



# What is a Tunicate?

A tunicate is a marine invertebrate animal and a member of the subphylum Tunicata, which is part of the Chordata, a phylum that includes all animals with dorsal nerve cords and notochords. The subphylum was at one time called Urochordata, and the term urochordates is still sometimes used for these animals. Some tunicates live as solitary individuals, but others replicate by budding and become colonies; each unit is known as a zooid. Tunicates are marine filter feeders with a water-filled, sac-like body structure and two tubular openings, known as siphons, through which they draw in and expel water. During their respiration and feeding, they take in water through the incurrent (or inhalant) siphon and expel the filtered water through the excurrent (or exhalant) siphon. Most adult tunicates are sessile and are permanently attached to rocks or other hard surfaces on the ocean floor; others, such as salps, doliolids, and pyrosomes, swim in the pelagic zone of the sea as adults. Various species are commonly known as sea squirts, sea pork, sea livers, or sea tulips.

The earliest probable species of tunicate appears in the fossil record in the early Cambrian period. Despite their simple appearance and very different adult form, their close relationship to vertebrates is evidenced by the fact that, during their mobile larval stage, tunicates possess a notochord, or stiffening rod, and resemble a tadpole. Their name derives from their unique outer covering or "tunic," which is formed from proteins and carbohydrates and acts as an exoskeleton. In some species, the outer covering is thin, translucent, and gelatinous, while in others, it is thick, tough, and stiff.

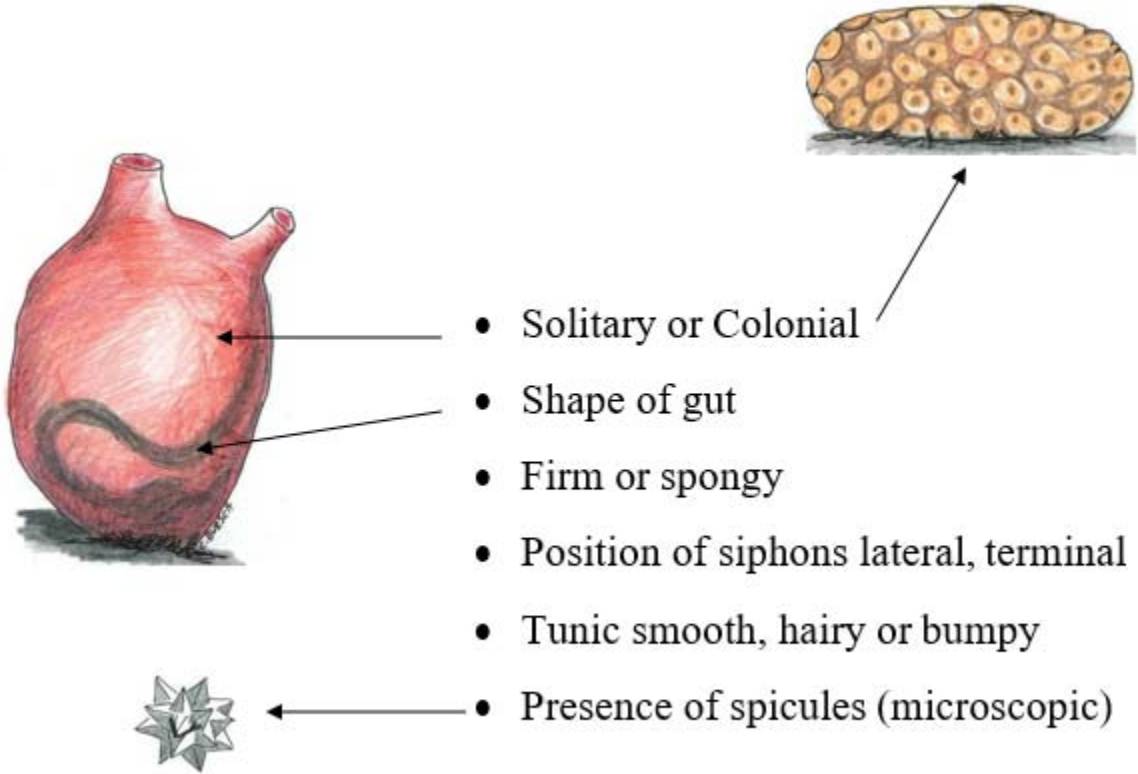
Source: Wikipedia contributors. "Tunicate." *Wikipedia, The Free Encyclopedia*. Wikipedia, The Free Encyclopedia, 14 Jan. 2018. Web. 7 Feb. 2018.

Guide may be downloaded from KBRR website at:  
<http://accs.uaa.alaska.edu/kbnerr/field-guides/>  
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# Key Features: Tunicata



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# Field Guide Species List

Species are in order within Family groupings. Those with an asterisk have unclear origins.  
NIS = non-native invasive species

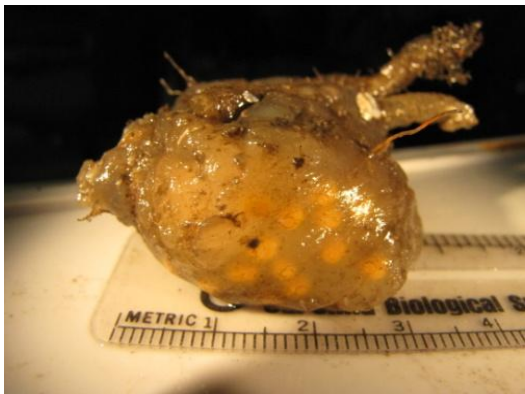
Taxonomic Name	Common Name	Status Pacific NW	Page
<b>Marine Fouling Invertebrates</b>			
<b>Phyla: Tunicata</b>			
<i>Aplidium californicum</i>	Sea pork	Native	6
<i>Aplidium coei</i>		Native	7
<i>Aplidium</i> sp.		Native	8
<i>Ascidia callosa</i>	Sea blister	Native	9
<i>Boltenia echinata</i>	Cactus sea squirt	Native	10
<i>Boltenia villosa</i>	Spiny-headed tunicate	Native	11
<i>Botryllus schlosseri</i>	Golden star tunicate	NIS	12
<i>Botrylloides violaceus</i>	Chain or sheath tunicate	NIS	13
<i>Ciona robusta</i>	Vase tunicate	NIS	14
<i>Ciona savignyi</i>	Vase tunicate	NIS	15
<i>Chelyosoma productum</i>	Flat top sea squirt	Native	16
<i>Corella inflata</i>	Brooding transparent tunicate	Native	17
<i>Corella willmeriana</i>	Transparent tunicate	Native	18
<i>Didemnum vexillum</i>	Marine or sea vomit	NIS	19
<i>Distaplia alaskensis</i>	Compound tunicate	Native	20
<i>Distaplia occidentalis</i>	Mushroom compound tunicate	Native	21
<i>Halocynthia aurantium</i>	Sea peach	Native	22
<i>Halocynthia igaboja</i>	Hedgehog tunicate	Native	23
<i>Molgula citrina</i> *	Sea grape	Native?	24
<i>Molgula manhattensis</i>	Sea grape	NIS	25
<i>Molgula pacifica</i>	Sea grape	Native	26
<i>Molgula retortiformis</i>	Sea grape	Native	27
<i>Riterella pulchra</i>	Sea salmonberry	Native	28
<i>Pyura haustor</i>	Wrinkled sea squirt	Native	29
<i>Cnemidocarpa finmarkiensis</i>	Broad base tunicate	Native	30
<i>Dendrodoa pulchella</i>		Native	31

Taxonomic Name	Common Name	Status Pacific NW	Page
<b>Tunicates continued</b>			
<i>Metandrocarpa taylori</i>	Orange social sea squirt	Native	32
<i>Styela clava</i>	Club tunicate	NIS	33
<i>Styela yakutatensis</i>	Club tunicate	Native	34
<i>Synoicum irregulare</i>	Gnomes toes	Native	35
<i>Synoicum</i> sp. aff. <i>jordani</i> or <i>kincaidi</i>	Sea pork	Native	36

A collection of most of these tunicates was made from Kachemak Bay by the Kachemak Bay Research Reserve and resides at the University of Fairbanks, Museum of the North in Fairbanks, Alaska. Specimen may be borrowed.

