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Decapoda of the Huinay Fiordos-expeditions to the Chilean fjords 2005–2014: Inventory, pictorial atlas and faunistic remarks

(Crustacea, Malacostraca)

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During "Huinay Fiordos"-expeditions between 2005 and 2014 benthic Decapoda (Crustacea: Malacostraca) were collected down to 40 m depth using minimal invasive sampling methods. The 889 specimens were attributed to 54 species. The infraorder Brachyura was the most speciose with 27 species, followed by Anomura with 18 species, Caridea with 8 species and Dendrobranchiata with one species. Taxonomic examination was complemented by in-situ photo documentation and close-up pictures with extended depth of field taken from sampled individuals showing the species-specific features. Faunistic data was evaluated with location maps and sample localities are discussed according to existing literature, often resulting in the extension of known distribution ranges of various species. *Pinnixa brevipollex* Rathbun, 1898 is recorded for the first time in the South-East Pacific.

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Introduction

The extremely structured coast of Chilean Patagonia including fjords, channels and islands extends from Puerto Montt (41° S) to Cape Horn (55° S), and comprises a total of 84 000 km of coastline (Sobarzo Bustamante 2009). During the ice age, an ice cap covered most of the region. First the glacial erosion and then the retraction of the glaciers 15 000 years ago brought these unique fjordic surroundings to light (Hervé et al. 2009, Soto 2009). Geological and geographical characteristics together with climate and circulation dynamics result in highly variable habitat conditions (from sheltered to exposed, or continental to coastal) and special hydrological features. Most notably, the fjords receive a high discharge of freshwater due to both high precipitation rates and freshwater income from the rivers (in the

North Patagonian Zone) and glaciers of the Andes (in the Central and South Patagonian Zone; Försterra 2009, Sobarzo Bustamante 2009). This causes a Low Salinity Layer (LSL) in the upper water layer that may have a dimension of 10 m and a salinity below 2 ‰ (Försterra 2009); it is separated from the lower layers with oceanic salinity values through a halocline. These variabilities challenge the local fauna in a special way (Hervé et al. 2009, Försterra 2009).

The Huinay Scientific Field Station (HSFS), located in the Comau fjord in the Los Lagos region (Xth region) of Chile, has the general aim to inventory and identify the benthic organisms from the Chilean fjord region. Therefore an expedition series 'Huinay-Fiordos' (HF) was established in 2005, resulting in various studies of different benthic taxa (e. g. Häussermann & Försterra 2005, Galea 2007, Galea et al. 2007, Esteves et al. 2007, Montiel & Rozbaczylo 2009, Weis & Melzer 2012), and a comprehensive work summarizing the first expedition years (Häussermann & Försterra 2009).

In the present paper we give a complete survey of benthic decapods collected by these expeditions and their sample localities, thus summarizing 10 years of "HF"-expeditions. The data presented herein focus on the upper infralittoral zone at SCUBA accessible depths, while earlier studies were mainly based on vessel based sampling using mechanical devices such as dredges. Thus, this is the first comprehensive survey of south Chilean decapods from the upper 40 m of the water column including many stations and fjord regions that have never been sampled before.

The first to describe this section of the ocean was Charles Darwin aboard the Beagle (1831–36), followed by Hans Steffen (1892) and Alameyada-Arroyo (1955). They contributed greatly to the geographical and climatological knowledge of the Chilean fjord region (Soto 2009). However, regarding carcinofauna, the exploration of this region started 200 years ago with Juan I. Molina, who was the first to describe crustacean species scientifically (Molina, 1788). Vessel-based expeditions that provided important information on carcinofauna of the Chilean fjord region, were the H.M.S. "Challenger" (1872–76), the Lund-University Chile Expedition (1948/49) and the 'Victor Hensen' (1994) (Meyer et al. 2009). The aforementioned Lund-expedition has to be highlighted above the other scientific expeditions in the carcinofaunal context. The reports of this expedition by Garth (1957), Haig (1955) and Holthuis (1952) are very useful reference works for all taxonomic studies on decapods, whereas, an often cited overall report about the benthic fauna was elaborated by Brattström & Johanssen (1983). Apart from those, other valuable sources include studies by Mary Rathbun (1918, 1925 and 1930), who created keys and descriptions for Brachyura from all over America, and the more recent decapod species lists of Antonio Retamal (e. g. Retamal 1981, 2007, Retamal & Gorny 2001; see also Gorny 1999). However, there is a gap in actual overall literature about the south Chilean fauna (Mutschke & Gorny 1999, Försterra 2009). Häussermann & Försterra (eds, 2009) made a first step in closing this gap by creating the first multi-taxa identification guide for the Chilean fjord region: 'Marine Benthic Fauna of Chilean Patagonia'. This guide summarizes all the information obtained from HF-expeditions 1 to 6. Within this book the chapter "Decapoda – Crabs, Shrimps and Lobsters" (Meyer et al. 2009) is a collection of descriptions, identification keys and pictures. In 2013 another study with a taxonomic analysis of Chilean fjord decapods was published by Meyer et al. (2013): herein a combination of DNA sequences and morphological data with special focus on the genera *Acanthocyclus* and *Eurypodius* was used. Further recent studies on benthic species of Chile are named in the taxonomic chapters of the identification guide (Meyer et al. 2009).

Although Meyer et al. (2009) presented the species collected during HF 1 to 6, they did not analyse the species distribution records. Up to 2014, 14 more HF-expeditions, one additional field trip to the coast north of Puerto Montt (described below) and various collections in the Comau fjord were undertaken. Among these, decapods were collected on seven expeditions. Meyer et al. (2013) included more recent data, however, they focused on two decapods genera, i. e. *Eurypodius* and *Acanthocyclus*. The present study complements the mentioned studies by presenting a current and overall report on the benthic Decapoda collected during the HF-expeditions in the Chilean fjords spanning a whole decade. Photos of species that have not been pictured yet come along with information about the collected material. In addition, first steps towards a biogeographical analysis based on the data from all HF-expeditions are taken to detect distributional species patterns (Ceseña et al., in preparation).

Material and methods

Collection of decapods

Most of the sampling (Figs 1, 2) took place during 11 'Huinay-Fiordos'-expeditions: HF1 (Región de los Lagos, Región de Aisén), HF2 (Región de Aisén, Región de Magallanes), HF3 (Región de Aisén, Región de Magallanes), HF4 (Región de los Lagos), HF6 (Región de los Lagos, Región de Aisén), HF7 (Región de los Lagos), HF9 (Región de Magallanes y de la Antártica

Chilena), HF10 (Región de los Lagos), HF11 (Región de Aisén), HF16 (Región de Aisén, Región de Magallanes) and HF21 (Región de Aisén). In addition, samples were also taken during other research stays and are referred to as "HSFS", "North" and "Add". HSFS means "Huinay Scientific Field Station" and covers all samples collected around the field station and in the Comau fjord (see Fig. 2: C4–C17, Región de los Lagos). The northernmost samples – listed as warm-temperate- or 'North'-samples in this study – were collected during a field trip to parts of the Chilean coast between 36°S and 39°S (Región del Bío-Bío, Región de los Ríos) in 2011. Among the 'Add'-samples are all individuals that have been collected on other occasions and are housed in collections of section Arthropoda varia at the Bavarian State Collection of Zoology (Zoologische Staatssammlung München, ZSM). All individuals except the "North"-specimens, and specimens of *Eusergestes similis* (Hansen, 1903) and *Latreutes antiborealis* Holthuis, 1952 were collected by hand-sampling during SCUBA-dives between 0 m and 40 m. North of Puerto Montt, the collection only took place in the intertidal zone (hand-sampling along the beach, no SCUBA-dives). *E. similis* and *L. antiborealis* were collected with light traps and, therefore, present the only exceptions being pelagic and not benthic. If possible, in situ photos were taken of each animal before collecting and also photos of the diver's depth gauge indicating the depth where the specimen was found.

Identification of Decapoda

All animals were identified at the ZSM using morphological features with the help of identification keys and illustrated species descriptions. The main general papers used were the following: Garth et al. (1967), Retamal (1981, 2007), Retamal & Moyano (2010), Retamal & Gorny (2001), Zuñiga-Romero (2002) and Meyer et al. (2009). Pleocyemata specimens were identified with Guzmán (2003) and Meyer et al. (2009). For the representatives of the Caridea the key in Holthuis (1955) and the species descriptions and illustrations in Holthuis (1952) were resorted to. Furthermore, the keys, descriptions and illustrations in Rathbun (1918, 1925, 1930) and Garth (1957) were used for representatives of the Brachyura. For Anomura, Haig (1955) represented a valuable reference, though supplementary literature had to be consulted for different groups, i.e. Viviani (1969) and Haig (1960) for Porcellanidae, and Guzmán (2004), McLaughlin (2003) and Meyer et al. (2009) for the Paguridae. In cases where the identification of specimens proved difficult with the given literature, it was necessary to work with more specialised studies and original descriptions. This was the case for individuals of *Eusergestes similis* (Dendrobranchiata). For the identification of this species Hansen (1903), Milne (1968) and Guzmán (1999, 2002) were resorted to. For the identification of *Liopetrolisthes patagonicus* Urbina (1991), *Munida gregaria* Baba et al. (2008), *Pachycheles chilensis* Carvacho Bravo (1968) and *Paralomis tuberipes* (the last four from the infraorder Anomura) Macpherson (1988b) and Meyer et al. (2009) were used. Hippolytidae (Caridea) were identified with Wicksten (1990) and *Pinnixa valdiviensis* (Brachyura) with Torres (2006). After identification, the currently accepted names were checked on Worms Editorial Board (2015), the 'Systema Brachyurorum' by Ng et al. (2008) and the 'Carideorum Catalogus' by De Grave & Fransen (2011).

Preparation of data

Important data, such as the GPS-data of the sample location, the water depth, the collection date and other was recorded in Excel lists for every specimen. All sample locations were listed from north to south and subdivided into three groups belonging to different biogeographic regions. The northernmost locations (from 36°S to 41°S) are associated with the 'north-group' which is part of the Peruvian or the warm-temperate region, the locations from 41°S (Puerto Montt) to 46°S (in accordance with the Magellanic or cold-temperate region) belong to the 'central-group' and the locations from 47°S to 60°S, the subantarctic region, form the 'south-group'. This subdivision into biogeographical zones follows Viviani (1979), Brattström & Johanssen (1983), Försterra (2009) and Weis & Melzer (2012). Thus, identification-codes with N, C or S and a consecutive number were given to every location. If sampling took place more than once at one location the code was enhanced with letters (for example 'N5a') to subdivide each sample event (Table 1). Each sample location and event is listed with following information in Table 1: the GPS-data, the corresponding expedition, the depth and the date on which sampling events took place. If additional representatives of species treated in this study could be found in coll. ZSM, their sample location was listed, too. Due to scarce information about these older samples from the collection some fields in the table are to remain empty. Lacking GPS-data, these specimens were georeferenced with Google Earth (https://www.google.de/intl/de/earth/) according to the name of the site given on the sample label (Table 1).

Overview maps, detailed maps for the three location-groups and maps for the different species were made with the software 'MapCreator' (http://www.primap.com/wsen/). Every sample location, or rather locations where the treated species were found are registered in these maps.

For a complete presentation of every species, photos from one well preserved individual were taken in dorsal and ventral view; and in many cases also of additional details important for identification. The equipment used was a 'Nikon Digital Camera D7000' with macro-lens 'Nikon DX SWM VR ED IF Micro 1:1' (Nikon, Tokio) and the 'Stack Shot'-equipment by Cognisys (Cognisys, Michigan). Stacks of 20 photos were put together with the program 'Helicon Focus' (http://www.heliconsoft.com/heliconsoft-products/helicon-focus/). If necessary up to two Macro Extension Tube Sets (3-piece) by Meike (http://www.meikestore.com/) were used. Additionally, flashlights 'Speedlite SB-R200, AS-20' by Nikon (Nikon, Tokio) were used, if light conditions demanded it. The camera was fixed in an appliance

Table 1. List of sampling sites and sampling events for Decapoda treated in this study.

Site name	Latitude	Longitude	HF-expedition	Station code	Depth	Date
Dichato	−36.547667	−72.944472	North	N1a	7–8 m	14.12.2005
Dichato	−36.547667	−72.944472	North	N1b	0 m	05.03.2011
Bahia de Concepción	−36.805097	−73.187569	North	N2	n.a.	04.03.2001
Concepcion	−36.818938	−73.050319	Collection	N3	n.a.	n.a.
Playa Laraquete	−37.175639	−73.199472	North	N4	0–1 m	05.03.2011
Playa Chica	−39.719528	−73.403278	North	N5a	5–20 m	27.11.2010
Playa Chica	−39.719528	−73.403278	North	N5b	0 m	07.03.2011
Playa Chica	−39.719528	−73.403278	North	N5c	0 m	08.03.2011
Playa Chica	−39.719528	−73.403278	North	N5d	0 m	09.03.2011
Valdivia	−39.819588	−73.245210	Collection	N6	n.a.	n.a.
Llanquihue	−41.133334	−72.783330	Collection	N7	n.a.	n.a.
Playa Caballito	−41.246667	−73.862361	HF7	N8a	1.5 m	18.01.2009
Playa Caballito	−41.246667	−73.862361	HF7	N8b	2 m	19.01.2009
Playa Caballito	−41.246667	−73.862361	HF7	N8c	2 m	20.01.2009
Playa Corales	−41.254917	−73.860389	HF7	N9	0–1 m	18.01.2009
Puerto Montt	−41.471700	−72.936900	Collection	N10	n.a.	n.a.
Metri	−41.595750	−72.706800	Add	N11	n.a.	31.03.2012
Calbuco, opposite Pta. Agostin	−41.750000	−73.100000	Add	N12	n.a.	01.03.2005
Calbuco	−41.772014	−73.132706	Collection	N13	n.a.	n.a.
Faro Corona	−41.783944	−73.883000	HF4	N14a	0 m	20.03.2007
Faro Corona	−41.783944	−73.883000	HF7	N14b	0.5–3 m	22.01.2009
Chiloé, Canal Chacao, Remolino	−41.807267	−73.525167	HF4	C1	3–4 m	06.03.2007
Chiloé – Puñihuil Beach	−41.929050	−74.036700	HF4	C2a	0 m	14.03.2007
Chiloé – Puñihuil Beach	−41.929050	−74.036700	HF4	C2b	0 m	18.03.2007
Chiloé – Puñihuil Beach	−41.929050	−74.036700	HF4	C2c	0 m	19.03.2007
Chiloé – Puñihuil Beach	−41.929050	−74.036700	HF4	C2d	4–8 m	20.03.2007
Hornopiren	−41.972181	−72.472353	Add	C3	0 m	12.03.2011
I. Lilihuapi (north side, east of penguin colony)	−42.154831	−72.596264	HSFS	C4a	0 m	24.03.2006
I. Lilihuapi (north side, east of penguin colony)	−42.154831	−72.596264	HSFS	C4b	17 m	26.03.2006
I. Lilihuapi (north side, east of penguin colony)	−42.154831	−72.596264	HSFS	C4c	n.a.	27.03.2006
I. Lilihuapi (north side, east of penguin colony)	−42.154831	−72.596264	HSFS	C4d	15 m	14.04.2006
I. Lilihuapi (north side, east of penguin colony)	−42.154831	−72.596264	HSFS	C4e	8–17 m	28.04.2006
I. Lilihuapi (north side, east of penguin colony)	−42.154831	−72.596264	HSFS	C4f	n.a.	07.03.2009
I. Lilihuapi (south side, under bird colony)	−42.162033	−72.598583	HSFS	C5a	22 m	06.01.2005
I. Lilihuapi (south side, under bird colony)	−42.162033	−72.598583	HSFS	C5b	0.6–20 m	12.01.2005
I. Lilihuapi (south side, under bird colony)	−42.162033	−72.598583	HSFS	C5c	5–36 m	24.02.2005
I. Lilihuapi (south side, under bird colony)	−42.162033	−72.598583	HSFS	C5d	5–10 m	28.04.2006
I. Lilihuapi (south side, under bird colony)	−42.162033	−72.598583	HSFS	C5e	0–5 m	24.03.2006
I. Lilihuapi (south side, under bird colony)	−42.162033	−72.598583	HSFS	C5f	15–17 m	26.03.2006
I. Lilihuapi (south side, under bird colony)	−42.162033	−72.598583	HSFS	C5g	15 m	14.04.2006
I. Lilihuapi (south side, under bird colony)	−42.162033	−72.598583	HSFS	C5h	17 m	15.04.2006
E. Quintupeu (north side of mouth)	−42.163700	−72.444533	HSFS	C6a	15 m	25.02.2005
E. Quintupeu (north side of mouth)	−42.163700	−72.444533	HSFS	C6b	25 m	05.12.2005
E. Quintupeu (north side of mouth)	−42.163700	−72.444533	HSFS	C6c	8 m	2006
E. Quintupeu (north side of mouth)	−42.163700	−72.444533	HSFS	C6d	17 m	27.03.2006
E. Quintupeu (north side of mouth)	−42.163700	−72.444533	HSFS	C6e	20 m	28.03.2006
Punta Comau	−42.189117	−72.590867	HSFS	C7a	10–25 m	09.03.2004
Punta Comau	−42.189117	−72.590867	HSFS	C7b	n.a.	07.05.2005
Punta Comau	−42.189117	−72.590867	HSFS	C7c	5 m	24.03.2006
Punta Comau	−42.189117	−72.590867	HSFS	C7d	20–30 m	25.03.2006
Punta Comau	−42.189117	−72.590867	HSFS	C7e	n.a.	07.05.2006
Cahuelmo Fjord	−42.258950	−72.441217	HSFS	C8	0 m	Jan. 2007
Punta Cascada	−42.307183	−72.467383	HSFS	C9	15 m	23.03.2006
Swall	−42.331567	−72.461017	HSFS	C10a	25 m	04.03.2009

Site name	Latitude	Longitude	HF-expedition	Station code	Depth	Date
Swall	−42.331567	−72.461017	HF10	C10b	10 m	15.03.2011
Punta Llonco	−42.344102	−72.457087	HSFS	C11	5.5 m	25.12.2004
Playa Llonco	−42.344917	−72.453533	HSFS	C12a	15 m	20.03.2006
Playa Llonco	−42.344917	−72.453533	HSFS	C12b	20–27 m	21.03.2006
Punta Huinay	−42.374572	−72.427978	HSFS	C13a	1 m	20.02.2005
Punta Huinay	−42.374572	−72.427978	HSFS	C13b	n.a.	08.03.2005
Punta Huinay	−42.374572	−72.427978	HSFS	C13c	0–20 m	12.03.2006
Punta Huinay	−42.374572	−72.427978	HSFS	C13d	8 m	14.03.2006
Punta Huinay	−42.374572	−72.427978	HSFS	C13e	5–20 m	20.03.2006
Punta Huinay	−42.374572	−72.427978	HSFS	C13f	5–20 m	23.02.2008
Punta Huinay	−42.374572	−72.427978	HSFS	C13g	20–30 m	05.03.2009
Punta Huinay	−42.374572	−72.427978	HF10	C13h	10 m	14.03.2011
Punta Huinay	−42.374572	−72.427978	HF10	C13i	5–10 m	15.03.2011
Punta Huinay	−42.374572	−72.427978	HF10	C13j	20–30 m	22.03.2011
Muelle Huinay	−42.379797	−72.415897	HSFS	C14a	stranded dead	13.09.2004
Muelle Huinay	−42.379797	−72.415897	HSFS	C14b	n.a.	Feb. 2005
Muelle Huinay	−42.379797	−72.415897	HSFS	C14c	n.a.	09.02.2005
Muelle Huinay	−42.379797	−72.415897	HSFS	C14d	5–20 m	17.02.2005
Muelle Huinay	−42.379797	−72.415897	HSFS	C14e	n.a.	23.02.2005
Muelle Huinay	−42.379797	−72.415897	HSFS	C14f	n.a.	27.02.2005
Muelle Huinay	−42.379797	−72.415897	HSFS	C14g	n.a.	01.05.2005
Muelle Huinay	−42.379797	−72.415897	HSFS	C14h	10 m	20.–26.04. 2006
Muelle Huinay	−42.379797	−72.415897	HSFS	C14i	15 m	11.03.2006
Muelle Huinay	−42.379797	−72.415897	HSFS	C14j	0 m	14.03.2006
Muelle Huinay	−42.379797	−72.415897	HSFS	C14k	n.a.	15.03.2006
Muelle Huinay	−42.379797	−72.415897	HSFS	C14l	0–15 m	18.03.2006
Muelle Huinay	−42.379797	−72.415897	HSFS	C14m	22 m	28.03.2006
Muelle Huinay	−42.379797	−72.415897	HSFS	C14n	10 m	19.04.2006
Muelle Huinay	−42.379797	−72.415897	HSFS	C14o	17 m	21.04.2006
Muelle Huinay	−42.379797	−72.415897	HSFS	C14p	10–19 m	22.04.2006
Muelle Huinay	−42.379797	−72.415897	HSFS	C14q	n.a.	2007
X-Huinay north	−42.387752	−72.460646	HSFS	C15a	6 m	25.04.2006
X-Huinay north	−42.387752	−72.460646	HSFS	C15b	n.a.	04.03.2009
Punta Gruesa	−42.424744	−72.423114	HSFS	C16a	20 m	23.02.2005
Punta Gruesa	−42.424744	−72.423114	HSFS	C16b	n.a.	05.01.2006
Punta Gruesa	−42.424744	−72.423114	HSFS	C16c	5–20 m	13.03.2006
Punta Gruesa	−42.424744	−72.423114	HSFS	C16d	8–30 m	03.03.2009
Huinay, Vodudahue	−42.483002	−72.408613	HSFS	C17	10 m	26.02.2005
Loberia	−42.580556	−72.554056	HF10	C18	20 m	20.03.2011
Palena	−42.584222	−72.498139	HF10	C19a	0 m	19.03.2011
Palena	−42.584222	−72.498139	HF10	C19b	0 m	21.03.2011
Outside Fiordo Palvitad – Isla Carmen	−43.017017	−72.833167	HF4	C20	4–15 m	14.03.2007
Outside Fiordo Palvitad – Auchemo Bay	−43.025117	−72.805067	HF4	C21a	0–5 m	14.03.2007
Outside Fiordo Palvitad – Auchemo Bay	−43.025117	−72.805067	HF4	C21b	0 m	16.03.2007
Fiordo Palvitad – RaNegra	−43.028767	−72.780583	HF4	C22a	6 m	15.03.2007
Fiordo Palvitad – RaNegra	−43.028767	−72.780583	HF4	C22b	7.9–13 m	16.03.2007
Chiloe – Quellon – Piedra Lile	−43.182333	−73.639667	HF1	C23a	13	04.03.2005
Chiloe – Quellon – Piedra Lile	−43.182333	−73.639667	HF4	C23b	2–8.5 m	18.03.2007
Inio 1	−43.369139	−74.200083	HF6	C24a	13 m	21.02.2008
Inio 1	−43.369139	−74.200083	HF6	C24b	12 m	22.02.2008
Inio 3	−43.392611	−74.132361	HF6	C25a	0 m	20.02.2008
Inio 3	−43.392611	−74.132361	HF6	C25b	0 m	22.02.2008
Inio 3	−43.392611	−74.132361	HF6	C25c	0–26 m	23.02.2008

Table 1. (continued).

