

Marine Amphipods of the Macaronesian archipelagos and north-west African margin: checklist and geographical distribution

Jean-Claude DAUVIN¹, Ali BAKALEM² and Mohamed MENIOU³

¹ Normandie Université, UNICAEN, CNRS, UMR 6143 M2C, Laboratoire Morphodynamique Continentale et Côtière, 24 Rue des Tilleuls, 14000 Caen, France

² Ecole Nationale Supérieure Agronomique (ENSA), Avenue Hassan Badi, 16200 El Harrach, Algiers, Algeria

³ Institut Scientifique, Université Mohammed V, BP 703, Rabat-Agdal, Rabat, Morocco

Corresponding author: Jean Claude DAUVIN; jean-claude.dauvin@unicaen.fr

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Abstract

An updated amphipod checklist for 2024 is given for the amphipods recorded from the adlittoral to abyssal zones of the Macaronesian archipelagos and the north-west African margin. Four marine regions are taken into account: 1) North West Africa (NWA), 2) Mauritania and Senegal (SEN), 3) Canary, Selvagens and Madeira Archipelagos (CAN-MAD) and 4) the Cabo Verde Archipelago (CV). The total number of species recorded in these four regions is 509. CAN-MAD is the region with the greatest species richness (302 species), followed by NWA (297 species), SEN (152 species) and finally CV (122 species). Among the 509 species recorded, 66 have been described from this region while 59 are endemic. The most diverse family is the Ampeliscidae Krøyer, 1842 (32 species), the Scinidae Stebbing, 1888 (29 species), the Caprellidae Leach, 1814 (22 species). Then, five other families are each represented by 16 species or more, the Photidae Boeck, 1871, Maeridae Krapp-Schickel, 2008 and Ischryoceridae Stebbing, 1899 (17 species), Aoridae Stebbing, 1899 and Hyalidae Bulyčeva, 1957 (16 species). Only five species are non-indigenous or possibly non-indigenous. The biogeographical affinities of the benthic amphipods are highlighted by comparing them with communities from the continental/insular shelf of the four regions studied here as well as with three neighbouring areas, i.e.: part of the Lusitanian maritime province (BIS-IBE), the Mediterranean shores of Morocco and Algeria (MOR-ALG) and the Azores Archipelago (AZO). The CV and SEN fauna are distinguishable from the others, which form two main groups: the NWA, MOR-ALG and BIS-IBE on the one hand, and the CAN-MAD and AZO archipelagos on the other. Future research should be focused along the coasts of Mauritania and Senegal and around the Cabo Verde Archipelago where there is a lack of knowledge not only on amphipods but also regarding marine invertebrate biodiversity in general. Special attention should be paid to biofouling in harbours since this is liable to increase the number of non-indigenous species which appears to be very low in the Macaronesian archipelagos in spite of the intense maritime traffic.

Keywords: Amphipods; biogeography; Macaronesia; Morocco; Madeira Archipelago; Canary Archipelago; Cabo Verde Archipelago; Mauritania; Senegal.

Introduction

Faced with the increase in marine human activities and the pressures on ecosystems, particularly in coastal environments, it is essential to measure the impacts generated by these anthropogenic stressors (Halpern *et al.*, 2015). The macrobenthos is among the biological compartments most affected by the degradation of the marine environment due to trawler fishing, the extraction of aggregates, port dredging and spoil deposition as well as the installation of offshore wind turbines in Europe, the United States and China (Jiao *et al.*, 2015). To measure the impacts, it is mandatory in most cases to monitor the

benthos affected by these activities. The BACI (Before After Control Impact) approach is most often proposed to assess these impacts. Such studies generate a lot of environmental data, including lists of benthic species sampled during these surveys. However, some of the species recorded during these surveys - often carried out by consultancy firms - are subject to caution and deserve to be verified by an expert (Dauvin, 2005). Nevertheless, these studies generate interesting data, including sightings of new species for a given site or region.

Many global inventories of marine fauna were carried out at the end of the 1990s. However, to obtain a better knowledge of the degradation of biodiversity in marine

areas, we need to integrate the data from consultancy engineers and ecologists and not merely from taxonomists. Moreover, these studies are habitually to be found in reports and other documents of the grey literature which need to be checked in detail to extract useful data.

Indeed, comprehensive checklists of the marine fauna have been published over the last few decades, thus increasing our knowledge of biodiversity, such as on the scale of the Mediterranean (Coll *et al.*, 2010) or on a regional scale as in the case of Italian marine molluscs (Renda *et al.*, 2022) or the marine molluscs of Spanish waters (Gofas *et al.*, 2017).

Similarly, a number of checklists of marine amphipods have been recently published for several regions of the world-wide Ocean, including Indian waters (Bhoi *et al.*, 2023), the tropical eastern Pacific (Garcia Madrigal, 2007), southeast Asia and neighbouring regions (Azman *et al.*, 2022), Pacific Mexican waters (Winfield *et al.*, 2020), the Gulf of Mexico (Escobar-Briones & Winfield, 2003), the English Channel (Dauvin, 2022), the Mediterranean Spanish coast (De-La-Ossa-Carretero *et al.*, 2010) or for the southern part of the Mediterranean Sea (Bakalem *et al.*, 2024). These latter authors (Bakalem *et al.*, 2024) added 26 species which were not included in the ‘Amphipoda of the Mediterranean Sea’, but which had been reported as species identified up until 1997 at the scale of this semi-enclosed Sea (Ruffo, 1982; 1989; 1993; 1998). Among these new records, seven species were described from the Mediterranean Sea and 19 correspond to new localities mainly found in Moroccan and Algerian waters.

The importance of amphipods has been recently pointed out, in view of the abundant pelagic and benthic populations of this group in marine ecosystems. In their review, Ritter & Bourne (2024) highlight the fact that amphipods provide an essential biological link between benthic and pelagic processes as well as between marine and atmospheric ecosystems. Amphipods fulfil many functional roles as predators and prey, bioturbators, mesograzers, secondary producers and facilitators of nutrient cycling, and also serve as indicators of marine and sediment health. In another review on the predation of birds, cephalopods, fish and marine mammals on marine amphipods, Dauvin (2024) showed that amphipods are important prey for fish and mammals. Along with cephalopod juveniles, they are also included in the trophic diet of shorebirds that consume amphipods mostly during low tide on tidal flats. They display diel migration, which reinforces the predation by demersal fish in the Benthic Boundary Layer, as well as by pelagic fish in the water column.

Other studies have also focused on this important group; Arfianti & Costello (2020) have presented a global biogeography of marine amphipods, Momtazi & Saeedi (2024) have explored the latitudinal gradients and environmental drivers of amphipod biodiversity patterns regarding depth and habitat variations, while Marchini & Cardecchia (2017) have contributed to a global review of the alien amphipods in a “sea of troubles”. Horton *et al.* (2023) have provided an overview of the World Amphipoda

Database (WAD), a global species database that is part of the World Register of Marine Species (WoRMS). Launched in 2013, the database contains entries for over 10,500 accepted species names. Further work remains to complete the linking of unaccepted names, original descriptions and environmental information. Once these tasks are completed, the database will be considered complete for 8 of the 13 priorities, and efforts will continue to input new taxa annually and focus on the remaining priorities, particularly the input of type localities (Horton *et al.*, 2023).

Amphipods are distributed from the adlittoral to the hadal zones, but mostly live on the continental shelf from 0 to 200 m depth (Barnard & Karaman, 1991). Among these, about 8 000 are marine benthic species, while there are only about 300 marine pelagic species (Horton *et al.*, 2023).

Given the geographical proximity and communication through the Strait of Gibraltar and the spreading of data on amphipods from the Macaronesian archipelagos and the north-west African coasts, it would appear interesting to summarize our knowledge on the amphipods of these regions. Our study follows on from a first inventory of amphipods of the southern Mediterranean (Bakalem *et al.*, 2024). In this way, we aim to contribute to a better knowledge of amphipods recorded in the North-East Atlantic.

The main objective of this study is to provide an updated checklist of benthic and pelagic amphipods in coastal and continental shelf waters, as well as bathyal and abyssal zones in four Macaronesian archipelagos and the north-west African coasts.

With a view to discussing biogeographic relationships of amphipods from the North-Eastern Atlantic Ocean, we present a comparison which covers benthic species from the continental shelf supplemented with a checklist for three adjacent marine regions: the Azores, part of the Lusitanian province (Bay of Biscay and Iberian coast) and the Mediterranean coasts of Morocco and Algeria.

Materials and Methods

Amphipod checklist method and data sources

In this paper, we report the marine amphipods recorded from the adlittoral to abyssal zones of the north-west African margin and the Macaronesian archipelagos. All available scientific papers (fauna, taxonomic and ecological studies), as well as the grey literature including reports and PhD theses available on the Internet, have been checked to access the amphipod lists for each country or region included in the present study (see Appendix listing all the available papers in which amphipods have been reported).

The World Register of Marine Species (WoRMS Editorial Board, 2025) was used to update the literature data.

As in a previous paper on amphipods from countries bordering the southern Mediterranean Sea (Bakalem *et al.*, 2024), the present list is arranged in alphabetical or-

der of the family names, with a view to comparing the present checklist with the former checklist: a number of species are amalgamated under the previous classification: Caprellidea, Gammaridea, Ingolfiellidea and Hyperiidea. The checklist reports only taxa that are formally identified at the species level.

Marine regions

Following Freitas *et al.* (2019), Figure 1 shows the limits of the checklists for four marine regions: 1) North West Africa (NWA: from Gibraltar Strait to Cape Blanc), 2) Mauritania and Senegal (from Cape Blanc to Cape Skirring) (SEN), 3) Canary, Selvagens and Madeira Archipelagos (CAN-MAD). These three archipelagos (MAD, SEL and CAN) are included in the Macaronesian biogeographic region, along with 4) CAB or CV in the present study for Cabo Verde Archipelago, [but this latter is not included in the marine biogeographic region defined by the European Environment Agency].

To study the geographical affinities of amphipods of the north-eastern Atlantic, three other marine regions were selected: 1) the Azores Archipelago (AZO), 2) the Bay of Biscay and Iberian coast, belonging to the Lusitanian province (BIS-IBE), which includes the Gulf of Cadiz (CAD); the Portuguese coast (POR), the Asturias

coast (AST) and the Bay of Biscay (BIS), and 3) the Mediterranean coasts of Morocco and Algeria (MOR-ALG). Only the benthic amphipods of the continental shelf (0-200 m) of these three regions are listed here and compared with the benthic amphipods reported in four sectors of the Macaronesian archipelagos and north-west African coast, i.e., covering a total of seven biogeographic regions.

Statistical analyses

The comparison of the checklists of amphipods (Presence/Absence of the species) is based here on Sørensen's coefficient which takes into account only the presence of the species and the construction of dendrograms using the group average algorithm generated from the PRIMER V6 software (Clarke & Gorley, 2006). Hierarchical Cluster Analysis (HCA) was carried out on all the amphipod species recorded from four Macaronesian archipelagos and the north-west African coasts, then a HCA including only continental shelf benthic amphipods (0-200 m); a final HCA was carried out only on benthic amphipods recorded from seven marine regions, i.e. the four regions of the present study plus three neighbouring regions (Azores, Atlantic Iberian Peninsula plus the Bay of Biscay and the Mediterranean coast of Morocco-Algeria).