Tunicate (colonial) - *Aplidium californicum*

DESCRIPTION	This colonial tunicate, commonly called Sea Pork, is very smooth, round and often glossy. Sometimes sand is in folds of the tunic, but never embedded. Form is extremely variable including mounds, lobes or sheets.
RANGE	Alaska to southern California
SIZE	1-3 cm tall, to 20 cm in diameter
STATUS	Native
COLOR	Variable, white, pink, peach, or brown with yellow to orange spots within the tunic, to nearly colorless
HABITAT	Intertidal to subtidal, rocks, sand, and common on man-made substrates to 85 m
TIDAL HEIGHT	Lower intertidal, subtidal to 85 m
SALINITY	25.4 to 35 ppt
TEMPERATURE	-0.4 to 16.2°C
SIMILAR SPECIES	Glossy surface distinctive. Species is highly variable in form and can look similar to <i>A. solidum</i> , but the latter is generally much larger and has five lobes on the atrial siphon, whereas <i>A. californicum</i> has none.



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Tunicate (colonial) - *Aplidium coei*

DESCRIPTION	Colonial tunicate with 1–4 enlarged lobes arising from a common base. The top of lobes are gathered looking, with the zooids columnar like <i>Distaplia</i> .
RANGE	Alaska: Ritter described and collected them on Kodiak Island during the Harriman expedition (Ritter, 1901). Gretchen Lambert identified them again in Kodiak in 2001 and reported that they were fairly common in the low rocky intertidal. They were also seen in Kachemak Bay in low rocky intertidal and in Scow Bay, near Sitka.
SIZE	Lobes to 5.5 cm tall. Colonies photographed ~15 cm wide or less.
STATUS	Native
COLOR	Bright yellow or orange
HABITAT	Sand and rock, on the latter sometimes under dense kelp cover
TIDAL HEIGHT	Low intertidal and subtidal
SALINITY	15.2 to 33.3 ppt (Homer & Seldovia Harbor range)
TEMPERATURE	-2.3 to 14.9°C (Homer & Seldovia Harbor range)
SIMILAR SPECIES	Can be confused with <i>Distaplia</i> spp., which do not have a puckered top to the lobes. There are many <i>Aplidium</i> and <i>Synoicum</i> spp. as well as other compound tunicates in the Pacific Northwest that can be difficult to tell apart without a microscope.



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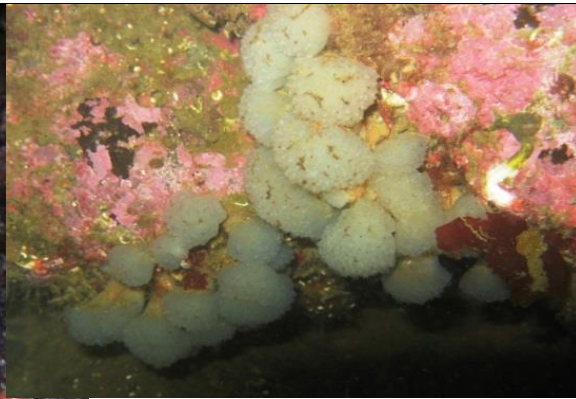
Photos 1-3 from Kachemak Bay

Tunicate (colonial) - *Aplidium* sp.

DESCRIPTION	Tunicate white or grayish. Attachment narrower than body with zooids organized at top. Zooids have three body regions.
RANGE	Unknown, common in Kachemak Bay, Alaska
SIZE	Up to 3 cm in diameter and/or height
STATUS	Native
COLOR	Yellowish white or grayish
HABITAT	Hard substrates, rocky overhangs
TIDAL HEIGHT	Intertidal down to unknown depth
SALINITY	15.2 to 33.3 ppt (Homer & Seldovia Harbor range)
TEMPERATURE	-2.3 to 14.9°C (Homer & Seldovia Harbor range)
SIMILAR SPECIES	This species has been looked at by ascidian expert Gretchen Lambert. Examination of well relaxed specimen lead to <i>Aplidium coei</i> , but it is not that species. For now it is an unknown <i>Aplidium</i> .



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Tunicate (solitary) - *Ascidia callosa*

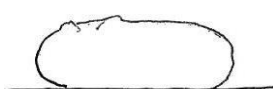
DESCRIPTION	This solitary tunicate is soft, hairless, ~1–2 mm thick and easily torn. Its body is wider than it is tall with a somewhat flattened appearance. The tunic margins are rounded and in old individuals looks wrinkled. Because this animal is lying mostly on its left side, the oral siphon is at the extreme anterior end of body, and the atrial siphon is close to it but slightly posterior. Both siphons six lobed.
RANGE	Circumboreal in northern seas. In North America, it's found from Alaska to Puget Sound, Washington. In Alaska, it is found in Homer, Cordova, and Chenega.
SIZE	Body length up to 5 cm, ~3 cm in diameter
STATUS	Native
COLOR	Clear, white to orange. More transparent when young.
HABITAT	Attaches to firm substrates, rocks in the intertidal, and floats and ropes in harbors
TIDAL HEIGHT	Low intertidal and sub-tidal to 146 m
SALINITY	15.2 to 33.3 ppt (Homer & Seldovia Harbor range)
TEMPERATURE	-2.3 to 14.9°C (Homer & Seldovia Harbor range)
SIMILAR SPECIES	It can be distinguished from <i>Ascidia columbiana</i> by the lack of a dense circle of papillae around the siphons. Rather, its siphons look a bit like those of <i>Cnemidocarpa finmarkiensis</i> , in that they cramp up when shut and have smooth edges. Also, the edges of its tunic are rounded and may roll up whereas the tunic of <i>A. columbiana</i> is wide and sheet-like at the base. It is a brooder, releasing tadpoled larvae, while <i>A. columbiana</i> is not a brooder. Locally, it could be confused with <i>Molgula</i> , but is flatter and attached on its side.



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SIDE VIEW



TOP VIEW

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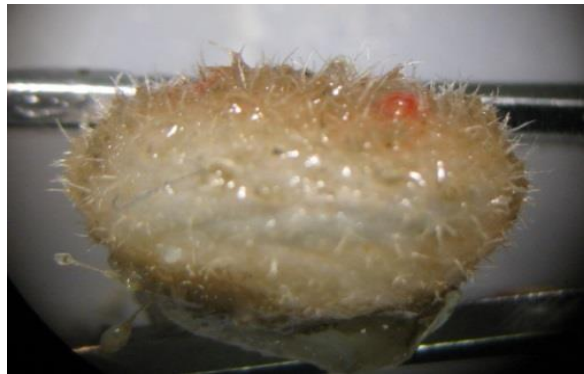
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Tunicate (solitary) - *Boltenia echinata*

DESCRIPTION	Globular to ovoid solitary, sessile tunicate. Tunic thick and leathery covered with hairs. Bright red siphons on top with clear four-lobed openings. Hairs or spines are fine, radially branched near the tips. No stalk. Attached to the substrate at its base. Tunic is visible between siphons.
RANGE	North Pacific, North Atlantic, and the Arctic: Canadian Arctic Archipelago and Europe. Temperate to polar climates.
SIZE	Up to 4.5 cm in diameter, but more commonly ~2 cm. About as tall as it is wide.
STATUS	Native
COLOR	Yellowish or light brown
HABITAT	Hard substrates. In Alaska, found on brick hung 1 m below surface in Seldovia boat harbor.
TIDAL HEIGHT	Subtidal to 350 m
SALINITY	15.2 to 33.3 ppt (Homer & Seldovia Harbor range)
TEMPERATURE	-2.3 to 14.9°C (Homer & Seldovia Harbor range)
SIMILAR SPECIES	<i>Boltenia villosa</i> and <i>Halocynthia igajoba</i> are similar species. Each of these species is characterized by the presence of spines. <i>B. villosa</i> is stalked, without secondary spine-lets at the tip of each spine. (Spine density varies; in all three spp., if very dense, the tunic may not be very visible and may be covered in debris). The bristly spines of <i>H. igajoba</i> also have secondary spine-lets but these are arranged in several rings along the length of the spine. There are so many spines on <i>H. igajoba</i> that the rest of the tunic is usually obscured.



