Brachyuran crabs (Crustacea: Decapoda) from the Cape Verde Islands (eastern Atlantic): updated checklist, zoogeographic comments and conservation

José Antonio González [1], Raül Triay-Portella [1], Albertino Martins [2], Evandro Lopes [3]

[1] Ecología Marina Aplicada y Pesquerías, i-UNAT, Universidad de Las Palmas de Gran Canaria, Campus Universitario de Tafira, 35017 Las Palmas de Gran Canaria, Spain. E-mail: pepe.solea@ulpgc.es

[2] Instituto Nacional de Desenvolvimento das Pescas (INDP), C.P. 132, Mindelo, São Vicente, Cabo Verde. E-mail: Albertino.Martins@indp.gov.cv

[3] Departament of Enginery and Sea Sciences. University of Cabo Verde (UNICV), Mindelo, São Vicente, Cabo Verde. E-mail: evandro.lopes@docente.unicv.edu.cv

Summary: Nearly 35 years have passed since Türkay (1982) published his work on decapod crustaceans of the Cape Verde Islands, where apart from his contributions he compiled all records published by Monod (1956), and Manning and Holthuis (1981) among others. No checklists of decapod fauna specifically covering this area have been published since then, and an update is needed. The current list of Cape Verdean brachyuran crabs comprises 125 species and subspecies. Additional species have been mainly recorded thanks to intensified research into deep water and description of new taxa; several of these changes are detailed in this review. *Anamathia rissoana* (Epialtidae) and *Macropipus rugosus* (Polybiidae) are recorded for the first time from the Cape Verdes herein. However, introductions by anthropogenic activities and description of new brachyuran species is expected to occur at a significant rate, and an increase in the number of species from the

Cape Verdes is expected to result from trawling and dredging sampling, as well as from introduction of non-native species. Some zoogeographic comments on the Cape Verdean brachyurans are made. Crab species of commercial or potential interest are listed, their current/future threats are identified, and some conservation measures are proposed.

Running title: Brachyuran crabs from Cape Verde Islands

Keywords: checklist; zoogeography; conservation; Brachyura; Decapoda; Crustacea; Cape Verde Islands; eastern Atlantic.

Cangrejos braquiuros (Crustacea: Decapoda) de las Islas Cabo Verde (Atlántico oriental): lista comentada y comentarios zoogeográficos

Resumen: Se cumplen cerca de 35 años desde que Türkay (1982) publicó su trabajo sobre crustáceos decápodos de las Islas Cabo Verde donde, además de sus contribuciones, recopiló todas las citas de Monod (1956) y Manning y Holthuis (1981) entre otros. Desde entonces no ha sido publicada ninguna lista completa de decápodos que cubra específicamente esta área y es necesaria una actualización. La lista actual de braquiuros cabo-verdianos consta de 125 especies y subespecies. Otras especies han sido citadas debido sobre todo a la intensificación de las investigaciones dirigidas a aguas profundas y a descripción de nuevas especies; algunos de estos cambios se detallan en esta revisión. En este trabajo *Anamathia rissoana* (Epialtidae) y *Macropipus rugosus* (Polybiidae) se citan por primera vez en aguas de Cabo Verde. Sin embargo, se prevé que introducciones causadas por actividades antropogénicas y descripción de nuevos braquiuros se produzcan a un ritmo significativo, siendo esperable un incremento en el número de especies en Cabo Verde como resultado de muestreos con arrastre bentónico y dragas y de la introducción de especies exóticas. Se realizan consideraciones zoogeográficas sobre los braquiuros de

Cabo Verde. Las especies de interés comercial o potencial son listadas, sus amenazas actuales o potenciales identificadas y se proponen algunas medidas de conservación.

Palabras clave: lista; zoogeografía; conservación; Brachyura; Decapoda; Crustacea; Islas Cabo Verde; Atlántico oriental.

INTRODUCTION

Nearly 35 years have passed since Türkay (1982) published his work on decapod crustaceans of the Cape Verde Islands, where apart from his contributions he compiled all records published by Monod (1956), and Manning and Holthuis (1981) among others. Such publications allowed d'Udekem d'Acoz (1999) to include the main references for the Cape Verdean decapods also occurring in the North-eastern Atlantic north of 25ºN.

The Cape Verde archipelago (officially the Republic of Cabo Verde) is an African oceanic country placed in the north-eastern Atlantic. This archipelago has about 965 km of coastline, the islands lying within the 4000 m marine contour. The islands are well-separated from the coasts of Western Africa by great depths of more than 3000 m, being Boa Vista –the easternmost island– located 570 km (305 nautical miles) from Cape Verde, Senegal. Most of the islands arise from great depths, but São Vicente, Santa Luzia, Branco, Raso and São Nicolau (within the windward island chain), and Boa Vista and Maio (within the leeward chain) are linked by relative shallows (<200 m). Several submarine banks and seamounts are known in the area (Fig. 1).

The volcanic characteristics of the Cape Verde Islands are manifest by the absence of wide insular shelves, with a bottom depth of 300 m near the coast except around Boa Vista and Maio (with this bathymetry at 15 nm from their coasts, and linked by the João Valente Bank). Volcanic activity began in the early Miocene to 24-22 my. The islands are

organized in a horseshoe opened to the west, showing an increase of age from west (<3 my) to east (8-16 my) (Holm et al. 2008, Madeira et al. 2008).

Oceanographically, the waters of the Cape Verde Islands are under the influence of the North Equatorial Counter-Current and the Canary Current, with sea-surface temperature normally higher than 20 °C along the year (Türkay 1982, González et al. 2009, Wirtz et al. 2013). The Canary Current system, one of the 64 Large Marine Ecosystems of the World (Sherman and Hempel 2009) is characterized by their singular bathymetry, hydrography, productivity, and their ability to support marine populations. The seasonal circulation pattern of the North Equatorial Counter-Current show their influence in the south-eastern part of the archipelago from April to June, expanding gradually westwards and northwards covering the whole area by the end of July. This current reaches its northernmost position during August and September, and retreats reaching the lowest latitudes in the archipelago from October to March. The Canary Current is wider and more intense during the first half of the year, but weaker and closer to the African coast from July onwards (Lázaro et al. 2005, Marques et al. 2009).

Also, the Cape Verdes are geographically located on an increasingly important maritime route, and both ships and oil platforms were recognized as major vectors for the introduction of non-native species (e.g. González et al. 2012a, Triay-Portella et al. 2015, González 2016).

Geomorphological, geographical and oceanographic particularities of the Cape Verde Islands could explain the great diversity in the biogeographic patterns of the biota inhabiting this area. These physical and biodiversity characteristics, together with the climatic condition of the Cape Verdes –a tropical-subtropical area– highlight the uniqueness of this archipelago (e.g. Fernández-Gil et al. 2013, Almeida 2014). According to the comprehensive biogeographic system for classifying the oceans (for both coastal and

shelf areas) proposed by Spalding et al. (2007), the Cape Verde Islands ecoregion is included within the West African Transition province of the Tropical Atlantic realm. The sustainable use of marine resources and their conservation measures is a main goal on both national and international policy agendas (Spalding et al. 2007).

After the work of Türkay (1982), Fransen (1991) enumerated or first recorded many brachyuran species collected in waters of the Cape Verde Islands, the mithracid *Mithrax caboverdianus* (Türkay 1986a) and the pinnotherids *Viridotheres viridis* (Manning 1993) and *Viridotheres marionae* (Manning 1996) were first described based on Cape Verdean specimens. Also González et al. (2004, 2009) accounted on nine crab species, being mainly deep-sea forms with the first record for the geryonid *Chaceon maritae* (Manning and Holthuis, 1981) from waters off the Cape Verde Islands.

Moreover, several authors have published updated lists of brachyuran decapod fauna at different geographical scales (e.g. Türkay 2001, Araújo and Calado 2003, Ng et al. 2008, Araújo and Wirtz 2015, Marco-Herrero et al. 2015), even from the neighbouring Canary archipelago (González 1995, 2016). However, none of these has specifically covered the diversity found around the Cape Verde Islands; and an update is needed for this area.

The systematic research landscape on brachyuran decapods has changed drastically in the last few decades (e.g. Marco-Herrero et al. 2015, González 2016), and a great number of changes concerning the crab species found around the Cape Verde Islands have also taken place. These changes are due to systematic modifications, non-confirmed presence or newly recorded species for the area. Today's most widely used classifications have all appeared after the works of Zariquiey Álvarez (1968, Iberian waters) and Manning and Holthuis (1981, West African waters), and there is a concerted effort by carcinologists

worldwide to check the validity of taxa using multiple tools such as ecology, larvae and genetics (Marco-Herrero et al. 2015, González 2016).

The present work summarizes all changes in Cape Verdean brachyuran carcinofauna since Türkay (1982), Fransen (1991) and d'Udekem d'Acoz (1999), provides scientists with an updated classification list, and makes zoogeographic comments on this important component of the marine biota of the Cape Verde Islands. Moreover, crab species of commercial or potential interest are listed, their current or future threats are identified, and some conservation measures are proposed.

