

# Puget Sound Marine Invasive Species Identification Guide

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## ***Puget Sound Marine Invasive Species Volunteer Monitoring Program (MISM)***

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### ***Sponsored by:***



**Washington Department of Fish  
and Wildlife**  
**Aquatic Nuisance Species Program**  
600 Capitol Way North  
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**April 2008**

# MISM Target Species List 2/2008

## MARINE/ESTUARINE ORGANISMS\*

<u>Common Name</u>	<u>Scientific Name</u>
<b>PLANTS</b> (5 sp) (Spartina 4 sp) non-target but included due to association with green crab	
Japanese eelgrass	<b><i>Zostera japonica</i></b>
<b>MACRO ALGAE</b> (3 sp)	
Japanese kelp	<b><i>Undaria pinnatifida</i></b>
Caulerpa seaweed	<i>Caulerpa taxifolia</i>
Sargassum seaweed	<b><i>Sargassum muticum</i></b>
<b>INVERTEBRATES</b> (24 sp)	
<b>Mollusks - Bivalves</b> (9 sp):	
Clam, Asian	<b><i>Potamocorbula amurensis</i></b>
Clam, Atlantic gem	<b><i>Gemma gemma</i></b>
Clam, Northern quahog	<b><i>Mercenaria mercenaria</i></b>
Clam, purple varnish/mahogany	<b><i>Nuttalia obscurata</i></b>
Clam, Japanese	<i>Neotrapezium liratium</i>
Mussel, Atlantic ribbed	<b><i>Geukensia demissa</i></b>
Mussel, New Zealand green	<b><i>Perna spp</i></b>
Mussel, Japanese	<b><i>Musculista senhousia</i></b>
Mussel, gallo	<i>Mytilus galloprovincialis</i>
<b>Gastropods</b> (5 sp):	
Oyster drill, Japanese	<b><i>Ceratostoma inornatum</i></b>
Oyster drill, Atlantic/Eastern	<i>Urosalpinx cinerea</i>
Whelk, channeled	<i>Busycotypus canaliculatus</i>
Whelk, veined rapa	<i>Rapana venosa</i>
Asian mudsnail	<b><i>Batallaria attramentaria</i></b>
<b>Crustaceans</b> (3 sp.):	
Crab, European green	<b><i>Carcinus maenus</i></b>
Crab, mitten	<b><i>Eriocheir sinensis</i></b>
Crab, Japanese shore	<b><i>Hemigrapsus sanguineus</i></b>
<b>Polychaeta</b> (1 sp)	
Bamboo worm	<b><i>Clymenella torquata</i></b>
<b>Tunicates</b> (6 sp):	
Tunicate, club (solitary)	<b><i>Styela clava</i></b>
Tunicate (solitary)	<b><i>Ciona savignyi</i></b>
Tunicate (solitary)	<b><i>Molgula manhattensis</i></b>
Tunicate, chain (colonial)	<b><i>Botrylloides violaceus</i></b>
Tunicate, golden star (colonial)	<b><i>Botryllus schlosseri</i></b>
Tunicate (colonial)	<b><i>Didemnum sp.</i></b>

(32 species total)

\*Priority target species in **Bold**

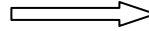
List extracted from **WA State Non-Native Aquatic Species Watchlist 8/2007**

## English Cordgrass - *Spartina angelica*

### Description

English Cordgrass, Atlantic native – most prevalent *Spartina* species in Puget Sound - abundant in north Puget Sound & Strait of Georgia. *S. angelica* grows in dense circular clumps unlike native vegetation - no rhizomes - perennial - leaves have angular appearance.

Note: all *Spartina* spp have a hollow stem - straight hairs on ligule or joint where leaf attaches to stem



**Size:** Tall - Plant H: 1.5 m – Blade W: 11-13mm  
leaves nearly horizontal to stem (45-90 degrees)

**Color:** Leaves are bright green to grayish green –  
flower spikes on reddish stems - flowers colorless  
blooming June-September



### Habitat

Tidal marsh

### Tide Height

Occupies wide range within tidal marsh habitat from low to high elevations.