Site name	Latitude	Longitude	HF-expedition	Station code	Depth	Date
Inio 2	−43.393000	−74.127139	HF6	C26	8.8–15.6 m	22.02.2008
Inio 5	−43.409583	−74.083528	HF6	C27	8–9 m	24.02.2008
Inio 4	−43.417500	−74.080889	HF6	C28	20 m	24.02.2008
Raul Marin – Fiordo Pitipalena 4	−43.703883	−72.823367	HF4	C29	25 m	10.03.2007
Raul Marin – Las Hermanas	−43.771417	−73.043867	HF4	C30a	5–16.4 m	11.03.2007
Raul Marin – Las Hermanas	−43.771417	−73.043867	HF4	C30b	5–16 m	12.03.2007
Raul Marin – Fiordo Pitipalena 1	−43.774617	−72.920500	HF4	C31	15–18 m	11.03.2007
Raul Marin – Fiordo Pitipalena 2	−43.775167	−72.878433	HF4	C32a	15–18 m	09.03.2007
Raul Marin – Fiordo Pitipalena 2	−43.775167	−72.878433	HF4	C32b	23.3 m	11.03.2007
Islas Tres Hermanas	−43.775375	−73.028928	Add	C33	5–12 m	17.01.2011
Isla Jaiba (in front of Anihué Reserva)	−43.798611	−72.975000	Add	C34	10 m	26.02.2011
Muelle Melinka	−43.883336	−73.749997	HF1	C35	n.a.	08.03.2005
Canal Betecoi	−43.933333	−73.866667	HF1	C36	10.3 m	08.03.2005
Isla Laurel W	−44.000000	−73.766666	HF1	C37	8–12 m	07.03.2005
Isla Amita S	−44.081917	−73.874667	HF21	C38	n.a.	15.04.2014
SE Point Isla Concoto	−44.200583	−73.825333	HF21	C39	19.3 m	15.04.2014
Canal Frodden	−44.349444	−73.154167	HF6	C40	26.2 m	Feb. 2008
Playa Angostura	−44.392583	−72.581639	HF6	C41	0 m	12.02.2008
Mix Island	−44.395194	−73.109250	HF6	C42	15.3–21.4 m	17.02.2008
Faro Puerto Cisnes	−44.716889	−72.703361	HF6	C43	14 m	15.02.2008
Canal Temuan Intertidal	−44.720733	−73.594233	HF11	C44	1 m	26.11.2011
Isla Jesus	−44.741000	−73.811167	HF21	C45	17 m	14.04.2014
NDF	−44.774861	−72.781611	HF6	C46	3–15 m	15.02.2008
Puerto Gato	−45.000000	−74.033333	HF21	C47	0 m	05.04.2014
Isla Orestes E	−45.033917	−73.450333	HF21	C48	20 m	13.04.2014
Punta Elisa	−45.299383	−73.327417	HF11	C49	19.1 m	01.12.2011
Caleta Tortuga	−45.325300	−73.097133	HF21	C50	22.3 m	04.04.2014
N Caleta Tronador	−45.521083	−73.553867	HF21	C51	0–24.9 m	13.04.2014
Isla Luz	−45.556278	−73.898056	HF11	C52	0 m	28.11.2011
Isla Dring	−45.601028	−74.478194	HF11	C53	n.a.	21.11.2011
Roca Gloria	−45.662433	−73.849267	HF21	C54	1–15 m	05.04.2014
Estero Millabu	−45.757617	−74.551600	HF11	C55	7.4 m	20.11.2011
W Island at mouth	−45.762667	−73.491500	HF21	C56	15–20 m	12.04.2014
Caleta de Espera Sur	−45.837200	−74.058300	HF21	C57	22 m	09.04.2014
SE Point of Canal Ultima Esperanza	−45.976083	−74.011333	HF21	C58	22.7 m	10.04.2014
Isla Usborne	−46.147917	−75.156333	HF21	C59	8 m	07.04.2014
Isla Millar	−47.979278	−74.679722	HF3	S1	20 m	15.03.2006
Canal Ofhidro, S Peninsula Swett	−48.164500	−74.396667	HF3	S2	2–20 m	16.03.2006
Isla van der Meulen SE	−48.291667	−74.336111	HF2	S3	6–30 m	28.03.2005
Pase de Isla Ofhidro	−48.349583	−74.194944	HF3	S4	10–18 m	16.03.2006
Seno Waldemar	−48.396806	−74.730222	HF3	S5	35 m	15.03.2006
Fjord Bernardo, Isla Calcleugh S	−48.445833	−74.161389	HF2	S6	12–25 m	28.03.2005
Canal Adalberto	−48.607972	−74.898806	HF3	S7	0–20 m	12.03.2006
Fjord Tempano, 11 km, N shore	−48.691750	−74.136083	HF2	S8	15 m	25.03.2005
Fjord Tempano, 16 km, S shore	−48.713889	−74.184083	HF2	S9a	11–14 m	24.03.2005
Fjord Tempano, 16 km, S shore	−48.713889	−74.184083	HF2	S9b	20 m	25.03.2005
500 m al W de Estación Tempano	−48.716583	−74.005222	HF2	S10	12–17 m	24.03.2005
Canal Castillo	−48.736500	−75.414750	HF3	S11	20 m	11.03.2006
Bahia sin nombre	-48.825972	-75.051806	HF3	S12a	2–30 m	14.03.2006
Bahia sin nombre	−48.825972	−75.051806	HF3	S12b	2–30 m	15.03.2006
Estero Denmann	−48.859583	−74.379778	HF3	S13	5–20 m	11.03.2006
Angostura Inglesa	−48.974722	−74.421361	HF2	S14	3 m	01.04.2005
Isla Lavinia	−49.013360	−74.977085	HF3	S15a	5 m	12.03.2006
Isla Lavinia	−49.013360	−74.977085	HF3	S15b	3 m	13.03.2006

Site name	Latitude	Longitude	HF-expedition	Station code	Depth	Date
Puerto Eden: Isla San Pedro	−49.133333	−74.416667	HF2	S16	22 m	01.04.2005
Isla Camello	−49.190417	−75.394250	HF3	S17	0–10 m	13.03.2006
Puerto Grappler	−49.422916	−74.296807	Collection	S18	n.a.	n.a.
Paso del Abismo	−49.577417	−74.447028	HF3	S19	15–20 m	10.03.2006
Fiordo Ringdove	−49.733337	−74.166669	Collection	S20	n.a.	n.a.
Muro Roberto	−50.338060	−75.381490	HF16	S22	2.9–20 m	17.04.2013
Canal Copihue	−50.339750	−75.377556	HF3	S23	15–20 m	09.03.2006
Canal Copihue (narrowest point)	−50.339790	−75.378340	HF16	S24	15–20 m	16.04.2013
Seno Contreras E	−50.342420	−75.225910	HF16	S25	20–22 m	24.04.2013
Cross Bascuñan	−50.352570	−75.283310	HF16	S26	8–20 m	21.04.2013
Isla Corbeta (IC)	−50.356760	−75.335350	HF16	S27	5–20 m	15.04.2013
Cono Guarello	−50.359360	−75.338500	HF16	S28a	0–1 m	14.04.2013
Cono Guarello	−50.359360	−75.338500	HF16	S28b	8–27 m	17.04.2013
Cono Guarello	−50.359360	−75.338500	HF16	S28c	10–15 m	19.04.2013
Cono Guarello	−50.359360	−75.338500	HF16	S28d	1–2 m	20.04.2013
Cono Guarello	−50.359360	−75.338500	HF16	S28e	7 m	23.04.2013
Guarello Base	−50.367740	−75.336450	HF16	S29a	8 m	15.04.2013
Guarello Base	−50.367740	−75.336450	HF16	S29b	8 m	21.04.2013
Guarello Base	−50.367740	−75.336450	HF16	S29c	7 m	22.04.2013
Mdios SW (= southwest of Madre de Dios Island)	−50.370700	−75.413800	HF16	S30	8–31 m	19.04.2013
Cueva	−50.380070	−75.435230	HF16	S31a	10 m	16.04.2013
Cueva	−50.380070	−75.435230	HF16	S31b	15 m	23.04.2013
Seno Eleuterio_E	−50.391020	−75.383800	HF16	S32	8–15 m	22.04.2013
Seno Guarello	−50.394710	−75.337310	HF16	S33	10–19 m	25.04.2013
Isla Cerda	−50.411530	−75.344860	HF16	S34	0–8 m	22.04.2013
Canal Artilleria	−50.414556	−74.559194	HF3	S35	5–35 m	08.03.2006
Islote Traro	−50.425100	−75.432240	HF16	S36	5–10 m	20.04.2013
Canal Pasaje	−50.463667	−75.128222	HF3	S37	0–35 m	09.03.2006
Canal Pitt Chico	−50.835333	−74.139167	HF3	S38	10–20 m	07.03.2006
Puerto Bueno	−50.992778	−74.215278	Collection	S39	n.a.	n.a.
Canal Sanviento	−51.605833	−73.926167	HF3	S40	2–25 m	07.03.2006
Puerto Natales, Hafen	−51.726169	−72.513283	HF3	S41a	n.a.	02.03.2006
Puerto Natales, Hafen	−51.726169	−72.513283	HF16	S41b	0 m	12.04.2013
Canal Vicuña	−52.162222	−73.276167	HF3	S42	5–20 m	06.03.2006
Punta Arenas	−53.154478	−70.916476	Collection	S43	n.a.	n.a.
Magellanstraße – Puerto Angosto	−53.221000	−73.368472	Collection	S44	n.a.	n.a.
Magellanstraße	−53.530080	−70.874970	Collection	S45	n.a.	n.a.
Puerto del Hambre	−53.600000	−70.916667	Add	S46	n.a.	25.02.2002
Fuerto Bulnes	−53.627400	−70.920120	Add	S47a	n.a.	11.04.2005
Fuerto Bulnes	−53.627400	−70.920120	HF9	S47b	10 m	07.12.2010
Ushuaia	−54.801912	−68.302951	Collection	S48	n.a.	n.a.
Tierra del Fuego Sur, W Puerto Pantalon (orig. Südfeuerland)	−54.900000	−67.933333	Collection	S49	n.a.	n.a.
Isla Santi Bañez	−54.917250	−68.363167	HF9	S50	12 m	16.12.2010
Los Gemelos	−54.919417	−67.363083	HF9	S51	8–15 m	15.12.2010
Isla Martinez	−54.919581	−68.279731	HF9	S52	10–16.9 m	21.12.2010
PW West1	−54.926500	−67.759483	HF9	S53	3–6 m	12.12.2010
Isla Magel	−54.926550	−67.413383	HF9	S54	6–7.7 m	14.12.2010
Isla Marchant	−54.932783	−67.683967	HF9	S55	7 m	11.12.2010
Islas Holger	−54.939550	−67.249100	HF9	S56	14 m	23.12.2010
Costa Holger	−54.949400	−67.215867	HF9	S57	16 m	23.12.2010
Isla Picton (orig. Pictoninsel)	−55.033333	−66.950000	Collection	S58	n.a.	n.a.
Fjord Ponsenby	−55.170292	−68.593836	HF9	S59	n.a.	19.12.2010

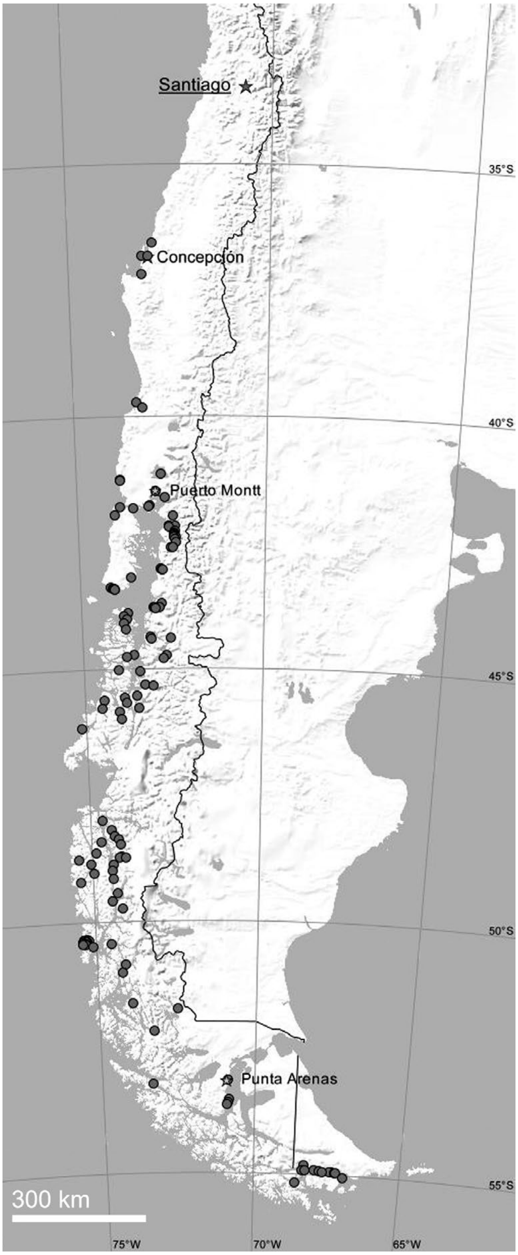

Fig. 1. Overview of collecting sites of benthic Decapoda collected by Huinay expeditions at SCUBA accessible depths and deposited at the Bavarian State Collection of Zoology.

(Kaiser RS 2 XA (Kaiser, Germany)) where the camera and additional lights could be adjusted vertically. The pictures shown here, are – if available – provided together with photos of the same specimens taken before conservation (named 'in situ' when shot in their natural environment or named 'vital specimen' when shot in the laboratory before conservation). This was done in order to give complete information about the morphology of the living animal, as in many cases the overall colour changes drastically after the animals are being preserved in ethanol. In situ photographs were taken by Roland Meyer, Vreni Häussermann, Günter Försterra and Roland Melzer. Species that have already been treated in Meyer et al. (2009, 2013) are not shown as detailed as the other species. Reference numbers to the samples housed at ZSM are given in the figure legends for each photo. Scale bars are not presented on photos of living animals.

Remarks to decapod species collected at HF-expeditions

All material examined is listed with its registration numbers and sample events from north to south. The underlined location codes indicate stations where older collection material housed at ZSM was collected. There are no registration numbers on older collection material, so – if only one specimen was collected – only the station number is listed, if two up to four specimens where collected the number of specimens is given; '∞' indicates more than 5 specimens collected at the same location.

Carapace measurements, which are provided in some cases, are abbreviated with CL for 'carapace length' including the rostrum and CW for 'carapace width' on the widest part.

The arrangement of the listed species follows a phylogenetical approach considering the infraorders (Martin & Davis 2001, De Grave et al. 2009, Crandall 2010). Within the higher taxa, species are listed in alphabetical order.

Results

Decapod species collected at HF-expeditions between 2005 and 2014

Altogether 889 decapod specimens from 25 families and 54 species were examined. All of them belonged to either the suborder Dendrobranchiata (1 species) or to one of the three infraorders Caridea (8 species), Anomura (18 species) and Brachyura (27 species).

Dendrobranchiata

Sergestidae Dana, 1852

Eusergestes similis (Hansen, 1903), Fig. 5

Material examined: ZSMA20111564 (3 individuals, plankton trawl): St. C6e; ZSMA20111565 (2 individuals, light trap exposed at night): St. C14c (= Huinay transect, 50–60 m, 09.02.2006).

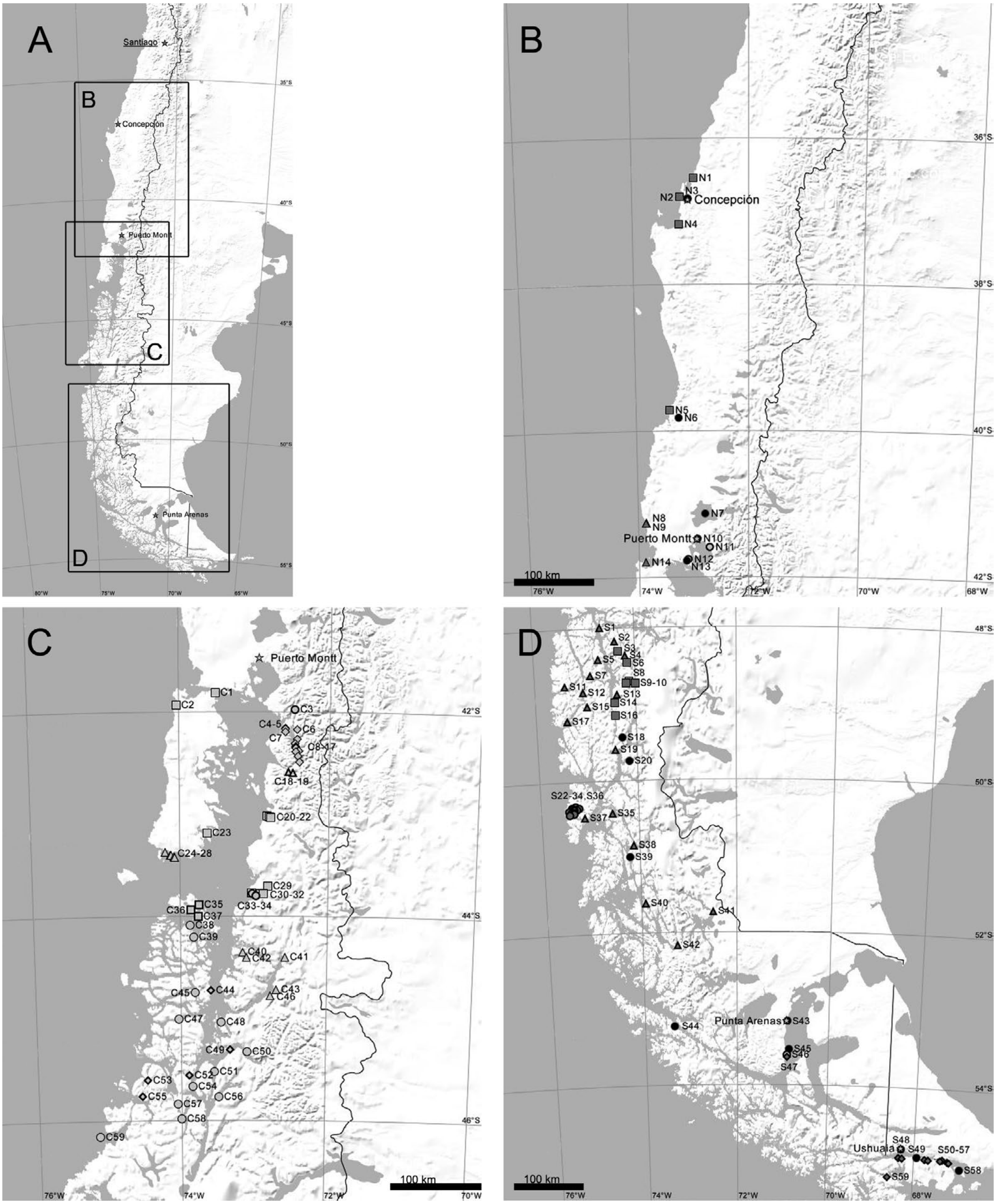

Fig. 2. Overview map and detailed maps of the collection sites of benthic Decapoda in the three biogeographic regions covered. Symbols indicate different HF-expeditions; symbols that are valid for maps B−C are first for locations from the collection material indicated by black circles and secondly for the additional material indicated by grey, thick-framed circles. **A.** Overview map of the referred regions in Chile; **B.** Collection locations for the warm-temperate or northern region: locations from the "North" field trip (squares), location from HF7 (triangles); **C.** Collecting localities for the cold-temperate or central region: locations around the Huinay Scientific Field Station, HSFS (thin-framed rhombs), locations from HF1 (thick-framed squares), locations from HF4 (thin-framed squares), locations from HF6 (thin-framed triangle), locations from HF10 (thick-framed triangle), locations from HF11 (thick-framed rhombs) and locations from HF21 (thin-framed circles); **D.** Collecting localities for the subantarctic or the south region: locations from HF2 (squares), locations from HF3 (triangles), locations from HF9 (rhombs) and locations from HF16 (circles).

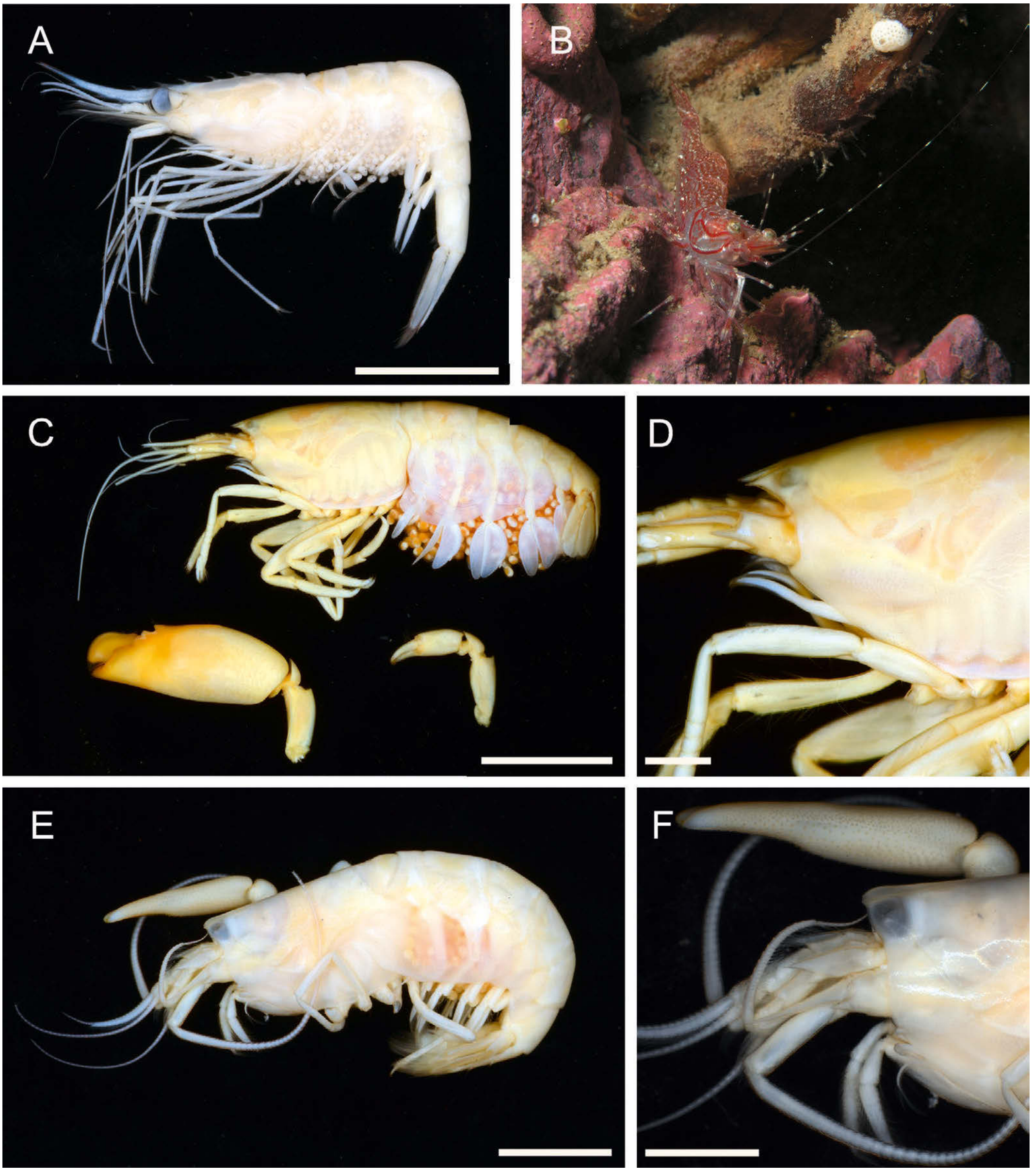

Fig. 3. A–B. *Austropandalus grayi* (Pandalidae): **A.** lateral left view; **B.** in situ; **C–F.** Alpheidae: **C–D.** *Synalpheus spinifrons*: **C.** lateral left view; **D.** detail of anterior part, lateral left view; **E–F.** *Betaeus truncatus*: **E.** lateral left view; **F.** detail of anterior part, lateral left view. Scale bars A, C: 1 cm; D, F: 3 mm; E: 5 mm. (A: ZSMA20111511; B: ZSMA 20150167; C–D: ZSMA20111519; E–F: ZSMA20111514).

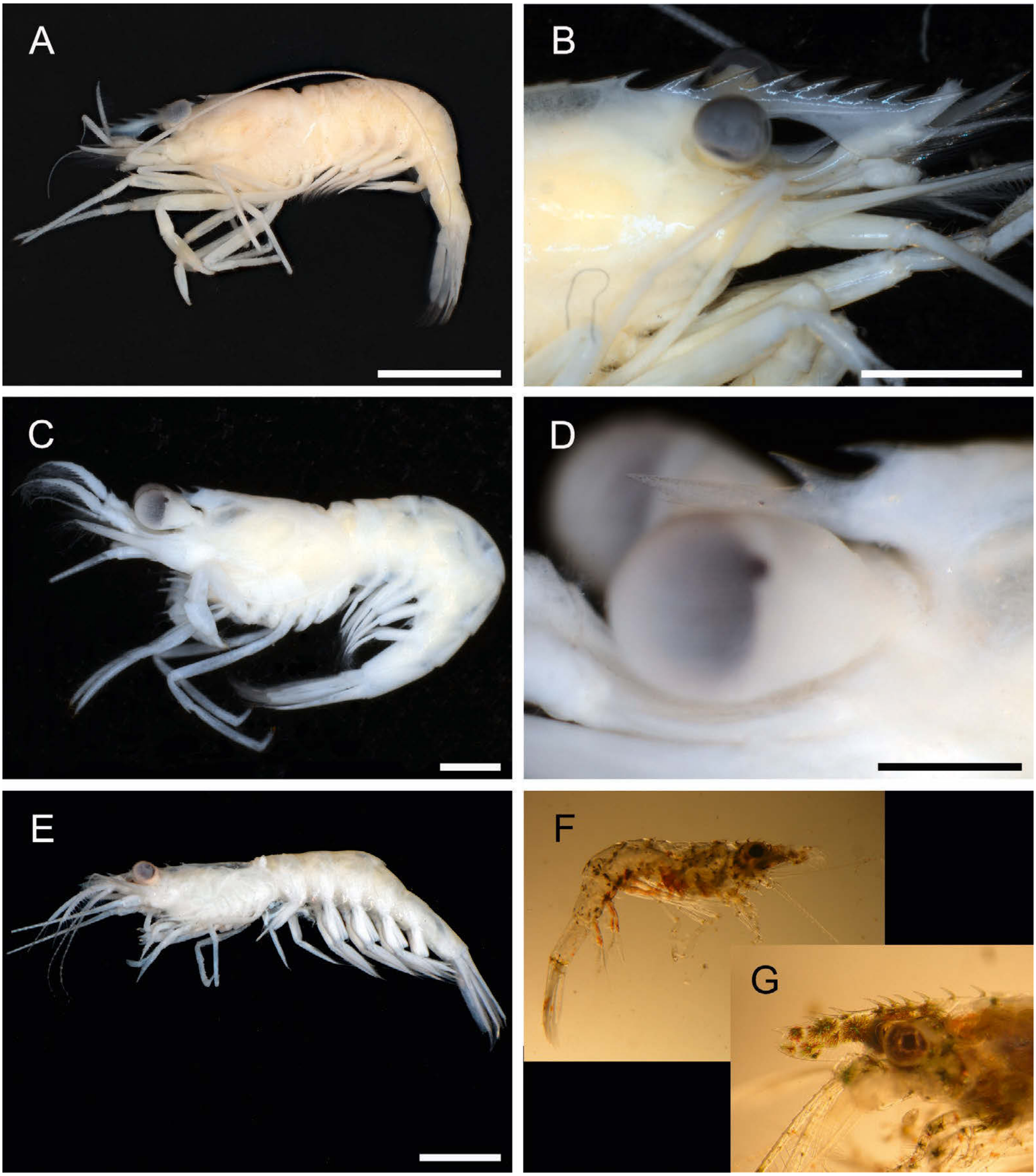

Fig. 4. Hippolytidae. **A–B**. *Nauticaris magellanica*: **A.** lateral left view; **B.** detail of frontal part, lateral right view; **C–D.** *Eualus dozei*: **C.** lateral left view; **D**. detail of anterior part, lateral left view; **E–G.** *Latreutes antiborealis*: **E**. lateral left view; **F–G.** vital specimen: **F.** lateral right view; **G.** detail of anterior part (lateral left). Scale bars A: 5 mm; B, E: 2 mm; C: 1 mm; D: 0.5 mm. (A: ZSMA20111526; B: ZSMA20111520; C–D: ZSMA20111559; E: ZSMA20150180).

Caridea

Alpheidae Rafinesque, 1815

Betaeus truncatus Dana, 1852, Fig. 4

Material examined: ZSMA20111514 (ovig. ♀), ZSMA 20111558: St. C2c; ZSMA20111516 (♂): St. C23b; ZSMA 20111517, ZSMA20111557, ZSMA20111515: St. C25a.

Synalpheus spinifrons (H. Milne Edwards, 1837), Fig. 4

Material examined: ZSMA20111519 (ovig. ♀): St. N14b.

Campylonotidae Sollaud, 1913

Campylonotus vagans Spence Bate, 1888, Fig. 5

Material examined: ZSMA20111525 (juv.): St. C43; ZSMA20111523 (between mussels), ZSMA20111518 (ovig. ♀, between mytilids), ZSMA20061454 (between mytilids): St. S37; ZSMA20060735: St. C36; ZSMA 20061474, ZSMA20061473: St. C13e; ZSMA20150113: St. S27; ZSMA20150172: St. S59.

Hippolytidae Spence Bate, 1888

Eualus dozei (A. Milne-Edwards, 1891), Fig. 3

Material examined: ZSMA20150177 (in Bryozoa and Hydrozoa), ZSMA20150179 (in Bryozoa and Hydrozoa): St. C4b; ZSMA20150178 (in algae and Hydrozoa): St. C6d; ZSMA20111559 (juv.): St. C36.

