Metridium senile

Plumose or frilled anemone

Phylum: Cnidaria

Class: Anthozoa, Hexacorallia

Order: Actiniaria, Enthemonae

Family: Metridioidea, Metridiidae

Taxonomy: *Metridium senile* was first described by Linnaeus in 1761. When it was first described, scientists believed that there was only one, very diverse species of *Metridium*: *M. senile*. Hand (1955) took the first step in dividing this species by distinguishing the Atlantic and Pacific populations as subspecies. Since then, further work has been done to determine the genetic lines that should be drawn in *Metridium* sea anemones. Bucklin and Hedgecock (1982) determined that the clonal *M. senile*, the solitary *M. senile*, and the recently (at the time) described *M. exilis* were genetically distinct species. The clonal species kept the name *M. senile*, while the solitary species gained the name *M. gigantus*, which then became *M. farcimen* (Fautin and Hand 2000). There is still some debate on the matter. Recent studies are suggesting that the Atlantic subspecies of *M. senile* may actually be *M. dianthus*, but further research is necessary to fully understand this relationship (Fautin and Sebens 1987; Fautin 2013; Fautin 2015).

In the larger taxonomic scale, the subclass Zoantharia has been synonymized with Hexacorallia (Hoeksema 2015).

Description

Medusa: No medusa stage in Anthozoans

Polyp:

Size: Specimens average about 5 cm (2 inches) in diameter, including tentacles. Maximum height is 10 cm, while average is 5 cm (Fautin et al. 1987) and minimum is usually larger than 2 cm (Fautin et al. 1987).

Color: Juveniles are white. Adults can be brown, orange, white, or grey, and cinclides (pores through which acontia can protrude) are sometimes visible as dark spots (Fautin et al. 1987). The tentacles are grey to white, and there is usually a ring of white around the mouth (Kozloff 1983). Because of asexual reproduction, all animals in one area may be same color.

Body: This anemone is cylindrical with many fine short tentacles. Mesenteries divide the internal structure and cannot be seen through the body walls. Defensive tentacles called acontia can extend through pores called cinclides in the column. The parapet rings the end of the column, from which the capitulum extends distally. On the oral disc, specimens occasionally have ciliated grooves to direct water (siphonoglyphs).

Column: The column is stout. It is compact in young specimens and often long in old ones. It is not striped (Perkins 1977).

Collar: A parapet (collar) is seen beneath the crown of tentacles (Fig. 2).

Oral Disc: There is very little tentacle-free area around mouth (Fautin and Hand 2007). Siphonoglyphs (ciliated grooves) vary from 0-3, and one is usual (Hand 1955). It is sometimes very slightly lobed, and sometimes it is not lobed at all (Fautin et al. 1987; Fautin and Hand 2007). The margin is frilled (Fautin and Hand 2007).

Tentacles: Tentacles are fine, unknobbed, and short. *Metridium senile* can have up to 18 "catch" tentacles; these are short, blunt and opaque near the mouth (Haderlie et al. 1980) and are used to attack anemones from another clonal group or of another species (Ricketts et al. 1985). There are

