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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 latter 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-

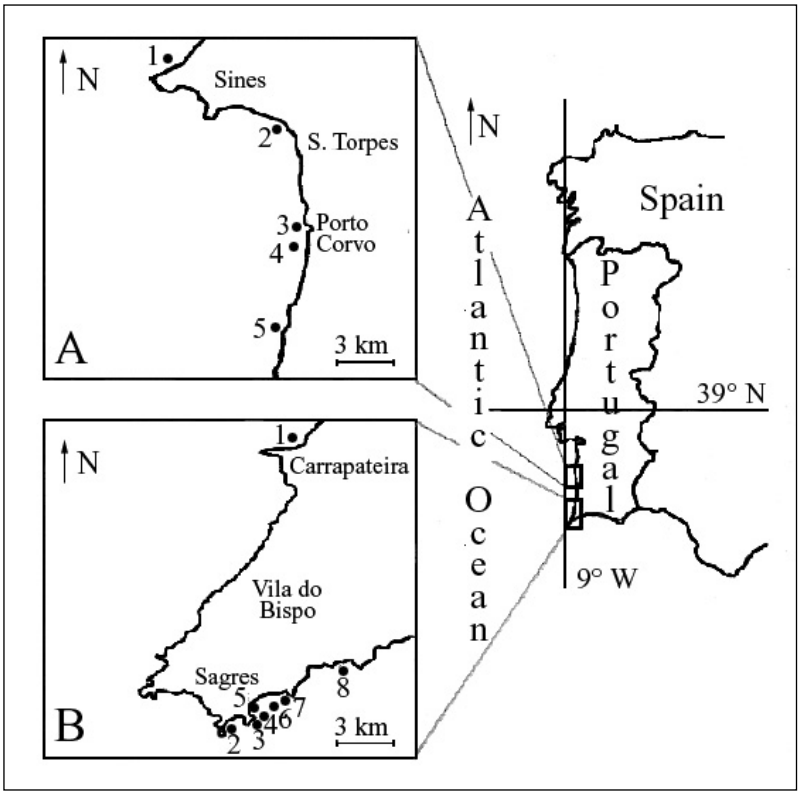

Figure 1. Map of the study area. (A): sampling stations around Sines: (1): Pedras Amarelas (North); (2): São Torpes; (3): Porto Covo; (4): Ilha do Pessegueiro; (5): Praia do Malhão. (B): sampling stations around Sagres: (1): Praia da Bordeira; (2): Ponta de Sagres (Fortaleza); (3): Gruta do Salva-vidas; (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 chlorine 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* (Bruguière, 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

***Hermaeopsis 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 verticilata* Ortea, 1981:** Sa, + specimens, 0/ –22 m.

■ NUDIPLEURA 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

***Bertellina 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 Doridiidae 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 specimens, –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
***Hanockia uncinata* (Hesse, 1872):** Si, 5 specimens, –7/ –14 m.

Family Dotoidae Gray, 1853
Genus *Doto* Oken, 1815
***Doto pinnatifida* (Montagu, 1804):** Sa, 3 specimens, –7/ –15 m.

***Doto rosea* Trinchese, 1881:** Sa, 1 specimen, –10 m.

***Doto dunnei* 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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