

WHAT IN THE WORLD IS A NUDIBRANCH?

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Some might think that a nudibranch is a tree limb without any leaves or some kind of a sun worshipper. Wrong. A nudibranch is a marine snail that, over time, has lost its shell. The term “nudibranch” in zoological patter is “naked gill” meaning that these organisms have external gills or branchial plumes. Nudibranchs, or sea slugs, are very popular subjects for scuba divers to photograph, second only to tropical fish for outstanding color patterns. They are not usually adaptable to aquariums because of the lack of a suitable food to sustain them.

The appearance of nudibranchs is quite vividly described by Helmut Debelius, an avid oceanic photographer and author, in his book *Nudibranchs and sea snails, Indo-Pacific Field Guide*: “They look like the creation of talented painters, like exercises in imagination. They come mostly in bright colors, decorated with such profusions of undulating flaps, sensory organs and waving forests of ‘fingers’ that it is difficult to tell which end is which. Delicate, seemingly unprotected, they are beautiful to look upon, the underwater analogues of butterflies. Yet, they too are animals surviving in an eat-or-be-eaten world, sometimes predator and sometimes prey. Moreover, they have taken an evolutionary gamble by giving up the protective shell that has always sheltered their kind, and appear to have won handsomely”. Sea slugs and their kin, sea hares, head-shield slugs, side-gill slugs and sap-sucking slugs have shown their biodiversity in nine zoological Orders and over 100 Families. Zoologists have placed them in the Phylum Mollusca (molluscs), Class Gastropoda (oysters, clams, sea slugs, both marine and land snails, etc.), and Order Nudibranchia (nudibranchs or sea slugs).

Anatomically, nudibranchs may be recognized by a pair of *rhinophores* on the top of the head and several, to many, *cerata* in the middle or near the posterior end of the back, which serve a defensive function, by discharging nematocysts that the nudibranch has ingested from its prey. In addition, they have a rasp-like tongue known as a *radula*. These animals are primarily hermaphroditic; each individual possesses both male and female reproductive organs. When mating takes place all four organs are involved, which ensures successful insemination. Some deep water nudibranchs may reach lengths of 16 inches.

These unique gastropods may be found in all the oceans of the world but there are more species and individuals in the Indian and Pacific Oceans, which may be the center of dispersal of the order.

The lack of a shell makes the nudibranchs more mobile. Most species still creep along the bottom of the ocean, but many can swim, at least enough to move around looking for a mate or to escape from a predator. Even without a shell to slow them down most nudibranchs do not depend on flight. Instead, they stand their ground, staking their lives on camouflage or chemical warfare. Bright colors may be used to warn predators that they are noxious, or even toxic, or to hide. For example, a bright red nudibranch ‘disappears’ when it is feeding, or resting, on a bright red sponge. These fascinating creatures often acquire their color from what they eat.

Chemical warfare is the weapon of choice for many nudibranchs. Some secrete organic acids, which produce a reaction that most fish find extremely distasteful. Others secrete toxins, some so venomous that a single nudibranch placed in a bucket with fish or crustaceans will kill them in roughly an hour. Scientists have discovered that a group of

nudibranchs in the Suborder Aeolidacea borrow the weapons of others. They feed upon another category of marine invertebrates, the hydroids and sea anemones. The latter animals in turn are unique in that they produce nematocysts that are cells that can discharge a tiny coiled hollow thread; something like a whaler's harpoon. One type of nematocyst pierces the skin of a victim and injects a toxin. When an aeolid nudibranch eats hydroids, it can ingest the nematocysts without ill effects. The nudibranch's digestive system neutralizes the mature nematocysts just as our stomach is capable of rendering rattlesnake venom harmless. However it passes the immature nematocysts to special sacks at the tips of cerata, where they develop into fully dischargeable weapons. The cerata, or "fingers", are often the most brightly colored part of the aeolid and they may turn attention to themselves instead of the animal's head and vital organs. A fish that nibbles on these cerata gets a mouthful of stinging nematocysts in addition to other foul-tasting secretions and rapidly loses interest. The nudibranch crawls away and quickly regrows any cerata that have been lost. Other observations show that crabs carefully pick off the cerata from the aeolid before eating them.

