12. Opisthobranchs of the Gulf of Eilat and the Red Sea: an account of similarities and differences

(color plates pp. 189-196)

Yonow, N.

Opisthobranchs are fascinating molluscs: their evolution has led them to lose their shell completely in the more evolved genera, but each step in this evolutionary loss has been successful and examples survive today (Fig. 1. p 189). The lack of a protective shell has led to active methods of defence, an amazing array of body forms, and to flamboyant colors and patterns. Opisthobranchs form part of the class Gastropoda. They are highly evolved, and almost all species are marine. They range in size from 2 to 500 millimetres, and are characterized by a soft and flexible body with a dorsal fold of skin known as the mantle. The sub-class Opisthobranchia includes more than 6000 species (Behrens and Hermosillo, 2005). The prosobranchs (sea snails and shells) are certainly more numerous, but the opisthobranchs surpass them with the diversity of flamboyancy, behavior, dietary requirements, and by their extraordinary methods of defence.

Introduction to Opisthobranchs

Opisthobranchs are predators and grazers, occurring in all marine habitats, and their diet can be extremely specialized. They may display seasonal population explosions, dramatically affecting the reef ecosystems. In the Gulf of Eilat, for example, increased numbers are frequently due to eutrophication of the sea around industrial regions. These high incidences have facilitated the study of swimming and feeding behaviors of *Notarchus indicus* Schweigger and *Melibe rangi* Bergh by Schuhmacher (1973), for example. Studies on the diet and acid secretion of *Berthellina citrina* (Rüppell and Leuckart) have also been conducted in the Gulf of Eilat (Marbach and Tsurnamal, 1973). And, it has been shown that *Aplysia oculifera* Adams and Reeve hatches, metamorphoses, grows, reproduces and dies in less than one year in this location (Plaut *et al.,* 1995, 1998).

Opisthobranchs keep their predators at bay with remarkable powers of attack and defence. Some species (aeolids) incorporate the stinging cells – nematocysts – they recover from the tentacles of their cnidarian (e.g., jelly fish, sea anemone, coral and hydroid) prey, to use them for their own defence. Other species (pleurobranchs) secrete acids in a mono-layer of epidermal cells, situated in the mantle, foot and rhinophores as a defence. Finally, there are all those species which are capable of

F. D. Por ed. Aqaba-Eilat, the Improbable Gulf. Environment, Biodiversity and Preservation, Magnes Press Jerusalem 2008.

concentrating toxic substances extracted from the sponges upon which they feed, which render them inedible and poisonous. In these cases, the sea slugs advertise their colors boldly, acting as warning signs to would-be predators (chromodorids and phyllidiids; aposematic coloration). Indeed, they often have extra appendages where they concentrate these toxins (*Ceratosoma*). Opisthobranchs which feed on sponges can also be cryptic, adopting the same colors as their sponge food or the surrounding substrate. They are often very flattened and usually rough to touch, because they can take the spicules from the sponge and incorporate them into their own skin, giving them a second line of defence if their camouflage fails. Some even have pits which imitate the sponge's osculae (*Aldisa* sp., *Sclerodoris tuberculata* Eliot) and make them virtually invisible to predators. Other particularly vigorous species will not hesitate to attack marine molluscs, including other sea slugs.

All opisthobranchs are hermaphrodite, the reproductive organs of both sexes being present in the adults, on the right side of the body. Copulation is usually reciprocal, but aplysiids, for instance, will mate in long chains, injecting the one in front with sperm. Eggs are usually laid in a characteristic spiral or string, often brightly colored: they contain the toxins acquired by the adult and do not need camouflage (Pawlik et *al.* 1988). Larval development type is related to egg size: numerous small eggs hatch into veligers with a longer planktonic phase, and fewer larger eggs either hatch into a short-lived veliger or a benthic larva with no planktonic stage. Most species of opisthobranchs have a planktonic stage which can survive in the open ocean for many months if the trigger for metamorphosis (usually the adult food) is unavailable. The lifespan of opisthobranchs is generally less than one year but in more primitive species, larger species, species which live in temperate and cold water, and species living at depths may live longer, but probably not more than a few years. The longest-lived tropical sea slug is *Dolabella auricularia* (Lightfoot), living for five years in an aquarium in Hawaii (Hadfield and Switzer-Dunlap, 1984), a similar lifespan to the Antarctic species *Philine gibba* Strebel (Seager, 1982).

Opisthobranchs are distributed among ten orders; only five are considered here as the others are specialized and have their own literature and two are unknown in the Red Sea. Of the Cephalaspidea, the more primitive bubble shells, for example *Bulla* and *Hydatina*, rummage in the mud whereas the colorful chelidonurids (*Chelidonura* and *Philinopsis*) have only a small internal cap-like shell and glide along on the sea bottom and among corals in search of prey. Some are herbivorous, but the majority are active predators: *Philinopsis cyanea* (Martens) was found to feed on its cousins *Bulla ampulla* (Linnaeus), *Ringicula acuta* Philippi and *Chelidonura sandrana* Rudman in the Red Sea and the Maldives (Yonow, 1992). The order Anaspidea, otherwise known as sea hares, have the shell reduced to a small internal plate. They are herbivorous, feeding on a variety of algae, often changing species composition as they grow. Many can produce a purple ink when disturbed, and some species swim gracefully, using their parapodia as undulating wings. The Pleurobranchida may also retain a cap-like shell internally, and have a large gill present on the right side. They are a relatively sparse order and all species are carnivorous, feeding on a variety of sessile invertebrates. Most species can secrete acid as a defence mechanism. The Sacoglossa are almost exclusively herbivorous, and have developed a uniseriate radula for piercing algal cells. Species have a variety of shells, bulloid as in *Oxynoe viridis* (Pease), bivalved (*Julia exquisite* Gould), cap-like, or it may be lacking altogether (*Elysia, Thuridilla, Plakobranchus*). Body form covers the whole range, from simple and leaf-like to covered in cerata as in *Cyerce elegans* (Bergh) and *Polybranchia orientalis* (Kelaart) or with parapodia like the aplysiids (*Elysia trilobata* Heller and Thompson).

The order Nudibranchia has the greatest number of species which are the most specialized (see Fig. 1, colour plate p. 189). They owe their evolutionary success to the total loss of a shell and the resulting development of other mechanisms of defence. The majority of species hatch from an egg with a larval shell, which is retained in the more primitive Opisthobranchia but lost during stages of metamorphosis in the Nudibranchia. There are four sub-orders, each with a range of species which exploit every niche and many prey species. The Doridina are the most numerous and probably the most varied in body form, followed by the Dendronotina, with tree-like gills present on the dorsum for respiration. Many species of Aeolidina store nematocysts for their own defence, and are species-specific when it comes to diet. The Arminina are the least well known, being the least frequently encountered, and have traditionally included species which did not fit in any other grouping.

Variety of body form in nudibranchs is influenced directly by diet organism and mode of life of the species. Nudibranchs are carnivorous without exception, and feed on a wide range of marine invertebrates, from sessile epifauna such as barnacles and ascidians to highly mobile polychaetes, gastropods and crustaceans. Some have also specialized to feed on egg masses, such as *Favorinus japonicus* Baba, now found in the Red Sea (Yonow, 2008). In numerous sub-orders and families, the mantle bears digitiform appendages. As well as being used for respiration, they may also be used to store sponge toxins in the Chromodorididae or unexploded nematocysts from cnidarian prey for the sea slug's own defence in the aeolids. In fact, two species *Pteraeolidia ianthina* (Angas) and *Glaucilla marginata* Bergh can give a nasty sting if roughly handled. Most dorids feed on sponges, but others feed on other opisthobranchs, soft corals, or ascidians (see review, Yonow, 1996). They, and indeed all other opisthobranchs, except the Dendrodorididae and Phyllidiidae, have a rasping "tongue," or radula covered with small hook-shaped teeth, as varied in number and shape as the prey items they feed on. All have numerous rows of teeth on the radula, and the number in the rows can vary from five to several hundred. The phyllidiids feed on sponges, like most dorids, but by everting their mouthparts; they have no teeth but an eversible pharynx with glands attached (internally) which dissolve the sponge in situ, and they then suck up the nutritious juices. The chemical substances and terpenoids produced by the sponge to protect it are contained in this juice (Gunthorpe and Cameron, 1987).

