

**A preliminary check-list of Opisthobranchia (Mollusca, Gastropoda)
from the Maltese Islands**

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A check-list of the opisthobranch molluscs recorded from the Maltese Islands to date is presented; 163 species are reported of which 78 are new records. The orders Cephalaspidea, Anaspidea, Notaspidea, Acochliidiacea, Sacoglossa (=Ascoglossa), and Nudibranchia are represented. Some data on distribution are given.

Key words: Gastropoda, Opisthobranchia, check-list, Malta, Mediterranean.

INTRODUCTION

The Maltese archipelago consists of a group of small islands located in the central Mediterranean (latitude: 35°48'28" to 36°05'00"N; longitude: 14°11'04" to 14°34'37"E). The total surface area is 315.8 km² and only the three largest islands (Malta, Gozo and Comino) are inhabited. The islands lie on a submarine platform separating the Western and Eastern basins in the Mediterranean. The archipelago is 96 km South of Sicily and 290 km North of Africa. The maximum depth to the North is less than 200 m and averages 80 m. The South/South-West area is deeper, descending rapidly to over 1700 m in the Malta trough (Marchant, 1971), but the deepest region lies several kilometers in an East/North-East direction.

Interest in the Maltese malacofauna has been focused mainly on the terrestrial molluscs, probably because of the isolation of the Maltese islands and the presence of a number of endemic forms (see Giusti, Manganelli & Schembri, 1995). Little work has been done on marine molluscs and the subclass Opisthobranchia has been almost totally neglected. The first check-list of marine molluscs was compiled by MacAndrew (1850), soon followed by another by Tallack (1861). The work of Mamo, compiled posthumously by Caruana (1867), was the first to include some information on locality of capture and species abundance. Weinkauff (1868), Aradas & Benoit (1870), Benoit & Gulia (1872), and Gulia (1874) list only a few shelled opisthobranchs in their works. Despott's (1919) list is more informative and includes notes on habitat, abundance and distribution.

Mamo (in Caruana, 1867) has remained for decades the only work to include some shell-less species. A century later, Micallef & Evans (1968) published a list of species, identified by comparison with Riedl (1963). Bebbington (1970) reported four species of anaspidean opisthobranchs. More recently, some interesting material has been published by Perrone (1980, 1988), Cachia (1981) and Mifsud (1992, 1996). It is clear that much more work needs to be done on this molluscan group, and the present study was

initiated in 1992 with the primary aim of preparing a list of species present in Maltese waters, and of evaluating the distribution of recorded species.

The first few species of Chromodorididae collected during the early part of this study have already been reported (Perrone, 1993). Meanwhile Cachia et al. (1993) published a check-list of marine molluscs which consisted of a compilation of the taxa recorded to that date and included several new additions to the Pyramidelloidea. Little critical evaluation of the taxa was made and no information on the distribution of the recorded species was included. Shell-less species have been little studied and this is reflected in the small number of representatives listed. The present paper includes a large number of new additions, particularly to the naked slug species, recorded in the past five years. As no new additions are made to the list of pyramidellids and the 'pteropods' (Thecosomata and Gymnosomata) these will not be considered further.

MATERIAL AND METHODS

A number of different sampling techniques were used. The searches can be divided into four broad groupings:

(a) beachcombing — restricted to 0-2 m depth, consisting of searches under rocks and beached materials;

(b) searches in marine biota — depth range 0-40 m; mainly restricted to collections of algae, with attached biota;

(c) SCUBA diving with manual collection — depth range 0-50 m, in caves, under overhangs, on and under rocks, amongst algae, on hydroids and sponges and on *Posidonia* leaves or amongst rhizomes;

(d) searches in sand and gravel for burrowing species.

A total of 51 stations was sampled with over 640 man hours dedicated to searches: 208 hours were spent diving, over a period of 58 months, yielding 21% of the total number of specimens; 284 man hours were spent in searches in marine biota yielding 47% of specimens; and 32% of the specimens were found during beachcombing and searches in gravel (total 150 man hours). Each specimen was identified and the depth, locality of capture, substratum type and date of capture were recorded. New records were collected, photographed and preserved. All sampling and collection was done by CS. Identification was done by AP. The material is deposited in the research collection of AP. A few specimens collected during other studies were passed to us for identification.

Attempts to examine the material of Mamo and the material of Micallef & Evans were unsuccessful as none of the material apparently survives.

SPECIES LIST

In the following list the name of the species is followed by previous records. The following abbreviations are used to identify the source: [AB] — Aradas & Benoit (1870-1876); [B] — Bebbington (1970); [BG] — Benoit & Gulia (1872); [BW] — Brunckhurst & Willan (1989); [C] — Cachia (1981); [CMS] — Cachia, Mifsud & Sammut (1993); [D] — Despott (1919); [G] — Gulia (1874); [Gu] — Gulia Giov. (1889-1890); [M] — Mamo in Caruana (1867); [Mc] — MacAndrew (1850); [Md] — Medlycott (in Sedall, 1870); [ME] — Micallef & Evans (1967); [Mi] — Mifsud (1992); [Ms] — Mifsud (in

Sultana & Falzon, 1996); [Mf] — Mifsud (1996); [P] — Perrone (1988); [P*] — Perrone (1993); [PS] — Perrone & Sammut (1997); [PF] — Pruvot-Fol (1954); [T] — Tallack (1861); [W] — Wägele (1985); [We] — Weinkauff (1868). Material examined in the present study is denoted by an asterisk (*). Station numbers are preceded by an S in the text and refer to fig. 1. Dimensions given refer to the length of the live opisthobranch in the extended form unless otherwise indicated. The classification is based on Sabelli, Giannuzzi-Savelli & Bedulli (1992), with minor modifications.

ORDER CEPHALASPIDEA

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|------|---|----------------------------------|
| (1) | <i>Acteon tornatilis</i> (Linnaeus, 1758) | [D][ME][CMS] |
| (2) | <i>Acteon monterosatoi</i> Dautzenberg, 1889 | [CMS] |
| (3) | <i>Crenilabium exile</i> (Forbes in Jeffreys, 1870) | [CMS] |
| (4) | <i>Liocarenus globulinus</i> (Forbes, 1844) | [CMS] |
| (5) | <i>Japonacteon pusillus</i> (McGillivray, 1843) | [CMS] |
| (6) | <i>Diaphana</i> cf. <i>minuta</i> Brown, 1827 | [CMS] |
| (7) | <i>Retusa mammilata</i> (Philippi, 1836) | [M][CMS] |
| (8) | <i>Retusa obtusa</i> (Montagu, 1803) | [CMS] |
| (9) | <i>Retusa semisulcata</i> (Philippi, 1836) | [CMS] |
| (10) | <i>Retusa truncatula</i> (Bruguière, 1792) | [M][CMS] |
| (11) | <i>Cylichnina laevisculpta</i> (Granata, 1877) | [PF][CMS] |
| (12) | <i>Cylichnina multiquadrata</i> (Oberling, 1970) | [CMS] |
| (13) | <i>Cylichnina umbilicata</i> (Montagu, 1803) | [CMS] |
| (14) | <i>Pyrrunculus minutissimus</i> (Martin in Monterosato, 1878) | [CMS] |
| (15) | <i>Volvulella acuminata</i> (Bruguière, 1792) | [M][CMS] |
| (16) | <i>Ringicula auriculata</i> (Ménard de la Groye, 1811) | [Mc][T][M][We][CMS] |
| (17) | <i>Ringicula conformis</i> (Monterosato, 1877) | [CMS] |
| (18) | <i>Ringicula leptocheila</i> Brugnone, 1873 | [CMS] |
| (19) | <i>Bulla striata</i> Bruguière, 1789 | [Mc]?[T][M][BG][D] [ME][CMS]* |