MATERIALS AND METHODS

For the compilation of this list, brachyuran records from the Cape Verde Islands in Monod (1956), Manning and Holthuis (1981), Türkay (1982), Fransen (1991) and d'Udekem d'Acoz (1999) were checked as main bibliographic sources. Previous older works (such as Dana 1852, Stimpson 1857-1858, 1907, de Brito Capello 1864, A. Milne-Edwards 1867, 1868, 1869, 1878, Cunningham 1871, Miers 1881, 1886, Lucas 1882, Studer 1882, 1883, Filhol 1885, Osorio 1888, 1898, 1906, Benedict 1893, Ortmann 1893, Bouvier 1894, 1922, A. Milne-Edwards and Bouvier 1897, 1898, 1899, 1900, Rathbun 1907, Lenz and Strunck 1914, Stebbing 1914, Monod 1933, Capart 1951, Guinot and Ribeiro 1962, Ribeiro 1964, 1968, 1973, Forest 1974, and Ingle 1985) containing records from the Cape Verde Islands were checked when necessary. Additional papers dealing with littoral brachyurans from the Cape Verde Islands (Türkay 1986b, Galil and Clark 1996, Wirtz and d'Udekem d'Acoz 2001) were also taken into account. Some works (Türkay 1986a, Manning 1993, 1996) describing new species based on Cape Verdean crab specimens, some lists on Cape Verdean species (González et al. 2004, 2009), and specific works on brachyurans (Neumann 1996) were also used as source of brachyurans occurring

149 in the area. The cruise report "Dr. Fridtjof Nansen" (Krakstad et al. 2011) was checked in
150 search of brachyuran records from the Cape Verde Islands. Data from Internet databases
151 such as WoRMS (http://www.marinespecies.org/) and GBIF (http://www.gbif.org/species),
152 systematic data, and unpublished data were also checked.

153 Four major contributions need to be highlighted here. The impressive studies on
154 West African brachyuran crabs by Monod (1956), and Manning and Holthuis (1981)
155 compiled many references and records of the Cape Verdean brachyurans. The superb work
156 by Türkay (1982) summarized the history of research on decapod crustaceans of the Cape
157 Verde Islands (which started with the "U.S. Exploring Expedition 1838-1842", Dana 1852)
158 and the state of knowledge at that time (accounting 78 decapod species), conducting the
159 first zoogeographic analysis to this carcinofauna (with ten endemic decapods, 6.8%).
160 Finally, Fransen (1991) enumerated 74 brachyuran species collected in waters of the Cape
161 Verde Islands (including 22 first records from this area), with detailed data on their habitat
162 and depth of capture.

163 Many vouchers from the study collection of the 'Instituto Canario de Ciencias
164 Marinas' (ICCM, now transferred to the 'Universidad de Las Palmas de Gran Canaria')
165 were checked.

166 This checklist covers all terrestrial and marine brachyuran species present in the
167 Cape Verde Islands from the intertidal to deep water. The study area is bounded by the
168 14º50'N and 17º20'N parallels and the 22º40'W and 25º30'W meridians, covering a
169 combined area of about 800560 km^2 (Fig. 1).

170 This updated systematic classification follows Ng et al. (2008), but also takes into
171 account the latest changes in particular taxa (e.g. Marco-Herrero et al. (2013) for Majoidea;
172 Schubart and Reuschel (2009) and Spiridonov et al. (2014) for Cancroidea and
173 Portunoidea). Superfamilies are listed by systematic order following the Sections and

Subsections as currently accepted, and by alphabetical order within them. Families, subfamilies, genera, species and subspecies are also listed by alphabetical order within their respective superfamilies. All changes with respect to the lists by Monod (1956), Manning and Holthuis (1981), Türkay (1982), Fransen (1991) and d'Udekem d'Acoz (1999) are explained, including systematic modifications, misidentifications, synonyms, and new records from the Cape Verde Islands.

Each crab species was classified as pelagic or benthic according to the main spatial distribution of their adults. Moreover, according to depth boundaries (closely linked to regional oceanographic conditions determined by the water masses present) found around the Cape Verde Islands (Menezes et al. 2015), each benthic species was then assigned to a depth boundary where the species mainly occur in waters of the Cape Verde Islands: shelf area (SHA, 0-150 m), shelf-break/upper-slope (SUS, 151-300 m), deep/upper-slope (DUS, 301-600 m) and mid-deep/mid-slope (DMS, >600 m).

Each crab species was also assigned to a biogeographic pattern category adapted from Türkay (1982) and González (2016) who clearly separate the coastal and shelf biota occurring in the Macaronesian ecoregion (i.e. the Azores, Madeira and the Canaries) from that occurring in the Cape Verde Islands, as stated by many authors (e.g. Spalding et al. 2007, Wirtz et al. 2013). Cape Verdean brachyuran crabs were classified into the following 12 groups according to their distribution range and the above-mentioned considerations: 1, cosmopolitan or worldwide species (COSM); 2, pantropical or circumtropical species (PANT); 3, amphi-Atlantic species of wide distribution (AAWD); 4, amphi-Atlantic species of warm affinity (AAWA); 5, eastern Atlantic species of wide distribution (EAWD); 6, eastern Atlantic cold-temperate species (EACT); 7, eastern Atlantic warm-temperate species (EAWT); 8, Atlanto-Mediterranean species (ATLM); 9, Guinean species (restricted to tropical and subtropical eastern Atlantic) (TSEA); 10, eastern-central Atlantic

island species (from the Azores to Cape Verde Islands, and southwards even to St. Helena) (ECAI); 11, insular West African species (around the Cape Verdes and the islands of the Gulf of Guinea) (IWAF); and 12, endemic to the Cape Verde Islands (ECVI). Two different zoogeographic approaches (consisting in describing the different components of the brachyuran fauna) were performed. A first description included all species. For the second approach, both pelagic and deep-water benthic species (those living deeper than upper insular slope, >300 m of depth) were excluded of the analysis. It is widely accepted (e.g. González 2016) that the set of species living shallower than the upper slope (0-300 m) better characterize the brachyuran carcinofauna and their zoogeographic affinities.

The zoogeographic components of the brachyuran faunas from the Cape Verde (this work) and Canary Islands (González 2016) referred to littoral and upper bathyal benthic species (0-300 m) were compared.

Main references used to check the occurrence of the brachyuran species were: A, Monod (1956); B, Manning and Holthuis (1981); C, Türkay (1982); D, Fransen (1991); E, d'Udekem d'Acoz (1999); and F, this work (including González et al. 2004, 2009). Additional sources were: A. Milne-Edwards and Bouvier (1900) for *Phyllodorippe armata* (Miers, 1881) (Dorippidae), Türkay (1986a) for *Mithrax caboverdianus* (Mithracidae), Manning (1993) for *Viridotheres viridis*, and Manning (1996) for *Viridotheres marionae* (Pinnotheridae). First records for all crab species listed herein were registered with their original names, and their references indicated in chronological order as follows: 1, Dana (1852); 2, Stimpson (1858); 3, A. Milne-Edwards (1867); 4, A. Milne-Edwards (1868); 5, A. Milne-Edwards (1869); 6, Cunningham (1871); 7, A. Milne-Edwards (1878); 8, Miers (1881); 9, Lucas (1882); 10, Studer (1882); 11, Studer (1883); 12, Filhol (1885); 13, Miers (1886); 14, Bouvier (1894); 15, A. Milne-Edwards and Bouvier (1897); 16, A. Milne-Edwards and Bouvier (1898); 17, A. Milne-Edwards and Bouvier (1899); 18, A. Milne-

Edwards and Bouvier (1900); 19, Bouvier (1922); 20, Guinot and Ribeiro (1962); 21, Forest (1974); 22, Ingle (1985); 23, Türkay (1986a); 24, Manning (1993); 25, Manning (1996), apart two newly recorded species. Finally, the species' occurrence around the neighbouring archipelago of the Canaries (González 2016) has also been recorded.

For the newly recorded species from the study area, measurements taken and abbreviations used were as follows: CL – carapace length; CW – carapace width. Measurements were taken using Vernier callipers (±0.1 mm). Sex and ovigerous condition of the females were also noted.

RESULTS

A total of 125 crab species are reported herein around the Cape Verde Islands (including three species of doubtful presence). Of them, 124 species and subspecies are marine, and *Cardisoma armatum* Herklots, 1851 (Gecarcinidae) is terrestrial. No freshwater crab species occur in the study area. Their spatial distribution, depth boundary, bathymetric range and biogeographic pattern are presented in Table 1. This represents a number of species close to the 132 brachyuran species reported around the Canary Islands (González 2016), and to the 140 brachyuran species from the Iberian Peninsula (Marco-Herrero et al. 2015).

When compared with the recent brachyuran catalogue from the Canaries (González 2016), it is noteworthy that both the Cape Verdean and the Canarian lists comprise 20 currently accepted brachyuran superfamilies (Ng et al. 2008, Spiridonov et al. 2014). Only the Cape Verdean superfamily Raninoidea does not currently occur around the Canary archipelago. On the contrary, the Canarian superfamily Cryptochiroidea has not been found in waters of the Cape Verdes. The 125 Cape Verdean brachyuran species listed herein are grouped in 40 accepted families and 83 genera, whereas the Canarian crabs

249 comprise 39 families and 77 genera (González 2016). The Cape Verdean tropical-
250 subtropical families Dynomenidae (Dromioidea), Raninidae, Menippidae (Eriphioidea),
251 Acidopsidae, Chasmocarcinidae (Goneplacoidea), Mithracidae (Majoidea) and
252 Gecarcinidae (Grapsoidea) do not currently occur around the Canary archipelago. The
253 Canarian cold/warm-temperate families Cancridae (Cancroidea), Eriphiidae (Eriphioidea),
254 Euryplacidae, Mathildellidae, Progeryonidae (Goneplacoidea), Thiidae (Portunoidea) and
255 Cryptochiridae (González 2016) have not been found in the Cape Verdes.
256
257 REMARKS
258 **Systematic changes since Manning and Holthuis (1981)**
259 Systematic changes have affected the taxonomical arrangement of Brachyura by
260 Zariquiey Álvarez (1968) and Manning and Holthuis (1981). Neither Türkay (1982) nor
261 Fransen (1991) used supra-generic arrangement in their works. The main changes in the
262 systematics of brachyuran crabs after the impressive catalogues by Manning and Holthuis
263 (1981) and d'Udekem d'Acoz (1999) were recently explained by Marco-Herrero et al.
264 (2015) and González (2016). Several currently accepted families were included within
265 other families as follows: Ethusidae within the Dorippidae; Menippidae, Oziidae,
266 Pilumnidae, Pseudoziidae, Domeciidae, and Panopeidae within the Xanthidae;
267 Acidopsidae and Chasmocarcinidae as subfamilies within the Goneplacidae; Epialtidae and
268 Inachidae within the Majidae; Carcinidae and Polybiidae within the Portunidae; Percnidae,
269 Plagusiidae, and Varunidae as subfamilies within the Grapsidae.
270 The family Mithracidae were newly reported from the Cape Verde Islands by
271 Türkay (1986a), and the Pinnotheridae by Fransen (1991). According to Marco-Herrero et
272 al. (2013), larval morphology and DNA data supported that *Ergasticus clouei* should be
273 moved from Inachidae to Oregoniidae within the Majoidea.