History of Opisthobranch Research in Red Sea

The Red Sea is an important marine biogeographical region, but to date the opisthobranch fauna has only been described sporadically. Despite the ancient connection between the Red Sea and the Mediterranean, the fauna and flora of the Red Sea are derived from the Indian Ocean. The Red Sea is considered part of the Western Indian Ocean Province, of the Indo-West Pacific zoogeographical region. Scientific expeditions to these regions date back nearly 250 years. The first European scientific expedition specifically to the Red Sea was the ill-fated Danish "Arabia Felix" expedition from 1761 - 1767, which spent October 1762 to August 1763 in the Red Sea, final destination Yemen. Peter Forsskål, a Swedish botanist and student of Linnaeus, was on the trip, and one of the six of seven scientists who died. The extensive mollusc collection of Forsskål with detailed field notes was published posthumously by the leader and sole survivor of the expedition, Carsten Niebuhr, in 1775 (Forsskål 1775). Niebuhr was in fact the first geographer to accurately measure and map the Red Sea, and his chart was used by the British Royal Navy 100 years later. His measurements and calculations of the Gulf of Suez were so precise that they were used in the building of the Suez Canal (Maempel 1992). The history of the collection and the taxonomic status of the species described by Forsskål, including three opisthobranchs, have recently been reviewed by Yaron *et al*. (1986).

The second important expedition was Napoleon I's great "Expedition d'Egypte" during 1798 - 1801, with the natural historian J.C. de Savigny, among others. Savigny's beautiful engraved plates of marine organisms, including 15 opisthobranchs, were published in 1817, but he became blind before he was able to write the accompanying descriptions. Audouin's interpretation of the molluscs (1826) was completed by Issel (1869) and Pallary (1926). Bouchet and Danrigal (1982) published copies of the plates, with a history of both the plates and the collections.

Ehrenberg and Hemprich made extensive invertebrate collections between 1820 and 1826, which were published by Ehrenberg (Hemprich died in Ethiopia) as 10 colored plates in 1828 followed by the accompanying text in 1831. Eduard Rüppell also travelled in the Red Sea during this period and published beautiful coloured plates and monographs, the opisthobranchs in 1828 and 1830 with Leuckart, including 16 new species. Reproductions of these beautiful plates are presented for the first time in a monograph of benthic opisthobranchs of the Red Sea (Yonow, 2008).

An important review of all records of molluscs published since the time of Linnaeus was published in a book of Red Sea molluscs by Issel (1869) in Italian. Expeditions to the Red Sea continued, and the Austrian research vessel "Pola" cruised the northern Red Sea in 1895 - 1896, and the southern half in 1897 - 1898. Sturany published the gastropod material, including a few opisthobranchs, in 1903. In 1904 Cyril Crossland, a British zoologist with tropical experience, was sent to the Sudanese Red Sea, and his collections of opisthobranchs were described in two publications by Eliot (1908, 1911). Albert Vayssière, who was the director of the marine laboratory in Marseille, published descriptions and plates of opisthobranchs, approximately 45 species, collected by Jousseaume during five voyages from 1887 - 1894 to Aden, Djibouti, and throughout the Red Sea and by Gravier in an expedition in 1904 to Djibouti (1906, 1911a, 1911b, 1912).

The next major work on the Red Sea opisthobranchs resulted from the Cambridge Expedition to the Suez Canal in 1924, its main aim to assess the effects of migration since the opening of the Suez Canal. O'Donoghue's large work describes four cephalaspideans and 15 nudibranchs, together with a list of all species recorded from the Red Sea (then a total of 82 species) and a list of all species recorded in the Mediterranean for comparison (O'Donoghue, 1929). The French "Mission Robert Ph. Dollfus en Egypte" (December 1927 - March 1929, s/s "Al Sayad") collected opisthobranchs in the northern Red Sea and in Lake Timsah in the Suez Canal. Alice Pruvot-Fol (Museum National d'Histoire Naturelle, Paris) published the findings on their collection of opisthobranchs in 1933. Many of her species have not been found subsequently, and many are too poorly described to be recognized. One species, *Hypselodoris dollfusi* Pruvot-Fol, was long considered *incertae sedis,* but it has been rediscovered recently in the Gulf of Oman (Gosliner and Behrens, 2000) and the Gulfs of Eilat and Suez (Yonow, 2008).

The John Murray Expedition (1933 - 1934) was the third expedition in the first half of that century to collect a significant number of opisthobranchs (23 species) in the Red Sea and Gulf Aden (and the Kuria Muria Islands, off the coast of Oman). These were published by Nellie Eales (British Museum [Natural History]) in 1938. Heller and Thompson (1983) published some of the results of the British Suakin expedition, describing eight new species and re-describing ten species. Barash and Danin worked from the Gulf of Eilat, and documented the fauna, especially in comparison with migrations to and from the Red Sea (1972, 1977, 1980). Gohar and his colleagues, based at the Marine Station of Al Ghardaqa (= Hurghada) on the Egyptian coast, detailed the biology, spawning and development of numerous species (1948-1967).

During the summer of 1983, the m/v "Ibn Batuta" circumnavigated the Red Sea, with the express purpose of collecting bivalves, prosobranchs and opisthobranchs. This voyage, supplemented by further collections, culminated in two books (Sharabati, 1984; Yonow, 2008) and a series of taxonomic papers (Yonow, 2000 *passim*). Dekker and Orlin (2000) published a valuable assessment and list of all mollusc species recorded from the Red Sea. Since the "Ibn Batuta" trip, I have been collecting and compiling a record of benthic opisthobranchs; published records from the Red Sea now exceed 250 (compared with 82 in 1929) excluding the Thecosomata, Gymnosomata, and Acochlida. Additional specimen and photographic records have been provided from further collections by the author and by few reliable and trusted sources, bringing the total number of species recorded to 300: these are listed in the appendix (including species without names) with an assessment for presence or absence in the Gulf of Eilat and geographical distribution. Descriptions and illustrations of the majority of these species can be found in Yonow (2008).

Zoogeography and Endemism

The real extent of endemism in the Red Sea, and indeed anywhere, is difficult to estimate due to the extensive collections and comparisons of faunas necessary. However, some taxa have been well studied and in fish, an endemism level of 17% in the Red Sea appears to be accurate (Ormond and Edwards, 1987). However, this is higher for butterfly fish, 41% (Righton *et al*., 1996), cardinal fish, 22% (Randall, 2003) and gobies, 27% (Goren, pers. comm.). Levels of 8% are reported for scleractinian corals (De Ventier *et al*., 2000), but 56% for Xeniidae (Reinicke, 1997); 14% for echinoderms and 9% for algae have also been estimated (Head 1987, Campbell 1987). Polychaetes are estimated to have a 7.5% endemic population (calculated from Wehe and Fiege, 2002). Cowries show higher endemism levels of 35% (calculated from Foin and Ruebush, 1969) as do echinoids (Nebelsick, 1996). Endemism of the molluscan fauna is estimated at 16% (Dekker and Orlin, 2000). Of the 300 species of sea slugs recorded from the Red Sea, 80 are found only here, representing 27% endemism.