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Tunicate (solitary) - *Boltenia villosa*

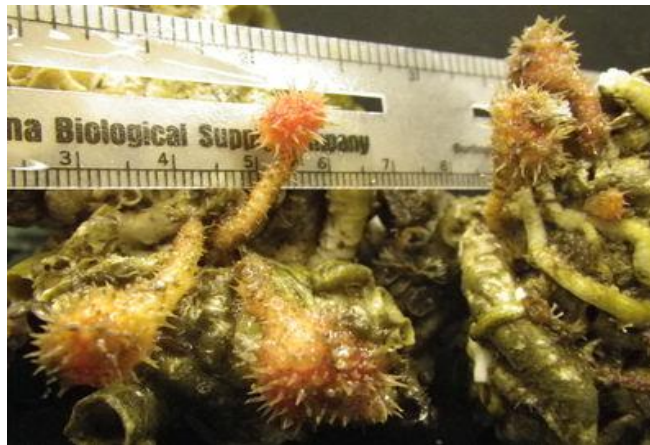
DESCRIPTION	Small, solitary tunicate with stalked, hairy body. The stalk can be long relative to size of tunicate.
RANGE	Alaska to California
SIZE	Up to 3 cm wide and 10 cm long
STATUS	Native
COLOR	Orange, red, or brown and aperators often red
HABITAT	Among colonies of tubeworms that grow on submerged man-made structures or hard substrates
TIDAL HEIGHT	Lower intertidal to 100 m subtidal
SALINITY	15.2 to 33.3 ppt (Homer & Seldovia Harbor range)
TEMPERATURE	-2.3 to 14.9°C (Homer & Seldovia Harbor range)
SIMILAR SPECIES	<i>Halocynthia igaboja</i> , but the latter is not stalked, is more densely covered with long spines and can get quite large. Another species of the genus, <i>B. ovifera</i> , which is stalked but does not have the spiny tunic, is circumpolar, and may be in Alaska, but we have no records at present.



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Tunicate (colonial) - *Botryllus schlosseri*

DESCRIPTION	The zooids in this colonial tunicate are organized in a star pattern (usually conspicuous). Colonies are flat, but can develop lobes as they mature.
RANGE	Alaska to California. First noted in California and Washington in the 1970's. Native to Europe and the Mediterranean. Now abundant in Sitka and recently found at one locality in Ketchikan but no clear evidence of establishment yet.
SIZE	Forms flat irregular sheets 3–4 mm thick and up to around 15 cm
STATUS	Invasive, see the complete record at <a href="http://invasions.si.edu/nemesis/">http://invasions.si.edu/nemesis/</a>
COLOR	Often two-toned, the color patterns are extremely variable, white, purple, orange, or brown to almost black.
HABITAT	Docks, boat hulls, buoys, ropes, pilings, on top of and underneath rocks, on mussels and solitary sea squirts, seaweeds, and eelgrass
TIDAL HEIGHT	Subtidal to 200 m, occasionally found in lower intertidal
SALINITY	<14 to 44 ppt. Found in marine and estuarine habitats.
TEMPERATURE	Species dies below 3°C and needs at least 11°C to reproduce
SIMILAR SPECIES	<i>Botrylloides</i> has long rows of zooids, numerous large vascular ampulae along the exterior margins of the colony (present in <i>B. schlosseri</i> but fewer in number), and much larger brooded larvae.



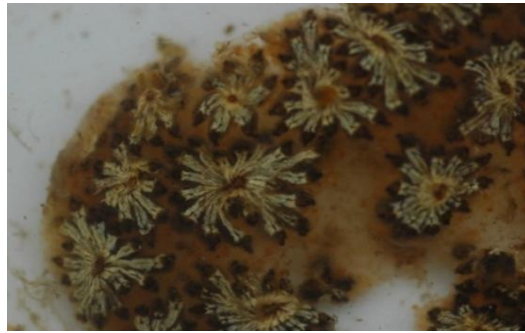
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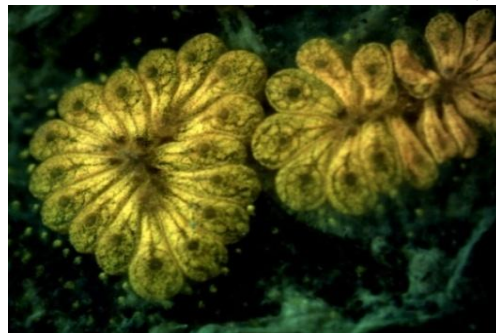
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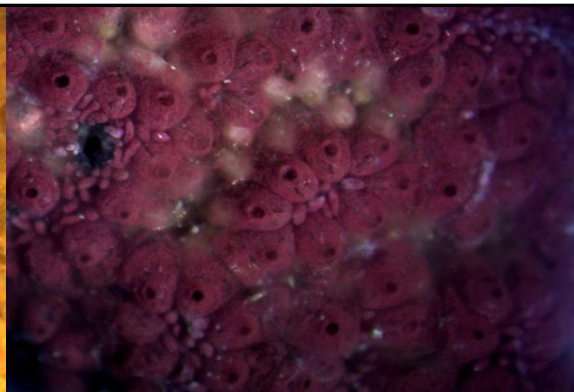
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Tunicate (colonial) - *Botrylloides violaceus*

DESCRIPTION	This colonial tunicate is thin and lobe-like with zooids forming long double rows or chains. Short chains sometimes look similar to the flower-like pattern in <i>Botryllus schlosseri</i> . The tunic is relatively tough and leathery to the touch.
RANGE	Alaska to California. It was first noted on the west coast in San Francisco, CA in the early 1970's. Native to Japan and China, it has become abundant in Sitka and Ketchikan, AK over the last decade.
SIZE	Colonies can be large, up to 0.3 m in diameter
STATUS	Invasive, see the full record at <a href="http://invasions.si.edu/nemesis/">http://invasions.si.edu/nemesis/</a>
COLOR	Solid color, variable—often orange but can be red, yellow, purple, or tan, occasionally brown or lavender
HABITAT	It generally grows subtidally in protected areas on a variety of surfaces, such as docks, boat hulls, buoys, ropes, pilings, on top of and underneath rocks, on mussels and solitary sea squirts, seaweeds (see photo), and eelgrass.
TIDAL HEIGHT	Shallow subtidal, < 50m, but can be found in the intertidal in protected areas
SALINITY	18 to 40 ppt
TEMPERATURE	-0.6 to 25°C, but generally found above 8°C
SIMILAR SPECIES	<i>Botrylloides diegensis</i> is two toned with a light colored ring around the siphons and darker test. <i>Botrylloides</i> spp. do not form the star-like pattern found in <i>Botryllus schlosseri</i> , rather, the zooids form long chains or ladders. Also distinctive, <i>Botrylloides violaceus</i> has numerous very large vascular ampulae that are visible in the lower left hand corner in the first photo to the left. Brooded larvae of <i>Botrylloides violaceus</i> are much larger than those of <i>Botryllus schlosseri</i> .



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©Gary Freitag note meandering rows



on algae ©Heather Meuret Woody

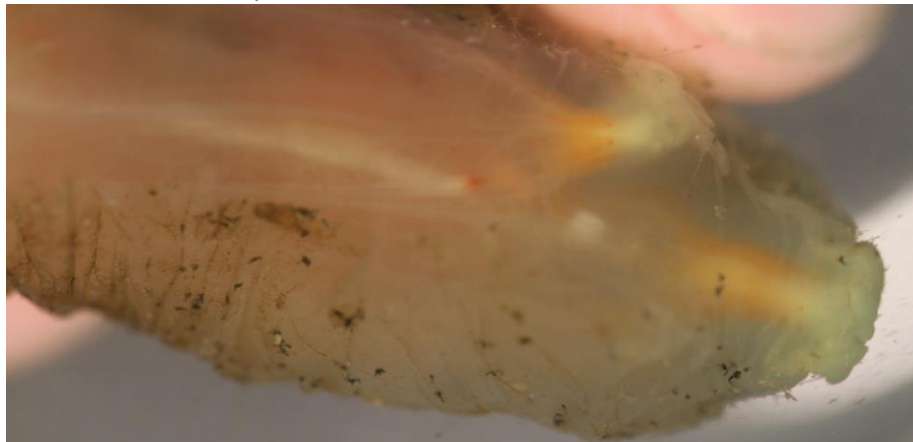
Tunicate (Solitary) - *Ciona robusta* formerly *intestinalis*

DESCRIPTION	This solitary tunicate is long and transparent with orange to red dots on the scalloped edges of the siphons. The body is easily torn. They can form large groups.
RANGE	Puget Sound, Washington to San Diego, California on the west coast and globally in ports and harbors. Native to Japan and the NW Pacific. First reported on the West Coast (as <i>C. intestinalis</i> ) in San Diego in 1897.
SIZE	Up to 15 cm
STATUS	Invasive, see complete record at <a href="http://invasions.si.edu/nemesis/index.html">http://invasions.si.edu/nemesis/index.html</a>
COLOR	Body yellowish, often transparent, with orange dots on the top edges of the siphon
HABITAT	They are found in protected harbors and marinas growing on docks, boat hulls, buoys, ropes, pilings, but also on natural substrates such as rocks, shells, and boulders.
TIDAL HEIGHT	Subtidal, but sometimes in low intertidal
SALINITY	11 to 50 ppt. Highly tolerant species that can reproduce up to 40 ppt.
TEMPERATURE	Cold temperate to tropical, 10 to 30°C, but can withstand temperatures as cold as -1°C for months at a time
SIMILAR SPECIES	<i>Ciona savignyi</i> has a more fragile tunic than <i>C. robusta</i> with much brighter yellow markings on the siphon edges (rather than orange) and a white rather than a red dot on the vas deferens (upper left photo).



