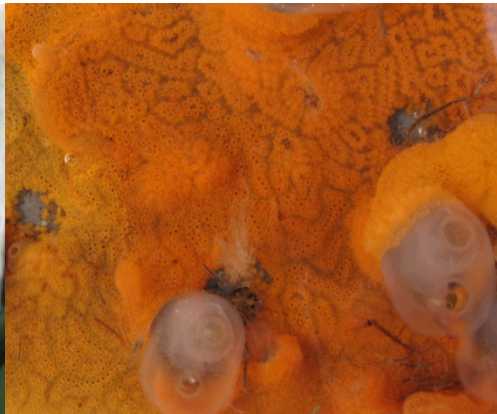


# Guide to Some Common Fouling Invertebrates of Alaska with focus on known and potential invasives



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](mailto:mccannl@si.edu) or Catie Bursch [cmbursch@alaska.edu](mailto:cmbursch@alaska.edu). We thank Bureau of Ocean Energy Management (BOEM) for funding to Kachemak NERR for recent expansion of the tunicate section. Work on the Guide is ongoing, so check the websites for updates!



Cover Photos: *Molgula retortiformis* tunicate: Catie Bursch, *Botrylloides violaceus* and *Corella inflata* tunicates on settlement plate: Kim Holzer, *Distaplia alaskensis*: Heather Meuret Woody, Plate covered with *Ciona* spp, San Francisco Bay: Chela Zabin. Photo this page: *Didemnum vexillum* fouling a floating shed in Whiting Harbor, Sitka Alaska: Kim Holzer.

This Field Guide can be downloaded from the Plate Watch website at <http://platewatch.nisbase.org> and is also linked to the KBRR website. Species are in order within Family groupings. Those with an asterick have unclear origins.

## Field Guide Species List

### Marine Fouling Invertebrates

#### Phyla

#### Tunicata

| Taxonomic Name                    | Common Name                   | Status Pacific NW |
|-----------------------------------|-------------------------------|-------------------|
| <i>Aplidium</i> sp.*              |                               | Native?           |
| <i>Aplidium californicum</i>      | sea pork                      | Native            |
| <i>Aplidium coei</i>              |                               | Native            |
| <i>Ascidia callosa</i>            | sea blister                   | Native            |
| <i>Boltenia echinata</i>          | cactus sea squirt             | 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>Chelysoma productum</i>        | flat topped tunicate          | Native            |
| <i>Ciona robusta</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>Didemnum vexillum</i>          | marine or sea vomit           | NIS               |
| <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>Riterella pulchra</i>          | Sea salmonberry               | Native            |
| <i>Pyura haustor</i>              | wrinkled sea squirt           | Native            |
| <i>Cnemidocarpa finmarkiensis</i> | broad base tunicate           | Native            |
| <i>Dendrodoa pulchella</i>        |                               | Native            |

Tunicates continued

| Taxonomic Name   | Common Name              | Status Pacific NW |
|--|--------------------------|-------------------|
| <i>Metandrocarpa taylori</i>                               | orange social sea squirt | Native            |
| <i>Styela clava</i>  | club tunicate            | NIS               |
| <i>Styela yakutatensis</i>                                 | Club tunicate            | Native            |
| <i>Synoicum irregulare</i>                                 | Gnomes toes              | Native            |
| <i>Synoicum</i> sp. aff. <i>jordani</i> or <i>kincaidi</i> | sea pork                 | Native            |

#### Bryozoa

|                                |                        |     |
|--------------------------------|------------------------|-----|
| <i>Amathia verticillata</i>    | Spaghetti bryozoan     | NIS |
| <i>Watersipora subtorquata</i> | red rust bryozoan      | NIS |
| <i>Schizoporella japonica</i>  | orange ripple bryozoan | NIS |
| <i>Bugula neritina</i>         | brown bryozoan         | NIS |

#### Decapoda

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

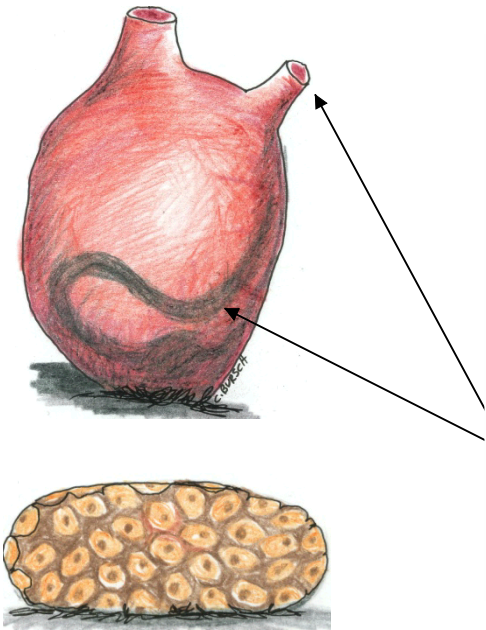
#### Macroalgae


##### Phaeophyta

|                            |               |     |
|----------------------------|---------------|-----|
| <i>Undaria pinnatifida</i> | Japanese kelp | NIS |
|----------------------------|---------------|-----|

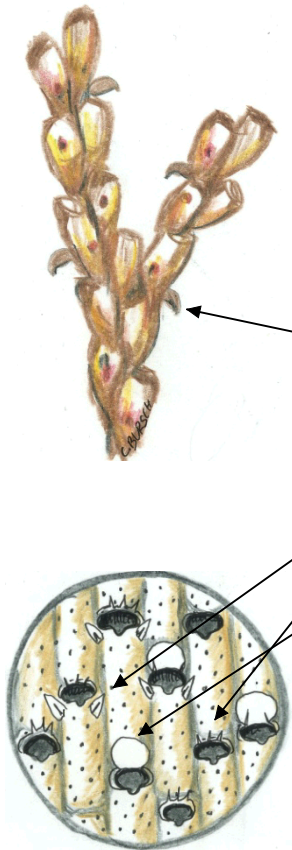
## Key Features

### Tunicata



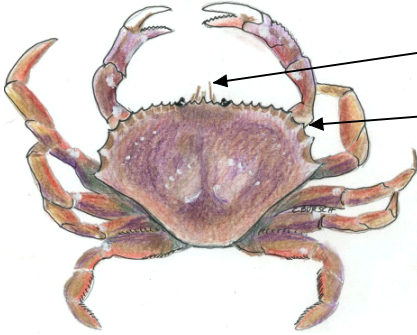
- Solitary or Colonial
- Firm or spongy
- Position of siphons lateral, terminal
- Tunic smooth, hairy or bumpy
- Presence of spicules (microscopic)
- Shape of gut 
- Shape and orientation of siphons

### Bryozoa



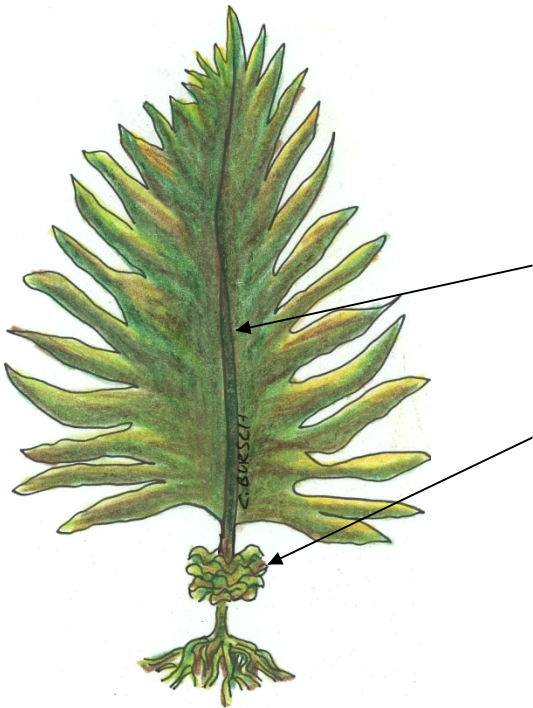
- Erect or Encrusting
- Soft or Calcareous
- Color
- Presence of spines
- Presence of avicularia
- Presence of ovicells

## Decapoda



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

## Macroalgae



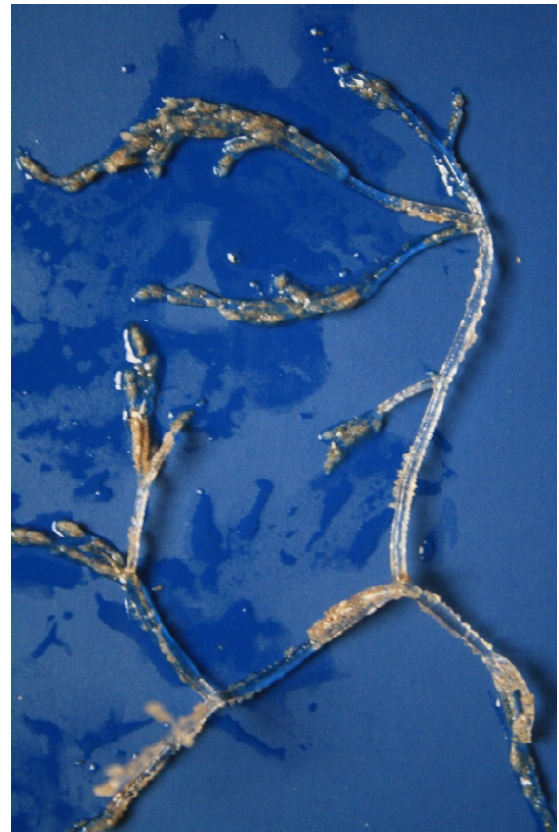
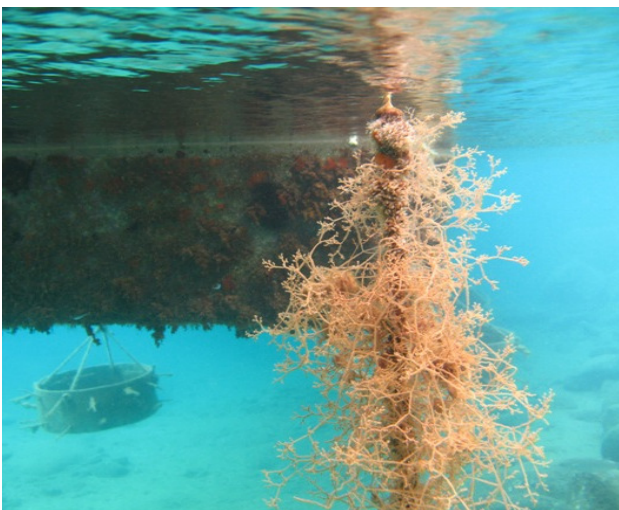
- Brown, Red or Green Alga
- Presence of midrib
- Blade divided or whole
- Presence of sporophyll
- Presence of air bladders