The distribution of molluscs is not homogeneous, with more species being present in the southern region of the Red Sea. This distribution pattern also occurs with echinoids, 25 species recorded from the northern part of the Red Sea and 43 recorded from the southern region (Nebelsick, 1996). Nineteen species of cowries are present in the northern Red Sea, 24 in the central Red Sea, and 37 in the south (Foin and Ruebush, 1969). A study of the Polyplacophora reveals 23 species for the Red Sea with only two endemic species (9%), five of which are limited to the southern Red Sea (Strack, 1993). Pteropods are also more speciose in the southern Red Sea (Almogi-Labin, pers. comm.). While molluscs in general show a trend of higher diversity in the southern half of the Red Sea, opisthobranchs follow an opposite trend with 51 species found only in the Gulf of Eilat but not in the southern Red Sea. It remains to be seen whether these observations are real (possibly due to differences in habitat, shipping or other causes) or artificial (and may decrease with increased taxonomic effort). This "anomalous" distribution of opisthobranchs will certainly change as numerous species are not yet formally described and others recently described may yet be found in the Indian Ocean or further afield. However, others have been shown to be different from their Indian Ocean counterparts, demonstrating a real difference with the Indian Ocean.

No recent surveys have been carried out in the Gulf of Suez following the Cambridge and Dollfus expeditions in the 1920s. A study based on collections by the Hebrew University and Smithsonian Institute (1967 - 1969) provided only six opisthobranch species: of these, four species were previously recorded from the Gulf of Suez and two species were Indo-Pacific species already known from the Red Sea. However, *Diniatys dentifer* (A. Adams in Sowerby) is a west Pacific species and was only recorded from the Gulf of Suez but just recently it has been recorded from the Gulf of Eilat (Yonow, 2008). Opisthobranchs also differ from the general molluscan rule of greatest affinity to the Gulfs of Aden and Arabia and the western Indian Ocean: a few opisthobranch species which were thought to be endemic have recently been found in the Gulf of Oman and the Gulf of Aden. There are only 8.5% in common with the western Indian Ocean compared to 31% affinity with the broader Indo-West Pacific region, in contrast to other groups for which information is available. For example, cluster analysis of coral species show greatest affinities with the Gulf of Aden and the Persian Gulf species, and this cluster shows affinities with the western Indian Ocean fauna (Shepard and Sheppard, 1991). Polychaetes show a very high affinity with the nearby regions of the Gulf of Aden, Arabian Sea, and Arabian Gulf, and Wehe

Region	Opisthobranch numbers		Opisthobranch percentages	
	Red Sea	Gulf of Eilat	Red Sea	Gulf of Eilat
Endemic	80	21	26.67%	41.18%
Western Indian Ocean	25	3	8.33%	5.88%
Indo-West Pacific	5	1	1.67%	1.96%
West Pacific-Pacific	93	11	31.00%	21.57%
Circumtropical	44	10	14.67%	19.61%
Mediterranean	12	0	4.00%	0.00%
Not assessed-NW Atlantic	4	1	1.33%	1.96%
	37	4	12.33%	7.84%
Total	300	51	100.00%	100.00%

Table 1. Zoogeographical Affinities of Red Sea and Gulf of Eilat Opisthobranchs

and Fiege (2002) calculate 20% endemism for the "Arabian region" alone. Chitons also show similar affinities with all the non-endemic species also recorded from the western Indian Ocean (Strack, 1993).

Of the 300 species recorded in total in the Red Sea (see list on pp. 192 - 196) 51 species are found only in the Gulf of Eilat while 249 species are common to both areas. Of the 51 species recorded only in the Gulf of Eilat, ten are western Pacific species but not found in the Red Sea or Indian Ocean, and only three are western Indian Ocean species (and one Indian Ocean species). None of the 21 species recorded only from the Gulf of Eilat are named. As many as 15 are possibly new species; the remainder belong to groups in need of taxonomic revision or whose food items may be more widely distributed. The Indian Ocean and Indo-West Pacific species are not problematic, in view of marine species assemblages. The ten western Pacific species not recorded in the Red Sea or Indian Ocean pose more of a problem. One probable suggestion is that the larvae travelled in the ballast tanks of large ships. This appears to have been the distribution of many invasive species all over the world. Another possibility is transport via the hulls of these ships: a whole invertebrate community can exist on these hulls, and it is feasible that opisthobranch larvae, most likely nudibranchs, could settle and metamorphose on the invertebrate hull community as the ship travels, growing and eventually laying before dying. The egg mass would develop and the larvae hatch weeks later in a different sea. Enquiries were made to the Eilat Port Authority to obtain an idea of the number of ships entering the port (there was no information available for the port of Aqaba). In 2004, 2.3 million tons of cargo arrived on ships compared to 2.8 million tons for 1995. Although most ships come to unload cargo, a few come in ballast, and these are the ones of interest for larval transfer. Israel has already placed safety measures on ballast water (IMO 1999) but if none of the other countries bordering the Red Sea adheres to this, alien species will certainly continue to invade the Red Sea. Colour photographs of some sea slugs from the Gulf are presented on two colour plates, pp 190-191.

References

Audouin, J.V. 1826. Explications sommaire des planches de Mollusques de l'Egypte et de la Syrie publiées par J.C. Savigny.*Histoire Naturelle, Animaux Invertébrés* 1 (4): 7 - 56.

Barash, A. and Danin, Z. 1972. The Indo-Pacific species of Mollusca in the Mediterranean and notes on a collection from the Suez Canal. *Israel Journal of Zoology* 21: 301 - 376.

Barash, A. and Danin, Z. 1977. Additions to the knowledge of Indo – Pacific Mollusca in the Mediterranean. *Conchiglie* 13 (5-6): 85 – 116.

Barash, A. and Danin, Z. 1980. Notes on the Aplysiidae from the Red Sea (Mollusca, Gastropoda, Opisthobranchia). *Levantina* 28: 325 - 329.

Behrens, D.W. and Hermosillo, A. 2005. *Eastern Pacific Nudibranchs. A guide to the opisthobranchs from Alaska to Central America*. Sea Challengers, California, 137 pp.

Bouchet, P. and Danrigal, F. 1982. Napoleon's Egyptian campaign (1798 - 1801) and the Savigny collection of shells. *The Nautilus* 96 (1); 9 - 24.

Campbell, A.C. 1987. Echinoderms of the Red Sea. In: Edwards, A.J. and Head, S.M. (eds.) *Red Sea*. Pergamon Press, Oxford, pp. 215 - 232.

De Ventier, L., E. Turck, K. Al-Sheikh, and G. De'ath. 2000. Coral communities of the central and northern Saudi Arabian Red Sea. *Fauna of Arabia* 18: 23 – 66.

Dekker, H. and Orlin, Z. 2000. Check-list of Red Sea Mollusca. *Spirula*, suppl. 47: 1–46.

Eales, N.B. 1938. A systematic and anatomical account of the Opisthobranchia. *Scientific Reports of the John Murray Expedition* 5**:** 77 - 122.

Ehrenberg, C.G. 1828/1831. Decas 1. Mollusca. *Symbolae physicae, seu icones et descriptiones animalium evertebraterum sepositis insectis quae ex itinere per Africam Borealum et Asiam Occidentalem - novae ant illustratae redierunt* (pages unnumbered).

Eliot, C.N.E. 1908. Reports on the marine biology of the Sudanese Red Sea XI. Notes on a collection of nudibranchs from the Red Sea. *Journal Linnean Society* (Zoology) 31: 86 - 122.

Eliot, C.N.E. 1911. Chromodorids from the Red Sea, collected and figured by Mr. Cyril Crossland. *Proceedings Zoological Society, London*: 1068 - 1072.

Foin, T.C. and Ruebush, L.P. 1969. Cypraeidae of the Red Sea at Massawa, Ethiopia, with a zoogeographical analysis based on the Schilders' regional lists. *The Veliger* 12 (2): 201 – 206.

Forsskål, P. 1775/1776. Vermes. I. Mollusca. In: Niebuhr, C. (ed.). Descriptiones Animalium, Avium ... Vermium quae in itinere orientali observavit Petrus Forsskål.

