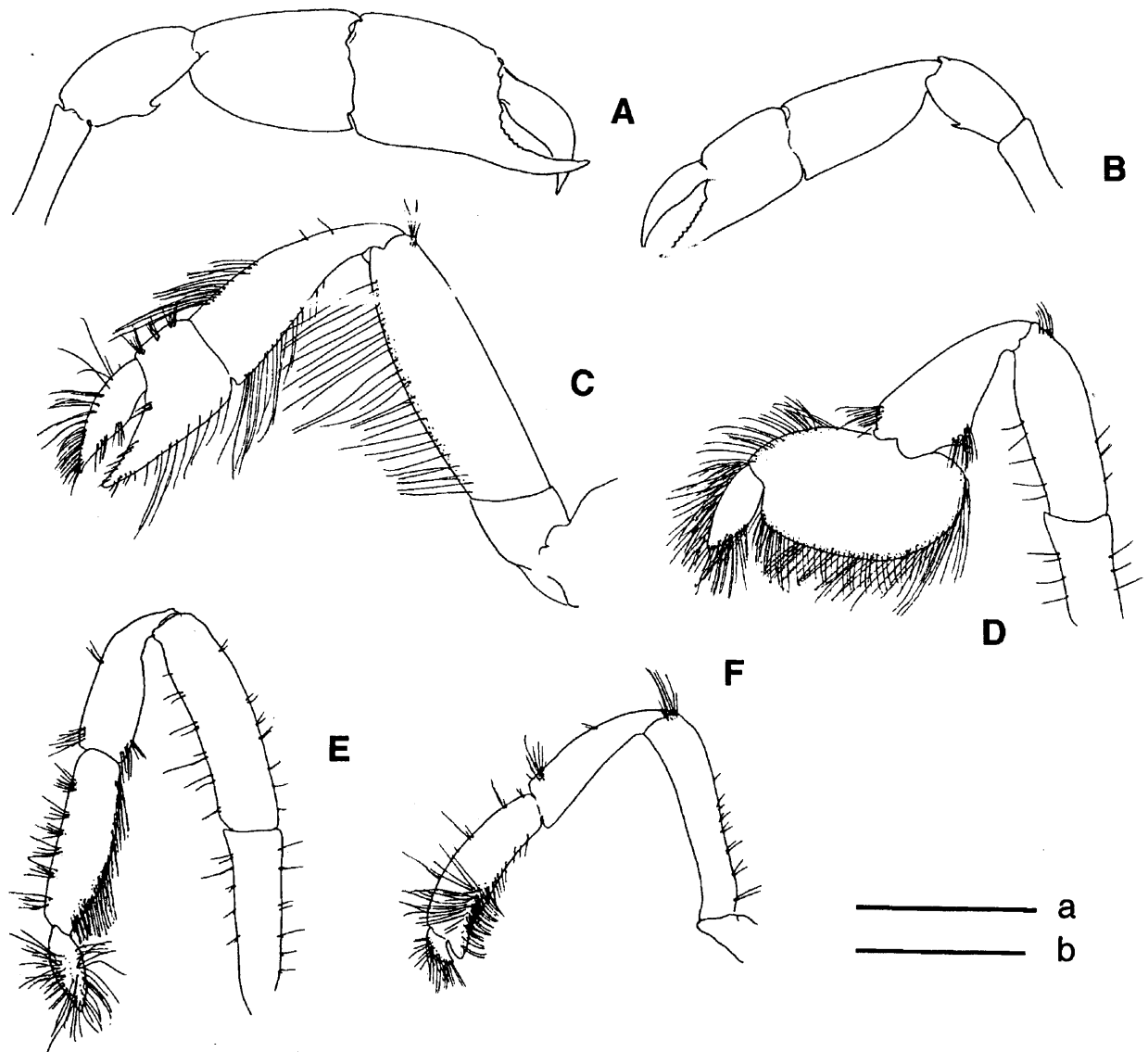


FIG. 2. – *Biffarius pacificus* sp. nov. A, Major cheliped of male; B, Minor cheliped of male; C, Pereiopod 2; D, Pereiopod 3; E, Pereiopod 4; F, Pereiopod 5. A, male holotype, TL = 26 mm; B-F, male paratype, TL = 20 mm. Scale bars: a = 4 mm (A); b = 2 mm (B-F).

