

## Six new records of decapod crustacean species (Anomura, Brachyura) from southern Brazil

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### ABSTRACT

Five anomuran and one brachyuran species collected from continental shelf and slope off southern Brazil have their geographic ranges considerably extended southward: *Neolithodes agassizii* (Smith), *Paguristes spectabilis* McLaughlin and Provenzano, *Pagurus heblingi* Nucci and Melo, *Phimochirus oclusus* (Henderson), *Mixtopagurus paradoxus* A. Milne-Edwards, and the brachyuran *Euchirograpsus antillensis* Türkay. *Pagurus heblingi* was previously known only from its type locality (off Cabo Frio, Rio de Janeiro) and from off Espírito Santo. *Paguristes spectabilis* was known only from the holotype (off Trinidad, Caribbean Sea) and two additional females from off Rio de Janeiro. One female was found of the brachyuran *Robertsella meridionalis* Tavares and Gouvêa, a species previously known only from two males. Additionally, the occurrence of the hermit crabs *Dardanus venosus* (H. Milne Edwards) and *Oncopagurus gracilis* (Henderson), and the brachyuran *Hexapanopeus paulensis* Rathbun are confirmed for Santa Catarina. The record of the brachyuran *Neopilumnoplax americana* (Rathbun)

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from Santa Catarina (27°S) probably actually refers to *Neopilumnoplax lipkeholthuisi* Tavares and Melo, a species described from Rio Grande do Sul (33°S) and Mar del Plata (37°S).

## KEYWORDS

Arvoredo Marine Biological Reserve, biodiversity, deep-water, range extension, shallow-water

## INTRODUCTION

In 2009, the CEPESUL-ICMBio (Centro Nacional de Pesquisa e Conservação da Biodiversidade Marinha do Sudeste e Sul-Instituto Chico Mendes da Conservação da Biodiversidade) launched the project MOBIO (Monitoramento da Biodiversidade Marinha no Sul do Brasil) aimed at monitoring marine biodiversity in Santa Catarina, southern Brazil. From 2009 to 2011, as part of MOBIO, the research vessel “Soloncy Moura” was commissioned to conduct eleven oceanographic cruises along the shelf and upper slope of Santa Catarina in depths between 20 and 1000 m. The main results of the MOBIO Project concerning the decapod crustaceans were compiled by Boos et al. (2012), Misturini and Segal (2017), and references therein.

Among the decapod crustaceans amassed during the MOBIO in Santa Catarina there were five anomuran species collected between 21–500 m, which constitute new records for the region. The opportunity is taken to include one deep-water brachyuran species caught by the fishing vessel “Cordeiro de Deus I” off the coast of Rio Grande do Sul, whose geographic range is considerably extended southward. The study of this material forms the basis of this report.

## MATERIAL AND METHODS

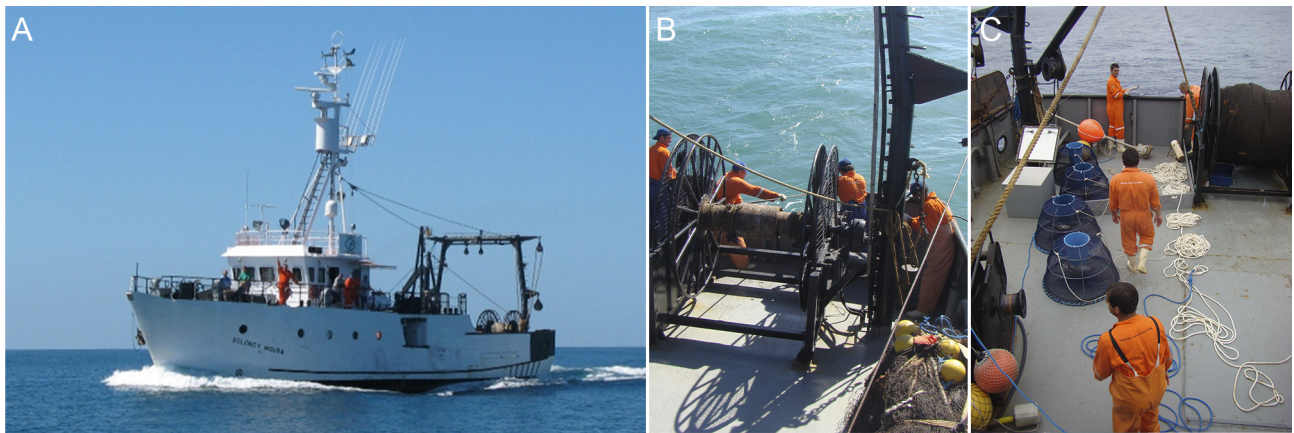
The material studied here was obtained with an otter-trawl and fishing pots (four pots per main line) baited with skipjack tuna on the research vessel “Soloncy Moura” in Santa Catarina (Fig. 1), and otter-trawl on the fishing vessel “Cordeiro de Deus I” off the coast of Rio Grande do Sul.