Hauniae, pp. 99 - 140 (1775) and pp. 1 - 13 (1776).
Gohar, H.A.F. 1948. A description and some biological studies of a new alcyonarian species *Clavularia hamra* Gohar. *Publications of the marine biological Station Ghardaqa* **6**: 3 - 33.
Gohar, H.A.F. and Aboul-Ela, I.A. 1957a. The development of *Berthellina citrina*. *Publications of the marine biological Station Ghardaqa* 9: 69 - 84.
Gohar, H.A.F. and Aboul-Ela, I.A. 1957b. On a new nudibranch *Phyllodesmium xeniae*. *Publications of the marine biological Station Ghardaqa* 9: 131 - 144.
Gohar, H.A.F. and Aboul-Ela, I.A. 1957c. The development of three chromodorids. *Publications of the marine biological Station Ghardaqa* 9: 203 - 228.
Gohar, H.A.F. and Aboul-Ela, I.A 1959. On the biology and development of three nudibranchs. *Publications of the marine biological Station Ghardaqa* 10: 41 - 62.
Gohar, H.A.F. and Soliman, G.N. 1963. The biology and development of *Hexabranchus sanguineus* (Rüppell and Leuckart) (Gastropoda, Nudibranchiata). *Publications of the marine biological Station Ghardaqa* 12: 219 - 247.
Gohar, H.A.F. and Soliman, G.N. 1967a. The biology and development of *Dendrodoris (Doriopsis) fumata* (Rüppell and Leuckart) (Gastropoda, Nudibranchiata). *Publications of the marine biological Station Ghardaqa* 14: 31 - 54.
Gohar, H.A.F. and Soliman, G.N. 1967b. The biology and development of *Chromodoris inornata* Pease (Gastropoda, Nudibranchiata). *Publications of the marine biological Station Ghardaqa* 14: 79 - 94.
Gohar, H.A.F. and Soliman, G.N. 1967c. The biology and development of the nudibranch *Chromodoris tinctoria* (Rüppell and Leuckart) (Gastropoda, Nudibranchiata). *Publications of the marine biological Station Ghardaqa* 14: 95 - 108.
Gohar, H.A.F. and Soliman, G.N. 1967d. The direct development of the nudibranch *Casella obsoleta* (Rüppell and Leuckart) (Gastropoda, Nudibranchiata). *Publications of the marine biological Station Ghardaqa* 14: 149 - 166.
Gohar, H.A.F. and Soliman, G.N. 1967e. The biology and development of *Asteronotus cespitosa* (van Hasselt) (Gastropoda, Nudibranchiata). *Publications of the marine biological Station Ghardaqa* 14: 177 - 195.
Gohar, H.A.F. and Soliman, G.N. 1967f. The biology and development of *Discodoris concinna* (Alder and Hancock) (Gastropoda, Nudibranchiata). *Publications of the marine biological Station Ghardaqa* 14: 197 - 214.
Gohar, H.A.F. and Soliman, G.N. 1967g. On two rare nudibranchs of the genus *Trippa* Bergh (Gastropoda, Nudibranchiata). *Publications of the marine biological Station Ghardaqa* 14: 269 - 293.
Gosliner, T.M. and Behrens, D.W. 2000. Two new species of Chromodorididae (Mollusca: Nudibranchia) from the Tropical Indo-Pacific, with a redescription of *Hypselodoris dollfusi* (Pruvot-Fol, 1933). *Proceedings of the California Academy of Sciences* 52 (10): 111 – 124.
Gunthorpe, L. and Cameron, A.M. 1987. Bioactive properties of extracts from Australian dorid nudibranchs. *Marine Biology* 94: 39 – 43.
Hadfield, M.G. and Switzer-Dunlap, M. 1984. Opisthobranchs. In: Tompa, A. S.,

Verdonk, N. H. and Van Den Biggelaar, J. A. M. (eds.), Wilbur, K.M. (ed. in Chief). *Mollusca, volume 7, Reproduction*. Academic Press, pp. 209-350.
Head, S.M. 1987. Introduction. In: Edwards, A.J. and Head, S.M. (eds.). *Red Sea*. Pergamon Press, Oxford, pp. 1 - 21.
Heller, J. and Thompson, T.E. 1983. Opisthobranch molluscs of the Sudanese Red Sea. *Zoological Journal of the Linnean Society* 78: 317 – 348.
International Maritime Organization. August 1999. Alien invaders – putting a stop to the ballast water hitch-hikers. *Focus on IMO*. http://www.imo.org/includes/blastDataOnly.asp/data_id%#D799/BALLASTAlieninvaders1999.pdf.
Issel, A. 1869. Malacologia del Mar Rosso**.** Memoria letta al congresso dei naturalisti Italiani in Vicenza nel 1868, Pisa, Italy, 387 pp.
Maempel, G.Z. 1992. The Arabian Voyage of 1761 – 67 and Malta: Forsskål and his contribution to the study of local natural history. *Proceedings of History Week 1992*: 35 – 76.
Marbach, A. and Tsurnamal, M. 1973 On the Biology of *Berthellina citrina* (Gastropoda, Opisthobranchia) and its defensive acid secretion. *Marine Biology* 21: 331 - 339.
Nebelsick, J.H. 1996. Biodiversity of shallow-water Red Sea echinoids: implications for the fossil record. *Journal of the Marine Biological Association* 76 (1): 185 – 194.
O'Donoghue, C.H. 1929. Report on the Opisthobranchiata, with a comparison of the nudibranch fauna of the Red Sea and of the Mediterranean. Cambridge Expedition to the Suez Canal 1924. *Transactions Zoological Society, London* 22 (38): 713 - 841.
Ormond, R.F.G. and Edwards, A.J. 1987. Red Sea Fishes. In: Edwards, A.J. and Head, S.M. (eds.). *Red Sea*. Pergamon Press, Oxford, pp. 251 - 287.
Pallary, P. 1926. Explication des planches de J.C. Savigny. *Memoires presentées à l'Institut d'Egypte* 11: 1 - 139.
Pawlik, J.R., Kernan, M.R., Molinski, T.F., Harper, M.K. and Faulkner, D.J. 1988. Defensive chemicals of the Spanish dancer nudibranch *Hexabranchus sanguineus* and its egg ribbons: macrolides derived from a sponge diet. *Journal of Experimental Marine Biology and Ecology* 119: 99 – 109.
Plaut, I., Borut, A. and Spira, M.E. 1995. Growth and metamorphosis of *Aplysia oculifera* larvae in laboratory culture. *Marine Biology* 122: 425 – 430.
Plaut, I., Borut, A. and Spira, M.E. 1998. Seasonal cycle and population dynamics of the sea hare *Aplysia oculifera* in the northern Gulf of Eilat (Aqaba), Red Sea. *Journal of Molluscan Studies* 64: 239 - 247.
Pruvot-Fol, A. 1933. Mission Robert Dollfus en Egypte. Opisthobranchiata. *Memoires presentées à l'Institut d'Egypte* 21: 89 -159.
Randall, J.E. 2003. A review of cardinal fishes (Perciformes; Apogonidae) of the Red Sea. *The South African Institute for Aquatic Biodiversity* 1 (1); 1 – 48.
Reinicke, G.B. 1997. Xeniidae (Coelentrata; Octocorallia) of the Red Sea, with descriptions of six new species of *Xenia*. *Fauna of Saudi Arabia* 16: 5 – 62.
Righton, D. Kemp, J. and Ormond, R. 1996. Biogeography, community structure, and diversity of Red Sea and western Indian Ocean butterfly fishes. *Journal Marine*