Animals: S2, S17. Shells: S12, S17, S18, S42. Size range of live mollusc 3-17 mm. This species is usually found in fine silty to muddy sand. The juvenile specimen was collected from algae (S2).

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| (20) | <i>Haminoea hydatis</i> (Linnaeus, 1758) | [Mc][T][M][BG][Gu] [D][Mi][CMS]* |
|------|--|-------------------------------------|

S1-2, S14, S16-17, S19, S24-25, S27, S30, S33, S42, S46. Size range 1-11 mm. Specimens were recorded from algae except for one specimen from fine sand (S24). Some specimens (S30, S46) were collected from *Polysiphonia* sp. (identification E. Lanfranco). A few specimens (S2 & S17) were black in colour.

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| (21) | <i>Haminoea navicula</i> (Da Costa, 1778) | [CMS] |
| (22) | <i>Haminoea orbignyana</i> (Férussac, 1822) | [G] |
| (23) | <i>Atys jeffreysi</i> (Weinkauff, 1868) | [CMS] |
| (24) | <i>Weinkauffia turgidula</i> (Forbes, 1844) | [Mf][CMS] |
| (25) | <i>Philine angulata</i> Jeffreys, 1867 | [CMS] |
| (26) | <i>Philine aperta</i> (Linnaeus, 1767) | [D][Mf][CMS]* |

S33. Size 15 mm. This specimen was collected from the top few centimetres of a sandy area flanked by *Posidonia* meadows.

- (27) *Philine catena* (Montagu, 1803) [CMS]*
S16, S19, S42. All specimens were collected from algae. Specimens were white with a few brown spots and the shell was visible through the transparent body wall.
- (28) *Philine denticulata* (J.Adams, 1800) [CMS]
- (29) *Philine intricata* Monterosato, 1875 [CMS]
- (30) *Philine lima* (Brown, 1827) [CMS]
- (31) *Philine monterosatoi* (Jeffreys in Monterosato, 1874) [CMS]
- (32) *Philine punctata* (J.Adams, 1800) [T][M][D] [CMS]
- (33) *Philine quadrata* (S.Wood, 1839) [Mf][CMS]*
S2. Size range 9 — 16 mm. One specimen collected by C. Mifsud was uniformly brown in colour. The specimen collected from S2 in algae was white with brown patches.
- (34) *Philine scabra* (Mueller, 1784) [CMS]
- (35) *Johania retifera* (Forbes, 1844) [Mf][CMS]
- (36) *Laona flexuosa* M.Sars, 1870 [CMS]
- (37) *Laona pruinosa* (Clark, 1827) [Mf][CMS]
- (38) *Philinopsis depicta* (Renier, 1804) *
Collected by C. Mifsud
- (39) *Aglaja tricolorata* (Renier, 1804) *
Collected by J.A. Borg on sand near S5.
- (40) *Melanochlamys seurati* (Vayssière, 1926) *
S8, S23, S30, S31. Size range 8-15 mm. All specimens were collected from algae except for one specimen collected from fine (detritic) sand (S8).
- (41) *Chelidonura fulvipunctata* Baba, 1938 *
One specimen collected by J.M. Bezzina from S31, size 33 mm. Another specimen collected recently from S27 was coloured a uniform brown (whole body) with rust-coloured spots. The colour of this specimen contrasts with that indicated by Perrone & Sammut (1997).
- (42) *Chelidonura italica* Sordi, 1980 *
S1-2, S8, S14, S16-18, S27, S31, S33. Size range 1-13 mm. Spawn recorded in April and August. All specimens collected from algae in shallow water.
- (43) *Cylichna cylindracea* (Pennant, 1777) [Mf][CMS]
- (44) *Cylichna hoernesii* (Weinkauff, 1866) [Mf][CMS]
- (45) *Scaphander lignarius* (Linnaeus, 1758) [Mc][CMS][Ms]
- (46) *Roxania utriculus* (Brocchi, 1814) [Mc][CMS]
- (47) *Gastropteron meckeli* Kosse, 1813 [Mf][CMS]

ORDER ANASPIDEA

- (48) *Akera bullata* Mueller, 1776 [CMS]
- (49) *Aplysia (Aplysia) depilans* Gmelin, 1791 [M][Md][Gu]
[B][CMS]*
S2. Size range 30- >200 mm. Mating and spawn have been observed in March.
- (50) *Aplysia (Pruvotaplysia) parvula* Guilding in Moersch, 1863 [B] [CMS] *
S2.
- (51) *Aplysia (Pruvotaplysia) punctata* Cuvier, 1803 [T][M][Gu][D]
[ME][P][Mi][CMS]*
S25. Size 17 mm.

- (52) *Aplysia (Varria) fasciata* Poiret, 1789 [P][CMS][Ms]*
S2, S7-8, S17-18, S33, S43. The colour in this species is variable and possibly diet dependent. Juvenile specimens show a greater colour variation. The 14 mm specimen from station S43 was collected at 48 m depth from the red alga *Sphondylothamnion multifidum* (Hudson) Naegeli, (identification by E. Lanfranco) and the specimen was coloured pinkish; specimens with a white body colour and streaks of brown (S33) and specimens with spots of black and brown (S18) were observed. Perrone (1983, 1986) has reported similar specimens from the Salento coast (South Italy).
- (53) *Bursatella leachii* Blainville, 1817 [B][CMS]*
Specimen collected by J.A. Borg (S22) near fish-farm cages. This specimen belongs to the subspecies *B. leachii savignana* previously reported by Bebbington (1970) from Sliema Harbour, Fort St. Angelo.
- (54) *Petalifera petalifera* (Rang, 1828) [Mi][CMS]*
S2, S4, S14, S18, S27, S31, S33, S39-40, S42, S46-47. One specimen (S14) collected by J.M. Bezzina. Size range 1-40 mm. Specimens were collected from masses of different algae. The larger specimens were collected from *Posidonia* leaves (S14); under rocks (S33) or from *Dictyopteris* sp. (S33). The taxonomic status of a number of small specimens is undetermined.
- (55) *Notarchus punctatus* Philippi, 1836 [ME][B][CMS]*
S31, S39. Size 5 mm