## Bryozoa (branching) - *Amathia verticillatum* (Zoobotryon)

|                        |   |
|------------------------|---|
| <b>DESCRIPTION</b>     | upright bryozoan, with limp, cellophane noodle like branches  |
| <b>RANGE</b>           | First described from the Gulf of Naples, Italy in 1822. In the southeastern US and on the west coast from San Diego to San Francisco Bay, California. Possibly native to the Caribbean, it is now invasive worldwide.                                     |
| <b>SIZE</b>            | Zooids in single rows on long, wide, branches; grows up to 1 meter length   |
| <b>STATUS</b>          | Invasive  |
| <b>COLOR</b>           | clear to opaque   |
| <b>HABITAT</b>         | A warm water species, it is often found on docks and man made structures, but also grows on hard natural substrate such as mangroves  |
| <b>TIDAL HEIGHT</b>    | subtidal  |
| <b>SALINITY</b>        | 15-35 ppt, optimum between 20-30°C  |
| <b>TEMPERATURE</b>     | 10 - 35°C with large colonies forming over 22°C   |
| <b>SIMILAR SPECIES</b> | Recently revised to be a member of the genus <i>Amathia</i> , the species can be distinguished from others in this genus by it's longer, wider, spaghetti-like branches that can reach up to a meter in length and the linear arrangements of the zooids. |



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## NATIVE TUNICATES

### Tunicate (colonial) - *Aplidium californicum*

|                        |   |
|------------------------|---|
| <b>DESCRIPTION</b>     | 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.              |
| <b>RANGE</b>           | Alaska to southern California   |
| <b>SIZE</b>            | 1- 3 cm tall, to 20 cm in diameter.   |
| <b>STATUS</b>          | Native  |
| <b>COLOR</b>           | Variable, white, pink, peach or brown with yellow to orange spots within the tunic, to nearly colorless.  |
| <b>HABITAT</b>         | Intertidal to subtidal, rocks, sand and common on man-made substrates to 85 m.  |
| <b>TIDAL HEIGHT</b>    | Lower intertidal, subtidal to 85 m.   |
| <b>SALINITY</b>        | 25.4 to 35 ppt  |
| <b>TEMPERATURE</b>     | -0.4 to 16.2 °C   |
| <b>SIMILAR SPECIES</b> | 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*

|                        |  |
|------------------------|--|
| <b>DESCRIPTION</b>     | 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> .  |
| <b>RANGE</b>           | 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. |
| <b>SIZE</b>            | Lobes to 5.5 cm tall. Colonies photographed ~ 15 cm wide or less.  |
| <b>STATUS</b>          | Native   |
| <b>COLOR</b>           | Bright yellow or orange.   |
| <b>HABITAT</b>         | Sand and rock, on the latter sometimes under dense kelp cover.   |
| <b>TIDAL HEIGHT</b>    | Low intertidal and subtidal.   |
| <b>SALINITY</b>        | 15.2 to 33.3 ppt. (Homer & Seldovia Harbor range)  |
| <b>TEMPERATURE</b>     | -2.3 to 14.9 °C (Homer and Seldovia Harbor range)  |
| <b>SIMILAR SPECIES</b> | 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

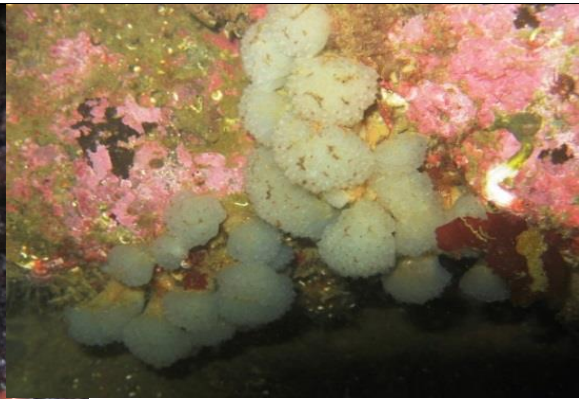
# NATIVE TUNICATES

## Tunicate (colonial) - *Aplidium* sp.

|                        |   |
|------------------------|---|
| <b>DESCRIPTION</b>     | Tunicate white or grayish. Attachment narrower than body with zooids organized at top. Zooids have 3 body regions.  |
| <b>RANGE</b>           | Unknown. Common in Kachemak Bay, Alaska   |
| <b>SIZE</b>            | Up to 3 cm in diameter and/or height  |
| <b>STATUS</b>          | Native  |
| <b>COLOR</b>           | Yellowish white or grayish  |
| <b>HABITAT</b>         | Hard substrates. Rocky overhangs.   |
| <b>TIDAL HEIGHT</b>    | Intertidal down to unknown depth  |
| <b>SALINITY</b>        | 15.2 to 33.3 ppt. (Homer & Seldovia harbor range)   |
| <b>TEMPERATURE</b>     | neg 2.3 to 14.9° C (Homer & Seldovia harbor range)  |
| <b>SIMILAR SPECIES</b> | 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*

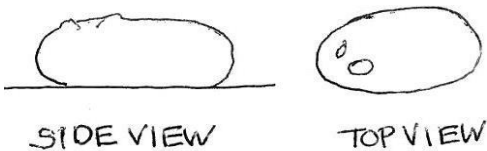
|                        |   |
|------------------------|---|
| <b>DESCRIPTION</b>     | This solitary tunicate is soft, hairless, ~1-2 mm thick and easily torn. Its body is wider than it is tall with a somewhat flattened appearance. The tunic margins are rounded and in old individuals looks wrinkled. 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.  |
| <b>RANGE</b>           | 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.  |
| <b>SIZE</b>            | Body length up to 5 cm, ~3 cm in diameter.  |
| <b>STATUS</b>          | Native  |
| <b>COLOR</b>           | Clear, white to orange. More transparent when young.  |
| <b>HABITAT</b>         | Attaches to firm substrates, rocks in the intertidal and floats and ropes in harbors.   |
| <b>TIDAL HEIGHT</b>    | Low intertidal and sub-tidal to 146 m   |
| <b>SALINITY</b>        | 15.2 to 33.3 ppt. (Homer & Seldovia Harbor range)   |
| <b>TEMPERATURE</b>     | neg 2.3 to 14.9 °C (Homer and Seldovia Harbor range)  |
| <b>SIMILAR SPECIES</b> | 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 it's side. |



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SIDE VIEW

TOP VIEW

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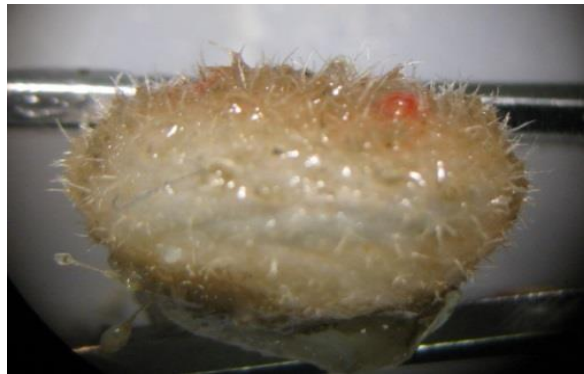
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**Tunicate (solitary) - *Boltenia echinata***

|                        |  |
|------------------------|--|
| <b>DESCRIPTION</b>     | 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.   |
| <b>RANGE</b>           | North Pacific, North Atlantic, and the Arctic: Canadian Arctic Archipelago and Europe. Temperate to polar climates.  |
| <b>SIZE</b>            | Up to 4.5 cm in diameter, but more commonly ~2 cm About as tall as it is wide.   |
| <b>STATUS</b>          | Native   |
| <b>COLOR</b>           | Yellowish or light brown.  |
| <b>HABITAT</b>         | Hard substrates. In Alaska found on brick hung 1 m below surface in Seldovia boat harbor.  |
| <b>TIDAL HEIGHT</b>    | Subtidal to 350 m  |
| <b>SALINITY</b>        | 15.2 to 33.3 ppt. (Homer & Seldovia harbor range)  |
| <b>TEMPERATURE</b>     | neg 2.3 to 14.9 ° C (Homer & Seldovia harbor range)  |
| <b>SIMILAR SPECIES</b> | <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 3 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*

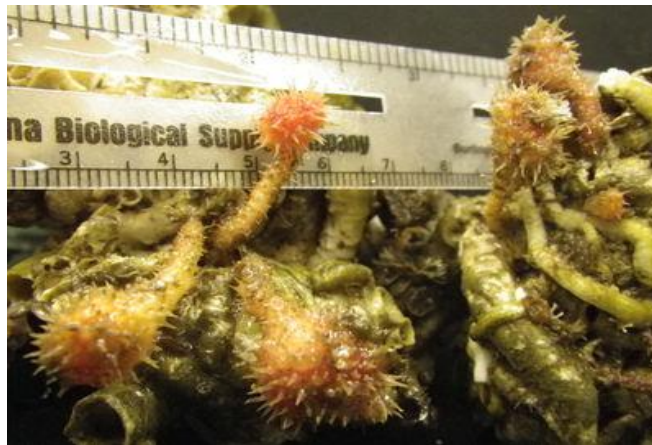
|                        |  |
|------------------------|--|
| <b>DESCRIPTION</b>     | Small, solitary tunicate with stalked, hairy body. The stalk can be long relative to size of tunicate.   |
| <b>RANGE</b>           | Alaska to California   |
| <b>SIZE</b>            | Up to 3 cm wide and 10 cm long   |
| <b>STATUS</b>          | Native   |
| <b>COLOR</b>           | Orange, red or brown and aperators often red   |
| <b>HABITAT</b>         | Among colonies of tubeworms that grow on submerged man-made structures or hard substrates.   |
| <b>TIDAL HEIGHT</b>    | Lower intertidal to 100 m subtidal.  |
| <b>SALINITY</b>        | 15.2 to 33.3 ppt (Homer & Seldovia harbor range)   |
| <b>TEMPERATURE</b>     | neg 2.3 to 14.9 C (Homer & Seldovia harbor range)  |
| <b>SIMILAR SPECIES</b> | <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) - *Botrylloides violaceus*