Omissions, recent records and nominal changes

Phyllodorippe armata (Miers, 1881) (Dorippidae) was first recorded from the Cape Verde Islands by A. Milne-Edwards and Bouvier (1900, as *Dorippe armata*), based on three Talisman 1883 specimens caught off São Vicente Island, and another eight specimens from off Branco Islet at 60 m of depth; that record was surprisingly not compiled by main references A, B, C or E (Table 1). *Pilumnus spinifer* H. Milne Edwards, 1834 (Pilumnidae) was first recorded from the Cape Verde Islands by Bouvier (1922, as *P. hirtellus* var. *spinifer*), based on specimens caught in SW of Boa Vista at 61 m of depth; that record was compiled by Monod (1956), but not in subsequent publications (Table 1).

Paromola cuvieri (Risso, 1816), *Latreillia elegans* Roux, 1830, *Ebalia nux* A. Milne-Edwards, 1883, *P. spinifer*, *Chaceon affinis* (A. Milne-Edwards and Bouvier, 1894), *Paractaea rufopunctata* (H. Milne Edwards, 1834), *Monodaeus couchii* (Couch, 1851), *Planes minutus* (Linnaeus, 1758), and *Cyclograpsus integer* H. Milne Edwards, 1837, all these species previously reported from the study area, were not compiled by Türkay (1982). *Panopeus africanus* A. Milne-Edwards, 1867 in Fransen (1991) was not compiled by d'Udekem d'Acoz (1999). *Xantho sexdentatus* (Miers, 1881), *Xantho* sp. Fransen, 1991, and *Pachygrapsus maurus* (Lucas, 1846), all in Fransen (1991), were not included in the inventory by d'Udekem d'Acoz (1999). *P. maurus* could be first recorded from the Cape Verdes by Monod (1956, as *Goniograpsus simplex*).

Mithrax caboverdianus Türkay, 1986 was first recorded from the Cape Verdes by Tükay (1982, as Majidae gen. sp. indet.) based on two specimens collected at Boa Vista Island between 0.5 and 2 m of depth, which were considered to be as a new species for science by Türkay (1986a). Then it was reported by Fransen (1991) based on one specimen from Sal Island collected in an intertidal rock pool. Two Cape Verdean species of genus

Macropodia, i.e. *M. tenuirostris* (Leach, 1814) and *Macropodia* spec. 3 Fransen, 1991, were compiled by d'Udekem d'Acoz (1999), the latter potentially representing an endemic species to the Cape Verdes.

Viridotheres viridis (Manning, 1993) was first recorded from the Cape Verdes by Fransen (1991, as *Pinnotheres* spec.) based on one specimen from Branco Islet collected on sand at a depth between 12 and 15 m, then assigned to *Nepinnotheres viridis* by Manning (1993), and currently reassigned to genus *Viridotheres* by Manning (1996). Wirtz (2009) found this species to be quite common in the bivalve *Pseudochama cristella* (Lamarck, 1819) (as *P. radians*), at Sal Island between 3 and 7 m of depth, which represents the first host record for this pinnotherid species (Table 1). *Viridotheres marionae* was newly described for science by Manning (1996) based on one specimen from Boa Vista Island collected by dredging on sand at 91 m of depth, being found commensal on the bivalve *Europicardium caparti* (Nicklès, 1955) (as *Cardium caparti*).

Bathynectes maravigna (Prestandrea, 1839) (Polybiidae) was first recorded from the Cape Verdes by González et al. (2004), based on the collection of 19 specimens off Boa Vista Island and 23 off Santiago Island (cruise "Taliarte 2003-08", R/V "Taliarte", August 2003). A total of 107 specimens (accumulate) of this species were reported by González et al. (2009) between 301 and 700 m of depth (same islands, cruise "Cabo Verde 2005-06", R/V "Pixape II", June 2005).

Globopilumnus africanus (Eriphidae) in d'Udekem d'Acoz (1999) was reassigned to *Eupilumnus africanus* (A. Milne-Edwards, 1867) (Oziidae) by Davie (2015a). *Carcinoplax barnardi* (Goneplacidae) in d'Udekem d'Acoz (1999) was synonymized with *Goneplax barnardi* (Capart, 1951) by Davie (2015b). *Philyra laevidorsalis* in Fransen (1991) was synonymized with *Atlantolocia laevidorsalis* (Miers, 1881) (Leucosiidae) by Davie (2015c).

Within the Parthenopidae, *Parthenope bouvieri* in Fransen (1991) was synonymized with *Daldorfia bouvieri* (A. Milne-Edwards, 1869) (Parthenopidae) by Davie and Fransen (2015). *Heterocrypta maltzami marionis* A. Milne-Edwards, 1881, *Parthenope expansa*, *Parthenope macrochelos*, *Parthenope massena* and *Parthenope notialis*, all in d'Udekem d'Acoz (1999), were synonymized with *Distolambrus maltzami* (Miers, 1881) (Davie 2015d), *Velolambrus expansus* (Miers, 1879) (Davie 2015e) (also reported as *Parthenope expansa*), *Spinolambrus macrochelos* (Herbst, 1790) (Davie 2015f), *Parthenopoides massena* (Roux, 1830) (Davie 2015g) and *Spinolambrus notialis* (Manning and Holthuis, 1981) (Davie 2015f), respectively. Most of these changes were done on the basis of the description of new genera (i.e. *Distolambrus*, *Velolambrus*, and *Spinolambrus*) of the subfamily Parthenopinae by Tan and Ng (2007). Moreover, *Parthenope miersii* (A. Milne-Edwards and Bouvier, 1898) in d'Udekem d'Acoz (1999) was considered by Türkay (2001) as a synonym of *S. macrochelos*.

Pilumnus nom. nov. d'Udekem d'Acoz, 1999 (Pilumnidae) was resurrected as *Pilumnus inermis* A. Milne-Edwards and Bouvier, 1894 in Türkay (1982) and Fransen (1991). *Xantho incisus* (Leach, 1814) (Xanthidae) in Türkay (1982) and Fransen (1991) is here considered a junior subjective synonym of *Xantho hydrophilus* (Herbst, 1790), according to Reuschel and Schubart (2006).

First records from waters of the Cape Verde Islands

Anamathia rissoana (Roux, 1828) (Epialtidae, Pisinae) is first recorded from the Cape Verde Islands herein, based on one male (ICCM413, CL/CW 33.5/23.3 mm) collected with semi-floating trap off the NW of Santiago Island, between 220 and 258 m of depth (cruise "Camarão-1", station 5, Ponta Água Doce, 15°09'N 23°47'W, rocky bottom,

19 Nov 2011). It is an Atlanto-Mediterranean species, also known from Madeira and the Canary Islands, with a vertical distribution range of 100-730 m (González 2016).

Macropipus rugosus (Doflein, 1904) (Polybiidae) is first recorded from the Cape Verde Islands herein. Material examined: ICCM410, one male, CL/CW 16.3/20.2 mm, cruise "Camarão-2", station 15-D4, 15°55'N 22°57'W, Ponta Lacacão, Boa Vista Island, 113-133 m, rocky bottom, 14 Mar 2012, bottom trap; ICCM411, one male, CL/CW 22.6/28.8 mm, ICCM412, one non-ovigerous female, CL/CW 20.1/25.7 mm, both cruise "Camarão-3", station 22, 16°47'N 22°53'W, Calhetinha, Sal Island, 125-130 m, rocky bottom, 18 Jul 2012, bottom trap. It is a tropical and subtropical species from West Africa, from off Cape Blanc (22°44'N) to Angola (10°S), including São Tomé and Principe Islands, on a variety of substrates at depths between 5 and 400 m (Guinot and Ribeiro 1962, Manning and Holthuis 1981, Fransen 1991, d'Udekem d'Acoz 1999, Muñoz et al. 2012). Doubtful presence northward in the Atlantic Morocco (33°37.5'N) and Western Sahara (Manning and Holthuis 1981, d'Udekem d'Acoz 1999). Absent from the Canary Islands (González 2016).

Species of doubtful presence in the Cape Verde Islands

Three species have been considered as having valid records from the study area, and therefore they have been included (marked with an asterisk * in table 1) in the checklist.

According to Manning and Holthuis (1981), *Inachus grallator* Manning and Holthuis, 1981 was probably first recorded from the Cape Verde Islands by A. Milne-Edwards and Bouvier (1900, as *I. dorsettensis*), based on material collected on sand with shells at São Vicente-Santo Antão channel (75-90 m) and E of Santo Antão Island (318 m). This citation was compiled by Monod (1956). It is a tropical and subtropical species,

known from the Canaries and Mauritania (Fransen 1991) to Angola (Manning and Holthuis 1981), on mud or muddy sand at 36-325 m (Fransen 1991).