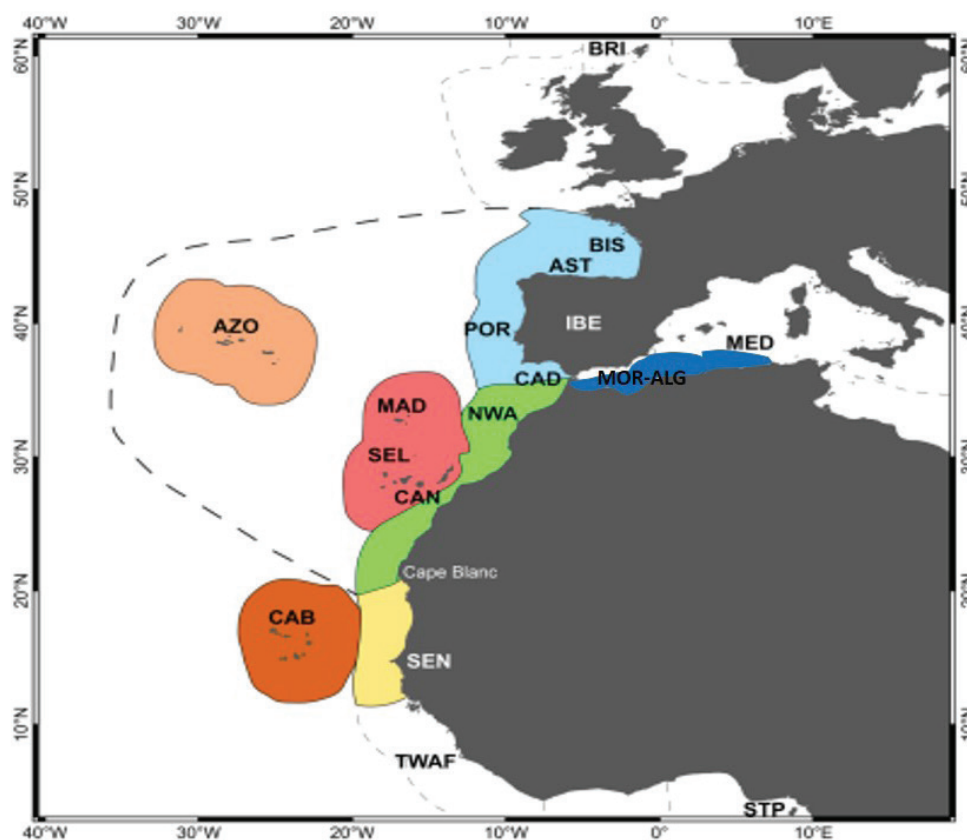


Fig. 1: Biogeographic regions considered in this study: North West Africa (NWA: from Gibraltar Strait to Cape Blanc); Mauritania (Cape Blanc) and Senegal (to Cape Skirring) (SEN); Canaries, Selvagens and Madeira Archipelagos (CAN-MAD) and the Cabo Verde Archipelago (CAB or CV in the present study). Three archipelagos (MAD, SEL and CAN) are included in the Macaronesian biogeographic region. The Azores (AZO) also belong to the Macaronesian archipelagos. The Bay of Biscay and Iberian coast form part of the Lusitanian province (BIS-IBE: the Gulf of Cadiz, CAD: the Portuguese coast: POR, the Asturias coast: AST and the Bay of Biscay: BIS), and the Mediterranean coasts of Morocco and Algeria (MOR-ALG) (Freitas *et al.*, 2019, modified).

Results

Number of species and families

A total of 509 species have been reported for the four marine regions (or sectors) studied here (Table 1). The richest region is CAN-MAD (302 species), followed by

NWA showing a similar biodiversity with 297 species. The two other regions show lower numbers of species with 152 for SEN and 122 for CV. For the four regions taken together, the deep-sea amphipods account for 28 species, while the number of pelagic species are well represented with 147 species, making up 29% of the total number.

Table 1. Checklist of the 509 amphipods from the four regions of the Macaronesian Archipelagos and North-Western Atlantic Africa, classified per alphabetical names of the families (NWA: Northwest African coasts; CAN-MAD: Canary & Madeira Archipelagos; SEN: Senegalese & Mauritanian coasts; CV: Cabo Verde).

Families & Species	Zones			
	NWA	CAN – MAD	SEN	CV
Alicellidae Lowry & De Broyer, 2008				
<i>Alicella gigantea</i> Chevreux, 1899		1		
<i>Paralicella tenuipes</i> Chevreux, 1908		1		1
Amaryllididae Lowry & Stoddart, 2002				
<i>Bathymaryllis haswelli</i> (Stebbing, 1888)	1	1	1	
<i>Bathymaryllis pulchellus</i> (Bonnier, 1896)	1			
Ampeliscidae Krøyer, 1842				
<i>Ampelisca aequicornis</i> Bruzelius, 1859	1	1	1	
<i>Ampelisca anophthalma</i> Bellan-Santini & Kaim-Malka, 1977	1			
<i>Ampelisca armoricana</i> Bellan-Santini & Dauvin, 1981	1		1	
<i>Ampelisca bidentata</i> Schellenberg, 1925			1	
<i>Ampelisca brevicornis</i> (A. Costa, 1853)	1	1	1	
<i>Ampelisca cavicoxa</i> Reid, 1951		1		1
<i>Ampelisca ctenopus</i> Schellenberg, 1925			1	
<i>Ampelisca diadema</i> (A. Costa, 1853)	1		1	
<i>Ampelisca gibba</i> G.O. Sars, 1883	1		1	
<i>Ampelisca heterodactyla</i> Schellenberg, 1925	1		1	
<i>Ampelisca hupferi</i> Schellenberg, 1925			1	
<i>Ampelisca latifrons</i> Schellenberg, 1925			1	
<i>Ampelisca lusitanica</i> Bellan-Santini & Marques, 1987	1			
<i>Ampelisca monoculata</i> Dauvin & Bellan-Santini, 1985			1	
<i>Ampelisca palmata</i> K.H. Barnard, 1916			1	
<i>Ampelisca pectenata</i> Reid, 1951			1	
<i>Ampelisca rubella</i> A. Costa, 1864	1	1	1	
<i>Ampelisca sarsi</i> Chevreux, 1888			1	
<i>Ampelisca senegalensis</i> Chevreux, 1925	1		1	
<i>Ampelisca serraticaudata</i> Chevreux, 1888	1	1	1	
<i>Ampelisca spinifer</i> Reid, 1951			1	
<i>Ampelisca spinimana</i> Chevreux, 1887	1		1	
<i>Ampelisca spinipes</i> Boeck, 1861	1		1	
<i>Ampelisca tenuicornis</i> Lilljeborg, 1855			1	
<i>Ampelisca typica</i> (Spence Bate, 1857)	1		1	
<i>Ampelisca uncinata</i> Chevreux, 1887	1		1	
<i>Ampelisca unidentata</i> Schellenberg, 1936	1			

Continued

Table 1 continued

Families & Species	Zones			
	NWA	CAN – MAD	SEN	CV
<i>Ampelisca verga</i> Reid, 1951			1	
<i>Byblis guernei</i> Chevreux, 1887	1		1	
<i>Haploops lodo</i> J.L. Bernard, 1961	1			
<i>Haploops proxima</i> Chevreux, 1919	1		1	
<i>Haploops tubicola</i> Liljeborg, 1856	1			
Amphilochidae Boeck, 1871				
<i>Amphilochus manudens</i> Spence Bate & Westwood, 1862		1		
<i>Apolochus brunneus</i> (Della Valle, 1893)		1		
<i>Apolochus neapolitanus</i> (Della Valle, 1893)	1	1	1	
<i>Apolochus picadurus</i> (J.L. Barnard, 1962)	1			
<i>Apolochus spencebatei</i> (Stebbing, 1876)	1	1	1	
Amphithyridae Zeidler, 2016				
<i>Amphithyrus bispinosus</i> Claus, 1879	1	1		
<i>Amphithyrus glaber</i> Spandl, 1924	1			
<i>Amphithyrus muratus</i> Volkov, 1982				1
<i>Amphithyrus sculpturatus</i> Claus, 1879	1	1		
<i>Amphithyrus similis</i> Claus, 1879		1		
<i>Paralycaea gracilis</i> Claus, 1879		1		
Ampithoidae Boeck, 1871				
<i>Amphitholina cuniculus</i> (Stebbing, 1874)	1			
<i>Ampithoe ferox</i> (Chevreux, 1902)	1	1		
<i>Ampithoe grubiformis</i> Reid, 1951				1
<i>Ampithoe kergueleni</i> Stebbing, 1888			1	1
<i>Ampithoe ramondi</i> Audouin, 1826	1	1		1
<i>Ampithoe riedli</i> Krapp-Schickel, 1968	1	1		
<i>Ampithoe rubricata</i> (Montagu, 1808)	1	1		
<i>Cymadusa crassicornis</i> (A. Costa, 1853)	1			
<i>Cymadusa filosa</i> Savigny, 1816	1	1	1	1
<i>Pleonexes gammaroides</i> Spence Bate, 1857	1	1	1	
<i>Pleonexes helleri</i> (Karaman, 1975)	1	1		
<i>Sunamphitoe pelagica</i> (H. Milne Edwards, 1830)	1	1	1	
Aoridae Stebbing, 1899				
<i>Aora gracilis</i> (Spence Bate, 1857)	1	1		
<i>Aora spinicornis</i> Afonso, 1976	1			
<i>Aora typica</i> Krøyer, 1845	1	1	1	1
<i>Autonoe hirsutipes</i> (Stebbing, 1895)		1	1	
<i>Autonoe longipes</i> (Liljeborg, 1852)		1		
<i>Globosolembos francanni</i> (D. M. Reid, 1951)				1
<i>Grandidierella elongata</i> Chevreux, 1926	1		1	
<i>Lembos websteri</i> Spence Bate, 1857	1			
<i>Microdeutopus algicola</i> Della Valle, 1893	1			
<i>Microdeutopus anomalus</i> (Rathke, 1843)	1	1		

Continued

Table 1 continued

Families & Species	Zones			
	NWA	CAN – MAD	SEN	CV
<i>Microdeutopus chelifera</i> (Spence Bate & Westwood, 1862)	1	1		
<i>Microdeutopus damnoniensis</i> (Spence Bate, 1857)	1	1		
<i>Microdeutopus gryllotalpa</i> A. Costa, 1853	1			
<i>Microdeutopus obtusatus</i> Myers, 1973	1			
<i>Microdeutopus stationis</i> Della Valle, 1893		1		
<i>Microdeutopus versiculatus</i> (Spence Bate, 1857)	1	1	1	
Archaeoscinidae K. H. Barnard, 1930				
<i>Archaeoscina steenstrupi</i> (Spence Bate, 1857)	1			1
Argissidae Walker, 1904				
<i>Argissa hamatipes</i> (Norman, 1869)	1		1	
Aristiidae Lowry & Stoddart, 1997				
<i>Perrierella audouiniana</i> (Spence Bate, 1857)	1		1	
Atylidae Lilljeborg, 1865				
<i>Nototropis falcatus</i> (Metzger, 1871)	1			
<i>Nototropis guttatus</i> (A. Costa in Hope, 1851)	1	1	1	1
<i>Nototropis swammerdamei</i> (H. Milne Edwards, 1830)	1	1	1	
<i>Nototropis vedlomensis</i> (Spence Bate & Westwood, 1862)	1			
Bathyporeiidae d'Udekem d'Acoz, 2011				
<i>Bathyporeia chevreuxi</i> d'Udekem d'Acoz & Vader, 2005	1		1	
<i>Bathyporeia elegans</i> Watkin, 1938	1	1		
<i>Bathyporeia elkaimi</i> d'Udekem d'Acoz & Menioui, 2004	1			
<i>Bathyporeia guilliamsoniana</i> (Spence Bate, 1857)	1	1	1	
<i>Bathyporeia ledoyeri</i> d'Udekem d'Acoz & Menioui, 2004	1			
<i>Bathyporeia microceras</i> d'Udekem d'Acoz & Menioui, 2004	1			
<i>Bathyporeia nana</i> Toumond, 1966	1			
<i>Bathyporeia pelagica</i> (Spence Bate, 1857)	1	1	1	
<i>Bathyporeia pilosa</i> Lindström, 1855	1			
<i>Bathyporeia watkini</i> d'Udekem d'Acoz, Echchaoui & Menioui, 2005	1			
Bogidiellidae Hertzog, 1936				
<i>Bogidiella madeirae</i> Stock, 1994		1		
<i>Cabogidiella littoralis</i> Stock & Vonk, 1992				1
<i>Stygogidiella atlantica</i> (Sánchez, 1991)		1		
<i>Xystriogidiella spathulata</i> (Stock & Rondé-Broekhuizen, 1987)		1		
Brachyscelidae Stephensen, 1923				
<i>Brachyscelus cruscum</i> Spence Bate, 1861	1	1		1
<i>Brachyscelus globiceps</i> (Claus, 1879)				1
<i>Brachyscelus macrocephalus</i> Stephensen, 1925		1		1
<i>Brachyscelus rapax</i> (Claus, 1871)				1
Calliopiidae G.O. Sars, 1893				
<i>Apherusa alacris</i> Krapp-Schickel, 1969	1	1		
<i>Apherusa bispinosa</i> (Spence Bate, 1857)	1	1	1	
<i>Apherusa chiereghinii</i> Giordani Soika, 1950		1		