### Salinity

5-40 ppt



### Similar Native Species

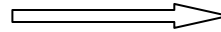
Seashore saltgrass (*Distichlis spicata*)

## Smooth Cordgrass - *Spartina alterniflora*

### Description

Atlantic native - present in Puget Sound. *S. alterniflora* grows in dense circular clumps – erect stems - usually distinct from native vegetation

Note: all *Spartina* spp have a hollow stem - straight hairs on ligule or joint where leaf attaches to stem



**Size:** Tall grass up to 2 m - Blade L: 20-55 cm W: 2-25 cm

**Color:** Leaves green-gray - base of shoots (leaf sheath around culmen) maroon or red - large flower spikes colorless - blooms late July-October

### Habitat

Tidal marsh

### Tide Height

Ranges from mean high water to about 1 meter from mean low water.

### Salinity

10-20 ppt optimal - tolerant of higher 50-60ppt



### Similar Native Species

Seashore saltgrass (*Distichlis spicata*)

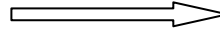
Seacoast bulrush (*Scripus maritimus*)

## Dense Flower Cordgrass - *Spartina densiflora*

### Description

Present in Puget Sound – uncommon. *S. densiflora* grows in dense tufts or clumps - no rhizomes - usually distinct from native vegetation.

Note: all *Spartina* spp have a hollow stem - straight hairs on ligule or joint where leaf attaches to stem



**Size:** Tall – Plant H: up to 1.5 m - Blade L: 12-43 cm - long narrow leaves w/ curled edges

**Color:** Leaves are tough, grayish green - flowers colorless blooming April-July

### Habitat

Among pickleweed or just below it on open mud.

### Tide Height

Upper intertidal near mean high water.

### Salinity

n/a



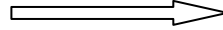
### Similar Native Species

## Salt meadow Cordgrass - *Spartina patens*

### Description

Rare in Puget Sound – occurs in Strait of Georgia. Rhizomatous grass with fine, flexible stems growing in clumps – difficult to identify - usually distinct from native vegetation –

Note: all *Spartina* spp. have a hollow stem - straight hairs on ligule or joint where leaf attaches to stem



**Size:** Plant H: up to 1.2 m (shorter than other *Spartina*) - thin leaves rolled inward Blade L:10-50 cm - W: 0.5-2 mm

**Color:** Leaves are green - flowers small branching and delicate



### Habitat

High salt marsh

### Tide Height

Middle to upper tidal marsh zones - favors higher elevations than other *Spartina*

### Salinity

n/a



### Similar Native Species

Seaside Arrow-grass (*Triglochin maritimum*): plant 20-120 cm tall - fleshy leaves extend from rhizome base

Dunegrass (*Leymus mollis*): bluish color, up to 1.5 m – leaf blades 6-15 cm, wider than *Spartina*

## Japanese Eelgrass – *Zostera japonica*

### Description

Japanese native found in Puget Sound - marine adapted vascular plant - fine bladed eelgrass - shorter and thinner blade than *Z. marina*

**Size:** leaves thin, flat, straight, limp - length to 30 cm and width 0.8-1.3 mm

**Color:** olive green.

### Habitat

Sheltered bays and estuaries - commonly associated with *Z. marina* and *ulva* - colonized historically unvegetated intertidal zones above *Z. marina* and significantly altered physical habitat structure - has naturalized in many areas

### Tidal Height

Upper intertidal above *Z. Marina* - on sandy or muddy substrates at depths of up to 1-3 meters

### Salinity

Marine and estuarine waters



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### Similar Native Species

*Zostera marina* - wider blade - usually deeper water



*Z. japonica* left – *Z. marina* right

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## Japanese kelp (wakame) - *Undaria pinnatifida*

### Description

Japanese native - status in Puget Sound not known. Annual algae - broad blade with obvious midrib and sporophylls (reproductive structure) at base. Mature plant blade deeply divided, young plant blade undivided - hold fast - may grow in kelp forest – popular Asian food source. Large flat fronds with leaf-like pinnae attached to central midrib.

