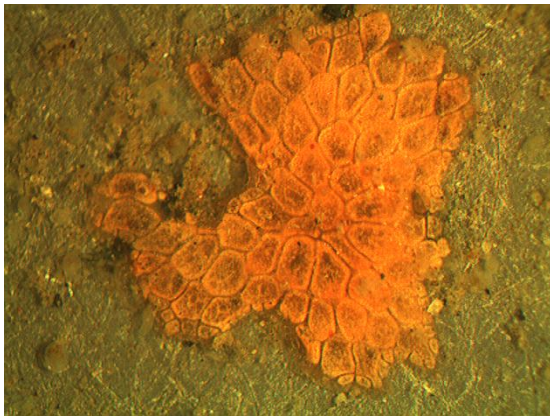




Guide to Some Common Fouling Invertebrates of Alaska with focus on known and potential invasives



Introduction

Invasive species are a concern in many parts of the world, but nowhere is the threat more evident than in the state of Alaska. With 30-40 thousand miles of pristine coastline and commercial fisheries worth billions of dollars annually, introductions to Alaskan waters have the potential for great impact, both environmentally and economically. To meet this threat, a citizen science monitoring network called Plate Watch was established in 2007 (<http://platewatch.nisbase.org/>) to help monitor for invasive marine invertebrates in Alaska. The invertebrate fauna of the Pacific Northwest is varied and diverse and can provide challenges to identification, thus the idea of a field guide was born, to ensure that monitors could distinguish Alaskan native species from non native invasives. This work is the result of a collaboration of the Smithsonian Environmental Research Center and Kachemak Bay Research Reserve. Many thanks to Ann Eissinger of the Puget Sound Marine Invasive Species Volunteer Monitoring Program (MISM) and Ray McNally at the Puget Sound Partnership, for giving us access to the Marine Invasive Species Guide for the Puget Sound Area which provided the basic framework for our Guide. As much as possible, the species descriptions include key features discernable with the naked eye, to help separate them from similar species without the aid of a microscope. Distributional information is focused primarily on the west coast.

For questions or further information about the field guide, contact Linda McCann mccannl@si.edu or Catie Bursch catie.bursch@alaska.gov. Work on the Guide is ongoing, so check the websites for updates!



Cover Photos: Botryllid juvenile: Linda McCann, *Molgula* tunicate: Catie Bursch, Plate covered with *Ciona* spp: Chela Zabin, *Distaplia alaskensis*: Heather Meuret Woody. Photo this page: *Ciona* sp. fouling aquaculture cages.
http://www.whoi.edu/cms/images/oceanus/seasquirt2_n1_41620.jpg

This Field Guide can be downloaded from the Plate Watch and KBRR websites at: <http://platewatch.nisbase.org> and http://www.adfg.alaska.gov/index.cfm?adfg=kbrr_educationResources.home.

Field Guide Species List

Marine Fouling Invertebrates

Phyla

Tunicata

Taxonomic Name	Common Name	Status Pacific NW
<i>Aplidium californicum</i>	sea pork	Native
<i>Aplidium coei</i>		Native
<i>Ascidea callosa</i>	sea blister	Native
<i>Ascidea columbiana</i>	sea blister	Native
<i>Boltenia villosa</i>	spiny headed tunicate	Native
<i>Botryllus schlosseri</i>	golden star tunicate	NIS
<i>Botrylloides violaceus</i>	chain or sheath tunicate	NIS
<i>Ciona intestinalis</i>	vase tunicate	NIS
<i>Ciona savignyi</i>	vase tunicate	NIS
<i>Corella inflata</i>	brooding transparent tunicate	Native
<i>Corella willmeriana</i>	transparent tunicate	Native
<i>Dendrodoa pulchella</i>		Native
<i>Didemnum vexillum</i>	marine or sea vomit	NIS
<i>Didemnum carnulentum</i>	White crust tunicate	Native
<i>Trididemnum spp</i>		Native
<i>Distaplia alaskensis</i>	compound tunicate	Native
<i>Distaplia occidentalis</i>	mushroom compound tunicate	Native
<i>Halocynthia aurantium</i>	sea peach	Native
<i>Halocynthia igaboja</i>	Hedge hog tunicate	Native
<i>Molgula citrina</i>	sea grape	Native?
<i>Molgula manhattensis</i>	sea grape	NIS
<i>Molgula pacifica</i>	sea grape	Native
<i>Molgula retortiformis</i>	sea grape	Native
<i>Styela clava</i>	club tunicate	NIS
<i>Synoicum irregulare</i>	Gnomes toes	Native
<i>Synoicum jordani</i>	sea pork	Native
<i>Cnemidocarpa finmarkiensis</i>	broad base tunicate	Native

