Annotated checklist of brachyuran crabs (Crustacea: Decapoda) of the Iberian Peninsula (SW Europe)

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Summary: Almost 50 years have passed since a group of reputed carcinologists (*viz*. Lipke B. Holthuis, Isabella Gordon and Jacques Forest) finished the posthumous work of Ricardo Zariquiey Álvarez (1968) on decapod crustaceans of the Iberian Peninsula. No lists of decapod fauna specifically covering this area have been published since then, and an update is needed. The current list of brachyuran crabs of the Iberian Peninsula comprises 140 species, which is 35 species more than the 105 valid species listed in Zariquiey Álvarez (1968). Systematic changes have affected the original classification, so now there are 20 superfamilies, 36 families and 77 genera. Additional species have been recorded in Iberian waters due to natural range expansions from nearby areas (Mediterranean and Atlantic), introductions by anthropogenic activities, and description of new taxa. Also, two species were synonymized. Several of these changes, based on evidence from larval morphology and/or molecular data, are detailed in this review. Although descriptions of crab species new to science are not expected to occur at a significant rate, an increase in the number of species in the Iberian Peninsula is expected to result from the introduction of alien species.

Keywords: checklist; Brachyura; Crustacea; Decapoda; crab; Iberian Peninsula.

Lista comentada de los cangrejos braquiuros (Crustacea: Decapoda) de la península Ibérica (SO Europa)

Resumen: Han pasado casi 50 años desde que un grupo de reputados carcinólogos (viz. Lipke B. Holthuis, Isabella Gordon y Jacques Forest) finalizaran la obra póstuma de Ricardo Zariquiey Álvarez (1968), "Crustáceos decápodos de la Península Ibérica". Desde entonces no se ha publicado una lista de la fauna de decápodos que cubra específicamente este área, y era necesaria una actualización. La lista actual de braquiuros de la Península Ibérica consta de un total de 140 especies, 35 especies más de las 105 especies válidas enumeradas en Zariquiey Álvarez (1968). Los cambios en la sistemática han afectado la clasificación original, por lo que ahora hay 20 superfamilias, 36 familias y 77 géneros. Otras especies han sido citadas en aguas ibéricas debido a expansiones naturales de su rango de distribución desde áreas cercanas (Mediterráneo y Atlántico), a las introducciones mediadas por las actividades antropogénicas y a la descripción de nuevas especies. Además, se han sinonimizado dos especies. Varios de estos cambios, basados en evidencias de la morfología de las larvas y/o datos moleculares, se detallan en esta revisión. Aunque no se espera que las descripciones de nuevas especies de cangrejos para la ciencia se produzcan a un ritmo significativo, si es esperable un incremento en el número de especies en la Península Ibérica como resultado de la introducción de especies exóticas.

Palabras clave: lista; Brachyura; Crustacea; Decapoda; cangrejo; península Ibérica.

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INTRODUCTION

Almost 50 years have passed since a group of reputed carcinologists (*viz*. Lipke B. Holthuis, Isabella Gordon and Jacques Forest) finished the posthumous work of Ricardo Zariquiey Álvarez (1968) on decapod crustaceans of the Iberian Peninsula. This geographic area has over 6000 km of coastline and is washed by the warm and oligotrophic Mediterranean Sea in the east and by the colder Atlantic Ocean in the west, which converge at the Strait of Gibraltar (Fig. 1). The high environmental heterogeneity and the proximity between the European and African continents provide suitable conditions for a particularly diverse marine fauna. The extensive information compiled by Zariquiey Álvarez regarding habitat, spawning season and distribution of Iberian decapods made L.B. Holthuis (Zariquiey Álvarez 1968) state that "this peninsula is, in the present moment, one of the best known areas of South Europe concerning decapod fauna". After the work of Zariquiey Álvarez (1968), several authors have published updated lists of decapod fauna at different geographical scales, from European species by d'Udekem d'Acoz (1999) and Türkay (2001) to worldwide brachyuran decapods by Ng et al. (2008). However, none of these has specifically covered the diversity found around the Iberian Peninsula; and an update is needed for this area.

A great number of changes concerning the crustacean species found around the Iberian Peninsula have taken place in the last decades. These changes can be due to systematic modifications such as synonymizations (qualitative) or due to non-corroborated presence or newly reported species for the area (quantitative). The systematic research landscape on decapod crustaceans has changed dramatically in the last few decades as well. A general tendency during the last few years has been to increase the number of families, in most cases simply by raising the rank of extant subfamilies. Today's most widely used classifications have all appeared after the work of Zariquiey Álvarez (1968), including those by Guinot (1977), Bowman and Abele (1982), Martin and Davis (2001) or Ng et al. (2008). De Grave et al. (2009) have also listed all known suprageneric taxa of decapod crustaceans, with estimates on the number of valid species within each group. There is a concerted effort by carcinologists worldwide to check the validity of taxa using multiple tools such as ecological characterization, larval morphology and molecular techniques (Schubart et al. 2001, Reuschel and Schubart 2006, Marco-Herrero et al. 2013a).

The infraorder Brachyura Linnaeus, 1758 may be claimed to contain the highest degree of diversity among decapod crustaceans and includes both crab species with an important role in trophic webs as well as others of commercial interest. The main species of commercial interest found in Iberian waters are *Maja brachydactyla, Maja squinado, Cancer pagurus* and *Necora puber*; but *Calappa granulata, Carcinus maenas, Carcinus aestuarii, Liocarcinus depurator, Geryon longipes* and *Uca tangeri* are also important.

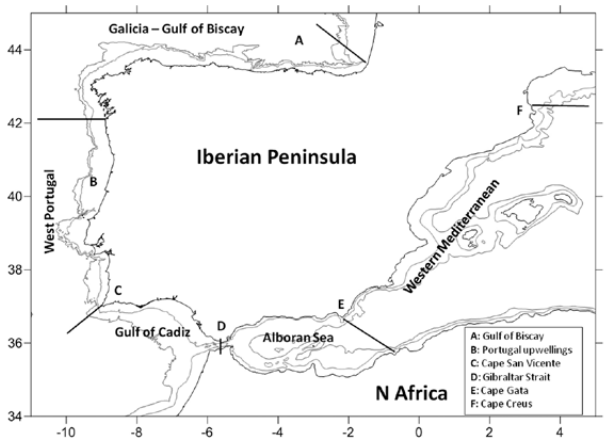

Fig. 1. Map of the Iberian Peninsula and nearby waters showing the different areas considered here to characterize the spatial distribution of brachyuran species. The 200- and 1000-metre isobaths are shown. Abbreviations: A, Gulf of Biscay; B, Portugal upwellings; C, Cape San Vicente; D, Gibraltar Strait; E, Cape Gata; F, Cape Creus.