**Size:** 1-3 m in length

**Color:** golden-brown – midrib lighter color

### Habitat

Protected waters such as bays and harbors. Colonizes numerous substrates including: rock reefs, cobble, piles, docks, floats, buoys and boats – abundant at waterline on floating objects. May also be found in association with kelp, seagrass and other seaweeds. Spores may attach to any surface.

### Tidal Height

Low intertidal to 18 m depth. Most common between 1-3 m depth.

### Salinity

Marine waters

### Temperature

Optimal growth in 12 deg C or cooler



### Similar Native Species

Winged kelp (*Alaria marginata*): similar appearance with mid rib or stipe – linear blades not divided or pinnate – smaller wing-like blades at base only

## Sargassum - *Sargassum muticum*

### Description

Japanese native brown algae naturalized in Puget Sound. Distinct small spherical float bladders attached individually to stipe.

**Size:** to 2 m or more in length – forms floating mats.

**Color:** yellowish brown or olive brown

### Habitat

Protected rocky areas – observed on sea surface as floating mats

### Tidal Height

Intertidal zone to subtidal

### Salinity

7-34 ppt

### Temperature

10-13 deg C



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### Similar Native Species

Northern Bladder Chain (*Cystoseira geminate*) – distinguished by chain of floats rather than individual floats of Sargassum

## **Caulerpa - *Caulerpa taxifolia***

### **Description**

Northern Australian native - not yet found in Puget Sound, present on west coast. Toxic, spreads rapidly, may spread from fragments, forms dense mats – capable of growing up to one inch per day, may survive up to ten days out of water. Leaves are distinct bright green feather-like leaf fronds, flat and extending upward from main stem.

**Size:** fronds about 1 cm wide, up to 65 cm high spaced 2 cm apart along root-like stem

**Color:** bright green

### **Habitat**

May colonize on any surface including rock, sand, or mud - from shallow to deep ocean waters. Occupies polluted and non-polluted waters.

### **Tidal Height**

Shallow to deep subtidal to 150 m

### **Salinity**

Marine waters

### **Temperature**

n/a



### **Similar Native Species**

none

## Asian Clam - *Potamocorbula amurensis*

### Description

Asian native, found in San Francisco Bay - may occur in Puget Sound. Valves of unequal length - shells partly exposed near sediment surface - found in dense aggregations.

**Size:** small 2-3 cm - shell halves are unequal in size giving an appearance of an "overbite"

**Color:** white, tan or yellow - no distinct markings

### Habitat

Bays and estuaries - most abundant on a variety of mixed mud-sand, found in mud, clay and sand substrates

### Tidal Height

Subtidal - occasionally intertidal

### Salinity

Found brackish to high salinity waters - tolerates pollution

### Temperature

Found from tropical to cold temperate waters.



### Similar Native Species

none

## Atlantic Gem Clam - *Gemma gemma*

### Description

Native to eastern N. America - found in Puget Sound. Shell is smooth or with fine concentric ridges and a glossy finish.

**Size:** very small - to 5 mm

**Color:** varies from white to pale reddish purple to dark reddish-purple with a glossy, smooth surface and fine concentric growth rings

### Habitat

Estuaries and bays, coastal mudflats - fine-grained substrates from sandy-mud to silt-sand

### Tidal Height

Intertidal to subtidal - 6 meters max depth

### Salinity

Estuarine and marine waters - 13-28 psu (practical salinity units)

### Temperature

n/a



### Similar Native Species

*Trasennella tantilla* ??– possible old name, Kozloff

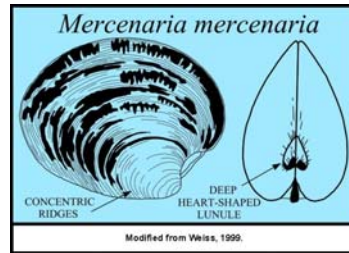
## Northern Quahog Clam - *Mercenaria mercenaria*

### Description

Native to Atlantic eastern N. America present in Puget Sound. Hard, thick shell off-set beak point with obvious concentric grooves and striations - each valve has three conspicuous teeth – heart-shaped lunule

**Size:** to 15 cm - long lived

**Color:** Exterior: light brown to gray - varying concentric bands and ridges on the shell – light brown film or periostracum. Interior: mostly white with a violet border near valve.