Decapoda

<i>Carcinus maenas</i>	European green crab	NIS
<i>Metacarcinus magister</i>	Dungeness crab	Native

Bryozoa

Taxonomic Name	Common Name	Status Pacific NW
<i>Watersipora subtorquata</i>		NIS
<i>Schizoporella japonica</i>		NIS
<i>Bugula neritina</i>		NIS

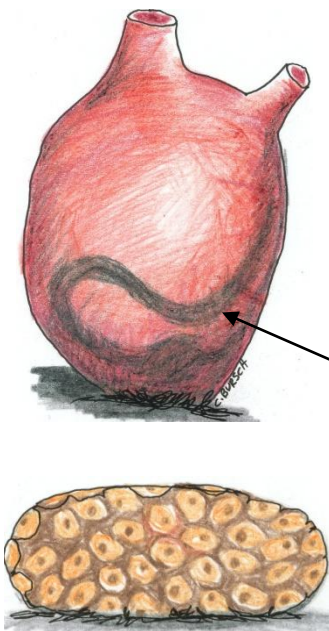
Macroalgae

Phaeophyta

<i>Undaria pinnatifida</i>	Japanese kelp	NIS
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Key Features

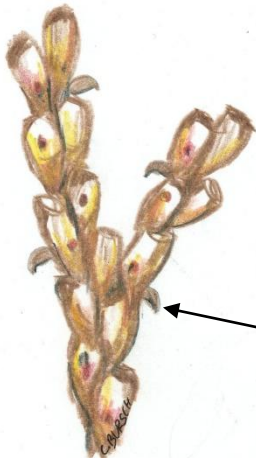
Tunicata



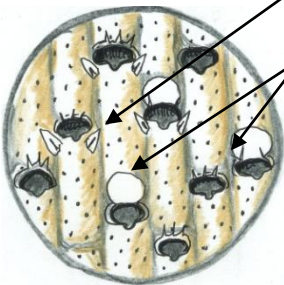
- Solitary or Colonial
- Firm or spongy
- Position of siphons lateral, terminal
- Tunic smooth, hairy or bumpy
- Presence of spicules (microscopic)
- Shape of gut



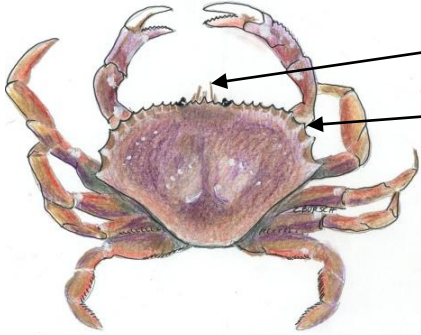
Bryozoa



- Erect or Encrusting
- Soft or Calcareous
- Color
- Presence of spines
- Presence of avicularia
- Presence of ovicells

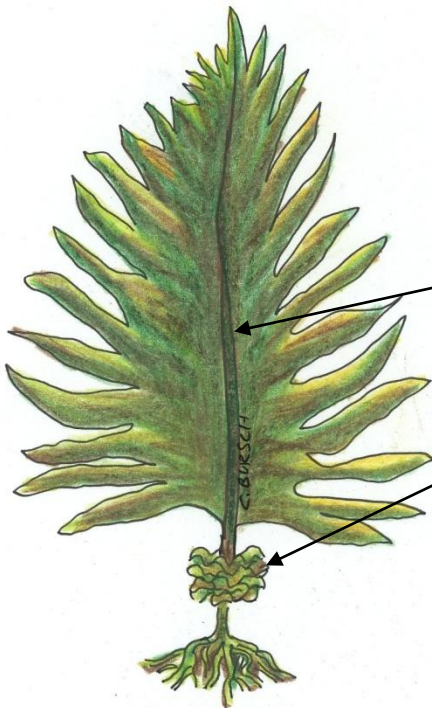


Decapoda



- Presence of 10 legs
- Number of spines between eyes
- Number of spines laterally
- Swimming or walking legs
- Shape and color of claw

Macroalgae



- Brown, Red or Green Alga
- Presence of midrib
- Blade divided or whole
- Presence of sporophyll
- Presence of swim bladders

NATIVE TUNICATES

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 5 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 and 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 (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. Since this animal is lying mostly on its left side, the oral siphon is at the extreme anterior end of body, the atrial siphon is close to it but slightly posterior. Both siphons 6 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 and 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. Locally it could be confused with <i>Molgula</i> but is flatter and attached on it's side.