Because of their world wide distribution and astonishing array of color patterns many countries have issued postage stamps to show off their native nudibranchs. For example, at least 84 stamps have been issued depicting these unique animals. One of the best known nudibranchs, the Spanish Dancer, *Hexabranchus sanguineus*, Family Hexabranchidae, has appeared on three stamps – Fiji Islands #697, Tuvalu #465 and the United States #3831g. See on right. This is one of the largest nudibranchs known with individuals over 40 cm recorded. It is also described in John Steinbeck's *Cannery Row* in 1945 – "Orange and speckled and fluted nudibranchs slide gracefully over the rocks, their skirts waving like the dresses of Spanish dancers." This



creature has two color forms, one solid bright red and the other a mottled form shown here. The stamp from Fiji is just one of a set of stamps issued July 27, 1993. The 83c value in this set (at left) portrays the blue and white *Glaucus atlanticus*, Family Glaucidae, which floats on the surface of the ocean upside down and feeds on the Portuguese Man-of-war. See left. It has been found here in the Gulf of Mexico and is world wide in distribution.

Another beautiful nudibranch issued by Vanuatu #406 is Elizabeth's Nudibranch, *Chromodoris elizabethina*, Family Chromodoridae, which would make a more attractive football mascot than the University of Michigan's wolverine with its deep maize and brilliant blue colors. The yellow pair of rhinophores on the head is at the left and the yellow cerata at right. The broad medial stripe is bright blue. (See sea slug on right).

On #407 the Golden Nudibranch, *Halgerda aurantiomaculata*, Family Dorididae, is shown next to a brain





coral. The mantle is pale blue spotted with golden ovals. The cerata are placed posteriorly on the mantle. This species ranges from eastern Australia to eastern Papua and New Guinea. It is characterized by orange-tipped tubercles. (See at left.)

Papua New Guinea issued a set of four stamps (#482-85) on August 29, 1978 featuring different species of these weird animals. The 15 toea value shows *Chromodoris fidelis*, Family Chromodoridae, and also

clearly shows the two rhinophores at the left and the cerata at right. The mantle is creamy white with a broad orange-red band around the edge of the mantle and a thin wine red line between the white and the orange. On the inner edge of the orange there is a series of dark, tongue-like patches running into the white area. In some cases these patches are almost wine red while in others there is only a slight thickening of the red band. The species reaches lengths of 20-25 mm.



Another stamp in this series (#484) depicts *Flabellina macassarana*, Family Flabellinidae, which reminds one of a mass of earthworms baited on a hook for fishing. The body and rhinophores of this nudibranch are pink while the cerata are various shades of lilac and they are yellow-tipped. Some variations in this color pattern occur where the mantle is whitish with lilac tints and the cerata whitish with reddish-brown tips.



One of the most unique color patterns on nudibranchs may be found on Solomon Islands #639 – the Scrambled Egg Sea Slug, *Phyllidia varicosa*, Family Phyllidiidae. The “scrambled eggs” are ornamental tubercles but to me they look more like sunny-side up eggs of various sizes since they have orange-yellow centers surrounded by white. This species may be found in the central Pacific Ocean and in the Red Sea. In length they are slightly over 100 mm. (See at right).



There is a great deal of information on the Internet, mostly under the name of sea slugs. In the search bar just type in “Sea Slug Forum”. There are fact sheets and color illustrations of hundreds of species of nudibranchs listed systematically by family. There are other sections on general topics such as general biology, evolution, and ecology; life history; predators and parasites; aquarium facts; anatomy; marine plants; sea hares; references and further reading and localities and geographical regions. Another excellent source of information sponsored by the California Academy of Sciences and the National Health Museum is a web page called “The Slug Site”.