The specimens are deposited in the collections of the Museu de Zoologia, Universidade de São

Paulo (MZUSP). Specimens from Santa Catarina and Rio Grande do Sul not previously reported in the literature are listed under “New material”; comparative specimens are listed when relevant. Remarks on morphology, taxonomy, geographic distribution and habitat are included when relevant. Updated geographic distribution are also included for all species.

Acronyms: TAAF MD55, refers to the deep-water expedition conducted off the southeastern coast of Brazil in depths down to 5,155 m (Guille and Ramos, 1987; Tavares, 1999). Guille and Ramos (1987) provided the bottom type for each location sampled by the TAAF MD55 expedition. Otherwise, information on bottom type was essentially obtained from the compilations by Melo (1996), Felder et al. (2009), and Nucci and Melo (2015). GEDIP (Grupo Executivo do Desenvolvimento da Indústria da Pesca) refers to a research program aimed at the evaluation of the fishing potential of Rio Grande do Sul (Brazil) and Maldonado (Uruguay); the oceanographic operations were conducted aboard R/V “Prof. W. Besnard” from Instituto Oceanográfico, Universidade de São Paulo (Miranda, 1971; Furtado, 1973; Miranda et al., 1973). REVIZEE (Recursos Vivos na Zona Econômica Exclusiva) was a research program carried out to evaluate the living resources in Brazil’s exclusive economic zone.

Abbreviations: ARM, baited fishing trap (“pot”); cl, carapace length for *Neolithodes agassizii* (Smith, 1882), measured from the posterior margin of the orbit to the midpoint of the posterior margin of the carapace and given in millimeters (mm); DC, Charcot dredge; F/V, fishing vessel; R/V, research vessel; stn, sampling station. “Lance” refers to a trawling operation.



**Figure 1.** Sampling operations. **A**, The R/V “Soloncy Moura” at sea during the MOBIO Project conducted in Santa Catarina, southwestern Brazil, February 2011; **B, C**, Fishing operations with otter-trawl and fishing pots baited with skipjack tuna conducted by the R/V “Soloncy Moura” in December 2009. Photographs from the CEPSSUL collection.

## SYSTEMATICS

### Infraorder Anomura

#### Family Lithodidae Samouelle, 1819

#### *Neolithodes agassizii* (Smith, 1882) (Fig. 2A, B)

*New material.* 1 male, cl 146.5 mm (MZUSP 25992), off Rio Grande do Sul, 33°46′55.2″S 51°18′39.6″W, “Cordeiro de Deus I”, 26.viii.2011, 332 m.

*Comparative material.* 1 juvenile (MZUSP 42409), Bacia de Campos, off Rio de Janeiro, 08.iv.2008, 1800 m.

*Diagnosis.* See Macpherson (1988).

