

New data on opisthobranchs (Mollusca: Gastropoda) from the southwestern coast of Portugal

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ABSTRACT

The present papers reports the results obtained from different field samplings carried out on the southwestern Portuguese coast during July 2002, within the scope of three research projects on opisthobranch molluscs. Two areas were sampled, one around Sagres (37° 00' N, 8° 57' W) on the SW tip of the Portuguese mainland, the other near Sines (37° 57' N, 8° 53' W), 110 km north of the other site. Eighty-one species of opisthobranchs were identified, six of them new to the Portuguese fauna.

Keywords: Mollusca, Opisthobranchia, Portugal.

RESUMEN

Nuevos datos sobre opistobranquios (Mollusca: Gastropoda) en la costa suroeste de Portugal

Se exponen los resultados obtenidos a partir de los diferentes muestreos realizados en julio de 2002 en el suroeste de la costa portuguesa, en el ámbito de tres proyectos centrados en los moluscos opistobranquios. Se muestrearon dos áreas: una en los alrededores de Sagres (37° 00' N, 8° 57' O), en el extremo suroeste continental de Portugal y la otra en los alrededores de Sines (37° 57' N, 8° 53' O), a 110 km al norte de la primera. Se identificaron 81 especies de opistobranquios, seis de las cuales constituyen nuevas citas para la fauna portuguesa.

Palabras clave: Moluscos, opistobranquios, Portugal.

INTRODUCTION

Recent advances in the study of Portuguese opisthobranch fauna have added many names to the country's species roster. The international marine biology expedition Algarve 88, by the Muséum National d'Histoire Naturelle of Paris, and the publication of its results (García-Gómez *et al.*, 1991), can be considered the most important turning point. During that expedition, samples were collected from two areas on the southern Portuguese coast (Sagres and Olhão), and 53 species were reported for the first time for the Portuguese fauna. More recently, further relevant data were reported from the southern coast by Malaquias and Morenito (2000), and from the western coast by Calado and Urgorri (1999), Calado *et al.* (1999) and Gavaia *et al.* (2003). Due to the excellent results obtained at Sagres in 1988, and in order to contribute to updating the Iberian opisthobranch catalogue, a new campaign was carried out in July 2002. In addition to sampling around Sagres, it was decided to investigate the nearby western coast (along the area around Sines), since not much data was then available, and also because it represents a mid point between Sagres and Arrábida –the lat-

ter zone having already been well explored (Calado *et al.*, 1999; Gavaia *et al.*, 2003).

The checklist of species found is presented herein with comments on the relevant species.

MATERIALS AND METHODS

Study area

The campaign was divided into two sampling areas, one at Sagres (37° 00' N, 8° 57' W), on the southwest tip of the Portuguese mainland, with 8 sampling stations, the other around Sines (37° 57' N, 8° 53' W), 110 km north of the other site, with 5 sampling stations (figure 1).

Collection of the material

Specimens were collected from the rocky intertidal zone down to 22 m, using scuba gear whenever necessary. Only one specimen came from 400 m, trawled by a commercial vessel. Both direct and indirect methods were used, including observation in specific substrata (over sessile organisms, under boul-