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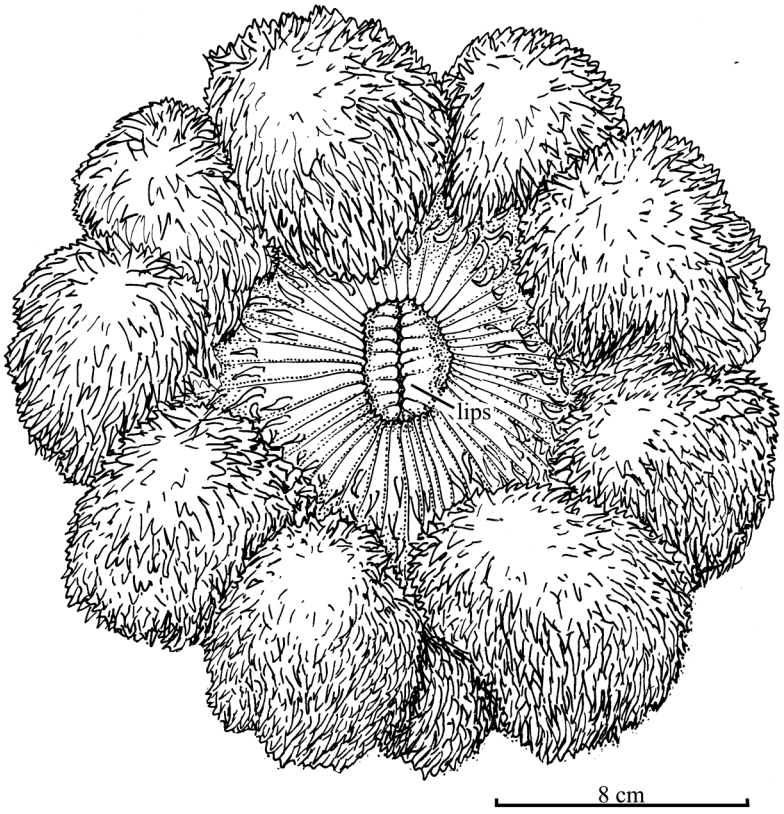
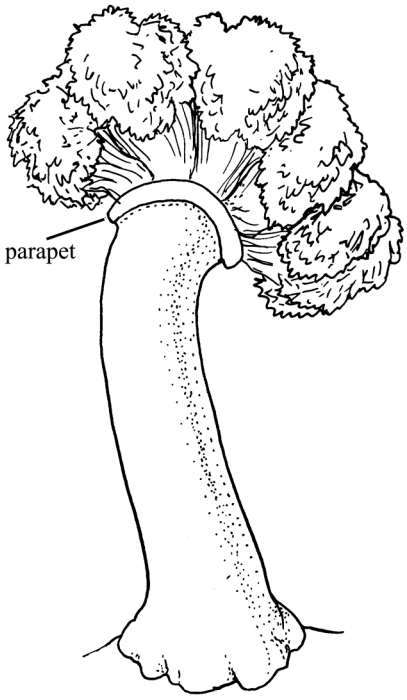
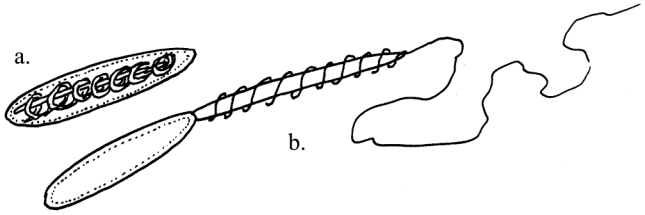


1. *Metridium senile* (dorsal view, D: 24cm):
large subtidal specimen, many small tentacles in lobe-like groups; column stout, not striped; base flat, attached; oral disc with obvious lips.



2. Subtidal specimen (lateral view) x1.

3. Nematocysts (generalized):
a. undischarged.
b. discharged.



4. Small piling specimen (D: 6cm) x1.

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varied accounts of the maximum number of tentacles, but some say that this anemone cannot have more than 100 (Fautin et al. 1987. Tentacles arranged in lappet-like groups or lobes (Fig. 1). Acontia are thread-like tentacles that are found in the lower part of mesenteries. They are discharged through the lower column wall when the animal is disturbed (Fautin et al. 1987).

Mesenteries: These are vertical body cavity partitions. There can be 3-15 pairs in this anemone, but they are not visible through the body wall, as the animal is opaque.

Pedal Disc: This is flat and attached to a hard surface.

Cnidae: There are several kinds of cnidae present (Hand 1955), especially in specimens with catch tentacles (Ricketts et al. 1985); (Fig. 3a, b). Some contain a toxin with a protein fraction that dialyzable material with aromatic amines.

Possible Misidentifications

Anthopleura artemesia, an estuarine anemone with a white stalk, can be confused with young *M. senile*. *Anthopleura artemesia* lives in fine sand, not on pilings, and when extended tentacles are either pink or green and are heavy.

There are two other species of *Metridium* locally:

Metridium exilis lives under rocks and other ledges on the open coast. It has fewer than 100 tentacles with more area around the mouth clear of tentacles, while *M. senile* has very little area on the oral disc without tentacles. *Metridium exilis* has a yellow, orange or red column rather than white, brown, or grey (Fautin and Hand 2007).

Metridium farcimen was once considered conspecific with *M. senile*. Where *M. senile* is smaller, intertidal, and clonal, *M. farcimen* is large (up to a meter in height), subtidal, and solitary (Fautin and Hand 2000; Eash-Loucks and Fautin 2012). *M. farcimen* also has a highly lobed oral disc, while the oral disc of *M. senile* is simply circular (Fautin and Hand 2007). Finally, the two species have different kinds of cnidae on their acontia (Fautin and Hand 2000). Many older descriptions of *M. senile* are actually of *M. farcimen*.

Ecological Information

Range: The type locality is San Francisco Bay (Hand 1955). This species is circumpolar in the northern hemisphere. They are found in harbors and bays in both the Atlantic and Pacific Oceans. On the Pacific Coast, they can be found from Sitka, Alaska, to Santa Barbara, California.