Occasionally, other species may be seen in markets, such as *Macropipus tuberculatus, Paromola cuvieri* and *Cancer bellianus*. Several allochthonous species have been recorded in recent years and some may even show well-established populations. The present work summarizes all changes in Iberian carcinofauna since Zariquiey Álvarez (1968), and provides scientists with an updated classification list. Furthermore, the current status of brachyuran alien species throughout this region is thoroughly reviewed.

MATERIALS AND METHODS

The updated list of Iberian brachyuran crabs was drawn up in the context of the MEGALOPADN research project, which is focused on the use of morphological and molecular techniques for identifying planktonic larval stages. For the compilation of this list, all publications since 1968 about the distribution of brachyuran crabs were checked, including previous lists for Iberian or European regions, data from Internet databases such as WoRMS (http://www.marinespecies.org/), GBIF (http://www.gbif.org/species) and Observadores del Mar (http://www.observadoresdelmar.es/), systematic data, new records, and unpublished or in preparation data. Several contributions need to be highlighted here, mainly the works on European decapods carried out by d'Udekem d'Acoz (1999) and Türkay (2001), but also several specific works on Iberian carcinofauna (García Raso 1984, 1985, 1989, 1993, 1996, García Raso et al. 1987, García and Corbera 2007). In order to clarify the taxonomic status of controversial species and genera, the authors have checked multiple vouchers from the Natural History Museum (London), Muséum National d'Histoire Naturelle (Paris) and the Biological Reference Collections of the Institute of Marine Sciences (Barcelona) using morphology or molecular techniques.

This checklist covers all brachyuran species present in the Iberian Peninsula and Balearic Islands (see Fig. 1), including marine (from deep water to intertidal),

brackish (estuaries, costal lagoons, marshes, ponds) and freshwater species (note that *Eriocheir sinensis* is considered a freshwater species here, although it depends on seawater for reproduction). The updated systematic classification follows Ng et al. (2008), but also considers the latest changes in particular taxa (e.g. new results by Spiridonov et al. (2014) on the Portunoidea). Superfamilies are listed by systematic order following the Sections and Subsections as currently accepted, and by alphabetical order within them. Families, genera and species are also listed by alphabetical order within their respective superfamilies and families. The tribe level has not been considered and the use of subgenera is left at a minimum.

All changes with respect to the work by Zariquiey Álvarez (1968) are explained, including new species, introduced alien species, synonyms, systematic modifications, species that reach Iberian waters by increasing their distribution range, and species no longer found in the Iberian Peninsula.

RESULTS

A total of 140 crab species are reported around the Iberian Peninsula, and their distribution is indicated in Table 1. This represents about half of the 284 brachyuran species known in European waters, of which 40 are freshwater crabs (d'Udekem d'Acoz 1999). It is also noteworthy that about two thirds of the currently accepted brachyuran superfamilies (Ng et al. 2008, Spiridonov et al. 2014) are represented in the Iberian carcinofauna.

REMARKS

Systematic changes have affected the original classification of Brachyura, so instead of the 5 superfamilies, 20 families and 58 genera considered in Zariquiey Álvarez (1968), a total of 20 superfamilies, 36 families and 77 genera are presented here.

The current account of brachyuran crabs of the Iberian Peninsula adds another 35 to the 105 valid species in Zariquiey Álvarez (1968). Though a total of 113 brachyuran species were listed in his seminal work, five of these (*Parthenope miersii, Portunus sayi, Euchirograpsus americanus, Grapsus grapsus* and *Percnon planissimum*) should not be considered here because they are synonyms or misidentifications, or their presence in Iberian waters has not been confirmed. The *Xantho incisus* subspecies (*X. incisus incisus* and *X. incisus granulicarpus*) mentioned in Zariquiey Álvarez (1968), and considered as proper species by some authors (e.g. Mavidis et al. 2008), are not valid anymore. Although the morphology may be questionable (see García Raso et al. 1987, Mavidis et al. 2008), a recent genetic study did not allow their differentiation and *X. incisus* is considered here a synonym of *X. hydrophilus* (Reuschel and Schubart 2006).

Some additional species are now present in Iberian waters due to natural range expansions from nearby areas (Mediterranean and Atlantic), accidental introductions by anthropogenic activities, and species new to science. For example, two species (*Pisa carinimana* and *Paractaea monodi*) had not been recorded along the Iberian coasts before Zariquiey Álvarez (1968). Several of these modifications are detailed below, most of them based on evidence from larval morphology and/or molecular data.

Species no longer found in the Iberian Peninsula

As noted above, five species included in Zariquiey Álvarez (1968) should not be considered as present in Iberian waters:

1. *Parthenope miersii* (A. Milne-Edwards and Bouvier, 1898)

This species has been collected only twice, the first time corresponding to a male collected at 112 m depth in the Gulf of Cádiz and used as holotype by A. Milne-Edwards and Bouvier (1898, 1900) and the second time corresponding to another male at 135-150 m depth in the Cape San Vicente (Nunes-Ruivo 1961). D'Udekem d'Acoz (1999) questioned the validity of this species based on two male specimens only, and Türkay (2001) considered that *P. miersii* is a synonym of *Spinolambrus macrochelos*.

2. *Portunus sayi* (Gibbes, 1850)

The records of this species in Cabo Espartel (NW Africa close to Gibraltar Strait) and in the Balearic Islands (Zariquiey Álvarez 1968) should be considered juveniles of *Portunus hastatus* according to Türkay (1987).

3. *Euchirograpsus americanus* A. Milne-Edwards, 1880

This species is only distributed in the western Atlantic, and all reports in Mediterranean and eastern Atlantic must be referred to *E. liguricus* (see Türkay 1975).

4. *Grapsus grapsus* (Linnaeus, 1758)

This species was reported along the coast of Portugal, once in Setubal (Osório 1905) and later on in Sesimbra (Vilela 1936). *G. grapsus* is mainly distributed in the western Atlantic, while *Grapsus adscensionis* is the main eastern Atlantic species of this genus (see Manning and Chace 1990). It is hard to imagine that *G. grapsus* could occur along the Iberian coast and pass unnoticed, taking into account the habitat (intertidal rocky shores) and typical size of this species. Given that there are no other reports for these species along the Iberian coast, *G. grapsus* was not included in this checklist.

5. *Percnon planissimum* (Herbst, 1804)

Zariquiey Álvarez (1968) reports this species as rare in the coastal and sub-coastal waters of Portugal. No reports have been published confirming its presence in Iberian waters. In the last few years though, *Percnon gibbesi* has been collected throughout the Mediterranean, and specifically from Mediterranean localities on the Iberian coast.