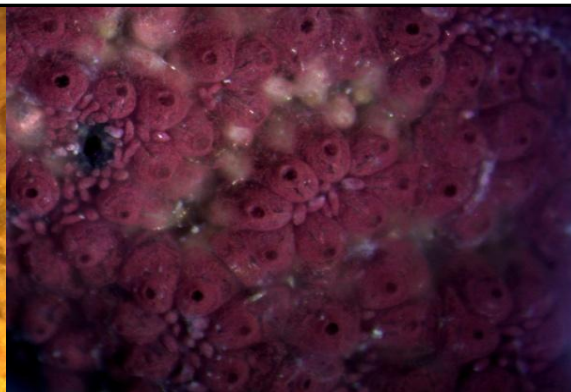
|                     |   |
|---------------------|---|
| <b>DESCRIPTION</b>  | This colonial tunicate is thin and lobe-like with zooids forming long double rows or chains. Short chains sometimes look similar to the flower-like pattern in <i>Botryllus schlosseri</i> . The tunic is relatively tough and leathery to the touch. |
| <b>RANGE</b>        | 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.   |
| <b>SIZE</b>         | Colonies can be large, up to 0.3 m diameter   |
| <b>STATUS</b>       | Invasive; see the full record at <a href="http://invasions.si.edu/nemesis/">http://invasions.si.edu/nemesis/</a>  |
| <b>COLOR</b>        | Solid color, variable - often orange but can be red, yellow, purple, or tan, occasionally brown or lavender.  |
| <b>HABITAT</b>      | 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.                   |
| <b>TIDAL HEIGHT</b> | Shallow subtidal, < 50m, but can be found in the intertidal in protected areas  |
| <b>SALINITY</b>     | 18-40 ppt   |
| <b>TEMPERATURE</b>  | -0.6 -25°C but generally found above 8°C  |

### SIMILAR SPECIES

*Botrylloides diegensis* is two toned with a light colored ring around the siphons and darker test. *Botrylloides spp.* do not form the star-like pattern found in *Botryllus schlosseri*, rather the zooids form long chains or ladders. Also distinctive, *Botrylloides violaceus* 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 *Botrylloides violaceus* are much larger than those of *Botryllus schlosseri*.



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©Gary Freitag note meandering rows



on algae ©Heather Meuret Woody

## Tunicate (colonial) - *Botryllus schlosseri*

|                        |  |
|------------------------|--|
| <b>DESCRIPTION</b>     | The zooids in this colonial tunicate are organized in a star pattern (usually conspicuous). Colonies are flat, but can develop lobes as they mature.   |
| <b>RANGE</b>           | 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. |
| <b>SIZE</b>            | Forms flat irregular sheets 3-4 mm thick, and up to around 15 cm.  |
| <b>STATUS</b>          | Invasive, see the complete record at <a href="http://invasions.si.edu/nemesis/">http://invasions.si.edu/nemesis/</a>   |
| <b>COLOR</b>           | Often two-toned, the color patterns are extremely variable, white, purple, orange or brown to almost black.  |
| <b>HABITAT</b>         | Docks, boat hulls, buoys, ropes, pilings, on top of and underneath rocks, on mussels and solitary sea squirts, seaweeds and eelgrass.  |
| <b>TIDAL HEIGHT</b>    | Subtidal to 200 m, occasionally found in lower intertidal  |
| <b>SALINITY</b>        | <14-44 ppt. Found in marine and estuarine habitats.  |
| <b>TEMPERATURE</b>     | Species dies below 3°C and needs at least 11°C to reproduce  |
| <b>SIMILAR SPECIES</b> | <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.                             |



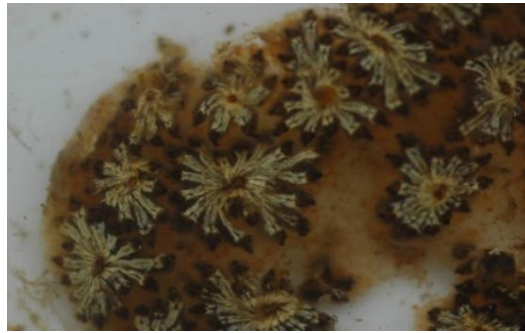
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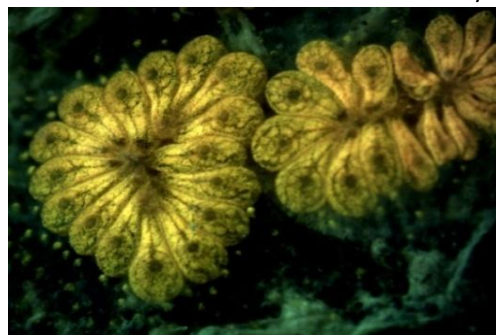
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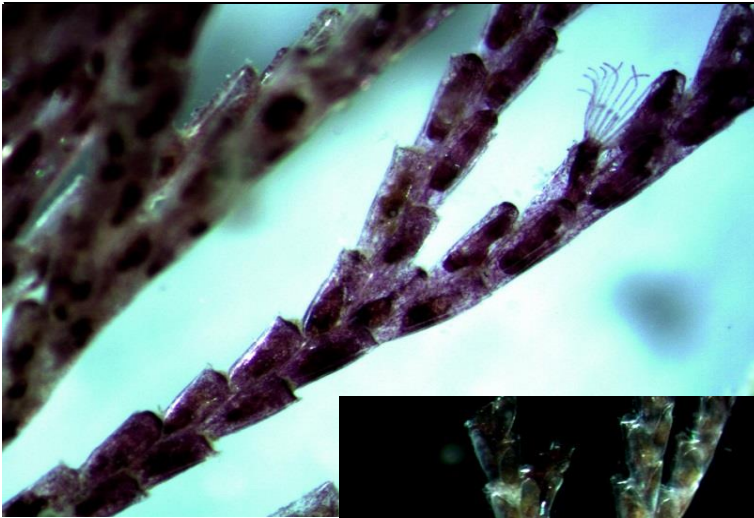
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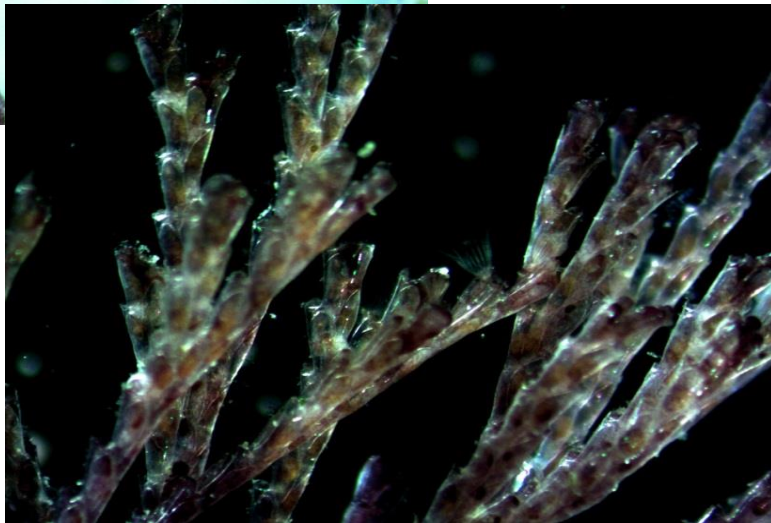
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## Bryozoa (encrusting) - *Bugula neritina*

|                        |  |
|------------------------|--|
| <b>DESCRIPTION</b>     | This upright branching bryozoan can be distinguished from the west coast Bugula species by it's dark purple/maroon color   |
| <b>RANGE</b>           | First reported on the west coast in Baja, California in 1905, it is now abundant up and down the west coast and was recently found in Ketchikan, Alaska. A species complex found around the world, it's origin is unclear. |
| <b>SIZE</b>            | Zooids have pointed corners, but without spines, ovicells large and globular, no avicularia (birds heads)  |
| <b>STATUS</b>          | Invasive/Cryptogenic   |
| <b>COLOR</b>           | dark purple, maroon to brick red colored, sometimes pale   |
| <b>HABITAT</b>         | Very common on docks and man made structures but also abundant on natural substrates   |
| <b>TIDAL HEIGHT</b>    | lower intertidal to subtidal with a deeper water morphotype  |
| <b>SALINITY</b>        | 14-50 ppt  |
| <b>TEMPERATURE</b>     | 12 - 30 C  |
| <b>SIMILAR SPECIES</b> | There are several other 'red' Bugulas, but not that currently occur on the US west coast. All the other Bugula's have avicularia, making this species easy to distinguish.   |



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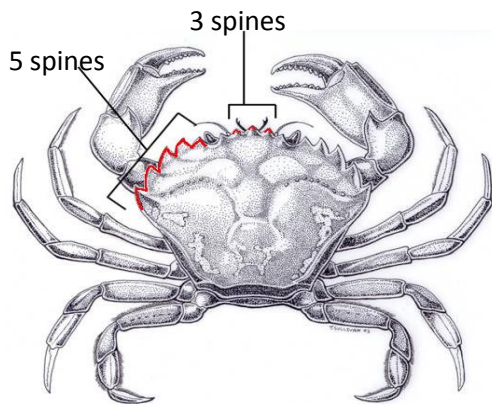