fixed finger triangular, unarmed; dactylus lanceolate (Fig. 2C). P3 with ischium and merus of about same width, merus longer than ischium, carpus subtriangular, broadening distally, distal lobe with a tuft of dense setae; propodus longer and wider than carpus; dactylus twice as long as broad (Fig. 2D).

P4 with ischium slender, merus as long as ischium, carpus subtriangular in shape, ventral margin with a tuft of long distal setae, propodus longer than carpus, ventral margin densely covered with spinous, simple and plumose setae; dactylus lanceolated, densely covered with long setae (Fig. 1E).

P5 distinctly chelate, fingers small, tips curved; ischium short, merus slender and about five times as long as broad; carpus subtriangular, propodus slen-

der; dactylus subconical, dorso-distal margin densely covered with plumose setae (Fig. 1F).

Abdominal somites smooth, somite 1 shortest, half as long as somite 2, being a third longer than somites 3-5; somites 3-5 subequal in length; somites 2-4 each with small lateral row of fine setae; somites 2-5 each with small tuft of setae on postero-dorsal margin; somite 6 about as long as telson, bearing postero-dorsal rows of long posteriorly directed setae (Fig. 1A).

Plp1 absent in males, in females reduced, represented by a small lobe (Fig. 1M); Plp2 of females biramous, unsegmented; endopod straight but a third shorter than exopod, with 1-2 short setae scattered along its length; exopod similar but slightly curved,

bearing a few short terminal setae (Fig. 1L). Plp3-5 biramous, bilobed (Fig. 1J), with stubby, projecting appendices internae in both sexes, typical characteristic for genus (Manning and Felder, 1991).

Telson subquadrate, longer than wide, with one posteriorly directing tuft of setae on mid-dorsal surface; posterior margin fringed with short dense setae, slightly concave medially and with a median spine (Fig. 1I); Uropodal endopod widening to its distal extremity, about as long as broad, fringed with marginal spinous setae; exopod slightly longer than endopod, upper plate incomplete, with distal convex margin; exopod margin (including indentation of upper plate) fringed with finest setae, lateral margin with less dense setae (Fig. 1I)

Etymology: From the Latin, *pacificus*.

Remarks: *Biffarius pacificus* sp. nov. shows similarities to *B. poorei* from Tasmanian waters (Sakai, 1999). *Biffarius pacificus* sp. nov. differs from *B. poorei* (compare with Sakai, 1999) in lacking the crista dentata in the Mxp3, the absence of a rostral spine, a minor pronounced meral hook in the larger cheliped (meral hook of two spines in *B. poorei*), Plp1 lacking in males (present in *B. poorei*), Plp2 present in males (absent in *B. poorei*).

DISCUSSION

The genus *Biffarius* was erected by Manning and Felder (1991) on the basis of the redescription of *Callianassa biformis* (Biffar, 1971b) from the western Atlantic Ocean. Distinctive characters separating the genus *Biffarius* from the other genera of the Cal-

lianassidae (after Manning and Felder, 1991) were already mentioned in the Introduction of this work to which we refer. All *Biffarius* species are relatively small in size and known to occur in intertidal or shallow sublittoral waters (Table 1). *Biffarius pacificus* sp. nov. can be clearly distinguished from the closely allied Tasmanian species *B. poorei* (Sakai, 1999; see also Tudge *et al.*, 2000), and must be considered as the first find of the genus *Biffarius* from southeastern Pacific waters. *Biffarius debilis* is the only additional representative of the genus known from Pacific waters off America (Table 1; Hernández-Aguilera, 1998).