Table 1. – List of brachyuran species present in the Iberian Peninsula. Abbreviations: ALB, Alboran Sea; GC, Gulf of Cadiz; G-GB, Galicia-Gulf of Biscay; MED, Mediterranean Sea; WP, West Portugal. (+) present; ([1]) García Raso (unpublished data); ([2]) Rufino (unpublished data); ([3]) Cuesta et al. (unpublished data); (?) not confirmed. Species marked with an asterisk were questioned in recent and ongoing studies as possible synonyms, and could be removed from the Iberian carcinofauna in the near future.

Taxa/Species	Distribution				
	G-GB	WP	GC	ALB	MED
BRACHYURA Linnaeus, 1758					
PODOTREMATA Guinot, 1977					
CYCLODORIPPOIDEA Ortmann, 1892					
Cymonomidae Bouvier, 1898					
Cymonomus granulatus (Thomson, 1873)	(+)	(+)	(+)	(+)	(+)
Cymonomus normani Lankester, 1903	(+)	(+)			
DROMIOIDEA de Haan, 1833					
Dromiidae de Haan, 1833					
Dromia personata (Linnaeus, 1758)	(+)	(+)	(+)	(+)	(+)
HOMOLODROMOIDEA Alcock, 1899					
Homolodromiidae Alcock, 1899					
Dicranodromia mahieuxii A. Milne-Edwards, 1883	(+)				
HOMOLOIDEA de Haan, 1839					
Homolidae de Haan, 1839					
Homola barbata (Fabricius, 1793)	(+)	(+)	(+)	(+)	(+)
Homologenus boucheti Guinot and Richer de Forges, 1995			(+)		
Paromola cuvieri (Risso, 1816)	(+)	(+)	(+)	(+)	(+)
Latreilliidae Stimpson, 1858					
Latreillia elegans Roux, 1830		(+)	(+)	(+)[1]	(+)
EUBRACHYURA de Saint Laurent, 1980					
HETEROTREMATA Guinot, 1977					
CALAPPOIDEA de Haan, 1833					
Calappidae de Haan, 1833					
Calappa granulata (Linnaeus, 1758)	(+)	(+)	(+)	(+)	(+)
Calappa pelii Herklots, 1851				(+)	
Calappa tuerkayana Pastore, 1995 *					(+)
Cryptosoma cristatum Brullé, 1837			(+)[2]	(+)	
CANCROIDEA Latreille, 1802					
Atelecyclidae Ortmann, 1893					
Atelecyclus rotundatus (Olivi, 1792)	(+)	(+)	(+)	(+)	(+)
Atelecyclus undecimdentatus (Herbst, 1783)	(+)	(+)	(+)	(+)	(+)
Cancridae Latreille, 1802					
Cancer bellianus Jonhson, 1861	(+)	(+)			
Cancer pagurus Linnaeus, 1758	(+)	(+)	(+)		(+)
CORYSTOIDEA Samouelle, 1819					
Corystidae Samouelle, 1819					
Corystes cassivelaunus (Pennant, 1777)	(+)	(+)	(+)	(+)	(+)
DORIPPOIDEA MacLeay, 1838					
Dorippidae MacLeay, 1838					
Medorippe lanata (Linnaeus, 1767)		(+)	(+)	(+)	(+)
Ethusidae Guinot, 1977					
Ethusa mascarone (Herbst, 1785)		(+)	(+)	(+)	(+)
Ethusina talismani A. Milne-Edwards and Bouvier, 1897		(+)			
ERIPHIOIDEA MacLeay, 1838					
Eriphiidae MacLeay, 1838					
Eriphia verrucosa (Forskål, 1775)	(+)	(+)	(+)	(+)	(+)
GONEPLACOIDEA MacLeay, 1838					
Goneplacidae MacLeay, 1838					
Goneplax rhomboides (Linnaeus, 1758)	(+)	(+)	(+)	(+)	(+)
Progeryonidae Števčić, 2005					
Paragalene longicrura (Nardo, 1869)					(+)
LEUCOSIOIDEA Samouelle, 1819					
Leucosiidae Samouelle, 1819					
Ebalia cranchii Leach, 1817	(+)	(+)	(+)	(+)	(+)
Ebalia deshayesi Lucas, 1846	(+)	(+)		(+)	(+)
Ebalia edwardsii Costa, 1838			(+)	(+)	(+)
Ebalia granulosa H. Milne-Edwards, 1837	(+)		(+)	(+)	(+)
Ebalia nux A. Milne-Edwards, 1883	(+)	(+)	(+)	(+)	(+)
Ebalia tuberosa (Pennant, 1777)	(+)	(+)	(+)	(+)	(+)
Ebalia tumefacta (Montagu, 1808)	(+)	(+)	(+)	(+)	(+)
Ilia nucleus (Linnaeus, 1758)			(+)	(+)	(+)
Merocryptus boletifer A. Milne-Edwards and Bouvier, 1894					(+)
MAJOIDEA Samouelle, 1819					
Epialtidae MacLeay, 1838					
Acanthonyx lunulatus (Risso, 1816)			(+)	(+)	(+)
Anamathia rissoana (Roux, 1828)		(+)		(+)	(+)
Herbstia condyliata (Fabricius, 1787)	(+)		(+)	(+)	(+)
Lissa chiragra (Fabricius, 1775)		(+)	(+)	(+)	(+)
Pisa armata (Latreille, 1803)	(+)	(+)	(+)	(+)	(+)
Pisa carinimana Miers, 1879			(+)	(+)	
Pisa hirticornis (Herbst, 1804)				?	(+)
Pisa muscosa (Linnaeus, 1758)				(+)	(+)
Pisa nodipes (Leach, 1815)	(+)	(+)		(+)	(+)