©California Academy of Science Red dot on vas deferens.

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Tunicate (Solitary) - *Ciona savignyi*

DESCRIPTION	This solitary tunicate is long and transparent with orange dots and broad yellow markings on the scalloped edges of the siphons. The body is fragile and easily torn. They can form large groups.
RANGE	Puget Sound, Washington to southern California. They are native to Japan and were first reported in the lower 48 in 1985 in Long Beach, California. First possible record in Alaska in Loring in 1903.
SIZE	Body long, up to 15 cm
STATUS	Invasive, see the full record at <a href="http://invasions.si.edu/nemesis/">http://invasions.si.edu/nemesis/</a>
COLOR	Pale yellow, often transparent with white and yellow dots in body cavity. The tip of vas deferens is white.
HABITAT	Often found on docks and manmade structures such as boat hulls. They can form dense aggregates.
TIDAL HEIGHT	Subtidal to 60 m
SALINITY	18 to 35 ppt
TEMPERATURE	Broad temperature range, 11 to 27°C
SIMILAR SPECIES	In California, <i>Ciona robusta</i> (formerly <i>intestinalis</i> ) is distinguished by its red/orange dots on the siphon edges ( <i>C savignyi</i> has bright yellow streaking on the siphon edges as in photo below), and the red dot on the vas deferens seen through the body wall. The tunic also gets tougher and browner in <i>C. robusta</i> . Genetic analyses is showing that these patterns may be regional, making the taxonomy difficult.



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Tip of siphon showing bright yellow lines

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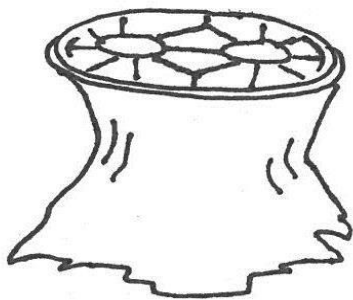


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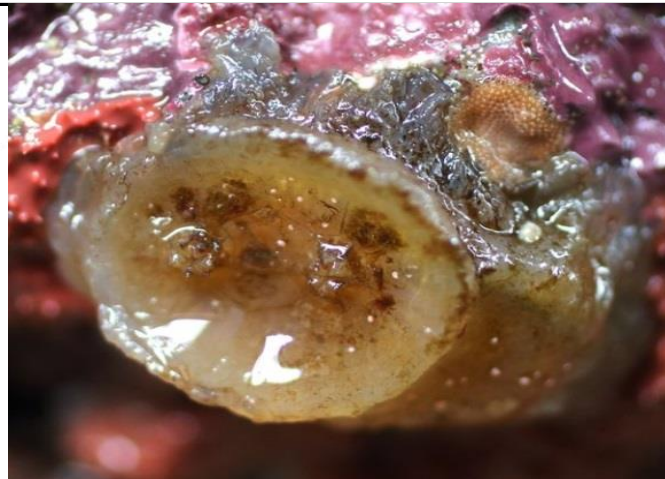
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Tunicate (solitary) - *Chelysoma productum*

DESCRIPTION	Solitary, sessile tunicate. Tunic translucent or opaque, usually tan in color. Incurrent and excurrent siphons short and on flat disk shaped top. There are plates on the top that can be used for identification. Six plates surround each of the siphons, plus two plates between the siphons; all have concentric growth rings. Muscle strands that connect the two central disk plates are not visible through the tunic. Body is oval shaped, leaning slightly sideways.
RANGE	Alaska to southern California
SIZE	6 cm tall. Disk diameter 2.5 cm. Taller than wide.
STATUS	Native
COLOR	Can be covered with fouling organisms. Tunic is tan, gray or whitish.
HABITAT	In Kachemak Bay, found on rocks
TIDAL HEIGHT	Very low intertidal and subtidal to 50 m
SALINITY	15.2 to 33.3 ppt (Homer & Seldovia Harbor range)
TEMPERATURE	-2.3 to 14.9° C (Homer & Seldovia Harbor range)
SIMILAR SPECIES	<i>Chelysoma columbianum</i> ; also has disk plates but there are intermediary plates between the plates surrounding the siphons and the edge of the disk, and the disk is without growth lines. The muscle strands are visible between the siphons.



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siphon plates © Lisa Needles - CalPoly



Tunicate (solitary) - *Corella inflata*

DESCRIPTION	This solitary tunicate has an oblong-oval body, with a bumpy surface. Its atrial chamber is greatly enlarged into a brood chamber, giving it a roughly cubical outline. The tunic is translucent, and it has poorly developed siphons.
RANGE	Common throughout Alaska. Found to the San Juan Islands, WA. Recently extended range south to San Francisco, CA, probably due to boat fouling.
SIZE	To 5 cm high
STATUS	Native
COLOR	Clear and colorless, often with flecks of white, gold, or orange
HABITAT	On rocks and floats and other man-made structure
TIDAL HEIGHT	Low intertidal zone to sub tidal depths of 20 m
SALINITY	Minimum 27 ppt
TEMPERATURE	-2.3 to 14.9 °C (Homer & Seldovia Harbor range)
SIMILAR SPECIES	<i>Ciona intestinalis</i> is several times taller than wide and has visible longitudinal muscle bands. <i>Corella willmeriana</i> is very similar to this species, but its color is more beige than white, and its atrial siphon is not expanded into a brood chamber (bottom photo).
MORE FACTS	This tunicate is more than 99 percent water, yet it is preyed upon by several animals, including the morning sun star.

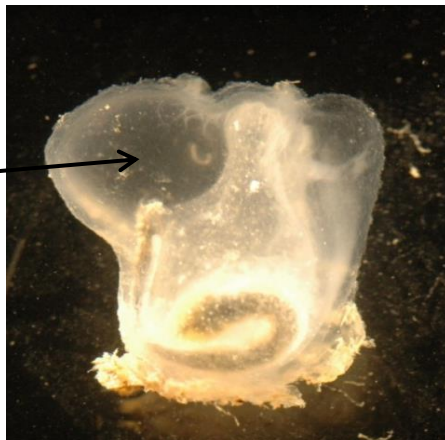


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brood chamber



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Tunicate (solitary) - *Corella willmeriana*

DESCRIPTION	Solitary, sessile tunicate. Tunic transparent or translucent. Incurrent and excurrent siphons directed upwards, away from substratum. Oral & atrial apertures terminal; gut on right side of body (instead of left like most other solitary ascidians).
RANGE	Pacific Ocean from Alaska to Southern California. Often found in harbors and fouling communities. It is a primary colonizer, as the tadpoles have demonstrated preference to settle on clean, unfouled surfaces.
SIZE	1-5 cm tall. Taller than wide.
STATUS	Native
COLOR	Clear, with a faint pink or peach colored tinge. Glass-like. Tunic with small wrinkles. May have small white spots.
HABITAT	In Alaska found on settling plates hung 1 m below water surface in harbors. Also, down to low intertidal and subtidally on hard surfaces.
TIDAL HEIGHT	Subtidal to 75 m
SALINITY	15.2 to 33.3 ppt (Homer & Seldovia Harbor range)
TEMPERATURE	-2.3 to 14.9°C (Homer & Seldovia Harbor range)
SIMILAR SPECIES	<i>Corella inflata</i> ; more white in color, has short intestine about half the body length and a large expanded atrial brood pouch usually containing a clump of developing embryos.