Biological Association 76 (1): 223 – 228.
Rüppell, W.P.E.S. and Leuckart, F.S. 1828/1830. Mollusca. In: Atlas zu der Reise im nördlichen Afrika von Eduard Rüppell. *Zoologische neue wirbellose Thiere des Rothen Meeres*, pp. 15 - 22 and Tab. 4, 5 (1828), pp. 23 – 47 and Tab. 7 – 11 (1830).
Schmid, H. 1996. *Desert Sea. Fauna of the Saudi Arabian Red Sea Coast*. Privately printed, Paramount Printing Co. Ltd., Hong Kong, 201 pp.
Schmid, H. 2006. *Out of the Blue. Underwater realm of the Red Sea*. Privately printed, Heidelberger Reprographic, Andreas Grosch GmbH, Germany, 165 pp.
Schuhmacher, H. 1973. Notes on occurrence, feeding, and swimming behaviour of *Notarchus indicus* and *Melibe bucephala* at Elat, Red Sea (Mollusca: Opisthobranchia). *Israel Journal of Zoology* 22: 13 - 25.
Seager, J.R. 1982. Population dynamics of the Antarctic opisthobranch *Philine gibba* Strebel. *Journal of experimental Marine Biology and Ecology* 60: 163 – 175.
Sharabati, D.P. 1984. *Red Sea Shells*. Privately printed, K.P.I. Ltd., London, 128 pp.
Sheppard, C.R.C. and Sheppard, A.L.S. 1991. Coral communities of Arabia. *Fauna of Saudi Arabia* 12: 3 – 170.
Strack, H.L. 1993. The Polyplacophora of the Red Sea. *Journal of the Malacological Society, Australia* 14: 1 - 40.
Sturany, R. 1903. Gastropoden des Rothen Meeres. Denkschrifte Kaiserlicher *Akademie der Wissenschaften, in Wien, Mathematische-Naturwissenschaftliche Klasse, Zoologische Ergebnisse* 23: 209 - 283.
Vayssière, A. 1906. Recherches zoologiques et anatomiques sur les opisthobranches de la Mer Rouge et du Golfe d'Aden, partie 1. *Annales de la Faculté des Sciences de Marseille* 16: 1 - 72.
Vayssière, A. 1911a. Sur les opisthobranches et sur les Marséniadés du Golfe de Tadjoura. *Comptes Rendu Academie des Sciences, Paris* 153: 1164 - 1166.
Vayssière. A. 1911b. Note sur les Mollusques Nudibranches Marsénidés, et Onchididés receuillis dans le Golfe d'Aden, à Djibouti, par M. Ch. Gravier, en 1904. *Bulletin du Museum National d'Histoire Naturelle, Paris* 17: 442 - 443.
Vayssière, A. 1912. Recherches zoologiques et anatomiques sur les Opisthobranches de la Mer Rouge et du Golfe d'Aden, partie 2. *Annales de la Faculté des Sciences de Marseille* 20: 5 - 157.
Wehe, T. and Fiege, D. 2002. Annotated checklist of the polychaete species of the seas surrounding the Arabian Peninsula: Red Sea, Gulf of Aden, Arabian Sea, Gulf of Oman, Arabian Gulf. *Fauna of Arabia* 19: 7 – 238.
Willan, R.C. and Morton, J. 1984. *Marine Molluscs Part 2 Opisthobranchia*. University of Aukland, New Zealand, 106 pp.
Yaron, I., Schiotte, T. and Wium-Andersen, G. 1986. A review of molluscan taxa described by P. Forskål and C. Niebuhr with citation of original descriptions, discussion of type material available, and selection of some lectotypes. *Steenstrupia* 12: 157 - 203.
Yonow, N. 1986. Red Sea Phyllidiidae (Mollusca, Nudibranchia) with descriptions of new species. *Journal of Natural History* 20 (6): 1401 - 1428.
Yonow, N. 1988. Red Sea Opisthobranchia. 1. The family Phyllidiidae (Mollusca,

Nudibranchia). *Fauna of Saudi Arabia* 9: 138 - 151.

Yonow, N. 1989. Red Sea Opisthobranchia. 2. The family Chromodorididae (Mollusca, Nudibranchia). *Fauna of Saudi Arabia* 10: 290 - 309.

Yonow, N. 1990. Red Sea Opisthobranchia. 3. The orders Sacoglossa, Cephalaspidea, and Nudibranchia: Doridacea (Mollusca, Opisthobranchia). *Fauna of Saudi Arabia* 11: 286 - 299.

Yonow, N. 1992. Observations on the diet of *Philinopsis cyanea* (Martens) (Cephalaspidea, Aglajidae). *Journal of Conchology* 34 (4): 199 - 204.

Yonow, N. 1994. A new species and new record of *Chelidonura* from the Red Sea (Cephalaspidea: Aglajidae). *Journal of Conchology* 35 (2): 141 - 147.

Yonow, N. 1996. Une brève revue du regime alimentaire des Nudibranches et Sacoglosses (Mollusques, Opisthobranches). *Revue française d'Aquariologie Herpetologie* 23: 77 – 84.

Yonow, N. 2000. Red Sea Opisthobranchia. 4. The orders Cephalaspidea, Anaspidea, Notaspidea, and Nudibranchia: Dendronotacea and Aeolidacea. *Fauna of Arabia* 18: 87 – 131.

Yonow, N. 2008. *Sea Slugs of the Red Sea*. Pensoft Publishers, Sophia, Bulgaria, 306 pp.

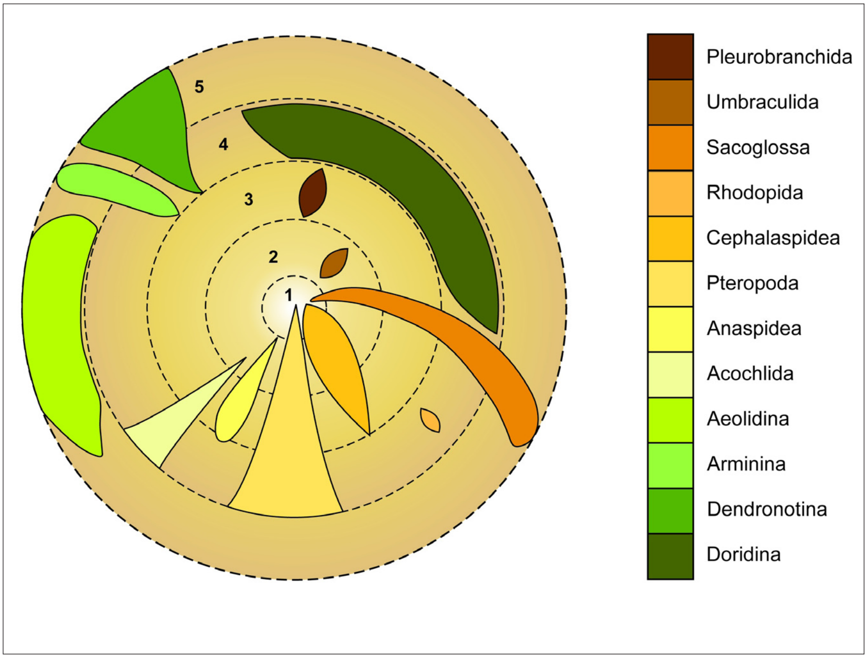
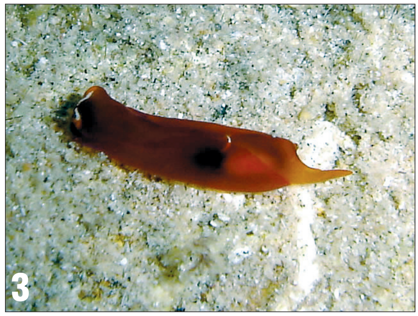


Figure 1. The levels or stages in the evolution of opisthobranchs from the heavily shelled species to the naked ones. The area of each group approximates the number of species it contains . **1** animals retain a spiral shell and operculum. **2** reduced shell , displays enlargement of body. Slug-like body, internal shell, single gill remaining. **4** bilaterally symmetrical bodies, no shell, secondary gills developing. 5 digestive gland extending into cerata (adapted from Willan & Morton 1984, drawn by Anna Ratcliffe).