Taxa/Species	Distribution				
	G-GB	WP	GC	ALB	MED
Pisa tetraodon (Pennant, 1777)	(+)	(+)	(+)	(+)	(+)
Pisa sp. Marco-Herrero et al. (in prep.)				(+)	(+)
Rochinia carpenteri (Thomson, 1873)	(+)	(+)	(+)	(+)	(+)
Inachidae MacLeay, 1838					
Achaeus cranchii Leach, 1817	(+)		(+)	(+)	(+)
Achaeus gracilis (Costa, 1839)	(+)	(+)	(+)	(+)	(+)
Dorhynchus thomsoni Thomson, 1873	(+)	(+)	(+)	(+)	(+)
Inachus aguiarii Brito Capello, 1876	(+)[3]	(+)	(+)	(+)	
Inachus communissimus Rizza, 1839			(+)	(+)	(+)
Inachus dorsettensis (Pennant, 1777)	(+)	(+)	(+)	(+)	(+)
Inachus leptochirus Leach, 1817	(+)	(+)	(+)	(+)	(+)
Inachus phalangium (Fabricius, 1775)	(+)	(+)		(+)	(+)
Inachus thoracicus Roux, 1830		(+)	(+)	(+)	(+)
Macropodia czernjawskii (Brandt, 1880)			(+)	(+)	(+)
Macropodia deflexa Forest, 1978	(+)	(+)			
Macropodia linaresi Forest and Zariquiey Álvarez, 1964	(+)		(+)	(+)	(+)
Macropodia longipes (A. Milne-Edwards and Bouvier, 1899) *	(+)	(+)	(+)	(+)	(+)
Macropodia longirostris (Fabricius, 1775)				(+)	(+)
Macropodia parva Van Noort and Adema, 1985 *		(+)	(+)		
Macropodia rostrata (Linnaeus, 1761)	(+)	(+)	(+)	(+)	(+)
Macropodia tenuirostris (Leach, 1814)	(+)	(+)	(+)	(+)	(+)
Majidae Samouelle, 1819					
Eurynome aspera (Pennant, 1777)	(+)	(+)	(+)	(+)	(+)
Eurynome spinosa Hailstone, 1835	(+)		(+)	(+)	(+)
Maja brachydactyla Balss, 1922	(+)	(+)	(+)	(+)	
Maja crispata Risso, 1827	(+)	(+)	(+)	(+)	(+)
Maja goltziana d'Oliveira, 1888	(+)	(+)			(+)
Maja squinado (Herbst, 1788)				(+)	(+)
Oregonidae Garth, 1958					
Ergasticus clouei A. Milne-Edwards, 1882	(+)	(+)	(+)	(+)	(+)
PALICOIDEA Bouvier, 1898					
Palicidae Bouvier, 1898					
Palicus caronii (Roux, 1828)				(+)	(+)
PARTHENOPOIDEA MacLeay, 1838					
Parthenopidae MacLeay, 1838					
Derilambrus angulifrons (Latreille, 1825)			(+)	(+)	(+)
Distolambrus maltzami (Miers, 1881)	(+)			(+)	(+)
Parthenopoides massena (Roux, 1830)	(+)	(+)	(+)	(+)	(+)
Spinolambrus macrochelos (Herbst, 1790)		(+)	(+)[1]	(+)	(+)
Velolambrus expansus (Miers, 1879)				(+)	
PILUMNOIDEA Samouelle, 1819					
Pilumnidae Samouelle, 1819					
Pilumnopeus africanus (De Man, 1902)	(+)				
Pilumnus aestuarii Nardo, 1869					(+)
Pilumnus hirtellus (Linnaeus, 1761)	(+)	(+)	(+)	(+)	(+)
Pilumnus inermis A. Milne-Edwards and Bouvier, 1894		(+)	(+)	(+)	(+)
Pilumnus spinifer H. Milne-Edwards, 1834	(+)	(+)	(+)	(+)	(+)
Pilumnus villosissimus (Rafinesque, 1814)			(+)	(+)	(+)
Pilumnus sp. d'Udekem d'Acoz and Schubart (in prep.)			(+)		(+)
PORTUNOIDEA Rafinesque, 1815					
Carcinidae MacLeay, 1838					
Carcinus aestuarii Nardo, 1847				(+)	(+)
Carcinus maenas (Linnaeus, 1758)	(+)	(+)	(+)	(+)	(+)
Portumnus latipes (Pennant, 1777)	(+)	(+)	(+)	(+)	(+)
Xaiva biguttata (Risso, 1816)	(+)			(+)	(+)
Geryonidae Colosi, 1923					
Chaceon affinis (A. Milne-Edwards and Bouvier, 1894)	(+)				
Chaceon mediterraneus Manning and Holthuis, 1989					(+)
Chaceon inglei Manning and Holthuis, 1989	(+)				
Geryon longipes A. Milne-Edwards, 1881	(+)		(+)	(+)	(+)
Geryon trispinosus (Herbst, 1803) *	(+)	(+)			
Pirimelidae Alcock, 1899					
Pirimela denticulata (Montagu, 1808)	(+)	(+)	(+)	(+)	(+)
Sirpus zariquieyi Gordon, 1953		(+)	(+)	(+)	(+)
Polybiidae Ortmann, 1893					
Bathynectes longipes (Risso, 1816)		(+)		(+)	(+)
Bathynectes maravigna (Prestandrea, 1839)	(+)	(+)	(+)	(+)	(+)
Liocarcinus bolivari (Zariquiey Álvarez, 1948)			(+)		(+)
Liocarcinus corrugatus (Pennant, 1777)	(+)	(+)	(+)	(+)	(+)
Liocarcinus depurator (Linnaeus, 1758)	(+)	(+)	(+)	(+)	(+)
Liocarcinus holsatus (Fabricius, 1798)	(+)	(+)			
Liocarcinus maculatus (Risso, 1827)	(+)		?	(+)	(+)
Liocarcinus marmoreus (Leach, 1814)	(+)	(+)		(+)	(+)
Liocarcinus mcleayi (Barnard, 1947)		(+)	(+)		
Liocarcinus navigator (Herbst, 1794)	(+)	(+)	(+)	(+)	(+)
Liocarcinus pusillus (Leach, 1815)	(+)	(+)	(+)		
Liocarcinus vernalis (Risso, 1816)	(+)	(+)	(+)	(+)	(+)