Continued

Table 1 continued

Families & Species	Zones			
	NWA	CAN – MAD	SEN	CV
<i>Apherusa jurinei</i> (H. Milne Edwards, 1830)	1			
<i>Apherusa mediterranea</i> Chevreux, 1911	1	1		
<i>Apherusa ovalipes</i> Norman & Scott, 1906	1	1	1	
<i>Apherusa vexatrix</i> Krapp-Schickel, 1979		1		
<i>Stenopleura atlantica</i> Stebbing, 1888	1	1	1	1
Caprellidae Leach, 1814				
<i>Aeginina longicornis</i> (Krøyer, 1843)			1	
<i>Caprella acanthifera</i> Leach, 1814	1	1		
<i>Caprella cavediniae</i> Krapp-Schickel & Vader, 1998		1		
<i>Caprella danilevskii</i> Czerniavsky, 1868	1	1		
<i>Caprella dilatata</i> Krøyer, 1843	1			
<i>Caprella equilibra</i> Say, 1818	1	1	1	
<i>Caprella grandimana</i> Mayer, 1882	1	1		
<i>Caprella hirsuta</i> Mayer, 1890	1			
<i>Caprella innocens</i> Mayer, 1903	1			
<i>Caprella liparotensis</i> Haller, 1879	1	1		
<i>Caprella penantis</i> Leach, 1814	1	1	1	
<i>Caprella scaura</i> Templeton, 1836		1		
<i>Caprella takeuchii</i> Guerra-García, Sánchez-Moyano & García-Gómez, 2001	1			
<i>Caprella wirtzi</i> Krapp-Schickel & Takeuchi, 2000				1
<i>Liropus gracilis</i> Chevreux, 1920	1		1	
<i>Mantacaprella macaronensis</i> Vázquez-Luis, Guerra-García, Carvalho & Png-Gonzalez, 2013		1		1
<i>Paracaprella pusilla</i> Mayer, 1890	1		1	
<i>Pariambus typicus</i> (Krøyer, 1845)		1		
<i>Phtisica marina</i> Slabber, 1769	1	1	1	1
<i>Pseudolirius kroyeri</i> (Haller, 1879)	1			
<i>Pseudoprotella inermis</i> Chevreux, 1920	1			
<i>Pseudoprotella phasma</i> (Montagu, 1804)	1	1	1	
Cebocaridae Lowry & Stoddart, 2011				
<i>Crybelocephalus birsteini</i> Thurston, 1976		1		
<i>Metacyphocaris helgae</i> Tattersall, 1906		1		
Colomastigidae Chevreux, 1899				
<i>Colomastix pusilla</i> Grube, 1861		1		
Corophiidae Leach, 1814				
<i>Apocorophium acutum</i> (Chevreux, 1908)	1	1		
<i>Corophium orientale</i> Schellenberg, 1928	1			
<i>Corophium volutator</i> (Pallas, 1766)	1			
<i>Leptocheirus guttatus</i> (Grube, 1864)				1
<i>Leptocheirus hirsutimanus</i> (Spence Bate & Westwood, 1862)	1			
<i>Leptocheirus mariae</i> Karaman, 1973		1		
<i>Leptocheirus pectinatus</i> (Norman, 1869)	1	1	1	

Continued

Table 1 continued

Families & Species	Zones			
	NWA	CAN – MAD	SEN	CV
<i>Leptocheirus pilosus</i> Zaddach, 1844	1	1		
<i>Medicorophium minimum</i> (Schiecke, 1978)		1		
<i>Medicorophium runcicorne</i> (Della Valle, 1893)	1		1	
<i>Monocorophium acherusicum</i> (A. Costa, 1853)	1	1	1	
<i>Monocorophium insidiosum</i> (Crawford, 1937)	1			
<i>Monocorophium sextonae</i> (Crawford, 1937)	1	1		
Cressidae Stebbing, 1899				
<i>Cressa mediterranea</i> Ruffo, 1979		1		
Cyclocaridae Lowry & Stoddart, 2011				
<i>Cyclocaris tahitensis</i> Stebbing, 1888				1
Cyphocarididae Lowry & Stoddart, 1997				
<i>Cyphocaris anonyx</i> Boeck, 1871	1			1
<i>Cyphocaris challengerii</i> Stebbing, 1888	1	1		1
Cyproidae J.L. Barnard, 1974				
<i>Peltocoxa damnoniensis</i> (Stebbing, 1885)		1		
<i>Peltocoxa gibbosa</i> (Schiecke, 1977)	1			
<i>Peltocoxa marioni</i> Catta, 1875	1		1	
<i>Peltocoxa mediterranea</i> Schiecke, 1977	1	1		
Cystisomatidae Willemoes-Suhm, 1875				
<i>Cystisoma fabricii</i> Stebbing, 1888	1	1		
<i>Cystisoma latipes</i> (Stephensen, 1918)		1		
<i>Cystisoma spinosus</i> (Fabricius, 1775)		1		
Dairellidae Bovallius, 1887				
<i>Dairella californica</i> (Bovallius, 1885)		1		
Dexaminidae Leach, 1814				
<i>Dexamine spiniventris</i> (A. Costa, 1853)	1			
<i>Dexamine spinosa</i> (Montagu, 1813)	1	1	1	
<i>Guernea</i> (<i>Guernea</i>) <i>coalita</i> (Norman, 1868)	1	1		
<i>Tritaeta chelata</i> Chevreux, 1925			1	
<i>Tritaeta gibbosa</i> (Spence Bate & Westwood, 1862)		1	1	
Dogielinotidae Gurjanova, 1953				
<i>Parhyale plumicornis</i> (Heller, 1866)	1			
Eriopisidae Lowry & Myers, 2013				
<i>Psammogammarus initialis</i> Stock & Sanchez, 1987		1		
<i>Psammogammarus spinosus</i> Stock & Vonk, 1992				1
<i>Psammogammarus stocki</i> Vonk, 1990		1		
<i>Victoriopisa atlantica</i> Stock & Platvoet, 1981			1	
Eupronoidae Zeidler, 2016				
<i>Eupronoe armata</i> Claus, 1879		1		1
<i>Eupronoe laticarpa</i> Stephensen, 1925	1	1		1
<i>Eupronoe maculata</i> Claus, 1879	1	1		1
<i>Eupronoe minuta</i> Claus, 1879	1	1		1

Continued

Table 1 continued

Families & Species	Zones			
	NWA	CAN – MAD	SEN	CV
<i>Parapronoe campbelli</i> Stebbing, 1888	1	1		1
<i>Parapronoe crustulum</i> Claus, 1879	1	1		1
<i>Parapronoe parva</i> Claus, 1879		1		
Eurytheneidae Stoddart & Lowry, 2004				
<i>Eurythenes gryllus</i> (Lichtenstein in Mandt, 1822)	1	1		1
Eusiridae Stebbing, 1888				
<i>Cleonardo neuvillei</i> Chevreux, 1908		1		
<i>Eusiroopsis riisei</i> Stebbing, 1897		1		1
<i>Eusirus longipes</i> Boeck, 1861	1			
<i>Rhachotropis grimaldii</i> (Chevreux, 1887)			1	
<i>Rhachotropis rostrata</i> Bonnier, 1896	1			
Gammaridae Latreille, 1802				
<i>Gammarus aequicauda</i> (Martynov, 1931)	1			
<i>Gammarus chevreuxi</i> Sexton, 1913	1			
<i>Gammarus insensibilis</i> Stock, 1966	1			
<i>Gammarus locusta</i> (Linnaeus, 1758)	1	1		
<i>Gammarus nox</i> Stock, 1995		1		
<i>Gammarus subtypicus</i> Stock, 1966	1			
<i>Marinogammarus marinus</i> (Leach, 1816)	1			
<i>Pectenogammarus olivii</i> (H. Milne Edwards, 1830)	1	1		
Hadziidae S. Karaman, 1943				
<i>Dulzura lobata</i> Stock & Vonk, 1991				1
<i>Hadzia acutus</i> (Andres, 1978)		1		
Haustoriidae Stebbing, 1906				
<i>Haustorius arenarius</i> (Slabber, 1769)	1			
Hornelliidae d'Udekem d'Acoz, 2010				
<i>Hornellia (Metaceradocus) perdentatus</i> Chevreux, 1925			1	
Hyalidae Bulyčeva, 1957				
<i>Apohyale media</i> (Dana, 1853)		1		
<i>Apohyale perieri</i> (Lucas, 1846)	1	1	1	
<i>Apohyale prevostii</i> (H. Milne Edwards, 1830)	1	1	1	
<i>Apohyale stebbingi</i> (Chevreux, 1888)	1	1		
<i>Hyale macrodactyla</i> Stebbing, 1899			1	
<i>Hyale pontica</i> Rathke, 1836	1	1		
<i>Parhyale aquilina</i> (Costa, 1857)		1		
<i>Parhyale hawaiiensis</i> (Dana, 1853)		1		
<i>Parhyale inyacka</i> (K.H. Barnard, 1916)			1	
<i>Parhyale multispinosa</i> Stock, 1987		1		
<i>Protohyale (Boreohyale) camptonyx</i> (Heller, 1866)	1	1		
<i>Protohyale (Protohyale) grimaldii</i> (Chevreux, 1891)		1		
<i>Protohyale (Protohyale) schmidtii</i> (Heller, 1866)	1	1	1	
<i>Ptilohyale barnardi</i> (Chevreux, 1926)			1	

Continued

Table 1 continued

Families & Species	Zones			
	NWA	CAN – MAD	SEN	CV
<i>Serejohyale ramalhoi</i> (Reid, 1939)		1		
<i>Serejohyale spinidactylus</i> (Chevreux, 1926)		1	1	
Hyperiidae Dana, 1852				
<i>Hyperoche medusarum</i> (Kröyer, 1838)		1		
<i>Hyperoche picta</i> Bovallius, 1889	1	1		
Hyperiopsideae Bovallius, 1886				
<i>Hyperiopsis voringi</i> G.O. Sars, 1885		1		
Ingolfiellidae Hansen, 1903				
<i>Ingolfiella canariensis</i> Vonk & Sánchez, 1991		1		
<i>Ingolfiella similis</i> Rondé-Broekhuizen & Stock, 1987		1		
<i>Ingolfiella unguiculata</i> Stock, 1992		1		
Iphimediidae Boeck, 1871				
<i>Iphimedia minuta</i> G.O. Sars, 1883			1	
<i>Iphimedia obesa</i> Rathke, 1843		1	1	
Isaeidae Dana, 1852				
<i>Pareurystheus dentatus</i> (Holmes, 1908)	1		1	1
Ischyroceridae Stebbing, 1899				
<i>Bonnierella abyssi</i> (Chevreux, 1887)			1	
<i>Centraloecetes dellavallei</i> (Stebbing, 1899)			1	
<i>Centraloecetes kroyeranus</i> (Spence Bate, 1857)		1	1	
<i>Centraloecetes neapolitanus</i> (Schiecke, 1978)	1			
<i>Centraloecetes striatus</i> (Myers & McGrath, 1979)	1			
<i>Erichthonius brasiliensis</i> (Dana, 1853)	1	1	1	1
<i>Erichthonius difformis</i> H. Milne Edwards, 1830		1		
<i>Erichthonius punctatus</i> (Spence Bate, 1857)	1	1	1	
<i>Jassa falcata</i> (Montagu, 1808)	1	1	1	
<i>Jassa herdmani</i> (Walker, 1893)		1		
<i>Jassa marmorata</i> Holmes, 1905	1	1		
<i>Jassa pusilla</i> (G.O. Sars, 1894)			1	
<i>Microjassa cumbrensis</i> (Stebbing & Robertson, 1891)		1		
<i>Neoischyrocerus inexpectatus</i> (Ruffo, 1959)		1		
<i>Parajassa pelagica</i> (Leach, 1814)	1			
<i>Plumulojassa oia</i> (Spence Bate & Westwood, 1862)	1			
<i>Siphonoecetes sabatieri</i> Rouville, 1894	1			
Kamakidae Myers & Lowry, 2003				
<i>Cerapopsis longipes</i> Della Valle, 1893		1		1
<i>Cerapopsis takamado</i> Menioui & Myers, 2001	1			
Kuriidae J.L. Barnard, 1964				
<i>Micropythia carinata</i> (Spence Bate, 1863)	1	1		
Lanceolidae Bovallius, 1887				
<i>Lanceola clausii</i> Bovallius, 1885	1	1		
<i>Lanceola loveni</i> Bovallius, 1885		1		