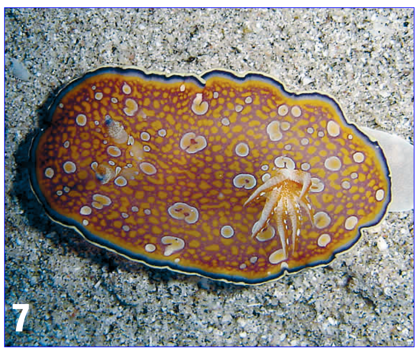
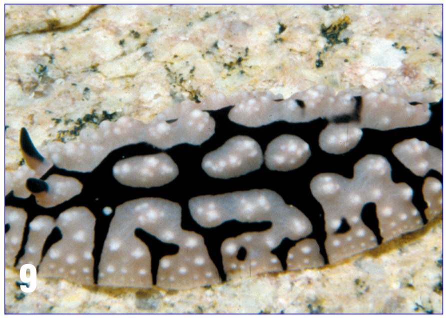


Figure 2. *Chelidonura livida* Yonow, 1994 50 mm (photo J. Kuchinke)
Figure 3. *Chelidonura* sp. 10 mm (photo B. & S. Koretz)
Figure 4. *Pleurobranchus forskalii* Rüppell & Leuckart, 1828 100 mm (photo B. & S. Koretz)
Figure 5. *Thuridilla decorata* (Heller & Thompson, 1983) 20 mm (photo O. Lederman)
Figure 6. *Analogium* sp. 35 mm (photo B. & S. Koretz)
Figure 7. *Chromodoris charlottae* (Schrödl, 1999) 40 mm (photo B. & S. Koretz)



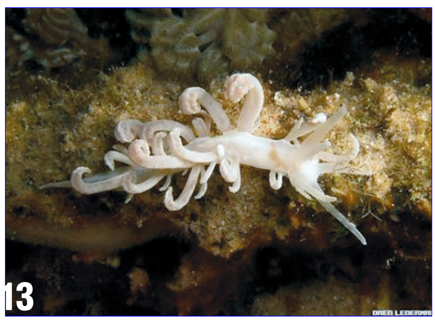


Figure 8. *Chromodoris obsoleta* Rüppell & Leuckart, 1828 50 mm (photo G. Smith)
Figure 9. *Phyllidiopsis sinaiensis* (Yonow, 1988) 85 mm (photo N. Yonow)
Figure 10. *Marioniopsis cyanobranchiata* (Rüppell & Leuckart, 1828) 45 mm (photo J. Kuchinke)
Figure 11. *Armina* sp. 100 mm (B. & S. Koretz)
Figure 12. "*Facelina*" sp. 25 mm (photo B. & S. Koretz)
Figure 13. *Phyllodesmium colemani* 20 mm (photo O. Lederman)

LIST OF SPECIES RECORDED FROM THE RED SEA

The version published here is modified from a similar list including all published records of every species recorded in the Red Sea (Yonow 2008). This list has been coded to show endemic species, geographical distribution of species, and their presence (or absence) in the Gulf of Eilat. Some of the unnamed species in the list are misidentifications from the older literature, a dozen are present as specimens in collections (N. Yonow), but most are photographic records only, of which a number, especially most of those recorded from the Gulf of Eilat, can be found at http://www.koretz.net/Eilat/Invertebrates/Molluscs/Opistobranchs.htm. A plethora of websites now exist illustrating diving holiday snaps and have not been included here due to the unreliability of locality data, but imply that there may be still more species recorded from the Red Sea.

Key: **Endemic Species. Western Indian Ocean. Indian Ocean. Indo-West Pacific. West pacific.** Circumtropical. **Mediterranean. ???unkown.**
Also recorded in Eilat. **Only recorded in Eilat.**

Order Cephalaspidea

Acteon sp.	??????
Pupa affinis (A. Adams, 1855)	??????
Pupa tessellata (Reeve, 1842)	??????
Pupa cf. *solidula* (Linnaeus, 1758)	??????
Pupa sp.	??????
Hydatina physis (Linnaeus, 1758)	Circumtropical
Hydatina zonata (Lightfoot, 1786)	**Indo-West Pacific**
Ringicula acuta Philippi, 1849	??????
Colpodaspis thompsoni Brown, 1979	**Indian Ocean**
Acteocina fusiformis (A. Adams, 1850)	??????
Acteocina inconspicua (H. Adams, 1852)	??????
Acteocina involuta (Nevill, 1871)	??????
Acteocina simplex (A. Adams, 1850)	??????
Utriculastra mucronata (Philippi, 1849)	***Lessepsian migrant***
Cylichna mongii (Audouin 1826)	
***Cylichna villersii* Audouin, 1826**	
***Roxania lithiensis* (Sturany, 1903)**	
***Retusa desgenettii* (Audouin, 1826)**	
***Pyrunculus fourierrii* (Audouin, 1826)**	**Indo-West Pacific (Lessepsian migrant)**
Retusa tarutana Smythe, 1979	**Western Indian Ocean**
Ventomnestia girardi (Audouin, 1826)	**West Pacific (Lessepsian migrant)**
***Philine vaillanti* Issel, 1869**	
***Chelidonura flavolobata* Heller & Thompson, 1983**	
Chelidonura fulvipunctata Baba, 1938	**Indo-West Pacific (Lessepsian migrant)**
Chelidonura livida Yonow, 1994	**Western Indian Ocean**
Chelidonura punctata Eliot, 1903	**Western Indian Ocean**
Chelidonura sandrana Rudman, 1973	**Western Indian Ocean**
Philinopsis cyanea (Martens, 1879)	**Indo-West Pacific**
Philinopsis reticulata (Eliot, 1904)	**Western Indian Ocean**
Odontoglaja guamensis Rudman, 1978	**West Pacific**
Chelidonura sp.1	
Chelidonura sp.2	
Chelidonura sp.3	??????
Chelidonura sp.4	??????
Philinopsis sp.1	??????
Philinopsis sp.2	??????
Sagaminopteron cf. *ornatum* Tokiota & Baba, 1964	**West Pacific**
Sagaminopteron cf. psychedelicum Carlson & Hoff, 1974	**Western Indian Ocean**
***Siphopteron* sp.**	
Atys cylindricus (Helbling, 1779)	**Indo-West Pacific**
***Atys ehrenbergi* Issel, 1869**	
Atys naucum (Linnaeus, 1758)	**Indo-West Pacific**
Atys semistriatus Pease, 1860	**West Pacific**
Diniatys dentifer (A. Adams, 1850)	**West Pacific**
Diniyatys dubius (Schepman, 1913)	**West Pacific**
***Haminoea cyanocaudata* Heller & Thompson, 1983**	
***Haminoea cyanomarginata* Heller & Thompson, 1983**	***Lessepsian migrant***
Haminoea pemphis (Philippi, 1847)	??????
Liloa curta (A. Adams, 1850)	**West Pacific**
***Phanerophthalmus albocollaris* Heller & Thompson, 1983**	
Phanerophthalmus olivaceus (Ehrenberg, 1828)	**Indo-West Pacific (+ P. smaragdina)**
Smaragdinella calyculata (Broderip & Sowerby, 1829)	**Indo-West Pacific**
Smaragdinella sieboldi A. Adams, 1864	**West Pacific**

Bulla ampulla Linnaeus, 1758	**Indo-West Pacific (Lessepsian migrant)**

Order Anaspidea

Akera soluta (Gmelin, 1791)	**Indo-West Pacific**
Aplysia cornigera (Sowerby, 1869)	**Indo-West Pacific**
Aplysia dactylomela (Rang, 1828)	Circumtropical
Aplysia fasciata (Poiret, 1789)	**Mediterranean**
Aplysia oculifera (Adams & Reeves, 1850)	**Indo-West Pacific**
Aplysia parvula (Guilding in Morch, 1863)	Circumtropical
Aplysia sp.	**Western Indian Ocean**
Dolabella auricularia (Lightfoot, 1786)	**Indo-West Pacific**
Dolabrifera dolabrifera (Curvier, 1817)	Circumtropical
Phyllaplysia sp.	??????
Petalifera petalifera Rang, 1828	**Mediterranean**
Petalifera ramosa Baba, 1959	**West Pacific**
Syphonota geographica (Adams & Reeve, 1850)	Circumtropical
Bursatella leachii savignana (Audouin, 1826)	Circumtropical
Notarchus indicus (Schweigger, 1820)	Circumtropical
Stylocheilus longicauda (Quoy & Gaimard, 1824)	Circumtropical
Stylocheilus striatus (Quoy & Gaimard, 1832)	Circumtropical