Taxa/Species	Distribution				
	G-GB	WP	GC	ALB	MED
Liocarcinus zariquieyi Gordon, 1968				(+)	(+)
Macropipus tuberculatus (Roux, 1830)	(+)	(+)	(+)	(+)	(+)
Necora puber (Linnaeus, 1767)	(+)	(+)	(+)	(+)	(+)
Polybius henslowii Leach, 1820	(+)	(+)	(+)	(+)	(+)
Portunidae Rafinesque, 1815					
Callinectes exasperatus (Gerstaecker, 1856)			(+)		
Callinectes sapidus Rathbun, 1896	(+)	(+)	(+)		(+)
Charybdis (*Charybdis*) *feriata* (Linnaeus, 1758)					(+)
Portunus (*Portunus*) *hastatus* (Linnaeus, 1767)				(+)	(+)
Thiidae Dana, 1852					
Thia scutellata (Fabricius, 1793)	(+)	(+)	(+)	(+)	(+)
XANTHOIDEA MacLeay, 1838					
Panopeidae Ortmann, 1893					
Dyspanopeus sayi (Smith, 1869)					(+)
Panopeus africanus A. Milne-Edwards, 1867	(+)	(+)	(+)		
Rhithropanopeus harrisii (Gould, 1841)		(+)	(+)		
Xanthidae MacLeay, 1838					
Microcassiope minor (Dana, 1852)				(+)	?
Monodaeus couchii (Couch, 1851)	(+)		(+)	(+)	(+)
Paractaea monodi Guinot, 1969				(+)	(+)
Xantho hydrophilus (Leach, 1814)	(+)	(+)	(+)	(+)	(+)
Xantho pilipes A. Milne-Edwards, 1867	(+)	(+)	(+)	(+)	(+)
Xantho poressa (Olivi, 1792)		(+)	(+)	(+)	(+)
Xantho sexdentatus (Miers, 1881)			(+)		
THORACOTREMATA Guinot, 1977					
GRAPSOIDEA MacLeay, 1838					
Grapsidae MacLeay, 1838					
Pachygrapsus gracilis (Saussure, 1858)	(+)				
Pachygrapsus marmoratus (Fabricius, 1787)	(+)	(+)	(+)	(+)	(+)
Pachygrapsus maurus (Lucas, 1846)				(+)	(+)
Pachygrapsus transversus (Gibbes, 1850)		(+)	(+)	(+)	(+)
Planes minutus (Linnaeus, 1758)	(+)	(+)	(+)	(+)	(+)
Plagusiidae Dana, 1851					
Euchirograpsus liguricus H. Milne-Edwards, 1853		(+)	(+)	(+)	(+)
Percnidae Števčić, 2005					
Percnon gibbesi (H. Milne-Edwards, 1853)		(+)		(+)	(+)
Varunidae H. Milne-Edwards, 1853					
Asthenognathus atlanticus Monod, 1933	(+)		(+)	(+)	
Brachynotus atlanticus Forest, 1957			(+)	(+)	
Brachynotus foresti Zariquiey Álvarez, 1968					(+)
Brachynotus sexdentatus (Risso, 1827)			(+)	(+)	(+)
Eriocheir sinensis H. Milne-Edwards, 1853	(+)	(+)	(+)		
Hemigrapsus takanoi Asakura and Watanabe, 2005	(+)				
OCYPODOIDEA Rafinesque, 1815					
Ocypodidae Rafinesque, 1815					
Uca (*Afruca*) *tangeri* (Eydoux, 1835)		(+)	(+)		
PINNOTHEROIDEA de Haan, 1833					
Pinnotheridae de Haan, 1833					
Afropinnotheres monodi Manning, 1993			(+)		
Nepinnotheres pinnotheres (Linnaeus, 1758)	(+)	(+)	(+)	(+)	(+)
Pinnotheres pisum (Linnaeus, 1767)	(+)	(+)	(+)	(+)	(+)

New species present in Iberian waters (since 1968)

In this first group we have included 10 species new to science and reported in Iberian waters after the work of Zariquiey Álvarez (1968). Note that *Monodaeus guinotae* is considered as an invalid species and is not included in the checklist.

1. *Homologenus boucheti* Guinot and Richer de Forges, 1995

This deep-sea species was described to comprise the eastern Atlantic populations of *Homologenus rostratus* (A. Milne-Edwards 1880). In the Iberian Peninsula, it had only been reported (as *H. rostratus*) in the south of Portugal (García Raso 1996).

2. *Calappa tuerkayana* Pastore, 1995

This new species was described by Pastore (1995) from the Ionian Sea, and has been reported in the Balearic Islands (García 2002, García and Corbera 2007) and Atlantic waters (d'Udekem d'Acoz 2001). The validity of *C. tuerkayana* was already questioned by Holthuis (2001), and new molecular evidence indicates that this species represents juvenile stages of *Calappa granulata* (Abelló and Palero in prep.). Therefore, *C. tuerkayana* should be excluded from the Iberian checklist in the near future.

3. *Pisa* sp. Marco-Herrero et al. (in prep.)

A megalopa stage collected in Balearic waters has been assigned to the genus *Pisa* using molecular data. However, the DNA sequence obtained does not correspond to any of the species of this genus found in Iberian waters (Marco-Herrero et al. in prep.). In addition, a small specimen of this genus, morphologically different to other known Iberian species, has been found in the Alboran Sea (García Raso et al. unpublished).

4. *Macropodia deflexa* Forest, 1978

Forest described this *Macropodia* species as being closely related to *M. czernjawskii*, and its taxonomic validity has been questioned by d'Udekem d'Acoz (1999). The species has been reported in the Gulf of Biscay, Galicia, Portugal and the Gulf of Cádiz (Forest 1978, Fernández Cordeiro et al. 2006).

5. *Macropodia parva* Van Noort and Adema, 1985

D'Udekem d'Acoz (1999) suggested that this species could be attributed to juvenile stages of *M. rostrata.* Molecular evidence obtained by the authors support this assumption (Marco-Herrero et al. in prep.), so this species should also be excluded from the Iberian checklist in the near future.

6. *Maja brachydactyla* Balss, 1922

This species was established by the recognition of two distinct taxa within *M. squinado sensu lato*: *M. squinado sensu stricto* in Mediterranean waters and *M. brachydactyla* in Atlantic waters. The first hints given by Neumann (1998) were recently confirmed by DNA analyses (Sotelo et al. 2008). It should be pointed out that *M. brachydactyla* is also known to occur in the western Alboran Sea (Abelló et al. 2014).

7. *Pilumnus* sp. d'Udekem d'Acoz and Schubart (in prep.)

The taxonomy of *Pilumnus* is controversial, with no clear distinction between several species (d'Udekem d'Acoz 1999, Mavidis et al. 2009). Recent molecular studies on the European representatives of this genus have established six different operative taxonomic units, one of them corresponding to a yet undescribed species present in the Gulf of Cádiz (Oliveira-Biener et al. 2010, Schubart and Aichinger 2013).

8. *Chaceon mediterraneus* Manning and Holthuis, 1989

This deep-sea species is known so far from Mediterranean waters only. It has been reported in both the western (Cartes 1993) and eastern (Kitsos et al. 2005) Mediterranean basins.

9. *Chaceon inglei* Manning and Holthuis, 1989

This species was described based on a female specimen obtained during the Challenger expedition. It has been reported from Iceland, Scotland, southwest England, the Bay of Biscay, Madeira, and the Canary and Azores Islands (Manning and Holthuis 1989). In Iberian waters, it has been reported (as *Geryon affinis*) off Vigo (northwest Spain) (d'Udekem d'Acoz 1999, Araújo et al. 2009).

Invalid species:

1. *Monodaeus guinotae* Forest, 1976

This species has been recorded in southwest Portugal (d'Udekem d'Acoz 1999), southwest Spain, the Alboran Sea (García Raso 1996) and the Balearic Islands (García and Gracia 1996). The differences between this species and *Monodaeus couchii* are very small, and Mavidis et al. (2008) consider this species identical to *M. couchii*. Indeed, the recent molecular phylogeny study by Reuschel and Schubart (2006) indicates that *M. guinotae* should be considered a synonym of *M. couchii.*

Species reported after 1968

This second group includes 17 species that were known by 1968 but had not been reported in Iberian waters. It also includes one invalid species:

1. *Cymonomus normani* Lankaster, 1903

This eastern Atlantic species was reported in Portuguese waters by Türkay (1976).