The presence of *Spinolambrus notialis* (Manning and Holthuis, 1981) in the study area is based on the report by Fransen (1991, as *Parthenope notialis/miersi*) of specimens (one from the Cape Verdes, and 15 from Mauritania) showing intermediate features between *S. notialis* and *S. macrochelos* (Herbst, 1790). It is a tropical and subtropical species, known from the Western Sahara to Angola, on a variety of substrates at 18-162 m (Manning and Holthuis 1981). It was erroneously compiled by d'Udekem d'Acoz (1999) as a Cape Verdean species on the basis of the citation from Cap Vert, Senegal by Manning and Holthuis (1981).

According to Monod (1956) and Türkay (1982), *Ocypode africana* de Man, 1881 was first recorded from the study area by Bouvier (1922), based on material collected at Branco Islet. Guinot and Ribeiro (1962) and Ribeiro (1964) reported on *Ocypoda* (sic) sp. collected at Santo Antão Island (Bay of Monte do Trigo) and at Boa Vista Island (Bay of Sal Rei, and Curralinho). It is a tropical and subtropical species, known from southern Mauritania to South-West Africa, in sandy beaches at 0-3 m (Manning and Holthuis 1981).

Species no longer found in waters of the Cape Verde Islands

Two crab species reported from the Cape Verde Islands should not be considered as present in the study area, and therefore they have not been included in the present checklist. *Calappa gallus* (Herbst, 1803) (Calappidae) was reported from the Cape Verdes by Manning and Holthuis (1981), Türkay (1982) and Fransen (1991). Also in WoRMS distribution details for this species it is currently noted "between Cape Verde Islands and Senegal to Angola, …". However, d'Udekem d'Acoz (1999) stated that this Indo-Pacific

species has been misidentified with *Calappa galloides* Stimpson, 1859 for a long time. This was recently corroborated to the first author (JAG) by Charles Fransen (pers. comm.).

During cruise "Taliarte 2003-08" three crab specimens collected off Boa Vista and Santiago islands, between 140 and 280 m of depth, were initially identified on board by the first author (JAG) as *Sanquerus validus* (Herklots, 1851). Unfortunately, this material was lost with the ship sinking in September of 2003. In spite of this, this finding was reported from the Cape Verdes by González et al. (2004, as *Portunus validus*) and González et al. (2009, as *Portunus* cf. *validus*). Since this species inhabits shallow waters in depths mostly from the intertidal to 40 m, rarely to 50-55 m, on continental coasts (Manning and Holthuis 1981), it has not been included in the present checklist.

Spatial and vertical distribution

Of the 125 brachyuran species occurring around the Cape Verde Islands, one is terrestrial and the remaining 123 species are benthic forms (Table 1). *Planes minutus* is epipelagic, living on loggerhead sea turtles and inanimate flotsam (e.g. Dellinger et al. 1997), but also has benthic stages when flotsam riches the beaches (González 2016). *Dorhynchus thomsoni* is known to be benthic with a pelagic initial stage (e.g. Hartnoll et al. 1987). *Portunus (Portunus) hastatus* has juveniles with pelagic stages, but adults are clearly benthic (Table 1).

Of the 123 marine benthic brachyurans occurring in the Cape Verdes, 83 are forms of the shelf area (SHA, 67.5%, inhabiting at a depth interval of 0-150 m), 11 occur on shelf area and shelf-break/upper-slope (SHA-SUS, 8.9%, at 0-300 m), 9 live from shelf area to deep/upper-slope (SHA-DUS, 7.3%, at 0-600 m), 15 inhabit from shelf area to mid-deep/mid-slope (SHA-DMS, 12.2% at 0->600 m), only one species occurs from shelf-break/upper-slope to deep/upper-slope (SUS-DUS, 0.8%, at 151-600 m), two from

deep/upper-slope to mid-deep/mid-slope (DUS-DMS, 1.6%, at 301->600 m), and two species of the mid-deep/mid-slope (DMS, 1.6%, living deeper than 600 m) (Table 1).

Seven brachyuran benthic species seem to occur in waters of the Cape Verde Islands at the shallowest depth ever recorded elsewhere: *D. bouvieri*, *Pilumnus inermis* (this work), *Chaceon gordonae*, *Bathynectes piperitus* (this work), *Cronius ruber*, *Paractaea margaritaria*, and *Nanocassiope melanodactyla*. Sixteen brachyuran benthic species seem to occur in waters of the Cape Verdes at the greatest depth ever recorded elsewhere: *Sternodromia spinirostris* (this work), *Dynomene filholi*, *L. elegans*, *Acidops cessacii*, *Ilia spinosa*, *Apiomithrax violaceus*, *Chaceon maritae* (this work), *B. piperitus*, *P. (P.) hastatus*, *Euryozius bouvieri*, *Eurypanopeus blanchardi*, *P. margaritaria*, *Paractaea rufopunctata*, *Nanocassiope melanodactyla*, *Grapsus adscensionis* (this work), and *Cyclograpsus integer*.

This work enlarges the known depth lower limit in waters of the Cape Verde Islands for four species: *Homola barbata*, *Paromola cuvieri*, *Calappa granulata*, and *Merocryptus obsoletus*. Moreover, this study provides for the first time vertical ranges of distribution for *Menippe nodifrons* and *Xanthodius inaequalis faba* (Table 1).

Zoogeographic considerations

To describe the different components of the brachyuran fauna, all the Cape Verdean brachyuran crabs listed herein (125 species, depth 0->2000 m) are grouped by biogeographic pattern in Table 2. A first preliminary description showed just one main group: 50 TSEA species (40.0%), followed distantly by 18 ATLM species (14.4%), 12 ECVI species (9.6%), and 10 EAWT species (8.0%). The remaining eight biogeographic groups varied from eight EACT species (6.4%) to one AAWD (0.8%) and one COSM species (0.8%) (Table 2).

447 The presence of one deep-sea endemic species to the Cape Verde Islands,
448 *Macropodia* spec. 3 Fransen, 1991, is noteworthy. The first record for this shelf to mid-
449 slope species from the study area was by Fransen (1991), then compiled by d'Udekem
450 d'Acoz (1999). The collected material consisted of fifteen specimens (including one
451 ovigerous female) caught off several localities (Branco and Raso Islets, Boa Vista, Sal,
452 Maio, and São Vicente islands), at depths between 61 and 1200 m. Since all *Macropodia*
453 species known to date were discarded during the identification, this specimen may
454 represent a new species, even being an endemic to the Cape Verdes (Table 1).
455 The Cape Verdean brachyuran crabs inhabiting the shelf area and shelf-
456 break/upper-slope (96 species, depth 0-300 m) are grouped by biogeographic pattern in
457 Table 2. This description of the benthic littoral and/or upper-bathyal species showed the
458 same principal group formed by 41 TSEA species (42.7%), followed far behind by 12
459 ATLM species (12.5%), and 11 ECVI species (11.5%). The remaining nine biogeographic
460 groups with presence varied from seven AAWA (7.3%) and seven PANT species (7.3%) to
461 one EAWD (1.0%) and one IWAF species (1.0%). In this zoogeographical approach,
462 AAWD and COSM are represented by no species (Table 2). These results confirm the
463 biogeographic composition of the Cape Verdean decapods found by Türkay (1982),
464 dominated by tropical and subtropical species.
465 The presence of 11 endemic species and subspecies to the study area (ECVI,
466 11.5%) is noteworthy: 1. *Dromia* sp. Türkay, 1982. 2. *Eupilumnus* aff. *stridulans* (Monod,
467 1956). 3. *Inachus* spec. 2 Fransen, 1991. 4. *Macropodia doracis* Manning and Holthuis,
468 1981. 5. *Macropodia* aff. *doracis* Manning and Holthuis, 1981. 6. *Macropodia longicornis*
469 A. Milne-Edwards and Bouvier, 1899. 7. *Mithrax caboverdianus* Türkay, 1986. 8.
470 *Glyptoxanthus corrosus* (A. Milne-Edwards, 1869). 9. *Xanthodius inaequalis faba* (Dana,

1852). 10. *Viridotheres marionae* Manning, 1996. 11. *Viridotheres viridis* (Manning, 1993) (Table 1).

The occurrence of another six endemics to the eastern-central Atlantic islands (ECAI, 7.3%) is also noteworthy: 1. *Calappa* spec. Fransen, 1991 (also in Canaries and Savage Islands). 2. *Cryptosoma cristatum* Brullé, 1837 (also in Canaries, Desertas Islands, Madeira, Porto Santo, and St. Helena Island). 3. *Acanthonyx brevifrons* A. Milne-Edwards, 1869 (also in Canaries, Madeira, and Azores). 4. *Euryozius bouvieri* (A. Milne-Edwards, 1869) (also in Canaries, Madeira, and Azores). 5. *Glyptoxanthus cavernosus* (A. Milne-Edwards, 1878) (also in Canaries). 6. *Paraxanthias eriphioides* (A. Milne-Edwards, 1867) (also in Azores) (Table 1).

When compared with the recent brachyuran catalogue from the Canaries (González 2016), the brachyuran carcinofauna from the Cape Verdes is markedly composed of tropical and subtropical eastern Atlantic species (Guinean) (TSEA, 42.7%), with a moderate contribution of Atlanto-Mediterranean forms (ATLM, 12.5%) and a relevant presence of endemic species (ECVI, 11.5%) (Table 3). However, the brachyuran carcinofauna from the Canary Islands (González 2016) is dominated by Atlanto-Mediterranean species (ATLM, 31.7%), with significant contributions of Guinean (TSEA, 22.8%) and eastern Atlantic cold-temperate species (EACT, 17.1%) (Table 3).