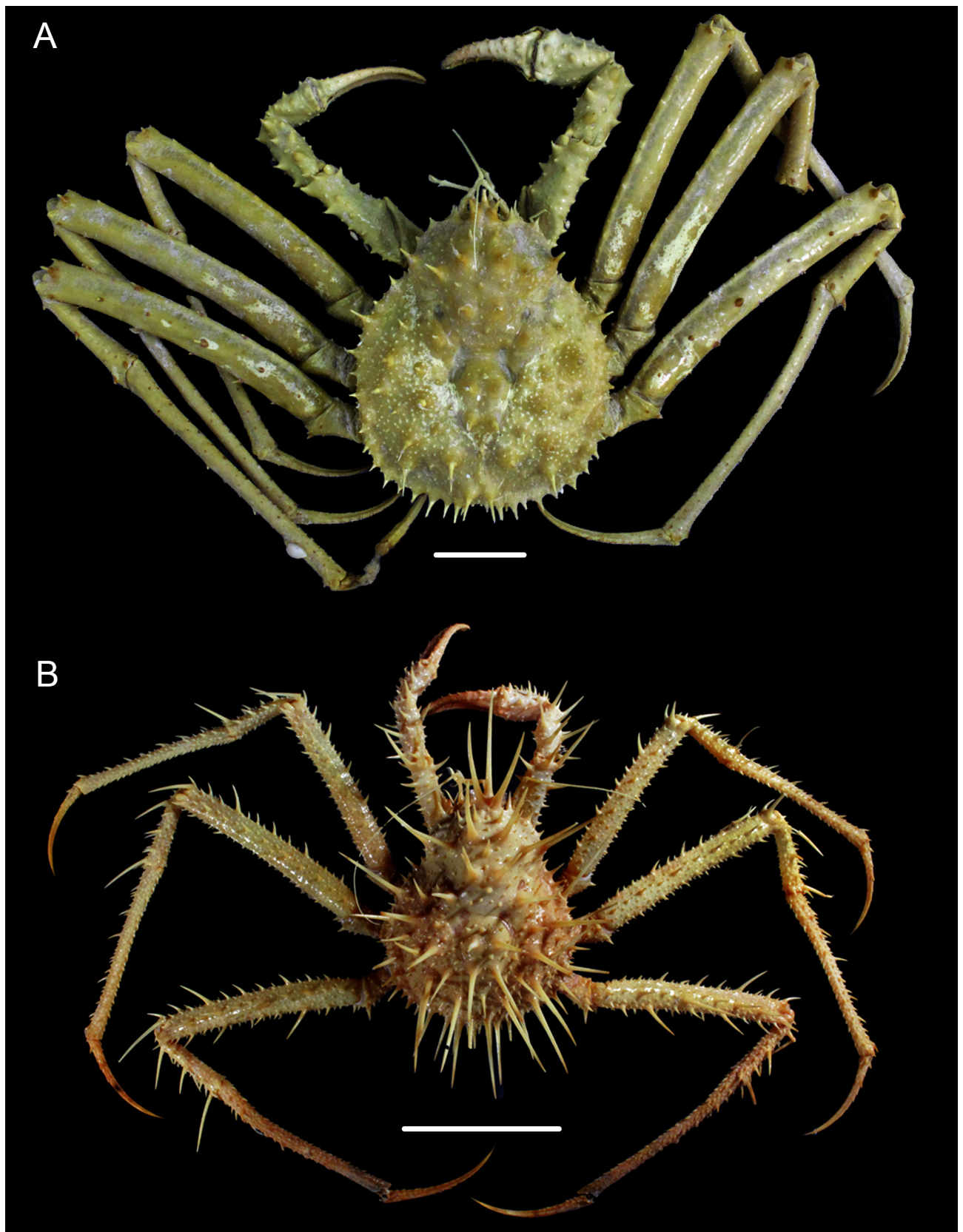
*Distribution and habitat.* Western Atlantic: eastern coast of United States (North and South Carolina, Alabama), Gulf of Mexico, Bahamas, Caribbean Sea, Martinique, Colombia, Suriname, French Guiana, and Brazil (Rio Grande do Norte, Bahia, Espírito Santo, and Rio de Janeiro); from 332 to 2076 m (Serejo et al., 2007; Alves-Júnior et al., 2019, and references therein). This is the first record of *Nl. agassizii* from Rio Grande do Sul.