2. *Calappa pelii* Herklots, 1851

This is a West African species collected once in the Chafarinas Islands (Silvestre, identification confirmed by Galil et al. 2002)

3. *Cryptosoma cristatum* Brullé, 1837

This species has been reported from the Macaronesian archipelagos (Madeira, Azores, Canarias, Cape Verde), and also in Málaga and Alboran Sea by García Raso (1993). There is an unpublished photography of a specimen collected in Algarve (Portugal) in 2008 (M.M. Rufino pers. comm.).

4. *Ethusina talismani* A. Milne-Edwards and Bouvier, 1897

This is a West African species, reported from South Portugal by García Raso (1996).

5. *Paragalene longicrura* (Nardo, 1869)

This is a rare species with a wide distribution, from the Aegean Sea (eastern Mediterranean) to Madeira (eastern Atlantic), reported in the Balearic Islands by García Socias (1985) and Gili and Macpherson (1987).

6. *Pisa carinimana* Miers, 1879

This species is known to occur from the Canary Islands (topotypic locality) to Angola, and was recently observed for the first time in Madeira (Ramalhosa et al. 2014). It was collected in Melilla (Mediterranean North Africa) by Zariquiey Álvarez (1968) and for the first time in the Alboran Sea by García Raso (1981, 1984), and in the Gulf of Cádiz by González-Gordillo et al. (1990).

7. *Velolambrus expansus* (Miers, 1879)

Also reported as *Parthenope expansa*, this species is distributed from the eastern Atlantic to the eastern Mediterranean. It was collected from the Alboran Sea by García Raso (1989, 1996).

8. *Chaceon affinis* (A. Milne-Edwards and Bouvier, 1894)

This eastern Atlantic species was found off Galicia (Northwestern Spain) by González Gurriarán and Méndez (1986).

9. *Geryon trispinosus* (Herbst, 1803)

This species, very similar to the northeastern Atlantic *G. longipes,* has been captured off Galicia (Urgorri et al. 1990) and Portugal (Vilela 1936, Türkay 1976).

10. *Liocarcinus maculatus* (Risso, 1827)

This species has been confounded with *L. pusillus* and *L. zariquieyi*, but Froglia and Manning (1982) summarized their distinctive morphological traits. It is mainly present in the Mediterranean Sea, with some occurrences in the eastern Atlantic. It has been collected in the Alboran Sea (García Raso 1984, 1996) and along the Catalan coast (Abelló et al. 1988, 2002).

11. *Liocarcinus mcleayi* (Barnard, 1947)

A synonym of *Xaiva mcleayi* and *Polybius mcleayi*. It was recorded in Portugal (as *Macropipus zariquieyi*) by Neves (1978), and in the South of Spain (Barbate, Cádiz) by García Raso and Manjón Cabeza (1996).

12. *Paractaea monodi* Guinot, 1969

This species was reported from North Africa (Melilla) as *Actaea rufopunctata* (Zariquiey, 1968). Specimens (as *Paractaea rufopunctata*) were caught in the Alboran Sea (García Raso and Barrajón 1983, García Raso 1990). It is also known from the Balearic Islands (Corbera et al. 1993).

13. *Microcassiope minor* (Dana, 1852)

An Atlantic species that has also been reported from Almeria and the Alboran Sea (García Raso and López de la Rosa 1992).

14. *Xantho sexdentatus* (Miers, 1881)

This tropical and subtropical Atlantic species is distributed from Senegal to the western Sahara (d'Udekem d'Acoz 1999), and the closest records to the Iberian Peninsula so far correspond to the Azores and Canary Islands (Fransen 1991). A specimen, identified by DNA barcoding in the context of the MEGALOPADN project as *X. sexdentatus*, has been collected in Rota (Cádiz). This constitutes a new report for the Iberian fauna.

15. *Brachynotus atlanticus* Forest, 1957

This western Atlantic species has been reported for Iberian waters in the Gulf of Cádiz (García Raso 1985, González-Gordillo et al. 1990) and the Alboran Sea (García Raso 1984, 1985).

16. *Afropinnotheres monodi* Manning, 1993

This African pinnotherid was recently reported for the first time in the Gulf of Cádiz by Subida et al. (2011), which also constituted the first record in European waters. This was the third report for this species worldwide. Although it is probably a case of natural range expansion, an introduction by fouling should not be discarded, given that the mussel *Mytilus galloprovincialis* is one of its main hosts (Drake et al. 2014).

Invalid species:

1. *Brachynothus gemmellaroi* (Rizza, 1839)

The westernmost record for this Mediterranean endemic species was reported as *B. gemmellari* in the Ebro Delta (Guerao et al. 1995). Although it is still considered a valid species (e.g. WoRMS), initial DNA evidence suggests that *B. gemmellari* should be considered an ecophenotype of *Brachynotus sexdentatus* (Schubart et al. 2001).

Newly introduced alien species

Human introduction of alien/allochthonous species has become an important biodiversity concern (Zenetos et al. 2010). Crab species are not an exception and up to ten alien species have recently been found in Iberian waters, namely: *Hemigrapsus takanoi, Eriocheir sinensis, Percnon gibbesi, Dyspanopeus sayi, Rhithropanopeus harrisii, Callinectes sapidus, Charybdis feriata, Callinectes exasperatus, Pachygrapsus gracilis* and *Pilumnopeus africanus* (Cuesta Mariscal et al. 1991, Abelló and Hispano 2006, García-de-Lomas et al. 2010, Castejón and Guerao 2013, Marco-Herrero et al. 2013b, Almon et al. 2014, Cuesta et al. 2015). The first six species from this list show established populations in Iberian waters:

1. *Hemigrapsus takanoi* Asakura and Watanabe, 2005

The first European records of this varunid crab from Asia were identified as *Hemigrapsus penicillatus* (de Haan, 1835) since *H. takanoi* was not described at that time. Asakura and Watanabe (2005) described *H. takanoi* as a new species and differentiated it from *H. penicillatus*. In the Iberian coast, *H. takanoi* was first reported from Laredo (Gulf of Biscay) (Noël et al. 1997), and it is now well established in several localities of this region (Dauvin et al. 2009).

2. *Eriocheir sinensis* H. Milne-Edwards, 1853

The Chinese mitten crab is native to the east coast of China, from Hong Kong to North Korea. In the Iberian Peninsula, *E. sinensis* has been established in the Guadalquivir Estuary, SW Iberian Peninsula (Garcia-de-Lomas et al. 2010). It has been reported from the Tagus estuary (Cabral and Costa 1999) and Zumaia (Gulf of Biscay) (Martínez and Adarraga 2006), but there are no data about stable populations in these localities.

