



On the occurrence of the genus *Paranebalia* (Crustacea: Phyllocarida: Leptostraca) in northern Patagonia, Argentina

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In the present study, the genus *Paranebalia* is recorded from Argentina for the first time, with a large number of specimens collected in Nuevo, San José and San Matías Gulfs, northern Patagonia, in the years 2003 to 2007 (see Fig. 1). Although these specimens agree with the diagnostic characters of *Paranebalia longipes* (Willemoes-Suhm, 1875), the description and subsequent redescrptions of this species are not sufficiently detailed for a reliable identification. Hence, we provisionally named our material as *Paranebalia* cf. *longipes* (see below).

The order Leptostraca contains a small number of marine species distinguished by a large bivalved carapace, an anterior hinged rostrum, eight leaf-like thoracic limbs, and seven abdominal segments. Leptostracans are known to occur in a wide variety of habitats, from hydrothermal vents and marine caves to the intertidal zone (Haney & Martin 2004).

Only four species of this order have been reported from the southern South-West Atlantic (34°–56°S): the bathypelagic *Nebaliopsis typicus* G. O. Sars, 1887 found in deep-waters off Argentina, and three species attributed to the bottom-dwelling genus *Nebalia*, viz. *N. patagonica* Dahl, 1990 from Ushuaia (Beagle Channel), *N. cannoni* Dahl, 1990 from South Georgia Island and *N. falklandensis* Dahl, 1990 from the Malvinas Islands (see Cannon 1931, Geiger & Brahm 1969, Dahl 1990).

Specimens were sorted out from the sediment, fixed in 10 % buffered formalin, and then transferred to 70 % ethanol. All the material studied herein was deposited in the invertebrate collection of the Museo Argentino de Ciencias Naturales "Bernardino Rivadavia" (MACN-In). The specimens were collected at the following localities (the number of males included in each sample is reported between parentheses): *Río Negro Province*: — Off San Antonio Oeste, San Matías Gulf, coll. D. Roccatagliata, 8 m, small dredge, 25 Nov 2003, 59 specimens (10 ♂♂) (MACN-In 37582). — Off San Antonio Oeste, San Matías Gulf, coll. D. Roccatagliata, B. Doti, I. Chiesa and M. Díaz. Sta. 6: 40° 54.135'S, 65° 05.074'W, 15 m, Van Veen grab, 03 Jan 2005, 9 specimens (3 ♂♂) (MACN-In 37583). Sta. 8: 40° 53.362'S, 65° 03.985'W, 20 m, Van Veen grab, 03 Jan 2005, 15 specimens (MACN-In 37584). Sta. 11: 40° 55.156'S, 65° 04.268'W, Van Veen grab, 03 Jan 2005, ? m, 1 specimen (MACN-In 37585). Sta. 14: 40° 55.728'S, 65° 04.317'W, ? m, Rauschert epibenthic dredge, 05 Jan 2005, 109 specimens (27 ♂♂) (MACN-In 37586). Sta. 16: 40° 55.717'S, 65° 04.459'W, 18 m, Van Veen grab, 05 Jan 2005, 55 specimens (13 ♂♂) (MACN-In 37587). Sta. 17: 40° 55.903'S, 65° 04.484'W, 18 m, Van Veen grab, 05 Jan 2005, 13 specimens (2 ♂♂) (MACN-In 37588). Sta. 21: 40° 55.208'S, 65° 03.983'W, 18 m, Van Veen grab, 05 Jan 2005, 18 specimens (3 ♂♂) (MACN-In 37589). *Chubut Province*: — Villarino Beach, San José Gulf, coll. J. P. Lívore, 42° 24.767'S, 64° 17.267'W, 5–10 m, diver-operated suction sampler, Mar 2006, 47 specimens (4 ♂♂) (MACN-In 37590). — Villarino Beach, San José Gulf, coll. M. Brögger, 42° 24.833'S, 64° 17.333'W, 2–5 m, taken manually by divers: Dec 2005, 1 specimen (MACN-In 37591); Jul 2006, 12 specimens (MACN-In 37592); Dec 2006, 6 specimens (MACN-In 37593); Apr 2007, 77 specimens (MACN-In 37594); Aug 2007, 32 specimens (MACN-In 37595). — Off Puerto Madryn, Nuevo Gulf, coll. D. Roccatagliata, B. Doti, I. Chiesa and R. Centurión, small dredge, 03 Feb 2006. Sta. 8: 42° 46.999'S, 64° 59.256'W, 9 m, 1 specimen (MACN-In 37596). Sta. 9: 42° 46.991'S, 64° 59.088'W, 12 m, 2 specimens (MACN-In 37597). Sta. 12: 42° 46.964'S, 64° 59.019'W, 10 m, 1 specimen (MACN-In 37598). — Cracker Bay, Nuevo Gulf, on the sediment and also associated with the holdfasts of the seaweeds *Macrocystis pyrifera* and *Undaria pinnatifida*, taken manually by divers, Mar 2004, 42° 56'S, 64° 27'W, 8 m (for additional sampling data, see Raffo *et al.*, 2009): 12 poorly preserved specimens (MACN-In 37599).