©Melissa Frey *Bugula neritina*



## European Green Crab - *Carcinus maenas*

|                        |   |
|------------------------|---|
| <b>DESCRIPTION</b>     | Pagurid marine crab with 5 spines on each side of the eye stalk and 3 between.  |
| <b>RANGE</b>           | San Diego, CA to British Columbia. Native to Europe, they are now as far north as the northern end of Vancouver Island in BC.   |
| <b>SIZE</b>            | A small species, adults up to 10 cm across carapace.  |
| <b>STATUS</b>          | Invasive  |
| <b>COLOR</b>           | mottled greens and browns, older specimens becoming very orange, especially on the ventral side   |
| <b>HABITAT</b>         | rocky shores, cobble beaches, sand flats, eel grass beds and salt marshes.  |
| <b>TIDAL HEIGHT</b>    | low intertidal to about 6 m   |
| <b>SALINITY</b>        | 6-35 ppt, estuarine and marine  |
| <b>TEMPERATURE</b>     | tolerant of a broad range of temperatures from below freezing to 35°C, though larvae do not survive below 10°C  |
| <b>SIMILAR SPECIES</b> | 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](http://www.wallawalla.edu/academics/departments/biology/rosario/inverts)

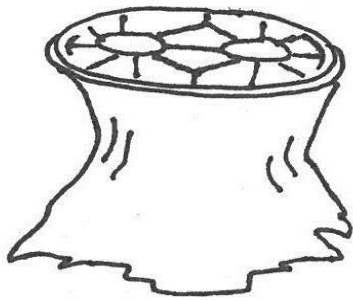
## Tunicate (solitary) - *Chelysoma productum*

**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. 6 plates surround each of the siphons, plus 2 plates between the siphons; all have concentric growth rings. Muscle strands that connect the two ventral disk plates are not visible through the tunic. Body is oval shaped, leaning slightly sideways.

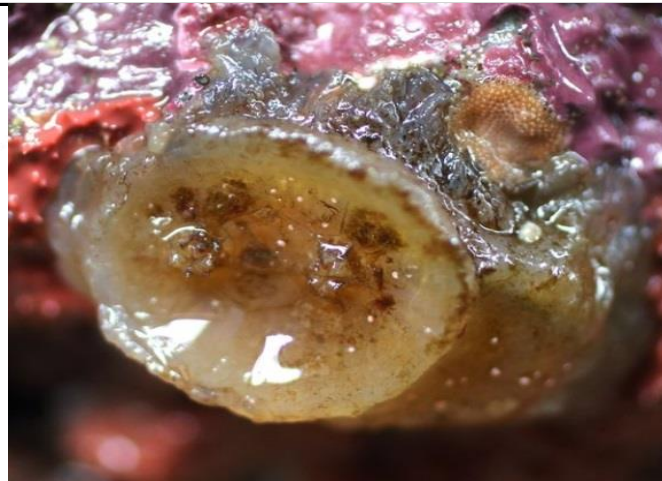
|                     |   |
|---------------------|---|
| <b>RANGE</b>        | Alaska to southern California   |
| <b>SIZE</b>         | 6 cm tall. Disk diameter 2.5 cm. Taller than wide.                    |
| <b>STATUS</b>       | Native  |
| <b>COLOR</b>        | Can be covered with fouling organisms. Tunic is tan, gray or whitish. |
| <b>HABITAT</b>      | In Kachemak Bay, found on rocks.                                      |
| <b>TIDAL HEIGHT</b> | Very low intertidal and subtidal to 50 m                              |
| <b>SALINITY</b>     | 15.2 to 33.3 ppt. (Homer & Seldovia harbor range)                     |
| <b>TEMPERATURE</b>  | neg 2.3 to 14.9° C (Homer & Seldovia harbor range)                    |

### SIMILAR SPECIES

*Chelysoma columbianum*; 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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© E.McKittrick-Ground Truth Trekking



siphon plates © Lisa Needles - CalPoly

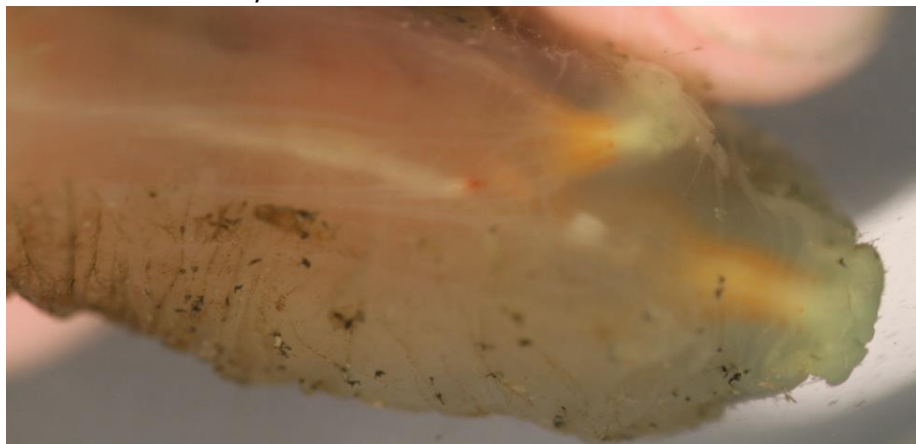
## Tunicate (Solitary) - *Ciona robusta* formerly *intestinalis*

|                        |   |
|------------------------|---|
| <b>DESCRIPTION</b>     | 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.  |
| <b>RANGE</b>           | 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. |
| <b>SIZE</b>            | to 15 cm.   |
| <b>STATUS</b>          | Invasive (find the complete record at <a href="http://invasions.si.edu/nemesis/index.html">http://invasions.si.edu/nemesis/index.html</a> )   |
| <b>COLOR</b>           | Body yellowish, often transparent, with orange dots on the top edges of the siphon  |
| <b>HABITAT</b>         | 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.   |
| <b>TIDAL HEIGHT</b>    | Subtidal, but sometimes in low intertidal   |
| <b>SALINITY</b>        | 11-50 ppt. Highly tolerant species that can reproduce up to 40 ppt  |
| <b>TEMPERATURE</b>     | cold temperate to tropical, 10-30°C, but can withstand temperatures as cold as -1°C for months at a time  |
| <b>SIMILAR SPECIES</b> | <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.

© Melissa Frey



© Melissa Frey

## Tunicate (Solitary) - *Ciona savignyi*

|                        |   |
|------------------------|---|
| <b>DESCRIPTION</b>     | 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.   |
| <b>RANGE</b>           | 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.  |
| <b>SIZE</b>            | Body long, up to 15 cm.   |
| <b>STATUS</b>          | Invasive. See the full record at <a href="http://invasions.si.edu/nemesis/">http://invasions.si.edu/nemesis/</a>  |
| <b>COLOR</b>           | Pale yellow, often transparent with white and yellow dots in body cavity. The tip of vas deferens is white.   |
| <b>HABITAT</b>         | Often found on docks and manmade structures such as boat hulls. They can form dense aggregates.   |
| <b>TIDAL HEIGHT</b>    | Subtidal to 60m.  |
| <b>SALINITY</b>        | 18-35 ppt   |
| <b>TEMPERATURE</b>     | Broad temperature range, 11-27°C  |
| <b>SIMILAR SPECIES</b> | 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. |



© Janna Nichols

Tip of siphon showing bright yellow lines ©M. Frey



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## 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.

|                        |  |
|------------------------|--|
| <b>RANGE</b>           | Circumpolar. Western distribution Japan, and Alaska to California.                                       |
| <b>SIZE</b>            | up to 5 cm in diameter.  |
| <b>STATUS</b>          | Native   |
| <b>COLOR</b>           | Red, orange, rose or pinkish-red. White when juvenile.   |
| <b>HABITAT</b>         | Rocks and hard substrates in areas with moderate to high wave action. Uncommon on artificial substrates. |
| <b>TIDAL HEIGHT</b>    | Low intertidal to at least 50m.  |
| <b>SALINITY</b>        | 25.4 to 33.3 ppt. (Homer & Seldovia Harbor deep sonde range)   |
| <b>TEMPERATURE</b>     | -0.4 to 12.4 °C (Homer & Seldovia Harbor deep sonde range)   |
| <b>SIMILAR SPECIES</b> | <i>Halocynthia aurantium</i> is similar with a smooth orange tunic but it is taller than wide.           |



©K. Iken Kachemak Bay



©Paul Norwood Sitka

## Tunicate (solitary) - *Corella inflata*

|                        |  |
|------------------------|--|
| <b>DESCRIPTION</b>     | 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.  |
| <b>RANGE</b>           | Common throughout Alaska. Found to the San Juan Islands, WA. Recently extended range south to San Francisco, CA, probably due to boat fouling.   |
| <b>SIZE</b>            | To 5 cm high   |
| <b>STATUS</b>          | Native   |
| <b>COLOR</b>           | Clear and colorless, often with flecks of white, gold or orange.   |
| <b>HABITAT</b>         | On rocks and floats and other man-made structure.  |
| <b>TIDAL HEIGHT</b>    | Low intertidal zone to sub tidal depths of 20 m  |
| <b>SALINITY</b>        | Minimum 27 ppt   |
| <b>TEMPERATURE</b>     | neg 2.3 to 14.9 °C (Homer and Seldovia Harbor range)   |
| <b>SIMILAR SPECIES</b> | <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). |
| <b>MORE FACTS</b>      | This tunicate is more than 99 percent water, yet it is preyed upon by several animals, including the morning sun star.   |