ORDER RUNCINACEA

- (56) *Runcina capreensis* (Mazzarelli, 1892) *
S2, S7-8, S16-20, S25, S27, S29, S31, S33, S37, S39, S41-42, S46. Size range 1-5 mm.
- (57) *Runcina* cf. *coronata* (Quatrefages, 1844) *
S2, S16-18, S29. Size range 1-4 mm. This runcinid shows external morphological characters similar to *R. coronata* as described by Thompson (1976) but the anterior paler (white) regions were different (not continuous). Anatomical examination is pending.
- (58) *Runcina ferruginea* Kress, 1977 *
S1-2, S7, S16-17, S22. Size range 1-3 mm. Specimens of this species were collected on *Dictyopteris* sp. (S22) but also from other algae.
- (59) *Runcina* cf. *zavodniki* Thompson, 1980 *
S2, S4, S7, S14, S16-19, S25, S27-28, S30-33, S37, S39-43, S45-46. Size range 1-5 mm. This very common species can be seen crawling on algae and was found with the notum colour ranging from brown to black, as reported by Thompson & Brodie (1988), with a metallic-blue sheen.

ORDER NOTASPIDEA

- (60) *Tylodina perversa* (Gmelin, 1791) [M][CMS]*
S17, S48. Size 11 mm. Prior to this survey this species was recorded from S20 on the yellow sponge *Aplysina aerophoba* (Schmidt). None of the specimens collected in this survey was found on this sponge; one specimen (S17) was found close to shore, in water a few centimetres deep.

- (61) *Umbraculum umbraculum* (Roeding, 1798) [1][M][D][ME] [CMS]*
S8, S17, S33. Size 80 mm. Recorded on a black sponge (*Cacospongia* sp.).
- (62) *Berthella aurantiaca* (Risso, 1818) [M][ME][P] [CMS] *
S2, S17, S25. Size range 8-35 mm. All specimens were found under rocks except for one specimen which was collected from a small rock pool (S17).
- (63) *Berthella ocellata* (Delle Chiaje, 1820) *
S33. Size range 6-78 mm. One specimen collected by J.M. Bezzina. Found in shaded precoralligenous biocoenosis. Juveniles were found amongst *Posidonia* rhizomes (collected by J.A. Borg).
- (64) *Berthella plumula* (Montagu, 1803) [M][P][CMS]*
S2, S4, S13. Size range 6-25 mm. The colour range of this species varies from (transparent) honey-coloured (S2) to yellow-orange specimens with or without white spots. Very young specimens were observed with the shell covering the whole body (external?), and easily detached from the notum.
- (65) *Berthella stellata* (Risso, 1826) *
S2, S14, S17. Size range 3-25 mm. Juveniles of this species have a small white cross on the notum. The adults invariably have the white cross plus several white spots on the notum. The notum colour darkens from a pale honey to a darker honey colour with age. The subspecies *B. stellata albocrossata* Heller & Thompson, 1983, is the juvenile form of this species. All specimens were found under rocks. Mating has been observed in July; juveniles (3 mm) were observed in September/October.
- (66) *Berthellina citrina* (Rueppel & Leuckart, 1830) [CMS]*(?)
- (67) *Pleurobranchaea meckelii* (Meckel in Leue, 1813) [ME][CMS]

ORDER SACOGLOSSA

- (68) *Ascobulla fragilis* (Jeffreys, 1856) [CMS]
- (69) *Oxymoe olivacea* Rafinesque, 1814 [We][Md][AB][G][CMS]*
S1. Size 20 mm. Found under a rock overlying *Caulerpa prolifera* (Forsskål) Lamouroux, 1809 rhizomes.
- (70) *Lobiger serradifalci* (Calcara, 1840) [C][CMS]
- (71) *Elysia flava* Verrill, 1901 *
S17, S31. Size range 5-7 mm. Found under rocks (S31 overlying sand).
- (72) *Elysia* cf. *gordanae* Thompson & Jaklin, 1988 *
S2, S16-18, S27, S31, S33, S37, S40-42, S48. Size range 3-14 mm. Medium-sized papillae are present along the parapodia and on the body.
- (73) *Elysia timida* (Risso, 1818) *
S2-4, S6-8, S13-20, S24-25, S27-28, S30-34, S37, S39-40, S42-44, S46, S48-49, S51. Size range 4-20 mm. A very common species in shallow water. Mating was observed in May.
- (74) *Elysia* cf. *viridis* (Montagu, 1814) *
S16-18, S31, S33, S46. Size range 1-10 mm. Few papillae are present in specimens assigned to this species. Several large red and blue spots are present on the body.
- (75) *Elysia* sp.1 *
S1-2, S16-17, S39. Size range 2-22 mm. This species was found only on *Cladophora* sp. in overhangs away from direct sunlight. Colour is very dark green, area