In the study area, the fourth biogeographic component in number of species is formed by the amphi-Atlantic species of warm affinity (AAWA, 7.3% versus 4.1% in the Canaries) (Table 3), suggesting according to Spalding et al. (2007) a relatively good bio-connexion between the Cape Verde ecoregion (within the West African Transition province) and the Guianan and Amazonia ecoregions (both forming the North Brazil Shelf province). Similar results were obtained by Freitas (2014) when describing the zoogeographic composition of the Cape Verdean coastal ichthyofauna: a predominance of

Guinean species, followed by amphi-Atlantic forms of warm affinity and by endemic species. The present results seem to corroborate the role played by the Cape Verde Islands and nearby seamounts/banks as stepping stones anchored in the middle of the ocean, but connecting the western and eastern Atlantic basins. In this regard, Freitas et al. (2014) recommended paying more attention to the North Equatorial Countercurrent, as a potential dispersal route for marine organisms crossing the Atlantic in a west–east direction. However, it is quite probable that the increasingly heavy overseas traffic from South America arriving to the Cape Verde Islands was responsible for several first records that were attributed to other sources in the past five years (Triay-Portella et al. 2015). A main oil platforms' route coming from southern Brazil (often with one stop in the Cape Verdes) is arriving to the Canary Islands. This would explain the recent rise in the observations of non-indigenous fish species in waters of the Canaries (Triay-Portella et al. 2015).

The higher diversity and greater number of coastal crabs endemic to the Cape Verdes (11 species, 11.5%) than those of the Macaronesian archipelagos (Table 3, González 2016) can be explained as a combined result of (i) the archipelago's good bio-connexion, (ii) its considerable geological age and (iii) their relatively healthy shallow habitats. Additionally, twenty coastal fishes of the Cape Verde Islands (6.3%) appear to be endemic to the archipelago (Wirtz et al. 2013). On the contrary, the coastal fish communities of the Macaronesian archipelagos (Canaries, Brito et al. 2007; Madeira, Wirtz et al. 2008; Azores, Afonso et al. 2013) are characterized by low endemism rates and low diversity. There is no coastal marine fish species endemic for Madeira, Madeira and the Canaries share just one endemic species, and Madeira and the Azores also share one endemic species (Wirtz et al. 2008). None of the decapod species is endemic to Madeira, there also appear to be no shared endemic species for the Canary Islands plus Madeira, and nor any shared endemic species for the Canaries plus Madeira plus the Azores (Araújo and

521 Wirtz 2015). This pattern has been interpreted as the result of (i) the archipelagos'
522 isolation, (ii) their generally young geological age and (iii) the shortening of their shallow
523 habitats and oceanographic bottlenecks during the most recent glaciations (Brito et al.
524 2005, 2007, Domingues et al. 2007, 2008, Wirtz et al. 2008, Afonso et al. 2013).

525 Twenty-four brachyuran benthic species occurring in the Cape Verde Islands
526 currently have their southern limit of distribution in this archipelago: *Dromia nodosa*, *L.*
527 *elegans*, *Ethusina alba*, *E. nux*, *A. brevifrons*, *A. rissoana*, *Pisa nodipes*, *Inachus*
528 *phalangium*, *Macropodia longipes*, *Macropodia* aff. *parva* (known to date from the
529 Canaries, Mauritania, and the Cape Verdes), *Maja crispata*, *E. clouei*, *S. macrochelos*,
530 *Pilumnus hirtellus*, *P. spinifer*, *C. affinis*, *Pirimela denticulata* (also in Senegal), *B.*
531 *maravigna*, *E. bouvieri*, *Paractaea monodi*, *G. cavernosus*, *P. eriphioides*, *X. sexdentatus*,
532 *Xantho* sp. Fransen, 1991 (also in Senegal), and *Pachygrapsus maurus*. This southern
533 group of 24 species represents 19.5% of the 123 benthic crabs listed herein.

534 Another seventeen brachyuran benthic species occurring in the Cape Verde Islands
535 currently have their northern limit of distribution in this archipelago: *D. filholi* (restricted
536 to Cape Verde, Principe and Annobon Islands), *Ranilia constricta*, *Ethusa rugulosa* (also
537 in Senegal), *M. nodifrons* (also in Senegal in the East Atlantic), *Epixanthus helleri* (also in
538 Senegal), *Acidops cessacii* (also in Senegal), *Typhlocarcinodes integrifrons* (also in
539 Senegal), *Ilia nucleus*, *Acanthonyx depressifrons* (elsewhere from Point-Noire, Congo),
540 *Macropodia spinulosa* (also in Senegal), *D. bouvieri*, *Pilumnus perrieri* (also in Senegal),
541 *Chaceon gordonae* (also in Sierra Leone), *B. piperitus*, *P. margaritaria*, *Cycloxanthops*
542 *occidentalis* (also in Senegal), and *Geograpsus lividus* (in the East Atlantic). This northern
543 group of 17 species represents 13.8% of the 130 benthic crabs listed herein.

544 Seventy-two brachyuran benthic species occur in both the Cape Verde and Canary
545 archipelagos (Table 1); this represents 57.6% of species shared with the Canary Islands.

Given that the Cape Verde Islands belongs to its own ecoregion within the West African Transition province, whereas the Canaries belongs to the Macaronesian ecoregion within the Lusitanian province (Spalding et al. 2007), the above-mentioned information could be relevant in the context of faunal movements derived from the eastern Atlantic warming.

The Cape Verdean carcinofauna: future changes

Advances in larval morphology together with the phylogenetic studies are expected to bring further changes in the systematics of brachyurans; these will have an impact at several taxonomic levels, from superfamilies to species. Significant changes will affect new synonymizations, the split of some taxa into new species, and the erection of new genera (e.g. Marco-Herrero et al. 2015, González 2016).

Some taxa occurring in waters of the Cape Verde Islands need an in-depth revision, like the Dromiidae and the Calappidae. Within the *Inachus* species, some geographic distribution remains uncertain due to the morphological similarity and confusion among males of these species and their respective close relatives (e.g. González 2016). The *Macropodia* species have been traditionally assigned and reassigned to different species, but there remain some doubtful synonyms and several species *affinis* (e.g. González 2016). The Parthenopidae is a taxonomically problematic group. Finally, within the Xanthidae, morphology differences and distribution of the *Paractaea* species should be better explained (e.g. González 2016).

An increase in the number of species from the Cape Verdes is expected to result from dredging, trapping and trawling samplings (including both sublittoral and deep-sea bottom), as well as from human-caused introduction of non-indigenous species via the following main vectors: through ballast waters, fouling, oil platforms, and release of aquarium or pet trade.

Species of commercial or potential interest and conservation measures

No intertidal crab species are being currently harvested in the Cape Verde Islands to be used for human consumption or as bait in the small-scale fisheries. However, several species with potential interest are living in this habitat, such as the Xanthinae (*Xantho* spp. and others), the Grapsinae (*Grapsus adscensionis* and *Pachygrapsus* spp.), *Percnon gibbesi* (Percnidae), *Plagusia depressa* (Plagusiidae), and *Ocypode cursor* (Ocypodidae) among others. On the contrary, a dozen of them are being intensively harvested in the Canaries (González 2016), and the implementation of a minimum landing size for the largest species was proposed by González et al. (2012b). Additionally, at least two intertidal and littoral crabs, *P. gibbesi* and *Platypodiella picta* (Xanthidae, Zosiminae), have potential interest for both aquarium and pet trade.

A deep-water species, the peppermint swimming crab *Bathynectes piperitus* (Polybiidae), appears as a relatively important by-catch in the traditional trapping fishery for the endemic Cape Verde spiny lobster, *Palinurus charlestoni* Forest and Postel, 1964. A portion of crab catches is destined for directed consumption by the fishermen themselves, another part of the catch (usually live specimens) is discarded or returned back to the sea. Some trapping prospections (including both experimental and professional campaigns) have suggested the potentially commercial interest, at a small-scale level, of two large deep-sea crabs, the box crab *Paromola cuvieri* (Homolidae) but mainly the deep-sea red crab *Chaceon affinis* (Geryonidae) (González et al. 2004, 2009). Both species are target of an incipient artisanal fishery off the Canary Islands with moderate catches (Triay-Portella et al. 2014, Biscoito et al. 2015). Basic biological parameters of these crabs should be determined, their populations evaluated, and some conservation measures implemented

prior to future exploitation activities. Some of these measures have been recently proposed for *P. cuvieri* (Triay-Portella et al. 2014) and *C. affinis* (Biscoito et al. 2015).

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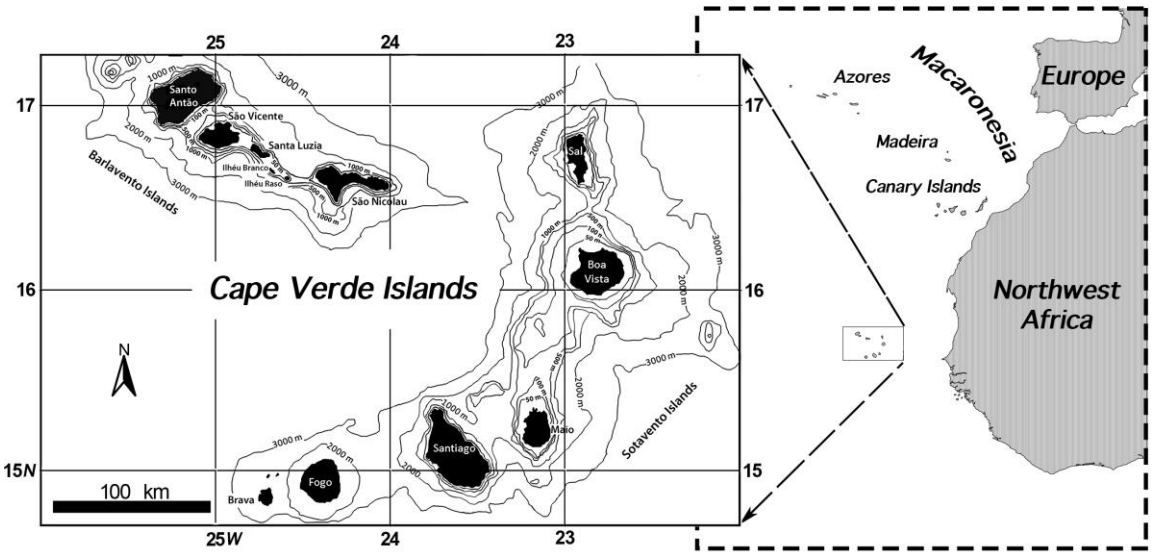
912 Fig. 1.- Map of the Cape Verde Islands (eastern Atlantic) showing their geographic
913 situation and bathymetric characteristics.