The adult females measured up to 6.8 mm length, whereas the adult males varied between 2.3 and 4.3 mm length.

The measurements were taken with an ocular micrometer, from the base of the rostrum to the tip of the caudal furca (excluding setae).

The family Paranebalidae is composed of (1) the genus *Paranebalia*, which currently comprises three species: *P. longipes* (Willemöes-Suhm, 1875), *P. belizensis* Modlin, 1991 and *P. ayalai* Escobar Briones & Alcocer Durand, 2003; (2) the genus *Levinebalia* that includes two species: *L. fortunata* (Wakabara, 1976) and *L. maria* Walker-Smith, 2000; and (3) the genus *Saronebalia* with only one species: *S. guanensis* Haney & Martin, 2004 (see Walker-Smith & Poore 2001, Escobar Briones & Alcocer Durand 2003, Haney & Martin 2004).

Our specimens can be assigned to the genus *Paranebalia* given the following combination of characters: (1) eyes with denticles (unornamented in *Levinebalia* and *Saronebalia*); (2) male with callynophore-like antennular flagella, carrying just a few setae in addition to the aesthetascs (callynophore elongate and heavily setose in *Saronebalia*); (3) thoracopods stenopodous (*i.e.*, narrow); (4) thoracopods 1–8 subequal in length and extending well beyond the ventral margin of carapace (thoracopods 1–7 shorter than 8 and concealed by carapace in *Saronebalia*); (5) posterior margin of pleonite 5 smooth and that of pleonites 6–7 distinctly crenate (pleonites 5, 6 and 7 with ill-defined crenations in *Levinebalia*); (6) exopod of pleopod 1 with a comb-row of bipectinate setae (comb-row absent in *Saronebalia*); (7) protopods of pleopods 2–4 strongly serrulate along their posterior margins (smooth in *Levinebalia* and in *Paranebalia ayalai*) (see Walker-Smith 2000, Walker-Smith & Poore 2001, Escobar Briones & Alcocer Durand 2003, Haney & Martin 2004).

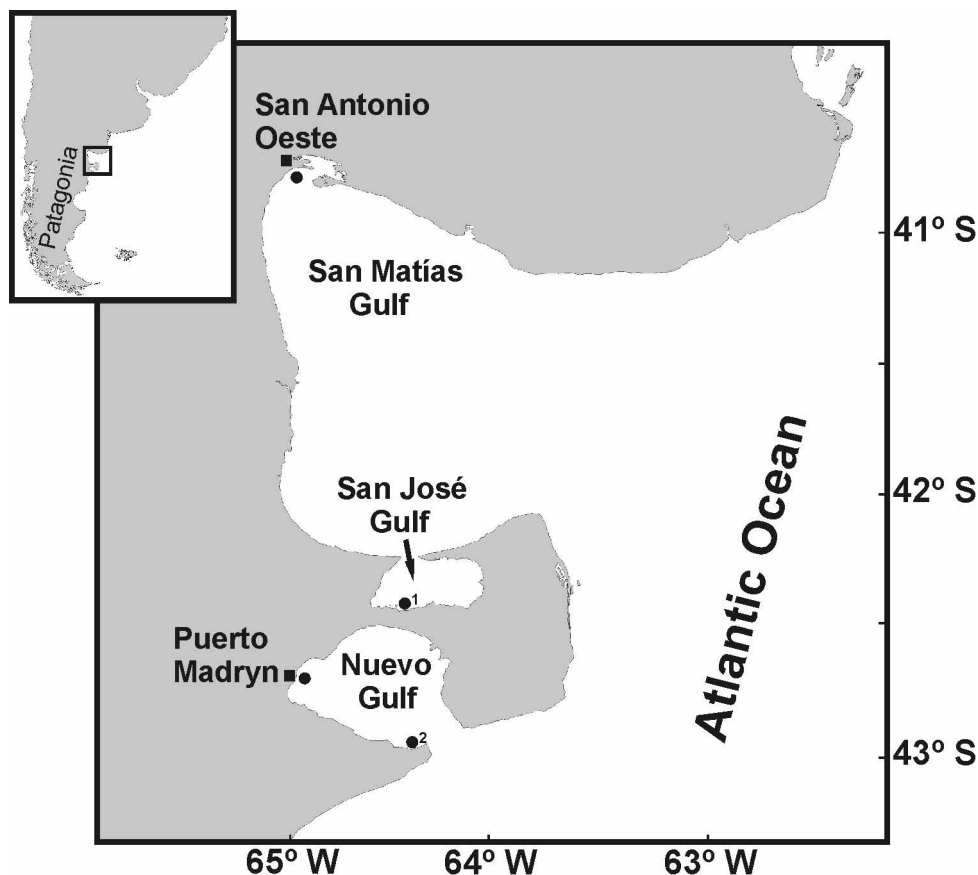


FIGURE 1. Map of the southern tip of South America with an enlargement showing the sampling locations for *Paranebalia cf. longipes*. (1) Villarino Beach, (2) Cracker Bay.