Continued

Table 1 continued

Families & Species	Zones			
	NWA	CAN – MAD	SEN	CV
<i>Lanceola pacifica</i> Stebbing, 1888	1	1		
<i>Lanceola sayana</i> Bovallius, 1885		1		
<i>Scypholanceola aestiva</i> (Stebbing, 1888)	1	1		
Lestrigonidae Zeidler, 2004				
<i>Hyperietta luzoni</i> (Stebbing, 1888)	1	1		1
<i>Hyperietta parviceps</i> Bowman, 1973				1
<i>Hyperietta stebbingi</i> Bowman, 1973				1
<i>Hyperietta stephensi</i> Bowman, 1973		1		1
<i>Hyperietta vosseleri</i> (Stebbing, 1904)	1	1		1
<i>Hyperionides longipes</i> Chevreux, 1900	1	1		1
<i>Hyperionyx macrodactylus</i> (Stephensen, 1924)				1
<i>Lestrigonus bengalensis</i> Giles, 1888	1	1		1
<i>Lestrigonus latissimus</i> (Bovallius, 1889)		1		1
<i>Lestrigonus macrophthalmus</i> (Vosseler, 1901)		1		1
<i>Lestrigonus schizogeneios</i> (Stebbing, 1888)	1	1		1
<i>Phronimopsis spinifera</i> Claus, 1879		1	1	1
<i>Themistella fusca</i> (Dana, 1853)		1		1
Leucothoidae Dana, 1852				
<i>Leucothoe brunonis</i> Krapp-Schickel & Menioui, 2005	1			
<i>Leucothoe euryonyx</i> Walker, 1901	1		1	
<i>Leucothoe incisa</i> Robertson, 1892	1	1		
<i>Leucothoe lilljeborgi</i> Boeck, 1861	1			
<i>Leucothoe occulta</i> Krapp-Schickel, 1975	1			
<i>Leucothoe procera</i> Spence Bate, 1857	1			
<i>Leucothoe richiardi</i> Lessona, 1865			1	
<i>Leucothoe spinicarpa</i> (Abildgaard, 1789)	1	1	1	1
<i>Leucothoe spinulosa</i> Chevreux, 1919			1	
Liljeborgiidae Stebbing, 1899				
<i>Idunella picta</i> (Norman, 1889)			1	
<i>Idunella sketi</i> Karaman, 1980		1		1
<i>Liljeborgia inermis</i> Chevreux, 1920			1	1
<i>Liljeborgia pallida</i> (Spence Bate, 1857)		1	1	
<i>Sextonia longirostris</i> Chevreux, 1920	1			
Lycaeidae Claus, 1879				
<i>Lycaea bovallii</i> Chevreux, 1900		1		1
<i>Lycaea pachypoda</i> (Claus, 1879)		1		1
<i>Lycaea pulex</i> Marion, 1874	1	1		
<i>Lycaea vincentii</i> Stebbing, 1888		1		1
<i>Simorhynchotus antennarius</i> (Claus, 1871)		1		1
Lycaeopsidae Chevreux, 1913				
<i>Lycaeopsis themistoides</i> Claus, 1879	1	1		1
<i>Lycaeopsis zamboangae</i> (Stebbing, 1888)	1	1		1

Continued

Table 1 continued

Families & Species	Zones			
	NWA	CAN – MAD	SEN	CV
Lysianassidae Dana, 1849				
<i>Lysianassa caesarea</i> Ruffo, 1987	1	1	1	
<i>Lysianassa ceratina</i> (Walker, 1889)		1	1	
<i>Lysianassa costae</i> H. Milne Edwards, 1830	1			
<i>Lysianassa pilicornis</i> Heller, 1866				1
<i>Lysianassa plumosa</i> Boeck, 1871	1		1	
<i>Lysianassina longicornis</i> (Lucas, 1846)		1		
<i>Socarnes erythrophthalmus</i> Robertson, 1892			1	
<i>Socarnes filicornis</i> (Heller, 1866)	1		1	
<i>Socarnopsis obesa</i> Chevreux, 1919			1	
Maeridae Krapp-Schickel, 2008				
<i>Animoceradocus semiserratus</i> (Spence Bate & Westwood, 1862)		1		
<i>Ceradocus</i> (<i>Ceradocus</i>) <i>orchestipes</i> A. Costa, 1853			1	1
<i>Elasmopus antennatus</i> (Stout, 1913)	1	1		
<i>Elasmopus brasiliensis</i> (Dana, 1853)	1			1
<i>Elasmopus canarius</i> Krapp-Schickel & Ruffo, 1990		1		
<i>Elasmopus pecteniscus</i> (Spence Bate, 1863)	1	1		
<i>Elasmopus pocillimanus</i> (Spence Bate, 1863)	1			1
<i>Elasmopus rapax</i> A. Costa, 1853	1	1	1	
<i>Elasmopus vachoni</i> Mateus & Mateus, 1966	1	1		
<i>Maera edwardsi</i> Chevreux, 1920	1	1	1	1
<i>Maera grossimana</i> (Montagu, 1808)		1	1	1
<i>Maera hirondellei</i> Chevreux, 1900				1
<i>Maeropsis perrieri</i> Chevreux, 1920	1		1	
<i>Othomaera knudseni</i> (Reid, 1951)	1			
<i>Othomaera othonis</i> (H. Milne Edwards, 1830)	1		1	
<i>Quadrimaera ascensionis</i> (K.H. Barnard, 1932)		1		
<i>Quadrimaera inaequipes</i> (A. Costa in Hope, 1851)	1	1		1
Megalurotidae Thomas & Barnard, 1886				
<i>Megaluropus agilis</i> Hoek, 1889		1		
Melitidae Bousfield, 1973				
<i>Abludomelita aculeata</i> (Chevreux, 1911)	1			
<i>Abludomelita obtusata</i> (Montagu, 1813)	1		1	
<i>Abludomelita richardi</i> (Chevreux, 1900)		1		
<i>Dulichchiella fresnelii</i> (Audouin, 1826)				1
<i>Melita coroninii</i> Heller, 1866	1			
<i>Melita hergensis</i> Reid, 1939	1			
<i>Melita palmata</i> (Montagu, 1804)	1	1	1	
<i>Verdeia grandimana</i> (Chevreux, 1908)				1
Melphidippidae Stebbing, 1899				
<i>Melphidippella macra</i> (Norman, 1869)			1	
Microphasmidae Stephensen & Pirlot, 1931				

Continued

Table 1 continued

Families & Species	Zones			
	NWA	CAN – MAD	SEN	CV
<i>Microphasma agassizi</i> Woltereck, 1909	1	1		
Microprotopidae Myers & Lowry, 2003				
<i>Microprotopus longimanus</i> Chevreux, 1887		1		
Mimonectidae Bovallius, 1885				
<i>Mimonectes gaussi</i> (Woltereck, 1904)	1	1		
<i>Mimonectes loveni</i> Bovallius, 1885	1	1		1
<i>Mimonectes spandlii</i> Bovallius, 1885	1			
<i>Mimonectes sphaericus</i> Bovallius, 1885		1		1
Nuuanuidae Lowry & Myers, 2013				
<i>Gammarella fucicola</i> (Leach, 1814)	1	1	1	
Oedicerotidae Lilljeborg, 1865				
<i>Kroyera carinata</i> Spence Bate, 1857	1	1		
<i>Periculodes longimanus</i> (Spence Bate & Westwood, 1868)	1		1	
<i>Pontocrates altamarinus</i> (Spence Bate & Westwood, 1862)	1		1	
<i>Pontocrates arenarius</i> (Spence Bate, 1858)	1	1		
<i>Synchelidium maculatum</i> Stebbing, 1906	1			
<i>Westwoodilla caecula</i> (Spence Bate, 1857)	1			
<i>Westwoodilla rectirostris</i> (Della Valle, 1893)	1		1	
Oxycephalidae Dana, 1852				
<i>Calamorrhynchus pellucidus</i> Streets, 1878	1	1		1
<i>Glossocephalus milneedwardsi</i> Bovallius, 1887	1	1		
<i>Leptocotis tenuirostris</i> (Claus, 1871)		1		1
<i>Oxycephalus clausi</i> Bovallius, 1887	1	1		1
<i>Oxycephalus longiceps</i> Claus, 1879		1		
<i>Oxycephalus piscator</i> H. Milne Edwards, 1830	1	1		1
<i>Rhabdosoma brevicaudatum</i> Stebbing, 1888	1	1		
<i>Rhabdosoma whitei</i> Spence Bate, 1863		1		
<i>Streetsia challengerii</i> Stebbing, 1888	1	1		1
<i>Streetsia porcella</i> (Claus, 1879)		1		1
Paraphronimidae Bovallius, 1887				
<i>Paraphronima crassipes</i> Claus, 1879	1	1		1
<i>Paraphronima gracilis</i> Claus, 1879	1	1		1
Parargissidae Lowry & Myers, 2017				
<i>Parargissa nasuta</i> Chevreux, 1908				1
Parascelidae Bovallius, 1887				
<i>Parascelus edwardsi</i> Claus, 1879		1		1
<i>Parascelus parvus</i> Claus, 1879		1		
<i>Schizoscelus ornatus</i> Claus, 1879		1		
<i>Thyropus sphaeroma</i> (Claus, 1879)		1		1
Pardaliscidae Boeck, 1871				
<i>Halice aculeata</i> Chevreux, 1912	1	1		
<i>Halice macronyx</i> (Stebbing, 1888)		1		