*Remarks.* Males and females of *Nl. agassizii* can grow as large as 167 mm and 154 mm in carapace length, respectively (Macpherson, 1988). Small

specimens are known to differ from larger ones in being proportionally narrower and in having stronger development of the spinulation of carapace and appendages (Smith, 1882: plate I; Macpherson, 1988: fig. 13, plate 2C; Alves-Júnior et al., 2019: fig. 1a). The adult and juvenile males MZUSP 25992 and MZUSP 42409 (Fig. 2A, B), respectively, agree well with *N. agassizii* as understood by Macpherson (1988).

Lianos et al. (2017) recorded an adult male of *Neolithodes asperrimus* Barnard, 1947 from Santa Catarina caught in depths between 250–500 m. This species was previously known from the eastern Atlantic, between 250–2000 m. *Neolithodes asperrimus* and *Nl. agassizii* are morphologically closely related but differ in some aspects including the spinulation of the walking legs and the proportions of the third walking leg relative to carapace length (see Macpherson, 1988). The adult male MZUSP 25992 can be assigned to *Nl. agassizii* and differs from the male of *N. asperrimus* reported by Lianos et al. (2017) in having: 1) the main spines on the walking legs distinctly larger (vs. spines tending to be reduced to thick granules or very short spines in *Nl. asperrimus*); 2) the third walking legs more than three times the carapace length (vs. third walking legs 2.5 times the carapace length in *N. asperrimus*); and 3) the merus of the third walking legs longer than carapace length (vs. merus of the third walking legs shorter than carapace length in males in *Nl. asperrimus*).





**Figure 2.** *Neolithodes agassizii* (Smith, 1882). **A**, Adult male 146.5 mm carapace length (MZUSP 25992); **B**, juvenile male 66.0 mm carapace length (MZUSP 42409). Scale bar: 5 cm.

### Family Diogenidae Ortmann, 1892

#### *Paguristes spectabilis* McLaughlin and Provenzano, 1975

*New material.* 8 females (MZUSP 26076), off Santa Catarina, 27°35.611'S 47°09.351'W, R/V "Soloncy Moura", MOBIO IV, Lance 58, 02.vii.2010, 426–460 m.

*Diagnosis.* See Lemaitre and Tavares (2015).

*Distribution and habitat.* Western Atlantic: Caribbean Sea (Trinidad), and Brazil (off Rio de Janeiro); on soft mud bottoms; from 137 to 430 m (Lemaitre and Tavares, 2015). This is the first record of *P. spectabilis* from Santa Catarina.

*Remarks.* *Paguristes spectabilis* was only known from the holotype (a female caught off Trinidad Island on the northern edge of the South America mainland) and two additional females reported from off Rio de Janeiro by Lemaitre and Tavares (2015). The eight additional females reported here extend the distribution of this species much farther south. Lemaitre and Tavares (2015) noted that the specimens from off Rio de Janeiro differed from the holotype in lacking spines on the lateral margins of the anterior lobes of the telson, whereas in the holotype the telson has one to three small spines on the left and right lobes, respectively. The specimens from off Santa Catarina, while fitting well with *Pt. spectabilis*, also lack spines on the lateral margins of the anterior lobes of the telson. Males of this species remain unknown.

### Family Paguridae Latreille, 1802

#### *Pagurus exilis* (Benedict, 1892)

*New material.* 1 specimen (MZUSP 37644), off Santa Catarina, Calhau São Pedro, 27°15.318'S 48°26.125'W, R/V "Soloncy Moura", MOBIO-ARVOREDO III, Lance 06, 04.ix.2010, 21–25 m.

*Diagnosis.* See Nucci and Melo (2007).