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©Chela Zabin



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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 and British Columbia to San Diego, CA
SIZE	up to 3 cm wide and 10 cm long
STATUS	Native
COLOR	orange, red or brown and aperatures often red
HABITAT	Among colonies of tubeworms that grow on submerged man-made structures or hard substrates.
TIDAL HEIGHT	Alaska and British Columbia to San Diego, CA
SALINITY	28.0-33.3 ppt Seldovia Harbor
TEMPERATURE	0-12.4 °C Seldovia Harbor
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 does not have the spiny tunic, is circumpolar and may be in Alaska but we have no records at present.



©ADF&G - Shawn Harper Kachemak Bay



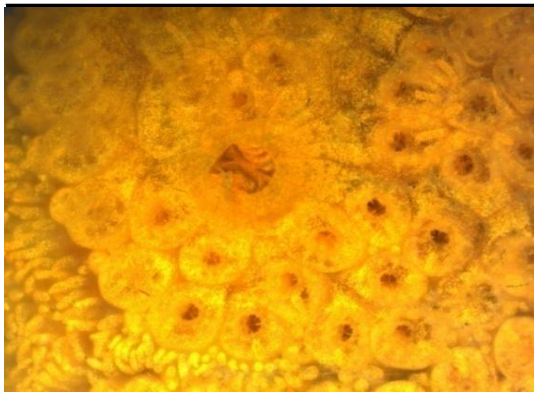
©Janna Nichols Washington state



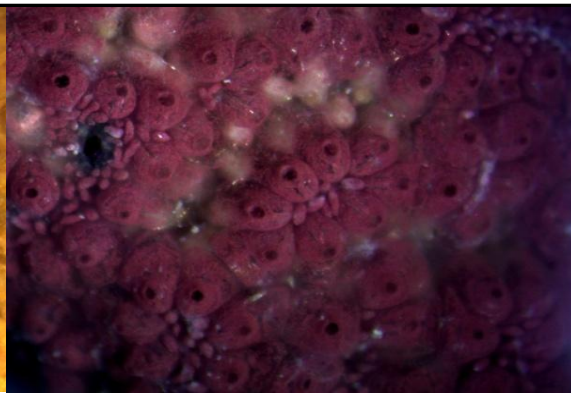
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Tunicate (colonial) - *Botrylloides violaceus*

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>B. 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 diameter
STATUS	Invasive; see the full record at http://invasions.si.edu/nemesis/
COLOR	Solid color, variable - often orange but can be red, yellow, purple, or tan, occasionally brown or lavender.
HABITAT	It generally grows subtidal 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	18-40 ppt
TEMPERATURE	-0.6 -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 ampulae that are visible in the lower left hand corner in the first photo to the left.



©M. Frey



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©Gary Freitag note meandering rows



on algae ©Heather Meuret Woody

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 http://invasions.si.edu/nemesis/
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	<14-44 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 ampulae along the exterior margins of the colony, and much larger larvae.