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Tunicate (colonial) *Didemnum vexillum*

DESCRIPTION	Extremely variable in form, the colony can be sheet like, leathery, lobed, or hang in droopy, pendulous extensions. The tunic contains distinctive spike or star shaped spicules that are visible only under a microscope.
RANGE	Considered a native of Asia, the specie has been introduced all over the world. First described on the West Coast in 1993 in San Francisco, it is now present from CA to British Columbia, and most recently in Sitka, Alaska.
SIZE	Can form extensive mats, meters across
STATUS	Invasive, see the complete record at <a href="http://invasions.si.edu/nemesis/">http://invasions.si.edu/nemesis/</a>
COLOR	Variable, pale tan to orange
HABITAT	Colonizes most hard surfaces, both natural and man-made, but common at aquaculture facilities. Will grow over most species and can smother organisms, forming vast sheets.
TIDAL HEIGHT	Low intertidal to about 81 m
SALINITY	18 to 40 ppt, but survives best between 26 to 30 ppt
TEMPERATURE	-2 to 24°C, needs temperatures > 9°C to reproduce
SIMILAR SPECIES	Native <i>Didemnum</i> and <i>Trididemnum</i> species can be hard to distinguish from <i>D. vexillum</i> without dissection. The brooded larvae of <i>D. vexillum</i> have six pairs of lateral ampullae, a characteristic unique to this Didemnid only. The native species do not form the extensive mats, nor the drip-like dangles that often occur in <i>D. vexillum</i> (photo bottom right).



subtidal © Linda Shaw



intertidal ©Heather Meuret Woody



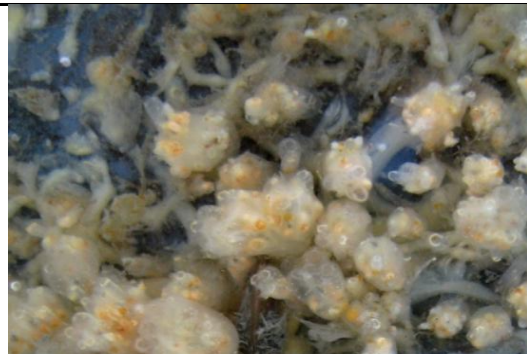
©Ian Davidson



"dangle" ©Marnie Chapman

Tunicate (colonial) - *Distaplia alaskensis*

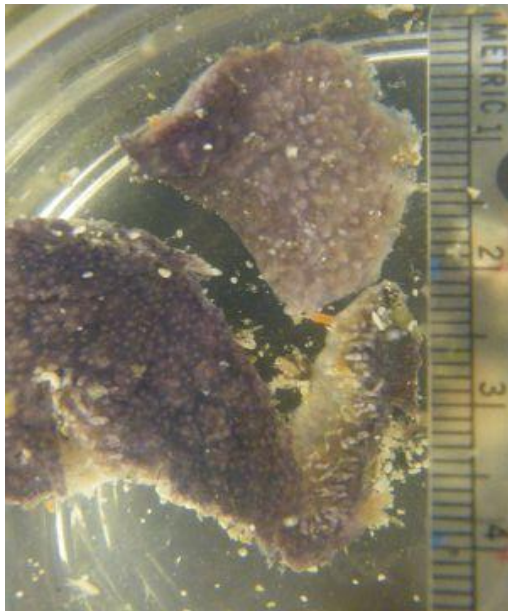
DESCRIPTION	Colonies consist of several cone-shaped lobes generally narrowing from the top to the base with a small area of attachment. The lobes are elongated and flat-topped. Lateral offshoots can sometimes cover settling plate surface without many lobes attached.
RANGE	This species was undescribed until 2001 and was only found on manmade structures in Homer Harbor and Cordova Marina.
SIZE	Colonies up to 5 cm in length always subdivided into numerous lobes < 3 cm in diameter
STATUS	Unknown origin
COLOR	Orange, peach, or yellow to tan. Translucent, shiny tunic.
HABITAT	Preferred habitat is sheltered surfaces, rocks and crevices. In shallow water, but never exposed at low tide. Situated away from very much light. Found on harbor pilings, ropes and settling plates. Overgrows molgulas, mussels and has been seen on decorator crabs.
TIDAL HEIGHT	Shallow sub tidal
SALINITY	15.2 to 33.3 ppt (Homer & Seldovia Harbor range)
TEMPERATURE	-2.3 to 14.9°C (Homer & Seldovia Harbor range)
SIMILAR SPECIES	<i>Distaplia occidentalis</i> is often purple or pinkish and is much shorter and mushroom-like in growth form. The latter species is also often larger, ranging to many centimeters and feels firmer to the touch.



All photos ©ADF&G - KBRR

Tunicate (colonial) - *Distaplia occidentalis*

DESCRIPTION	This colonial tunicate, commonly called the mushroom ascidian, is globular (sometimes flat) with a short, narrow attachment stalk. The mushroom-like globe can be pale orange, yellow, pink, dark purplish-red, or brown. Each zooid has its own incurrent siphon and pharynx, but share a slightly raised common excurrent siphon and atrial cavity.
RANGE	Alaska to Southern California. In Alaska, it has been seen in Prince William Sound, Kodiak Island, and the Sitka area.
SIZE	Most colonies are less than 2 cm in diameter, though they can be as large as 10 cm.
STATUS	Native
COLOR	Variable, pale orange, yellow, pink, dark purplish-red, or brown
HABITAT	Rocky shore and man-made structures
TIDAL HEIGHT	Intertidal to 50 m
SALINITY	High salinity species
TEMPERATURE	Cold water species
SIMILAR SPECIES	<i>Distaplia alaskensis</i> can be distinguished from this species by its more columnar lobes and often paler color.



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©Heather Meuret Woody

Tunicate (solitary) - *Halocynthia aurantium*

DESCRIPTION	A large, solitary tunicate with a barrel shaped body that is directly attached to the substrate. Two uneven large siphons on top. Tunic can be smooth or slightly wrinkled. Often found in groups.
RANGE	Occurs from the Arctic, throughout the Bering Sea, and south to Puget Sound. Common north of the Alaska Peninsula, the SE Bering, NE Bering, and SE Chukchi Seas.
SIZE	<18 cm
STATUS	Native
COLOR	Bright orange-red, often unfouled and may appear shiny. Looks like a peach.
HABITAT	Attaches to rocks. Often seen washed up on beach or comes up on hooks when fishing for bottom fish.
TIDAL HEIGHT	0 to 100 m deep. Most common in depths of 40–100 m in the SE Bering, NE Bering, and SE Chukchi Seas.
SALINITY	28.0 to 33.3 ppt Seldovia, AK station
TEMPERATURE	0 to 12.4 °C Seldovia, AK station
SIMILAR SPECIES	<i>Cnemidocarpa finlandiensis</i> is similar in color and has the same smooth tunic, and can look the same out of water, but it is much more broad and squat. There is another species in the same genus in Alaska, <i>H. hispida</i> (previously <i>hilgendorfi</i> or <i>igabajo</i> ), but the latter is tan and covered with spines.
OTHER FACTS	Another tunicate in this family is cultivated for human consumption in Japan and Korea. The tunic is removed before it is eaten. Along Alaskan coasts, they are prey to predatory snails, nudibranchs, sharks and skates, crab, sea stars, and bottom fish.



©D. Hondolero



©Katrin Iken

Tunicate (solitary) - *Halocynthia igaboja*

DESCRIPTION	Common name: Sea hedgehog. Body unstalked, stout. Distinctive flexible bristles. Bristles sometimes completely covered in silt, making the animal hard to detect.
RANGE	Japan, Aleutian Islands, and Alaska south to Southern California.
SIZE	5 cm across to 10 cm tall
STATUS	Native
COLOR	Dark brown tunic under bristles, siphons red or orange
HABITAT	Rocky or gravel areas. Usually near current.
TIDAL HEIGHT	Intertidal to 175 m
SALINITY	15.2 to 33.2 ppt (Homer & Seldovia Harbor range)
TEMPERATURE	-2.3 to 14.9°C (Homer & Seldovia Harbor range)
SIMILAR SPECIES	This may be one species or a group of cryptic species under several names including <i>Halocynthia hispida</i> , <i>H hilgendorfi</i> , <i>H. hilgendorfi hilgendorfi</i> , <i>H hilgendorfi igajoba</i> , and <i>H. igaboja</i> , depending on the publication. If they are all the same species, the spines make it very distinctive, though <i>Pyura haustor</i> , which is warty and often has many things growing on it, can look similar at first glance.