- around eyes is colourless (distinction from *E. cf. gordanae*), tips of rhinophores and end of foot coloured violet. Anatomical examination is pending.
- (76) *Thuridilla hopei* (Vérany, 1853) [ME][P][CMS]*
S2, S4, S8, S13-18, S20, S22-23, S25, S27-28, S30-31, S33-43, S45-49, S51. Size range 2-20 mm. Spawn recorded in August. A very common species, sometimes found with *E. timida*, but more often found in deeper water (>10 m). Juveniles (2-3 mm) were observed in September/October.
- (77) *Bosellia mimetica* Trinchese, 1891 [P][CMS]*
S2, S16-18, S31. Size range 2-4 mm. An unusual form of this species from Malta has been reported by Perrone (1980). All forms collected in this study are similar to the typical form (as described by Barletta, 1980). The carmine rings on the rhinophores are not always present on specimens of 2 mm body length but appear in specimens of 4 mm body length.
- (78) *Caliphylla mediterranea* A. Costa, 1869 *
S2. Size range 3-9 mm. Collected from *Cladophora* sp.
- (79) *Polybranchia borgninii* (Trinchese, 1895/6) *
S17. Size 9 mm. Two specimens were found under bare rocks in very shallow water.
- (80) *Cyerce cristallina* (Trinchese, 1881) [CMS]*
S2, S25, S27. Size range 4-40 mm. The juvenile specimen was found in algae; the adults under rocks.
- (81) *Hermaea (Hermaea) bifida* (Montagu, 1815) *
S2, S18, S33. Size range 2-10 mm. Spawn recorded in August.
- (82) *Hermaea (Placida) cremoniana* Trinchese, 1892 *
S2, S7, S46. Size range 1-4 mm. Spawn recorded in July.
- (83) *Hermaea (Placida) dendritica* (Alder & Hancock, 1843)*
S2, S18. Size range 2-4 mm. May be confused with *H. viridis* (see below) but this species has violet tips on the 'ceras'.
- (84) *Hermaea (Placida) viridis* (Trinchese, 1873) *
S2. Size 6 mm. Found on *Cladophora* sp. in shaded places (see also *Elysia* sp., and *Abysiosopsis elegans*).
- (85) *Hermaeopsis variopicta* A. Costa, 1869 *
S2, S31. Size range 5-11 mm. Spawn recorded in November. Collected from red algae but occasionally from the green alga *Cladophora* sp.
- (86) *Abysiosopsis elegans* Deshayes, 1864 *
S1, S2. Size range 2-20 mm. Spawn recorded: March, May and October. Usually found on *Cladophora* sp., but also collected from *Cystoseira* sp.
- (87) *Ercolania funerea* A. Costa, 1867 *
S1-2, S7, S14. Size range 1-5 mm. Spawn recorded: May, August, September, November, December. Usually found with *Stiliger* sp. 1. on a filamentous green algae. Some specimens had black pigmentation on the dorsum.
- (88) *Ercolania* sp. *
S2. Size 3 mm. May be confused with *Hermaea (Placida) cremoniana*, the rhinophores are solid and the animal lacks the brick-red colour on the dorsum, characteristic of that species. Anatomical examination is pending. The external features are characteristic of *E. coerulea* Trinchese, 1892.
- (89) *Stiliger* sp. 1 *
S1-2, S14. Size range 3-5 mm. Spawn recorded in September. This species is common in shallow water (0-1 m) living inside masses of filamentous green algae.

- (90) *Stiliger* sp. 2 *
S17. Size 3-4 mm. Collected from red algae. Only a single specimen of this pink transparent stiligeriid has been found. Its taxonomic status is currently unknown.

ORDER ACOCHLIDIACEA

- (91) *Pontohedyle milatschewitchi* (Kowalewsky, 1901) *
S42. Size: about 1 mm. Collected from gravel, known only from a single specimen.
- (92) *Hedyliopsis* sp. *
S17. Size about 1 mm. This transparent snail was collected from shelly gravel from an area with *Posidonia* meadows.

ORDER NUDIBRANCHIA

- (93) *Okenia quadricornis* (Montagu, 1815) *
Collected by C. Mifsud, close to S29.
- (94) *Trapania fusca* (Lafont, 1874) *
S4. Size 5 mm. Found in precoralligenous biocoenosis.
- (95) *Trapania maculata* Haefelfinger, 1960 *
S46. Size 11 mm. The single specimen was found on a black sponge at 8 m depth.
- (96) *Diaphorodoris luteocincta* (M. Sars, 1870) [CMS]*
S46. Size range 7-9 mm. The specimens were found in precoralligenous biocoenosis, on the brown filamentous algae *Polysiphonia* sp. Bryozoa were found growing on some of the algal filaments.
- (97) *Diaphorodoris papillata* Portmann & Sandmeier, 1960 *
Collected by Mr. Mifsud.
- (98) *Acanthodoris pilosa* (Abildgaard in Mueller, 1789) [P][CMS]
- (99) *Aegires* sp. *
S16-17, S29, S31, S33, S36, S42, S46. Size range 1-11 mm. The younger specimens were recorded from collections of algae. The body was coloured white with two brown rings on the rhinophores. The larger specimen has a white body colour with large dark brown spots on the dorsum and a brown ring on the rhinophores. The taxonomic status of this form is unclear.
- (100) *Doris ocelligera* Bergh, 1881 *
S1-2. Size range 4-9 mm. Specimens were collected under rocks in shallow water. The foot in all the examined specimens is yellow, the notum varies from brown to black.
- (101) *Doris verrucosa* Linnaeus, 1758 [M][CMS]
- (102) *Chromodoris britoi* Ortea & Perez, 1982 [P*][CMS]*
S4, S33. Size range 12-16 mm.
- (103) *Chromodoris elegantula elegantula* (Philippi, 1844) [P*] [CMS] *
S8, S17, S31, S33, S42. Size range 13-30 mm. Spawn recorded in July. This species is often found roaming on algae. A few specimens were collected from *Cystoseira* sp. together with *Hypselodoris villafranca*. All recorded specimens differ from the original description in lacking a submarginal yellow edge (see also Perrone, 1993).

- (104) *Chromodoris elegantula polychroma* Perrone, 1993 [P*][CMS]*
S13, S23. Size range 20-27 mm. One of the specimens (S13), with the submarginal yellow edge (Perrone, 1993), was observed spawning on a *Posidonia oceanica* (Linnaeus) Delile, 1813 leaf in August.
- (105) *Chromodoris krohni* (Vérany, 1846) [P*][CMS]*
S4, S31, S33, S44. Size range 11-20 mm. One specimen (S33) was collected by C. Mifsud.
- (106) *Chromodoris luteorosea* (Rapp, 1827) [P*][CMS]*
S8. Size 18-21 mm. A similar specimen was collected by T. Sammut & J. Cassar close to S1.
- (107) *Chromodoris purpurea* Risso in Guérin, 1831 [P*][CMS]*
S23, S33. Size range 62-80 mm.
- (108) *Hypselodoris messinensis* (von Ihering, 1880) *
S2, S4, S8, S14, S17, S20, S25, S27, S31, S33, S36, S38-39, S44-46. Size range 4-21 mm. This chromatically variable species has been found on sponges usually either the orange *Spirastrella cunctatrix* (Schmidt) (identification J.A. Borg) or rarely on a black *Cacospongia* sp. (a different *Cacospongia* sp. from that preyed upon by the related *H. tricolor*). Mating has been observed in July.
- (109) *Hypselodoris tricolor* (Cantraine, 1835) *
S2, S4, S6, S8-9, S14, S16, S26, S31, S33, S35, S42, S43. Size range 8-30 mm. Spawn recorded in July. May be confused with juvenile *H. messinensis*, even though the colours differ. Lives on *Cacospongia* [probably *mollior* (Schmidt)].
- (110) *Hypselodoris villafranca* (Risso, 1818) *
S17, S27, S37. Size range 15-20 mm. One specimen collected by J.A. Borg from area between S25, S26 in *Posidonia*. May be confused with *H. messinensis*. The colour patterns and the arrangement of azure lines are in agreement with the description for this species by Fontana et al. (1993).
- (111) *Hypselodoris webbi* (D'Orbigny, 1839) [CMS]*
S1, S5 Size range 75-127 mm. Several specimens collected by T. Sammut & J. Cassar showed large chromatic differences and varied from white to dark blue. The arrangement of the yellow lines was similar to that in specimens recorded under *H. elegans* (= *H. valenciennesi*) and *H. webbi*. Specimens with intermediate colouration were also recorded. Bouchet & Ortea (1980) consider *H. webbi* and *H. elegans* as a single species.
- (112) 'Rostanga' (?) *antheilia* Perrone, 1990 *
S16. Size range 4-8 mm. The larger specimen shows darker colouration; both specimens were collected from *Cystoseira* sp.
- (113) *Discodoris maculosa* Bergh, 1884 *
S2, S16-17. Size range 20-50 mm. All specimens were found under rocks in shallow water.
- (114) *Peltodoris atromaculata* Bergh, 1880 [ME][CMS][Ms] *
S20, S30, S33-34, S39, S44, S46. Size range 45-80 mm. Spawn recorded in May. Recorded only on the sponge *Petrosia ficiformis* Poiret. Spawn, adults and juveniles were recorded together on a single (large) sponge (S30).
- (115) *Paradoris indecora* (Bergh, 1881) *
S22, S25, S42, S46. Size range 5-10 mm. Recorded from *Cystoseira* sp.
- (116) *Jorunna tomentosa* (Cuvier, 1804) [CMS]*(?)
S2, S17. Size 2mm. Only juveniles were collected in this study and their specific identity is undetermined. The presence of *J. tomentosa* was reported by Cachia et al. (1993).