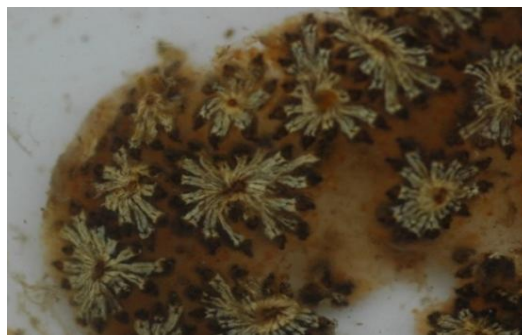
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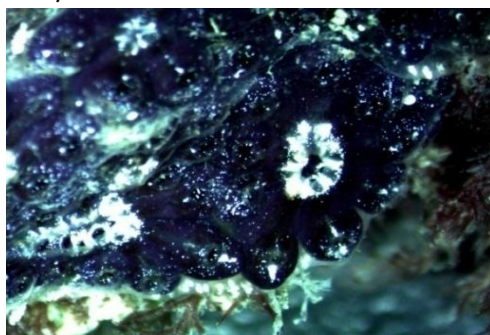
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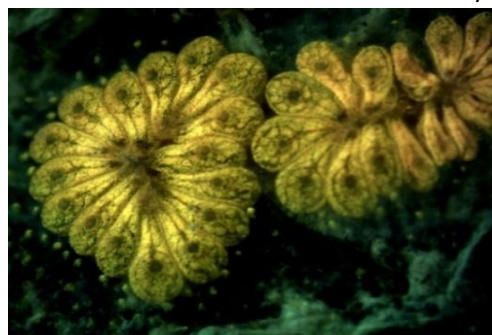
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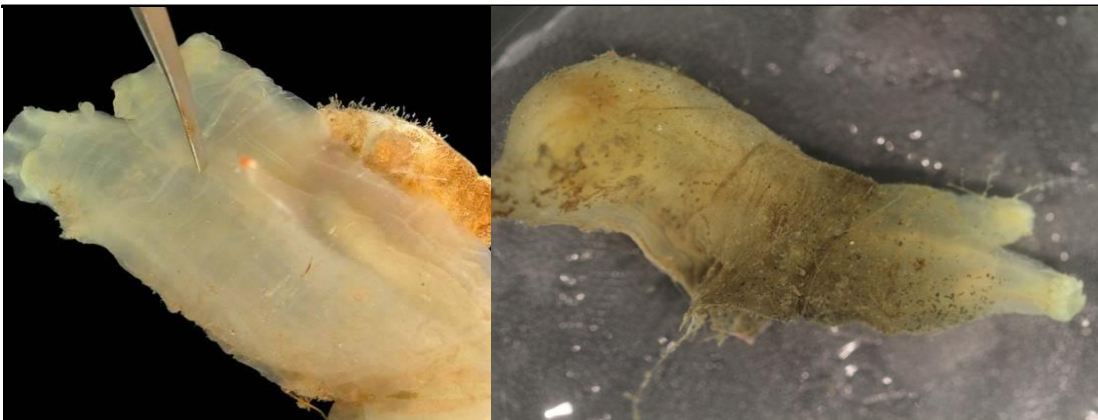
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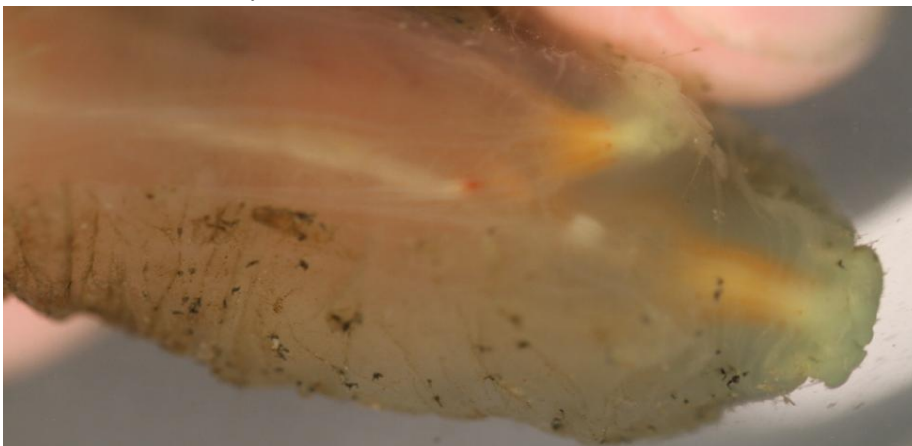
Tunicate (Solitary) - *Ciona intestinalis*

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. Native to the Atlantic and the Mediterranean. They were first reported on the west coast in San Diego in 1897.
SIZE	to 15 cm.
STATUS	Invasive (find the complete record at http://invasions.si.edu/nemesis/index.html)
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	11-50 ppt. Highly tolerant species that can reproduce up to 40 ppt
TEMPERATURE	cold temperate to tropical, 10-30°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. intestinalis</i> with much brighter yellow markings on the siphon edges 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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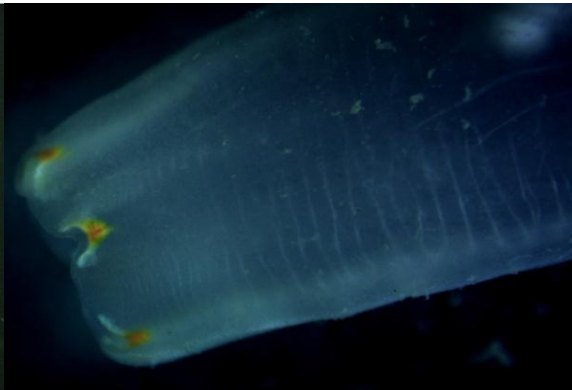
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Tunicate (Solitary) - *Ciona savignyi*

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 on the west coast in 1985 in Long Beach California.
SIZE	Body long, up to 15 cm.
STATUS	Invasive. See the full record at http://invasions.si.edu/nemesis/
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 60m.
SALINITY	18-35 ppt
TEMPERATURE	Broad temperature range, 11-27°C
SIMILAR SPECIES	In California <i>Ciona 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. intestinalis</i> . Genetic analyses is showing that these patterns may be regional.