Recently, Heard and Manning (2000) differentiated the closest related genus *Pseudobiffarius* from *Biffarius*. The main morphological differences separating *Pseudobiffarius* from *Biffarius* are: A1 peduncle longer than A2 peduncle, dorsal flagellum of A1 short and stout, shorter than peduncle, Mxp3 with crista dentata on the inner face of ischium (compare with Heard and Manning, 2000). Several species assigned to *Biffarius* are known to bear a crista dentata on the Mxp3 (compare with, Biffar, 1971b; Kensley, 1974; Poore, 1975; Poore and Griffin, 1979) and also A1/A2 peduncle size relationships are questionable as a distinctive character (see *B. pacificus* sp. nov.). An extensive phylogenetic attempt of over 100 representatives in the Thalassinidea combined most *Biffarius* species on the basis of adult morphological characters (Tudge *et al.*, 2000; see also Sakai, 1999). This leads to the conclusion that a comprehensive morphological revision of *Biffarius* species is needed, in order to determine, whether some *Biffarius* species must be re-assigned to *Pseudobiffarius*. As a second possibility, due to an increased morphological variability

TABLE 1. – Geographical and bathymetric distribution of species of the genus *Biffarius* (? = no information available from the literature).

| Species | Distribution Geographical | Bathymetric | Length (mm) TL(CL) | Reference |
|-----------------------|---|--------------------------------|-----------------------|---|
| <i>B. biformis</i> | South Georgia, USA | shallow intertidal | 40 | Biffar, 1970 |
| <i>B. delicatulus</i> | Brazil shallow | intertidal | < 7 | Rodríguez and Manning, 1992 |
| <i>B. pacificus</i> | Northern Chile | 17-30 m | 16-26 | present work |
| <i>B. arenosa</i> | Queensland, Victoria, Tasmania (Australia) | ? | 24-43 | Poore, 1975 Poore and Griffin, 1979 |
| <i>B. australis</i> | South Africa | 10-180 m | 32-53 | Kensley, 1974 |
| <i>B. poorei</i> | Tasmania (Australia) | 12.5 m | 17-22 | Sakai, 1999 |
| <i>B. ceramica</i> | Victoria, Tasmania (Australia) | intertidal to shallow subtidal | 16-80 | Fulton and Grant, 1906 Poore and Griffin, 1979 |
| <i>B. debilis</i> | Pacific Mexico | intertidal | (2.6-4.6) | Hernández-Aguilera, 1998 |
| <i>B. diaphora</i> | Gulf of Guinea | 10-60 m | 20 | Le Loeuff and Intes, 1974 |
| <i>B. fragilis</i> | Florida to Venezuela | intertidal | 45 | Biffar, 1971a |
| <i>B. lewtonae</i> | Queensland (Australia) | 1-34 m | 16-19.5 | Ngoc-Ho, 1994 |
| <i>B. limosa</i> | Port Phillip, Victoria, Tasmania (Australia) | < 100 m | 12-23 | Poore, 1975 Poore and Griffin, 1979 |

within the genus *Biffarius*, the maintenance of the genus *Pseudobiffarius* might be questionable.