Order Pleurobranchida

Berthella stellata (Risso, 1826)	**Mediterranean (+ circumtropical)**
Berthella citrina (Ruppell & Leuckart, 1828)	**Indo-West Pacific**
***Berthella saidensis* (O'Donoghue, 1929)**	
Pleurobranchus albiguttatus (Bergh, 1905)	**Indo-West Pacific**
Pleurobranchus forskalii (Ruppell & Leuckart, 1828)	**Indo-West Pacific (Lessepsian migrant)**
Pleurobranchus grandis Pease, 1868	**West Pacific**
***Pleurobranchus* cf. *grandis* (Pease, 1868)**	
Euselenops luniceps (Cuvier, 1817)	**Indo-West Pacific**

Order Sacoglossa

Oxynoe viridis (Pease, 1861)	**Indo-West Pacific**
Julia exquisita (Gould, 1862)	**Indo-West Pacific**
Elysia tomentosa Jensen, 1997	**Indo-West Pacific**
***Elysia trilobata* Heller & Thompson, 1983**	
Elysia sp.1	
Elysia sp.2	
Elysia sp.3	
Elysiella pusilla Bergh, 1872	**Indo-West Pacific**
Elysiella sp.	??????
***Thuridilla decorata* (Heller& Thompson, 1983)**	
Thuridilla ? indopacifica Gosliner, 1995	**Indian Ocean**
Thuridilla sp.	
Plakobranchus ocellatus van Hasselt, 1824	**Indo-West Pacific**
Cyerce elegans Bergh, 1870	**West Pacific**
Polybranchia orientalis (Kelaart, 1858)	**Indo-West Pacific**
Stiliger ornatus Ehrenberg, 1828	**Indo-West Pacific**

Order Nudibranchia Doridina - Phanerobranchs

Goniodoridella savignyi Pruvot-Fol, 1933	**Indo-West Pacific**
Goniodoris joubini (Risbec, 1928)	**West Pacific**
Goniodoris castanea (Alder & Hancock, 1845)	**north-western Europe**
Trapania toddi Rudman, 1987	**West Pacific**
Goniodorid	??????
Analogium striatum (Eliot, 1908)	**Indo-West Pacific**
Analogium sp.	
Gymnodoris alba (Bergh, 1877)	**West Pacific**
Gymnodoris ceylonica (Kelaart, 1858)	
Gymnodoris citrina (Bergh, 1875)	**Indo-West Pacific**
Gymnodoris impudica (Ruppell & Leuckart, 1828)	**Indo-West Pacific (** = *G. rubropapulosa*)
Gymnodoris inornata (Bergh, 1880)	**Indo-West Pacific**
Gymnodoris cf. *nigricolor* (Baba, 1960)	**West Pacific**
Gymnodoris sp.1	
Gymnodoris sp.2	**Indo-West Pacific**
***Nembrotha megalocera* Yonow, 1990**	

Tambja affinis (Eliot, 1904)	**Indo-West Pacific**
Tambja limaciformis (Eliot, 1908)	**Indo-West Pacific**
Thecacera pacifica (Bergh, 1883)	**Indo-West Pacific**
Kaloplocamus sp.	??????
Plocamopherus indicus (Bergh, 1890)	**Indo-West Pacific**
***Plocamopherus ocellatus* (Ruppell & Leuckart, 1828)**	***Lessepsian migrant***
Aegires citrinus Pruvot-Fol, 1930	**Indo-West Pacific**
Aegires villosus Farran, 1905	**Indo-West Pacific**
Hexabranchus sanguineus (Ruppell & Leuckart, 1830)	
Hexabranchus sp.	**West Pacific**

Doridina - Cryptobranchs

Actinocyclus sordida (Ruppell & Leuckart, 1830)	
Actinocyclus verrucosus Ehrenberg, 1831	**Indo-West Pacific**
Hallaxa indecora (Bergh, 1905)	**Indo-West Pacific**
Hallaxa sp.	
Discodoris fragilis (Alder & Hancock, 1864)	**Indo-West Pacific (Lessepsian migrant)**
***Discodoris granulata* (Ehrenberg, 1831)**	
Discodoris schmeltziana (Bergh, 1880)	**West Pacific**
Discodoris sp.1	??????
Discodoris sp.2	??????
Paradoris erythraeensis (Vayssiere, 1912)	**Indo-West Pacific**
Sebadoris nubilosa (Pease, 1871)	**Western Indian Ocean**
Aldisa sp.1	
Aldisa sp.2	**Western Indian Ocean**
***Archidoris vayssierea* O'Donoghue, 1929**	
Archidoris sp.	??????
Atagema ornata (Ehrenberg, 1831)	**Indo-West Pacific** *(= Trippa intecta)*
Atagema spongiosa (Kelaart, 1858)	**Indo-West Pacific** *(= Trippa areolata)*
Atagema sp.1	
Atagema sp.2	??????
Doriopsis granulosa Pease, 1860	**Indo-West Pacific**
Doris sp.1	??????
Doris sp.2	??????
Doris sp.3	??????
Doris sp.4	??????
Hoplodoris grandiflora (Pease, 1860)	**Indo-West Pacific**
Hoplodoris pustulata Abraham, 1877	**Indo-West Pacific** *(+ H. bifurcata)*
Hoplodoris sp.	??????
Hoplodoris cf. *armata* (Baba, 1993)	??????
Sclerodoris apiculata (Alder & Hancock, 1864)	**Indo-West Pacific**
Sclerodoris tuberculata Eliot, 1904	**Indo-West Pacific**
Sclerodoris cf. *rugosa* (Vayssiere, 1912)	??????
***Spongiodoris* sp.**	
***Artachaea clavata* Eliot, 1908**	
***Artachaea verrucosa* Eliot, 1908**	
Asteronotus cespitosus (van Hasselt, 1824)	**Indo-West Pacific**
***Asteronotus denticulata* (Eliot, 1908)**	
Halgerda willeyi Eliot, 1904	**Indo-West Pacific**
***Halgerda* sp.**	
Jorunna funebris (Kelaart, 1858)	**Indo-West Pacific**
Jorunna pantherina Angas, 1864	**West Pacific**
Jorunna sp.1	**Western Indian Ocean**
Jorunna sp.2	??????
Platydoris scabra (Cuvier, 1804)	**Indo-West Pacific**
Platydoris striata (Kelaart, 1858)	**Western Indian Ocean**
Platydoris sp.	??????
Ardeadoris egretta Rudman, 1984	**West Pacific**
Cadlinella ornatissima (Risbec, 1928)	**Indo-West Pacific**
***Cadlinella* sp.**	
Chromodoris africana Eliot, 1904	**Western Indian Ocean**
Chromodoris annulata Eliot, 1904	**Western Indian Ocean**
Chromodoris aspersa (Gould, 1852)	**Indo-West Pacific**
***Chromodoris charlottae* (Schrodl, 1999)**	
Chromodoris fidelis (Kelaart, 1858)	**Indo-West Pacific**
Chromodoris geminus Rudman, 1987	**Indian Ocean**
***Chromodoris obsoleta* (Ruppell & Leuckart, 1830)**	