© Janna Nichols



Tip of siphon showing bright yellow lines

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NATIVE TUNICATES

Tunicate (solitary) - *Cnemidocarpa finmarkiensis*

DESCRIPTION The tunic is opaque and smooth, 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 50m.
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.



©K. Iken Kachemak Bay



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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, Washington. It has recently extended its 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 and 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 has a rectum more than 3/4 the length of the body 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.

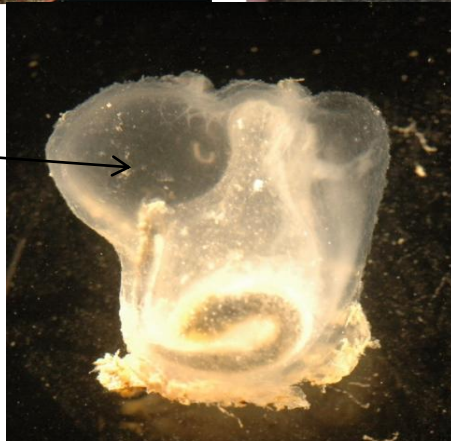


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brood chamber



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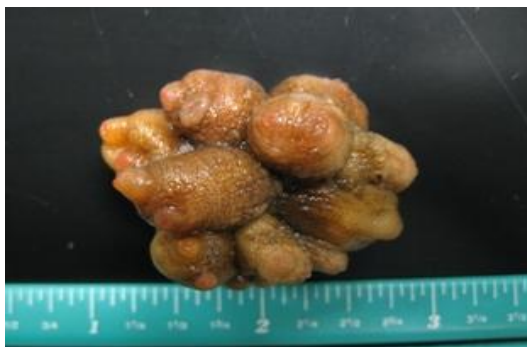
NATIVE TUNICATES

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	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 100m.
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 3 branched gonad (requires dissection).



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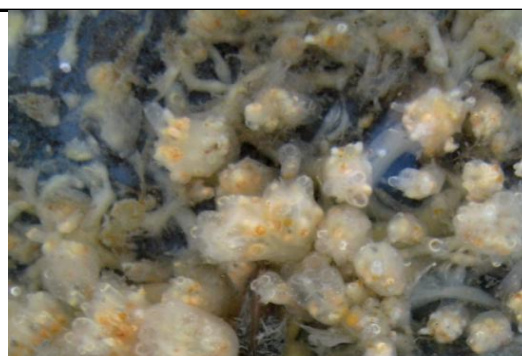


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Photos from Kachemak Bay, AK

Tunicate (colonial) - *Distaplia alaskensis*

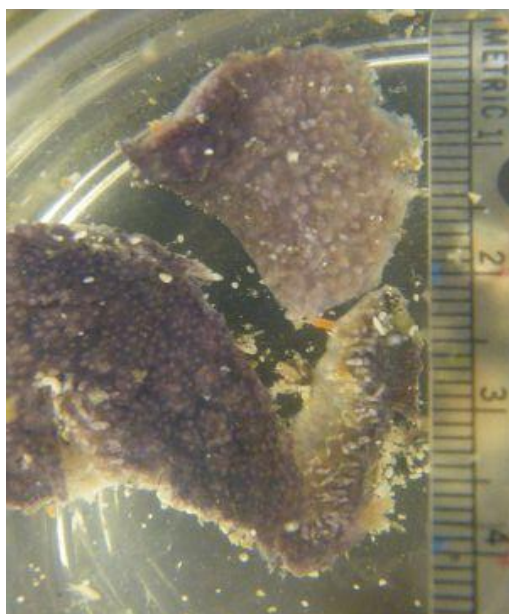
DESCRIPTION	Colonies consist of several cone-shaped lobes generally narrowing from the top to the base with a small area of attachment. The lobes are elongated and flat-topped. Lateral offshoots can sometimes cover settling plate surface without many lobes
RANGE	This species was undescribed until 2001 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 and Seldovia Harbor range)
SIMILAR SPECIES	<i>Distaplia occidentalis</i> is often purple or pinkish and is much shorter and mushroom-like in growth form.
OTHER FACTS	Common names; Sea peach. 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.



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 in 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.



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NATIVE TUNICATES

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 hook 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	28.0-33.3 ppt Seldovia Harbor
TEMPERATURE	0-12.4 °C Seldovia Harbor
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>igaboja</i>), but the latter is tan and covered with spines.
OTHER FACTS	Common names; Sea peach. 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.



©Dominic Hondolero



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NATIVE TUNICATES

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.