Latreutes antiborealis Holthuis, 1952, Fig. 3

Material examined: ZSMA20150180 (7 individuals, light trap): C14h.

Nauticaris magellanica (A. Milne-Edwards, 1891), Fig. 3

Material examined: ZSMA20111507: St. N5c; ZSMA 20110006: St. N5a; ZSMA20111522, ZSMA20111551 (2 individuals, in Bryozoa): St. C4b; ZSMA20060493: St. C5c; ZSMA20061769: St. C5d; ZSMA20111521: St. C7c; ZSMA20111561 (on *Macrocysthis*): St. C15a; ZSMA 20060494 (on Hydrozoa): St. C23a; ZSMA20111520 (on Hydrozoa): St. C27; ZSMA20111526 (on Hydrozoa), ZSMA20111560 (3 individuals, on Hydrozoa): St. C28; ZSMA20111562 (6 individuals): St. C32b; ZSMA 20111524: St. S1; ZSMA20150169: St. S24; ZSMA 20150164, ZSMA20150165: St. S32; 2 individuals: St. S45.

Pandalidae Haworth, 1825

Austropandalus grayi (Cunningham, 1871), Fig. 4

Material examined: ZSMA20111512, ZSMA20111552: St. C12b; ZSMA20150175: St. C13c; ZSMA20111513: St. C14p; ZSMA20111554 (ovig. ♀): St. C30a; ZSMA 20111553, ZSMA20111511 (ovig. ♀): St. C32a; ZSMA 20150073: St. C48; ZSMA20150066: St. C57; ZSMA 20111555: St. S12a; ZSMA20150167: St. S22; ZSMA 20150168: St. S32; ZSMA 20111556 (ovig. ♀): St. S7.

Pasiphaeidae Dana, 1852

Pasiphaea dofleini Schmitt, 1932, Fig. 5

Material examined: ZSMA20111563: St. C14a.

Anomura

Hippidae Latreille, 1825

Emerita analoga (Stimpson, 1857), Fig. 6

Material examined: ZSMA20150182 (2 exuviae): St. N1b; (ZSMA20080043: St. C14n. The sample location of this individual remains unclear for which reason it won't be considered further).

Lithodidae Samouelle, 1819

Lithodes santolla (Molina, 1782), Fig. 7

Material examined: ZSMA20111496: St. C12b; ZSMA 20060462: St. C13a; ZSMA20111495 (♀): St. C13i; ZSMA20111550 (♀), ZSMA20111584 (♀): St. C31; ZSMA20060461: St. S6; ZSMA20150079: St. S22; ZSMA20150082: St. S26; ZSMA20150080: St. S32; ZSMA20150083: St. S30; ZSMA20150081: St. S33; ZSMA 20111580 (juv., ♀): St. S42.

Remarks: There are two intraspecific morphological differences that were observed. The first consists in the carapace ornamentation, i.e. the spines on the carapace differ in juvenile and adult animals. In smaller specimens the spines appeared more numerous and acute. Examples in this study are three very small specimens (ZSMA20150079: carapace width: 5.43 mm carapace length: 8.01 mm, ZSMA20150082, ZSMA20150081). This intraspecific morphological difference was also observed by Haig (1955) and Retamal & Gorny (2001). However Hall & Thatje (2010) did not confirm this ornamental discrepancy in the genus *Lithodes*. Secondly, the shape of the abdomen differs between male and female *Lithodes santolla*-specimens as is the case with other anomuran crabs. Here the females have an asymmetric abdomen (Macpherson 1988a, McLaughlin et al. 2007).

Paralomis granulosa (Hombron & Jacquinot, 1846), Fig. 7

Material examined: ZSMA20150067: St. C56; ZSMA 20150078: St. S26; ZSMA20111570, ZSMA20111494 (♀): St. S38; ZSMA20111618: St. S42; 2 individuals: St. S45; ZSMA20111493: St. S54.

Remarks: According to Hall & Thatje (2010) the species *P. granulosa* presents the ontogenetic change of carapace ornamentation, which is still not clarified with *L. santolla*: The flattening of the tubercles in bigger animals compared to that in smaller animals. However, the ornamentation of the smallest (ZSMA20150067: CL = 13.96 mm, CW = 12.94) and the biggest (ZSMA20111570: CL = 49.21 mm, CW = 48.54 mm) representatives of *P. granulosa* in this study did not present named differences.

Paralomis tuberipes Macpherson, 1988, Fig. 7

Material examined: ZSMA20150147, ZSMA20150148, ZSMA20150149: St. S25.

Remarks: The above displayed three animals collected in 2013 (HF16) are the first of *P. tuberipes* found during the HF-expeditions. Its closest relative in the genus *Paralomis* is *P. granulosa* (Macpherson 1988b) which was found earlier and more often. However, there are morphological differences that should be mentioned briefly, since they are well visible in the HF-specimens. The granulation of the carapace in *P. tuberipes* is singular (Fig. 7J) while in *P. granulosa* clustered granules can be found (Fig. 7K). Furthermore, the spines present on the rostrum, the anterolateral borders of the carapace and on the ambulatory legs in both species are more acute in *P. granulosa* while they are more rounded in *P. tuberipes* (Macpherson 1988b) (Fig. 7D,E,G,H).

Paguridae Latreille, 1802

Pagurus comptus White, 1847, Fig. 8

Material examined: ZSMA20080042: St. C4c; ZSMA 20060400: St. C5c; ZSMA20061481: St. C5e; ZSMA 20111719 (2 individuals): St. C13h; ZSMA20150048 (5 individuals): St. C18; ZSMA20111481, ZSMA20111729: St. C24a; ZSMA20111708, ZSMA20111695: St. C26; ZSMA20150001: St. C32a; ZSMA20150077: St. C39; ZSMA20111691: St. C40; ZSMA20111723 (2 individuals): St. C42; ZSMA20150042: St. C49; ZSMA20150061: C50; ZSMA20150065: St. C51; ZSMA20150064: St. C56; ZSMA20150060: St. C58; ZSMA20060486, ZSMA 20060485, ZSMA20060403: St. S3M; ZSMA20061462 (on whip coral): St. S7; ZSMA20060401: St. S9a; ZSMA 20060402: St. S10; ZSMA20061453, ZSMA20111533: St. S12a; ZSMA20061452, ZSMA20061459: St. S17; ZSMA20150092 (4 individuals), ZSMA20150099: St. S22; ZSMA20111709 (3 individuals): S23; ZSMA20150088, ZSMA20150089: St. S24; ZSMA20150093: St. S27; ZSMA20150104: St. S28c; ZSMA20150091: St. S28e; ZSMA20150094, ZSMA20150102 (2 individuals): S30; ZSMA20111710: St. S35; ZSMA20150103: St. S36; ZSMA20111693: St. S37; ZSMA20111575: St. S40; ZSMA20061456: St. S42; ∞: S43; ∞: S45; ZSMA20111483: St. S47b; ∞: S48; ZSMA20111712: St. S52; ZSMA20111482: St. S56; ZSMA20111484: St. S54; ZSMA20111694: St. S57; ∞: S58.

Pagurus edwardsii (Dana, 1852), Fig. 8

Material examined: ZSMA20060487 (ovig. ♀): St. C5c; ZSMA20111574 (2 individuals): St. C5e; ZSMA201114 89 (ovig. ♀): St. C10b.

Pagurus villosus Nicolet, 1849, Fig. 8

Material examined: ZSMA20060488: St. C5c; ZSMA 20111678, ZSMA20111658, ZSMA20111487, ZSMA 20111662, ZSMA20111660: St. C5f; ZSMA20111668, ZSMA20111679: St. C5h; ZSMA20060490: St. C13b; ZSMA20111667, ZSMA20111663, ZSMA20150176: St. C13c; ZSMA20150003 (ovig. ♀), ZSMA20111486 (ovig. ♀), ZSMA20150004, ZSMA20150006: St. C13f; ZSMA20150005 (ovig. ♀): St. C13h; ZSMA20150051 (2 individuals): St. C14i; ZSMA20111656: St. C14p; ZSMA20111674, ZSMA20111680 (ovig. ♀), ZSMA 20111657, ZSMA20111644, ZSMA20111673: St. C16c; ZSMA2006049: St. C17; ZSMA20111485, ZSMA20150049 (6 individuals): St. C18; ZSMA20111676, ZSMA20111681, ZSMA20111661, ZSMA20111670, ZSMA20111659, ZSMA20111675, ZSMA20111664 (ovig. ♀), ZSMA 20111669, ZSMA20111665, ZSMA20111672 (ovig. ♀), ZSMA20111671 (ovig. ♀), ZSMA20111666, ZSMA 20111677 (ovig. ♀): St. C20; ZSMA20111692, ZSMA 20111488, ZSMA20150007: St. C23b; ZSMA20060489: St. C37; ZSMA20150095, ZSMA20150096 (3 individuals), ZSMA20150097 (ovig. ♀), ZSMA20150098 (ovig. ♀): St. S22; ZSMA20150090: St. S28e.

Propagurus gaudichaudii (H. Milne Edwards, 1836), Fig. 8

Material examined: ZSMA20061478: St. C12a; ZSMA 20111491: St. C25c; ZSMA20111620: St. C30b; ZSMA 20111490: St. C32a; ZSMA20111492: St. C34; ZSMA 20150105: St. S29b.

Porcellanidae Haworth, 1825

Allopetrolisthes angulosus (Guérin, 1835), Fig. 9

Material examined: ZSMA20111477 (♂): St. N8a; ZSMA 20150009 (♂), ZSMA20111480 (♂): St. N9; ZSMA20111478 (♂): C2a; ZSMA20111629, ZSMA20111642 (♀), ZSMA 20111582 (♀), ZSMA20111581 (♀), ZSMA20111643 (♀), ZSMA20111587 (♂), ZSMA20111549, ZSMA20111636, ZSMA20111632 (♀), ZSMA20111715 (♀): St. C2b; ZSMA 20111479 (♂): St. C2c; ZSMA20111476 (♀): St. C23b; ZSMA20111641 (♂): St. C30a.

Allopetrolisthes spinifrons (H. Milne Edwards, 1837), Fig. 9

Material examined: ZSMA20111470 (juv. ♂); ZSMA 20111469 (♀); ZSMA20111527: St. C2d; ZSMA20111471 (juv.): St. C20.

Remarks: This porcellanid species lives symbiotically on benthic macro-invertebrates. The two host species on which they live solitarily as adults are the sea anemones *Phymactis clematis* and *Phymanthea pluvia* (Baeza & Stotz 2003, Thiel et al. 2003, Baeza 2007, Hiller et al. 2010). Juvenile animals were also reported to dwell on other macro-invertebrates such as the sea stars *Stichaster striatus, Meyenaster gelatinosus* or gastropod species (Haig 1955, 1960,

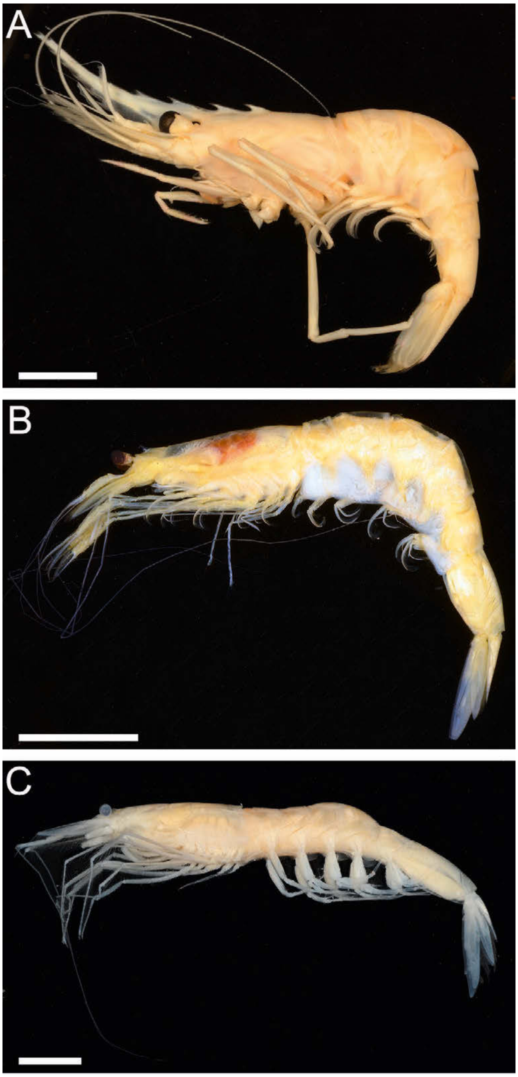

Fig. 5. Lateral left views of **A.** *Campylonotus vagans* (Campylonotidae); **B.** *Pasiphaea dofleini* (Pasiphaeidae); **C.** *Eusergestes similis* (Sergestidae). Scale bars A, B: 1 cm; C: 5 mm. (A: ZSMA20111523; B: ZSMA20111563; C: ZSMA20111564).

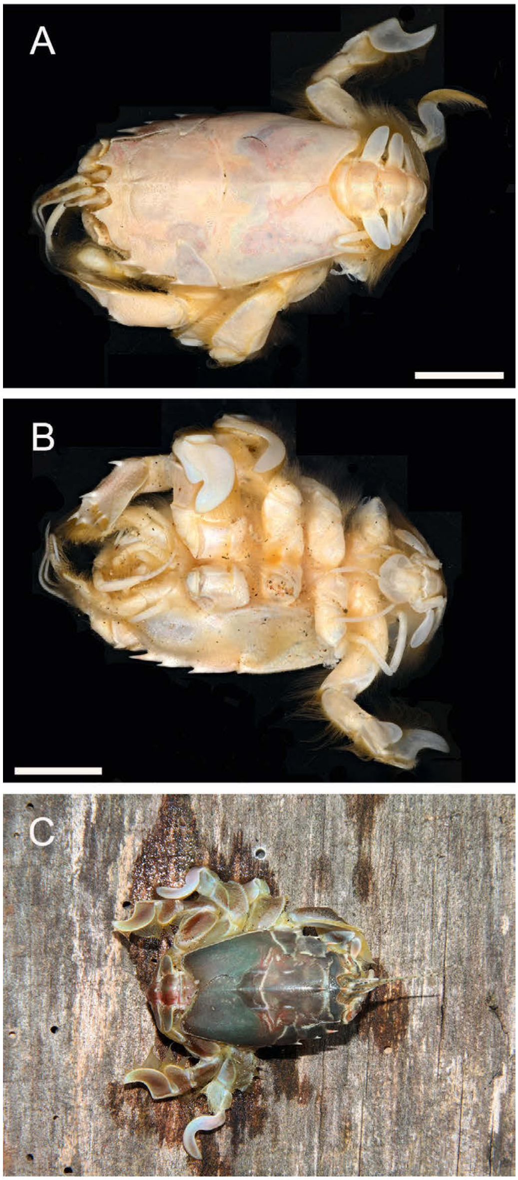

Fig. 6. *Emerita analoga* (exuvia). **A.** dorsal view; **B.** ventral view; **C.** in situ. Scale bars A, B: 1 cm. (A–B: ZSMA 20080043; C: n.a.).

Baeza et al. 2001, 2002, Baeza & Stotz 2003). Fig. 9D shows a specimen that dwells on the sea anemone *Antholoba achates* which to this point was not reported as a symbiont of *A. spinifrons*.

Liopetrolisthes patagonicus (Cunningham, 1871), Fig. 10

Material examined: ZSMA20111505 (juv.): St. N5b; ZSMA20150084, ZSMA20150085: St. S22; ZSMA 20150086, ZSMA20150087: St. S31b.

Remarks: Both Haig (1960) and Retamal (1981) reported only one species of the genus *Liopetrolisthes* – *Liopetrolisthes mitra* (Dana, 1852) in their studies about Eastern Pacific Porcellanidae and Decapods of Chile, respectively. Haig's notes on observed variations in the morphology of the front and of carpal structures, though, already indicated the instability of the concept of only one species. She

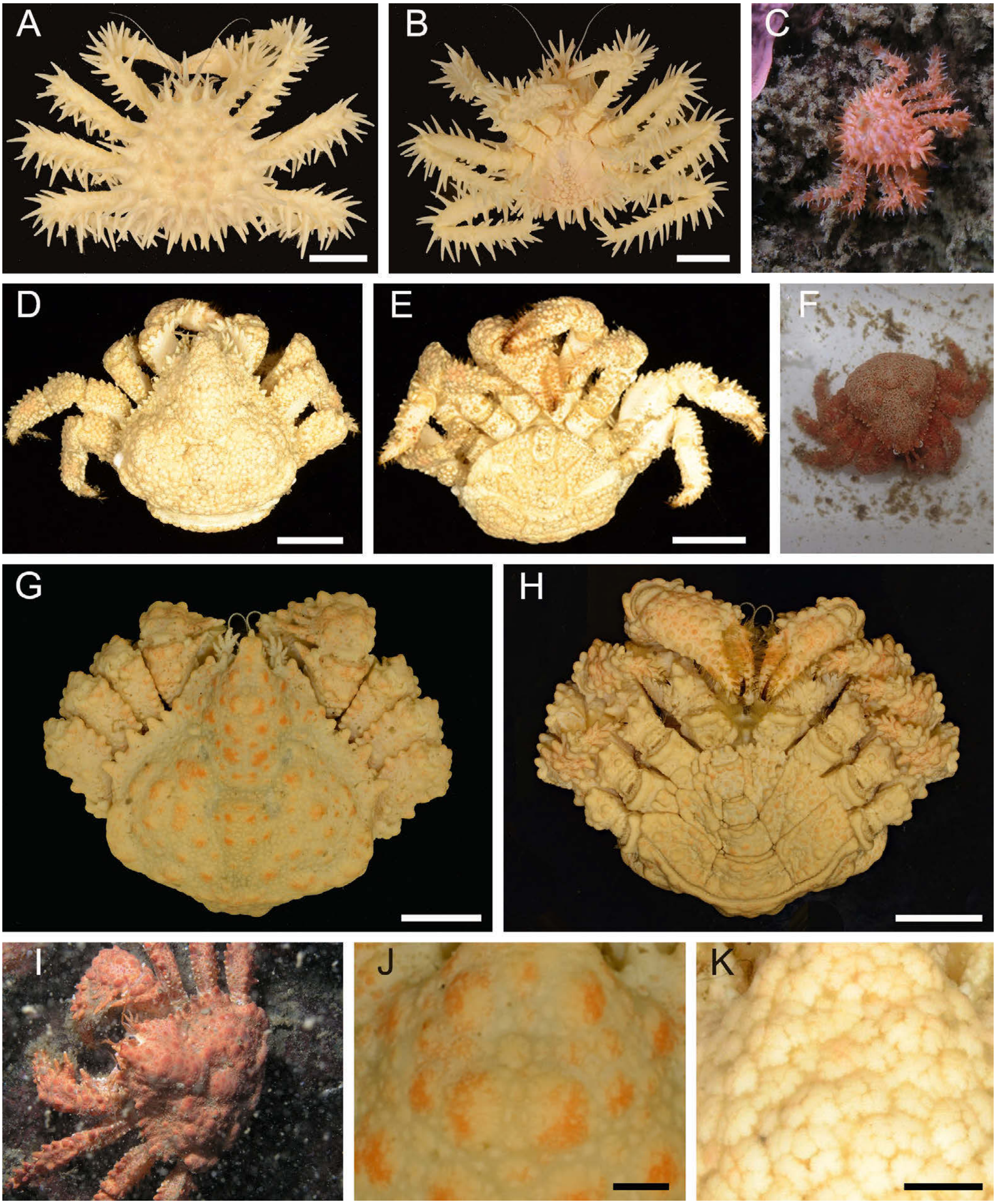

Fig. 7. Lithodidae. **A–C.** *Lithodes santolla*: **A.** dorsal view; **B.** ventral view; **C.** in situ; **D–F, K.** *Paralomis granulosa*: **D.** dorsal view; **E.** ventral view; **F.** vital specimen; **K.** detail of carapax ornamentation on the gastric region; **G–J.** *Paralomis tuberipes*: **G.** dorsal view; **H.** ventral view; **I.** in situ; **J.** detail of carapax ornamentation on the gastric region. Scale bars A, B, D, E, G, H: 1 cm; J, K: 2 mm. (A–B: ZSMA20111550; C: ZSMA20150081; D–E, K: ZSMA20111493; F: ZSMA20150067; G–H, J: ZSMA20150148; I: ZSMA20150149).

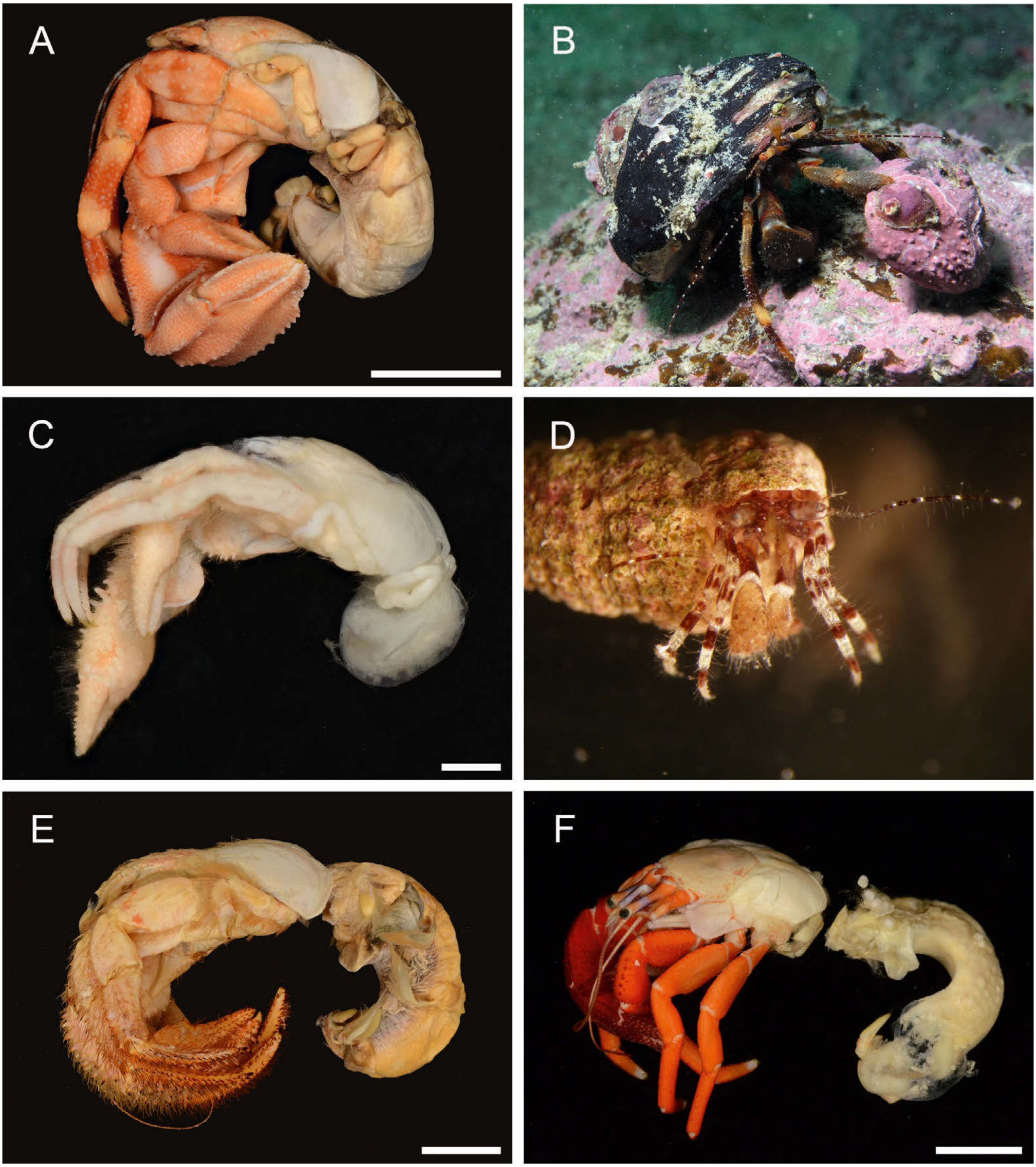

Fig. 8. Paguridae. **A–B.** *Pagurus comptus*: **A.** lateral left view; **B.** in situ; **C–D.** *Pagurus villosus*: **C.** lateral left view; **D.** vital specimen; **E.** *Propagurus gaudichaudii*, lateral left view; **F.** *Pagurus edwardsii*, lateral left view. Scale bars A, E: 1 cm; C: 2 mm; F: 5 mm. (A–B: ZSMA20150103; C: ZSMA20111487; E: ZSMA20150105; F: ZSMA20111489).

explained these differences as a matter of size. Weber & Galelguillos (1991) showed in their electrophoretic and morphometric survey that the genus *Liopetrolisthes* consists of two species. Urbina (1991) clarified synonymy and investigated the valid names for both species: *Liopetrolisthes mitra* and *Liopetrolisthes patagonicus*. He explained the variations, that Haig (1960) had already observed in 1960, as differences between the two species as follows: first of all, in *L. mitra* specimens the lateral lobes of the front are less projecting than in *L. patagonicus* (Fig. 10D) and secondly, the chelipeds are stouter in *L. patagonicus* as well as the three carpal spines on the chelipeds are either equal in size or the proximal is little smaller than the two distal spines (Fig. 10C).