Local Distribution: Locally, *M. senile* is found on protected pilings in larger Oregon estuaries, such as Coos Bay.

Habitat: This anemone likes bare, shaded pilings and rock jetties, as well as floats in harbors or bays. It can also attach to dead shells, the tunicate *Styela*, the kelp crab *Pugettia,* and barnacle tests (Ricketts et al. 1985).

Salinity: Collected at 30 in Coos Bay and at 27 in Puget Sound (communication, R. Boomer). Because this anemone lives in estuaries, it can tolerate brackish conditions; it can survive in salinities of ~15 (50% sea water) (Shumway 1978).

Temperature: This species is found in temperate to cold waters (Hand 1955). Its metabolic rate is often positively correlated with temperature, and it acclimates well.

Tidal Level: This anemone is primarily intertidal. It can tolerate limited exposure, and is found between 0.0 and -1.0 on some pilings, especially in summer (Kozloff 1983). It is most abundant at slightly above mean low low water intertidal (Fautin et al. 1987; Fautin and Hand 2007).

Associates: In Puget Sound, *M. senile* is often found in conjunction with *Diadumene line-*

ata. On protected pilings, it frequently lives with the sea star *Pisaster* and the tunicates *Styela* and *Cnemidocarpa* (Ricketts et al. 1985). Both juveniles and adults of the sea spider *Pycnogonum litorale* parasitize *M. senile* by sticking their proboscis through the anemone's body wall and ingesting their body fluids (Wilhelm et al. 1997).

Abundance: *Metridium senile* is often found on pilings, floats, and jetties of both Pacific and Atlantic bays and harbors. It is especially abundant in dark quiet corners, and tends to live in clonal clusters (Fautin and Hand 2007).

Life-History Information

Reproduction: Like other anemones, this species reproduces both sexually and asexually. Sexually, *M. senile* is oviparous and dioecious (has separate sexes). It discharges eggs or sperm from its mouth into the water in broadcast spawning (Kozloff 1983). Sperm is released first, and its presence triggers the females to release their eggs (Ricketts et al. 1985). For most specimens, sexual reproduction occurs annually (Hoffmann 1987). Sperm have wedge shaped heads, while eggs are pinkish and about 0.1 mm diameter. The sperm and eggs fertilize to create a planular larva, which settles as a young anemone. Asexually, these anemones can reproduce through pedal laceration and, less commonly, through longitudinal fission (Kozloff 1983). In pedal laceration, a small amount of the pedal disc is left on substrate as anemone moves about; each small clump forms a new anemone (Fautin and Hand 2007). Asexual reproduction accounts for the often irregular siphonoglyphs and mesenteries, which make *M. senile* a poor choice for lab use (Hyman 1940). Peak of the breeding season is August to September (Fautin and Sebens 1987).

Larva: This species produces pelagic feeding planula larvae (Fautin and Sebens 1987). They are ovaloid to cylindrical, covered in cilia, and have an apical tuft. They actively swim using the cilia on their apical tuft (Sadro 2001).

Juvenile: Juveniles from sexual reproduction are recruited annually (Hoffmann 1987). However, this larval recruitment is less common that juveniles created through asexual reproduction; it is possible that predator *Aeolidia papillosa* is responsible for limiting the survival of small, young anemones (Hoffmann 1987).

Longevity: This species survives well in small aquaria with running seawater.

Growth Rate: The time from pedal laceration to a complete (abet small) anemone is about three weeks (Fautin et al. 1987).

Food: *Metridium senile* is an active predator and carnivore. It eats very small organisms, unlike many anemones which manage larger prey (Kozloff 1983). Also eats algae *Enteromorpha intestinalis* and *Desmarestia viridis* (Perkins 1977). Copepods and other varied larvae, without preferential selection (Ricketts et al. 1985).

Predators: This species is popular food for nudibranchs like *Hermissenda crassicornis*, *Aeolidiella chromosoma*, *Aeolidiella oliviae* (McDonald 2007), and *Aeolidia papillosa* (MacGinitie and MacGinitie 1968; Ricketts et al. 1985).

Behavior: In dense groups of small animals, catch tentacles, used for stinging rather than feeding, serve to keep anemones separate (Haderlie et al. 1980). At low tide they can be seen on the sides of pilings hanging "fully relaxed and pendulous" (Ricketts et al. 1985).

Bibliography

1. BUCKLIN, A., and D. HEDGECOCK. 1982. Biochemical genetic evidence for a 3rd species of *Metridium* (Coelenterata, Actiniaria). Marine Biology. 66:1-7.
2. EASH-LOUCKS, W. E., and D. G.