*Distribution and habitat.* Western Atlantic: Brazil (from Rio de Janeiro to Rio Grande do Sul), Uruguay, and Argentina; in fine sand and mud bottoms; from 10 to 50 m (Melo, 1999; Nucci and Melo, 2007).

*Remarks.* The female MZUSP 37644 provides the opportunity to corroborate the presence of *Pr. exilis* in Santa Catarina, whose record has been repeated from source to source, but no voucher specimen has been hitherto located to corroborate it (Hebling and Rieger, 1986; Rieger, 1997; 1998; Melo, 1999; Nucci and Melo, 2007; Boos et al., 2012; Branco et al., 2015; Rodrigues Filho et al., 2016; Stanski et al., 2016). The specimen MZUSP 37644 match well with the diagnostic characters provided by Nucci and Melo (2007) in having the ocular peduncle (including cornea) less than 3 times the diameter of the cornea, the ultimate segment of the antennular peduncle shorter than the ocular peduncle (including cornea), and the right cheliped with the carpus covered by rounded tubercles.

#### *Pagurus heblingi* Nucci and Melo, 2003

*New material.* 1 male (MZUSP 37705), off Santa Catarina, 27°35.611'S 47°09.351'W, R/V "Soloncy Moura", MOBIO IV, Lance 58, 02.vii.2010, 426–460 m.

*Diagnosis.* See Nucci and Melo (2003; 2007).

*Distribution and habitat.* Western Atlantic: Brazil (Espírito Santo, Rio de Janeiro, and Santa Catarina); in soft mud bottoms with pteropods and foraminiferans; from 300 to 600 m (Lemaitre and Tavares, 2015). This is the first record of *P. heblingi* from Santa Catarina.

*Remarks.* This species was previously known only from its type locality, off Cabo Frio, Rio de Janeiro (Nucci and Melo, 2003) and from off Espírito Santo (Lemaitre and Tavares, 2015). The present material considerably extends the species' geographic range southward.

#### *Phimochirus oclusus* (Henderson, 1888)

*New material.* 1 ovigerous female (MZUSP 37703), Santa Catarina, off Itajaí, 26°48.791'S 46°44.621'W, R/V "Soloncy Moura", MOBIO III, Lance 32, 28.ii.2010, 208 m. 1 male (MZUSP 26068), off Santa Catarina, 26°13.219'S 46°26.584'W, R/V "Soloncy Moura", MOBIO II, Lance 15, 22.x.2009, 203–210 m. 1 male (MZUSP 21753), Santa Catarina, Itajaí, stn 6, from 26°41.527'S 46°42.200'W to 26°40.652'S 46°43.430", R/V "Soloncy Moura", 08.xi.2009, 205 m.

*Comparative material.* *Phimochirus oclusus*: 21 specimens (MZUSP 13881), Rio de Janeiro, Cabo Frio, 350–400 m. 5 specimens (MZUSP 13859), São Paulo, Projeto REVIZEE, stn 6661, 147 m. *Phimochirus leurocarpus* McLaughlin, 1981: 1 male (USNM 1267511), Curaçao, 12°04'59"N 68°53'57"W, "CURASUB" DSR/V, Baldwin, C., Castilho, C. and Bebber, B. coll., 9.xii.2014, submersible, 168–268 m. 1 ovigerous female (MZUSP 36196), off Espírito Santo, Trindade Island, 20°29'2"S 29°18'2"W, R/V "Marion Dufresne", cruise TAFF MD 55/Brésil 1987, stn 36/DC 61, 22.v.1987, *Halimeda* rich sand, 63 m.

*Diagnosis.* See Nucci and Melo (2011).

*Distribution and habitat.* Western Atlantic: Antilles and Brazil (from Pernambuco to São Paulo, and Santa Catarina); in *Halimeda* rich sand (present study); from 100 to 640 m (Nucci and Melo, 2011). This is the first record of *Ph. oclusus* from Santa Catarina.