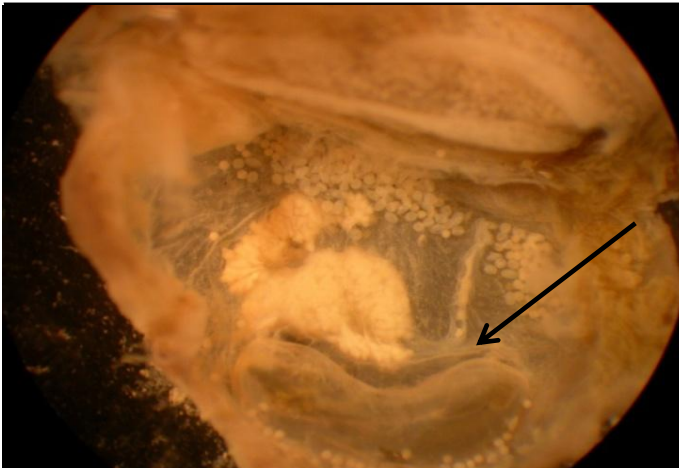
RANGE	Japan, Aleutian Islands, and Alaska south to southern California.
SIZE	5 cm across to 10 cm tall
STATUS	Native
COLOR	Dark brown tunic under bristles: siphons red or orange.
HABITAT	Rocky or gravel areas. Usually near current.
TIDAL HEIGHT	Intertidal to 175m.
SALINITY	25.4 to 33.3 ppt. (Homer & Seldovia Harbor deep sonde range)
TEMPERATURE	- 0.4 to 12.4 °C (Homer & Seldovia Harbor deep sonde range)
SIMILAR SPECIES	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

Tunicate (solitary) - *Molgula citrina*

DESCRIPTION	This small, round to oval tunicate has 6 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 and Seldovia, Alaska, 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	15.2 to 33.3 ppt. (Homer & Seldovia Harbor range)
TEMPERATURE	-2.3 to 14.9 °C (Homer and 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 7 branchial folds (requires dissection), broods its larvae and has distinctively long, slender oviducts (requires dissection, marked with the arrow in first photo).



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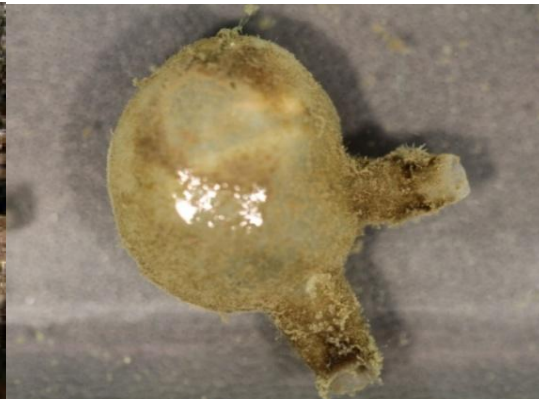
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Tunicate (solitary) - *Molgula manhattensis*

DESCRIPTION	grape-like tunicate, sometimes laterally flattened, with 6 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's 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 meters depth.
SALINITY	5-40 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 6 branchial folds (requires dissection) as opposed to the 7 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>).



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Tunicate (solitary) - *Molgula pacifica*

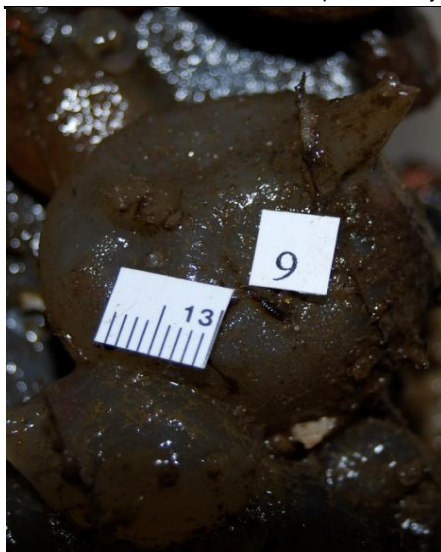
DESCRIPTION	small, grape-like tunicate with one siphon (atrial) extending upwards about twice as high as the the other, often covered with debris. Siphons appear orange.
RANGE	Alaska and Washington
SIZE	Body length to 2.5cm
STATUS	Native
COLOR	Clear, with 's' shaped intestine visible through the body 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 its base. Differs from other <i>Molgula</i> species in the orange siphons, one twice as long as the other, and the often accessive amount of debris attached to the body. It is also unique in having 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 and 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 4 lobes.
RANGE	Alaska and Washington, circumpolar species
SIZE	Body length to 10 cm
STATUS	Native
COLOR	Clear tunic, with an s shaped intestine visible through the body wall, oriented horizontally. Overall the body appears light olive or grayish green.
HABITAT	Attaches to firm substrates, rocks and man-made structures.
TIDAL HEIGHT	Low intertidal and sub tidal to offshore to 80m
SALINITY	15.2 to 33.3 ppt. (Homer & Seldovia Harbor range)
TEMPERATURE	-2.3 to 14.9 °C (Homer and Seldovia Harbor range)
SIMILAR SPECIES	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, in having the flattened, horizontally oriented gut, and 4 rather than 6 lobes on the oral siphon and one siphon is very long (upper right and left picture respectively)