Piazzola, C.D. and T.C. Hiebert. 2015. *Metridium senile. In:* Oregon Estuarine Invertebrates: Rudys' Illustrated Guide to Common Species, 3rd ed. T.C. Hiebert, B.A. Butler and A.L. Shanks (eds.). University of Oregon Libraries and Oregon Institute of Marine Biology, Charleston, OR.

FAUTIN. 2012. Taxonomy and distribution of sea anemones (Cnidaria: Actiniaria and Corallimorpharia) from deep water of the northeastern Pacific. Zootaxa:1-80.
3. FAUTIN, D. G. 2013. Hexacorallians of the World, http://geoportal.kgs.ku.edu/hexacoral/anemone2/index.cfm. [Accessed 10/22/2015].
4. —. 2015. *Metridum senile* (Linnaeus, 1761). *In:* Hexacorallians of the World. D. G. Fautin (ed.), World Register of Marine Species: http://www.marinespecies.org/aphia.php?p=taxdetails&id=100982. [Accessed 10/22/2015].
5. FAUTIN, D. G., and C. HAND. 2000. *Metridium farcimen*, the valid name of a common north Pacific sea anemone (Cnidnria: Actiniaria: Acontiaria). Proceedings of the Biological Society of Washington. 113:1151-1161.
6. —. 2007. Anthozoa, p. 173-184. *In:* The Light and Smith Manual: intertidal invertebrates from central California to Oregon. J. T. Carlton (ed.). University of California Press, Berkeley.
7. FAUTIN, D. G., and K. P. SEBENS. 1987. Phylum Cnidaria, Class Anthozoa, p. 83-104. *In:* Reproduction and development of marine invertebrates of the northern Pacific coast. M. F. Strathmann (ed.). University of Washington Press, Seattle.
8. FAUTIN, D. G., A. E. SIEBERT, and E. N. KOZLOFF. 1987. Class Anthozoa, p. 68-78. *In:* Marine invertebrates of the Pacific Northwest. E. N. Kozloff (ed.). University of Washington Press, Seattle.
9. HADERLIE, E. C., C. HAND, and W. B. GLADFELTER. 1980. Cnidaria (Coelenterata): the sea anemones and allies, p. 40-75. *In:* Intertidal invertebrates of California. R. H. Morris, D. P. Abbott, and E. C. Haderlie (eds.). Stanford University Press, Stanford.
10. HAND, C. 1955. The sea anemones of Central California. Part III. The Acontiarian anemones. Wasmann Journal of Biology. 13:190-206.
11. HOEKSEMA, B. 2015. Hexacorallia. Vol. 2015, World Register of Marine Species: http://www.marinespecies.org/aphia.php?p=taxdetails&id=1340. [Accessed 9/23/2015].
12. HOFFMANN, R. J. 1987. Short-term stability of genetic structure in populations of the sea anemone *Metridium senile*. Marine Biology. 93:499-507.
13. HYMAN, L. H. 1940. The Invertebrates: Protozoa through Ctenophora. McGraw-Hill, New York, London.
14. KOZLOFF, E. N. 1983. Seashore life of the northern Pacific coast. University of Washington Press, Seattle.
15. MACGINITIE, G. E., and N. MACGINITIE. 1968. Natural history of marine animals. McGraw-Hill Book Co., New York.
16. MCDONALD, G. R. 2007. Sacoglossa and Nudibranchia, p. 788-807. *In:* The Light and Smith manual: intertidal invertebrates from central California to Oregon. J. T. Carlton (ed.). University of California Press, Berkeley, CA.
17. PERKINS, E. G. 1977. *Metridium senile*: a clonal formation analysis. Vol. Summer: Book 4. Oregon Institute of Marine Biology (University of Oregon), Charleston, OR.
18. RICKETTS, E. F., J. CALVIN, J. W. HEDGEPETH, and D. W. PHILLIPS. 1985. Between Pacific tides. Stanford University Press, Stanford, CA.
19. SADRO, S. 2001. Cnidaria (Coelenterata), p. 13-23. *In:* An identification guide to the larval marine invertebrates of the Pacific Northwest. A. L. Shanks (ed.). Oregon State University, Corvallis.
20. SHUMWAY, S. E. 1978. Activity and respiration in anemone, *Metridium senile* (L) exposed to salinity fluctuations. Journal of Experimental Marine Biology and Ecology. 33:85-92.

21. WILHELM, E., D. BUCKMANN, and K. H. TOMASCHKO. 1997. Life cycle and population dynamics of *Pycnogonum litorale* (Pycnogonida) in a natural habitat. Marine Biology. 129:601-606.

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