*Remarks.* *Phimochirus oclusus* superficially resembles *Ph. leurocarpus* McLaughlin, 1981, a species known from Brazilian waters only from the remote oceanic island of Trindade (Lima et al., 2019). *Phimochirus oclusus* differs from *Ph. leurocarpus* in having smooth ventral margins on the dactyls of the ambulatory legs, whereas the dactyl ventral margins have a row of spines in *Ph. leurocarpus*. The present record extends the geographic range of *Ph. oclusus* further south.

***Pylopagurus discoidalis*  
(A. Milne-Edwards, 1880)**

*New material.* 1 female (MZUSP 21751), Santa Catarina, off Itajaí, from 26°41.527'S 46°42.200'W to 26°40.652'S 46°43.430'W, R/V "Soloncy Moura", 08.xi.2009, 205 m.

*Comparative material.* 1 specimen (MZUSP 13857), Santa Catarina, off Florianópolis, 27°28.70'S 47°09.66'W, REVIZEE Score Sul, stn 6786, 15.iii.1998, 380 m.

*Diagnosis.* McLaughlin and Lemaitre (2001), and Nucci and Melo (2011).

*Distribution and habitat.* Western Atlantic: eastern coast of United States (from North Carolina to Florida), Gulf of Mexico, Caribbean Sea, Antilles, and Brazil (Amapá to Santa Catarina); in soft mud bottoms from 11 to 1020 m (Lemaitre and Tavares, 2015).

*Remarks.* The record of *Py. discoidalis* from Santa Catarina has been hitherto based on only one small, damaged specimen reported by Nucci and Melo (2011). The present new material confirms Santa Catarina as the southern limit of *Py. discoidalis*.

**Family Pylochelidae Spence Bate, 1888**

***Mixtopagurus paradoxus* A. Milne-Edwards,  
1880**

*New material.* 1 specimen (MZUSP 26071), Santa Catarina, off Santa Marta, 28°40.328'S 47°19.874'W, R/V "Soloncy Moura", MOBIO II, Lance 23, 27.x.2009, 500 m.

*Diagnosis.* See Forest (1987).

*Distribution and habitat.* Western Atlantic: eastern coast of United States (from off North Carolina), Gulf of Mexico, Bahamas, and Caribbean Sea to Brazil (Amapá, Pará, Ceará, Rio de Janeiro, São Paulo), from 194 to 567 m (Lemaitre and Tavares, 2015). This is the first record of *M. paradoxus* from Santa Catarina.

*Remarks.* This species was previously known from the Straits of Florida and Gulf of Mexico to Brazil and as far south as the coast of Santos, São Paulo (Lemaitre and Tavares, 2015). The present record extends the range of *M. paradoxus* southward to Santa Catarina.

**Infraorder Brachyura**

**Family Plagusiidae Dana, 1851**

***Euchirograpsus antillensis* Türkay, 1975**

*New material.* 1 juvenile male (MZUSP 26066), off Santa Catarina, 28°33.379'S 47°24.809'W, R/V "Soloncy Moura", MOBIO I, Lance 5, 15.viii.2009, 200 m.



*Comparative material.* *Euchirograpsus antillensis*: 1 specimen (carapace only) (MZUSP 12303), Ubatuba, São Paulo, Projeto Integrado, 22.iv.1987. 1 specimen (MZUSP 3430), off Rio Grande do Sul, 33°29'S 50°44'W, R/V "Prof. W. Besnard", GEDIP, stn 458, 09.xii.1968, 200 m. 1 male, 1 female (MZUSP 3358), 1 male, 1 female juveniles (MZUSP 3431), off Rio Grande do Sul, 33°29'S 50°44'W, R/V "Prof. W. Besnard", GEDIP stn 458, 09.xii.1968, sand and mud, 200 m. *Euchirograpsus americanus* A. Milne-Edwards, 1880: 1 female (MZUSP 41775), off São Luis, Maranhão, Brazil, NOc "Almirante Saldanha", stn 1743A, 01°12'S 43°54'W, 55 m, 04.xi.1967, sandy bottom. *Miersiograpsus kingsleyi* (Miers, in Tizard, Moseley, Buchanan and Murray, 1885): 1 female, 1 juvenile (MZUSP 9274), Rio Grande do Sul, 33°45.45'S 51°12.00'W, R/V "Atlântico Sul", Projeto Talude IV, stn 14, 31.vii.1986, 300 m.