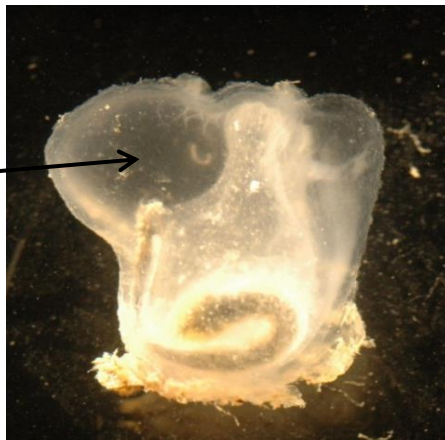


©G. Lambert



©Chela Zabin

brood chamber



©Melissa Frey

## NATIVE TUNICATES

### Tunicate (solitary) - *Corella willmeriana*

|                        |   |
|------------------------|---|
| <b>DESCRIPTION</b>     | 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). |
| <b>RANGE</b>           | 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.  |
| <b>SIZE</b>            | 1-5 cm tall. Taller than wide.  |
| <b>STATUS</b>          | Native  |
| <b>COLOR</b>           | Clear, with a faint pink or peach colored tinge. Glass-like. Tunic with small wrinkles. May have small white spots.   |
| <b>HABITAT</b>         | In Alaska found on settling plates hung 1m below water surface in harbors. Also, down to low intertidal and subtidally on hard surfaces.  |
| <b>TIDAL HEIGHT</b>    | Subtidal to 75 m  |
| <b>SALINITY</b>        | 15.2 to 33.3 ppt. (Homer & Seldovia harbor range)   |
| <b>TEMPERATURE</b>     | neg 2.3 to 14.9° C (Homer & Seldovia harbor range)  |
| <b>SIMILAR SPECIES</b> | <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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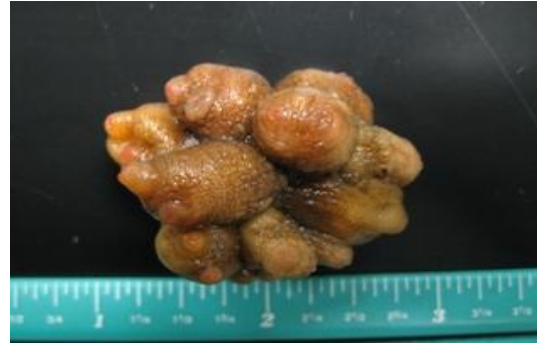
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## Tunicate (solitary) - *Dendrodoa pulchella*

|                        |   |
|------------------------|---|
| <b>DESCRIPTION</b>     | 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. |
| <b>RANGE</b>           | Circumpolar Arctic species, in the Pacific from Kamchatka to the Bering Strait. In Alaska, found in Nunivak Island and Kachemak Bay                             |
| <b>SIZE</b>            | To 2.5 cm in diameter.  |
| <b>STATUS</b>          | Native  |
| <b>COLOR</b>           | Grey, orange to pinkish.  |
| <b>HABITAT</b>         | Muddy sand. In Kachemak Bay seen washed up on beach after storms and on lines in harbors.   |
| <b>TIDAL HEIGHT</b>    | Subtidal to 100m.   |
| <b>SALINITY</b>        | 25.4 to 33.3 ppt. (Homer & Seldovia Harbor deep sonde range)  |
| <b>TEMPERATURE</b>     | -0.4 to 12.4 °C (Homer & Seldovia Harbor deep sonde range)  |
| <b>SIMILAR SPECIES</b> | 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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©ADF&G - KBRR

Photos from Kachemak Bay, AK



## Tunicate (colonial) *Didemnum vexillum*

|                        |  |
|------------------------|--|
| <b>DESCRIPTION</b>     | 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.   |
| <b>RANGE</b>           | 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.   |
| <b>SIZE</b>            | Can form extensive mats, meters across.  |
| <b>STATUS</b>          | Invasive, see the complete record at <a href="http://invasions.si.edu/nemesis/">http://invasions.si.edu/nemesis/</a>   |
| <b>COLOR</b>           | variable, pale tan to orange.  |
| <b>HABITAT</b>         | 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.   |
| <b>TIDAL HEIGHT</b>    | low intertidal to about 81 m   |
| <b>SALINITY</b>        | 18-40 ppt, but survives best between 26-30 ppt   |
| <b>TEMPERATURE</b>     | -2 - 24°C, needs temperatures > 9°C to reproduce   |
| <b>SIMILAR SPECIES</b> | 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 6 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

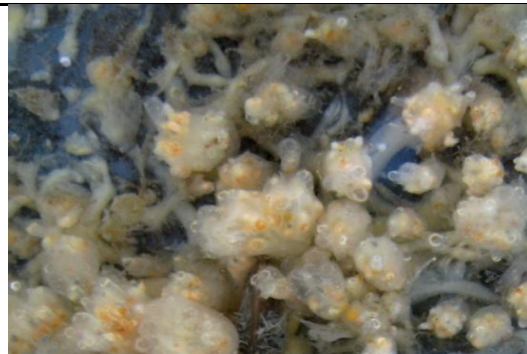


"dangle" ©Marnie Chapman

Pictures all from Whiting harbor, Sitka, Alaska

## Tunicate (colonial) - *Distaplia alaskensis*

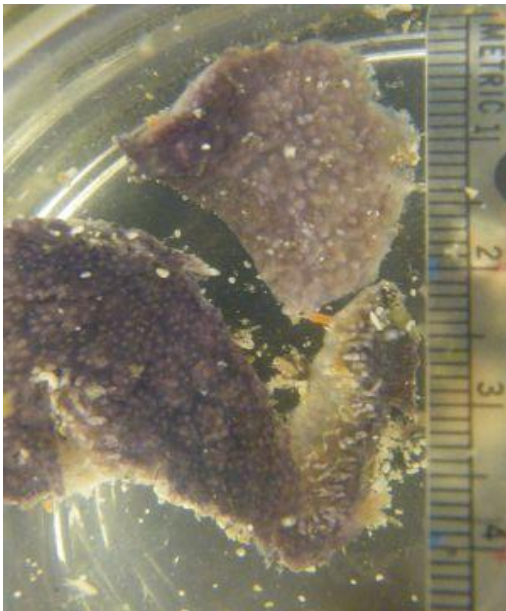
|                        |   |
|------------------------|---|
| <b>DESCRIPTION</b>     | Colonies consist of several cone-shaped lobes generally narrowing from the top to the base with a small area of attachment. The lobes are elongated and flat-topped. Lateral offshoots can sometimes cover settling plate surface without many lobes attached.          |
| <b>RANGE</b>           | This species was undescribed until 2001 and was only found on manmade structures in Homer Harbor and Cordova Marina.  |
| <b>SIZE</b>            | Colonies up to 5 cm in length always subdivided into numerous lobes < 3 cm in diameter.   |
| <b>STATUS</b>          | Unknown origin  |
| <b>COLOR</b>           | Orange, peach or yellow to tan. Translucent, shiny tunic.   |
| <b>HABITAT</b>         | 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. |
| <b>TIDAL HEIGHT</b>    | Shallow sub tidal.  |
| <b>SALINITY</b>        | 15.2 to 33.3 ppt. (Homer & Seldovia Harbor range)   |
| <b>TEMPERATURE</b>     | -2.3 to 14.9 °C (Homer and Seldovia Harbor range)   |
| <b>SIMILAR SPECIES</b> | <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*

|                        |   |
|------------------------|---|
| <b>DESCRIPTION</b>     | 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. |
| <b>RANGE</b>           | Alaska to Southern California. In Alaska it has been seen in Prince William Sound, Kodiak Island and in the Sitka area.   |
| <b>SIZE</b>            | Most colonies are less than 2 cm in diameter, though they can be as large as 10 cm.   |
| <b>STATUS</b>          | Native  |
| <b>COLOR</b>           | Variable, pale orange, yellow, pink, dark purplish-red, or brown  |
| <b>HABITAT</b>         | rocky shore, and man-made structures.   |
| <b>TIDAL HEIGHT</b>    | Intertidal to 50 m.   |
| <b>SALINITY</b>        | High salinity species   |
| <b>TEMPERATURE</b>     | Cold water species  |
| <b>SIMILAR SPECIES</b> | <i>Distaplia alaskensis</i> can be distinguished from this species by its more columnar lobes and often paler color.  |



©Paul Norwood



©Heather Meuret Woody

## Tunicate (solitary) - *Halocynthia aurantium*

|                        |  |
|------------------------|--|
| <b>DESCRIPTION</b>     | 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.   |
| <b>RANGE</b>           | 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.  |
| <b>SIZE</b>            | <18 cm   |
| <b>STATUS</b>          | Native   |
| <b>COLOR</b>           | Bright orange-red, often unfouled and may appear shiny. Looks like a peach.  |
| <b>HABITAT</b>         | Attaches to rocks. Often seen washed up on beach or comes up on hooks when fishing for bottom fish.  |
| <b>TIDAL HEIGHT</b>    | 0 to 100 m deep. Most common in depths of 40-100 m in the SE Bering, NE Bering, and SE Chukchi Seas.   |
| <b>SALINITY</b>        | 28.0-33.3 ppt Seldovia, AK station   |
| <b>TEMPERATURE</b>     | 0-12.4 °C Seldovia, AK station   |
| <b>SIMILAR SPECIES</b> | <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. |
| <b>OTHER FACTS</b>     | 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*

|                        |   |
|------------------------|---|
| <b>DESCRIPTION</b>     | Common name: Sea hedgehog. Body unstalked, stout. Distinctive flexible bristles. Bristles sometimes completely covered in silt making the animal hard to detect.  |
| <b>RANGE</b>           | Japan, Aleutian Islands, and Alaska south to Southern California.   |
| <b>SIZE</b>            | 5 cm across to 10 cm tall   |
| <b>STATUS</b>          | Native  |
| <b>COLOR</b>           | Dark brown tunic under bristles; siphons red or orange.   |
| <b>HABITAT</b>         | Rocky or gravel areas. Usually near current.  |
| <b>TIDAL HEIGHT</b>    | Intertidal to 175m.   |
| <b>SALINITY</b>        | 15.2 to 33.2 ppt. (Homer & Seldovia Harbor range)   |
| <b>TEMPERATURE</b>     | neg 2.3 to 14.9° C (Homer & Seldovia Harbor range)  |
| <b>SIMILAR SPECIES</b> | 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