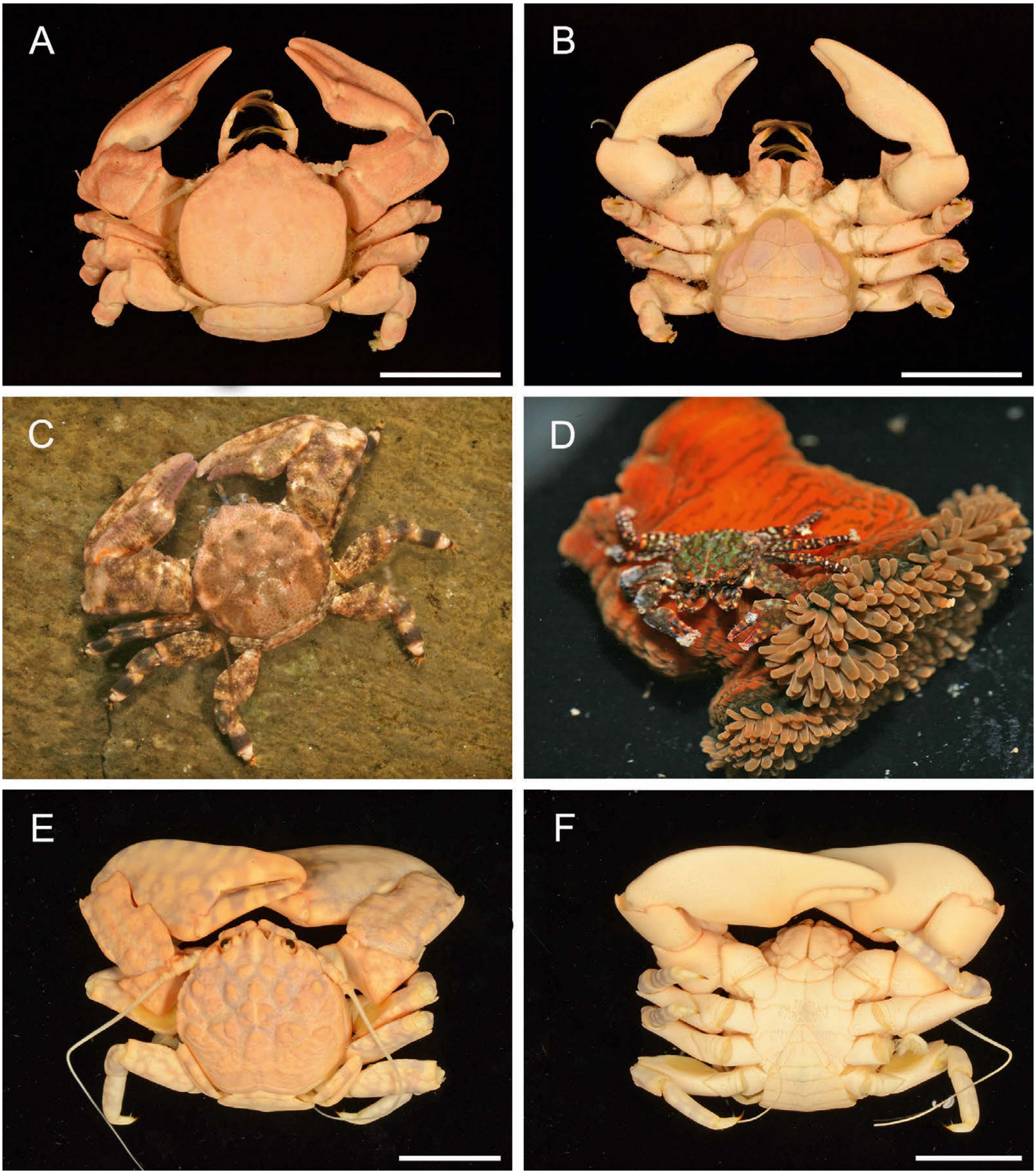

Fig. 9. Porcellanidae 1: Genus *Allopetrolisthes*. **A–C.** *Allopetrolisthes angulosus*: **A.** dorsal view; **B.** ventral view; **C.** vital specimen; **D–F.** *A. spinifrons*: **D.** vital specimen on the sea anemone *Antholoba achates*; **E.** dorsal view; **F.** ventral view. Scale bars A–B, E–F: 1 cm. (A–B: ZSMA20111549; C: ZSMA20111479; D: ZSMA20111471; E–F: ZSMA 20111527).

Another difference he described was the distribution range: *L. mitra* can be found from Ancón, Perú to Bahía san Vicente, Chile, whereas, *L. patagonicus* was registered from San Lorenzo, Perú to the Strait of Magellan reaching more southern regions than *L. mitra*.

Both are symbiotic species (Fig. 10E–F) with different echinoderms. Hosts are mostly sea urchins (*Tetrapygus niger* (Molina, 1782), *Loxechinus albus* (Molina, 1782)) and less frequently sea stars (e.g. *Stichaster striatus* Müller & Troschel, 1840) (Urbina 1991, Weber & Galelguillos 1991, Baeza & Thiel 2000, Baeza et al. 2002, Baeza 2007).

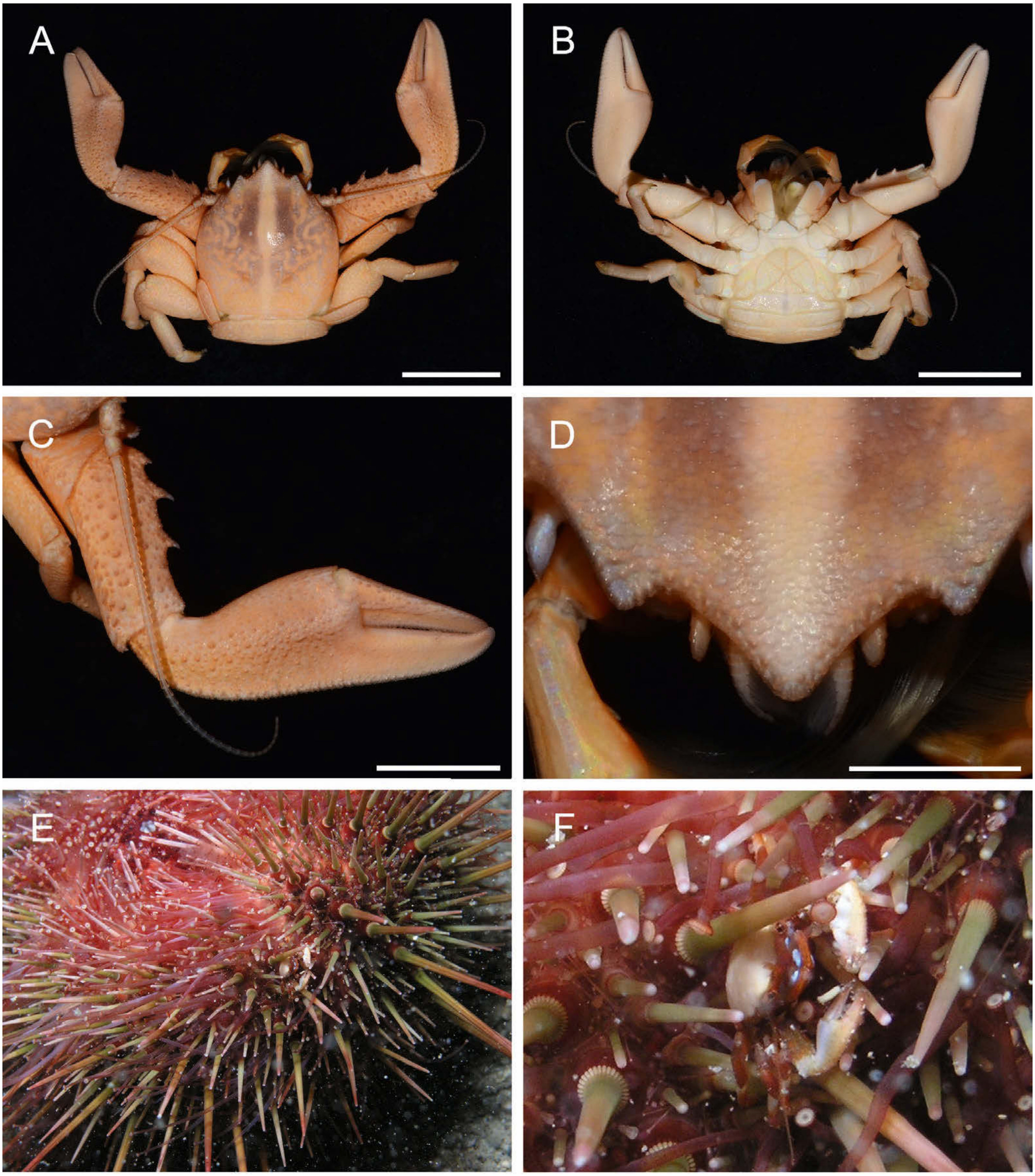

Fig. 10. Porcellanidae 2: *Liopetrolisthes patagonicus* (Porcellanidae). **A.** dorsal view; **B.** ventral view; **C.** detail of right cheliped; **D.** detail of rostrum, dorsal view; **E.** in situ on echinoid; **F.** closer view of *L. patagonicus* on echinoid. Scale bars A, B: 5 mm; C: 2.5 mm; D: 1 mm. (A–D: ZSMA20150084; E–F: ZSMA20150086).

The 5 specimens collected in 2011 and 2013 are the first representatives of the genus *Liopetrolisthes* to be found during all HF-expeditions. Our specimens have all the characteristics of *L. patagonicus* and can therefore be unequivocally attributed to this species.

Pachycheles chilensis Carvacho Bravo, 1968, Fig. 11

Material examined: ZSMA20111464 (♀), ZSMA20111463 (ovig. ♀): St. C2d.

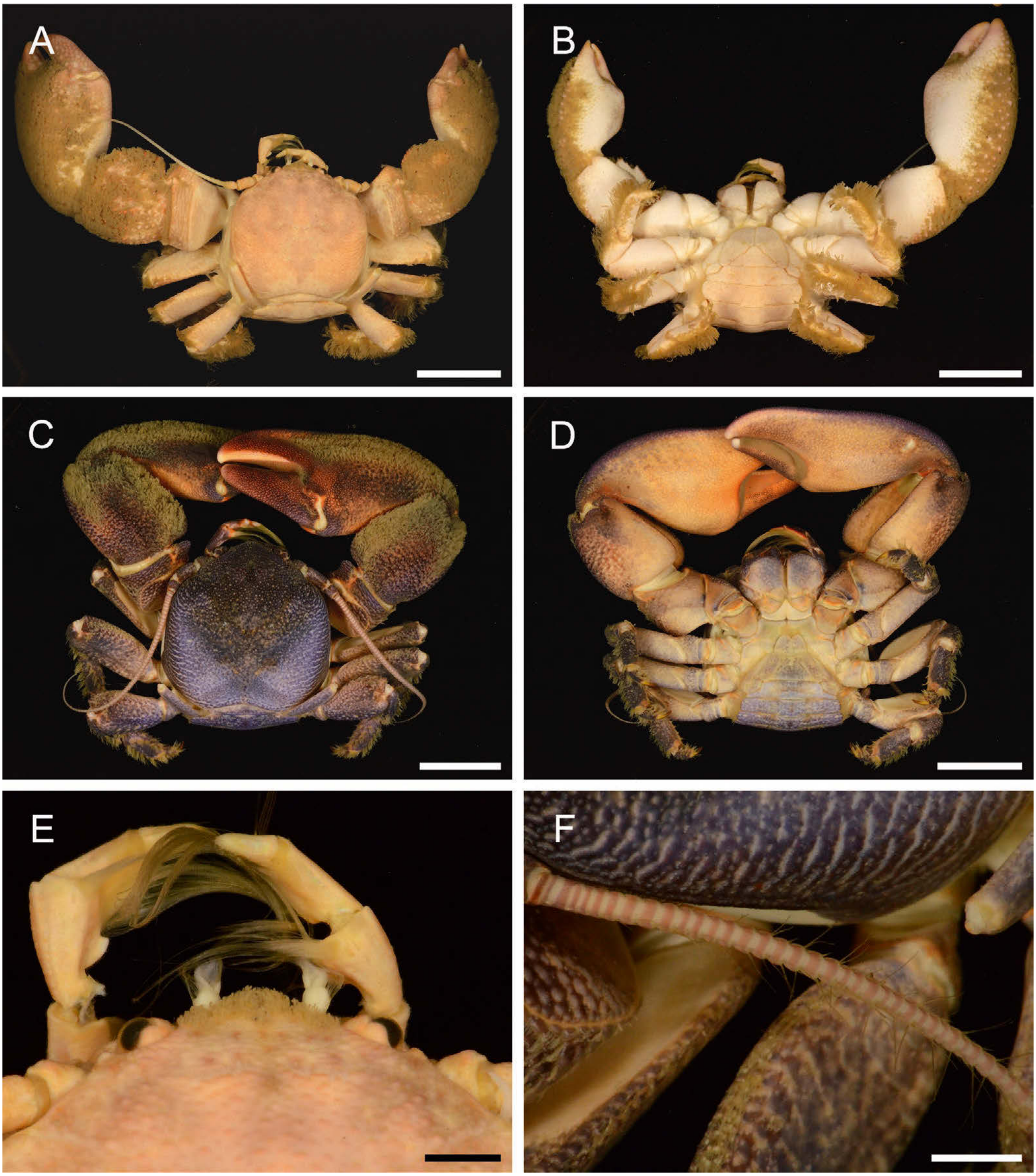

Fig. 11. Porcellanidae 3: **A–B, E.** *Pachycheles chilensis*: **A.** dorsal view; **B.** ventral view; **E.** detail of pilose frons; **C–D, F.** *Petrolisthes laevigatus*: **C.** ventral view; **D.** dorsal view; **F.** detail of antenna with long hair. Scale bars A–D: 1 cm; E–F: 2 mm. (A–B, E: ZSMA20111464; C–D, F: ZSMA20111548).

Petrolisthes granulosus (Guérin, 1835), Fig. 13

Material examined: ZSMA20111468 (♀): St. N1b.

Petrolisthes laevigatus (Guérin, 1835), Fig. 11

Material examined: ZSMA20111456 (♂), ZSMA20111711 (♀), ZSMA20111457: St. N1b; ZSMA20111725 (♀), ZSMA20111718 (♀), ZSMA20111716 (♂), ZSMA20111458 (♀), ZSMA20111697 (2 individuals), ZSMA20111548 (♂): St. N5b; ZSMA20060465: St. N12; ZSMA20111640 (2 individuals), ZSMA20111631 (2 individuals, juv.), ZSMA 20111573 (3 individuals, ♀): St. C5e; ZSMA20111637, ZSMA20111586 (♀), ZSMA20111628: St. C21a; ZSMA 20111459 (juv.), ZSMA20111713 (juv.), ZSMA20150008,

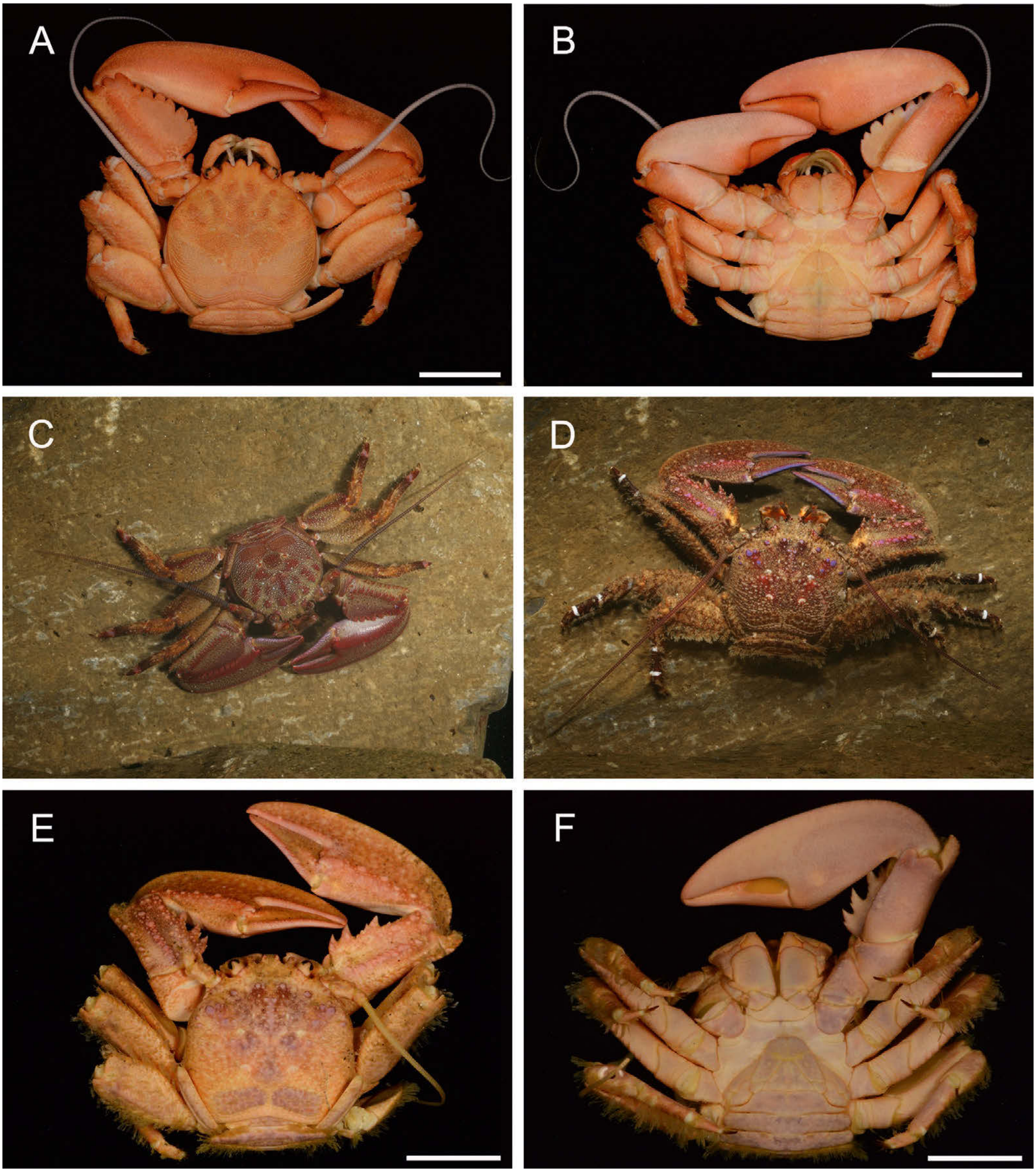

Fig. 12. Porcellanidae 4: **A–C.** *Petrolisthes tuberculatus*: **A.** dorsal view; **B.** ventral view; **C.** vital specimen; **D–F.** *Petrolisthes tuberculosus*; **D.** vital specimen; **E.** dorsal view; **F.** ventral view. Scale bars A–B, E–F: 1 cm. (A–B: ZSMA 20111472; C: ZSMA20111475; D–F: ZSMA20111467).

ZSMA20111728, ZSMA20111717, ZSMA20111721, ZSMA20111722, ZSMA20111684, ZSMA20150002, ZSMA20111727: St. C21b; ZSMA20111724, ZSMA20111720: St. C25b, ZSMA20111461: St. C25c; ZSMA 20111726 (♀), ZSMA20111714 (♀), ZSMA20111460; ZSMA20150055, ZSMA20150057, ZSMA20150059: St. C52.

Petrolisthes tuberculosus (H. Milne Edwards, 1837), Fig. 12

Material examined: ZSMA20111466 (♀), ZSMA20111465 (♂), ZSMA20111529 (♂): St. N9; ZSMA20111639, ZSMA 20111588 (♂), ZSMA20111635 (♂); ZSMA20111467 (♂): St. C2c.

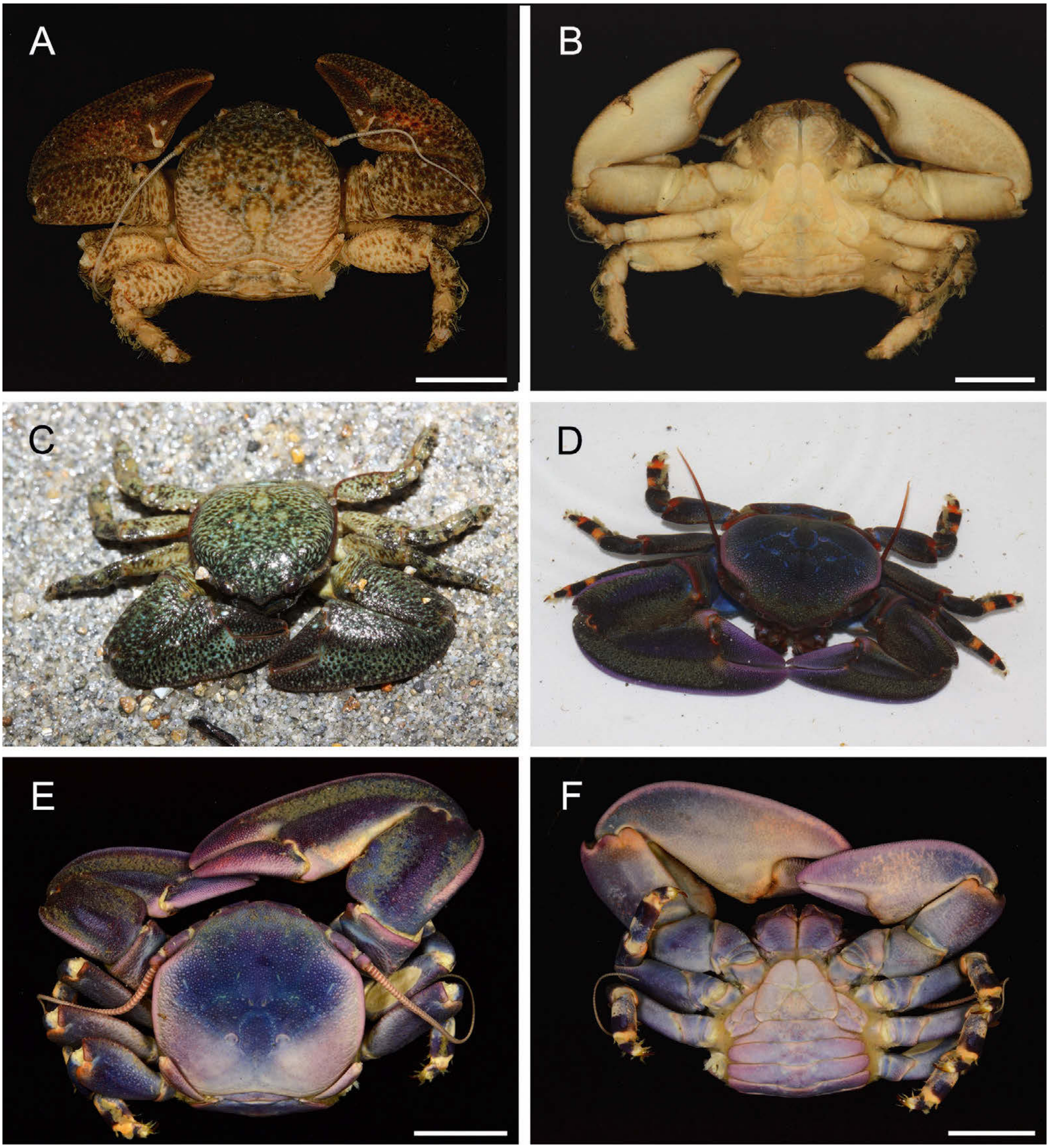

Fig. 13. Porcellanidae 5: **A–C.** *Petrolisthes granulosus*: **A.** dorsal view; **B.** ventral view; **C.** in situ; **D–F.** *Petrolisthes violaceus*: **D.** vital specimen; **E.** dorsal view; **F.** ventral view. Scale bars A–B: 5 mm; E–F: 1 cm. (A–C: ZSMA 20111468; D–F: ZSMA20111548).

Petrolisthes tuberculatus (Guérin, 1835), Fig. 12

Material examined: ZSMA20111472 (♂), ZSMA20111473 (♀), ZSMA20111474: St. N5b; ZSMA20111617 (ovig. ♀): St. N9; ZSMA20111630 (♀): St. C2b; ZSMA20111475 (♂): St. C2c.

Petrolisthes violaceus (Guérin, 1831), Fig. 13

Material examined: ZSMA20111462 (♀): St. N5b.

Munididae Ahyong, Baba, Macpherson, Poore, 2010

Munida gregaria (Fabricius, 1793), Fig. 14

Material examined: ZSMA20150058: St. N11; ZSMA 20111508: St. C1; ZSMA20080049: St. C14l; Chile/Decapoda 0057: St. C34; ZSMA20150071 (Morph: *M. subrugosa*): St. C45; ZSMA20150074, ZSMA20150075: St. C47; ZSMA20150056: St. C53; ZSMA20150069: St. C54; ZSMA20111528: St. S4; ZSMA20061762: St. S5;

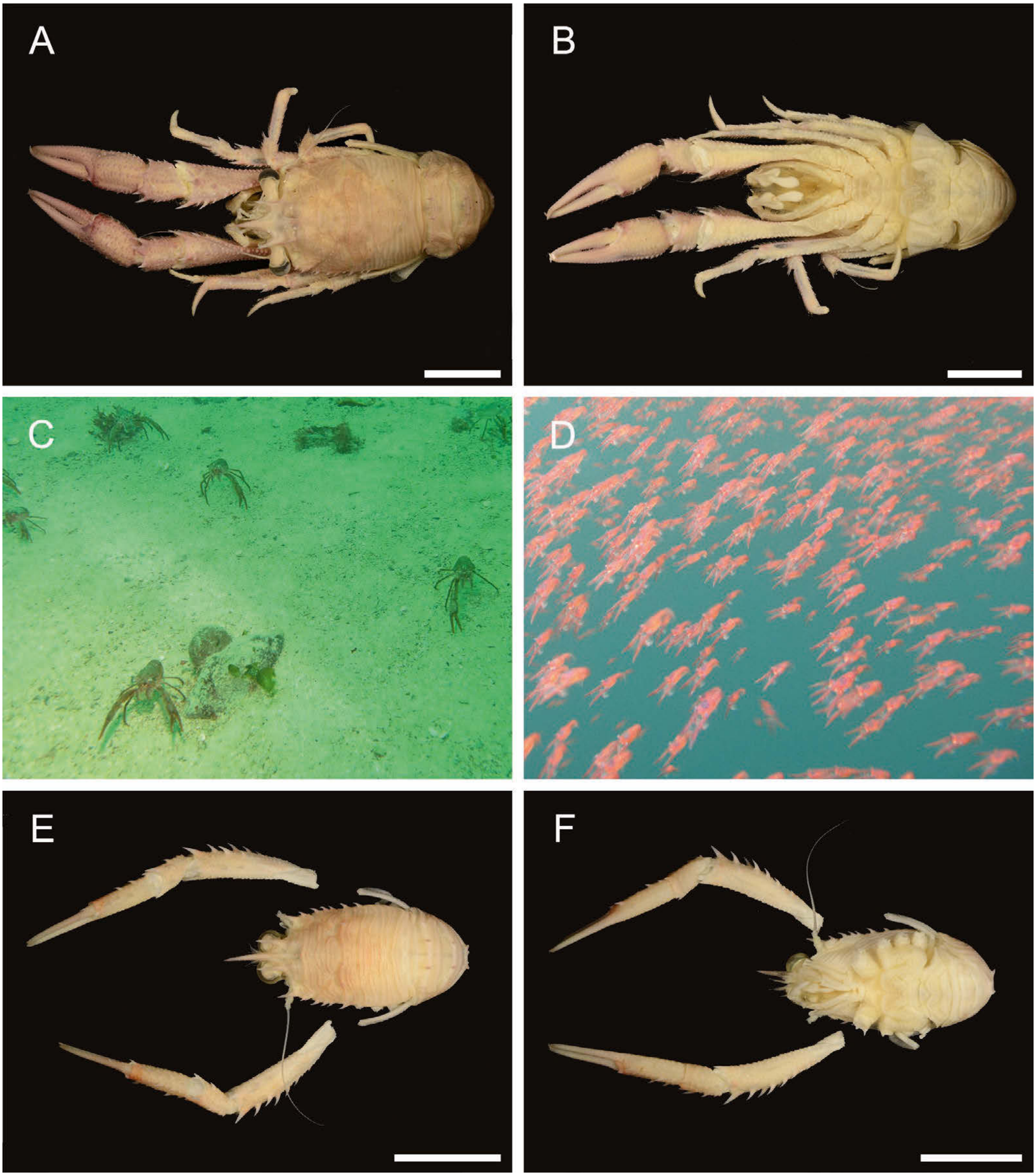

Fig. 14. *Munida gregaria*. **A–B.** 'Gregaria-morph': **A.** dorsal view; **B.** ventral view; **C–D.** in situ picture of ecotypes: **C.** conglomerate of benthic forms; **D.** pelagic swarm; **E–F.** 'Subrugosa-morph': **E.** dorsal view; **F.** ventral view. Scale bars A–B, E–F: 1 cm. (A–B: ZSMA20150152; C: ZSMA20150155; D: n.a.; E–F: ZSMA20150071).