right photo ©SERC note 4 lobes on oral siphon

left photo © Joni Johnson Petersburg, AK



© Paul Norwood Sitka, AK



© ADFG Homer, AK

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 http://invasions.si.edu/nemesis/browseDB/SpeciesSummary.jsp?TSN=159337
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	18-35 ppt. Found in marine and estuarine habitats.
TEMPERATURE	11-27°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 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



©Stachowitz lab UC Davis *Styela truncata*



© Janna Nichols



©Janna Nichols *Styela gibbsii*



©M. Frey

NATIVE TUNICATES

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	Subtidal 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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Bryozoa (encrusting) - *Watersipora subtorquata*

DESCRIPTION	This encrusting bryozoan is sheet-like to erect and the zooids are bright orange outlined in black with black opercula clearly visible to the naked eye.
RANGE	From Baja California to Coos Bay, Oregon. First record on the west coast in Cabo San Lucas, Mexico in 1937 based on collecting in 1888. Considered an Atlantic and Caribbean species, it is now invasive worldwide.
SIZE	Zooids with slight mid expansion, but basically rectangular, alternating and regularly spaced. Can form large, upright, chip-like growths that form colonies up to 25 cm tall
STATUS	Invasive
COLOR	bright orange with black opercula, zooids outlined in black.
HABITAT	Often found on docks and man made structures including aquaculture infrastructure. Its resistance to copper based paints allows it to colonize boat hulls and provide substrate for other invading species.
TIDAL HEIGHT	lower intertidal to subtidal
SALINITY	20-50 ppt
TEMPERATURE	12 - 28 C
SIMILAR SPECIES	<i>Schizoporella japonica</i> , another invasives species in Alaska, and <i>Tegella aquilirostris</i> (native) are also orange and look very similar at first glance, but neither of these species has the black opercula or black outline around each zooid. There are 2 other <i>Watersipora</i> species that may be confused with it, <i>Watersipora arcuata</i> (opercula has a distinctive arch proximally) and <i>Watersipora edmonsoni</i> (has a much narrower, longer opercular sinus).



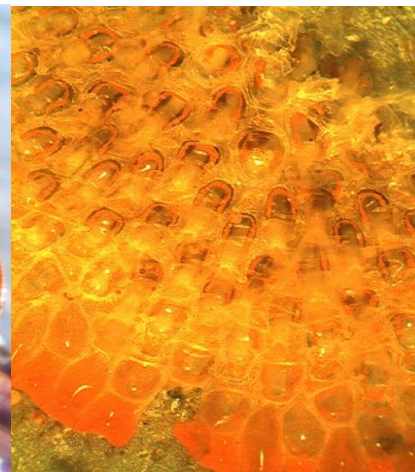
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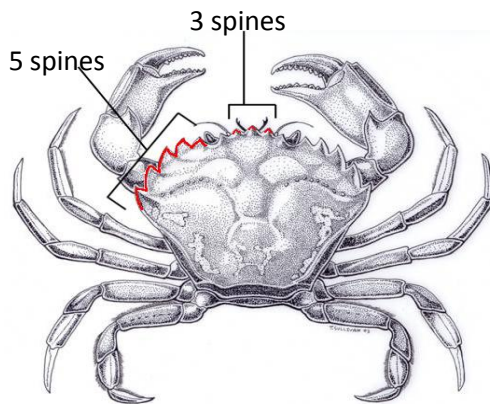
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©Linda McCann *Tegella aquilirostris*