- (117) *Platydoris argo* (Linnaeus, 1767) [M][CMS]*
S25, S31, S36, S39. Size range 38-80 mm. Spawn recorded in July. Specimens were collected from *Cystoseira* sp. the stem of which supported several sponges and hydroids.
- (118) *Taringa armata* Swennen, 1961 *
S17. Size 25 mm. Spawn recorded in June.
- (119) *Polycera* cf. *maculata* Pruvot-Fol, 1951 *
Collected by C. Mifsud. Pruvot-Fol (1954:317) considered this taxon, based on a description from a single specimen, as "*Polycera* (?) *maculata* Pruvot-Fol, (Palio), 1951". Nordsieck (1972) placed it in the genus *Folietta*. Thompson & Brown (1984) considered this species to be a junior synonym of *Palio dubia* (M. Sars, 1829), albeit doubtfully. The Maltese specimen is the first record after the original description and is currently under study (Perrone & Sammut, in preparation).
- (120) *Polycera quadrilineata* (Müller, 1776) *
S25, S31, S46. Size range 4-15 mm. Specimens were collected by J.A. Borg on *Posidonia oceanica* (Linnaeus) Delile, 1813, rhizomes in the area between S25, S26. In some specimens black pigmentation on the dorsum was observed.
- (121) *Polycerella emertoni* Verrill, 1881 *
S2. Size range 2-4 mm. Spawn recorded in July, August. Collected from *Zoobotryon* sp.
- (122) *Phyllidia flava* Aradas, 1847 [W][BW]*
S4-5, S46. Size range 13-18 mm. In the present study this species was found in a precoralligenous biocoenosis.
- (123) *Dendrodoris grandiflora* (Rapp, 1827) [P][CMS]*
S8, S17, S20, S24-25, S27, S31, S37. Size range 20-50 mm. Always found under rocks. The colour is usually greenish but a few brownish specimens were recorded. Mating was observed in September.
- (124) *Dendrodoris limbata* (Cuvier, 1804) [M][ME][P] [CMS]*
S14, S17, S22, S42. Size range 4-35 mm. Some juvenile specimens collected (S17) are reddish without any spots on the notum. An unusual specimen collected from S18 by Mr. C. Mifsud shows aberrant markings similar to the ornamentation depicted by Guangyu & Zhongjie, 1990, for *D. rubra* Kelaart, 1858. The individual has not yet been dissected and its taxonomic status is undetermined. Mamo (in Caruana, 1867) reported this species as *Doris limbata* and added "with varieties"; further down on the same page a description of *Doris marmorea* is given with the comment "an *limbata*, Cuvier, varietas *altera*?". The status of the taxa described by Mamo has already been commented upon (Perrone, 1993; Cachia et al., 1993); see also note below.
- (125) *Doriopsilla areolata areolata* Bergh, 1880 [CMS]*
S2, S16-17, S42, S46. Size range 1-12 mm. Several small individuals of unclear taxonomic status have been collected. The adults show the typical white circular pigmentation absent in younger specimens. A 10 mm specimen, found under a rock from S17, was identified as *D. rarispinosa*. Cachia et al.(1993), also reported *D. rarispinosa*. This taxon is now considered a junior synonym of *D. areolata areolata* (see Valdez & Ortea, 1997)
- (126) *Tritonia manicata* Deshayes, 1853 *
S2, S24, S31. Size range 7-17 mm. Found under rocks and overhangs in areas with moderate currents.

- (127) *Tritonia* cf. *striata* Haefelfinger, 1963 *
S28. Size 8 mm. Found on red algae in a precoralligenous biocoenosis.
- (128) *Doto coronata* (Gmelin, 1791) *
S27, S30. Size range 4-10 mm. The juvenile specimen from S27 found on *Posidonia* has been doubtfully assigned to this taxon.
- (129) *Doto floridicola* Simroth, 1888 *
S30, S43, S46. Size range 6 mm. Spawn recorded in June and July. This species was observed on *Aglaophenia* sp. The external morphology is very similar to that of *Doto* sp. A (see Picton & Morrow, 1994:134).
- (130) *Doto* sp. 1 *
S1-2, S11, S16-19, S27, S33, S37. Size range 1-5 mm. Spawn recorded in February, June and September. This form shows external features similar to *D. cervicenigra* Bouchet & Ortea, 1989. Some specimens show characters similar to *D. acuta* Kress & Schmekel, 1979, as described in Schmekel & Portmann (1982).
- (131) *Doto* sp. 2 *
S25, S40. Size range 1-4 mm. The larger specimen has an external morphology similar to that of the taxon *D. maculata* (Montagu, 1804) as described in Picton & Morrow, 1994. Further specimens are required to confirm the occurrence of that species, which has not been recorded in the Mediterranean before.
- (132) *Doto* sp. 3 *
S2, S27. Size range 2-4 mm. The specimens recorded were collected together with *Doto* sp.1, differing from that form by lacking the black spots on the cerata.
- (133) *Doto* sp. 4 *
S30. Size 4mm. The specimen shows external characters typical of *D. koeneckeri* Lemche, 1976, but more specimens are needed for anatomical study.
- (134) *Doto* sp. 5 *
S31, S33. Size range 2-8 mm. The larger specimen was collected from the sertulariid hydroid *Dynamena* sp. together with spawn. It probably belongs to *Doto fragaria* Bouchet & Ortea, 1989.
- (135) *Tethys fimbria* Linnaeus, 1767 [M][CMS]
- (136) *Armina maculata* Rafinesque, 1814 *
Collected by C. Mifsud. The single specimen collected is a juvenile and has been placed in this taxon pending anatomical examination.
- (137) *Coryphella pedata* (Montagu, 1815) *
S4, S30-31, S33, S35-36, S39, S46. Size range 5-20 mm. Common in precoralligenous biocoenosis, particularly during the winter months.
- (138) *Calmella cavolini* (Vérany, 1846) *
S2, S6, S13-14, S16-17, S25, S27, S31, S39. Size range 5-14 mm. Spawn recorded in July. Common in precoralligenous biocoenosis.
- (139) *Flabellina affinis* (Gmelin, 1791) [ME][CMS]*
S4, S8, S13, S20, S27, S31, S33, S36, S46, S49. Size range 20-30 mm. Spawn recorded in June, July, August, September and November. Very common in summer on *Eudendrium* sp. often with *Cratena peregrina*.
- (140) *Piseinotheucus gabimieri* (Vicente, 1975) *
S30, S36, S46. Size range 14-18 mm. Recorded moving on the brown filamentous alga *Polysiphonia* sp. Bryozoa were found on the algal filaments.
- (141) *Caloria elegans* (Alder & Hancock, 1845) *
S27, S40, S46. Size range 4-10 mm. Found in precoralligenous biocoenosis and also on a recently sunk tug-boat covered with several species of hydroids.