ZSMA20061768: St. S9b; ZSMA20061765: St. S10; ZSMA20061763: St. S11; ZSMA20061767: St. S15a; ZSMA20061764: St. S16; ZSMA20150152, ZSMA20150157 (2 individuals): St. S27; ZSMA20150163 (5 individuals, from swarm): St. S28a; ZSMA20150156 (2 individuals): St. S28b; ZSMA20150158 (from swarm), ZSMA20150159 (from swarm), FC 103 (from swarm), ZSMA20150160 (23 individuals, from swarm), ZSMA20150161 (27 individuals, from swarm), ZSMA20150162 (14 individuals, from swarm): St. S28d; ZSMA20150153: St. S29a; ZSMA20150154 (2 individuals): St. S29c; ZSMA20150155: St. S36; S39 ZSMA20061766: St. S42; ZSMA20111510: St. S51; ZSMA20111509: St. S55.

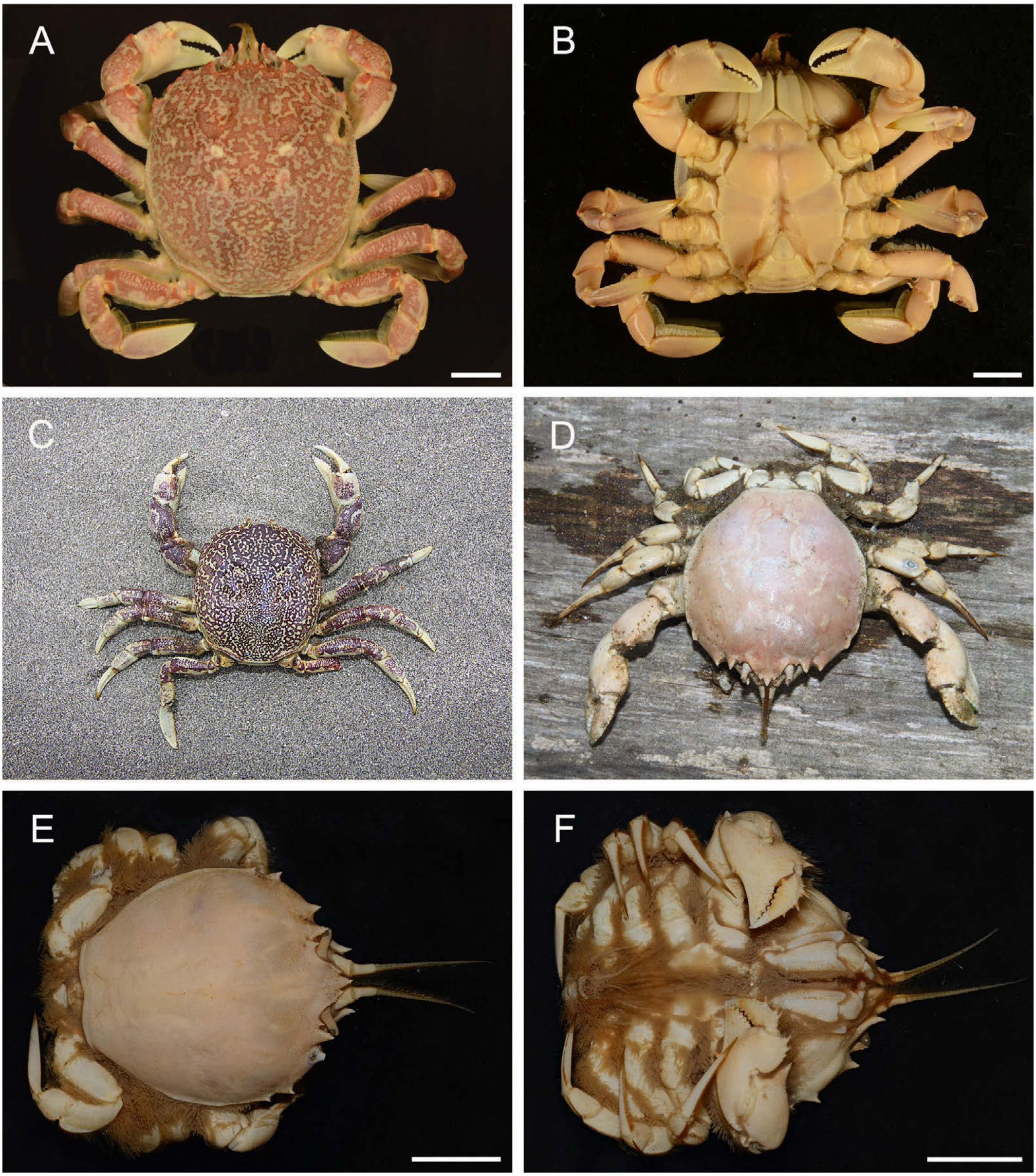

Fig. 15. Atelecyclidae. **A–C.** *Bellia picta*: **A.** dorsal view; **B.** ventral view; **C.** in situ; **D–F.** *Pseudocorystes sicarius*; **D.** exuvia; **E.** dorsal view; **F.** ventral view. Scale bars A–B, E–F: 1 cm. (A–C: ZSMA20111434; D: n.a; E–F: ZSMA 20111435).

Remarks: Representatives of *Munida gregaria* are found in two different ecotypes (Wang & Held 2013): Pelagic and benthic. Pelagic animals are small and gather in large swarms of up to 366 individuals/m^3 (Fig. 14D–F); benthic forms are much bigger and also occur in high densities, but less dense as compared to pelagic forms (27 individuals/m^2) (Tapella et al. 2002) (Fig. 14A–C). Furthermore, there are two morphotypes (Pérez-Barros et al. 2008, Wang & Held 2013). The 'subrugosa-morph' (Fig. 14E–F) has a kidney-shaped cornea, shorter ocular peduncles and a narrower base of the rostral spine than the 'gregaria-morph' (Fig. 14A–B) (Tapella et al. 2002, Peréz-Barros et al. 2008, Meyer et al. 2009). Because of

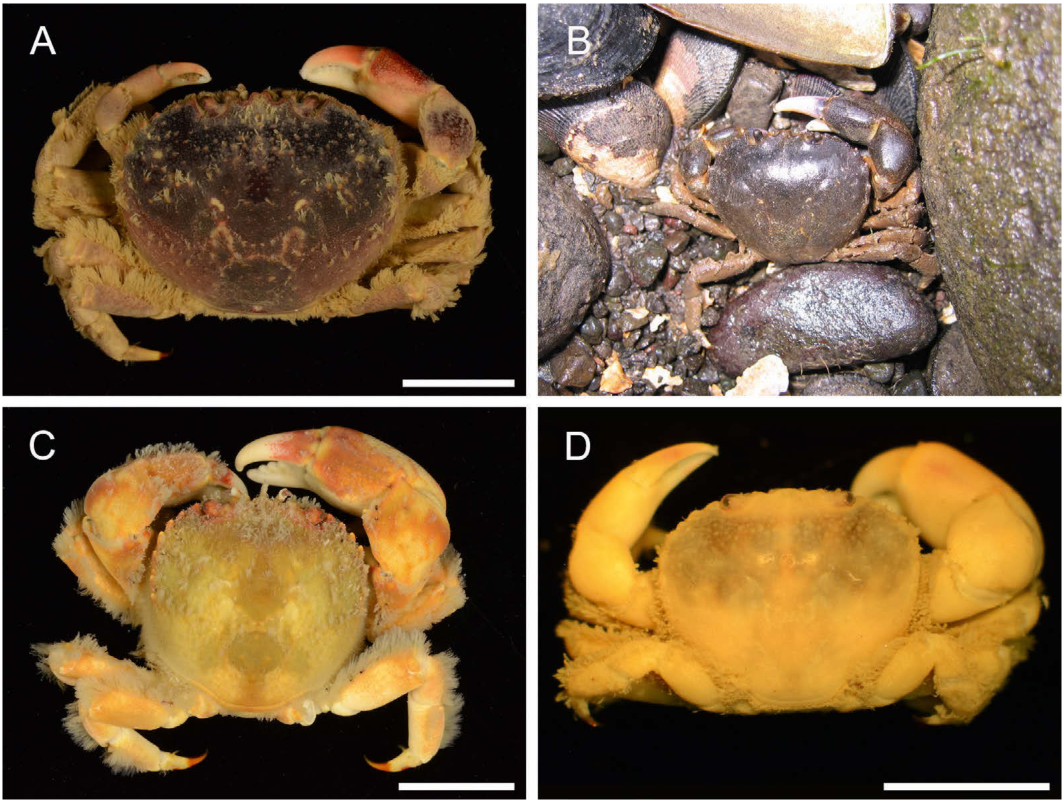

Fig. 16. Belliidae. **A–B.** *Acanthocylcus albatrossis*; **A.** dorsal view; **B.** in situ; **C.** *Acanthocyclus gayi*, dorsal view; **D.** *Acanthocyclus hassleri*, dorsal view. Scale bars A, C: 1 cm; D: 5 mm. (A: ZSMA20111445; B: ZSMA20150015; C: ZSMA 20111443; D: ZSMA20111501).

these ecological and morphological variabilities, the two types were understandably declared as two species: *Munida gregaria* and *Munida subrugosa*, whereat, *M. gregaria* was described as the benthic species and *M. subrugosa* as pelagic as juvenile and benthic as adult (Tapella et al. 2002). Only through recent molecular studies (Peréz-Barros et al. 2008, Wang & Held 2013) where the genetic uniformity of the two forms was discovered, the hypothesis of a single dimorphic species was confirmed. But it still remains unclear how such morphological and ecological variabilities can exist within one species. Among our specimens, only 5 presented the 'subrugosa-morph'. These five specimens exhibited different sizes from the smallest (ZSMA20111528) with CL 9.44 mm and CW 5.01 mm to the biggest (ZSMA20111509) with CL 28.27 mm and CW 18.21 mm. Recently, *Munida gregaria* has been suggested to represent the main vector for red tide toxins causing whale mass mortality (Häussermann et al. 2016).

Brachyura

Atelecyclidae Ortmann, 1893

Bellia picta H. Milne Edwards, 1848, Fig. 15

Material examined: ZSMA20111434 (♂): St. N4.

Pseudocorystes sicarius (Poeppig, 1836), Fig. 15

Material examined: ZSMA20150184 (2 exuviae): N1b; ZSMA20111435 (♂): Aquarium Dichato.

Belliidae Dana, 1852

Acanthocyclus albatrossis Rathbun, 1898, Fig. 16

Material examined: ZSMA20111445 (stony littoral, below stones), ZSMA20111607 (stony littoral, below stones), ZSMA20111444 (stony littoral, below stones): St. N1b; ZSMA20111503 (juv.), ZSMA20111610: St. N5b; ZSMA20061652 (3 individuals): St. N12; ZSMA20150016 (below stones): St. C3; ZSM20111454: St. C7a; ZSMA 20111447 (on Mytilidae & Hydrozoa): St. C7b; ZSMA 20111614 (9 individuals, on Mytilidae): St.C7e; ZSMA

Fig. 17. Cancridae. **A–C.** *Metacarcinus edwardsii*: **A.** dorsal view; **B.** ventral view; **C.** in situ; **D–F.** *Romaleon polyodon*; **D**. exuvia of *R. polyodon*; **E.** dorsal view; **F.** ventral view. Scale bars A–B: 5 mm; E–F: 1 cm. (A, B: ZSMA20111409; C: n.a.; D: n.a; E–F: ZSMA20111416).

20061654: St. C13a; ZSMA20150173 (juv., 3 individuals): St. C13c; ZSMA20061668: St. C14c; ZSMA20061653 (estuary): St. C14f; ZSMA20061657 (below stones): St. C14g; ZSMA20061655: St. C14i; ZSMA20150195: St. C14j; ZSMA20111608, ZSMA20111448: St. C19b; ZSMA 20111453, ZSMA20111452: St. C25c; ZSMA20150076: St. C38; ZSMA20111451: St. C41; ZSMA20150068: St. C51; ZSMA20061663: St. S3; ZSMA20111611: St. S4; ZSMA20061662: St. S7; ZSMA20061660, ZSMA20061658: St. S13; ZSMA20150143, ZSMA20150144, ZSMA 20150145: St. S34; ZSMA20061656 (1 exuvia, 1 animal): St. S41a; ZSMA20150146 (4 exuviae): St. S41b; 3 individuals: S45.

Acanthocyclus hassleri Rathbun, 1898, Fig. 16

Material examined: ZSMA20111504: St. N5b; ZSMA 20111531: St. N5c; ZSMA20111501: St. N5d; ZSMA 20150174 (juv.): St. C13c; ZSMA20080018 (estuary): C14f.

Acanthocyclus gayi H.Milne Edwars & Lucas, 1844, Fig. 16

Material examined: ZSMA20111604 (stony littoral, below stones): St. N1b; ZSMA20111446: St. N5b; ZSMA20111609, ZSMA20111605, ZSMA20111443, ZSMA20111606: St. N5c; 2 individuals: N7; ZSMA 20111455 (juv.), ZSMA20111449, ZSMA20111450: St. N9; ZSMA20111615: St. C34; ZSMA20061667, ZSMA 20061666: St. S2; S18; ZSMA20061661 (2 individuals): St. S40.

Remarks on the Genus *Acanthocyclus*: The three *Acanthocyclus* species have been reanalysed in detail by Meyer et al. (2013) using an integrative taxonomic approach. Both morphology and DNA sequences support the status of these three species.

Cancridae Latreille, 1802

Metacarcinus edwardsii (Bell, 1835), Fig. 17

Material examined: ZSMA20111410 (under stone, juv.), ZSMA20111409 (exuvia, ♂), ZSMA20111411 (juv.): St. C1; ZSMA20061477: St. C13d; ZSMA20061475: St. C13e; ZSMA20111650 (on Hydrozoa), ZSMA20111647 (juv.): St. C13g; ZSMA20060492: St. C14d; ZSMA 20061486: St. C14p; ZSMA20080326: St. C14q; ZSMA 20111622 (under stone, juv.): St.C21a; ZSMA20111408 (♂): St. C25c; ZSMA20111572: St. C30b; ZSMA20111627 (juv.): St. C33; ZSMA20111412 (♂): St. C34; ZSMA 20061458: St. S15b; ZSMA20061445 (common, on mytilid debris): St. S17.

Romaleon polyodon (Poeppig, 1836), Fig. 17

Material examined: ZSMA20111706 (♂), ZSMA 20111413: St. N5b; ZSMA20111414 (♂): St. N5c; ZSMA 20111416 (♂): N14a; ZSMA20111415 (♂): N14b.

Corystidae Samouelle, 1819

Gomeza serrata Dana, 1852, Fig. 18

Material examined: ZSMA20150170: St. S22; ZSMA 20150166: St. S33.

Remarks: In the existing illustrations of *G. serrata*, which can be found in Rathbun (1930), Retamal & Yáñez (1973) and Retamal (1981), the central rostral lobe is displayed as a seemingly truncated structure ending in an almost horizontal line. The two individuals examined in this study showed all features of *G. serrata* described in the studies mentioned but the shape of the rostral lobe. It differs in having two small spines equal in size on the apex. However, considering that the two studies by Retamal took the Rathbun-work as reference, it seems likely that Rathbun presented an individual with either a broken rostrum or a very untypical variation. If this is the case, this is the first work where the two-spined shape of a *G. serrata*-rostrum is shown (see Fig. 18D).

Epialtidae MacLeay, 1838

Taliepus dentatus (H. Milne Edwards, 1834), Fig. 19

Material examined: ZSMA20111497 (juv.), ZSMA 20111498 (juv.): St. N5b; ZSMA20111375: St. N5c; ZSMA 20111377: St. N8c; ZSMA20111619 (exuvia, only carapace): St. N9; ZSMA20111567 (♂), ZSMA20150046 (juv., ♂): St. C2b; ZSMA20111378 (♂), ZSMA20111379: St. C2c; ZSMA20150052 (juv.): St. C9; ZSMA20150010 (♀): St. C21a; ZSMA20150011 (♀): St. C25a; ZSMA20111376 (♂): St. C26.

Pisoides edwardsii (Bell, 1835), Fig. 19

Material examined: ZSMA20111500, ZSMA20111700, ZSMA20111499, ZSMA20111404: St. N5b; ZSMA 20111702, ZSMA20111701: St. N5c; ZSMA20111406, ZSMA20111698 (2 individuals): St. N8b; ZSMA20111530 (♂), ZSMA20111683 (♀), ZSMA20111407 (♂): St. C26; ZSMA20111405 (♂): St. C27; ZSMA20111703 (♂): St. C28; ZSMA20111625 (♂), ZSMA20111578 (♀), ZSMA20111577 (♂), ZSMA20111576 (♀): St. C30a; ZSMA20111699 (juv.): St. C33; ZSMA20150043: St. C52; ZSMA20150037, ZSMA 20150038: St. C55; ZSMA20150070: St. C59; ZSMA 20061468 (from yellow sponge): St. S1; ZSMA20061444: St. S17; ZSMA20061448 (mainly on hydrocoral and bryozoan debris): St. S23; ZSMA20150134, ZSMA 20150135, ZSMA20150136, ZSMA20150137: St. S24; ZSMA20150139: St. S26; ZSMA20150142: St. S27; ZSMA 20150140: St. S30; ZSMA20150133: St. S31b; ZSMA 20150141: St. S36.

Hymenosomatidae MacLeay, 1838

Halicarcinus planatus (Fabricius, 1775), Fig. 20

Material examined: ZSMA20080324 (ovig. ♀, on *Crepidula dilatata* Lamarck, 1822): St. N2; ZSMA20111624 (juv.): St. C4d; ZSMA20111655 (4 individuals, on Hydrozoa): St. C4f; ZSMA20060408: St. C5b; ZSMA20060430: St. C5c; ZSMA20060409, ZSMA20060424 (on Hydrozoa): St. C6a; ZSMA20111613 (3 individuals, on Mytilidae): St. C7e; ZSMA20111648: St. C10a; ZSMA20111437: St. C10b; ZSMA20060407: St. C11; ZSMA20111440, ZSMA20111688 (6 individuals), ZSMA20080035 (2 individuals): St. C13c; ZSMA20111652 (4 individuals): St. C13g; ZSMA20060426, ZSMA20060427, ZSMA 20060425: St. C14c; ZSMA20060423: St. C14d; ZSMA 20150050 (2 individuals): St. C14i; ZSMA20111654 (ovig. ♀): St. C15b; ZSMA20111439 (ovig. ♀): St. C16b; ZSMA20060422: St. C17; ZSMA20111686 (5 individuals, ♀), ZSMA20111689 (3 individuals): St. C18; ZSMA

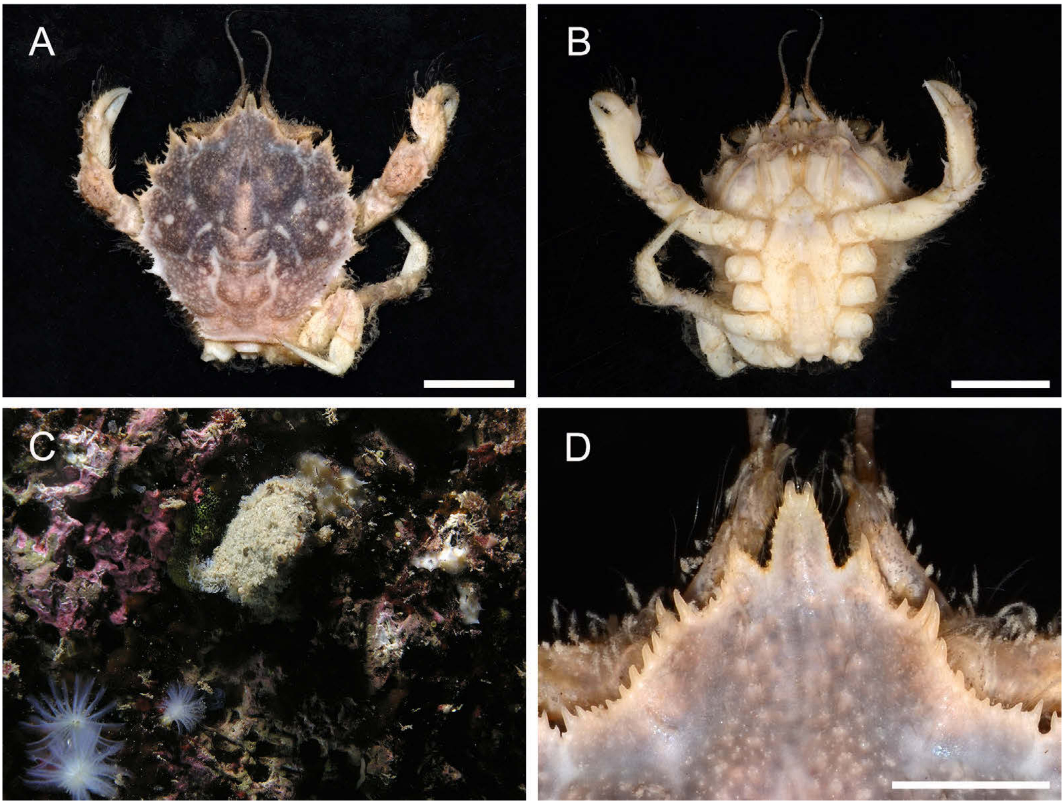

Fig. 18. *Gomeza serrata* (Corystidae). **A.** dorsal view; **B.** ventral view; **C.** in situ; **D.** detail of rostrum. Scale bars A–B: 5 mm; D: 1 mm. (A–D: ZSMA20150166).

20111687 (juv., under stones): St. C22a; ZSMA20111704 (on Polychaeta and Hydrozoa): St. S23; ZSMA20111685 (juv.): St. C26; ZSMA201111696 (♂): C27; ZSMA20060410: St. C36; ZSMA20111441 (♀): St. C46; ZSMA20150054, ZSMA20150053: St. C52; ZSMA20061457, ZSMA 20061471: St. S2; ZSMA20111705 (2 individuals, juv.): St. S13; ZSMA20060431: St. S14; ZSMA20060421 (on Hydrozoa): St. C16a; ZSMA20150107: St. S22; FC 051 (6 individuals): St. S24; ZSMA20150106: St. S30; ZSMA 20061470 (on biogenous limestone and mussel shells): St. S42; ZSMA20111645 (2 individuals): St. S46; ZSMA 20111438 (♀): St. S53; ZSMA20150039: St. C55; ZSMA 20111436 (ovig. ♀): St. S56; ZSMA20111646 (4 individuals): Bahia Possesion (no GPS data).

Inachidae MacLeay, 1838

Eurypodius latreillii Guérin, 1825, Fig. 20

Material examined: ZSMA20111424, ZSMA20111603: N1a; ZSMA20111425: St. C13j; ZSMA20061480 (3 individuals): St. C14m; ZSMA20111426: St. C18; ZSMA 20111591, ZSMA20111427, ZSMA20111428: St. C26; ZSMA20111594, ZSMA20111589 (2 individuals, on Hydrozoa): St. C30a; ZSMA20111590: St. C34; ZSMA 20150132: St. S27; ZSMA20150131: St. S30; 2 individuals: S44; S45.