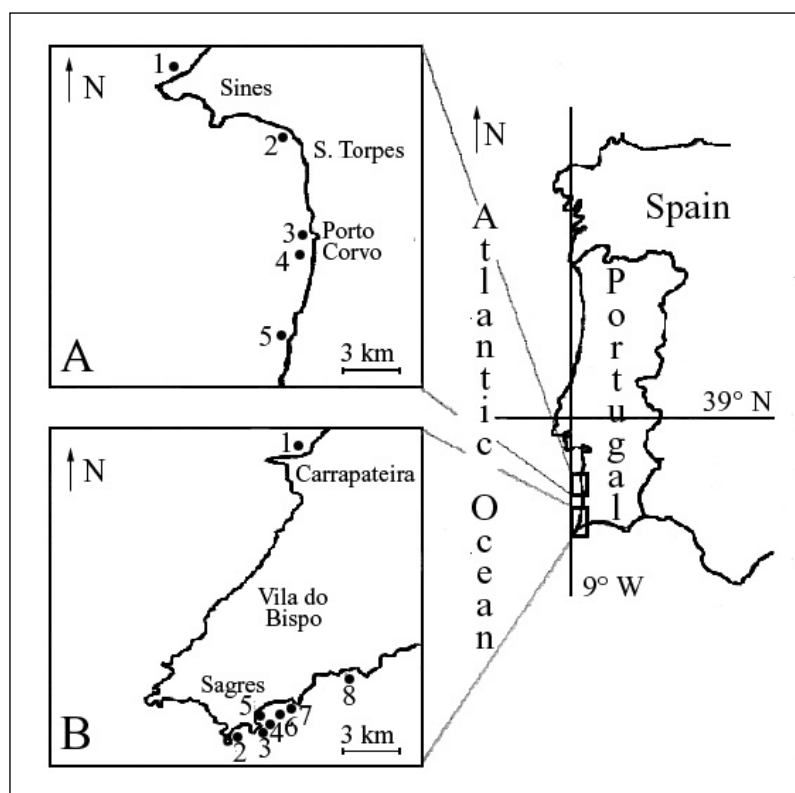


Figure 1. Map of the study area. (A): sampling stations around Sines: (1): Pedras Amarelas (North); (2): São Torpes; (3): Porto Covo; (4): Ilha do Pessegueiro; (5): Praia do Malhão. (B): sampling stations around Sagres: (1): Praia da Bordeira; (2): Ponta de Sagres (Fortaleza); (3): Gruta do Salva-vidas; (4): Ponta da Baleeira; (5): Praia da Baleeira; (6): Ilhéus do Martinhal; (7): Ponta dos Caminhos; (8): Praia da Ingrina

ders), brushing substrata into mesh bags, and an air-suction device. The latter two methods required subsequent laboratory screening. All collected animals were photographed and/or filmed *in vivo*. Those specimens selected for anatomical studies were then anaesthetised with menthol or magnesium chloride and preserved in Bouin's fluid. Specimens for molecular analysis were directly preserved in absolute ethanol. The material collected was deposited in the collections of the Museo Nacional de Ciencias Naturales of Madrid (Spain) and the California Academy of Sciences (San Francisco, USA).

RESULTS

Of the 85 species collected during the campaign, 81 were identified to species level; these are listed below. The classification presented herein is based on the most recent and comprehensive phylogenetic classifications of different higher taxa of opisthobranchs (Jensen, 1996, 1998; Wägele and Willan, 2000; Schrödl, Wägele and Willan 2001; Valdés and Gosliner, 2001; Valdés, 2002). Likewise, following the latest phylogenetic classification criteria, no taxa are ranked higher than the family level (De Queiroz and Gauthier, 1994). Therefore, the resultant classification is hierarchical. Data on sampling area –(Sa): Sagres; (Si): Sines–, number of specimens (with + for more than ten) and collecting depths are listed after the species name.

■ CEPHALASPIDEA *s.s.* Mikkelsen, 1996

RETUSOIDEA Thiele, 1926

Family Retusidae Thiele, 1926

Genus *Retusa* Brown, 1827

Retusa truncatula (Bruguère, 1792): Sa, 3 specimens, –10/–22 m.

RUNCINOIDEA Odhner 1958

Family Runcinidae H. and A. Adams, 1854

Genus *Runcina* Forbes and Hanley, 1853

Runcina coronata (Quatrefages, 1844): Sa, specimens, 0/–10 m; Si, + specimens, 0/–10 m.

Runcina ferruginea Kress, 1977: Sa, 6 specimens, –17/–20 m.