- (142) *Facelinopsis marioni* (Vayssière, 1888) *
- S20, S45. Size range 3-4 mm. Found in precoralligenous biocoenosis and areas with rich hydroid growth.
- (143) *Facelina* cf. *annulicornis* (Chamisso & Eisenhart, 1821) *
- Collected by J.A. Borg on *Posidonia oceanica* (Linnaeus) Delile, 1813.
- (144) *Facelina* cf. *coronata* (Forbes & Goodsir, 1839) *
- Collected by C. Mifsud from mixed decaying litter [including *Posidonia oceanica* (Linnaeus) Delile, 1813, leaves]. The specimen exhibited an intense blue irradiance.
- (145) *Facelina rubrovittata* (A. Costa, 1866) *
- S2, S8, S13, S16-17, S20, S25, S27, S29-31, S33-34, S36, S39, S41-42, S45. Size range 3-15 mm. Spawn recorded in September. Commonly recorded from collections of algae.
- (146) *Cratena peregrina* (Gmelin, 1791) *
- S4, S8, S13, S20, S22, S27, S30-31, S33, S41, S36, S39, S44, S46, S49. Size range 15-42 mm. Spawn recorded in June, July, August and November. Common in summer on *Eudendrium* sp. usually with *Flabellina affinis*.
- (147) *Favorinus branchialis* (Rathke, 1806) *
- S16-17, S25, S33, S39-40. Size range 2-11 mm. The larger specimen collected under a rock together with *Spurilla neapolitana*, was assigned to this taxon; the identification of a number of small specimens is doubtful.
- (148) *Aeolidiella alderi* (Cocks, 1852) [CMS]*
- S2, S14, S17. Size range 10-34 mm. Recorded under rocks in areas where *Spurilla neapolitana* is found.
- (149) *Aeolidiella indica* Bergh, 1888
- (= *A. takanosimensis* Baba, 1930) *
- S1, S2, S14. Size range 8-14 mm. Spawn recorded in January. Recorded together with *Aeolidiella alderi* under rocks.
- (150) *Spurilla neapolitana* (Delle Chiaje, 1841/44) [ME][CMS]*
- S2, S10, S14, S16-17, S31, S37, S42, S46. Size range 5-47 mm. Spawn recorded in January, February, March, June, July and December. Found under rocks close to *Aiptasia* sp. This species prefers shallow water with reduced circulation. Many of the collected specimens were infected by endoparasites, probably the copepod *Splanchnotropus* sp. (Pruvot-Fol, 1954), with the parasites' egg capsules attached to the dorsum of *Spurilla neapolitana*.
- (151) *Berghia coerulescens* (Deshayes, 1838) *
- S17. Size 15 mm. The specimen was found under a rock with *Aiptasia* sp. in an area where *Spurilla neapolitana* is commonly found.
- (152) *Berghia verrucicornis* (A. Costa, 1867) *
- S2, S45. Size 11 mm. Collected from algae and under rocks.
- (153) *Baeolidia nodosa* (Haefelfinger & Stamm, 1958) *
- S2, S16. Size range 3-9 mm. Collected from algae in shallow water.
- (154) *Eubranthus doriae* (Trinchese, 1874) *
- S1-2, S18. Size range 2-5 mm. Recorded on hydroids growing on *Sargassum* sp. in shallow water. The cerata are knobbly.
- (155) *Eubranthus* cf. *exiguus* (Alder & Hancock, 1848) *
- S33. Size range 2-5 mm. Recorded from hydroids growing on *Cystoseira* sp. Can be differentiated from the previous species by its rounded cerata.

- (156) *Eubranchus farrani* (Alder & Hancock, 1844) *
- S31. Size 10 mm. The single specimen was found on hydroids attached to *Sargassum* sp. The body colour is white with orange blotches on the dorsum; orange subterminal rings are present on the cerata, oral tentacles and rhinophores.
- (157) *Cuthona* cf. *amoena* (Alder & Hancock, 1845) *
- S17-18, S25. Size range 3-5 mm. Recorded in shallow water on *Cystoseira* sp..
- (158) *Cuthona caerulea* (Montagu, 1804) *
- S20, S25, S31-33, S36, S40, S43-47. Size range 3-10 mm. Fairly common in winter on sertulariid hydroids.
- (159) *Cuthona* cf. *foliata* (Forbes & Goodsir, 1839) *
- S2, S16-17, S20, S25, S27, S36, S39, S43. Size range 2-6 mm. The specimens show external features similar to *C. foliata* as described in Picton & Morrow (1994). The presence of this species in the Mediterranean has been doubted (Thompson & Brown, 1984), suggesting possible confusion with the related *C. genovae*.
- (160) *Cuthona genovae* (O'Donoghue, 1929) *
- S1-2, S11, S16, S27, S30, S33, S39, S46. Size range 2-4 mm. Spawn recorded in March and May. All collected specimens show a distinct yellow central line on the dorsum.
- (161) *Cuthona miniostrata* (Schmekel, 1968) *
- S1-2, S17-18, S30, S46. Size range 1-5 mm. Spawn recorded in September. Fairly common in shallow water on algae. Some specimens show a large amount of white pigment, especially on the cerata.
- (162) *Calma glaucoides* (Alder & Hancock, 1854) [P][CMS]
- (163) *Fiona pinnata* (Eschscholtz, 1831) [CMS]*
- S2-3, S7, S17, S25, S37, S46. Size range 4-16 mm. Spawn recorded in February, March and October. Recorded from floating objects with *Lepas* sp. Was recorded from floating wood, nylon ropes, *Sepia* bones, plastic buckets, *Posidonia* 'balls', synthetic bath sponges and other plastic material.