Eurypodius longirostris Miers, 1886, Fig. 20

Material examined: ZSMA20111653: St. C16d; ZSMA20111430: St. C18; ZSMA20111597: St. C25c; ZSMA20111429, ZSMA20111600: St. C27; ZSMA20111431: St. C29; ZSMA20111593 (ovig. ♀): St. C30a; ZSMA20111596: St. C32a; ZSMA20060440: St. C35; ZSMA20111690: St. C40; ZSMA20111602: St. C42; ZSMA20111532: St. C46; ZSMA20150063, ZSMA20150151: St. C54; ZSMA20150072: St. C56; ZSMA 20150062, ZSMA20150150: St. C58; ZSMA20061439: St. S2; ZSMA20061443: St. S4; ZSMA20061455: St. S5; ZSMA20111598: St. S6; ZSMA20061447: St. S7; ZSMA20060435: St. S8; ZSMA20060439: St. S10; ZSMA 20061467 (on Hydrozoa), ZSMA20061464: St. S12a; ZSMA20111599 (juv., ♂): S12b; ZSMA20061465 (on Hydrozoa): St. S17; 2 individuals: S20; ZSMA20150128, ZSMA20150118: St. S22; ZSMA20061446: St. S23; ZSMA20150119, ZSMA20150122, ZSMA20150123, ZSMA20150129: St. S24; ZSMA20150120 (2 individuals), ZSMA20150124: St. S27; ZSMA20150130: St. S28b; ZSMA20150125, ZSMA20150126: St. S28c;

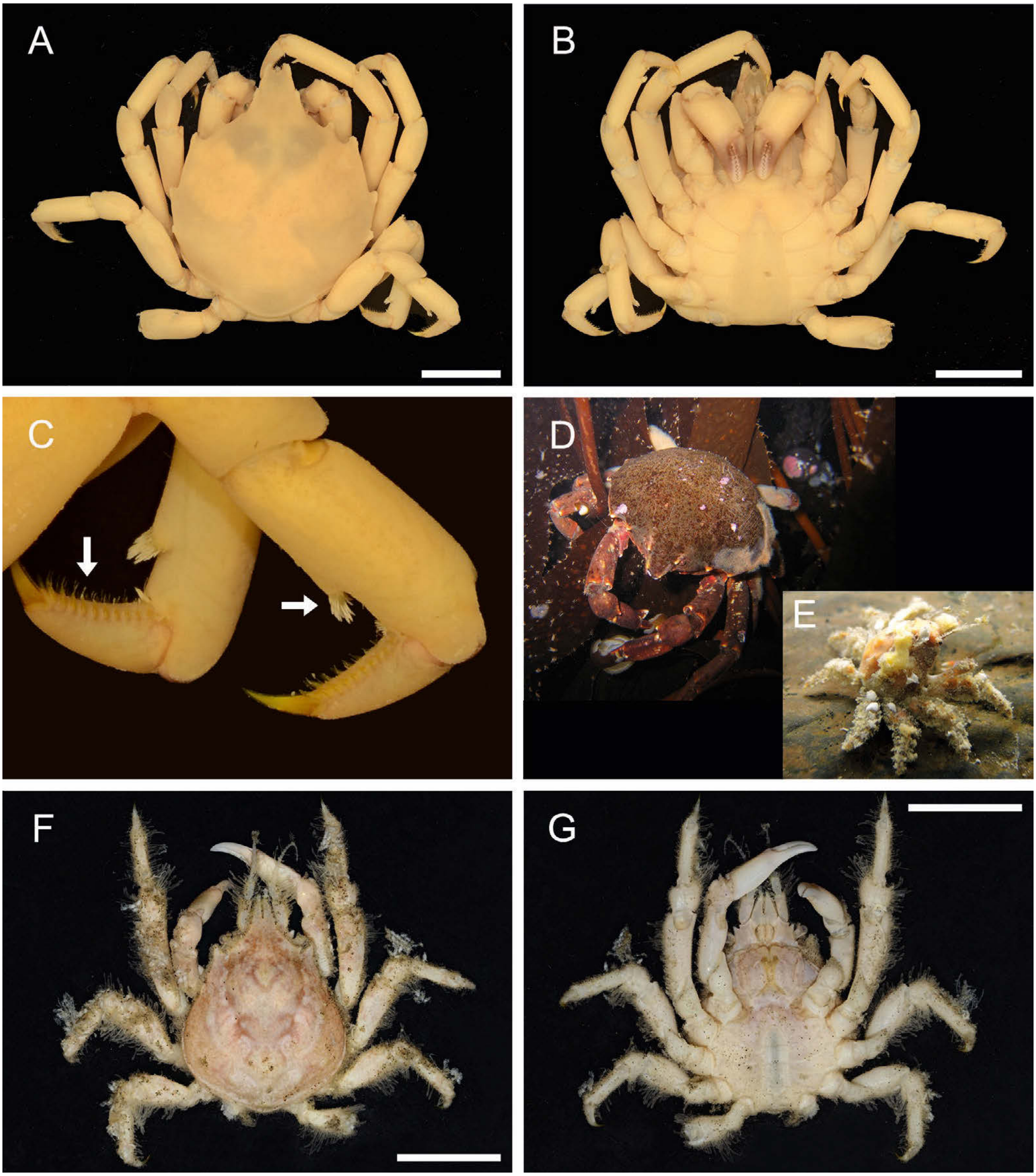

Fig. 19. Epialtidae. **A–D.** *Taliepus dentatus*: **A.** dorsal view; **B.** ventral view; **C.** detail of appendices of propodus and dactylus of third and fourth pareopod, right; **D.** in situ; **E–G.** *Pisoides edwardsii*; **E.** vital specimen; **F.** dorsal view; **G.** ventral view. Scale bars A–B, F–G: 1 cm. (A–C: ZSMA20111377; D: ZSMA20150010; E: ZSMA20150135; F–G: ZSMA20111405).

ZSMA20150121: St. S31a; ZSMA20111601 (on Hydrozoa): St. S35; ZSMA20150114, ZSMA20150115, ZSMA20150116, ZSMA20150117, ZSMA20150127, ZSMA20150138: St. S36; ZSMA20061440: St. S37; ZSMA20061442, ZSMA20061441 (on Hydrozoa): St. S38; S39; ZSMA20061466 (on *Gorgonocephalus* and Polychaeta), ZSMA20061463: St. S40; ZSMA20111595, ZSMA20061461 (2 individuals, on biogenous limestone and mussel shells): St. S42; 2 individuals: S43; S44; ZSMA20060434: St. S47a; S49; ZSMA20111432 (♂): St. S51; ZSMA20111592: St. S54.

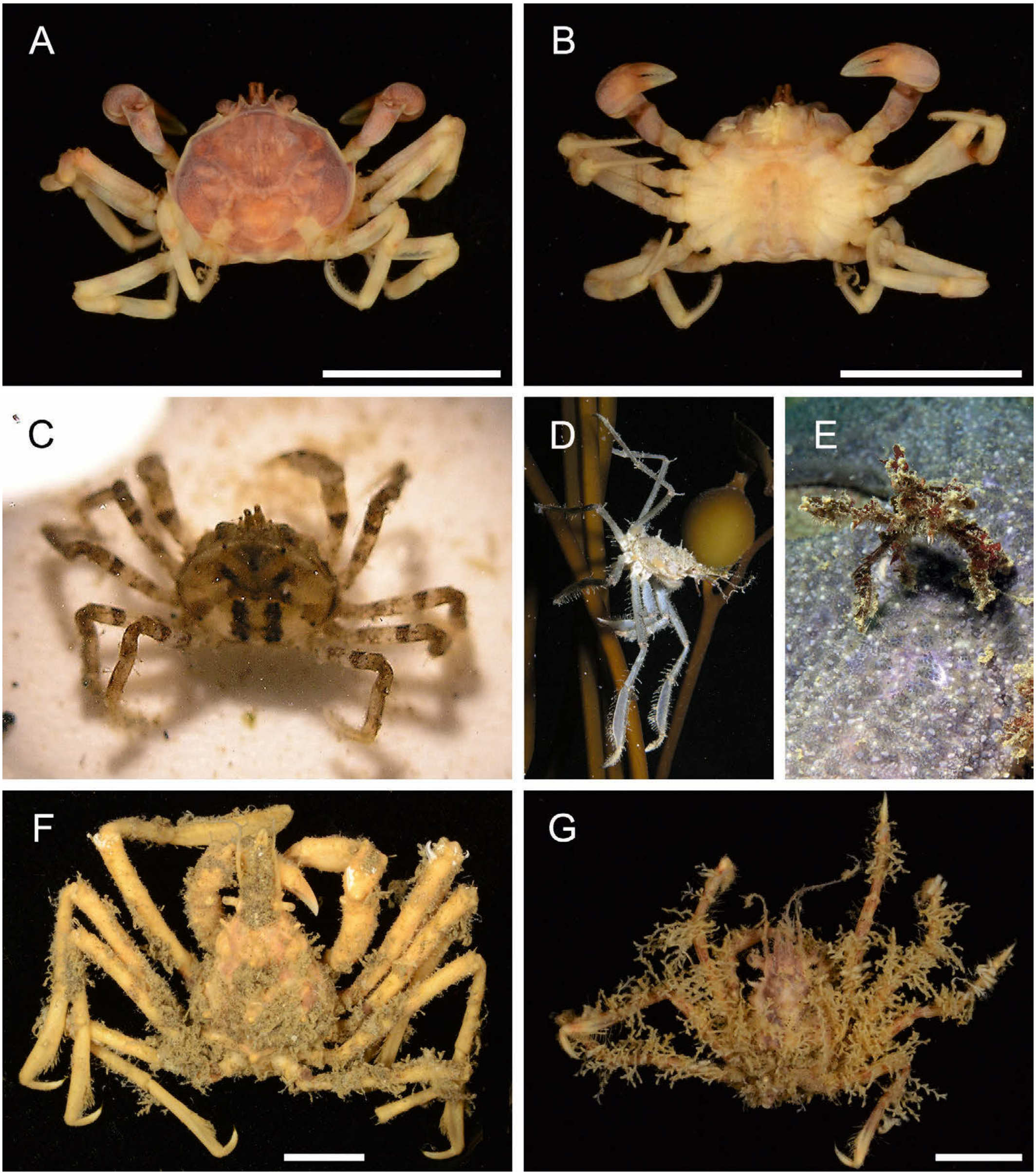

Fig. 20. **A–C.** *Halicarcinus planatus* (Hymenosomatidae): **A.** dorsal view; **B.** ventral view; **C.** vital specimen; **D–G.** Genus *Eurypodius* (Inachidae): **D.** *E. longirostris*, in situ; **E.** *E. longirostris*, in situ; **F.** *E. latreillii*, dorsal view; **G.** *E. longirostris*, dorsal view. Scale bars A–B, G: 5 mm; F: 1 cm. (A–B: ZSMA20111440; C: n.a; D: ZSMA20150125; E: ZSMA 20150114; F: ZSMA20111427; G: ZSMA20111429).

Remarks on the Genus *Eurypodius*: The two *Eurypodius* species have been reanalysed in detail by Meyer et al. (2013) using an integrative taxonomic approach. Both morphology and DNA sequences support the status of these two species.

Pilumnoididae Guinot & Macpherson, 1987

Pilumnoides perlatus (Poeppig, 1836), Fig. 23

Material exmined: ZSMA20111392 (juv.): St. N8b; ZSMA20111623 (♀),ZSMA20150017 (♂): St. C2c; ZSMA 20111585 (juv., on Bryozoa): St. C4 (no data about sam-

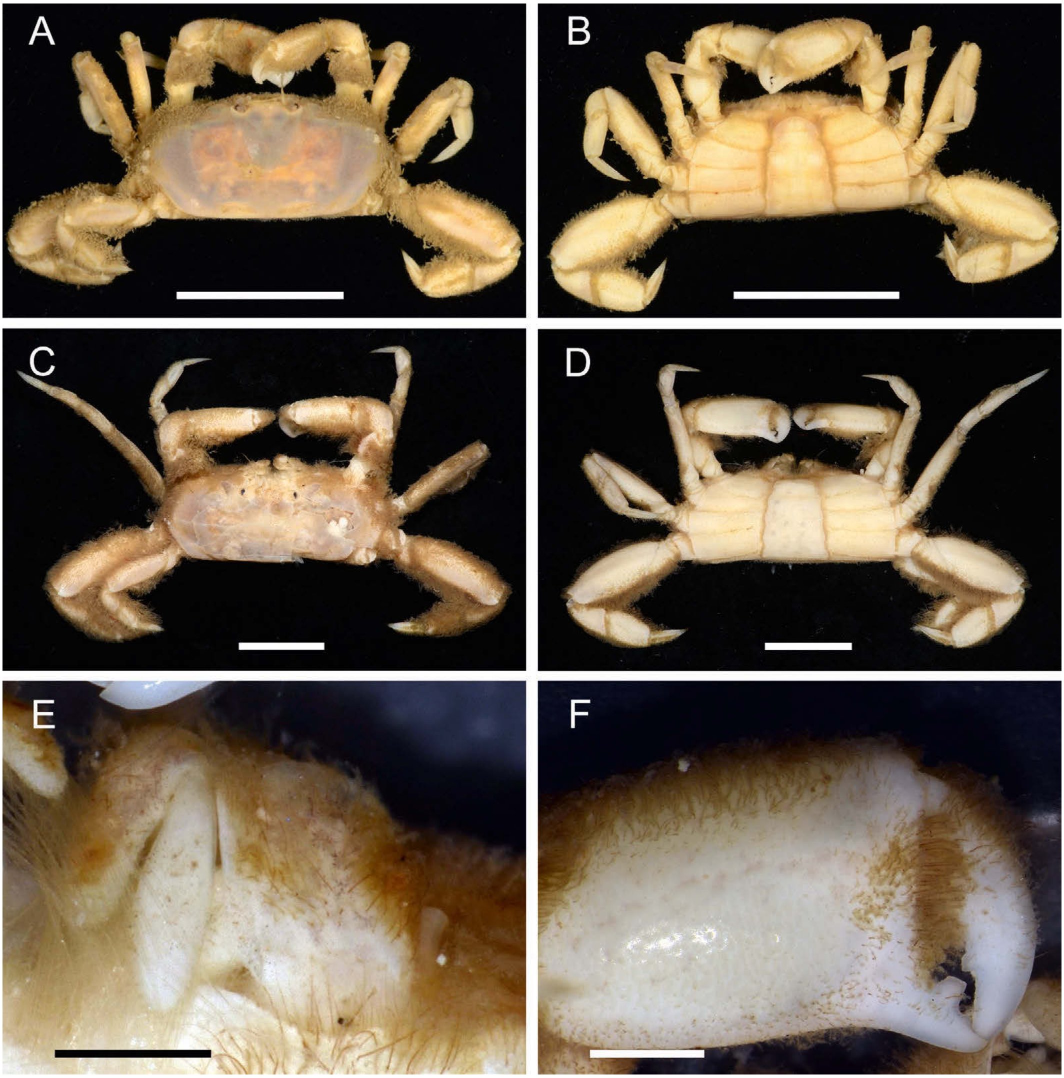

Fig. 21. Pinnotheridae 1: **A–B.** *Pinnixa valdiviensis*: **A.** dorsal view; **B.** ventral view; **C–F.** *P. brevipollex*: **C.** dorsal view; **D.** ventral view; **E.** detail of third maxilliped, left; **F.** detail of propodus and dactylus of right outer cheliped. Scale bars A–B: 1 cm; C–D: 5 mm; E–F: 1 mm. (A–B: ZSMA20111418; C–D: ZSMA20150181).

ple event); ZSMA20060475: St. C5a; ZSMA20060473: St. C5b; ZSMA20061483 (on Cirripedia): St. C5d; ZSMA 20150035 (on sponge): St. C5f; ZSMA20061485 (in empty Cirripedia): St. C5g; ZSMA20111626 (2 individuals, juv.): St. C5e; ZSMA20060477, ZSMA20060476: St. C6a; ZSMA20061472: St. C6b; ZSMA20061482: St. C6c; ZSMA 20150030 (on sponge): St. C6e; ZSMA20111649 (juv.): St. C10a; ZSMA20111390 (♂, in Bivalvia colonies): St. C13i; ZSMA20111502 (juv.): St. C13j; ZSMA20150032 (juv.), ZSMA20111394 (♂, between *Macrocysthis* sp., covered with Ascidiacea & sponges): St. C22b; ZSMA 20060470: St. C23a; ZSMA20150018 (juv., under stones), ZSMA20111391: St. C23b; ZSMA20111393 (juv.): St. C28; ZSMA20111634 (2 individuals: juv., ♂): St. C30a; ZSMA 20060474: St. C35; ZSMA20060472: St. C37; ZSMA 20061460: St. S17; ZSMA20150110: St. S30; ZSMA 20150109: St. S36

Pinnotheridae De Haan, 1833

Holothuriophilus pacificus (Poeppig, 1836), Fig. 22

Material examined: ZSMA20111423 (♂): St. N8b.

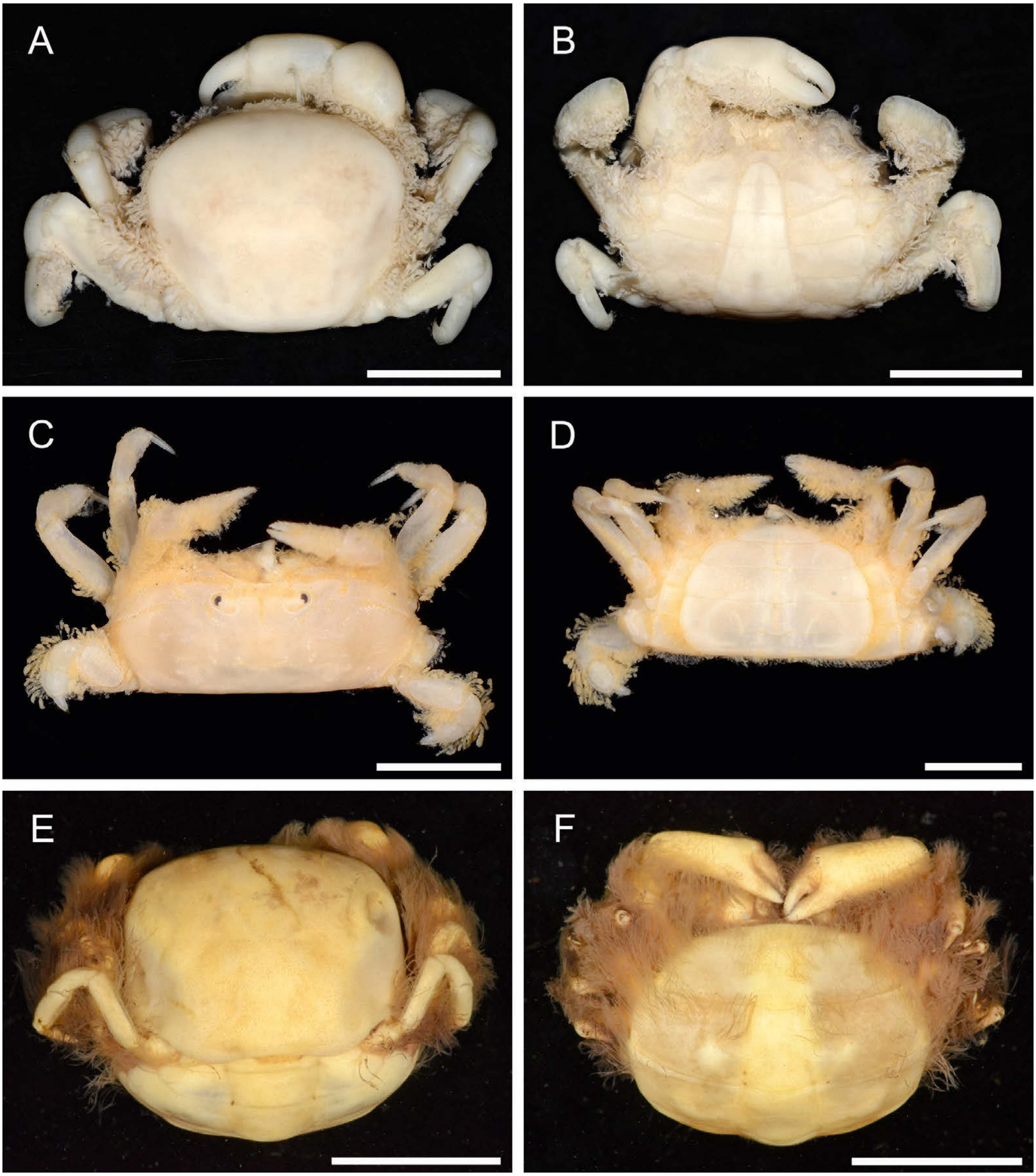

Fig. 22. Pinnotheridae 2: **A–B.** *Holothuriophilus pacificus*: **A.** dorsal view; **B.** ventral view; **C–D.** *Pinnixa bahamondei*: **C.** dorsal view; **D.** ventral view; **E–F.** *Pinnaxodes chilensis*: **E.** dorsal view; **F.** ventral view. Scale bars A–B: 5 mm; C–D: 2 mm; E–F: 1 cm. (A–B: ZSMA20111423; C–D: ZSMA20111651; E–F: ZSMA20111417).

Pinnixa bahamondei Garth, 1957, Fig. 22

Material examined: ZSMA20111651 (on Hydrozoa): St. C13g; ZSMA20061479 (commensal in *Chaetopterus variopedatus*-tube): St. C14o; ZSMA20060471: St. C23a.

Remarks: This commensal crab was found in the tubes of a tube worm (genus *Chaetopterus*) (Meyer et al. 2009).

Pinnixa brevipollex Rathbun, 1898, Fig. 21

Material examined: ZSMA20150112: St. S26.

Remarks: *Pinnixa brevipollex* was until now only recorded for the Western Atlantic, off the coasts of Brasil and Argentina (Brasil: Rio de Janeiro to Rio Grande do Sul and Argentina: province Rio Negro to

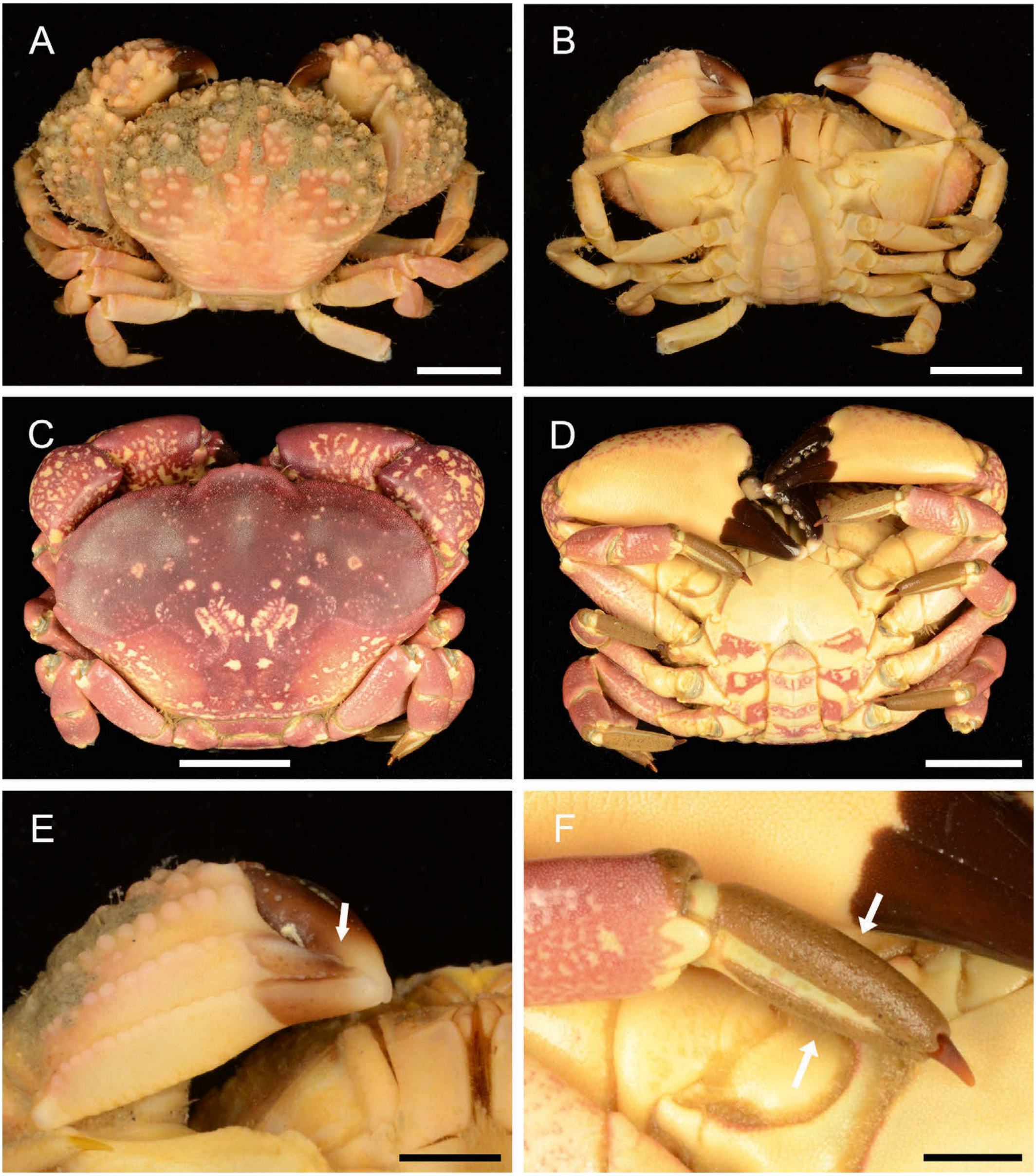

Fig. 23. A–B. *Pilumnoides perlatus* (Pilumnoididae): **A.** dorsal view; **B.** ventral view; **C–F.** *Homalaspis plana* (Platyxanthidae): **C.** dorsal view; **D.** ventral view; **E.** detail of propodus and dactylus of right outer cheliped, white arrow: tubercle at immovable finger; **F.** detail of dactylus of first peraeopod, right, white arrows: dense pilose dorsal and ventral sides. Scale bars A–B, F: 5 mm; C–D: 2 cm; E: 2 mm. (A–B, E: ZSMA20111391; C–D, F: ZSMA20111384).