*Diagnosis.* See Türkay (1975).

*Distribution and habitat.* Western Atlantic: eastern coast of United States (North and South Carolina, Florida), Gulf of Mexico, Antilles, Colombia, Venezuela, and Brazil (São Paulo and Rio Grande do Sul), in soft and hard bottoms from 15 to 430 m (Felder et al., 2009; Melo, 2010). This first record of *E. antillensis* from Santa Catarina begins to fill a gap in its geographic range between São Paulo and Rio Grande do Sul.

*Remarks.* The diagnostic characters for *E. antillensis*, more easily recognized in adult specimens, are less evident in juveniles. In the juvenile from Santa Catarina the second pereopod is provided with a small subdistal spine on the merus ventrolateral margin, whereas that margin is granulated in the adults.

### Family Panopeidae Ortmann, 1893

#### *Hexapanopeus paulensis* Rathbun, 1930

*New material.* 1 male (MZUSP 41776), off Santa Catarina, Rancho Norte, R/V "Soloncy Moura", MOBIO-ARVOREDO V, ARM 16, 27°16.54'S 48°22.715'W, 24.ii.2011, 10–23 m. 1 female (MZUSP 26038), off Santa Catarina, Farol, R/V "Soloncy Moura", MOBIO-ARVOREDO V, Lance 18, 27°17.52'S 48°20.272'W, 23.ii.2011, 32–34 m.

*Diagnosis.* See Williams (1984) and Melo (1996).

*Distribution and habitat.* Western Atlantic: South Carolina, Florida, Gulf of Mexico, and Brazil (from Pará to Santa Catarina) in sand, broken shells and rocky bottoms and in association with ascidians, bryozoans, from the intertidal to 34 m (Melo, 1996; this study).

*Remarks.* The records of *Hexapanopeus paulensis* from Santa Catarina are unclear due to lack of voucher material (Melo, 1996; Bouzon and Freire, 2007; Almeida and Coelho, 2008; Boos et al., 2012). Its occurrence in Santa Catarina is now conclusive.

### Family Pseudorhombilidae Alcock, 1900

#### *Robertsella meridionalis* Tavares and Gouvêa, 2013

*New material.* 1 male (MZUSP 26096), 1 female (MZUSP 26069), off Santa Catarina, Santa Marta, R/V "Soloncy Moura", MOBIO II – Lance 23, 27°36.3761'S 47°08.971'W, 26.x.2009, 290–346 m.

*Comparative material.* Holotype male (MZUSP 21772), off Santa Catarina, R/V "Soloncy Moura", stn 4, from 27°03.120"S 46°31.339"W to 27°03.101"S 46°31.367"W, 08.xi.2009, 400 m.

*Diagnosis.* See Tavares and Gouvêa (2013).

*Distribution and habitat.* Western Atlantic: Brazil (Rio Grande do Norte and Santa Catarina); in soft bottoms; from 180 to 400 m (Tavares and Gouvêa, 2013; Alves-Júnior et al., 2021; this study).

*Remarks.* *Robertsella meridionalis* is known so far only from two males: the holotype caught in Santa Catarina and a young male from much farther north in Natal, Rio Grande do Norte (Tavares and Gouvêa, 2013; Alves-Júnior et al., 2021). Poupin and Corbari (2016) provisionally attributed one specimen (sex not mentioned) from Guadeloupe to *R. meridionalis*. Here we report on a young female and an additional young male both from Santa Catarina. Both specimens agree well with the holotype, except for the male abdominal suture 3/4 which is only evident as a lateral notch in the young male, whereas it is evident along its entire

length in the adult holotype. The young female has heterochelous chelipeds and a stridulatory apparatus similar to that described for the male by Tavares and Gouvêa (2013).