©K. Iken, Kachemak Bay, AK



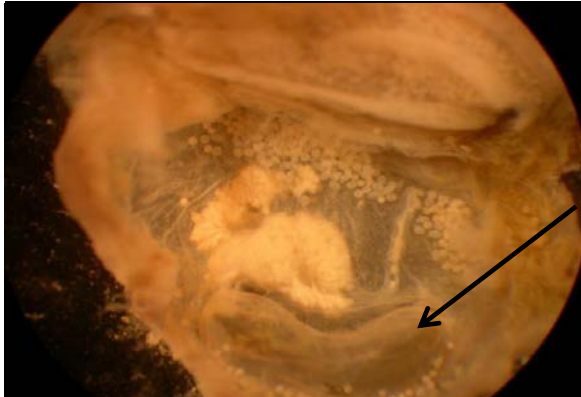
©E. McKittrick-Ground Truth Trekking



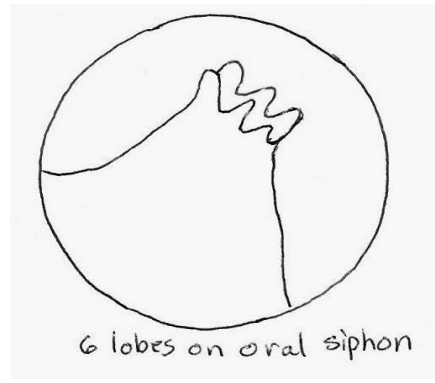
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Tunicate (solitary) - *Molgula citrina*

DESCRIPTION	This small, round to oval tunicate has six lobes on the oral (incurrent) siphon and a flattened, u-shaped gut oriented horizontally. The siphons are sometimes ringed with spines. The tunic can be bare to hairy, or sediment covered. Larvae with a tail and brooded.
RANGE	Current distribution is the Atlantic Arctic, Oregon (oyster aquaculture), Seldovia, Alaska, and San Diego Bay, California; however there are other Pacific records from early Museum collections that are yet to be confirmed. Circumpolar species.
SIZE	Body length usually 6–8 mm but can reach 2.3 cm
STATUS	Unknown: introduced or a range extension
COLOR	Clear to dull greenish or olive green
HABITAT	Attaches to firm substrates such as rocks
TIDAL HEIGHT	Low intertidal and sub tidal to offshore
SALINITY	27.9 to 32.4 ppt (Seldovia Harbor range)
TEMPERATURE	1.7 to 11.6°C (Seldovia Harbor range)
SIMILAR SPECIES	Unlike <i>Ascidia</i> , which is attached on its side, it is attached at its base. <i>Molgula citrina</i> is smaller than other Molgulids, has the flattened, u-shaped gut (less flattened in <i>M. manhattensis</i> ), has seven branchial folds (requires dissection), broods its larvae, and has distinctively long, slender oviducts (marked with the arrow in first photo, requires dissection).



©Gretchen Lambert



© Gretchen Lambert

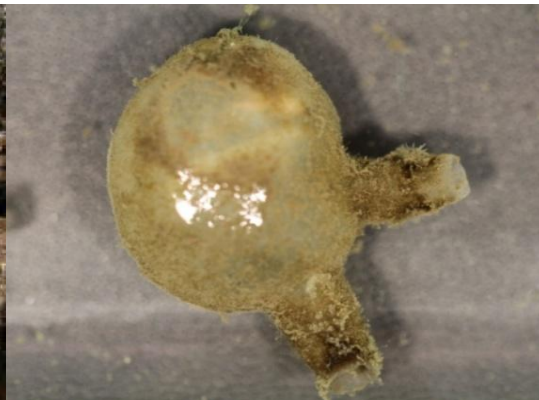


Tunicate (solitary) - *Molgula manhattensis*

DESCRIPTION	Grape-like tunicate, sometimes laterally flattened, with six lobes on the oral (incurrent) siphon, thick tunic, often with some papillae (hair-like projections). Larvae with a tail.
RANGE	Mexico to British Columbia. First recorded on the West Coast in Tamales Bay, CA in 1949. It has been introduced around the world. Native to the Atlantic coast of North America.
SIZE	Body length to 1–5 cm
STATUS	Invasive
COLOR	Clear, grey with a u-shaped intestine sometimes visible through the body wall, oriented vertically, body often sediment covered
HABITAT	Attaches to firm substrates, such as rocks, boulder, shell, and cobble, as well as man-made structures. Can be found on sands as well. Tolerates pollution.
TIDAL HEIGHT	Low intertidal, but generally subtidal to 90 m depth
SALINITY	5 to 40 ppt, estuarine to marine
TEMPERATURE	Tolerates a broad temperature range
SIMILAR SPECIES	Unlike <i>Ascidia</i> , which is attached on its side, it is attached at its base. To identify <i>M. manhattensis</i> from other Molgulids can be difficult: look for the u-shaped gut (see pictures), tadpole larvae (unlike <i>M. citrina</i> ), and six branchial folds (requires dissection) as opposed to the seven found in <i>M. retortiformis</i> , <i>M. pacifica</i> , and <i>M. citrina</i> . Siphons are long and similar in length (unlike <i>M. retortiformis</i> and <i>M. pacifica</i> ). Larvae are not brooded.



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Tunicate (solitary) - *Molgula pacifica*

DESCRIPTION	Small, grape-like tunicate with one siphon (atrial) extending upwards about twice as high as the the other, often covered with debris. Siphons appear orange.
RANGE	Alaska and Washington
SIZE	Body length to 2.5 cm
STATUS	Native
COLOR	Clear, with s-shaped intestine visible through the body wall, though body often covered with foreign materials, including algae. Siphons are pink to orange
HABITAT	Attaches to firm substrates, rocks intertidally. In harbor: floats, ropes. One of the most common species in Arctic waters.
TIDAL HEIGHT	Low intertidal and sub tidal to offshore
SALINITY	
TEMPERATURE	
SIMILAR SPECIES	Unlike <i>Ascidia</i> , which is attached on its side, <i>Molgulas</i> are attached at the base. All <i>Molgulids</i> have six lobes on the oral siphons and four lobes on the atrial siphon, whereas <i>Ascidia</i> spp. have the same number of lobes on both siphons. Differs from other <i>Molgula</i> species in the orange siphons, one twice as long as the other, and the often excessive amount of debris attached to the body. It is a free spawner, it does not brood, and the embryos develop directly, so there is no tadpole larvae.

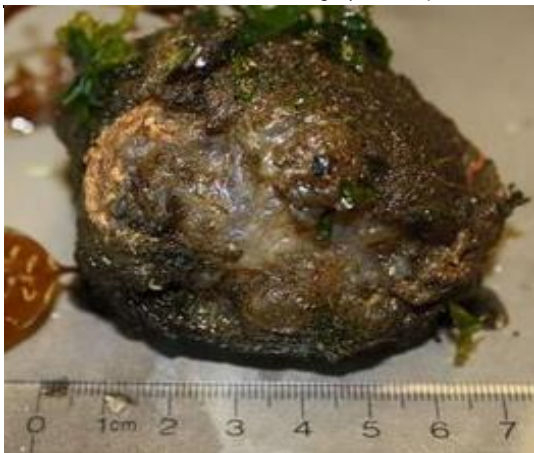


©Billie Swalla, University of Washington

Tunicate (solitary) - *Molgula retortiformis*

**DESCRIPTION** This grape-like tunicate is one of the largest Arctic ascidians. It is oval with a thick, firm tunic that is clear, but often covered in debris. When cleaned, the tunic appears rough or wrinkled. The two siphons are unequal with the atrial siphon being the longest, usually equal in length to the diameter of the body. The oral siphon is 1/4 as long as the atrial and has four lobes.

<b>RANGE</b>	Alaska and Washington, circumpolar species
<b>SIZE</b>	Body length to 10 cm
<b>STATUS</b>	Native
<b>COLOR</b>	Clear tunic, with an s-shaped intestine visible through the body wall, oriented horizontally. Overall, the body appears light olive or grayish green.
<b>HABITAT</b>	Attaches to firm substrates, rocks, and man-made structures
<b>TIDAL HEIGHT</b>	Low intertidal and sub tidal to offshore to 80 m
<b>SALINITY</b>	15.2 to 33.3 ppt (Homer & Seldovia Harbor range)
<b>TEMPERATURE</b>	-2.3 to 14.9°C (Homer & Seldovia Harbor range)
<b>SIMILAR SPECIES</b>	Unlike <i>Ascidia</i> , which is attached on its side, it is attached at its base. It differs from other <i>Molgula</i> species mainly in the much larger size and in having the flattened, horizontally oriented gut. Though it has six lobes on the oral siphon and four lobes on the atrial as in all Molgulids, one siphon is very long (photo upper right). This species doesn't brood and has direct development.