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916 Table 1.- List of the brachyurans occurring in the Cape Verde Islands. Spatial distribution,
917 benthic habitat, bathymetric range, biogeographic pattern, main sources, first record and
918 first reference name from the study area are provided for each species. Their occurrence
919 (X) or absence (-) around the Canaries is also provided. * Doubtful presence. Depth
920 boundaries: SHA shelf area (0-150 m), SUS shelf-break/upper-slope (151-300 m), DUS
921 deep/upper-slope (301-600 m), DMS mid-deep/mid-slope (>600 m). Species'
922 biogeographic patterns: COSM cosmopolitan or worldwide, PANT pantropical or
923 circumtropical, AAWD amphi-Atlantic of wide distribution, AAWA amphi-Atlantic of
924 warm affinity, EAWD eastern Atlantic of wide distribution, EACT eastern Atlantic cold-
925 temperate, EAWT eastern Atlantic warm-temperate, ATLM Atlanto-Mediterranean, TSEA
926 tropical and subtropical eastern Atlantic, ECAI eastern-central Atlantic island (Azores to
927 Cape Verdes, and even to St. Helena), IWAF insular West African (Cape Verdes and
928 islands of the Gulf of Guinea), ECVI endemic to Cape Verde Is. Main sources: A Monod
929 (1956), B Manning and Holthuis (1981), C Türkay (1982), D Fransen (1991), E d'Udekem

d'Acoz (1999), F this work (including González et al. 2004, 2009). First record: 1 Dana (1852), 2 Stimpson (1858), 3 A. Milne-Edwards (1867), 4 A. Milne-Edwards (1868), 5 A. Milne-Edwards (1869), 6 Cunningham (1871), 7 A. Milne-Edwards (1878), 8 Miers (1881), 9 Lucas (1882), 10 Studer (1882), 11 Studer (1883), 12 Filhol (1885), 13 Miers (1886), 14 Bouvier (1894), 15 A. Milne-Edwards and Bouvier (1897), 16 A. Milne-Edwards and Bouvier (1898), 17 A. Milne-Edwards and Bouvier (1899), 18 A. Milne-Edwards and Bouvier (1900), 19 Bouvier (1922), 20 Guinot and Ribeiro (1962), 21 Forest (1974), 22 Ingle (1985), 23 Türkay (1986a), 24 Manning (1993), 25 Manning (1996).

Taxa / Species	Spatial distribution	Depth boundary	Bathymetric range (m)		Biogeographic pattern	Main sources (references)	First record	Also in Canaries	First reference name (synonym)
			Cape Verdes	Elsewhere					
BRACHYURA Linnaeus, 1758									
PODOTREMATA Guinot, 1977									
DROMIOIDEA de Haan, 1833									
Dromiidae de Haan, 1833									
Dromia marmorea Forest, 1974	Benthic	SHA	10-30	0-76	TSEA	A, B, C, D, E	17	X	*D. vulgaris*
Dromia nodosa A. Milne-Edwards and Bouvier, 1898	Benthic	SHA	75-90	75-95	TSEA	A, B, C, D, E	16	-	
Dromia sp. Türkay, 1982	Benthic	SHA	1-3	-	ECVI	C	C	-	
Sternodromia spinirostris (Miers, 1881)	Benthic	SHA	40-122	7.5-108	TSEA	B, C, E, F	21	-	*Dromia spinirostris*
Dynomenidae Ortmann, 1892									
Dynomene filholi Bouvier, 1894	Benthic	SHA-DMS	58-1477	23-85	IWAF	A, B, C, D	14	-	
HOMOLOIDEA de Haan, 1839									
Homolidae de Haan, 1839									
Homola barbata (Fabricius, 1793)	Benthic	SHA-DMS	91-165	2-637	AAWD	A, B, C, F	19	X	
Paromola cuvieri (Risso, 1816)	Benthic	SHA-DMS	80-700	10-1212	EAWD	B, E, F	B	X	
Latreilliidae Stimpson, 1858									
Latreillia elegans Roux, 1830	Benthic	SHA-DUS	100-475	35-405	ATLM	A, B, D, E, F	18	X	
RANINOIDEA de Haan, 1839									
Raninidae de Haan, 1839									
Ranilia constricta (A. Milne-Edwards, 1880)	Benthic	SHA	76-76	40-481	AAWA	D	D	-	

EUBRACHYURA de Saint Laurent, 1980									
HETEROTREMATA Guinot, 1977									
CALAPPOIDEA de Haan, 1833									
Calappidae de Haan, 1833									
Calappa galloides Stimpson, 1859	Benthic	SHA	0-80	15-218	AAWA	A, B, C, D, F	13	X	*C. gallus*
Calappa granulata (Linnaeus, 1758)	Benthic	SHA-SUS	75-233	10-400	ATLM	A, B, C, D, E, F	18	X	
Calappa spec. Fransen, 1991	Benthic	SHA	92-92	80-192	ECAI	D	D	X	
Cryptosoma cristatum Brullé, 1837	Benthic	SHA	40-50	2-89	ECAI	A, B, C, D, E, F	9	X	
CANCROIDEA Latreille, 1802									
Atelecyclidae Ortmann, 1893									
Atelecyclus rotundatus (Olivi, 1792)	Benthic	SHA-SUS	102-275	0-795	EAWD	A, B, C, D, E, F	18	X	*A. septemdentatus*
Atelecyclus undecimdentatus (Herbst, 1783)	Benthic	SHA	0-51	0-51	ATLM	A, C, E	18	X	*A. rotundatus*
Ethusidae Guinot, 1977									
Ethusa rosacea A. Milne-Edwards and Bouvier, 1897	Benthic	SHA-DMS	628-660	100-1013	TSEA	A, E	19	X	
Ethusa rugulosa A. Milne-Edwards and Bouvier, 1897	Benthic	SHA-SUS	88-275	60-305	TSEA	A, B, C, D	15	-	
Ethusa vossi Manning and Holthuis, 1981	Benthic	SHA	40-69	6-96	TSEA	A, B, D	D	-	*E. mascarone*
Ethusina alba Filhol, 1884	Benthic	DMS	3000-3890	2800-4265	EACT	A, B, D, E	18	likely	*E. abyssicola*
DORIPPOIDEA MacLeay, 1838									
Dorippidae MacLeay, 1838									
Phyllodorippe armata (Miers, 1881)	Benthic	SHA	60-60	7-105	TSEA	18	18	-	*Dorippe armata*
ERIPHIOIDEA MacLeay, 1838									
Menippidae Ortmann, 1893									
Menippe nodifrons Stimpson, 1859	Benthic	SHA	3-3	0-20	AAWA	A, B, C, F	7	-	*M. rudis*
Oziidae Dana, 1851									
Epixanthus helleri A. Milne Edwards, 1867	Benthic	SHA	0-6	0-10	TSEA	A, B, C, D	18	-	

Eupilumnus africanus (A. Milne-Edwards, 1867)	Benthic	SHA	0-15	0-35	TSEA	A, B, C, D, E	13	X	*Globopilumnus africanus*
Eupilumnus aff. *stridulans* (Monod, 1956)	Benthic	SHA	0-6	-	ECVI	D	D	-	
GONEPLACOIDEA MacLeay, 1838									
Acidopsidae Števčić, 2005									
Acidops cessacii (A. Milne-Edwards, 1878)	Benthic	SHA	0.5-61	intertidal	TSEA	A, B, C, D	7	-	*Epimelus Cessaci*
Chasmocarcinidae Serène, 1964									
Typhlocarcinodes integrifrons (Miers, 1881)	Benthic	SHA	70-88	12-90	TSEA	D	D	-	
Goneplacidae MacLeay, 1838									
Goneplax barnardi (Capart, 1951)	Benthic	SUS-DUS	328-590	200-590	TSEA	D, E	D	X	*Carcinoplax barnardi*
Goneplax rhomboides (Linnaeus, 1758)	Benthic	DUS-DMS	310-310	0-580	EAWT	D, E	D	X	
LEUCOSIOIDEA Samouelle, 1819									
Leucosiidae Samouelle, 1819									
Atlantolocia laevidorsalis (Miers, 1881)	Benthic	SHA	neritic littoral	4-30	TSEA	A, B, C	18	-	*Philyra laevidorsalis*
Ebalia affinis Miers, 1881	Benthic	SHA	60-60	4-140	TSEA	A, C, E	16	X	*E. (Phlyxia) atlantica*
Ebalia nux A. Milne-Edwards, 1883	Benthic	SHA-DMS	219-875	80-2983	EACT	A, B	18	X	
Ebalia tuberculata Miers, 1881	Benthic	SHA	60-60	12-110	TSEA	A, B, C, E	18	X	
Ilia nucleus (Linnaeus, 1758)	Benthic	SHA	60-60	0.5-80	ATLM	A, B, C, E	18	X	
Ilia spinosa Miers, 1881	Benthic	SHA	8-150	5-132	TSEA	B, C, D, E, F	20	X	
Merocryptus obsoletus A. Milne-Edwards and Bouvier, 1898	Benthic	SHA	75-122	75-132	TSEA	A, B, C, E, F	16	-	
MAJOIDEA Samouelle, 1819									
Epialtidae MacLeay, 1838									
Epialtinae MacLeay, 1838									
Acanthonyx brevifrons A. Milne-Edwards, 1869	Benthic	SHA	75-110	0-110	ECAI	A, B, C, E	13	X	*A. lunulatus*
Acanthonyx depressifrons Manning and Holthuis, 1981	Benthic	SHA	5-5	5-10	TSEA	C	C	-	