European Green Crab - *Carcinus maenas*

DESCRIPTION	Pagurid marine crab with 5 spines on each side of the eye stalk and 3 between.
RANGE	San Diego, CA to British Columbia. Native to Europe, they are now as far north as the northern end of Vancouver Island in BC.
SIZE	A small species, adults up to 10 cm across carapace.
STATUS	Invasive
COLOR	mottled greens and browns, older specimens becoming very orange, especially on the ventral side
HABITAT	rocky shores, cobble beaches, sand flats, eel grass beds and salt marshes.
TIDAL HEIGHT	low intertidal to about 6 m
SALINITY	6-35 ppt, estuarine and marine
TEMPERATURE	tolerant of a broad range of temperatures from below freezing to 35°C, though larvae do not survive below 10°C
SIMILAR SPECIES	Other similar crabs include Dungeness (<i>Metacarcinus magister</i>) and the Red Rock Crab (<i>Cancer productus</i>), but they have 10 spines on each side and can be much larger, Pygmy Cancer crabs (<i>Cancer oregonensis</i>), which have black tipped claws and a more circular shell, and the Helmet or horse crab (<i>Telmessus cheiragonus</i>) which has large spines on the edge of it's more round carapace and is covered with stiff hairs.



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©Lina Ceballos



© Janna Nichols Dungeness crab



Red Rock crab

©www.wallawalla.edu/academics/departments/biology/rosario/inverts

Dungeness crab - *Metacarcinus magister*

DESCRIPTION This crab has white-tipped pinchers on the claws, and the top edges and upper pinchers are sawtoothed with dozens of teeth along each edge. The last three joints of the last pair of walking legs have a comb-like fringe of hair on the lower edge. Also the tip of the last segment of the tail flap is rounded as compared to the pointed last segment of many other crabs.

RANGE	Alaska's Aleutian Islands south to Pt Conception in California
SIZE	Carapace width to 25 cm (9 inches), but typically less than 20 cm
STATUS	Native; see the full record at http://www.dfg.ca.gov/marine/dungeness_crab.asp
COLOR	Light reddish brown on the back, with a purplish wash anteriorly in some specimens. Underside whitish to light orange.
HABITAT	Rock, sand and eelgrass
TIDAL HEIGHT	Subtidal to offshore
SALINITY	Normal range 10–32ppt; 15ppt optimum for hatching
TEMPERATURE	Normally found from 3–19°C
SIMILAR SPECIES	Unlike the green crab, it has 10 spines on either side of the eye sockets and grows much larger. It can be distinguished from <i>Metacarcinus gracilis</i> which also has white claws, by the carapace being widest at the 10th tooth vs the 9th in <i>M. gracilis</i> . Unlike the red rock crab it has a tooth on the dorsal margin of its white tipped claw (this and other similar Cancer crabs have black tipped claws).



©Paul Norwood



© bioweb.uwlax.edu red rock crab - note black tipped claws

Macroalgae (Brown) - *Undaria pinnatifida*

DESCRIPTION	brown kelp with long blades, a midrib and 'ruffled' reproductive structure or sporophyll at base, attaches by a root-like holdfast. No swim bladders and stipe (stem) is short relative to the rest of the plant.
RANGE	Islas de Todos, Mexico (Baja) to San Francisco Bay, Ca. Native to Japan, first record on the west coast from Long Beach and Los Angeles, California, 2000.
SIZE	Body from 1-3 m long, but typically up to 1.5 m
STATUS	Invasive, see complete record at http://undaria.nisbase.org
COLOR	appears yellow green to dark brown colored when you remove from the water
HABITAT	Often found growing on hard surfaces, both natural and man-made structures such as docks and boat hulls. Can form dense kelp forests in sheltered areas.
TIDAL HEIGHT	low intertidal to 25 m, but most common at 1-3 m
SALINITY	20-38 ppt, but grows best above 27ppt
TEMPERATURE	0-27C, but grows best below 12C
SIMILAR SPECIES	Can be confused with other kelps such as <i>Alaria fistulosa</i> (see picture), <i>Egregia menziesii</i> (has swim bladders and small paddle like blades unlike <i>Undaria</i>) and several native <i>Laminarias</i> , but the midrib and distinctive ruffled sporophyte distinguishes the species.



© Chela Zabin sporophyte



Chela Zabin / Smithsonian Institute

mature *Undaria* with sporophyte



©Chela Zabin *Alaria fistulosa*



©Chela Zabin juvenile *Undaria pinnatifida*

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North American East coast

Pictures and locality records for east coast species

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Salem Sound Coastwatch program:

<http://www.salemsound.org/chimp.htm> main page

http://www.sms.si.edu/irlspec/Species_Rpts.htm

http://www.salemsound.org/SSCW_MIS_Monitoring_Guide.pdf A good resource for citizen monitors.

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Link to BC Shellfish Growers Assoc. Aquatic Invasive Species Guide

<http://www.bcsga.ca/research-development/invasive-tunicates-monitoring-project/identifying-tunicates>

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