■ ANASPIDEA Fischer, 1883

Family Aplysiidae Lamarck, 1809

Genus *Aplysia* Linné, 1767

Aplysia depilans Gmelin, 1791: Sa, 2 specimens, –8/–12 m.

Aplysia fasciata Poiret, 1789: Sa, + specimens, 0/–10 m; Si, 1 specimen, intertidal.

Aplysia punctata Cuvier, 1803: Si, + specimens, –6/–20 m.

Aplysia parvula Guilding in Mörch, 1863: Sa, 8 specimens, 6/–22 m; Si, 1 specimen, 10 specimens, –7/–17 m.

■ SACOGLOSSA Ihering, 1876

PLAKOBRANCHOIDEA Rang, 1829

Family Plakobranchidae Rang, 1829

Genus *Elysia* Risso, 1818

Elysia viridis (Montagu, 1804): Sa, + specimens, 0/–22 m; Si, + specimens, 0/–15 m.

LIMAPONTIOIDEA Gray, 1847

Family Hermaeidae H. and A. Adams, 1854

Genus *Hermaea* Lovén, 1844

Hermaea bifida (Montagu, 1815): Sa, 2 specimens, –10/–22 m.

Hermaea paucicirra Pruvot-Fol, 1953: Sa, 1 specimen, intertidal.

Genus *Hermaeiopsis* A. Costa, 1869

Hermaeiopsis variopicta (A. Costa, 1869): Si, 1 specimen, –17 m.

Family Limapontiidae Gray, 1847

Genus *Placida* Trinchese, 1876

Placida tardyi (Trinchese, 1873): Sa, 1 specimen, –10/–22 m.

Placida verticillata Ortea, 1981: Sa, + specimens, 0/–22 m.

■ NUDIPLLEURA Wägele and Willan, 2000

PLEUROBRANCHOIDEA Férussac, 1822

Family Pleurobranchidae Férussac, 1822

Genus *Berthella* Blainville, 1824

Berthella plumula (Montagu, 1803): Sa, 2 specimens, intertidal.

Berthella stellata (Risso, 1826): Sa, + specimens, 0/–14 m; Si, 5 specimens, 0/–7 m.

Genus *Berthellina* Gardiner, 1936

Berthellina edwardsi (Vayssière, 1897): Sa, 1 specimen, –15 m.

NUDIBRANCHIA Blainville, 1814

ANTHOBRANCHIA Minichev, 1970

DORIDOIDEA Pelseneer, 1894

PHANEROBRANCHIA Fischer, 1883

Family Goniodorididae H. and A. Adams, 1854

Genus *Goniodoris* Forbes and Goodsir, 1839

Goniodoris castanea Alder and Hancock, 1845: Sa, 1 specimen, –8 m; Si, 1 specimen, intertidal.

Genus *Okenia* Menke, 1830

Okenia mediterranea (Ihering, 1886): Si, 1 specimen, –17 m.

Genus *Trapania* Pruvot-Fol, 1931

Trapania tartanella (Ihering, 1885): Sa, 6 specimens, –6/–17 m; Si, + specimens, –7/–15 m.

Family Onchidorididae Alder and Hancock, 1845

Genus *Diaphorodoris* Iredale and O'Donoghue, 1923
Diaphorodoris luteocincta (Sars, 1870): Sa, 5 specimens, -7/-15 m; Si, 2 specimens, -15 m.

Diaphorodoris papillata Portmann and Sandmeier, 1960: Sa, 5 specimens, -7/-22 m; Si, 1 specimen, -15 m.

Family Polyceridae Alder and Hancock, 1845

Genus *Crimora* Alder and Hancock, 1862
Crimora papillata Alder and Hancock, 1862: Sa, + specimens, -7/-22 m; Si, 3 specimens, -17 m.

Genus *Roboastra* Bergh, 1877
Roboastra europaea García-Gómez, 1985: Sa, 1 specimen, -20 m.