©E. McKittrick-Ground Truth Trekking

**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.

|                        |   |
|------------------------|---|
| <b>RANGE</b>           | Alaska's Aleutian Islands south to Pt Conception in California  |
| <b>SIZE</b>            | Carapace width to 25 cm (9 inches), but typically less than 20 cm   |
| <b>STATUS</b>          | Native; see the full record at <a href="http://www.dfg.ca.gov/marine/dungeness_crab.asp">http://www.dfg.ca.gov/marine/dungeness_crab.asp</a>  |
| <b>COLOR</b>           | Light reddish brown on the back, with a purplish wash anteriorly in some specimens. Underside whitish to light orange.  |
| <b>HABITAT</b>         | Rock, sand and eelgrass   |
| <b>TIDAL HEIGHT</b>    | Subtidal to offshore  |
| <b>SALINITY</b>        | Normal range 10–32ppt; 15ppt optimum for hatching   |
| <b>TEMPERATURE</b>     | Normally found from 3–19°C  |
| <b>SIMILAR SPECIES</b> | 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). |



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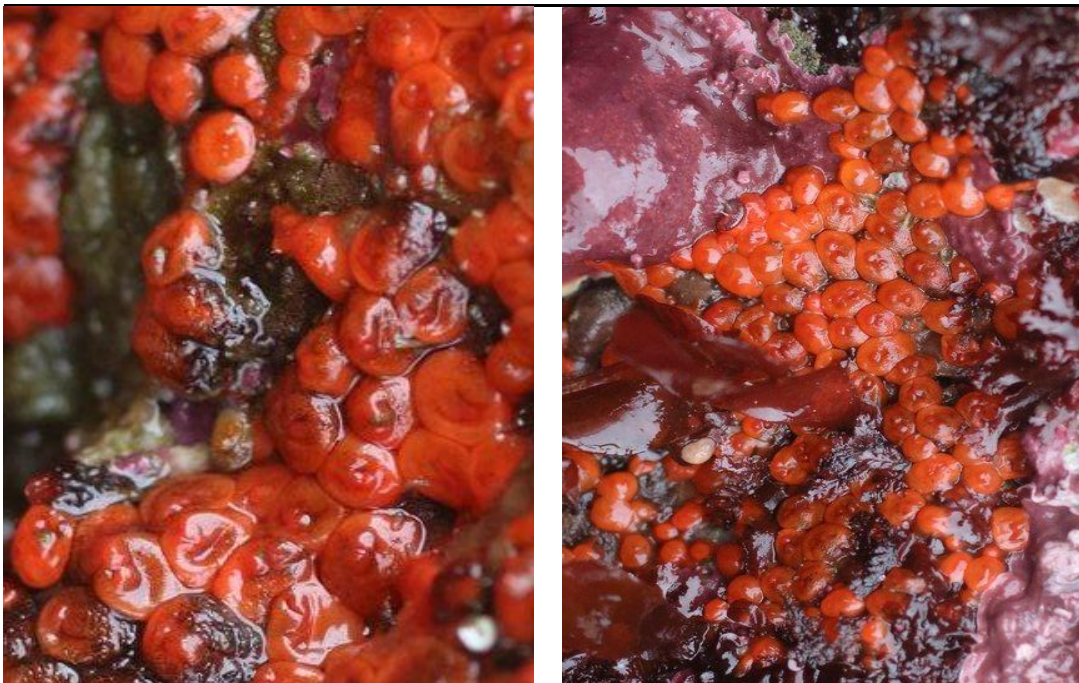


© bioweb.uwlax.edu red rock crab - note black tipped claws

## NATIVE TUNICATES

### ***Tunicate (colonial) - Metandrocarpa taylori***

|                        |   |
|------------------------|---|
| <b>DESCRIPTION</b>     | A colonial species with small globular bright orange or red zooids. Siphons are short and anterior. Colonies may be up to 20cm in size, 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 6mm 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>     | neg 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.   |

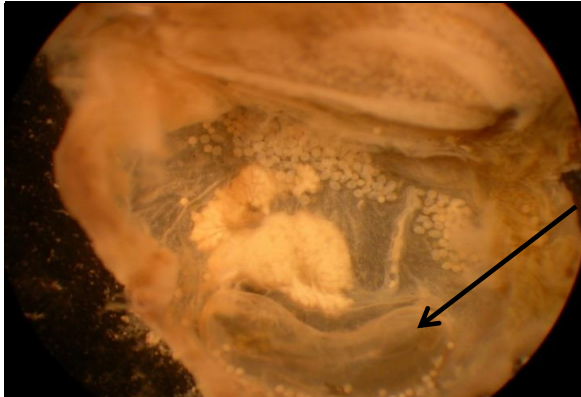


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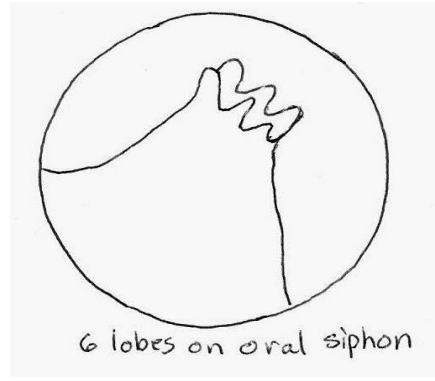
**Tunicate (solitary) - *Molgula citrina***

|                     |   |
|---------------------|---|
| <b>DESCRIPTION</b>  | 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. |
| <b>RANGE</b>        | 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.                   |
| <b>SIZE</b>         | Body length usually 6-8 mm but can reach 2.3 cm   |
| <b>STATUS</b>       | Unknown: introduced or a range extension  |
| <b>COLOR</b>        | Clear to dull greenish or olive green   |
| <b>HABITAT</b>      | Attaches to firm substrates such as rocks   |
| <b>TIDAL HEIGHT</b> | Low intertidal and sub tidal to offshore  |
| <b>SALINITY</b>     | 27.9 - 32.4 ppt (Seldovia Harbor range)   |
| <b>TEMPERATURE</b>  | 1.7-11.6 °C (Seldovia Harbor range)   |

**SIMILAR SPECIES** Unlike *Ascidia* which is attached on its side, it is attached at its base. *Molgula citrina* is smaller than other Molgulids, has the flattened, u shaped gut (less flattened in *M. manhattensis*), has 7 branchial folds (requires dissection), broods its larvae and has distinctively long, slender oviducts (marked with the arrow in first photo, requires dissection).



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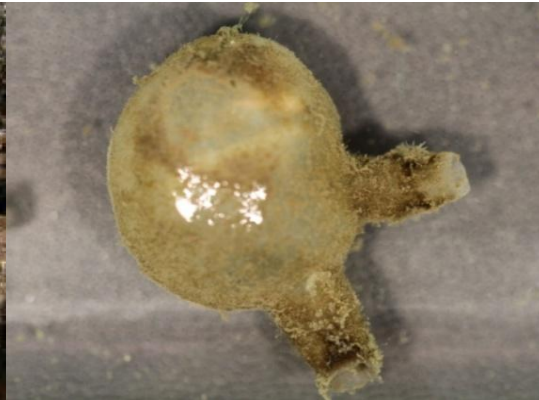


## Tunicate (solitary) - *Molgula manhattensis*

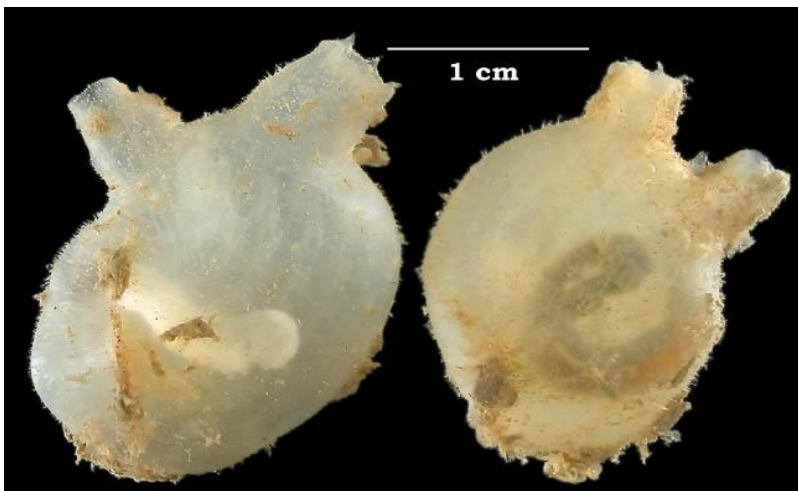
|                        |  |
|------------------------|--|
| <b>DESCRIPTION</b>     | grape-like tunicate, sometimes laterally flattened, with 6 lobes on the oral (incurrent) siphon, thick tunic, often with some papillae (hair-like projections). Larvae with a tail   |
| <b>RANGE</b>           | Mexico 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   |
| <b>SIZE</b>            | Body length to 1-5 cm.   |
| <b>STATUS</b>          | Invasive   |
| <b>COLOR</b>           | Clear, grey with a 'u' shaped intestine sometimes visible through the body wall, oriented vertically, body often sediment covered.   |
| <b>HABITAT</b>         | 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.  |
| <b>TIDAL HEIGHT</b>    | Low intertidal, but generally subtidal to 90 meters depth.   |
| <b>SALINITY</b>        | 5-40 ppt: estuarine to marine  |
| <b>TEMPERATURE</b>     | tolerates a broad temperature range  |
| <b>SIMILAR SPECIES</b> | 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> ). Larvae are not brooded. |