Acanthonyx lunulatus (Risso, 1816)	Benthic	SHA	0-90	0-90	EAWT	B, C, D, E, F	20	X	
Pisinae Dana, 1851									
Anamathia rissoana (Roux, 1828)	Benthic	SHA-DMS	220-258	100-730	ATLM	F	this work	X	
Apiomithrax violaceus (A. Milne-Edwards, 1868)	Benthic	SHA	3-110	3-36	TSEA	A, C, D	4	-	*Micropisa violacea*
Herbstia rubra A. Milne-Edwards, 1869	Benthic	SHA	0.5-75	0.5-75	TSEA	A, B, C, D, E, F	5	X	
Micropisa ovata Stimpson, 1858	Benthic	SHA	0-110	0-110	TSEA	A, B, C, D, E	2	X	
Pisa armata (Latreille, 1803)	Benthic	SHA	70-110	18-162	EAWT	A, B, C, D, E	11	X	*P. Gibsii*
Pisa nodipes (Leach, 1815)	Benthic	SHA	75-75	0-100	ATLM	A, B, C, E	18	X	*P. armata*
Inachidae MacLeay, 1838									
Dorhynchus thomsoni Thomson, 1873	Benthic	SHA-DMS	225-1200	106-2080	COSM	A, B, D	18	X	*Lispognathus Thomsoni*
* *Inachus grallator* Manning and Holthuis, 1981	Benthic	SHA-DUS	90-318	36-325	TSEA	A, B	18	X	*?I. dorsettensis*
Inachus phalangium (Fabricius, 1775)	Benthic	SHA	?	0.5-160	EACT	A, B, C, ?E	11	X	*Stenorhynchus phalangium*
Inachus spec. 2 Fransen, 1991	Benthic	SHA	50-110	-	ECVI	D	D	-	
Macropodia doracis Manning and Holthuis, 1981	Benthic	SHA-SUS	110-180	-	ECVI	A, B, C	18	-	*Stenorhynchus aegyptius* (part)
Macropodia aff. *doracis* Manning and Holthuis, 1981	Benthic	SHA	60-90	-	ECVI	D	D	-	
Macropodia longicornis A. Milne-Edwards and Bouvier, 1899	Benthic	SHA-SUS	150-275	-	ECVI	A, B, C	17	-	*Stenorhynchus longicornis*
Macropodia longipes (A. Milne-Edwards and Bouvier, 1899)	Benthic	SHA-DUS	318-318	50-445	ATLM	A, B, D	18	-	*Stenorhynchus longirostris*
Macropodia aff. *parva* van Noort and Adema, 1985	Benthic	SHA	30-90	20-90	TSEA	D, E	D	X	
Macropodia spinulosa (Miers, 1881)	Benthic	SHA	70-70	1-126	TSEA	A, B, C	10	-	*Stenorhynchus phalangium*
Macropodia tenuirostris (Leach, 1814)	Benthic	SHA-DMS	115-115	9-748	EACT	D, E	D	-	*M. longipes*

Macropodia spec. 3 Fransen, 1991	Benthic	SHA-DMS	61-1200	-	ECVI	D	D	-	
Stenorhynchus lanceolatus (Brullé, 1837)	Benthic	SHA	5-90	5-96	TSEA	A, B, C, D, E	13	X	*Leptopodia sagittaria*
Majidae Samouelle, 1819									
Eurynome aspera (Pennant, 1777)	Benthic	SHA-DMS	61-318	10-1216	EAWD	A, D, E	18	X	
Maja brachydactyla Balss, 1922	Benthic	SHA	?	0-91	EAWT	C	C	X	*M. squinado*
Maja crispata Risso, 1827	Benthic	SHA	84-84	0.5-95	ATLM	A, B, C, E	18	-	*Maia verrucosa*
Mithracidae MacLeay, 1838									
Mithrax caboverdianus Türkay, 1986	Benthic	SHA	0.5-2	-	ECVI	C	23	-	Majidae gen. sp. indet.
Oregoniidae Garth, 1958									
Ergasticus clouei A. Milne-Edwards, 1882	Benthic	SHA-DMS	70-400	70-1000	ATLM	A, C, D, E	10	X	
PALICOIDEA Bouvier, 1898									
Palicidae Bouvier, 1898									
Palicus caronii (Roux, 1828)	Benthic	SHA-SUS	20-100	18-220	ATLM	A, B, C, D, E	13	X	*Cymopolia caronii*
PARTHENOPOIDEA MacLeay, 1838									
Parthenopidae MacLeay, 1838									
Daldorfiinae Ng and Rodríguez, 1986									
Daldorfia bouvieri (A. Milne-Edwards, 1869)	Benthic	SHA	0.5-91	4-5	TSEA	A, B, C, D	5	-	*Parthenope bouvieri*
Parthenopinae MacLeay, 1838									
Distolambrus maltzami (Miers, 1881)	Benthic	SHA-DUS	24-347	22-550	EAWT	A, B, C, D	18	X	*Heterocrypta Maltzani* (sic)
Parthenopoides massena (Roux, 1830)	Benthic	SHA	20-110	3-141	ATLM	A, D, C, E	2	X	*Lambrus rugosus*
Spinolambrus macrochelos (Herbst, 1790)	Benthic	SHA-DMS	91-91	5-1478	ATLM	A, B, D, E	19	X	*Lambrus Miersi*
* *Spinolambrus notialis* (Manning and Holthuis, 1981)	Benthic	SHA	55-80	18-162	TSEA	D	D	-	*Parthenope notialis/miersi*
Velolambrus expansus (Miers, 1879)	Benthic	SHA	69-90	30-170	ATLM	A, B, C, D, E	18	X	*Parthenolambrus expansus*
PILUMNOIDEA Samouelle, 1819									

Pilumnidae Samouelle, 1819									
Pilumnus hirtellus (Linnaeus, 1761)	Benthic	SHA	?	0-90	EACT	B, C, E	B	X	
Pilumnus inermis A. Milne-Edwards and Bouvier, 1894	Benthic	SHA-DUS	3-225	5-400	ATLM	A, B, C, D, E, F	18	X	*P. hirtellus* var. *inermis*
Pilumnus perrieri A. Milne-Edwards and Bouvier, 1898	Benthic	SHA	40-91	20-91	TSEA	A, B, C, D, E, F	16	-	
Pilumnus spinifer H. Milne Edwards, 1834	Benthic	SHA-SUS	91-91	1-179	ATLM	A	19	X	*P. hirtellus* var. *spinifer*
PORTUNOIDEA Rafinesque, 1815									
Carcinidae MacLeay, 1838									
Xaiva biguttata (Risso, 1816)	Benthic	SHA	?	1-10	EAWT	A, B, C, E	18	-	*Portumnus biguttatus*
Geryonidae Colosi, 1923									
Chaceon affinis (A. Milne-Edwards and Bouvier, 1894)	Benthic	SHA-DMS	692-1300	130-2047	EACT	B, E, F	19	X	*Geryon affinis*
Chaceon gordonae (Ingle, 1985)	Benthic	DMS	628-628	1183-1183	TSEA	E	22	-	
Chaceon maritae (Manning and Holthuis, 1981)	Benthic	DUS-DMS	301-1000	100-1000	TSEA	F	D	-	
Pirimelidae Alcock, 1899									
Pirimela denticulata (Montagu, 1808)	Benthic	SHA-SUS	?	0-250	EACT	A, C, E	6	X	
Polybiidae Ortmann, 1893									
Bathynectes maravigna (Prestandrea, 1839)	Benthic	SHA-DMS	301-700	60-1410	EACT	F	F	X	
Bathynectes piperitus Manning and Holthuis, 1981	Benthic	SHA-DMS	108-628	200-546	TSEA	A, B, D, F	12	-	*Bathynectes* (sic)
Liocarcinus corrugatus (Pennant, 1777)	Benthic	SHA	35-68	1-147	EAWT	A, B, C, D, E	8	X	*Portunus corrugatus*
Macropipus rugosus (Doflein, 1904)	Benthic	SHA-DUS	125-130	5-530	TSEA	F	this work	-	
Portunidae Rafinesque, 1815									
Portuninae Rafinesque, 1815									
Callinectes amnicola (De Rochebrune, 1883)	Benthic	SHA	inshore	0-30	TSEA	B, C	20	-	*C. latimanus*