Genus *Limacia* O.F. Müller, 1781
Limacia clavigera (O.F. Müller, 1776): Sa, 6 specimens, -10/-22 m.

Genus *Polycera* Cuvier, 1817
Polycera quadrilineata (O.F. Müller, 1776): Sa, + specimens, -6/-22 m; Si, + specimens, -7/-15 m.
Polycera faeroensis Lemche, 1929: Sa, 3 specimens, -7/-17 m; Si, + specimens, -15/-17 m.

Family Aegiridae Fischer, 1883

Genus *Aegires* Lovén, 1844
Aegires punctilucens (D'Orbigny, 1837): Si, 1 specimen, intertidal.

CRYPTOBRANCHIA Odhner, 1934

LABIOSTOMATA Valdés, 2002

Family Chromodorididae Bergh, 1891

Genus *Hypselodoris* Stimpson, 1855
Hypselodoris villafranca (Risso, 1818): Sa, + specimens, 0/-22 m; Si, + specimens, -15/-17 m.

Hypselodoris fontandraui (Pruvot-Fol, 1951): Sa, 4 specimens, -7/-17 m; Si, 3 specimens, -15/-17 m.

Hypselodoris bilineata (Pruvot-Fol, 1953): Sa, 5 specimens, -6/-20 m; Si, 3 specimens, -7/-17 m.

Hypselodoris cantabrica Bouchet and Ortea, 1980: Si, + specimens, -15/-17 m.

Hypselodoris midatlantica Gosliner, 1990: Sa, + specimens, -10/-20 m; Si, + specimens, -15/-17 m.

Genus *Chromodoris* Alder and Hancock, 1855
Chromodoris luteorosea (Rapp, 1827): Si, 2 specimens, -15 m.
Chromodoris purpurea (Laurillard, 1831): Sa, 6 specimens, 0/-15 m; Si, 9 specimens, -7/-17 m.

Chromodoris krohni (Vérany, 1846): Sa, 9 specimens, -7/-20 m.

Genus *Cadlina* Bergh, 1878
Cadlina pellucida (Risso, 1826): Sa, 2 specimens, -15/-17 m; Si, 3 specimens, -15/-17 m.

Family Dorididae Rafinesque, 1815

Genus *Doris* Linné, 1758

Doris pseudoargus Rapp, 1827: Si, 2 specimens, -14/-15 m.

Doris cf. *sticta* (Iredale and O'Donoghue, 1923): Sa, 1 specimen, -15 m.

Genus *Aldisa* Bergh, 1878
Aldisa smaragdina Ortea, Pérez and Llera, 1982: Sa, 4 specimens, -14/-17 m.

Family Discodorididae Bergh, 1891

Genus *Jorunna* Bergh, 1876
Jorunna tomentosa (Cuvier, 1804): Si, 5 specimens, 0/-15 m.

Genus *Discodoris* Bergh, 1877
Discodoris rosi Ortea, 1979: Sa, 1 specimen, -10 m; Si, 6 specimens; -7/-17 m.

Genus *Rostanga* Bergh, 1879
Rostanga rubra Risso, 1818: Sa, 1 specimen; -12 m.

POROSTOMATA Bergh, 1892

Family Dendrodorididae O'Donoghue, 1924

Genus *Dendrodoris* Ehrenberg, 1831
Dendrodoris limbata (Cuvier, 1804): Sa, 3 specimens, intertidal.
Dendrodoris herythra Valdés and Ortea in Valdés, Ortea, Avila and Ballesteros, 1996: Sa, 5 specimens, 0/-20 m.

Genus *Doriopsilla* Bergh, 1880
Doriopsilla areolata Bergh, 1880: Sa, + specimens, -6/-20 m; Si, 8 specimens, -17 m.

Doriopsilla pelseneeri Oliveira, 1895: Sa, 2 specimens, -10/-14 m.