Patagonia) (Rathbun 1918, Manning & Felder 1989, Martins & D'Incao 1996, Bezerra et al. 2006, Torres 2006). The specimen in this study, found off Isla Guarello in Chile, exhibits the typical characteristics of *P. brevipollex*: the cardiac ridge is blunt (Rathbun 1918) (Fig. 21C). On the chelipeds the lower margin of the palm is nearly straight; it widens distally and the pollex is – as the name indicates – short; it is composed of a short wide base and a short spine which is bent downwards. The movable finger is also strongly bent downwards (Rathbun 1918, Martins & D'Incao 1996) (Fig. 21F). Furthermore, the third

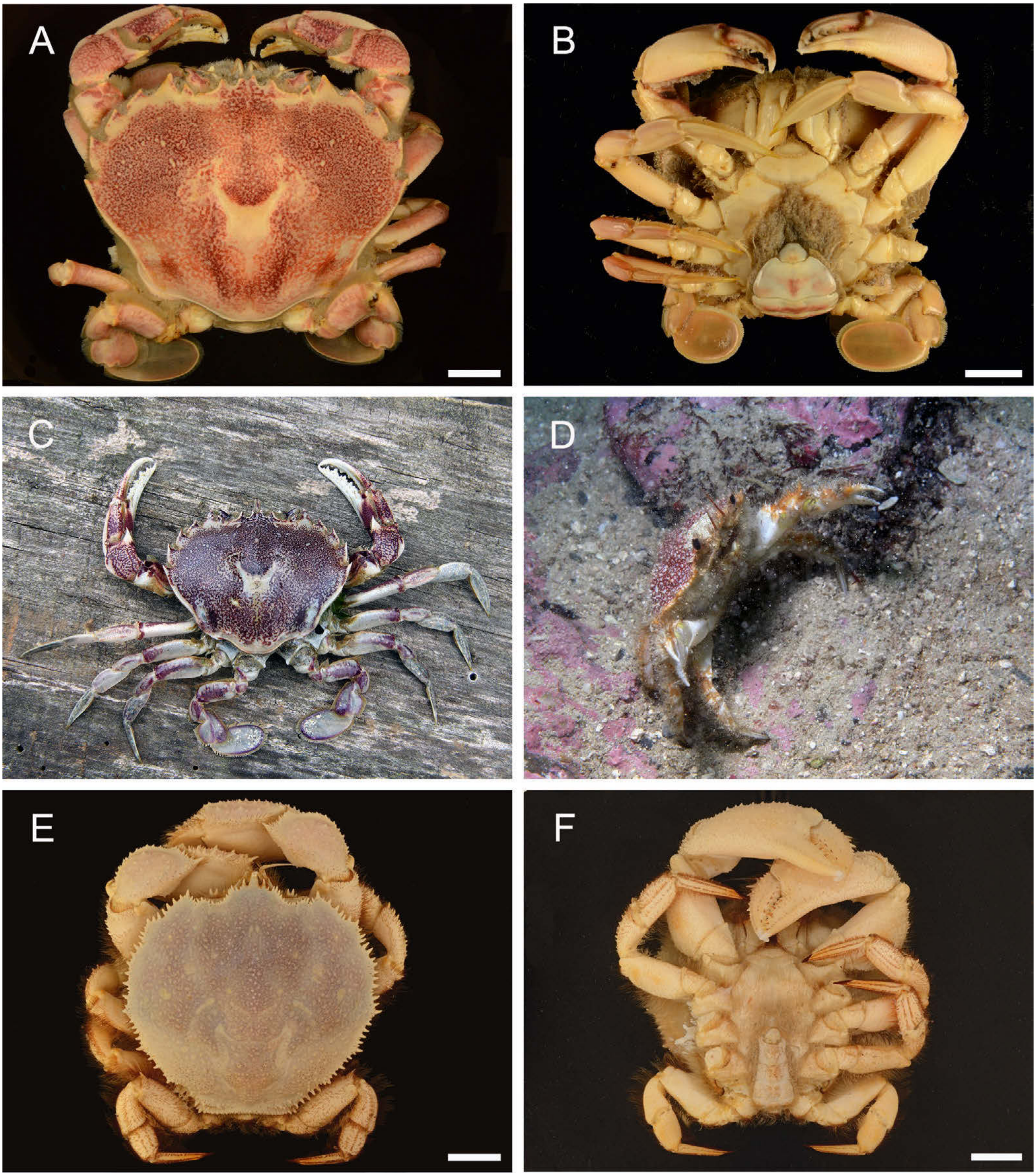

Fig. 24. **A–C.** *Ovalipes punctatus* (Polybiidae): **A.** dorsal view; **B.** ventral view; **C.** exuvia; **D–F.** *Peltarion spinulosum* (Trichopeltariidae): **D.** in situ; **E.** dorsal view; **F.** ventral view. Scale bars A–B, E–F: 1 cm. (A–B: ZSMA20111433; C: n.a.; D: ZSMA20150101; E–F: ZSMA20111396).

maxilliped is pilose (Martins & D'Incao 1996), its two last joints (propodus and dactylus) are oblong and the last joint is articulated near the base of the penultimate, overreaching it (Rathbun 1918) (Fig. 21E). For this reason, it was determined as *P. brevipollex*, even though the known distribution range is far away from the place where it was collected. This is the first record of this species in Chile. *Pinnixa valdiviensis* Rathbun, 1907 is distributed from Las Chinchas, Perú to the Strait of Magellan (Retamal 1981). It presents similar morphological features as *P. brevipollex*, e.g. the deflexed pollex and the more than twice as long as wide merus of the third leg, but can be distinguished by the longer and subtriangular

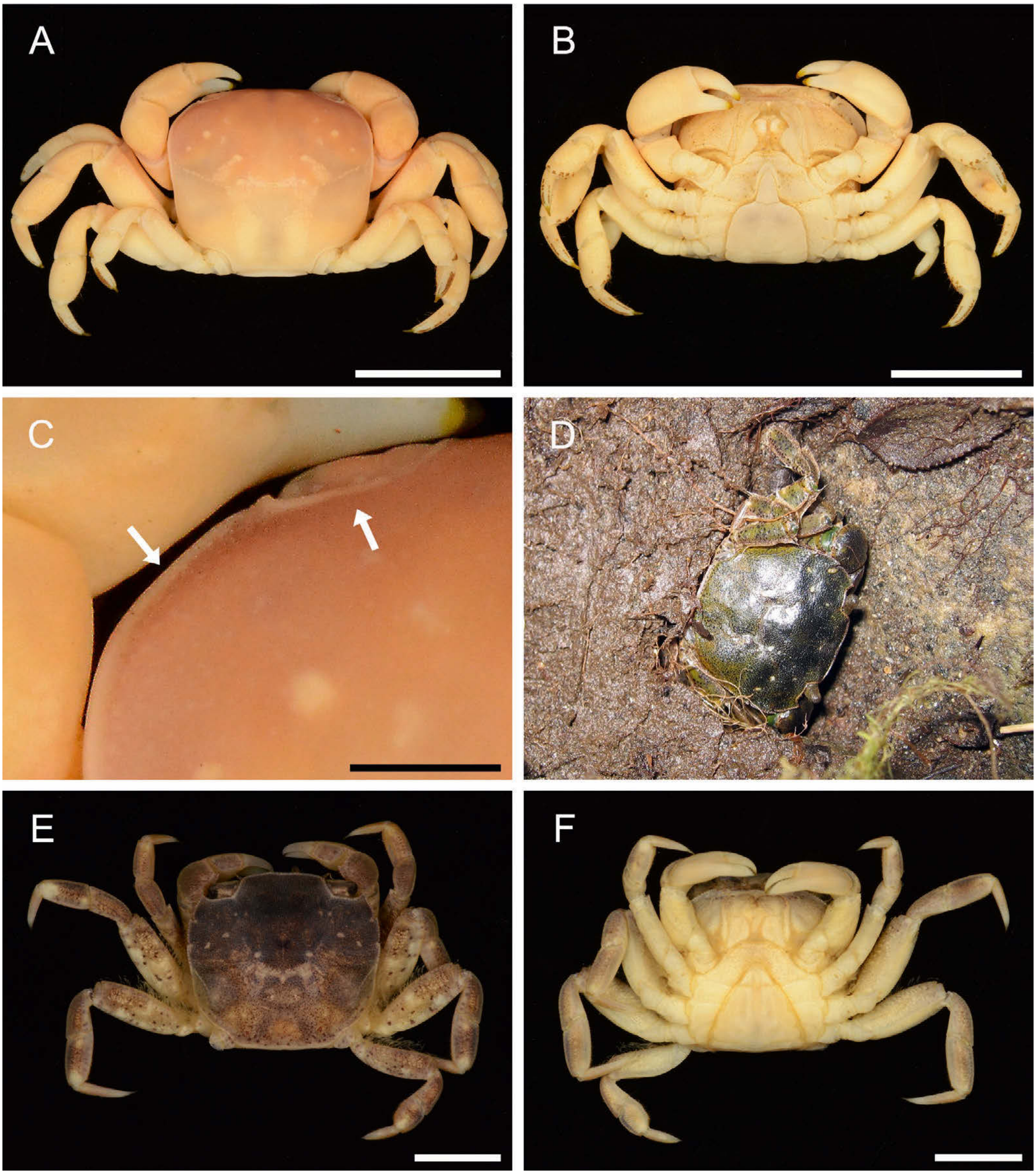

Fig. 25. Varunidae. **A–C.** *Cyclograpsus cinereus*. **A.** dorsal view; **B.** ventral view; **C.** detail of anterolateral part of carapax, left dorsal view; **D–F.** *Hemigrapsus crenulatus*: **D.** in situ; **E.** dorsal view; **F.** ventral view. Scale bars A–B: 1 cm; C: 2 mm; E–F: 5 mm. (A–C: ZSMA20111371; D: n.a; E–F: ZSMA20111366).

shape of the pollex and the shape of the penultimate joint of the third maxilliped which is triangular and not oblong (Rathbun 1918, Torres 2006). To confirm this new record, genetical analyses are desirable.

Pinnixa valdiviensis Rathbun, 1907, Fig. 21

Material examined: 4 individuals: N13; ZSMA20111621 (♀): St. C7d; ZSMA20111420 (♂), ZSMA20111422 (♂): St. C25a; ZSMA20111419 (♂), ZSMA20111421 (♂): St. C25c; ZSMA20150111: St. S26; S43; ZSMA20111418 (2 individuals: male, ovig. ♀): St. S52.

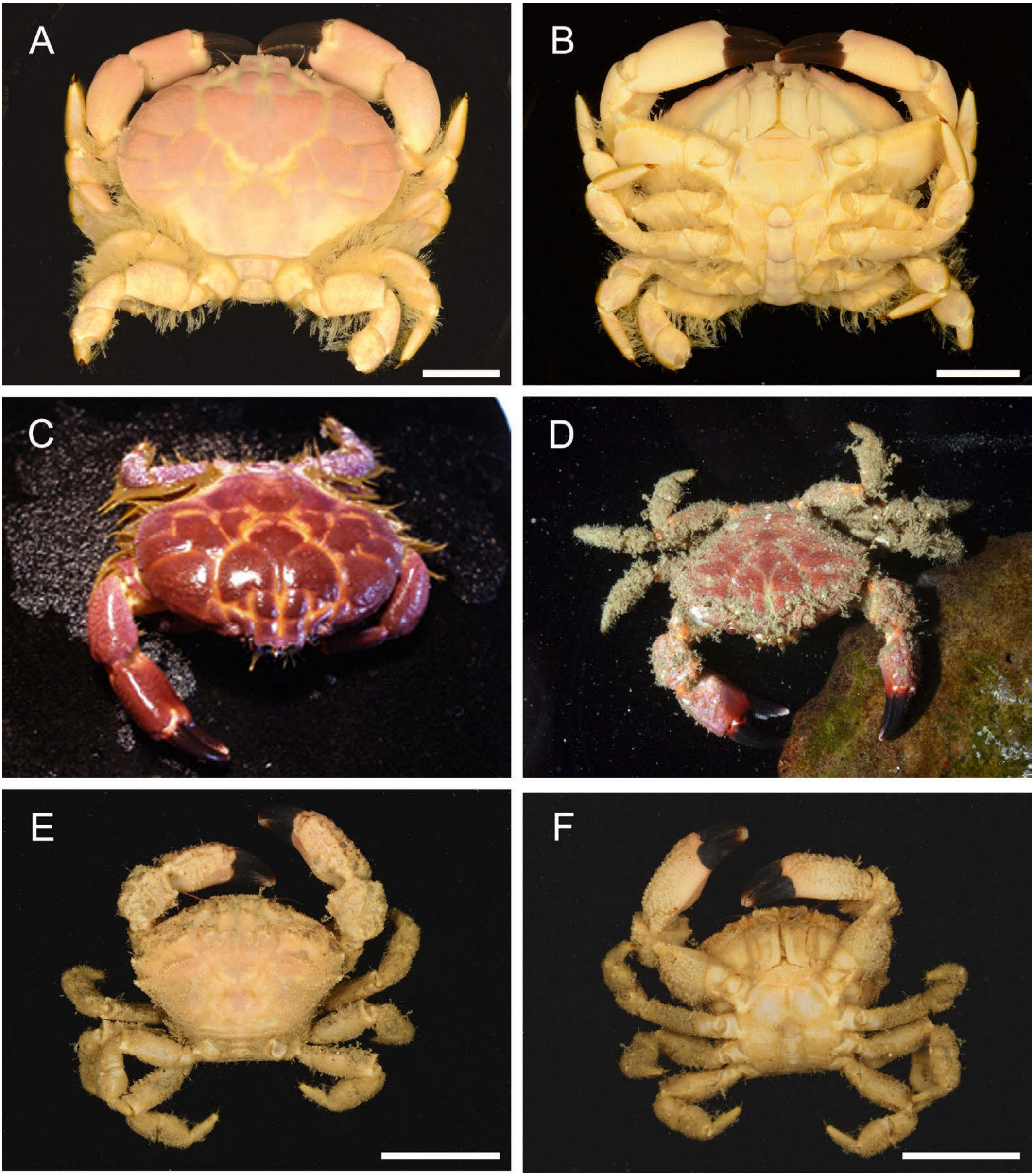

Fig. 26. Xanthidae. **A–C.** *Paraxanthus barbiger*: **A.** dorsal view; **B.** ventral view; **C.** vital specimen; **D–F.** *Gaudichaudia gaudichaudii*: **D.** vital specimen; **E.** dorsal view; **F.** ventral view. Scale bars A–B, E–F: 1 cm. (A–C: ZSMA20111386; D–F: ZSMA20111402).

Remarks: Associated with echiurid *Urechis chilensis* (Torres 2006).

Pinnaxodes chilensis (H. Milne Edwards, 1837), Fig. 22

Material examined: 2 specimens: ∞: N3; N10; ZSMA 20150041 (ovig. ♀, inside sea urchin): St. C44; ZSMA 20111417 (inside sea urchin), ZSMA20111707 (9 individuals, inside sea urchin), ZSMA20061487 (inside sea urchin): Puerto Montt – Mercado de Mariscos.

Remarks: This crab is a commensal of the sea urchins *Loxechinus albus* and *Caenocentrotus gibbosus* (Lardies & Castilla 2001, Meyer et al. 2009).

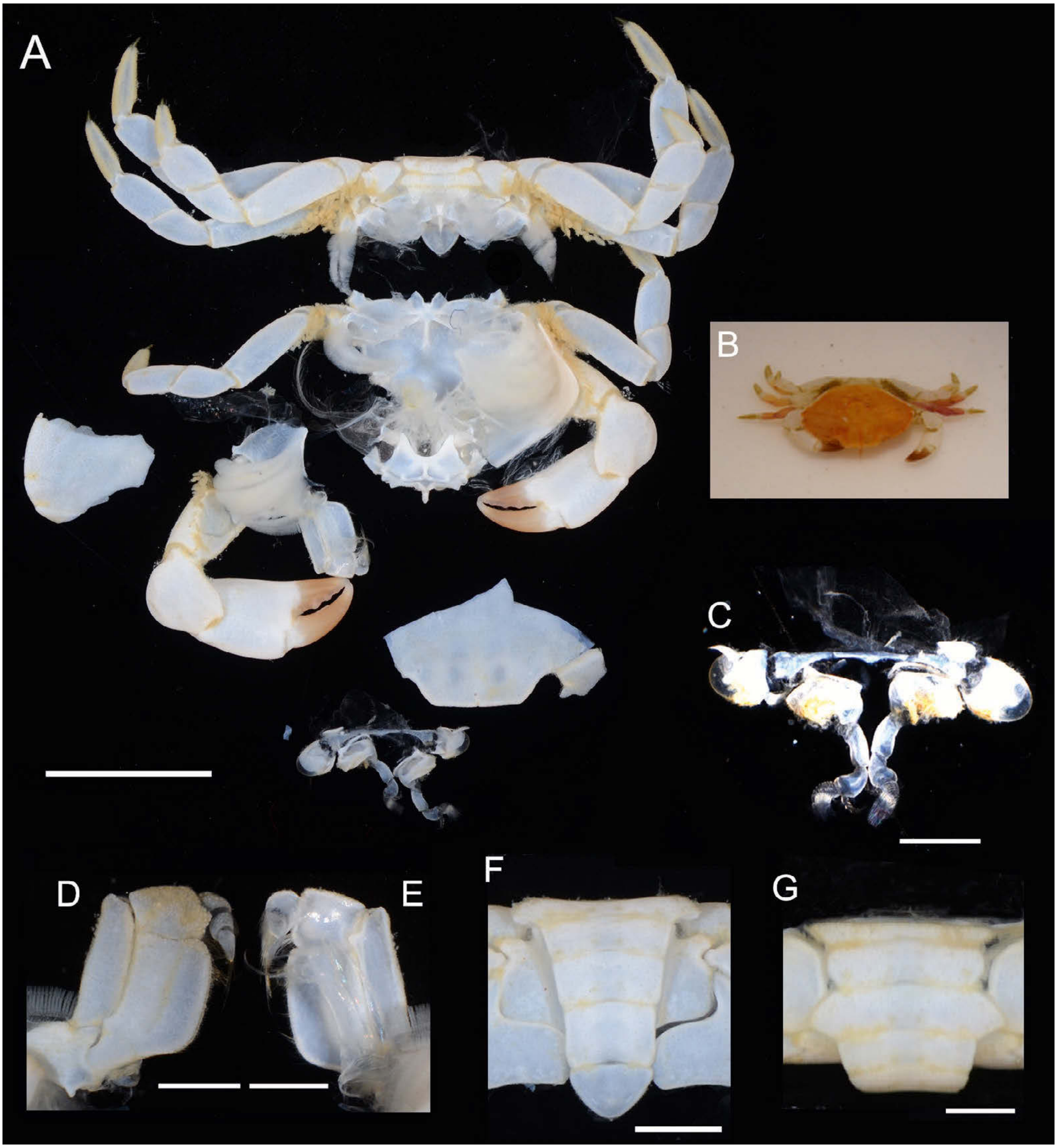

Fig. 27. *Cycloxanthops bocki* (Xanthidae). **A.** Set together fragments of the collected *C. bocki* specimen, dorsal view; **B.** vital specimen; **C.** detail of eyes and antennules; **D.** detail of right outer maxilliped, ventral view; **E.** detail of right outer maxilliped, dorsal view; **F.** detail of abdomen, ventral view; **G.** detail of abdomen, posterior view. Scale bars A: 5 mm; C–G: 1 mm. (A–G: ZSMA20150171).

Platyxanthidae Guinot, 1977

Homalaspis plana (H. Milne Edwards, 1834), Fig. 23

Material examined: ZSMA20111380, ZSMA20150012 (♂): St. N5b; ZSMA20111381: St. N5c; N6; ZSMA20111382 (juv.), ZSMA20150024 (juv.): St. N9; ZSMA20111579 (3 individuals: juv.), ZSMA20111633 (♂), ZSMA20111583 (♂): St. C2b; ZSMA20111383 (juv.): St. C2c; ZSMA 20111566 (below stones): St. C4e; ZSMA20111384 (♂): St. C21a.

Polybiidae Ortmann, 1893

Ovalipes punctatus (De Haan, 1833), Fig. 24

Material examined: ZSMA20111433 (sandy beach): St. N4; 3 individuals: N6.

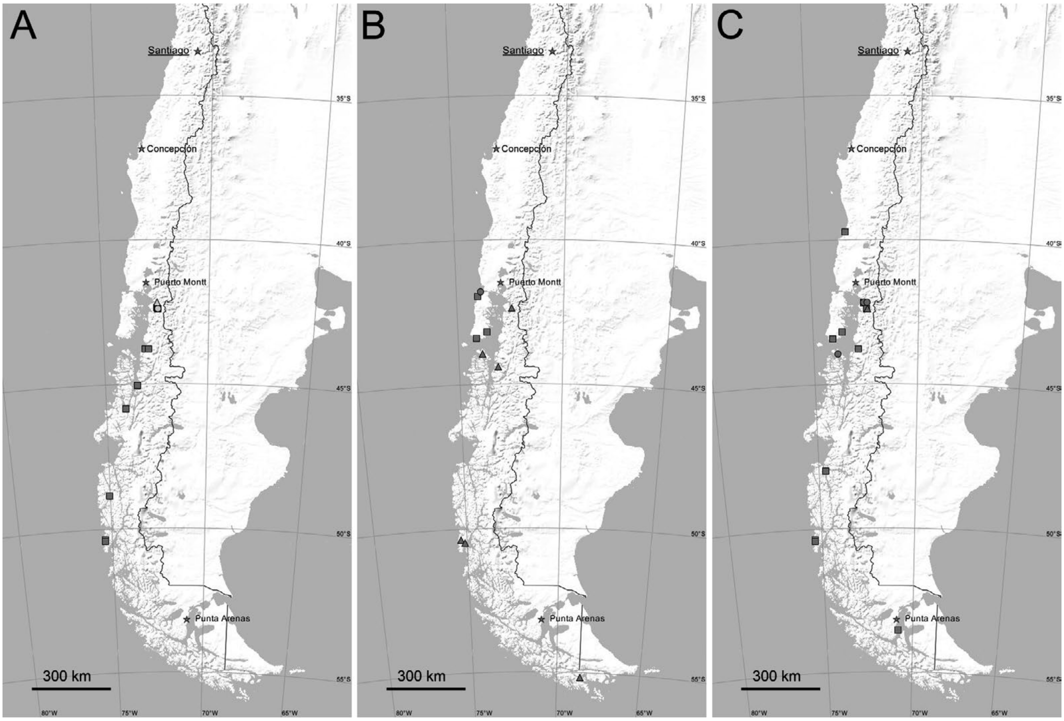

Fig. 28. Sample locations of **A.** *Austropandalus grayi* (square), *Pasiphaea dofleini* (circle) and *Eusergestes similis* (triangle); **B.** Alpheidae: *Betaeus truncatus* (square), *Synalpheus spinifrons* (circle) and Campylonotidae: *Campylonotus vagans* (triangle); **C.** Hippolytidae: *Eualus dozei* (circle), *Latreutes antiborealis* (triangle) and *Nauticaris magellanica* (square).

Trichopeltariidae Tavares & Cleva, 2010

Peltarion spinulosum (White, 1843), Fig. 24

Material examined: ZSMA20111398 (♂), ZSMA20111397 (♂): St. C23b; ZSMA20111395 (♂): St. C24b; ZSMA 20111442 (juv.), ZSMA20111396: St. C32a; ZSMA 20150040: St. C52; ZSMA20061450: St. S2; ZSMA 20060455: St. S9a; ZSMA20060441: St. S10; ZSMA 20061451 (in shell debris), ZSMA20061449 (digging in sediment, in reverse): St. S19; ZSMA20150100: St. S34; ZSMA20150101 (2 individuals): St. S36; ZSMA20061514: St. S38; ZSMA20061469 (on biogenous limestone and mussel shells): St. S42; S43; 2 individuals: S48; ZSMA 20111400: St. S50; ZSMA20111399: St. S53.

Varunidae H. Milne Edwards, 1853

Cyclograpsus cinereus Dana, 1851, Fig. 25

Material examined: ZSMA20111372 (rocky littoral, below stones), ZSMA20150023, ZSMA20111373: St. N1b; ZSMA20111374, ZSMA20150022 (4 individuals): St. C4a; ZSMA20061484 (below stones), ZSMA20111371 (below stones): St. C5e; ZSMA20061476 (below stones): St. C14k; ZSMA20111370 (4 individuals: 1♂, 3♀), ZSMA20150035 (3 individuals): St. C21b.

Hemigrapsus crenulatus (H. Milne Edwards, 1837), Fig. 25

Material examined: ZSMA20111365 (sandy littoral below stones), ZSMA20150025, ZSMA20150014, ZSMA 20150028 (3 individuals), ZSMA20150031, ZSMA 20150019, ZSMA20150027: St. N1; ZSMA20150036, ZSMA20111506, ZSMA20150026 (2 individuals): St. N5d; ZSMA20060406 (intertidal – no general data for this sampling event): St. N12; ZSMA20150015 (5 individuals, below stones): St. C3; ZSMA20150047 (exuvia, collected during low tide in river): St. C8; ZSMA20060404 (littoral): St. C14b; ZSMA20060405: St. C14e; ZSMA 20111616 (5 individuals: 4♂, 1♀): St. C14l; ZSMA 20150020 (2 individuals): St. C19a; ZSMA20111368, ZSMA20150027 (2 individuals), ZSMA20111369 (♀), ZSMA20150032: St. C19b; ZSMA20111366 (♀): St. C25c; ZSMA20111569 (♀): St. C34; ZSMA20111367 (♂): St. C41; ZSMA20150044, ZSMA20150045 (2 individuals): St. C52; ZSMA20060399: no data.

Xanthidae MacLeay, 1838

Paraxanthus barbiger (Poeppig, 1836), Fig. 26

Material examined: ZSMA20111385 (♀), ZSMA20111389 (♂): St. N5b; ZSMA20111386 (♂): St. N8b; ZSMA20111387

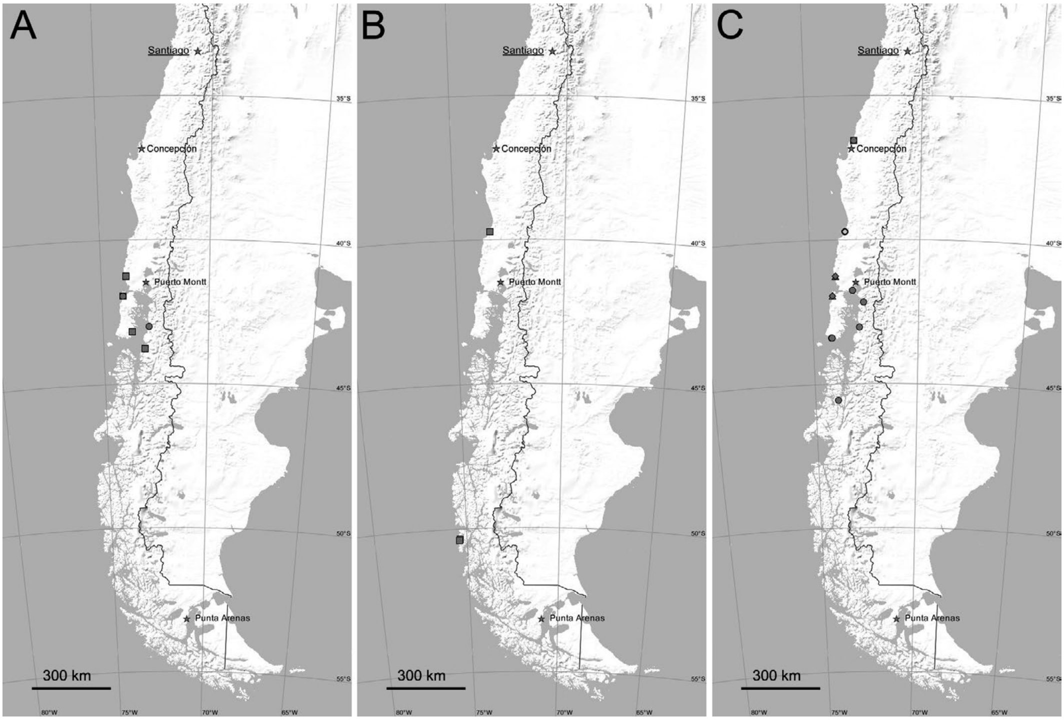

Fig. 29. Sample locations of the Porcellanidae: **A.** *Allopetrolisthes spinifrons* (circle) and *Allopetrolisthes angulosus* (square); **B.** *Liopetrolisthes patagonicus*; **C.** *Petrolisthes laevigatus* (circle), *P. violaceus* (bright rhomb), *P. granulosus* (square), *P. tuberculosus* (dark rhomb) and *P. tuberculatus* (triangle).

(♂): St. N14b; ZSMA20111568 (♀): St. C2b; ZSMA 20111388 (♂), ZSMA20150021 (juv.), ZSMA20150013 (♂): St. C2c.

Gaudichaudia gaudichaudii (H. Milne Edwards, 1834), Fig. 26

Material examined: ZSMA20111401 (juv.): St. C2c; ZSMA20111638 (♂, below stones), ZSMA20111571 (juv., below stones), ZSMA20111403 (♂, below stones), ZSMA 20111402 (♀, below stones): St. C23b.

Cycloxanthops bocki Garth, 1957, Fig. 27

Material examined: ZSMA20150171: St. N9.