Continued

Table 1 continued

Families & Species	Zones			
	NWA	CAN – MAD	SEN	CV
<i>Halicoides discoveryi</i> Thurston, 1976		1		
<i>Nicippe tumida</i> Bruzelius, 1859	1		1	
<i>Spelaeoconicippe buchi</i> (Andres, 1975)		1		
Phliantidae Stebbing, 1899				
<i>Pereionotus testudo</i> (Montagu, 1808)	1	1		
Photidae Boeck, 1871				
<i>Gammaropsis anomala</i> (Chevreux, 1926)			1	
<i>Gammaropsis dentata</i> Chevreux, 1900	1	1		
<i>Gammaropsis maculata</i> (Johnston, 1828)	1	1	1	1
<i>Gammaropsis minuta</i> (Chevreux, 1926)			1	
<i>Gammaropsis ostroumowi</i> (Sowinsky, 1898)		1	1	
<i>Gammaropsis sophiae</i> (Boeck, 1861)	1	1	1	
<i>Gammaropsis ulrici</i> Krapp-Schickel & Myers, 1979		1		
<i>Latigammaropsis atlantica</i> (Stebbing, 1888)	1	1	1	1
<i>Megamphopus cornutus</i> Norman, 1869		1	1	
<i>Megamphopus longicornis</i> Chevreux, 1911		1		
<i>Megamphopus longidactyla</i> Chevreux, 1926			1	
<i>Photis antennata</i> Chevreux, 1926	1		1	
<i>Photis longicarpa</i> Chevreux, 1926			1	
<i>Photis longicaudata</i> (Spence Bate & Westwood, 1862)	1	1	1	
<i>Photis obesa</i> Chevreux, 1926			1	
<i>Photis reinhardi</i> Krøyer, 1842		1		
<i>Podoceropsis angulosa</i> Chevreux, 1920			1	
Phoxocephalidae G.O. Sars, 1891				
<i>Basuto stimpsoni</i> (Stebbing, 1908)			1	
<i>Harpinia antennaria</i> Meinert, 1890	1	1		
<i>Harpinia crenulata</i> (Boeck, 1871)		1		
<i>Harpinia pectinata</i> G.O. Sars, 1891	1		1	
<i>Harpinia propinqua</i> G.O. Sars, 1891	1			
<i>Joubinella ciliata</i> Chevreux, 1908		1		
<i>Metaphoxus fultoni</i> (Scott, 1890)	1			
<i>Metaphoxus simplex</i> (Spence Bate, 1858)	1			
<i>Pseudharpinia brevirostris</i> (Chevreux, 1919)	1		1	
<i>Pseudharpinia latipes</i> (Norman, 1900)	1			
Phronimidae Rafinesque, 1815				
<i>Phronima atlantica</i> Guérin-Méneville, 1836	1	1		1
<i>Phronima colletti</i> Bovallius, 1887	1	1		1
<i>Phronima curvipes</i> Vosseler, 1901	1			1
<i>Phronima pacifica</i> Streets, 1877		1		1
<i>Phronima sedentaria</i> (Forskål, 1775)	1	1	1	1
<i>Phronima solitaria</i> Guérin-Méneville, 1844	1	1		
<i>Phronima stebbingi</i> Vosseler, 1901		1		1

Continued

Table 1 continued

Families & Species	Zones			
	NWA	CAN – MAD	SEN	CV
<i>Phronimella elongata</i> (Claus, 1862)	1	1		1
Phrosinidae Dana, 1852				
<i>Anchylomera blossevillei</i> H. Milne Edwards, 1830	1	1		1
<i>Phrosina semilunata</i> Risso, 1822	1	1		1
<i>Primno brevidens</i> Bowman, 1978				1
<i>Primno latreillei</i> Stebbing, 1888				1
<i>Primno macropa</i> Guérin-Méneville, 1836	1	1		
Platyscelidae Spence Bate, 1862				
<i>Hemityphis tenuimanus</i> Claus, 1879	1			
<i>Paratyphis maculatus</i> Claus, 1879	1	1		1
<i>Paratyphis parvus</i> Claus, 1887		1		1
<i>Paratyphis promontori</i> Stebbing, 1888	1	1		
<i>Platyscelus armatus</i> (Claus, 1879)	1	1		
<i>Platyscelus crustulatus</i> (Claus, 1879)				1
<i>Platyscelus ovoides</i> (Risso, 1816)	1	1		
<i>Platyscelus serratulus</i> Stebbing, 1888	1	1		
<i>Tetrathyrus forcipatus</i> Claus, 1879	1	1		1
Pleustidae Buchholz, 1874				
<i>Mesopleustes abyssorum</i> (Stebbing, 1888)	1			
<i>Stenopleustes latipes</i> (M. Sars, 1858)	1		1	
Podoceridae Leach, 1814				
<i>Laetmatophilus armatus</i> (Norman, 1869)	1	1	1	
<i>Laetmatophilus purus</i> Stebbing, 1888	1		1	
<i>Laetmatophilus tuberculatus</i> Bruzelius, 1859		1		
<i>Podocerus senegalensis</i> Chevreux, 1926			1	
<i>Podocerus variegatus</i> Leach, 1814	1	1		
Pontogeneiidae Stebbing, 1906				
<i>Dautzenbergia dentata</i> (Chevreux, 1920)		1		
<i>Dautzenbergia grandimana</i> (Chevreux, 1887)			1	
<i>Dautzenbergia megacheir</i> (Walker, 1897)		1		
<i>Eusiroides dellavallei</i> Chevreux, 1899	1	1		
<i>Eusiroides sarsi</i> Chevreux, 1900		1	1	1
<i>Pontogeneia minuta</i> Chevreux, 1908				1
Pronoidae Dana, 1852				
<i>Pronoe capito</i> Guérin-Méneville, 1836	1	1		1
Pseudoniphargidae Karaman, 1993				
<i>Pseudoniphargus cupicola</i> Stock, 1988		1		
<i>Pseudoniphargus littoralis</i> Stock & Abreu, 1993		1		
<i>Pseudoniphargus macrurus</i> Stock & Abreu, 1993		1		
<i>Pseudoniphargus multidentatus</i> Stock, 1988		1		
<i>Pseudoniphargus porticola</i> Stock, 1988		1		
<i>Pseudoniphargus portosanti</i> Stock & Abreu, 1993		1		

Continued

Table 1 continued

Families & Species	Zones			
	NWA	CAN – MAD	SEN	CV
<i>Pseudoniphargus salinus</i> Stock, 1988		1		
Scinidae Stebbing, 1888				
<i>Acanthoscina acanthodes</i> (Stebbing, 1895)	1	1		
<i>Ctenoscina brevicaudata</i> Wagler, 1926		1		
<i>Ctenoscina macrocarpa</i> (Chevreux, 1905)		1		
<i>Scina borealis</i> (G.O. Sars, 1883)	1	1		1
<i>Scina crassicornis</i> (Fabricius, 1775)	1	1		1
<i>Scina curvidactyla</i> Chevreux, 1914	1	1		
<i>Scina damasi</i> Pirlot, 1929	1	1		1
<i>Scina excisa</i> Wagler, 1926		1		
<i>Scina incerta</i> Chevreux, 1900	1			
<i>Scina inermis</i> Chevreux, 1919	1			
<i>Scina lamperti</i> Vosseler, 1901		1		
<i>Scina latifrons</i> Wagler, 1926				1
<i>Scina lepisma</i> Chun, 1889	1	1		
<i>Scina marginata</i> (Bovallius, 1885)	1	1		
<i>Scina megameros</i> Chevreux, 1919		1		
<i>Scina oedicarpus</i> Stebbing, 1895		1		
<i>Scina pacifica</i> (Bovallius, 1887)	1			
<i>Scina pusilla</i> Chevreux, 1919		1		
<i>Scina rattrayi</i> Stebbing, 1895	1	1	1	1
<i>Scina rattrayi keilhacki</i> Wagler, 1926				1
<i>Scina similis</i> Stebbing, 1895	1	1		1
<i>Scina stebbingi</i> Chevreux, 1919		1		1
<i>Scina stenopus</i> Stebbing, 1895	1	1		
<i>Scina submarginata</i> Tattersall, 1906	1	1		1
<i>Scina tullbergi</i> (Bovallius, 1885)		1		1
<i>Scina uncipes</i> Stebbing, 1895		1		
<i>Scina vosseleri</i> Tattersall, 1906	1	1		
<i>Scina wagneri atlantis</i> Thurston, 1976		1		1
<i>Scina wolterecki</i> Wagler, 1926		1		
<i>Spinoscina spinosa</i> (Chevreux, 1914)	1	1		
Scopelocheiridae Lowry & Stoddart, 1997				
<i>Paracallisoma alberti</i> Chevreux, 1903		1		
Stegocephalidae Dana, 1852				
<i>Andaniexis abyssi</i> (Boeck, 1871)			1	
<i>Parandania boeckii</i> (Stebbing, 1888)		1		1
Stenothoidae Boeck, 1871				
<i>Metopa propinqua</i> G.O. Sars, 1892		1		
<i>Stenothoe dollfusi</i> Chevreux, 1887		1		
<i>Stenothoe marina</i> (Spence Bate, 1857)	1	1	1	
<i>Stenothoe monoculoides</i> (Montagu, 1813)	1	1	1	

Continued

Table 1 continued

Families & Species	Zones			
	NWA	CAN – MAD	SEN	CV
<i>Stenothoe tergestina</i> (Nebeski, 1881)	1	1	1	
<i>Stenula latipes</i> (Chevreux & Fage, 1925)	1			
<i>Wollastenothoe minuta</i> Gouillieux & Navarro-Mayoral in Navarro-Mayoral <i>et al.</i> , 2024		1		
Synopiidae Dana, 1853				
<i>Synopia scheeleana</i> Bovallius, 1886				1
<i>Syrrhoe affinis</i> Chevreux, 1908	1		1	
Talitridae Rafinesque, 1815				
<i>Africorchestia spinifera</i> (Mateus, 1962)	1			
<i>Britorchestia brito</i> (Stebbing, 1891)	1			
<i>Canariorchestia chevreuxi</i> (de Guerne, 1887)		1		
<i>Gazia ancheidos</i> (K.H. Barnard, 1916)		1		
<i>Orchestia gammarellus</i> (Pallas, 1766)	1	1		
<i>Orchestia mediterranea</i> A. Costa, 1853	1	1		
<i>Platorchestia platensis</i> (Krøyer, 1845)	1	1		
<i>Talitrus saltator</i> (Montagu, 1808)	1	1		
Thamneidae Zeidler, 2016				
<i>Thamneus rostratus</i> Bovallius, 1887	1	1		
Trischizostomatidae Lilljeborg, 1865				
<i>Trischizostoma longirostre</i> Chevreux, 1919			1	1
Tryphanidae Boeck, 1871				
<i>Tryphana malmii</i> Boeck, 1871	1	1		1
Tryphosidae Lowry & Stoddart, 1997				
<i>Abyssorhomene chevreuxi</i> (Stebbing, 1906)	1			1
<i>Hippomedon denticulatus</i> (Spence Bate, 1857)	1			
<i>Hippomedon robustus</i> G.O. Sars, 1895	1		1	
<i>Lepidepcreum crenulatum</i> Chevreux, 1925	1		1	
<i>Lepidepcreum crypticum</i> Ruffo & Schiecke, 1977	1			
<i>Lepidepcreum longicorne</i> (Spence Bate & Westwood, 1861)	1	1		
<i>Lepidepcreum typhlops</i> Bonnier, 1896	1		1	
<i>Orchomene humilis</i> (A. Costa, 1853)			1	
<i>Pseudorchomene plebs</i> (Hurley, 1965)				1
<i>Tryphosa crenata</i> Chevreux & Fage, 1925)			1	
<i>Tryphosella minima</i> (Chevreux, 1911)	1			
<i>Tryphosites alleni</i> Sexton, 1911			1	
<i>Tryphosites longipes</i> (Spence Bate & Westwood, 1861)		1		
Unciolidae Myers & Lowry, 2003				
<i>Unciola tenuipes</i> Chevreux, 1920			1	
Uristidae Hurley, 1963				
<i>Anonyx sarsi</i> Steele & Brunel, 1968		1		
<i>Ichnopus spinicornis</i> Boeck, 1861	1			
<i>Stephonyx biscayensis</i> (Chevreux, 1908)	1		1	

Continued

Table 1 continued

Families & Species	Zones			
	NWA	CAN – MAD	SEN	CV
<i>Stephonyx talismani</i> (Chevreux, 1919)	1		1	
<i>Tmetonyx nardonis</i> (Heller, 1867)	1			
Urothoidae Bousfield, 1978				
<i>Urothoe atlantica</i> Bellan-Santini & Menioui, 2004	1			
<i>Urothoe elegans</i> Spence Bate, 1857	1		1	
<i>Urothoe grimaldii</i> Chevreux, 1895	1		1	
<i>Urothoe marina</i> (Spence Bate, 1857)	1	1		
<i>Urothoe poseidonis</i> Reibish, 1905	1		1	
<i>Urothoe pulchella</i> (A. Costa, 1853)	1	1	1	
Vibiliidae Dana, 1852				
<i>Vibilia armata</i> Bovallius, 1887	1	1		1
<i>Vibilia australis</i> Stebbing, 1888		1		
<i>Vibilia borealis</i> Spence Bate & Westwood, 1868	1	1		
<i>Vibilia chuni</i> Behning & Woltereck, 1912	1			
<i>Vibilia cultripes</i> Vosseler, 1901	1	1		
<i>Vibilia jeangerardii</i> Lucas, 1846	1	1		
<i>Vibilia propinqua</i> Stebbing, 1888	1	1		1
<i>Vibilia pyripes</i> Bovallius, 1887		1		
<i>Vibilia stebbingi</i> Behning & Woltereck, 1912		1		
<i>Vibilia viatrix</i> Bovallius, 1887	1	1		1
<i>Vibilioides alberti</i> Chevreux, 1905		1		
Total of species	297	302	152	122

When only taking account of the 334 benthic species from the continental shelf, 204 species are listed for NWA, 167 for CAN-MAD, 136 for SEN and only 34 for CV, region where pelagic species are dominant (88 species).