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## Tunicate (solitary) - *Molgula pacifica*

|                        |   |
|------------------------|---|
| <b>DESCRIPTION</b>     | 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.   |
| <b>RANGE</b>           | Alaska and Washington   |
| <b>SIZE</b>            | Body length to 2.5cm  |
| <b>STATUS</b>          | Native  |
| <b>COLOR</b>           | Clear, with 's' shaped intestine visible through the body wall, though body often covered with foreign materials, including algae. Siphons are pink to orange   |
| <b>HABITAT</b>         | Attaches to firm substrates, rocks intertidally. In harbor; floats, ropes. One of the most common species in Arctic waters.   |
| <b>TIDAL HEIGHT</b>    | Low intertidal and sub tidal to offshore  |
| <b>SALINITY</b>        |   |
| <b>TEMPERATURE</b>     |   |
| <b>SIMILAR SPECIES</b> | Unlike <i>Ascidia</i> which is attached on its side, Molgulas are attached at the base. All Molgulids have 6 lobes on the oral siphons and 4 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 accessive 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. |

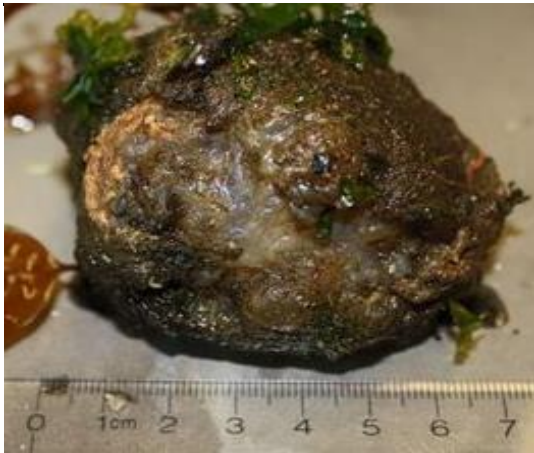


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## Tunicate (solitary) - *Molgula retortiformis*

**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 4 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>     | neg 2.3 to 14.9 °C (Homer and 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 6 lobes on the oral siphon and 4 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. |



©Paul Norwood Sitka , AK



©SERC, Note 4 lobes on atrial siphon



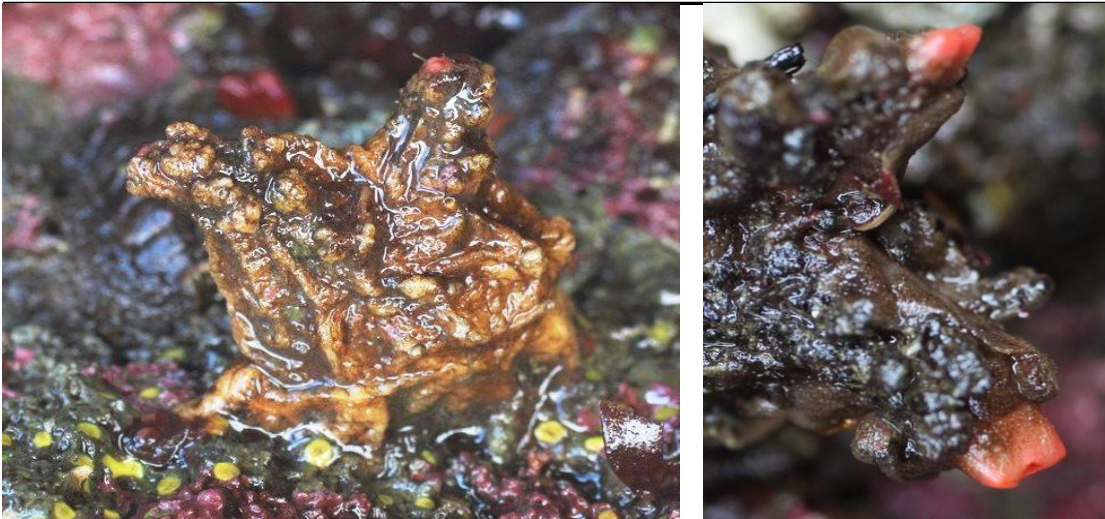
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©C. Bursch-KBRR

## Tunicate (solitary) - *Pyura haustor*

|                        |   |
|------------------------|---|
| <b>DESCRIPTION</b>     | 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. |
| <b>RANGE</b>           | Alaska to California  |
| <b>SIZE</b>            | Up to 5 cm tall and 3.5 cm wide   |
| <b>STATUS</b>          | Native  |
| <b>COLOR</b>           | Brown to reddish. Can be covered with encrusting organisms. Siphons bright red but can be retracted making the tunicate much harder to see.   |
| <b>HABITAT</b>         | Rocky habitats and cryptic crevices. Among kelp holdfasts.  |
| <b>TIDAL HEIGHT</b>    | Low intertidal to 200 m.  |
| <b>SALINITY</b>        | 15.2 to 33.3 ppt. (Homer & Seldovia harbor range)   |
| <b>TEMPERATURE</b>     | neg 2.3 to 14.°9 C (Homer & Seldovia harbor range)  |
| <b>SIMILAR SPECIES</b> | Nothing similar in Alaska.  |



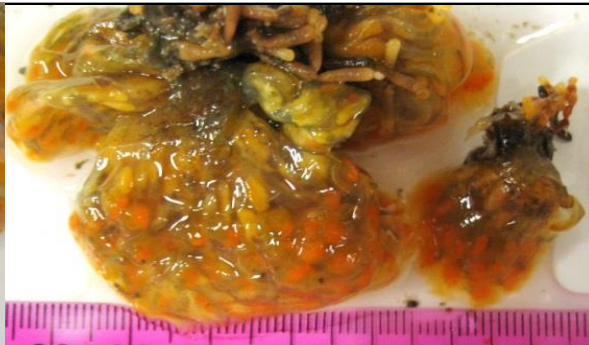
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## Tunicate (colonial) - *Ritterella pulchra*

|                        |   |
|------------------------|---|
| <b>DESCRIPTION</b>     | 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 sometime just one short lobe. |
| <b>RANGE</b>           | Alaska to southern California   |
| <b>SIZE</b>            | Colony up to 10 cm across. Individual lobes about 3 times longer than wide.   |
| <b>STATUS</b>          | Indigenous (or Native)  |
| <b>COLOR</b>           | Reddish-orange zooids with base yellow. Tunic is quite transparent.   |
| <b>HABITAT</b>         | Rocky cliffs or overhangs where shaded. May be washed up on beach after storm.  |
| <b>TIDAL HEIGHT</b>    | Extreme low intertidal down to shallow subtidal.  |
| <b>SALINITY</b>        | 15.2 to 33.3 ppt. (Homer & Seldovia harbor range)   |
| <b>TEMPERATURE</b>     | neg 2.3 to 14.9° C (Homer & Seldovia harbor range)  |
| <b>SIMILAR SPECIES</b> | <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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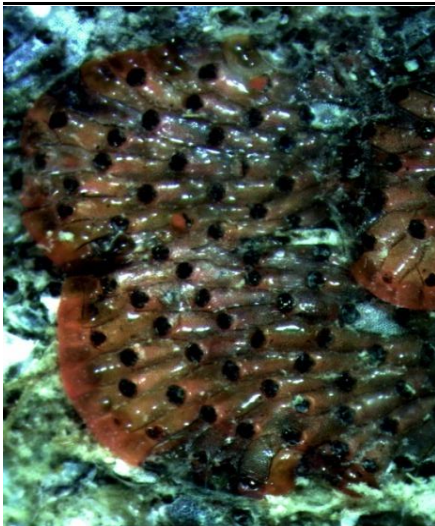
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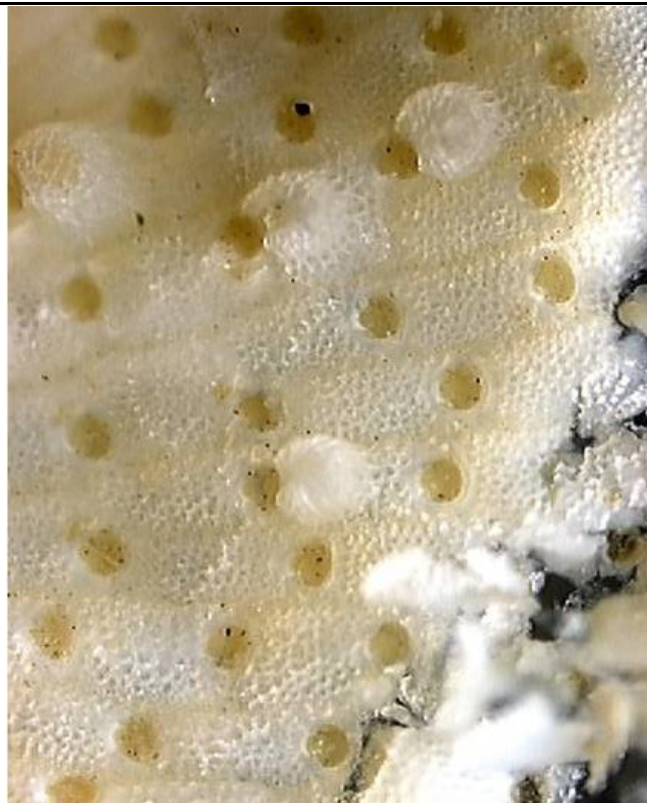
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## Bryozoa (encrusting) - *Schizoporella japonica*

|                        |   |
|------------------------|---|
| <b>DESCRIPTION</b>     | This encrusting bryozoan is sheet-like and the zooids are pale to bright orange, with ridged and porous ovicells.   |
| <b>RANGE</b>           | From San Diego, California to Alaska. Common all along the west coast. Originally from Japan, It was recorded in British Columbia as early as 1970.   |
| <b>SIZE</b>            | Zooids basically rectangular, more rounded distally, zooids alternating and regularly spaced.   |
| <b>STATUS</b>          | Invasive  |
| <b>COLOR</b>           | pale to bright orange.  |
| <b>HABITAT</b>         | Often found on panels, but also common on natural substrates.   |
| <b>TIDAL HEIGHT</b>    | lower intertidal to subtidal  |
| <b>SALINITY</b>        |   |
| <b>TEMPERATURE</b>     |   |
| <b>SIMILAR SPECIES</b> | <i>Watersipora subtorquata</i> (first photo) is also orange and looks similar at first glance, but the black opercula or black outline around each zooid distinguishes it from <i>Schizoporella</i> . |