## DISCUSSION

Boos et al. (2012) listed 280 species of decapods from Santa Catarina based on records from the literature complemented by the examination of specimens from various collections. Of these, eight marine species were recorded for the first time from Santa Catarina. However, the authors cautioned that several records (unspecified) were unverifiable for lack of voucher material. Such is the case of the brachyuran *H. paulensis*, only now confirmed for Santa Catarina (see above).

The diogenid hermit crab *Dardanus venosus* (H. Milne Edwards, 1848), recently recorded from Santa Catarina on account of a single male by Lima et al. (2019), is here confirmed for Santa Catarina based on an additional male (MZUSP 36037) caught in the Arvoredo Island. *Dardanus venosus* is a well-known species commonly found from the eastern coast of the United States, Bermuda, Florida, Antilles, northern coast of South America and Brazil (Amapá to São Paulo). It is also found in the oceanic islands of Fernando de Noronha, Rocas Atoll and Trindade and Martin Vaz and the seamounts Almirante Saldanha, Dogoressa and Minerva (Lima et al., 2019). *Dardanus venosus* is apparently less common southwards to São Paulo, where its presence went unrecorded and unnoticed previously (e.g., Hebling and Rieger, 1986; Bouzon and Freire, 2007; Boos et al., 2012). Santa Catarina may well be the southernmost limit to the distribution of *D. venosus*.

The amphi-Atlantic deep-water parapagurid *Oncopagurus gracilis* (Henderson, 1888) is known to occur in the eastern Atlantic in the Gulf of Guinea and off Angola. In the western Atlantic, *O. gracilis* has a much wider distribution ranging from the Straits of Florida and Gulf of Mexico in the northern hemisphere to off the coast of Brazil (Rio de Janeiro and Santa Catarina), where it inhabits soft mud with rubble between 146 and 900 m (Nucci et al., 2004; Lemaitre and Tavares, 2015, respectively).

Nucci et al. (2004) mentioned two specimens from Santa Catarina without further specifics, a record not verified by Boos et al. (2012) for lack of voucher material. The occurrence of *O. gracilis* was confirmed in this study, based on 1 specimen (MZUSP 37704, Santa Catarina, 27°35.611'S 47°09.351'W) caught by the R/V "Soloncy Moura", MOBIO IV, Lance 58, 02.vii.2010, between 426 and 460 m. The specimen reported here fits well with the description of *O. gracilis* and also agrees with the diagnostic characters provided by Lemaitre (2014). *Oncopagurus gracilis* and *Oncopagurus bicristatus* (A. Milne-Edwards, 1880) are similar and can occur sympatrically. However, they can be differentiated from each other by the shape of the right palm, armature of antennal acicles, and degree of development of the first and second gonopods in males (Lemaitre, 2014).

Bouzon and Freire (2007) recorded *Neopilumnoplax americana* (Rathbun, 1898) from Santa Catarina (Arvoredo Island, 27°17'7"S 48°25'30"W) without further specifics. This record, uncritically accepted by Boos et al. (2012), probably actually refers to *Np. lipkeholthuisi* Tavares and Melo, 2010, a species described from Rio Grande do Sul (33°S) and Mar del Plata (37°S) (Tavares and Melo, 2010).

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## ADDITIONAL INFORMATION AND DECLARATIONS

### Author Contributions

Conceptualization and Design: HB. Performed research: HB. Acquisition of data: HB. Analysis and interpretation of data: DL, MT. Preparation of figures: DL. Writing - original draft: DL, HB, MT. Writing - critical review & editing: DL, HB, MT.

### Consent for publication

All authors declare that they have reviewed the content of the manuscript and gave their consent to submit the document.

### Competing interests

The author(s) declare(s) no competing interest.

### Data availability

All data are archived within the Laboratório de Carcinologia, Museu de Zoologia, Universidade de

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### Study permits

All specimens were collected under Biodiversity Authorization and Information (SISBIO) license n° 16886-2 and 22456-1.