### Habitat

Bays and estuaries. Burrows (shallow) into sand or mud sediment

### Tidal Height

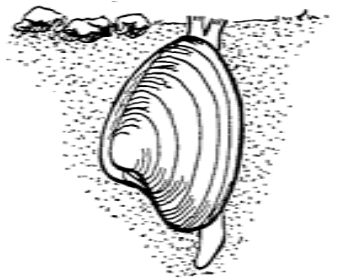
Lower shore from intertidal to 10-15 m subtidal. Prefers sandy environments.

### Salinity

n/a

### Temperature

n/a



### Similar native species

Butter clam (*Saxidomus gigantea*)

## Purple Varnish Clam - *Nuttallia obscurata*

### Description

Native to Japan - found in Puget Sound. Also known as dark mahogany clam. Shell distinct and easy to identify with rich brownish covering that peels, interior violet-purple.

**Size:** 40-75 mm

**Color:** Shell exterior: brown periostracum peeling like old varnish - Interior: purple or violet

### Habitat

Sand optimal substrate, also found in cobble to sandy mud – burrows to 20 cm

### Tidal Height

Mid to high intertidal - found in high intertidal areas where summer temperatures can be quite high

### Salinity

Marine - often associated with fresh water seeps

### Temperature

Broad thermal tolerance



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### Similar Native Species

None – could be confused with Manila clam *Venerupis philippinarum* which also has some purple on shell interior (left).



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## Japanese Clam - *Neotrapezium liratum*

### Description

Native to Asian Pacific - present in Puget Sound - species information scarce

**Size:**

**Color:**

**Habitat**

**Tidal Height**

**Salinity**

**Temperature**



**Similar Native Species**

## Atlantic Ribbed Mussel - *Geukensia demissa*

### Description

Native to Atlantic eastern N. America - present in Puget Sound. Shell off-set beak point - distinctive ridges or radial ribbing on shell surface. May form large, dense aggregations.

**Size:** Length 100-130 mm

**Color:** Shell: exterior olive-brown, yellowish-brown, dark brown or black - interior grayish white. Soft tissues are yellow.

### Habitat

Bays and estuaries. Anchors to saltmarsh plants, pebbles, shells, rocks, other firm substrates or each other in muddy habitats

### Tidal Height

Maine, largely subtidal. South Atlantic, intertidal zone to salt marsh. Most abundant mid-intertidal to lower saltmarsh marsh edge.

### Salinity

Wide tolerance from brackish to 70 ppt (twice as salty as open ocean)

### Temperature

Wide tolerance: 13-22 deg C – survives up to 56 deg C



### Similar Native Species

Pacific blue mussel *Mytilus trossulus*

California mussel *Mytilus californianus*

## New Zealand Green Mussel – *Perna* spp.

### Description

Native to Indo-Pacific region of Asia - present in Puget Sound. Shell exterior distinct green coloration - popular food shellfish due to large size.

**Size:** 8-10 cm - up to 15 cm

**Color:** Young mussels: brilliant green. Adults: darker green to brown.

### Habitat

Estuarine and marine, rocks, hard substrates including man-made structures - boats, docks, pilings, floats

### Tidal Height

Low Intertidal and subtidal zones to >18 m depth

### Salinity

18-33 ppt with extremes from 27-33 ppt high to 16 ppt low

### Temperature

11-32 deg C with 26-32 deg C optimal, but can survive short periods of extremes 10-35 deg C.



### Similar Native Species

None are green

## Japanese Mussel - *Musculista senhousia*

### Description

Native to Asian Pacific coast - found in Puget Sound. Unusual shell - small size and unique striped pattern. Highly adaptive forming dense mats.

**Size:** 10- 25 mm length to max 35 mm – 12 mm width

**Color:** shell exterior pale olive-green, yellow-green or greenish-brown with darker purple stripes radiating from center of growth out to shell margin - lustrous purplish-gray interior

### Habitat

Hard and soft substrates - natural beach and man-made structures including macro algae, rocks, docks and pilings.

### Tidal Height

Intertidal and shallow subtidal zones to 20 m depth.