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REFERENCES

- Biffar, T.A. – 1970. Three new species of callianassid shrimp (Decapoda, Thalassinidea) from the western Atlantic. *Proc. Biol. Soc. Wash.*, 83(3): 35-49.
- Biffar, T.A. – 1971a. The genus *Callianassa* (Crustacea, Decapoda, Thalassinidea) in south Florida, with keys to the western Atlantic species. *Bull. Mar. Sci.*, 21(3): 637-715.
- Biffar, T.A. – 1971b. New species of *Callianassa* (Decapoda, Thalassinidae) from the western Atlantic. *Crustaceana*, 21(3): 225-236.
- Dworschak, P.C. – 2000. Global diversity in the Thalassinidea (Decapoda). *J. Crust. Biol.*, 2: 238-245.
- Ferrari, L. – 1981. Aportes para el conocimiento de la familia Callianassidae (Decapoda, Macrura) en el oceano Atlantico sudoccidental. *Physis* (Buenos Aires), 39(97): 11-21.
- Fulton, S.W. and F.E. Grant. – 1906. Some little known Victorian decapod Crustacea with descriptions of new species. *Proc. R. Soc. Vict.*, 19: 5-15.
- Heart, R. and R.B. Manning. – 2000. A new genus and species of ghost shrimp from Tobago, West Indies (Crustacea: Decapoda: Callianassidae). *Proc. Biol. Soc. Wash.*, 113(1): 70-76.
- Hernández-Aguilera, J.L. – 1998. On a collection of thalassinids (Crustacea: Decapoda) from the Pacific coast of Mexico, with description of a new species of the genus *Biffarius*. *Ciencias Marinas*, 24(3): 303-312.
- Kensley, B. – 1974. The genus *Callianassa* (Crustacea, Decapoda, Thalassinidea) from the west coast of South Africa with a key to the south African species. *Ann. S. Afr. Mus.*, 62(8): 265-278.
- Le Loeuff, P. and A. Intes. – 1974. Les Thalassinidea (Crustacea, Decapoda) du Golfe de Guinée. Systématique – Ecologie. *Cah. O.R.S.T.O.M., sér. Océanogr.*, 12(1): 17-69.
- Manning, M. and D.L. Felder. – 1991. Revision of the American Callianassidae (Crustacea: Decapoda: Thalassinidea). *Proc. Biol. Soc. Wash.*, 104(4): 764-792.
- Ngoc-Ho, N. – 1994. Some Callianassidae and Upogebiidae from Australia with description of four new species (Crustacea: Decapoda: Thalassinidea). *Mem. Mus. Victoria*, 54: 51-78.
- Poore, G.C.B. – 1975. Systematics and distribution of *Callianassa* (Crustacea: Decapoda: Macrura) from Port Phillip Bay, Australia, with descriptions of two new species. *Pacific Sci.*, 29: 197-209.
- Poore, G.C.B. and D.J.G. Griffin. – 1979. The Thalassinidea (Crustacea: Decapoda) of Australia. *Rec. Aus. Mus.*, 32(6): 217-321.
- Retamal, M.A. – 1981. Catálogo ilustrado de los Crustáceos Decápodos de Chile. *Gayana Zool.*, 44: 1-110.
- Rodríguez de A., S. and R.B. Manning. – 1992. Two new Callianassid shrimps from Brazil (Crustacea: Decapoda: Thalassinidea) *Proc. Biol. Soc. Wash.*, 105(2): 324-330.
- Sakai, K. – 1999. A new species, *Callianassa poorei* sp. nov. (Decapoda: Crustacea: Callianassidae) from Tasmania. *J. Mar. Biol. Ass. U.K.*, 79: 373-374.
- Thatje, S. – 2000. *Notiax santarita*, a new species of the Callianassidae (Decapoda, Thalassinidea) from the Beagle Channel, southernmost America. *Crustaceana*, 73(3): 289-299.
- Thatje, S. and D. Gerdes. – 2000. *Upogebia australis*, a new species of the Upogebiidae (Crustacea, Decapoda, Thalassinidea) from the Beagle Channel (Magellan Region). *Mitt. Mus. Nat.kd. Berl., Zool. Reihe* 76(2): 231-236.
- Tudge, C.C., G.C.B. Poore and R. Lemaitre. – 2000. Preliminary phylogenetic analysis of generic relationships within the Callianassidae and Ctenochelidae (Decapoda: Thalassinidea: Callianassoidea). *J. Crust. Biol.*, 20(2): 129-149.
- Williams, A.B. – 1993. Mud shrimps, Upogebiidae, from the western Atlantic (Crustacea: Decapoda: Thalassinidea). *Smith. Contr. Zool.*, 544: 1-77.

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