The 509 species recorded in the four regions of the Macaronesian Archipelagos and the north-west African coasts belong to 90 families.

The most diversified family is the Ampeliscidae Krøyer, 1842 (32 species), the Scinidae Stebbing, 1888 (29 species), the Caprellidae Leach, 1814 (22 species). Then, five other families are each represented by 16 species or more: Photidae Boeck, 1871, Maeridae Krapp-Schickel, 2008 and Ischyroceridae Stebbing, 1899 (17 species), Aoridae Stebbing, 1899 and Hyalidae Bulyčeva, 1957 (16 species).

Eight families comprise between 10 and 15 species, 34 families between 3 and 9 species, while 13 families account for 2 species and 27 families (30%) account for only one species (Fig. 2).

Cluster analysis

The first analyses, including all species from the four

regions studied here, show a separation between the CV and SEN faunas, while the other three regions are separated at a similarity level of 30%. The SEN is separated from the CAN-MAD and NWA at 40 %, and these two latter regions are themselves separated at 60% (Fig. 3). Cluster analysis shows that each region displays a unique and particular amphipod diversity, with a high similarity between NWA and CAN-MAD amphipod faunas compared with SEN and CV. The second analyses include only the benthic species, showing the same pattern as above but with a greater separation of the CV fauna from the three others (Fig. 4).

Discussion

State of the inventory and comments

The amphipod checklist accounts for 509 species, which is a higher number than the 454 species in the inventory recently established for the five countries bordering the southern Mediterranean Sea (Bakalem *et al.*, 2024). However, there is a lack of data for pelagic species in the southern Mediterranean Sea, except along the Egyptian coast, while deep-sea amphipods are only

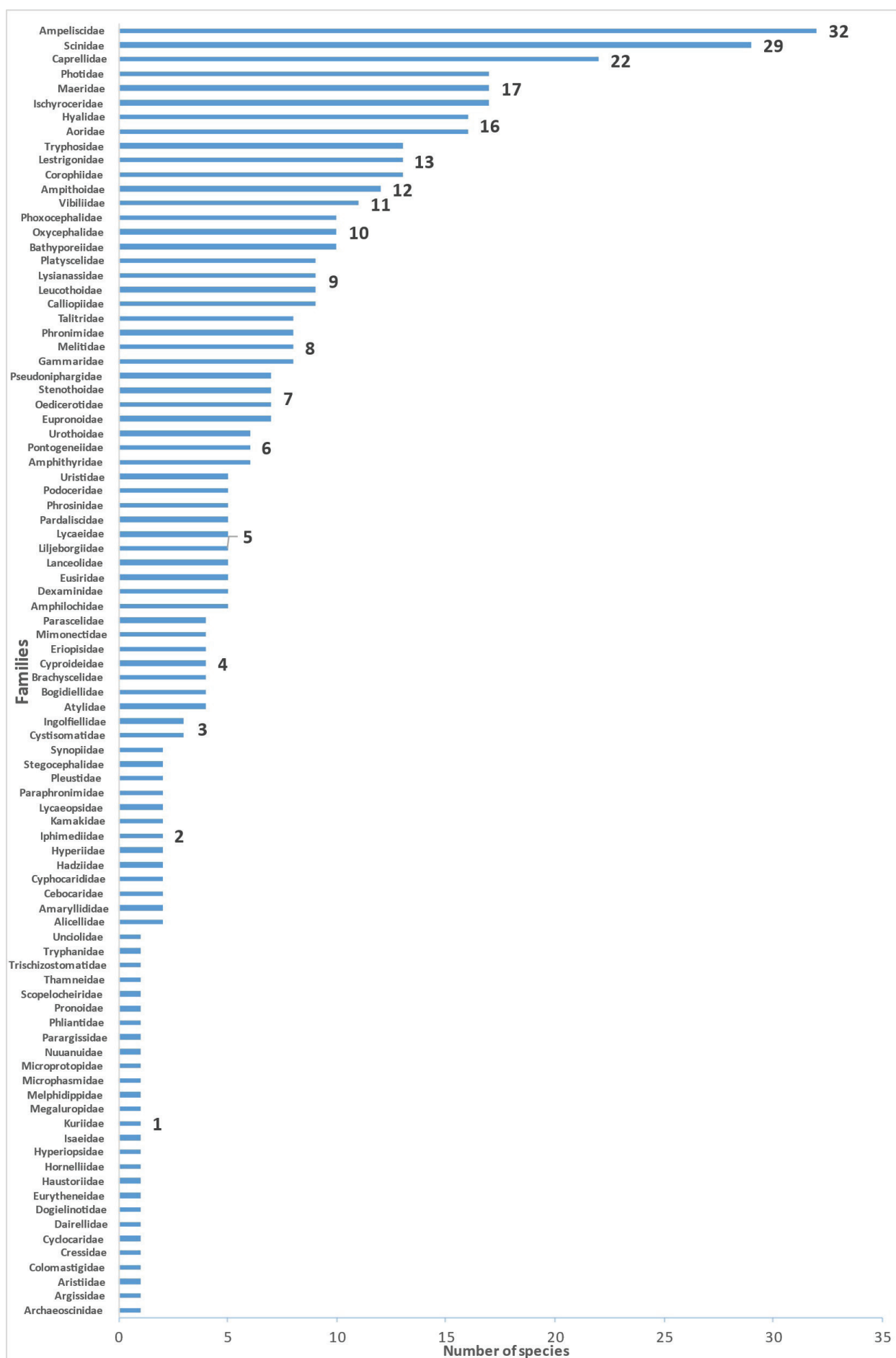


Fig. 2: Numbers of species among the 90 families reported in the 2024 amphipod checklist for the four regions Macaronesian Archipelagos and African coasts.

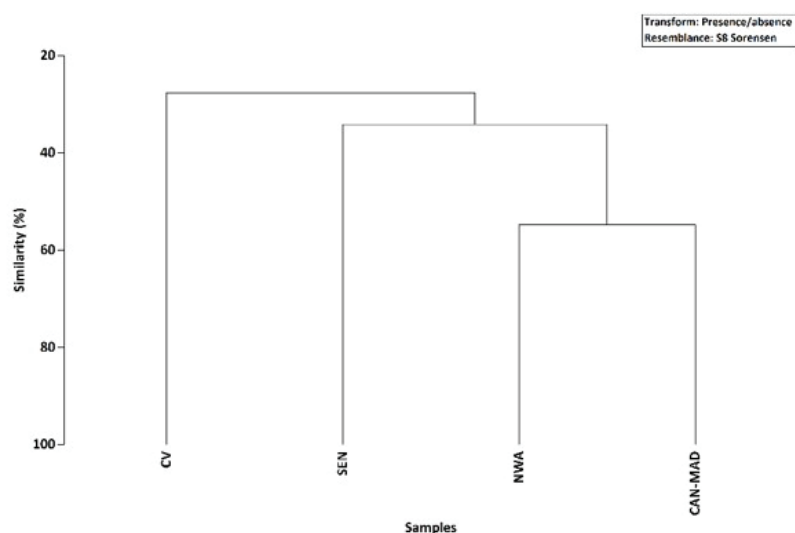


Fig. 3: Results of cluster analysis (Sørensen similarity) on all amphipod species in the four regions of the Macaronesian Archipelagos and north-west African coasts. See Figure 1 for location of the regions.

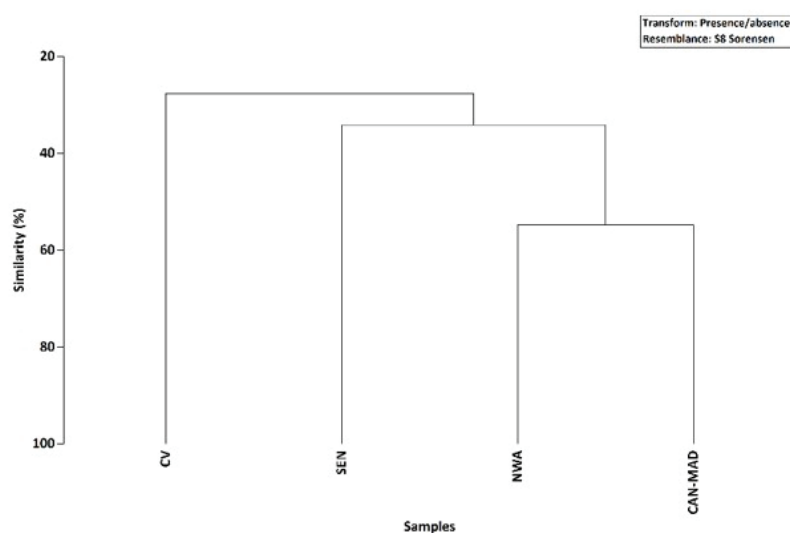


Fig. 4: Results of cluster analysis (Sørensen similarity) on benthic amphipod species recorded on the continental/insular shelf in the four regions of the Macaronesian Archipelagos and north-west African coasts. See Figure 1 for location of the regions.

known from a campaign off the Algerian coast (Bakalem *et al.*, 2024). Moreover, our checklist supersedes the checklists of Bachelet *et al.*, (2003) for amphipods from the southern Bay of Biscay (319 species) and Dauvin (2022) for the English Channel (269 species).

A total of 66 species (13% of total Amphipods) have been described from the four regions studied here, among them 21 coming from SEN, 17 from CAN-MAD, 17 from NWA and seven from CV, while four species were originally described from two regions (Table 2). Among the species new to science, Chevreux described 30 species (45%), then Stock (eight species), Reid (six species), and d'Udekem d'Acoz and Menioui (three species).

Table 3 reports the 59 endemic species recorded only in the four regions studied here. Most of them have been recorded only in the two archipelagos CAN-MAD and the region SEN. There are very few non-indigenous or possibly non-indigenous species in this part of the North-East Atlantic (Table 4), with four species from the Ca-

nary and Madeira Archipelagos and three species along the Moroccan coast. This is a very low number compared to the potential total of 105 species in this amphipod category for the world ocean (Marchini & Cardeccia, 2017), even though there is intense maritime traffic between Europe and the African continent as well as to the numerous islands of the region. Bakalem *et al.* (2024) reported 15 non-indigenous or possibly non-indigenous species for the five southern Mediterranean countries, while Dauvin (2022) indicated 12 that are non-indigenous species for the English Channel.

Comparison with other checklists of benthic amphipods from the Mediterranean Sea and neighbouring regions in the North-East Atlantic (Azores and Portugal-Spain-France)

The benthic amphipod checklists for the four Maca-

Table 2. List of the amphipod species described from material coming from the four zones of the Macaronesian Archipelagos and North-West Atlantic Africa (NWA: Northwest African coasts; CAN-MAD: Canary & Madeira Archipelagos; SEN: Senegalese & Mauritanian coasts and Cabo Verde).