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©SERC, Note 4 lobes on atrial siphon



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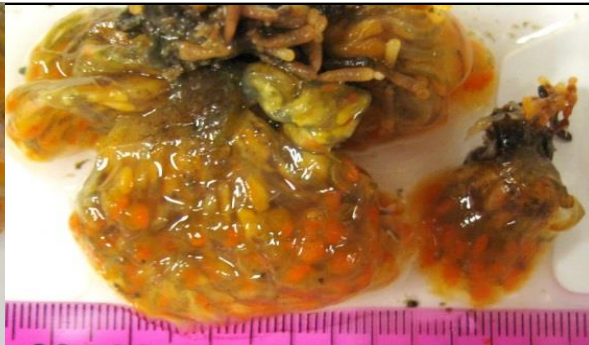
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Tunicate (colonial) - *Ritterella pulchra*

DESCRIPTION	Clean transparent tunic with large bright yellow-orange zooids visible in lobes. Lobes are flatter at top, narrow in the middle and expand again at base and are 2-4 cm long. At the base of each zooid, the moderately long post abdomen is an opaque light yellow-white oval. Sometimes many of these lobes grow together in a group and sometimes just one short lobe.
RANGE	Alaska to southern California
SIZE	Colony up to 10 cm across. Individual lobes about three times longer than wide.
STATUS	Indigenous (or Native)
COLOR	Reddish-orange zooids with base yellow. Tunic is quite transparent.
HABITAT	Rocky cliffs or overhangs where shaded. May be washed up on beach after storm.
TIDAL HEIGHT	Extreme low intertidal down to shallow subtidal
SALINITY	15.2 to 33.3 ppt (Homer & Seldovia Harbor range)
TEMPERATURE	-2.3 to 14.9° C (Homer & Seldovia Harbor range)
SIMILAR SPECIES	<i>Ritterella rubra</i> forms deep or bright ruby red colonies of stalked, rounded lobes. <i>Synoicum parvustis</i> forms stalked, sand covered colonies with orange tunics and zooids and is more likely to be found in locations with moderate to strong wave action.



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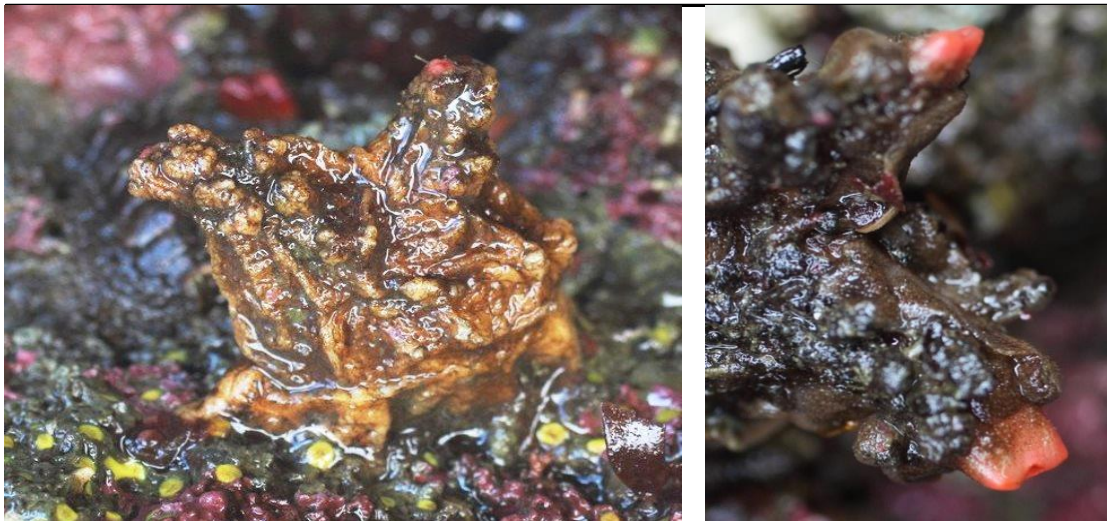
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Tunicate (solitary) - *Pyura haustor*

DESCRIPTION	Solitary tunicate roughly globular. Brown or reddish tunic tough, thick, and wrinkled. Siphons half total height of body with red siphon tips. Broad attachment, no stalk. No spines on the tunic.
RANGE	Alaska to California
SIZE	Up to 5 cm tall and 3.5 cm wide
STATUS	Native
COLOR	Brown to reddish. Can be covered with encrusting organisms. Siphons bright red but can be retracted making the tunicate much harder to see.
HABITAT	Rocky habitats and cryptic crevices. Among kelp holdfasts.
TIDAL HEIGHT	Low intertidal to 200 m
SALINITY	15.2 to 33.3 ppt (Homer & Seldovia Harbor range)
TEMPERATURE	-2.3 to 14.9°C (Homer & Seldovia Harbor range)
SIMILAR SPECIES	Nothing similar in Alaska



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Tunicate (solitary) - *Cnemidocarpa finmarkiensis*

DESCRIPTION	The tunic is opaque and smooth, and the body is low and dome-shaped to flattened and broadly attached to the substrate. The tunic is thin but tough and shiny. When out of water, siphons can fully retract and siphons look like small crosses making identity as a tunicate difficult. There are 5 to 12 tubular, hermaphroditic gonads in the atrial wall on each side, but there are usually more on the right side.
RANGE	Circumpolar. Western distribution Japan, and Alaska to California.
SIZE	Up to 5 cm in diameter.
STATUS	Native
COLOR	Red, orange, rose, or pinkish-red. White when juvenile.
HABITAT	Rocks and hard substrates in areas with moderate to high wave action. Uncommon on artificial substrates.
TIDAL HEIGHT	Low intertidal to at least 50 m
SALINITY	25.4 to 33.3 ppt (Homer & Seldovia Harbor deep sonde range)
TEMPERATURE	-0.4 to 12.4°C (Homer & Seldovia Harbor deep sonde range)
SIMILAR SPECIES	<i>Halocynthia aurantium</i> is similar with a smooth orange tunic but it is taller than wide.



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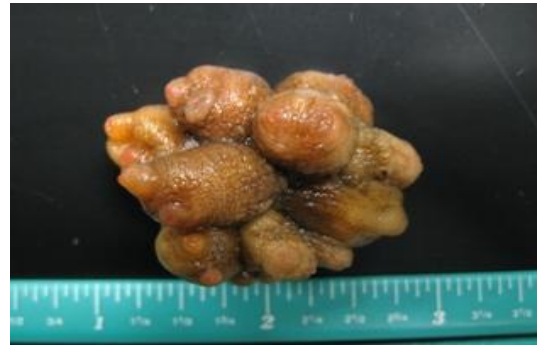
©Paul Norwood Sitka

Tunicate (solitary) - *Dendrodoa pulchella*

DESCRIPTION	Solitary tunicate but grows together in clumps. Tunicate globular, tough and wrinkled. Siphons can be pale red or pink in contrast to the rest of the tunicate.
RANGE	Circumpolar Arctic species in the Pacific from Kamchatka to the Bering Strait. In Alaska, found in Nunivak Island and Kachemak Bay
SIZE	Up to 2.5 cm in diameter
STATUS	Native
COLOR	Grey, orange to pinkish.
HABITAT	Muddy sand. In Kachemak Bay, seen washed up on beach after storms and on lines in harbors.
TIDAL HEIGHT	Subtidal to 100 m
SALINITY	25.4 to 33.3 ppt (Homer & Seldovia Harbor deep sonde range)
TEMPERATURE	-0.4 to 12.4°C (Homer & Seldovia Harbor deep sonde range)
SIMILAR SPECIES	Distinguished from other species of the genus by the numerous oral tentacles (only visible in water) and the three branched gonad (requires dissection).



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Photos from Kachemak Bay, AK

Tunicate (colonial) - *Metandrocarpa taylori*

**DESCRIPTION** A colonial species with small globular bright orange or red zooids. Siphons are short and anterior. Colonies may be up to 20 cm in size, and zooids are usually densely packed. This tunicate is considered "social," because the individual zooids are connected by stolons (runners) but are not embedded in a common sheet of tunic. Asexual reproduction occurs by "budding " from the stolons; sexual reproduction also occurs.

<b>RANGE</b>	NE Pacific from Alaska to California
<b>SIZE</b>	Individual zooids up to 6 mm across and 5 mm tall
<b>STATUS</b>	Native
<b>COLOR</b>	Most commonly bright orange or red. Yellow or green morphs also occur.
<b>HABITAT</b>	Rocky. Seen on high current, high energy beaches in Kachemak Bay, Alaska.
<b>TIDAL HEIGHT</b>	Intertidal to about 20 m subtidal
<b>SALINITY</b>	15.2 to 33.3 ppt (Homer & Seldovia Harbor range)
<b>TEMPERATURE</b>	-2.3 to 14.9°C (Homer & Seldovia Harbor range)
<b>SIMILAR SPECIES</b>	<i>Metandrocarpa dura</i> has similar small red zooids all embedded in a common tunic. <i>Cnemidocarpa finmarkiensis</i> is a solitary, bright red species that is much larger with siphons further apart.