Chromodoris quadricolor (Ruppell & Leuckart, 1830)	Western Indian Ocean
Chromodoris strigata Rudman, 1980	Indo-West Pacific
Chromodoris tennentana (Kelaart, 1859)	Western Indian Ocean
Chromodoris tinctoria (Ruppell & Leuckart, 1830)	Arabian Gulf (assessed as WIO)
Chromodoris verrieri (Crosse, 1875)	Indo-West Pacific
***Chromodoris* sp.**	
Durvilledoris lemniscata (Quoy & Gaimard, 1832)	Indo-West Pacific
Durvilledoris pusilla (Bergh, 1874)	Indo-West Pacific
Glossodoris atromarginata (Cuvier, 1804)	Indo-West Pacific
Glossodoris cincta (Bergh, 1888)	Indo-West Pacific
Glossodoris electra Rudman, 1990	West Pacific
Glossodoris hikuerensis (Pruvot-Fol, 1954)	Indo-West Pacific
Glossodoris pallida (Ruppell & Leuckart, 1830)	Indo-West Pacific
Glossodoris plumbea (Pagenstecher, 1877)	Western Indian Ocean
Glossodoris symmetricus Rudman, 1990	Indo-West Pacific
Glossodoris sp.	??????
Hypselodoris dollfusi (Pruvot-Fol, 1833)	Arabian Gulf (assessed as WIO)
Hypselodoris infucata (Ruppell & Leuckart, 1830)	Indo-West Pacific (Lessepsian migrant)
Hypselodoris maculosa (Pease, 1871)	Indo-West Pacific
Hypselodoris maridadilus Rudman, 1977	Western Indian Ocean
Hypselodoris nigrostriata (Eliot, 1904)	Western Indian Ocean
Mexichromis katalexis Yonow, 2001	Indo-West Pacific
Noumea alboannulata Rudman, 1986	West Pacific
Noumea flava (Eliot, 1904)	Indo-West Pacific
Noumea norba Marcus & Marcus, 1907	Indo-West Pacific
Noumea simplex (Pease, 1871)	West Pacific
***Noumea sudanica* Rudman, 1985**	
Noumea sp.	Indo-West Pacific
***Risbecia ghardaqana* (Gohar & Aboul-Ela, 1957)**	
Risbecia pulchella (Ruppell & Leuckart, 1830)	Western Indian Ocean
Thorunna africana Rudman, 1984	Western Indian Ocean
Ceratosoma tenue Abraham, 1876	Indo-West Pacific
Ceratosoma trilobatum (Gray, 1827)	Indo-West Pacific
Miamira magnifica Eliot, 1910	Western Indian Ocean
Orodoris miamirana Bergh, 1875	Indo-West Pacific

Doridina - Porostomes

Dendrodoris coronata Kay & Young, 1969	West Pacific
***Dendrodoris cuprea* (Ehrenberg, 1831)**	
Dendrodoris elongata Baba, 1936	Indo-West Pacific
Dendrodoris fumata (Ruppell & Leuckart, 1830)	Indo-West Pacific
***Dendrodoris immaculata* (Audouin, 1826)**	
***Dendrodoris jousseaumei* (Vayssiere, 1912)**	
***Dendrodoris leptopus* Ehrenberg, 1831**	
***Dendrodoris lugubris* Ehrenberg, 1831**	
Dendrodoris nigra (Stimpson, 1955)	Indo-West Pacific
***Dendrodoris nigropunctata* (Vayssiere, 1912)**	
***Dendrodoris tigrina* (Audouin, 1826)**	
Dendrodoris tuberculosa (Quoy & Gaimard, 1832)	Indo-West Pacific
Dendrodoris sp.	Western Indian Ocean
Doriopsilla sp.	??????
***Fryeria rueppelii* (Bergh, 1869)**	
***Phyllidia multifaria* Yonow, 1986**	
***Phyllidia schupporum* Fahrner & Schrodl, 2000**	
Phyllidia undula Yonow, 1986	Western Indian Ocean
Phyllidia varicosa Lamarck, 1801	Indo-West Pacific
Phyllidia sp.	
Phyllidiella pustulosa (Cuvier, 1804)	Indo-West Pacific
Phyllidiopsis cardinalis Bergh, 1873	Indo-West Pacific
***Phyllidiopsis dautzenbergi* (Vayssiere, 1912)**	
***Phyllidiopsis monacha* (Yonow, 1988)**	
***Phyllidiopsis sinaiensis* (Yonow, 1988)**	

Dendronotina

***Marioniopsis glama* (Ruppell & Leuckart, 1828)**	
***Marioniopsis cyanobranchiata* (Ruppell & Leuckart, 1828)**	

Marioniopsis levis (Eliot, 1904)	**Western Indian Ocean**
***Marioniopsis rubra* (Ruppell & Leuckart, 1828)**	
Marioniopsis viridescens (Eliot, 1904)	**Western Indian Ocean**
Tritoniopsis elegans (Audouin, 1826)	**Indo-West Pacific**
tritonid sp.1	??????
tritonid sp.2	??????
Bornella stellifer (Adams & Reeve in Adams, 1848)	**Indo-West Pacific**
***Bornellopsis kabretiana* O'Donoghue, 1929**	
***Doto orcha* Yonow, 2000**	
Lomanotus vermiformis Eliot, 1908	**West Pacific**
Scyllaea pelagica Linnaeus, 1758	Circumtropical
Crosslandia viridis Eliot, 1902	**Indo-West Pacific**
Melibe bucephala Bergh, 1902	**Indo-West Pacific**
Melibe rangii Bergh, 1875	**West Pacific** *(= M. engeli)*

Arminina

Armina semperi (Bergh, 1860)	**West Pacific**
Armina sp.1 cf. major Baba, 1955	
***Armina* sp.2**	
Dermatobranchus albus (Eliot, 1904)	**Western Indian Ocean**
***Dermatobranchus glabrus* (Eliot, 1908)**	
Dermatobranchus gonatophorus van Hasselt, 1824	**West Pacific**
Dermatobranchus ornatus (Bergh, 1874)	**West Pacific**
Dermatobranchus striatus van Hasselt, 1824	**West Pacific**
***Dermatobranchus* sp.1**	
***Dermatobranchus* sp.2**	
Madrella ferruginosa Alder & Hancock, 1864	**Indo-West Pacific**
***Janolus* sp.**	

Aeolidina

Flabellina bicolor (Kelaart, 1858)	**Indo-West Pacific**
***"Flabellina"* sp.**	
Flabellina bilas Gosliner & Willan, 1991	**West Pacific**
Flabellina rubrolineata (O'Donoghue, 1929)	**Indo-West Pacific (Lessespian migrant)**
Flabellina rhodopos Yonow, 2000	**Western Indian Ocean**
***"Facelina"* sp.**	
***Aeolidia habessinica* Ehrenberg, 1828**	
Aeolidiella alba Risbec, 1928	**Indo-West Pacific**
Aeolidia indica Bergh, 1888	Circumtropical (Lessepsian migrant)
Baeolidia fusiformis Baba, 1949	**West Pacific**
Baeolidia cf. *fusiformis*	??????
Baeolidia moebii Bergh, 1888	**West Pacific**
Cerberilla annulata (Quoy & Gaimard, 1832)	**Indo-West Pacific**
Cerberilla sp.	??????
Limenandra nodosa Haefelfinger & Stamm, 1959	**Mediterranean (+ circumtropical)**
Limenandra sp.	**West Pacific**
Spurilla australis Rudman, 1982	**West Pacific**
Spurilla major (Eliot, 1903)	**Indian Ocean**
Dunga ocellata (Alder & Hancock, 1864)	**Western Indian Ocean**
Eubranchus rubropunctatus, Edmunds 1969	**Indo-West Pacific**
Caloria indica (Bergh, 1896)	**Indo-West Pacific**
Favorinus japonicus Baba, 1949	**Indo-West Pacific**
Favorinus tsuruganus Baba & Abe, 1964	**West Pacific**
Favorinus sp.	??????
Glaucilla marginata Bergh, 1868	Circumtropical
Phyllodesmium colemani Rudman, 1991	**West Pacific**
Phyllodesmium crypticum Rudman, 1981	**Indo-West Pacific**
***Phyllodesmium hyalinum* Ehrenberg, 1831**	
***Phyllodesmium fastuosum* Ehrenberg, 1831**	
Phyllodesmium magnum Rudman, 1991	**Indo-West Pacific**
Pteraeolidia ianthina (Angas, 1864)	**Indo-West Pacific**
Embletonia gracile Risbec, 1928	**Indo-West Pacific**
***Catriona susa Marcus* & Marcus, 1960**	
Cuthona sibogae (Bergh, 1905)	**Indo-West Pacific**
***Cuthona* sp.**	
Phestilla lugubris (Bergh, 1870)	**Indo-West Pacific**
Phestilla melanobrachia Bergh, 1874	**Indo-West Pacific**