The following previous records are rejected for the reasons given:

— Tallack (1861) reported "*Bullaea Flanciana*" (without scientific authority or date) but no such nominal taxon could be traced; it is probably a misprint of *B. planciana* as reported in Caruana, 1867.

— Mamo (in Caruana, 1867) reported "*Bullaea planciana* Philippi" and "*Bulla ovulata* Brocchi" but no reference to these taxa could be traced. Mamo (op. cit.) also reported six new taxa, but these have remained undetermined (Perrone, 1988). As no new information could be found, the following taxa could not be determined: *Aeolis capitata*, *Doris elephantiaea*, *Doris marmorea*, *Elysia cyanea*, *Proctonotus delicatae*. One taxon is a nomen nudum: *Doris granulata*. Two taxa were questioned by Mamo (? or Caruana, 1867): *Aeolis* cf. *coronata* Forbes and *Aeolis* cf. *fasciculata* Lamarck. *Pleurobranchus* (*Berthella*) *porosa* probably refers to the same taxon of Philippi, [= *Berthella plumula* (Montagu, 1803)].

— The taxon *Dendronotus arborescens* reported by Micallef & Evans (1967), has been reported as *D. frondosa* (Ascanius, 1774) by Cachia et al. (1993). The presence of this species in the Mediterranean has never been confirmed and the record is probably based on a misidentification. The validity of certain identifications in Micallef & Evans' list has already been questioned (Borg & Schembri, 1996); this Boreo-arctic species was

identified without comparison to any literature, whereas the majority of species listed had been identified by comparing the external features with illustrations and descriptions published in Riedl (1963).

Mifsud (1996) reported a small black opisthobranch as *Limapontia* sp. Inspection of unpublished photographic material made available by Mifsud suggests that the taxon should be more correctly assigned to *Runcina* probably *R. zavodniki*.

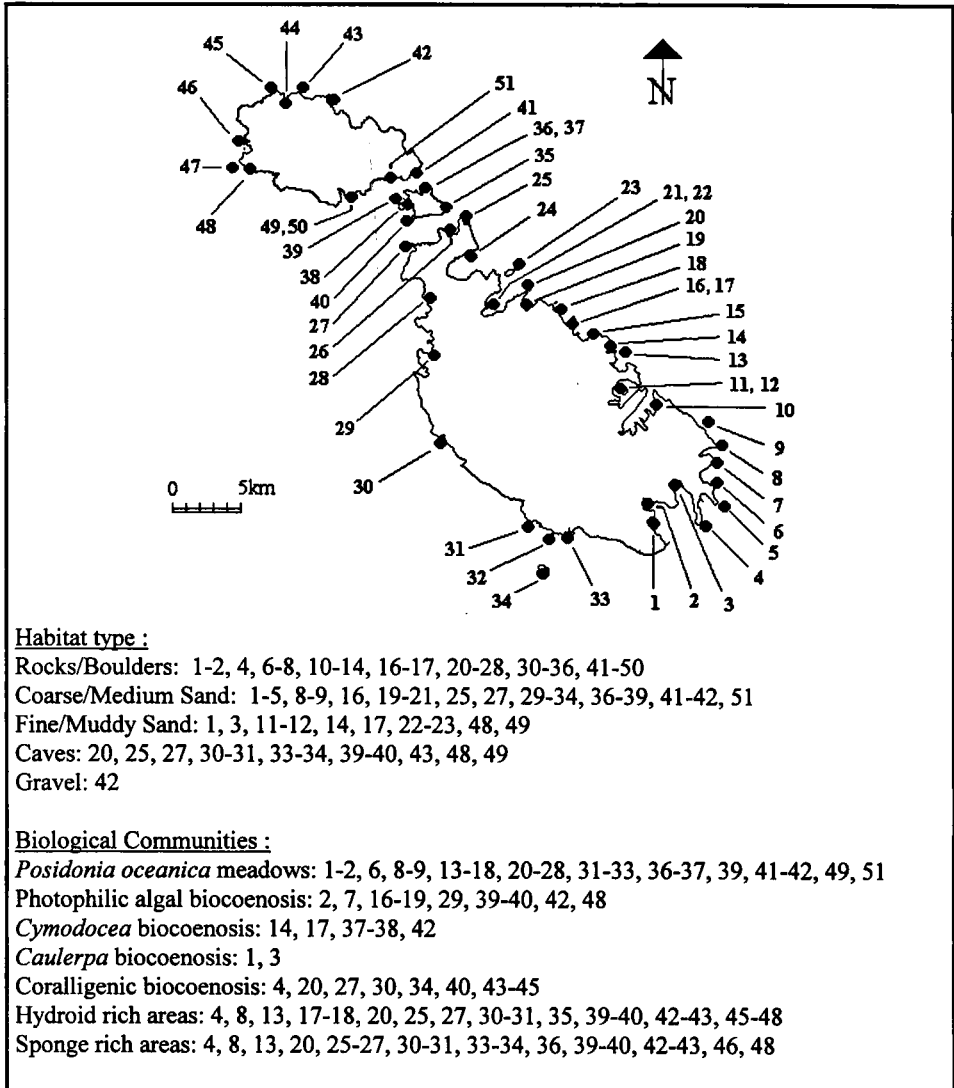


Fig. 1. Map of the Maltese Islands showing the location of the stations sampled. Station data refer specifically to the sampled station and do not necessarily reflect the general characteristics of the area.

SPATIAL DISTRIBUTION

Fig. 1 is a map of the Maltese Islands showing the location of the stations sampled, together with the type of habitat and the topography. A number of stations were surveyed only a few times, either because of logistic difficulties or because of poor or no finds. Table 1 gives the number of recorded specimens in each order together with the number of species recorded during this study. Some of the species recorded (*Che-lidonura fulvipunctata*, *Polybranchia borghinii*, *Chromodoris elegantula*) are considered very rare in the Mediterranean.