Remarks: The only individual of this species collected during HF-expeditions was in poor condition when indentified. Despite this poor state, detailed observation of morphological features and thus the identification of fragments as *C. bocki* was possible. Among these features the antennules (Fig. 27C), the third maxilliped (Fig. 27D–F) and the abdomen (Fig. 27F–G) are presented above.

Species records

Caridea and Dendrobranchiata

Figure 28 shows that among the Caridea *Austropandalus grayi* (Pandalidae), *Campylonotus vagans* (Campylonotidae) and *Nauticaris magellanica* (Hippolytidae) are the southernmost found species (*A. grayi*: 42–50° S, *C. vagans*: 45–54° S, *N. magellanica*: 40–54° S) and their range covered by HF samples extends from the cold-temperate to subantarctic. *Pasiphaea dofleini* (Pasiphaeidae) and *Eusergestes similis* (Dendrobranchiata, Sergestidae) (Fig. 28A) as well as the two remaining representatives of the Hippolytidae *Eualus dozei* and *Latreutes antiborealis* (Fig. 28C), were only found in the Comau fjord (42° S = cold-temperate). Only one specimen of *P. dofleini* was collected. Both species of Alpheidae were only collected on the Isla Grande de Chiloé (42–43° S = cold-temperate), whereat the second representative of this family *Synalpheus spinifrons* was only collected once (Fig. 28B).

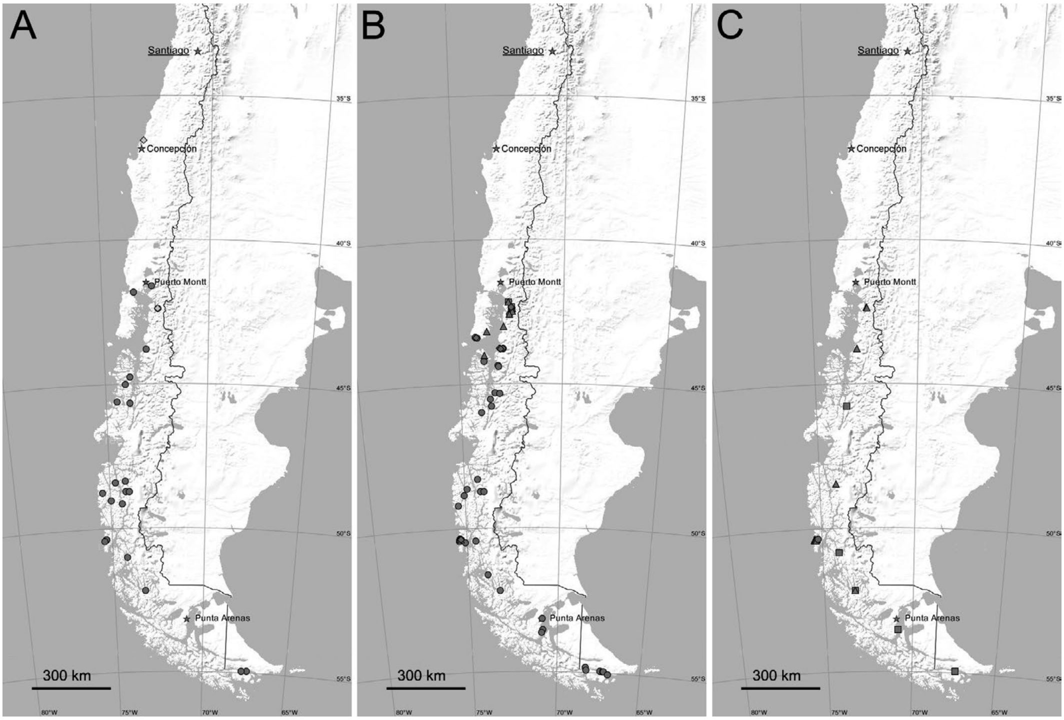

Fig. 30. Sample locations of **A.** *Munida gregaria* (circle) and *Emerita analoga* (bright rhomb); **B.** Paguridae: *Pagurus comptus* (circle), *P. villosus* (triangle), *P. edwardsii* (square) and *Propagurus gaudichaudii* (rhomb); **C.** Lithodidae: *Lithodes santolla* (triangle), *Paralomis granulosa* (square) and *P. tuberipes* (circle).

Anomura

From all the Porcellanidae *Liopetrolisthes patagonicus* was found southernmost (from 42–50° S = cold-temperate to subantarctic) (Fig. 29B). The two representatives of *Allopetrolisthes*, *A. angulosus* and *A. spinifrons* were found from 41 to 44° S (cold-temperate) (Fig. 29A). Among species of *Petrolisthes*, *P. laevigatus* was the most frequent and most wide-ranged (40–46° S = warm-temperate and cold-temperate) species. *P. violaceus* and *P. granulosus* were only collected once in the warm-temperate region (40 and 36.5° S, respectively). *P. tuberculatus* and *P. tuberculosus* were collected on the border from warm- to cold-temperate region (40–42° S) (Fig. 29C). Only two individuals of *Pachycheles chilensis* (sample location is not shown in the map) off Chiloé (41.9° S) were found. *Porcellanidae* were only found on exposed locations with three exceptions: *P. laevigatus* were found in the Comau fjord, *A. angulosus* and *A. spinifrons* were found at the mouths of fjords (Palvitad and Pitipalena) and were counted as sheltered.

Munida gregaria (Munididae) was found between 42 and 55° S. These latitudes include the cold-temperate and the subantarctic region (Fig. 30A). *Emerita analoga* was only sampled once at 36.5° S (not in the map). None of the Paguridae could be found in the warm-temperate region. Among them *Pagurus comptus* had the widest range (42–55° S = from cold-temperate to subantarctic region), *Pagurus villosus* and *Propagurus gaudichaudii* samples extend from 42–55° S, being situated in the cold-temperate and subantarctic region. *P. edwardsii* was only collected in the Comau fjord (42° S = cold-temperate) (Fig. 30B). As Fig. 30C shows most of the lithodid specimens were found in the subantarctic region. *Lithodes santolla* is found also in the cold-temperate region (range: 42–52° S). *Paralomis granulosa* exhibits specimens in the cold-temperate region, however most of the specimens were sampled in the subantarctic region (46–55° S). *P. tuberipes* was only collected off Isla Guarello (~50° S = subantarctic).

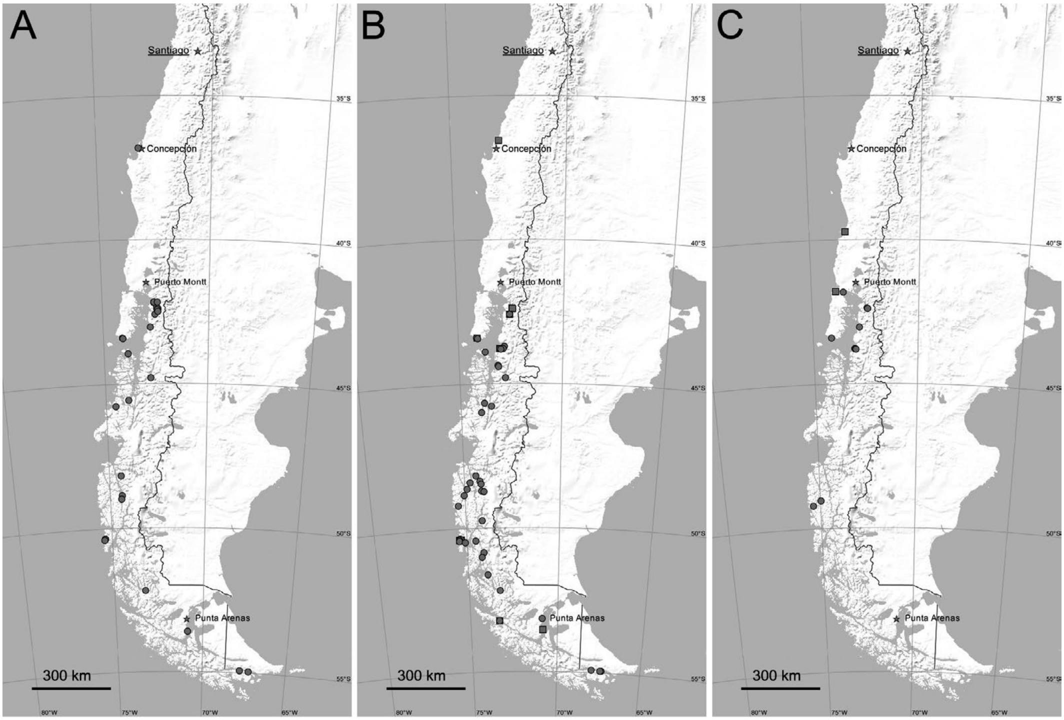

Fig. 31. Sample locations of **A.** *Halicarcinus planatus*; **B.** Inachidae: *Eurypodius latreillii* (square) and *E. longirostris* (circle); **C.** Cancridae: *Metacarcinus edwardsii* (circle) and *Romaleon polyodon* (square).

Brachyura

Halicarcinus planatus (Hymenosomatidae) ranges from 37–55° S (= warm-temperate, cold-temperate and subantarctic) according to the specimens collected here (Fig. 31A). The two *Eurypodius* species *E. latreillii* and *E. longirostris* (Inachidae) differ in their ranges (Fig. 31B). The first was found from 36.5 to 50° S and the latter from 42 to 55° S (however both: cold-temperate and subantarctic). Among the Cancridae *Metacarcinus edwardsii* samples indicate a southern range (range: 42–49° S = cold-temperate and subantarctic) whereas *Romaleon polyodon* was found more northerly (range: 40–42° S = warm-temperate) (Fig. 31C).

The Brachyura *Ovalipes punctatus* (Polybiidae), *Homalaspis plana* (Platyxanthidae), *Pilumnoides perlatus* (Pilumnoididae) and *Peltarion spinulosum* (Trichopeltariidae) are the only representatives of their families in this study. Their ranges are all shown in Figure 32A. The ranges of *O. punctatus* and *H. plana* seem to be successive with the first sampled from 37 to 40° S (warm-temperate region) and the latter from 40 to 43° S (warm-temperate and cold-temperate region). *P. perlatus* and *P. spinulosum* reach more southern latitudes, i. e. were found from 41 to 50.5° S (from the warm-temperate to the subantarctic region) and from 43 to 55° S (in the cold-temperate and the subantarctic region), respectively.

The Epialtidae were collected in warm-temperate and cold-temperate as well as in subantarctic regions (Fig. 32B). However *Taliepus dentatus* was only collected from 40 to 43° S, whereas *Pisoides edwardsii* reached more southern latitudes, having been collected from 40 to 50.5° S. The Atelecyclidae *Bellia picta* and *Pseudocorystes sicarius* were both only found once in the warm-temperate region on 37.2 and 36.5° S, respectively (not in maps).

The Xanthidae found during HF-expeditions were all collected in the temperate regions (Fig. 33A). Herein *Gaudichaudia gaudichaudii* was only found in the cold-temperate region 42 to 43° S, *Paraxanthus barbiger* was collected northerly from 40 to 42° S and therefore in both temperate regions. *Cycloxanthops bocki* was collected only once in the warm-temperate region at 41°S. The collection sites of pinnotherid species are shown in Figure 33B. Herein *Pinnixa valdiviensis* was found southernmost among all other representatives of this family: at 55° S in the subantarctic region. The northern border of *P. valdiviensis* collection was 42° S in the cold-temperate region,

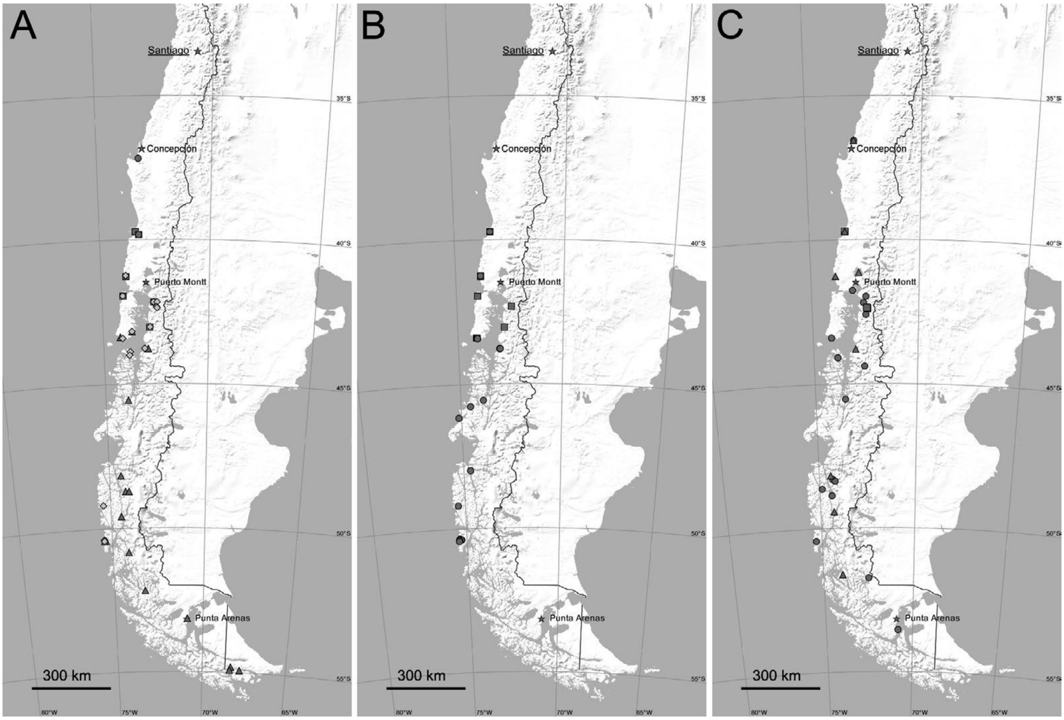

Fig. 32. Sample locations of **A.** *Ovalipes punctatus* (circle), *Homalaspis plana* (square), *Pilumnoides perlatus* (bright rhomb) and *Peltarion spinulosum* (triangle); **B.** the Epialtidae: *Pisoides edwardsii* (circle) and *Taliepus dentatus* (square); **C.** the Belliidae: *Acanthocyclus albatrossis* (circle), *A. gayi* (triangle) and *A. hassleri* (square).

or close to the border of warm-and cold-temperate. The same northern collection border is apparent in *P. bahamondei*, which was found from 42 to 43°S in the northerly cold-temperate region. *Holothuriophilus pacificus* was collected only once at 41°S (again on the border of the cold- and warm-temperate regions). *Pinnaxodes chilensis*, also among the rarely collected, was found twice at 37°S and at 45°S suggesting a range from 37 to 45°S for this study. *P. brevipollex* was collected once off Isla Guarello at 50°S in the subantarctic region. The two species of Varunidae collected on HF-expeditions, *Hemigrapsus crenulatus* and *Cyclograpsus cinereus*, range from 36.5 to 45.5°S and 36.5 to 43°S, respectively (Fig. 33C), thus inhabiting both the warm- and the cold-temperate regions.

Discussion

Geographical ranges of species treated in this study

Table 2 and 3 compare the ranges of benthic Decapoda found during the HF-expeditions to ranges in other major studies on southern South American decapods. Only if the 'HF-range' of a species extends the ranges in all compared studies, the general range is considered extended evidentially. To clarify the notion of distance it is noteworthy that the distance between two latitudes is 60 nautical miles or 111.12 km (Ramm 2015).

Among the Caridea and Dendrobranchiata (Table 2), *Eusergestes similis* was the only species of which the distribution could be extended: it was found at 42°S, while the southern distribution limit given by Guzmán (2003) is 35°S. Therefore, its range can be extended by 7 degrees southwards. In general, discussing information for Caridea proves difficult due to the fact that they were seldom found and many of them only once and/or at one sample location. It is, however, observable that *Nauticaris magellanica* is the only species widely spread over all three regions. It is also the only caridean found in the littoral or beach of the warm-temperate region; however, other caridean species are still expected here in considerably greater depths (Brattström & Johanssen 1983).

Among the Anomura (Table 2) there are more species whose range can be extended when compared to data presented in Haig (1955) and Retamal (1981).

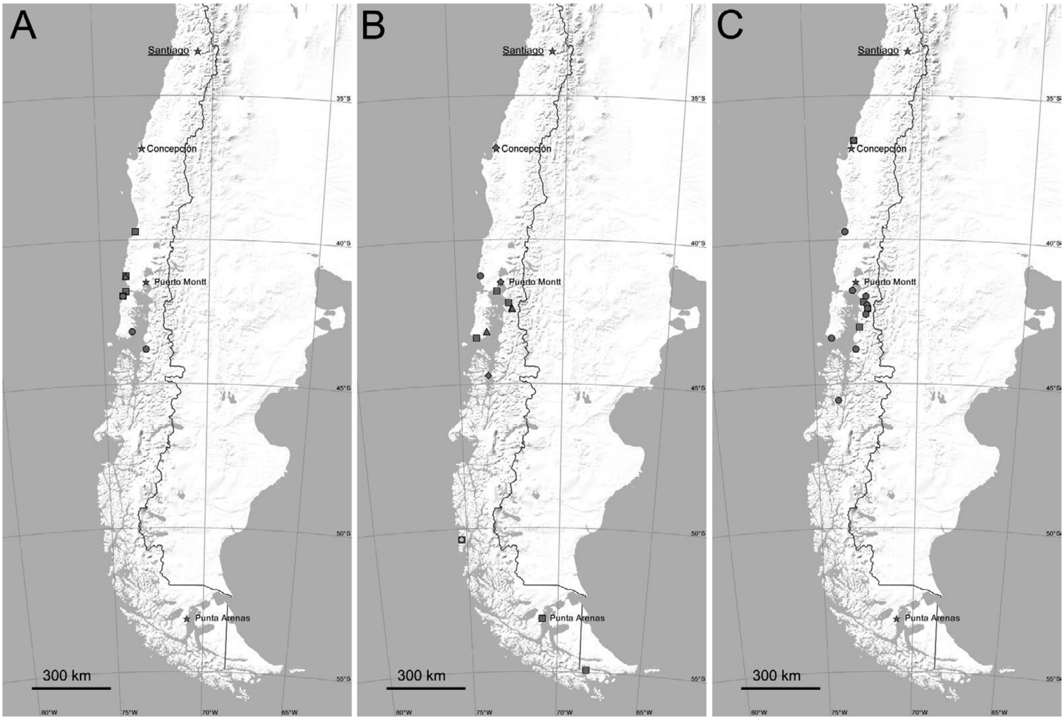

Fig. 33. Sample locations of **A.** Xanthidae: *Gaudichaudia gaudichaudii* (circle), *Paraxanthus barbiger* (square) and *Cycloxanthops bocki* (triangle); **B.** Pinnotheridae: *Pinnixa valdiviensis* (square), *P. bahamondei* (triangle), *Holothuriophilus pacificus* (circle), *Pinnaxodes chilensis* (dark rhomb) and *Pinnixa brevipollex* (bright rhomb); **C.** Varunidae: *Hemigrapsus crenulatus* (circle) and *Cyclograpsus cinereus* (square).

Five porcellanid species were found further south than stated in the named papers: the distribution ranges of *Allopetrolisthes angulosus* and *A. spinifrons* can be extended by 3 and 9 degrees southwards (s), respectively. Furthermore, the southern distribution boundary stated for *Petrolisthes tuberculatus* can be extended by 9 degrees and for *P. granulosus* by 3 degrees. *Pachycheles chilensis* was also found 3° further south than previously stated. Thus, the range can be extended by a considerable distance. The distribution range of two pagurid species can be extended to the south: *Pagurus villosus* and *P. comptus* (+8° s and +2° s, respectively). One lithodid species, *Paralomis tuberipes*, was only known from its type locality at 45° S before. The new sample locations range from 23 to 45° S.

There are nine brachyuran species (Table 3) whose range has been extended via findings in this study. *Acanthocyclus gayi* (+10° s), *A. hassleri* (+8° s), *Eurypodius longirostris* (+6° northwards and +5° s), *Pinnixa brevipollex* (first record for the Chilean coast) and *Holothuriophilus pacificus* (+5° s) were the species with the greatest range extension. Smaller extensions of distribution ranges can be reported of *Halicarcinus planatus*, *Cyclograpsus cinereus*, *Pinnixa valdiviensis* and *P. bahamondei* (all: +2° s). In order to discuss observed ranges of the genera *Acanthocyclus* and *Eurypodius* it is also necessary to consult the study by Meyer et al. (2013) whose observations differ for *A. gayi* and *E. latreillii*. For the former they proposed a range from 8 to 41° S whereas two specimens identified by this study where found at Canal Sanviento at 51°36' S. The latter were only found north of 43°36' S by Meyer et al. (2013). One specimen of *E. latreillii*, however, was found at Madre de Dios Island at 50°22' S during HF-expeditions, and another derives from the Strait of Magellan (~53° S) (ZSM collection material).

Acknowledgements

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Table 2. Species ranges of this study compared to ranges given by Rathbun (1918, 1925, 1930), Holthuis (1952), Haig (1955), Garth (1957) and Retamal (1981). **n**, known range is extended northwards; **s**, known range is extended southwards. In square brackets additional studies that had to be consulted are cited.

	this study	Holthuis (1952)		Retamal (1981)	
Caridea + Dendrobranchiata	range	range	deviation	range	deviation
Nauticaris magellanica	40–54° S	20–53° S		20–50° S	4° s
Austropandalus grayi	42–49° S	20–53° S		36–55° S	
Campylonotus vagans	45–55° S	50–55° S	5° n	41–55° S	
Betaeus truncatus	42–43° S	20–55° S		20–50° S	
Eualus dozei	42–44° S	42–55° S		42–55° S	
Eusergestes similis [Guzmán 2003]	42° S	33–35° S	7° s	35° S	7° s
Latreutes antiborealis	42° S	41° S		41–42° S	
Pasiphea dofleini	42° S	53° S		33–53° S	
Synalpheus spinifrons	42° S	33–46° S		6–46° S	
	this study	**Haig (1955)**		**Retamal (1981)**	
Anomura	range	range	deviation	range	deviation
Allopetrolisthes angulosus	41–44° S	12–41° S	3° s	5–41° S	3° s
Petrolisthes laevigatus	37–46° S	5–47° S		5–47° S	
P. tuberculatus	41–42° S	12–34° S	8° s	12–34° S	8° s
P. tuberculosus	41–42° S	25–42° S		15–42° S	
Lithodes santolla	42–52° S	42–55° S		42–55° S	
Munida gregaria	42–55° S	41–55° S		41–55° S	
Pagurus comptus	42–55° S	30–53° S	2° s	30–53° S	2° s
Propagurus gaudichaudii	42–50° S	30–53° S		30–53° S	
Paralomis granulosa	46–55° S	42–55° S		42–55° S	
Pagurus villosus	42–50° S	5–42° S	8° s	5–42° S	8° s
Emerita analoga	37° S	8–49° S		8–49° S	
Petrolisthes granulosus [Haig 1960]	37° S	5–34° S	3° s	5–34° S	3° s
Petrolisthes violaceus	40° S	12–46° S		11–46° S	
Allopetrolisthes spinifrons	42–43° S	12–34° S	9° s	11–34° S	9° s
Pagurus edwardsii	42° S	12–42° S		12–42° S	
Pachycheles chilensis [Carvacho Bravo 1968]	42° S	23–39° S	3° s	23–39° S	3° s
Liopetrolisthes patagonicus [Urbina 1991]	40–50° S	12–53° S		12–53° S	
Paralomis tuberipes [Macpherson 1988]	50° S	45° S	5° s	45° S	5° s

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Table 3. Species ranges of Brachyura of this study compared to ranges given by Rathbun (1918, 1925, 1930), Garth (1957) and Retamal (1981). **n**, known range is extended northwards, **s**, known range is extended southwards. In square brackets additional studies that had to be consulted are cited.

Brachyura	range, this study	Garth (1957)		Rathbun (1918, 1925, 1930)		Retamal (1981)	
		range	deviation	range	deviation	range	deviation
Acanthocyclus albatrossis	37–54° S	36–53° S		36–52° S	2° s	36–53° S	
Acanthocyclus gayi	37–52° S	8–37° S	15° s	3–37° S	15° s	8–42° S	10° s
Pisoides edwardsii	40–50° S	15–53° S		8° N–53° S		15–53° S	
Halicarcinus planatus	37–55° S	25–53° S	2° s	33–53° S	2° s	25–53° S	2° s
Pilumnoides perlatus	41–50° S	5–53° S		8° N–55° S		8° N–53° S	
Acanthocyclus hassleri	40–42° S	18–34° S	8° s	8–33° S	9° s	8° N–34° S	8° s
Romaleon polyodon	40–42° S	2–46° S		11–42° S		2–46° S	
Pinnaxodes chilensis	37–45° S	1–46° S		1–46° S		1–46° S	
Homalaspis plana	40–43° S	2–53° S		1–55° S		2–53° S	
Cyclograpsus cinereus	37–43° S	11–41° S	2° s	8° N–37° S	6° s	11–41° S	2° s
Hemigrapsus crenulatus	37–46° S	20–45° S		41–55° S		20–45° S	
Taliepus dentatus	40–43° S	12–51° S		8° N–50° S		12–51° S	
Paraxanthus barbiger	40–42° S	30–42° S		3–36° S	6° s	12–42° S	
Metacarcinus edwardsii	42–49° S	2–53° S		1–50° S		2–53° S	
Eurypodius latreillii	37–54° S	3–53° S		3–53° S		14–53° S	
E. longirostris	42–55° S	50° S	8° n, 5° s	50° S	8° n, 5° s	48–55° S	6° n
Pinnixa valdiviensis	42–55° S	17–53° S	2° s	40–53° S	2° s	13–53° S	2° s
Peltarion spinulosum	43–55° S	20–54° S	1° s	33° S, 42–53° S	2° s	20–54° S	1° s
Bellia picta	37° S	14–37° S		3–55° S		14–37° S	
Pseudocorytes sicarius	37° S	14–53° S		14–53° S		14–53° S	
Holothuriophilus pacificus	41° S	33–36° S	5° s	33–36° S	5° s	33–36° S	5° s
Ovalipes punctatus	37–40° S	14–50° S		3–50° S		14–50° S	
Cycloxanthops bocki	41° S	33–42° S		33–42° S		33–42° S	
Pinnixa bahamondei	42–43° S	41° S	2° s	41° S	2° s	36–41° S	2° s
Gaudichaudia gaudichaudii	42–43° S	5–46° S		1–55° S		5–46° S	
Gomeza serrata	50° S	12–53° S		12–53° S		12–53° S	
Pinnixa brevipollex [Bezerra et al. 2006]	50.4° S/ 75.3°W	23–55° S, east coast	west coast	42° S	west coast	23–55° S, east coast	west coast

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