© Melissa Frey *W. subtorquata*



©Linda McCann *Schizoporella japonica*

## 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.

|                        |  |
|------------------------|--|
| <b>RANGE</b>           | 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.  |
| <b>SIZE</b>            | Body usually 8-12 cm. long, but up to 20 cm. Stalk about 1/3 total length  |
| <b>STATUS</b>          | 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>   |
| <b>COLOR</b>           | Colors can range from yellowish to reddish to brownish. Sometimes they are yellow white stripes on the siphons. The juveniles often pale orange.   |
| <b>HABITAT</b>         | 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.   |
| <b>TIDAL HEIGHT</b>    | Low intertidal to shallow subtidal   |
| <b>SALINITY</b>        | 18-35 ppt. Found in marine and estuarine habitats.   |
| <b>TEMPERATURE</b>     | 11-27°C, found to -2 °C but need at least 15 °C to reproduce   |
| <b>SIMILAR SPECIES</b> | <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 2 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>  | neg 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, 2 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 5-7 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*

|                        |  |
|------------------------|--|
| <b>DESCRIPTION</b>     | 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.  |
| <b>RANGE</b>           | Range not well known. Originally collected from the Pribilof Islands, Ritter, W. E. 1899. Commonly seen on the beaches of Kachemak Bay.  |
| <b>SIZE</b>            | Usually <10 cm in colony diameter.   |
| <b>STATUS</b>          | Native   |
| <b>COLOR</b>           | Bright orange or pinkish when fresh.   |
| <b>HABITAT</b>         | Unknown, often seen when washed up on beaches.   |
| <b>TIDAL HEIGHT</b>    | Subtidal to 115 m Depth.   |
| <b>SALINITY</b>        | 25.4 to 33.3 ppt. (Homer & Seldovia Harbor deep sonde range)   |
| <b>TEMPERATURE</b>     | -0.4 to 12.4 °C (Homer & Seldovia Harbor deep sonde range)   |
| <b>SIMILAR SPECIES</b> | 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*

|                        |   |
|------------------------|---|
| <b>DESCRIPTION</b>     | 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 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. |
| <b>RANGE</b>           | Found in Bering Sea and Japan. In Alaska found from the Aleutians to Kachemak Bay. Also found in Washington state.  |
| <b>SIZE</b>            | Colonies 10 cm in diameter or greater   |
| <b>STATUS</b>          | Native  |
| <b>COLOR</b>           | Variable, white, pink, orange, peach or brown.  |
| <b>HABITAT</b>         | Wave washed rocks, open coast. Rocky overhangs and vertical walls. May be washed up on beaches after storms.  |
| <b>TIDAL HEIGHT</b>    | Lower intertidal, subtidal to 366 m.  |
| <b>SALINITY</b>        | 15.2 to 33.3 ppt. (Homer & Seldovia harbor range)   |
| <b>TEMPERATURE</b>     | neg 2.3 to 14.9° C (Homer & Seldovia harbor range)  |
| <b>SIMILAR SPECIES</b> | 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.   |



©C. Bursch KBRR-All photos from Kachemak Bay, Alaska

## Macroalgae (Brown) - *Undaria pinnatifida*

|                        |  |
|------------------------|--|
| <b>DESCRIPTION</b>     | 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.  |
| <b>RANGE</b>           | 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.   |
| <b>SIZE</b>            | Body from 1-3 m long, but typically up to 1.5 m  |
| <b>STATUS</b>          | Invasive, see complete record at <a href="http://undaria.nisbase.org">http://undaria.nisbase.org</a>   |
| <b>COLOR</b>           | appears yellow green to dark brown colored when you remove from the water  |
| <b>HABITAT</b>         | 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.   |
| <b>TIDAL HEIGHT</b>    | low intertidal to 25 m, but most common at 1-3 m   |
| <b>SALINITY</b>        | 20-38 ppt, but grows best above 27ppt  |
| <b>TEMPERATURE</b>     | 0-27C, but grows best below 12C  |
| <b>SIMILAR SPECIES</b> | 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*

## Bryozoa (encrusting) - *Watersipora subtorquata*

|                        |  |
|------------------------|--|
| <b>DESCRIPTION</b>     | 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.   |
| <b>RANGE</b>           | 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.  |
| <b>SIZE</b>            | 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  |
| <b>STATUS</b>          | Invasive   |
| <b>COLOR</b>           | bright orange with black opercula, zooids outlined in black.   |
| <b>HABITAT</b>         | 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.  |
| <b>TIDAL HEIGHT</b>    | lower intertidal to subtidal   |
| <b>SALINITY</b>        | 20-50 ppt  |
| <b>TEMPERATURE</b>     | 12 - 28 C  |
| <b>SIMILAR SPECIES</b> | <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). |



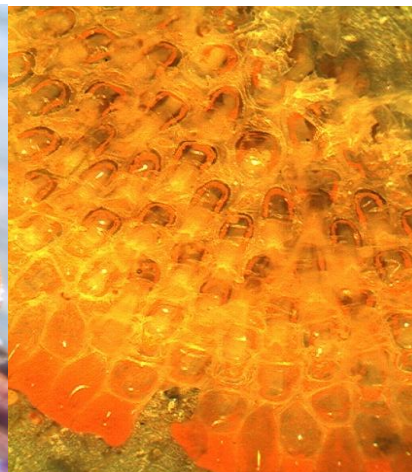
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©Linda McCann *Tegella aquilirostris*

## ***Bryozoa (branching) - Amathia verticillata (Zoobotryon)***

|                        |  |
|------------------------|--|
| <b>DESCRIPTION</b>     | upright bryozoan, with limp, cellophane noodle like branches   |
| <b>RANGE</b>           | First described from the Gulf of Naples, Italy in 1822. In the southeastern US and on the west coast from San Diego to San Francisco Bay, California. Possibly native to the Caribbean, it is now invasive worldwide.                                    |
| <b>SIZE</b>            | Zooids in single rows on long, wide, branches; grows up to 1 meter length  |
| <b>STATUS</b>          | Invasive   |
| <b>COLOR</b>           | clear to opaque  |
| <b>HABITAT</b>         | A warm water species, it is often found on docks and man made structures, but also grows on hard natural substrate such as mangroves   |
| <b>TIDAL HEIGHT</b>    | subtidal   |
| <b>SALINITY</b>        | 15-35 ppt, optimum between 20-30°C   |
| <b>TEMPERATURE</b>     | 10 - 35°C with large colonies forming over 22°C  |
| <b>SIMILAR SPECIES</b> | Recently revised to be a member of the genus <i>Amathia</i> , the species can be distinguished from others in this genus by it's longer, wider, spaghetti-like branches that can reach up to a meter in length and the linear arrangement of the zooids. |



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# References used for this tunicate guide:

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### **Books**

The Light and Smith Manual: Intertidal Invertebrates from Central California to Oregon. 2007. Fourth Edition, Completely Revised and Expanded. James T Carlton, editor. Univ. of California Press.

The Beachcombers Guide to Seashore Life in the Pacific Northwest

By: J. Duane Sept. 1999 Harbour Publishing.

Marine Invertebrates of the Pacific Northwest:

By: Eugene N. Kozloff. 1987 University of Washington Press

Marine Life of the Pacific Northwest. 2005.

By: Andy Lamb And Bernard Hanby

Southeast Alaska's Rocky Shores:

By: Rita M. O'Clair and Charles E. O'Clair. 1998 Plant Press

### **Online resources:**

#### **North American East coast**

Pictures and locality records for east coast species

[http://www.rosm.ca/recherche\\_espece/fiche\\_espece.php?recordID=96](http://www.rosm.ca/recherche_espece/fiche_espece.php?recordID=96)

Salem Sound Coastwatch program:

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

[http://www.sms.si.edu/irlspec/Species\\_Rpts.htm](http://www.sms.si.edu/irlspec/Species_Rpts.htm)

[http://www.salemsound.org/SSCW\\_MIS\\_Monitoring\\_Guide.pdf](http://www.salemsound.org/SSCW_MIS_Monitoring_Guide.pdf) A good resource for citizen monitors.

<http://www.salemsound.org/mis/misid.htm>

#### **North American West Coast**

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

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Link to BC Shellfish Growers Assoc. Aquatic Invasive Species Guide

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

Intertidal marine Invertebrates of the South Puget Sound

[Http://www.nwmarinelife.com/htmlswimmers/a\\_callosa.html](http://www.nwmarinelife.com/htmlswimmers/a_callosa.html)

Guide and key to species in Washington state

<http://www.wallawalla.edu/academics/departments/biology/rosario/inverts/index.html>

Marine Invaders of the Northeast pacific

<http://marineinvaders.lifedesks.org/image>

<http://bc biodiversity.lifedesks.org/>

Puget Sound Marine Invasive Species Volunteer Monitoring Program Guide

[http://psp.wa.gov/downloads/ANS/MISM\\_Online.pdf](http://psp.wa.gov/downloads/ANS/MISM_Online.pdf)



San Francisco area invasive species guide

<http://www.exoticsguide.org/>

species in the California Marine sanctuaries

<http://www.sanctuarysimon.org/species/index.php>

Arctic Bryozoa

[http://www.iopan.gda.pl/ekologia/Atlas\\_of\\_Arctic\\_Bryozoa/index.php](http://www.iopan.gda.pl/ekologia/Atlas_of_Arctic_Bryozoa/index.php)

General Tunicates

<http://depts.washington.edu/ascidian/>

**Europe**

<http://www.marlin.ac.uk/howtorecord.php>

<http://ascidians.com/>

<http://species-identification.org/about.php>

<http://www.marinespecies.org/aphia.php?p=webservice>

<http://www.habitas.org.uk/marinelife/index.html>

Invertebrates of Italy

<http://www.faunaitalia.it/checklist/introduction.html>

<http://bryozone.myspecies.info/category/bryozoa/bryozoa>

<http://data.gbif.org/welcome.htm>