TEMPORAL DISTRIBUTION

The biological cycles of the majority of opisthobranch species are reported to be of the order of one year (Ros, 1978; Thompson, 1964). Ros (1978) summarized data from

| Order | No. of Specimens recorded in the present study | % of Total Number of Specimens | No. of Species recorded in the present study | % of Total Mediterranean species |
|---------------|--|--------------------------------|--|----------------------------------|
| Cephalaspidea | 127 | 3.42 | 10 | 53% |
| Runcinoidea | 850 | 22.88 | 4 | 50% |
| Anaspidea | 155 | 4.17 | 7 | 62% |
| Notaspidea | 56 | 1.51 | 7 | 62% |
| Acochliadiaea | 2 | 0.05 | 2 | 20% |
| Sacoglossa | 1258 | 33.86 | 21 | 72% |
| Nudibranchia | 1267 | 34.11 | 67 | 29% |
| Total | 3715 | 100.00 | 118 | 40% |

Table 1. Number of recorded specimens with percentage representation per order.

| Order | E | AM | B | AT | IP | CT | C | NC |
|------------------|------|------|------|------|------|------|-----|------|
| Cephalaspidea | 21.3 | 21.3 | 38.3 | 8.5 | 2.1 | - | 2.1 | 6.4 |
| Runcinoidea | 50 | - | 50 | - | - | - | - | - |
| Anaspidea | 12.5 | 12.5 | 25.0 | - | 12.5 | 37.5 | - | - |
| Notaspidea | 12.5 | 37.5 | 12.5 | - | - | 37.5 | - | - |
| Acochliadiaea | - | - | - | 50 | - | - | - | 50 |
| Sacoglossa | 26.0 | 26.0 | 4.4 | 13.0 | 4.4 | 4.4 | 4.4 | 17.4 |
| Nudibranchia | 21.1 | 32.4 | 26.8 | 7.0 | 1.4 | 1.4 | 1.4 | 8.5 |
| Percentage Total | 21.5 | 26.4 | 26.4 | 8.0 | 2.4 | 4.9 | 1.8 | 8.6 |

Table 2. Zoogeographical classification of Maltese opisthobranchs reported as percentage of total number of Maltese representatives per order. The classification adopted by Cattaneo-Vietti & Thompson (1989) is used, with minor changes: E — Mediterranean endemic; AM — Atlantic-Mediterranean region; B — Boreal region; AT — Atlantic tropical region; IP — Indopacific region; CT — Circumtropical region; C — Cosmopolitan species; NC — Not classified.

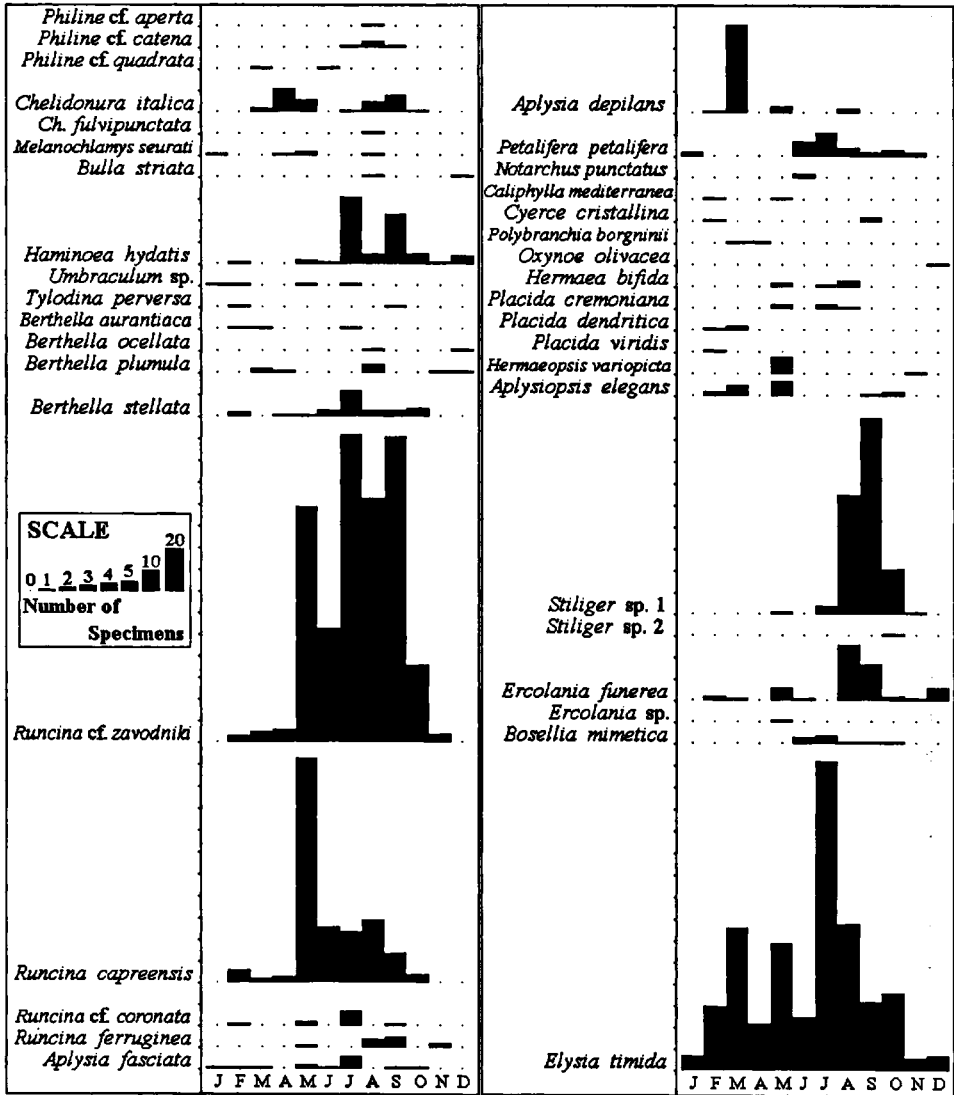


Fig. 2. Seasonal distributional data corresponding to a 58 month survey accumulated as a single cycle (see Ros, 1978). Months are represented by their respective first letter on the x-axis. Height of each histogram represents the number of specimens recorded (see Scale).

a four-year survey into one annual cycle and concluded that there is an increase in the number of opisthobranch species during the spring/summer months. Fig. 2 presents the seasonal distribution of a number of opisthobranch species recorded during the present 58 month survey. The number of specimens recorded in January, February, etc. were added to the number of specimens recorded in January, February, etc. of successive years and the results presented as a single annual cycle, after Ros (1978).

DISCUSSION

A total of 409 species of opisthobranchs has been recorded from the Mediterranean (Cattaneo-Vietti & Thompson, 1989). The present paper lists 163 species recorded to date from Maltese waters which represents only 40% of the Mediterranean fauna. The percentage representation per order, is shown in table 1. The poor representation of the Acochliadia is indicative of the limited number of searches for meiobenthic species in general. Following the zoogeographical observations made by Cattaneo-Vietti & Thompson (1989), the majority of species recorded from the Maltese Islands belong to the Atlantic-Mediterranean and Boreal zoogeographical categories as defined in the same work (see table 2); the species in these two categories account for over 52% of the total number of species.

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