3. *Rhithropanopeus harrisii* (Gould, 1841)

The Harris mud crab is native to the Atlantic coast of North America, from the southern Gulf of Saint Lawrence (Canada) to the Gulf of Mexico. *R. harrisii* has been established in the Guadalquivir and Guadalete estuaries, SW Iberian Peninsula (Cuesta Mariscal et al. 1991, Rodríguez et al. unpublished data) and it was also reported in the Mondego estuary (Portugal) (Gonçalves et al. 1995).

4. *Dyspanopeus sayi* (Smith, 1869)

Say's mud crab is native to the northwestern Atlantic Ocean from Canada to Florida. This species has been established in the Ebro Delta, NE Iberian Peninsula (Schubart et al. 2012, Marco-Herrero et al. 2013b).

5. *Percnon gibbesi* (H. Milne-Edwards, 1853)

Zariquiey Álvarez (1968) reported *Percnon planissimum* (Herbst, 1804) as being a species very rarely present in Portuguese waters, but these records have not been confirmed. Instead, the Atlantic species *Perc-*

non gibbesi has been recently recorded in different localities throughout the Mediterranean (see Katsanevakis et al. 2011). In the Iberian Peninsula, the species has been reported in the Balearic Islands (García and Reviriego 2000, Müller 2001), Alicante (Acosta 2003), the Columbretes Islands and Barcelona (Abelló et al. 2003), Murcia (Félix-Hackradt et al. 2010), Almeria (Junta de Andalucía, GEOBIO 2010), Valencia (Palero unpublished data) and Granada (de la Roza, personal comm.). Megalopa stages and early juvenile specimens have recently been collected from Cullera (Valencia). Citizen science reports, mediated through the website "Observadores del Mar", show that the species is now widely reported along the Mediterranean coasts from Cape Palos to Catalonia, as well as in the Balearic Islands. It is not yet clear whether this Mediterranean expansion from the Atlantic is a natural process or was mediated by human activities (accidental transport in ballast water or specimens released from pet trade).

6. *Callinectes sapidus* Rathbun, 1896

Some adult specimens of the American blue crab were recently captured in the Ebro Delta, but more data are needed to determine whether this species is definitely established. The species can be considered rare in other areas of the Iberian Peninsula (Castejón and Guerao 2013), although a recent report of one ovigerous female from the Sado estuary might indicate the establishment of a small population (Ribeiro and Verissimo 2014).

Some casual reports are known for the remaining alien species of this checklist, including a single adult female of the Indo-Pacific portunid *Charybdis feriata* caught in Barcelona (Abelló and Hispano 2006), one male specimen of *Callinectes exasperatus* collected in the Bay of Cádiz (Cuesta et al. 2015), and four specimens of *Pilumnopeus africanus* and two specimens of *Pachygrapsus gracilis* collected in Galicia (NW Spain) by Almon et al. (2014).

When species native from distant localities are reported within Iberian waters, there is little doubt that they were introduced through human activities (intentional or accidentally). However, this is not necessarily the case for species native from nearby areas in West and North Africa which have been recently found in the Alboran Sea and Gulf of Cádiz (*Calappa pelii, Cryptosoma cristatum,* and *Afropinnotheres monodi*). These were not considered as introduced species in the present account, but this hypothesis cannot be discarded.

Systematic remarks

The scientific names of some species considered by Zariquiey Álvarez (1968) have changed due to new systematic studies or synonymizations, and these are listed in Table 2. Other systematic changes refer to higher taxonomic levels, and these will be addressed here.

The first main change in the systematics of brachyuran crabs after 1968 was the proposal of new sections and subsections by Guinot (1977, 1978, 1979), de Saint Laurent (1979, 1980), and Guinot and Bouchard (1998). Based on the male and female genital apertures, these authors separated brachyuran crabs into Dromiacea and Eubrachyura, or the subsections Podotremata, Heterotremata and Thoracotremata. Morphological and molecular analyses do not reveal monophyly within Podotremata, so the most recent classifications divide it into three sections: Dromiacea, Cyclodorippoidea and Raninoida (De Grave et al. 2009). According to these changes, the old term Reptantia (present in Zariquiey Álvarez 1968) was removed from the classification. Considering just those superfamilies present in Iberian waters, most changes correspond to splits of old taxa into several new superfamilies. For example, the superfamily Corystoidea (which comprised the families Atelecyclidae, Cancridae, Corystidae, Pirimelidae and Thiidae) now comprises Corystidae only, while Atelecyclidae and Cancridae have been placed in the new superfamily Cancroidea, and Pirimelidae and Thiidae have been relocated within the Portunoidea (Spiridonov et al. 2014). All changes at the superfamily level are listed in Table 3, including new family composition.

Some of the most important changes affect the assignment of genera to new families, which cannot be appreciated in Table 3. For example, the former Majidae family suffered important changes due to its elevation into a superfamily (Majoidea) and the elevation to family level of previous subfamilies: Majidae, Epialtidae, and Inachidae. Some authors have raised Pisidae as well (Hendrickx 1995), but we followed here the more conservative classification of Ng et al. (2008) considering Pisiinae as a subfamily of Epialtidae. A recent study based on larval morphology and DNA did not support a clear separation between epialtid and pisid crabs (Hultgren and Stachowitz 2008). Neverthe-

Table 2. – Previous and current names of brachyuran species present in the Iberian Peninsula renamed since Zariquiey Álvarez (1968), listed by alphabetical order.

Previous names (as in Zariquiey Álvarez 1968)	Current names (as in Ng *et al*. 2008)
Achaeus gordonae	*Achaeus gracilis*
Actaea rufopunctata	*Paractaea monodi*
Bathynectes superbus	*Bathynectes maravigna*
Carcinus mediterraneus	*Carcinus aestuarii*
Dicranodromia mayheuxi	*Dicranodromia mahieuxii*
Ebalia cranchi	*Ebalia cranchii*
Ebalia edwardsi	*Ebalia edwardsii*
Heterocrypta maltzani	*Distolambrus maltzami*
Macropipus arcuatus	*Liocarcinus navigator*
Macropipus bolivari	*Liocarcinus bolivari*
Macropipus corrugatus	*Liocarcinus corrugatus*
Macropipus depurator	*Liocarcinus depurator*
Macropipus holsatus	*Liocarcinus holsatus*
Macropipus marmoreus	*Liocarcinus marmoreus*
Macropipus puber	*Necora puber*
Macropipus pusillus	*Liocarcinus pusillus*
Macropipus vernalis	*Liocarcinus vernalis*
Macropipus zariquieyi	*Liocarcinus zariquieyi*
Maja verrucosa	*Maja crispata*
Medaeus couchi	*Monodaeus couchii*
Parthenope angulifrons	*Derilambrus angulifrons*
Parthenope macrochelos	*Spinolambrus macrochelos*
Parthenope massena	*Parthenopoides massena*
Pinnotheres pinnotheres	*Nepinnotheres pinnotheres*
Pisa corallina	*Pisa hirticornis*
Xantho incisus granulicarpus	*Xantho hydrophilus*
Xantho incisus incisus	*Xantho hydrophilus*

Table 3. – Previous and current names (and family composition) of the superfamilies of brachyuran crabs present in the Iberian Peninsula, listed by systematic order.