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Tunicate (Solitary) - *Styela clava*

DESCRIPTION	This solitary tunicate has a leathery, bumpy and creased tunic. Its body is cylindrical or club-shaped narrowing to a stalk that is anchored to the substrate by a disk shaped holdfast. The wrinkled stalk is often 20–50% of the total body length.
RANGE	It is native to China, Japan, and Korea and introduced to both coasts of North America and to Europe, Australia, and New Zealand. It was first reported on the west coast in 1933 in Newport, Oregon and can now be found from British Columbia to Southern California.
SIZE	Body usually 8–12 cm long, but up to 20 cm. Stalk about 1/3 total length.
STATUS	Invasive, see the complete record at <a href="http://invasions.si.edu/nemesis/browseDB/SpeciesSummary.jsp?TSN=159337">http://invasions.si.edu/nemesis/browseDB/SpeciesSummary.jsp?TSN=159337</a>
COLOR	Colors can range from yellowish to reddish to brownish. Sometimes they are yellow white stripes on the siphons. The juveniles often pale orange.
HABITAT	Found in protected harbors and marinas growing on docks, boat hulls, buoys, ropes, pilings, but it also grows on natural substrates such as rocks and shell.
TIDAL HEIGHT	Low intertidal to shallow subtidal
SALINITY	18 to 35 ppt, found in marine and estuarine habitats
TEMPERATURE	11 to 27°C , found to -2 °C but need at least 15 °C to reproduce
SIMILAR SPECIES	<i>Styela truncata</i> (pictured below top left) and <i>Styela gibbsii</i> (native, bottom left photo) may have stripes on the siphons, but they are not stalked. The most similar species, <i>Styela montereyensis</i> is longer (up to 30 cm), with a longer stalk relative to the body size, distinctive stripes the entire length of the body, the oral siphon opens laterally rather than upward, and the tunic is smooth rather than wrinkled. The latter grows in high energy areas.



*Styela truncata* ©Stachowitz lab UC Davis

*Styela clava* © Janna Nichols



*Styela gibbsii* ©Janna Nichols

*Styela clava* ©M. Frey

Tunicate (solitary) - *Styela yakutatensis*

**DESCRIPTION** Solitary tunicate, cylindrical body tapering rather abruptly to a stalk that is usually shorter than the body. Yellow-brown with prominent longitudinal wrinkles. Red siphons, one straight, one curved in a semicircle at the anterior end. Internally, there are two elongate gonads per side. This species broods its embryos; during the breeding season (summer), there is usually a large group of developing embryos, including hatched tadpoles in the atrial chamber.

<b>RANGE</b>	Katchemak Bay, Alaska to Vancouver Island, Canada
<b>SIZE</b>	Up to 7 cm
<b>STATUS</b>	Native
<b>COLOR</b>	Reddish near siphons, body yellow-orangish, stalk darker to brown.
<b>HABITAT</b>	Hangs from rocks by a distinct stalk in rocky habitats on exposed shores
<b>TIDAL HEIGHT</b>	Low intertidal to 30 m
<b>SALINITY</b>	15.2 to 33.3 ppt (Homer & Seldovia Harbor range)
<b>TEMPERATURE</b>	-2.3 to 14.9°C (Homer & Seldovia Harbor range)

**SIMILAR SPECIES** *Styela montereyensis* has a slender stalk as long or longer than the body, two elongate slender gonads/side, and does not brood its embryos. (However, *S. yakutatensis* can also have stalk as long as body, see left photo). *Styela clava* has warty tubercles at upper part of body, internally five to seven elongated gonads/side, and is not a brooder. It is an introduced species that could come to Alaska. (It is currently found as far north as BC, Canada).



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Tunicate (colonial) - *Synoicum irregulare*

DESCRIPTION	This colonial tunicate is sometimes called "Gnomes toes" due to its tough and wrinkly texture. The colonies can be large or small, maybe only a few pieces.
RANGE	Range not well known. Originally collected from the Pribilof Islands (Ritter, W. E., 1899). Commonly seen on the beaches of Kachemak Bay.
SIZE	Usually <10 cm in colony diameter
STATUS	Native
COLOR	Bright orange or pinkish when fresh
HABITAT	Unknown, often seen when washed up on beaches
TIDAL HEIGHT	Sub tidal to 115 m depth
SALINITY	25.4 to 33.3 ppt (Homer & Seldovia Harbor deep sonde range)
TEMPERATURE	-0.4 to 12.4°C (Homer & Seldovia Harbor deep sonde range)
SIMILAR SPECIES	Many species of the family Polyclinidae, such as <i>Aplidium</i> and <i>Synoicum</i> look similar. They often require microscope work to tell them apart. Species of these groups are sometimes mistaken for a sponge.



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## NATIVE TUNICATES

### Tunicate (colonial) - *Synoicum* sp. aff. *jordani* or *kincaidi*

DESCRIPTION	Colonies are thick, massive, with a rounded shape. Tunic is smooth and mostly transparent. Attachment area is narrower than the width of the colony. Difficult to tell that it's a tunicate out of water (photo upper right and lower left). Individual zooids long and slender, up to 20–25 mm. Commonly called Sea Pork.
RANGE	Found in Bering Sea and Japan. In Alaska, found from the Aleutians to Kachemak Bay. Also found in Washington state.
SIZE	Colonies 10 cm in diameter or greater
STATUS	Native
COLOR	Variable, white, pink, orange, peach, or brown
HABITAT	Wave washed rocks, open coast. Rocky overhangs and vertical walls. May be washed up on beaches after storms.
TIDAL HEIGHT	Lower intertidal, subtidal to 366 m
SALINITY	15.2 to 33.3 ppt (Homer & Seldovia Harbor range)
TEMPERATURE	-2.3 to 14.9°C (Homer & Seldovia Harbor range)
SIMILAR SPECIES	Often mistaken for a sponge. Members of this Genus and several other compound tunicates are very difficult to tell apart and without a microscope. Photo in upper left has been sliced in half.



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## Resources for Alaskan Ascidians

### Websites

Stanford University; SeaNet; Common Marine Organisms of Monterey Bay, CA

<https://seanet.stanford.edu/Urochordata>

Walla Walla University; Invertebrates of the Salish Sea

<https://inverts.wallawalla.edu/index.html>

iNaturalist

<https://www.inaturalist.org/taxa/47811-Ascidiacea>

University of California; Davis

[http://convoluta.ucdavis.edu/gallery/slideshow.php?set\\_albumName=West Coast Tunicates](http://convoluta.ucdavis.edu/gallery/slideshow.php?set_albumName=West_Coast_Tunicates)

Royal BC Museum, Canada

[http://taxonomy.royalbcmuseum.bc.ca/Taxonomy/viewer/BC Tunicates.aspx](http://taxonomy.royalbcmuseum.bc.ca/Taxonomy/viewer/BC_Tunicates.aspx)

Barcode of Life Data System; Boldsystems

[http://www.boldsystems.org/index.php/TaxBrowser\\_Taxonpage?taxid=61](http://www.boldsystems.org/index.php/TaxBrowser_Taxonpage?taxid=61)

Ground Truth Trekking

[http://www.groundtruthtrekking.org/slideshows/uploader-tunicates-of-kachemak-bay/?photo=mixed-tunicates\\_2](http://www.groundtruthtrekking.org/slideshows/uploader-tunicates-of-kachemak-bay/?photo=mixed-tunicates_2)

inaturalist

[https://www.inaturalist.org/observations?taxon\\_name=sea%20squirts](https://www.inaturalist.org/observations?taxon_name=sea%20squirts)

University of Victoria; Biodiversity of the Central Coast

<http://www.centralcoastbiodiversity.org/tunicates.html>

Wiki site from South East Alaska. Ascidians info collected by associate of Linda McCann and Gretchen Lambert.

[http://wiki.seaknature.org/Category:Marine Invertebrate](http://wiki.seaknature.org/Category:Marine_Invertebrate)

idigbio; funded by a grant from the National Science Foundation's Advancing Digitization of Biodiversity Collections Program

<https://www.idigbio.org/>

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