Species	NWA	CAN-MAD	SEN	Cabo Verde
<i>Ampelisca cavicoxa</i> Reid, 1951			Senegal	
<i>Ampelisca monoculata</i> Dauvin & Bellan-Santini, 1985	Sahara			
<i>Ampelisca pectenata</i> Reid, 1951			Senegal	
<i>Ampelisca senegalensis</i> Chevreux, 1925			Senegal	
<i>Ampelisca verga</i> Reid, 1951			Senegal	
<i>Ampithoe grubiformis</i> Reid, 1951				+
<i>Bathyporeia chevreuxi</i> d'Udekem d'Acoz & Vader, 2005			Senegal	
<i>Bathyporeia elkaimi</i> d'Udekem d'Acoz & Menioui, 2004	Morocco			
<i>Bathyporeia ledoyeri</i> d'Udekem d'Acoz & Menioui 2004	Morocco			
<i>Bathyporeia microceras</i> d'Udekem d'Acoz & Menioui 2004	Morocco			
<i>Bathyporeia watkini</i> d'Udekem d'Acoz, Echchaoui & Menioui 2004	Morocco			
<i>Bogidiella madeirae</i> Stock, 1994		Madeira		
<i>Cabogidiella littoralis</i> Stock & Vonk, 1992				+
<i>Caprella wirtzi</i> Krapp-Schickel & Takeuchi, 2000				+
<i>Cerapopsis takamado</i> Menioui et Myers 2000	Morocco			
<i>Crybelocephalus birsteini</i> Thurston, 1976		Canarias		
<i>Dautzenbergia dentata</i> Chevreux, 1920		Canarias		
<i>Dulzura lobata</i> Stock & Vonk, 1991				+
<i>Elasmopus canarius</i> Krapp-Schickel & Ruffo, 1990		Canarias		
<i>Gammaropsis minuta</i> (Chevreux, 1926)			Senegal	
<i>Gammarus nox</i> Stock, 1995		Canarias-Madeira		
<i>Globosolembos francanni</i> (Reid, 1951)				+
<i>Grandidierella elongata</i> Chevreux, 1926	Sahara			
<i>Hadzia acutus</i> (Andres, 1978)		Canarias		
<i>Halice aculeata</i> Chevreux, 1912	Morocco	Madeira		
<i>Halicoides discovery</i> Thurston, 1976		Canarias		
<i>Haploops proxima</i> Chevreux, 1919	Morocco			
<i>Hornellia (Metaceradocus) perdentatus</i> Chevreux, 1925			Senegal	
<i>Ingolfiella unguiculata</i> Stock, 1992		Madeira		
<i>Lepidepcreum crenulatum</i> Chevreux, 1925	Sahara			
<i>Leucothoe brunonis</i> Krapp- Schickel & Menioui, 2005	Morocco			
<i>Leucothoe spinulosa</i> Chevreux, 1919			Mauritania	
<i>Liljeborgia inermis</i> Chevreux, 1920			Mauritania	
<i>Liropus gracilis</i> Chevreux, 1920	Morocco			
<i>Maera edwardsi</i> Chevreux, 1920		Canarias	Mauritania	+
<i>Maeropsis perrieri</i> Chevreux, 1920	Morocco			
<i>Mantacaprella macaronensis</i> Vázquez-Luis, Guerra-García, Carvalho & Png-González, 2013		Canarias		+
<i>Megamphopus longidactyla</i> Chevreux, 1926			Senegal	
<i>Mimonectes sphaericus</i> Bovallius, 1885		Canarias		
<i>Mimonectes spandlii</i> Stephensen & Pirlot, 1931	Morocco			
<i>Paracallisoma alberti</i> Chevreux, 1903		Madeira		
<i>Photis antennata</i> Chevreux, 1926	Sahara			
<i>Photis longicarpa</i> Chevreux, 1926			Senegal	

Continued

Table 2 continued

Species	NWA	CAN-MAD	SEN	Cabo Verde
<i>Photis obesa</i> Chevreux, 1926			Senegal	
<i>Podoceros angulosa</i> Chevreux, 1920			Mauritania	
<i>Podocerus senegalensis</i> Chevreux, 1926			Senegal	
<i>Pseudharpinia brevirostris</i> (Chevreux, 1919)			Mauritania	
<i>Psammogammarus initialis</i> Stock & Sanchez, 1987		Canarias		
<i>Psammogammarus spinosus</i> Stock & Vonk, 1992				+
<i>Psammogammarus stocki</i> Vonk, 1990		Canarias		
<i>Ptilohyale barnardi</i> (Chevreux, 1926)			Senegal	
<i>Scina damasi</i> Pirlot, 1929	Morocco	Madeira		
<i>Scina wagleri atlantis</i> Thurston, 1976		Canarias		
<i>Serejohyale ramalhoi</i> (Reid, 1939)		Madeira		
<i>Serejohyale spinidactylus</i> (Chevreux, 1926)		Canarias	Senegal	
<i>Socarnopsis obesa</i> Chevreux, 1919			Mauritania	
<i>Spelaeonicippe buchi</i> (Andres, 1975)		Canarias		
<i>Stephonyx talismani</i> (Chevreux, 1919)	Morocco			
<i>Syrrhoe affinis</i> Chevreux, 1908	Morocco			
<i>Trischizostoma longirostre</i> Chevreux, 1919			Senegal	+
<i>Tritaeta chelata</i> Chevreux, 1925			Senegal	
<i>Unciola tenuipes</i> Chevreux, 1920			Mauritania	
<i>Urothoe atlantica</i> Bellan Santini & Menioui, 2005	Morocco			
<i>Verdeia grandimana</i> (Chevreux, 1908)				+
<i>Victoriopisa atlantica</i> Stock & Platvoet, 1981			Mauritania	
<i>Wollastenothoe minuta</i> Gouillieux & Navarro-Mayoral in Navarro-Mayoral <i>et al.</i> , 2024		Canarias		

Table 3. Checklist of the endemic amphipod species in the four zones of the Macaronesian Archipelagos and North-West Atlantic Africa (NWA: Northwest African coasts; CAN-MAD: Canary & Madeira Archipelagos; SEN: Senegalese & Mauritanian coasts and Cabo Verde).

Species	NWA	CAN-MAD	SEN	Cabo Verde
<i>Ampelisca senegalensis</i> Chevreux, 1925			Senegal	
<i>Ampithoe grubiformis</i> Reid, 1951				+
<i>Bathyporeia chevreuxi</i> d'Udekem d'Acoz & Vader, 2005	Morocco			
<i>Bathyporeia ledoyeri</i> d'Udekem d'Acoz & Menioui 2004	Morocco			
<i>Bathyporeia microceras</i> d'Udekem d'Acoz & Menioui 2004	Morocco			
<i>Bathyporeia watkini</i> d'Udekem d'Acoz, Echchaoui & Menioui 2004	Morocco			
<i>Bogidiella madeirae</i> Stock, 1994		Madeira		
<i>Cabogidiella littoralis</i> Stock & Vonk, 1992				+
<i>Caprella wirtzi</i> Krapp-Schickel & Takeuchi, 2000				+
<i>Cerapopsis takamado</i> Menioui et Myers 2000	Morocco			
<i>Crybelocephalus birsteini</i> Thurston, 1976		Canarias		
<i>Dulzura lobata</i> Stock & Vonk, 1991				+
<i>Elasmopus canarius</i> Krapp-Schickel & Ruffo, 1990		Canarias		
<i>Gammaropsis minuta</i> (Chevreux, 1926)			Senegal	
<i>Gammarus nox</i> Stock, 1995		Canarias, Madeira		
<i>Hadzia acutus</i> (Andres, 1978)		Canarias		

Continued

Table 3 continued

Species	NWA	CAN-MAD	SEN	Cabo Verde
<i>Halice aculeata</i> Chevreux, 1912	Morocco	Madeira		
<i>Halicoides discovery</i> Thurston, 1976		Canarias		
<i>Hornellia (Metaceradocus) perdentatus</i> Chevreux, 1925			Senegal	
<i>Ingolfiella canariensis</i> Vonk & Sánchez, 1991		Canarias		
<i>Ingolfiella similis</i> Rondé-Broekhuizen & Stock, 1987		Canarias		
<i>Ingolfiella unguiculata</i> Stock, 1992		Canarias, Madeira		
<i>Leucothoe brunonis</i> Krapp-Schickel & Menioui, 2005	Morocco			
<i>Leucothoe spinulosa</i> Chevreux, 1919			Mauritania	
<i>Liropus gracilis</i> Chevreux, 1920	Morocco			
<i>Maera edwardsi</i> Chevreux, 1920		Canarias	Mauritania	+
<i>Maeropsis perrieri</i> Chevreux, 1920	Morocco			
<i>Mantacaprella macaronensis</i> Vázquez-Luis, Guerra-García, Carvalho & Png-González, 2013		Canarias		+
<i>Megamphopus longidactyla</i> Chevreux, 1926			Senegal	
<i>Parhyale multispinosa</i> Stock, 1987		Canarias		
<i>Photis antennata</i> Chevreux, 1926	Sahara			
<i>Photis longicarpa</i> Chevreux, 1926			Senegal	
<i>Photis obesa</i> Chevreux, 1926			Senegal	
<i>Podoceropsis angulosa</i> Chevreux, 1920			Mauritania	
<i>Podocerus senegalensis</i> Chevreux, 1926			Senegal	
<i>Psammogammarus initialis</i> Stock & Sánchez, 1987		Canarias		
<i>Psammogammarus spinosus</i> Stock & Vonk, 1992				+
<i>Psammogammarus stocki</i> Vonk, 1990		Canarias		
<i>Pseudharpinia brevirostris</i> (Chevreux, 1919)			Mauritania	
<i>Pseudoniphargus cupicola</i> Stock, 1988		Canarias		
<i>Pseudoniphargus multidentis</i> Stock, 1988		Canarias		
<i>Pseudoniphargus porticola</i> Stock, 1988		Canarias		
<i>Pseudoniphargus salinus</i> Stock, 1988		Canarias		
<i>Ptilohyale barnardi</i> (Chevreux, 1926)			Senegal	
<i>Scina wagleri atlantis</i> Thurston, 1976		Canarias		
<i>Serejohyale ramalhoi</i> (Reid, 1939)		Madeira		
<i>Socarnopsis obesa</i> Chevreux, 1919			Mauritania	
<i>Spelaenicippe buchi</i> (Andres, 1975)		Canarias		
<i>Stephonyx talismani</i> (Chevreux, 1919)	Morocco			
<i>Stygogidiella atlantica</i> (Sánchez, 1991)		Canarias		
<i>Stygogidiella uniramosa</i> (Stock & Rondé-Broekhuizen, 1987)		Canarias		
<i>Trischizostoma longirostre</i> Chevreux, 1919			Senegal	+
<i>Tritaeta chelata</i> Chevreux, 1925			Senegal	
<i>Unciola tenuipes</i> Chevreux, 1920			Mauritania	
<i>Urothoe atlantica</i> Bellan Santini et Menioui, 2004	Morocco			
<i>Verdeia grandimana</i> (Chevreux, 1908)				+
<i>Victoriopisa atlantica</i> Stock & Platvoet, 1981			Mauritania	
<i>Wollastenothoe minuta</i> Gouillieux & Navarro-Mayoral in Navarro-Mayoral et al., 2024		Canarias		
<i>Xystrriogidiella spathulata</i> (Stock & Rondé-Broekhuizen, 1987)		Canarias		

Table 4. Checklist of the non-indigenous species or may be non-indigenous species of amphipods reported in the four zones of the Macaronesian Archipelagos and North-west Atlantic Africa.