Previous names (as in Zariquiey Álvarez 1968)		Current names (as in Ng et al. 2008 and Spiridonov et al. 2014)	
Superfamily	Family	Superfamily	Family
Dromiacea	Dromiidae	Homolodromioidea	Homolodromiidae
		Dromioidea	Dromiidae
	Homolidae	Homoloidea	Homolidae
	Latreillidae		Latreillidae
Oxystomata	Dorippidae	Dorippoidea	Dorippidae
			Ethusidae
		Cyclodorippoidea	Cymonomidae
	Calappidae	Calappoidea	Calappidae
	Leucosiidae	Leucosioidea	Leucosiidae
Corystoidea	Corystidae	Corystoidea	Corystidae
	Atelecyclidae	Cancroidea	Atelecyclidae
	Canceridae		Cancridae
	Pirimelidae*		
	Thiidae*		
Brachyryncha	Goneplacidae	Goneplacoidea	Goneplacidae
			Progeryonidae
	Grapsidae	Grapsoidea	Grapsidae
			Percnidae
			Plagusiidae
			Varunidae
	Ocypodidae	Ocypodoidea	Ocypodidae
	Palicidae	Palicoidea	Palicidae
	Pinnotheridae	Pinnotheroidea	Pinnotheridae
	Portunidae	Portunoidea	Carcinidae
			Portunidae
			Pirimelidae*
			Polybiidae
			Thiidae*
			Geryonidae**
	Xanthidae	Pilumnoidea	Pilumnidae
		Xanthoidea	Xanthidae
			Panopeidae
		Eriphioidea	Eriphiidae
Oxyrhyncha	Majidae	Majoidea	Majidae
			Epialtiidae
			Inachidae
			Oregoniidae
	Parthenopidae	Parthenopoidea	Parthenopidae

* Pirimelidae and Thiidae have been relocated in Portunoidea according to Spiridonov et al. (2014)
**Geryonids were considered to belong to Xanthidae in Zariquiey Álvarez (1968)

less, larval morphology and DNA data suggest that *Ergasticus clouei* should be moved from Inachidae to Oregoniidae, a family that was not present in Iberian waters (Marco-Herrero et al. 2013a).

Within the Grapsoidea superfamily, the former Grapsidae is now restricted to the previous subfamily Grapsinae, while other subfamilies that acquired familial level (e.g. Varunidae, Plagusiidae and Percnidae) are also present in Iberian waters (see Schubart et al. 2002, Schubart and Cuesta 2010). Some genera and species have also changed their placement, such as *Euchirograpsus* that was considered a Varuninae and is now within the Plagusiidae.

The superfamily Portunoidea is still under discussion. Geryonid crabs, which were previously considered as part of Xanthidae, now belong to Geryonidae. Schubart and Reuschel (2009) proposed a new taxonomy based on molecular evidence for the Pirimelidae (traditionally placed in Cancroidea), Polybiidae, Carcinidae and Thiidae (according to Ng et al. 2008, but currently in its own superfamily Thioidea), and these changes obtained further support from Spiridonov et al. (2014). Several portunoid genera are currently under study and new modifications are expected.

The Parthenopidae family has also experienced strong changes after the work of Tan and Ng (2007). In the case of Iberian species, all generic names have been modified (new combinations) and the three species of *Parthenope* are now considered as one species of *Spinolambrus* and the monotypic genera *Derilambrus* and *Parthenopoides*. The former parthenopid genus *Heterocrypta*, a monotypic genus also found in Iberian waters, is now named *Distolambrus*.

Another important change affects the systematic position of *Asthenognathus atlanticus*, a former pinnotherid crab that is now considered a member of the subfamily Asthenognathinae (Grapsoidea: Varunidae). This modification, based on larval and molecular evidences provided by Cuesta et al. (2005), was already included in Ng et al. (2008).

Within the Ocypodidae, Spivak and Cuesta (2009) proposed to elevate the subgenus *Afruca* to genus level, based on larval morphology and supported by previous phylogenies of the genus *Uca*, and then named the species inhabiting the southwest of the Iberian Peninsula as *Afruca tangeri*. However, this proposal has not been followed in later studies and *Afruca tangeri* is maintained in this checklist as *Uca* (*Afruca*) *tangeri*.

Finally, morphological studies by Forest (1978) and García Raso et al. (1987) have questioned the validity of *Macropodia longipes* and considered its possible synonymy with *Macropodia tenuirostris*. Studying the larval development of both species, Guerao and Abelló (1997) also mentioned that "… the two species are closely related phylogenetically". Both species are maintained as reported in Zariquiey Álvarez (1968), but their taxonomic status will be clarified with ongoing molecular phylogenetics research.

The Iberian carcinofauna: future changes

Further modifications are still ongoing in brachyuran systematics, so changes in the Iberian carcinofauna are expected to come in the near future. The improvements on the application of molecular tools and phylogenetic inference methods and the use of larval morphology are expected to bring further changes in the systematics of brachyuran crabs. These will have an impact at several taxonomic levels, from species to superfamilies. For example, preliminary studies carried out by our team on the molecular phylogeny of the Inachidae family, or some genera like *Ebalia, Liocarcinus* and *Pisa*, point to the presence of synonymy, the necessity to split some taxa into new species, and the erection of new genera. The validity of some species is currently questioned, such as the case of *Calappa tuerkayana* (possible synonym of *Calappa granulata*), *Geryon trispinosus* (possible synonym of *Geryon longipes*), *Macropodia parva* (as synonym of *Macropodia rostrata*) and *Macropodia longipes* (as synonym of *Macropodia tenuirostris*).

Although descriptions of crab species new to science are not expected to occur at a significant rate, an increase on the number of taxa in the Iberian Peninsula will surely result from the human introduction of alien species, as well as the natural expansion of species from West and North Africa and the eastern Mediterranean. Likely candidates to expand the checklist include *Pinnotheres pectunculi* (presumably present in the Iberian Peninsula as a native species; d'Udekem d'Acoz pers. comm.), *Hemigrapsus sanguineus, Portunus sayi* and maybe *Potamon ibericum* (introduced to the Cagne river in southern France between 1975 and 1983 [Noël and Guinot, 1983]). Species of warmer waters will expand their geographic range through "tropicalization" and climate change will favour the expansion of thermophilic species (Verges et al. 2014). Although not all of their predictions have been fulfilled, the likely arrival of alien species was already mentioned by Almaça (1985) and García Raso et al. (1987), and new species are expected to arrive in the near future.

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