DEXIARCHIA Schrödl, Wägele and Willan, 2001

CLADOBRANCHIA Willan and Morton, 1984

DENDRONOTOIDEA Sars, 1878

Family Tritoniidae Lamarck, 1809

Genus *Tritonia* Cuvier, 1803
Tritonia manicata Deshayes, 1853: Si, 2 specimens, -15/-17 m.
Tritonia nilsodhneri Marcus, 1983: Sa, + specimens, -7/-18 m; Si, 2 specimens, -14 m.

Genus *Marionia* Vayssière, 1877
Marionia blainvillea (Risso, 1818): Sa, 1 specimen, from a trawling (-400 m).

Family Hancockiidae MacFarland, 1923

Genus *Hancockia* Gosse, 1877
Hancockia uncinata (Hesse, 1872): Si, 5 specimens, -7/-14 m.

Family Dotoidae Gray, 1853

Genus *Doto* Oken, 1815
Doto pimatijda (Montagu, 1804): Sa, 3 specimens, -7/-15 m.
Doto rosea Trinchese, 1881: Sa, 1 specimen, -10 m.
Doto dumei Lemche, 1976: Si, + specimens, -7/-15 m.
Doto koenneckery Lemche, 1976: Sa, 5 specimens, -7/-18 m.
Doto eireana Lemche, 1976: Sa, 1 specimen, -20 m.

Doto verdicioi Ortea and Urgorri, 1978: Sa, 1 specimen, -10 m; Si, 6 specimens, -17 m.

ARMINOIDEA Odhner, 1934

Family Proctonotidae Gray, 1853

Genus *Janolus* Bergh, 1884

Janolus cristatus (Delle Chiaje, 1841): Sa, 3 specimens, -10/-22 m; Si, 9 specimens, -7/-17 m.

AEOLIDOIDEA Odhner, 1934

Family Flabellinidae Bergh, 1889

Genus *Flabellina* Voigt, 1834

Flabellina pedata (Montagu, 1815): Sa, + specimens, 6/-22 m; Si, + specimens, -7/-17 m.

Flabellina babai Schmekel, 1972: Sa, 6 specimens, -7/-22 m; Si, + specimens, -7/-17 m.

Flabellina ischitana Hirano and Thompson, 1990: Sa, 9 specimens, -10/-22 m; Si, + specimens, 0/-17 m.

Family Piseinotecidae Edmunds, 1970

Genus *Piseinotecus* Marcus, 1955

Piseinotecus gaditanus Cervera, García-Gómez and García, 1986: Si, 1 specimen, -7 m.

Family Facelinidae Bergh, 1889

Genus *Favorinus* Gray, 1850

Favorinus branchialis (Rathke, 1806): Sa, 1 specimen, -14 m; Si, 1 specimen, -15 m.

Genus *Facelina* Alder and Hancock, 1855

Facelina annulicornis (Chamisso and Eisenhart, 1821): Sa, 3 specimens, -6/-15 m; Si, 3 specimens, -15 m.

Facelina coronata (Forbes and Goodsir, 1839): Sa, + specimens, -6/-22 m; Si, 7 specimens, 0/-15 m.

Genus *Cratena* Bergh, 1864

Cratena peregrina (Gmelin, 1791): Sa, 3 specimens, -6/-14 m; Si, 1 specimen, -15 m.

Genus *Caloria* Trinchese, 1888

Caloria elegans (Alder and Hancock, 1845): Sa, 1 specimen, -14 m.

Genus *Dondice* Marcus, 1958

Dondice banyulensis Portman and Sandmeier, 1960: Sa, + specimens, -10/-22 m; Si, 7 specimens, 0/-14 m.

Genus *Pruvotfolia* Tardy, 1969

Pruvotfolia pselliotes (Labbé, 1923): Sa, 1 specimen, -6 m; Si, 1 specimen, intertidal.