Species	Status of the species	Establishment success of the species	Date of first record and source of the first signalisation				
			Canary Archipelago		Madeira Archipelago		Morocco
<i>Caprella scaura</i> Templeton, 1836	Non-indigenous	Invasive	2009	Guerra-García <i>et al.</i> , 2011	2013	Ramalhosa & Canning-Clode, 2015	
<i>Erichthonius punctatus</i> (Spence Bate, 1857)	May be non-indigenous	Established			2018	Png-Gonzalez <i>et al.</i> , 2021	
<i>Jassa marmorata</i> Holmes, 1905	May be non-indigenous	Established	2011	Riera <i>et al.</i> , 2014			1984 Bitar, 1987
<i>Monocorophium acherusicum</i> (Costa, 1853)	Non-indigenous	Established	2005	Riera <i>et al.</i> , 2014			1972 Elkaim, 1974
<i>Platyscelus armatus</i> (Claus, 1879)	Non-indigenous	Casual	2012	Mingorance <i>et al.</i> , 2014			1922 Pirlot, 1929

ronesian archipelagos and north-west African coasts are compared with data from three neighbouring regions.

The checklist of benthic amphipods of the Azores Archipelago (AZO) is established from the first inventory of amphipod species provided by Lopes *et al.* (1993) and supplementary data obtained subsequently (Wirtz, 1998; Guerra-García, 2004; Bamber & Robbins, 2009; Zeina *et al.*, 2015; Andrade *et al.*, 2021). The total number of species for the AZO shelf is 88. This low number is probably due to the development of a narrow insular shelf around the volcanic Azores archipelago. Lopes *et al.* (1993) reported a total of 122 species including numerous deep-sea amphipods mainly described by Edouard Chevreux during the expeditions of Prince Albert Ist of Monaco in this part of the North-Eastern Atlantic; Guerra-García (2004) reported three new species of deep-sea Caprellidea for the Azores Archipelago, making a total of 125 species for the Azores.

The present checklist reports 377 species of benthic amphipods from the Mediterranean coasts of Morocco and Algeria (MOR-ALG); this checklist was established from the recent study of Bakalem *et al.* (2024), combined with the historical data for Morocco (Menioui & Bayed, 1986; Menioui & Ruffo, 1988). This total is higher than that reported for Morocco (240 species) and Algeria (336 species), certain species being present in only one of the two countries. In this part of the Mediterranean Sea, the numbers of pelagic and deep-sea species are very low (Bakalem *et al.*, 2024).

For the continental shelf extending from the Strait of Gibraltar to the North of the Bay of Biscay (BIS-IBE), the number of benthic amphipods reaches 315 species. The checklist was established for the whole Bay of Biscay from the lists of Dauvin & Bellan-Santini (2002, 2004) and Bachelet *et al.* (2003), with additional papers describing new species (Kaim-Malka, 2012; Tato *et al.*, 2012; Gouillieux & Sorbe, 2015; Gouillieux, 2019) or new records mainly for non-indigenous species from this

region (Jourde *et al.*, 2013; Gouillieux *et al.*, 2015, 2016; Gouillieux, 2017; Gouillieux & Massé, 2019; Gouillieux *et al.*, 2020; Gouillieux & Droual, 2020). For the Iberian Atlantic coast, the checklist was established from the inventories of Marques & Bellan-Santini (1991) and Sampaio *et al.* (2016), as well as more local studies including lists of coastal benthic amphipods (van Maren, 1975; Rodrigues & Dauvin, 1985, 1987; Pardal *et al.*, 2002; Lourido *et al.*, 2008; Moreira *et al.*, 2008; Carvalho *et al.*, 2012; Plicanti *et al.*, 2017; Dauvin *et al.*, 2021; Gomes *et al.*, 2022).

Including the four regions of our checklist, the total number of benthic species of the seven regions included in this comparison reaches 587 species. A total of 259 species (44%) are reported in only one of the studied regions. Only 7 species are recorded in CV and 10 in AZO. For NWA, SEN and CAN-MAD, the total numbers of species are 13, 25 and 30, respectively. The numbers are highest for MOR-ALG (100 species), where a large number of species have been reported that are endemic for the Mediterranean Sea (Bakalem *et al.*, 2024). A total of 74 species have been recorded only once for the BIS-IBE, in a region where cold-temperate species are present (Bachelet *et al.*, 2003; Dauvin, 2022).

A total of 203 species (35%) have been recorded in two or three regions, 52 (9%) in four regions, 30 (5%) in five regions, 26 (4%) in six regions, while only 5 species are present in all regions: *Aora typica*, *Erichthonius brasiliensis*, *Gammaropsis maculata*, *Leucothoe spinicarpa* and *Phtisica marina*.

At a similarity level of 45%, the Cluster Analysis shows that the seven regions can be separated into four main groups (Fig. 5). CV (group a) is separated from the rest of the regions, while SEN (group b) is separated from all the others. The third group c gathers together the three regions NWA, MOR-ALG and BIS-IBE, while group d is made up of the CAN-MAD and AZO archipelagos. In summary, the amphipod fauna is distinguished by the

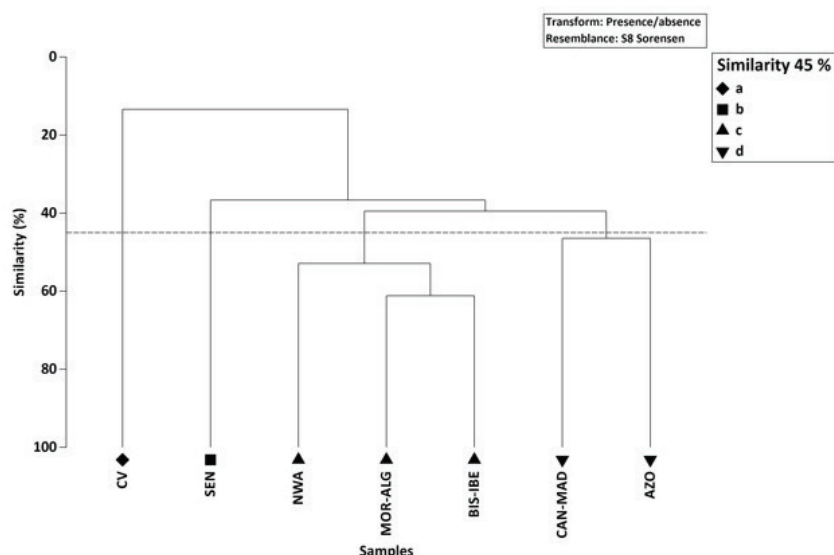


Fig. 5: Results of cluster analysis (Sørensen similarity) on benthic amphipod species (presence or absence) recorded on the continental shelf in seven regions of the North-East Atlantic plus the south-western Mediterranean Sea. See Figure 1 for location of the regions.

species diversity of the two southern regions SEN and CV. Moreover, a similar diversity is observed across the geographical continuum to the south, north and east of the Gibraltar Strait, as well as a high affinity with the amphipod diversity of the archipelagos lying offshore north-west Africa.

In their study of the biogeography of benthic marine amphipods of the Mediterranean Sea, Bellan-Santini & Ruffo (2003) stated that 38 % of the species were Mediterranean endemic species, while 59% were common to the Atlantic Ocean and the Mediterranean Sea, with a high affinity between both amphipod faunas. Based on a collection of soft-bottom crustaceans, Sampaio *et al.* (2016), showed that the Portuguese continental shelf offers favourable environmental conditions to support diverse benthic crustacean communities and confirmed that the Portuguese coast represents a transition zone with mixed Atlantic and Mediterranean faunas while also being exposed to noticeable North African and Macaronesian influences.

In their review of the benthos of the north-west Africa, Ramos *et al.* (2015) highlighted an important faunistic change between the tropical and temperate biota at the latitude of Cape Blanc, which is the limit between NWA and SEN. The benthos of Cabo Verde and the Canary Islands shows some specific features linked to their volcanic origin, insularity and oceanographic conditions.

More recently, Freitas *et al.* (2019) have reviewed the biogeographic region known as ‘Macaronesia’, including the Azores, Madeira, and the Selvagens, Canary and Cabo Verde archipelagos, using a multitaxon approach for a total of 3,737 marine species: 465 coastal fishes, 151 echinoderms, 1,312 gastropods, 177 brachyurans, 683 polychaetes and 949 macroalgae. These authors (*op. cit.*) show a complex situation including different patterns according to the type of organisms, and a clear separation of the Carbo Verde archipelago from the other Macaron-

esian islands due to the high number of endemic species in several marine phyla, particularly gastropod molluscs. When using the available checklist for the tropical West African shores (e.g., for fishes and macroalgae), their results support the inclusion of Cabo Verde as an independent marine ecoregion in the West African Transition province and separated from the Lusitanian Province, which includes the Azores, Madeira, Selvagens and Canary archipelagos. Therefore, Freitas *et al.* (2019) suggested redefining the Lusitanian biogeographical province, which could include the South European Atlantic Shelf, the Saharan Upwelling, the Azores and Webbnesia (i.e., Madeira, Selvagens and Canaries).

Vieira *et al.* (2021) has used mitochondrial DNA sequences to investigate the genetic differentiation between 28 populations from “Webbnesia” and adjacent coasts, based on 23 intertidal peracarid species including 13 amphipods. These populations display a notable genetic diversity and high endemism, with 83% of the MOTUs (molecular operational taxonomic units) being restricted to these islands, particularly La Palma (Canaries) and Madeira. A clear differentiation can be observed in all the examined species between Webbnesia and the Iberian populations. The populations from the Azores and Morocco display specificities depending on the taxon. In their study, Vieira *et al.* (2021) found that both patterns were observed, i.e.: connections between the Azores and Webbnesia as well as between the Azores and the Iberian Peninsula. However, these data suggest a higher genetic proximity between the Moroccan and Iberian populations, contradicting other studies that relate the populations from Morocco with those from Macaronesia due to their vicinity.

Our Cluster Analysis on the benthic amphipods is supported by the biogeographical patterns identified in these previous studies. There is a net separation of the Cabo Verde and Senegal amphipod faunas from the rest of the

other north-eastern regions, as well as a similarity of amphipod faunas between the Azores and Webbnesia, and between the Atlantic-Mediterranean regions to the south, north and east of the Gibraltar Strait (see Fig. 5). Moreover, for this last group of regions, several contingents of species can be identified: Mediterranean endemic species in MOR-ALG, cold temperate species present only in the Bay of Biscay (BIS-IBE region) and some tropical species in the NWA region. In summary, the number of shared species in these three regions exceeds the number of species found in only one region, showing the same biogeographical pattern of the Amphipoda fauna as in the Lusitanian province as suggested by Freitas *et al.* (2019).

Need for future research

The present checklist of amphipods covers not only the continental shelf of north-west Africa but also the bathyal and abyssal waters. It includes pelagic and benthic amphipods recorded in this extended part of the North-East Atlantic. It is clear that the research effort is different in all of the four studied regions. The CV region has been intensively sampled for the zooplankton, resulting in a large number of pelagic amphipod species (88); it is the only one of four regions studied where this number is significantly higher than that of benthic amphipods (34).

Mainly due to the cruises of Prince Albert Ist of Monaco in this part of the north-eastern Atlantic, the deep-sea amphipod fauna is acceptably known. Most of the deeper amphipods collected during these cruises were studied by Edouard Chevreux, and among them numerous species new to science were described. Chevreux (1925) also studied the amphipods from Senegal and described new species for this area from material collected during the ‘*Voyage de la goélette “Melita” aux Canaries et au Sénégal (1889-1890)*’. The contribution of Reid (1951) on the Amphipoda (Gammaridea and Caprellidea) of the coast of tropical West Africa has also increased our knowledge on the amphipods of this region. Very few recent studies are available for the coasts of Senegal and Mauritania over the last 70 years.

Similarly, for the SEN region, there are very numerous scientific studies and reports on the Arguin bank, which is a Mauritanian National Park of international importance mainly for birds (Wijnsma *et al.*, 1999; Araujo & Campredon, 2016). But, despite these publications, there are very few data on amphipod species and only the amphipod taxa are recorded.

Our knowledge of the amphipods is satisfactory for the two other regions (CAN-MAD and NWA), mainly concerning the Moroccan shallow waters and hard substrates of the Canaries Archipelago. In these regions, particular attention should be focused on artificial hard bottoms in harbours and other human infrastructures that could increase the number of indigenous and non-indigenous species responsible for biofouling.

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APPENDIX

List of bibliographic references containing data on amphipods

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