Paranebalia longipes is originally described from Bermuda, and has been subsequently reported from these islands and many other localities in the Caribbean Sea and the Gulf of Mexico (see Willemöes-Suhm 1875, G.O. Sars 1887, Thiele 1904, Verrill 1923, Clark 1932, Brattegard 1970, Haney & Martin 2004, Martin & Haney 2009). This species has also been recorded far from the type locality, namely, Japan, Gulf of Siam, Torres Strait, Walters Shoal, Madagascar and Mauritius Islands (see Thiele 1904; Gamô & Takizawa 1986; Ledoyer 1994, 2001). Moreover, Hale (1929) recorded *Paranebalia longipes* “or a closely allied species” from South Australia.

In contrast, *Paranebalia belizensis* and *P. ayalai* are recorded only from their type localities: the first species was found in algal masses of *Halimeda* at Twin Cays, Belize, whereas the second species was obtained from sponges and shell debris collected on the sandy mud substrate off Campeche Bay, Gulf of Mexico (see Modlin 1991, Escobar Briones & Alcocer Durand 2003).

Paranebalia cf. *longipes* is herein reported from 40° 53'S to 42° 56'S at three North-Patagonian gulfs (San Matías, San José and Nuevo), which dramatically extends the southern limit of distribution of this genus in the western Atlantic. In Cracker Bay (Nuevo Gulf) specimens were found on the sediments and also among holdfasts of *Macrocystis pyrifera* and *Undaria pinnatifida*; for the remaining station bottom composition was not recorded. However, neither of these two seaweeds have been recorded from the San Matías Gulf (see Boraso de Zaixso, 2007), which is a locality where *P.* cf. *longipes* is actually present. Thus, the distribution of *P.* cf. *longipes* seems not to be circumscribed to the area of occurrence of the above mentioned seaweeds.

Two biogeographic provinces are recognized along the southern coast of South America: an Argentine province extending from southern Brazil to 43°S, and a Magellanic province between 43°S and the Drake Passage (see López Gappa & Lichtschein 1988, and references therein). The Patagonian gulfs from which *P.* cf. *longipes* is herein reported are close to the boundary between these two provinces (see Fig. 1). The mean annual temperatures of these gulfs vary roughly from 9.7°C to 15.9°C (Rivas 1990). Although the range of distribution of this genus is now extended as far as South Atlantic temperate waters, *Paranebalia* is primary a tropical-subtropical genus. Thus, it is unlikely to occur farther south in the Magellanic province.

There are three other relevant records of the genus *Paranebalia*. Haney & Martin (2005) mentioned that many collections of *Paranebalia* have been made from Brazilian waters, and are at present housed at the Museu Nacional (Rio de Janeiro) and the Instituto Oceanográfico (São Paulo). In addition, Walker-Smith & Poore (2001) reported an unidentified species of *Paranebalia* from south Australia, and more recently Hirst *et al.* (2007) listed two unidentified species of *Paranebalia* from Port Davey, Bathurst Channel, S.W. Tasmania. This record from Tasmania (approximately 43° 20'S) and that from Cracker Bay, northern Patagonia (42° 56'S), are the southernmost records of this genus.

The taxonomy of *Paranebalia* at species level is unresolved. Willemöes-Suhm (1875) briefly described both sexes of *P. longipes* based on adult females and males collected during the stay of H.M.S. "Challenger" at Bermuda. A few years later, G.O. Sars (1887) presented a redescription of the female of *P. longipes* based on the type material. Later on, Thiele (1904), Verrill (1923), Clark (1932), Brattegard (1970), Gamô & Takizawa (1986) and Ledoyer (1994, 2001) published brief redescriptions of this species based on additional specimens from Bermuda and other localities. Ledoyer (2000) described the subspecies *P. longipes neocaledoniensis* from New Caledonia. In addition, Modlin (1991) described *P. belizensis*, and Escobar Briones & Alcocer Durand (2003) described *P. ayalai*. The latter can be easily separated from *P. longipes* because it lacks serrations on the propods of the pleopods 2-4, whereas the differences between *P. belizensis* and *P. longipes* are very subtle.

Our specimens agree well with the redescription of *P. longipes* presented by G.O. Sars (1887) but we observed slight differences in the number of denticles on the antennular flange, the number of articles of the antennular and antennal flagella, and the number of spines present along the outer margin of the first pleopod exopod (both in the spine row and below it). However, these features are size dependent and thus, they are not of primary importance in species identification (see also Dahl 1985).

A full revision of the genus *Paranebalia* is strongly needed. In addition, to elucidate whether *P. longipes* is a geographically widespread species or it is in fact a complex of cryptic species will most probably require the use of molecular techniques. Therefore, in order to avoid more taxonomic confusion we provisionally assign our specimens to *Paranebalia* cf. *longipes*.

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