Family Aeolidiidae D'Orbigny, 1834

Genus *Spurilla* Bergh, 1864

Spurilla neapolitana (Delle Chiaje, 1823): Sa, 2 specimens, 0/-16 m.

Genus *Aeolidiella* Bergh, 1867

Aeolidiella soemeringi (Leuckart, 1828): Sa, 1 specimen, intertidal.

Aeolidiella glauca (Alder and Hancock, 1845): Si, 1 specimen, -14 m.

Aeolidiella sanguinea (Normann, 1877): Sa, 3 specimens, -6/-18 m.

Family Eubranchidae Odhner, 1934

Genus *Eubranchus* Forbes, 1838

Eubranchus farrani (Alder and Hancock, 1844): Sa, 6 specimens, -7/-17 m; Si, 2 specimens, -17 m.

Family Calmidae Iredale and O'Donoghue, 1923

Genus *Calma* Alder and Hancock, 1855

Calma glaucoides (Alder and Hancock, 1854): Sa, 1 specimen, intertidal; Si, 3 specimens, -17 m.

Family Tergipedidae Thiele, 1931

Genus *Cuthona* Alder and Hancock, 1855

Cuthona caerulea (Montagu, 1804): Sa, 1 specimen, -14 m.

Cuthona foliata (Forbes and Goodsir, 1838): Sa, 1 specimen, -10 m.

Cuthona amoena (Alder and Hancock, 1845): Sa, 1 specimen, -17 m; Si, 1 specimen, -17 m.

Cuthona genovae (O'Donoghue, 1929): Sa, 1 specimen, -15 m.

Cuthona ocellata (Schmekel, 1966): Sa, + specimens, -6/-14 m; Si, 8 specimens, -15/-17 m.

Cuthona thompsoni García, López-González and García-Gómez, 1991: Si, 3 specimens, -7 m.

Family Embletoniidae Schmekel, 1970

Genus *Embletonia* Alder and Hancock, 1851

Embletonia pulchra Alder and Hancock, 1851: Si, 1 specimen, intertidal.

DISCUSSION

Six of the 81 identified species are new records for the Portuguese fauna, namely, *Placida tardyi*, *Placida verticilata*, *Okenia mediterranea*, *Hypselodoris fontandraui*, *Cuthona amoena*, and *Cuthona thompsoni*. *P. tardyi* was found for the first time in waters with a strong Atlantic influence, since previous Iberian records were confined to the western Andalusian coasts (Cervera *et al.*, 1988; Cervera, García-Gómez and Ortea, 1991). *C. thompsoni* was collected for the second time outside its type locality, which is El Portil, Huelva (western Andalusia) (García, López-González and García-Gómez, 1991); there is also a photographic reference of this species for the Costa Blanca, on the Iberian Mediterranean coast (Wirtz and Debelius, 2003). The collection of *Piseinotecus gaditanus* at Sines was the fourth since its original description, and the

northernmost on the Atlantic coast, although some photographic references are available for the French Atlantic Coast (Barrabes, 2003). Ortea *et al.* (1993) recorded this species at the Cape Verde Archipelago.

Our data, together with other published results from the Portuguese coast –from Ria Formosa (García-Gómez *et al.*, 1991, data from 1988; Malaquias and Morenito, 2000, data from 1996 to 1998), Sagres (García-Gómez *et al.*, 1991, data from 1988); and Arrábida (Calado *et al.*, 1999, data from 1994 to 1998)– were submitted to a cluster analysis. These data are not presented, since our results revealed no relevant differences among localities attributable to any kind of geographical variation. The distance between Arrábida and Ria Formosa (about 250 km along the coastline) was not enough for consistent differences to be found. The initial hypothesis was that Cape of São Vicente (close to Sagres), the southwestern tip of Europe, would constitute a marked geographical barrier, since the coastline here has a major discontinuity (figure 1). It is thus acceptable for the entire southern Portuguese coast to be considered the same biogeographical area. Any division for inventory purposes will, therefore, remain artificial.

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