Callinectes marginatus (A. Milne-Edwards, 1861)	Benthic	SHA	estuarine shallow waters	shallow w.	TSEA	A, B, C	7	-	*C. africanus*
Cronius ruber (Lamarck, 1818)	Benthic	SHA	2.5-20	5-69	PANT	A, B, C, D	5	-	*Goniosoma Milleri*
Laleonectes vocans (A. Milne-Edwards, 1878)	Benthic	SHA	5-6	6-37	AAWA	A, B, C, E	7	X	*Neptunus vocans*
Portunus (Portunus) hastatus (Linnaeus, 1767)	Benthic	SHA	24-40	2-32	TSEA	D, E	D	X	
Portunus (Portunus) inaequalis (Miers, 1881)	Benthic	SHA	4-15	4-73	TSEA	A, B, C	A	X	*Neptunus inaequalis*
Thalamitinae Paul'son, 1875									
Thalamita poissonii (Audouin, 1826)	Benthic	SHA	2-8	0.5-20	PANT	C, E	20	X	*T. africana*
PSEUDOZIOIDEA MacLeay, 1838									
Pseudoziidae MacLeay, 1838									
Euryozius bouvieri (A. Milne-Edwards, 1869)	Benthic	SHA	0-30	6-23	ECAI	A, B, C, D, E	5	X	*Xantho Bouvieri*
TRAPEZIOIDEA Miers, 1886									
Domeciidae Ortmann, 1893									
Domecia acanthophora africana Guinot, 1964	Benthic	SHA	2.5-22	0-35	IWAF	A, B, C, D, E	19	X	*D. hispida*
XANTHOIDEA MacLeay, 1838									
Panopeidae Ortmann, 1893									
Eurypanopeus blanchardi (A. Milne-Edwards, 1881)	Benthic	SHA	0-22	0-6	TSEA	A, B, C, D, F	1	-	*Xanthus (Xantho) parvulus*
Panopeus africanus A. Milne-Edwards, 1867	Benthic	SHA	0-8	0-140	TSEA	D	D	X	
Xanthidae MacLeay, 1838									
Xanthidae spec. Fransen, 1991	Benthic	SHA-DUS	0-312	0-0.5	TSEA	D	D	-	
Actaeinae Alcock, 1898									
Paractaea margaritaria (A. Milne-Edwards, 1868)	Benthic	SHA	3-91	4/5-45	TSEA	A, B, C, D, F	4	-	*Actaea margaritaria*
Paractaea monodi Guinot, 1969	Benthic	SHA-SUS	0.5-91	0.5-200	ATLM	A, B, C, D, E	18	X	*Actaea margaritaria*
Paractaea rufopunctata (H. Milne Edwards, 1834)	Benthic	SHA	30-91	0-69	PANT	A	4	X	*Actaea rufopunctata*

Euxanthinae Alcock, 1898									
Glyptoxanthus cavernosus (A. Milne-Edwards, 1878)	Benthic	SHA	0-17	0-17	ECAI	A, B, C, D, E	7	X	*Actaea cavernosa*
Glyptoxanthus corrosus (A. Milne-Edwards, 1869)	Benthic	SHA	neritic littoral	-	ECVI	A, B, C	5	-	*Xantho corrosus*
Monodaeus couchii (Couch, 1851)	Benthic	SHA	110-594	0-1415	EAWT	A, D, E	18	X	*Xantho tuberculatus*
Xanthinae MacLeay, 1838									
Coralliope parvula (A. Milne-Edwards, 1869)	Benthic	SHA-DUS	5-110	0-355	TSEA	A, B, C, D, E	5	X	*Actumnus parvulus*
Cycloxanthops occidentalis (A. Milne-Edwards, 1868)	Benthic	SHA	0-3	0-23	TSEA	A, B, C	4	-	*Xantho occidentalis*
Microcassiope minor (Dana, 1852)	Benthic	SHA-SUS	0.5-61	0-220	AAWA	A, B, C, D, E	5	X	*Xanthodes rufopunctatus*
Nanocassiope melanodactyla (A. Milne-Edwards, 1867)	Benthic	SHA-SUS	4-225	5-200	TSEA	A, B, D, E	4	X	*Xanthodes melanodactylus*
Paraxanthias eriphioides (A. Milne-Edwards, 1867)	Benthic	SHA	0.5-85	?	ECAI	A, B, C, D, E	3	-	*Xanthodes eriphioides*
Xantho hydrophilus (Herbst, 1790)	Benthic	SHA	0-30	0-37	ATLM	A, B, C, D, E	18	X	*X. floridus*
Xantho sexdentatus (Miers, 1881)	Benthic	SHA	0-15	0-35	TSEA	D, F	D	X	
Xantho sp. Fransen, 1991	Benthic	SHA	? 0-7	0-15	TSEA	D	D	X	
Xanthodius inaequalis faba (Dana, 1852)	Benthic	SHA	0.5-10	-	ECVI	A, B, C, F	?1, 5	-	*Actaeodes faba* (1) *Chlorodius (Leptodius) convexus* (5)
Zosiminae Alcock, 1898									
Platypodiella picta (A. Milne-Edwards, 1869)	Benthic	SHA	0.5-28	0-30	TSEA	A, B, C, D, E	5	X	*Lophactaea picta*
THORACOTREMATA Guinot, 1977									
GRAPSOIDEA MacLeay, 1838									
Gecarcinidae MacLeay, 1838									
Cardisoma armatum Herklots, 1851	Terrestrial	-	terrestrial	terrestrial	TSEA	A, B, C	2	-	*C. Guanhumi*
Grapsidae MacLeay, 1838									

Geograpsus lividus (H. Milne Edwards, 1837)	Benthic	SHA	10-10	shallow w.	PANT	A, B, C	18	-	
Grapsinae MacLeay, 1838									
Grapsus adscensionis (Osbeck, 1765)	Benthic	SHA	0-10	0-4	TSEA	A, B, C, D, E, F	1	X	*G. pictus*
Pachygrapsus maurus (Lucas, 1846)	Benthic	SHA	0-0	0-6	ATLM	?A, D	D	X	*? Goniograpsus simplex*
Pachygrapsus transversus (Gibbes, 1850)	Benthic	SHA	0-6	0-7	PANT	A, B, C, D, E	13	X	
Planes minutus (Linnaeus, 1758)	Pelagic	SHA	0-31	0-31	PANT	D	D	X	
Percnidae Števčić, 2005									
Percnon gibbesi (H. Milne Edwards, 1853)	Benthic	SHA	0.5-29	0.5-29	PANT	A, B, C, D, E, F	18	X	*Leiolophus planissimus*
Plagusiidae Dana, 1851									
Euchirograpsus liguricus H. Milne Edwards, 1853	Benthic	SHA-DUS	110-180	10-359	EAWT	A, B, C, E	18	X	*E. americanus*
Plagusia depressa (Fabricius, 1775)	Benthic	SHA	0-5	0-5	AAWA	A, B, C, D, E, F	13	X	
Varunidae H. Milne-Edwards, 1853									
Cyclograpsinae H. Milne Edwards, 1853									
Cyclograpsus integer H. Milne Edwards, 1837	Benthic	SHA	0-10	2-5	AAWA	A, B, F	7	-	*C. occidentalis*
OCYPODOIDEA Rafinesque, 1815									
Ocypodidae Rafinesque, 1815									
Ocypodinae Rafinesque, 1815									
* *Ocypode africana* de Man, 1881	Benthic	SHA	0-3	0-3	TSEA	A	19	-	
Ocypode cursor (Linnaeus, 1758)	Benthic	SHA	0-3	0-3	EAWT	A, B, C, D, E, F	2	-	
Ucinae Dana, 1851									
Uca (Afruca) tangeri (Eydoux, 1835)	Benthic	SHA	0-2	0-2	TSEA	A, C, E	A	X	
PINNOTHEROIDEA de Haan, 1833									
Pinnotheridae de Haan, 1833									
Viridotheres marionae Manning, 1996	Benthic	SHA	91-91	-	ECVI	25	25	-	
Viridotheres viridis (Manning, 1993)	Benthic	SHA	3-15	-	ECVI	24	D	-	*Pinnotheres* spec.

Table 2.- Zoogeographic composition of the Cape Verdean brachyuran fauna showing the number of species (N) grouped by biogeographic pattern.

Species' biogeographic pattern	All Cape Verdean brachyuran (125 species, depth 0->2000 m) Species		Littoral and upper bathyal benthic (96 species, depth 0-300 m) Species	
	N	%	N	%
Tropical and subtropical eastern Atlantic (TSEA)	50	40.2	41	42.7
Atlanto-Mediterranean (ATLM)	18	14.4	12	12.5
Endemic to the Cape Verde Islands (ECVI)	12	9.6	11	11.5
Eastern Atlantic warm-temperate (EAWT)	10	8.0	7	7.3
Eastern Atlantic cold-temperate (EACT)	8	6.4	3	3.1
Amphi-Atlantic of warm affinity (AAWA)	7	5.6	7	7.3
Pantropical or circumtropical (PANT)	7	5.6	7	7.3
Eastern-central Atlantic island (ECAI)	6	4.8	6	6.3
Eastern Atlantic of wide distribution (EAWD)	3	2.4	1	1.0
Insular West African (IWAF)	2	1.6	1	1.0
Amphi-Atlantic of wide distribution (AAWD)	1	0.8	0	0.0
Cosmopolitan or worldwide (COSM)	1	0.8	0	0.0

Table 3.- Comparison between zoogeographic components of the Cape Verdean and Canarian littoral and upper bathyal benthic brachyurans, showing the number of species (N) grouped by biogeographic pattern.

Species' biogeographic pattern	Littoral and upper bathyal benthic (depth, 0-300 m) This work Cape Verde Islands 96 species Species		González (2016) Canary Islands 123 species Species	
	N	%	N	%
Tropical and subtropical eastern Atlantic (TSEA)	41	42.7	28	22.8
Atlanto-Mediterranean (ATLM)	12	12.5	39	31.7
Endemic to the Cape Verde Islands (ECVI)	11	11.5	-	-
Amphi-Atlantic of warm affinity (AAWA)	7	7.3	5	4.1
Eastern Atlantic warm-temperate (EAWT)	7	7.3	10	8.1
Eastern-central Atlantic island (ECAI)	6	6.3	5	4.1
Pantropical or circumtropical (PANT)	7	7.3	4	3.3
Eastern Atlantic cold-temperate (EACT)	3	3.1	21	17.1
Eastern Atlantic of wide distribution (EAWD)	1	1.0	6	4.9
Insular West African (IWAF)	1	1.0	-	-
Amphi-Atlantic of wide distribution (AAWD)	0	0.0	1	0.8
Cosmopolitan or worldwide (COSM)	0	0.0	1	0.8
Macaronesian (MAC)	-	-	3	2.4