### Salinity

Ranges from 17-37 ppt

### Temperature

Ranges from 17-27 deg C



### Similar Native Species

None

## Gallo Mussel - *Mytilus galloprovincialis*

### Description

Mediterranean native - present in Puget Sound. Commonly used in aquaculture.

**Size:** Large mussel usually 5-7cm up to 15 cm

**Color:** Dark blue or brown to almost black

### Habitat

Common on rocky shoreline with high wave energy and water flow – also found in protected bays - in both marine and estuarine habitats. Will utilize artificial surfaces such as pilings and docks.

### Tidal Height

Low Intertidal to subtidal

### Salinity

marine

### Temperature

n/a



### Similar Native Species

Identical to and indistinguishable from Pacific blue mussel *Mytilus trossulus*

## Japanese Oyster Drill - *Ceratostoma inornatum*

### Description

Native to Asia - present in Puget Sound. Associated with shellfish aquaculture - feeds on young oysters. Shell solid-looking. Whorls about five or six - each with about eight low transverse ribs and faint spiral lines, some more like raised threads. Aperture oval - canal rather short and open in the early stages of growth, usually closed later.

**Size:** Narrow and elongate - up to 3 cm

**Color:** ranges from white to yellow and brown;  
inside of aperture brown or yellow - operculum light brown - no periostracum.

### Habitat

Estuarine and marine habitats - associated with shellfish beds – gravel, mud, sand beaches

### Tidal Height

n/a

### Salinity

n/a

### Temperature

n/a



### Similar Native Species

Similar to leafy hornmouth *Ceratostoma foliatum* of rocky shores, but smaller and less conspicuously ornamented.

## Atlantic/Eastern Oyster Drill - *Urosalpinx cinerea*

### Description

Native to northwestern Atlantic - present in Puget Sound. Identifiable by 5 whorls with 9-12 vertical rounded ribs per whorl.

**Size:** 30-35 mm length - females larger than males

**Color:** Shell varied - yellow with brown streaks, occasionally orange - will bleach on beach - interior is purple, reddish brown or yellow. Operculum is orange or yellow-brown.

### Habitat

In bays and estuaries. Common on rocks and oyster reefs. Feeds on barnacles, oysters, mussels, and sometimes snails.

### Tidal Height

Intertidal to shallow subtidal to a max, depth of 15 m.

### Salinity

Can live in salinities as low as 13-15 ppt.

### Temperature

n/a



### Similar Native Species

## Channeled Whelk - *Busycotypus canaliculatus*

### Description

Native to U.S. east coast - present in Washington – status in Puget Sound pending. Conical spire with 5-6 whorls - common conch shape with large tapered aperture

**Size:** up to 185 mm

**Color:** white, pink to orange-brown. Live whelk are covered with thin grayish-brown tissue or mantle

### Habitat

Buried in or crawling on mud and sand bottoms. Feeds on young clams, mussels and oysters.

### Tidal Height

intertidal to subtidal

### Salinity

n/a

### Temperature

n/a



### Similar Native Species

## **Veined Rapa Whelk - *Rapana venosa***

### **Description**

Native to western Pacific – status in Puget Sound pending. Shell globose - short spire and large body whorl - diagnostic deep orange color in the aperture and on the columella. Feed on molluscs

**Size:** up to 185 mm

**Color:** gray to reddish-brown with dark brown dashes on the spiral ribs. Most specimens have distinctive black veins through the shell.

### **Habitat**

Compact, sandy bottoms where it burrows into substrates.

### **Tidal Height**

Marine and estuarine - ???tidal range

### **Salinity**

Tolerates low salinities and oxygen deficient waters

### **Temperature**

Tolerates wide temperature ranges



### **Similar Native Species**

### **Asian mudsnail - *Batillaria attramentaria***

#### **Description**

Asian Pacific native found in Puget Sound. Small shell elongated, tapered with 8-9 whorls. Displaces native snail and abundantly populates invaded areas.

**Size:** 1.5 cm in first year - up to 3.5 cm in 8-10 years

**Color:** gray with brown bead-like finish, narrow light colored band swirl upward from aperture to tip

#### **Habitat**

Marine and estuarine habitats, including riparian areas. Mudflats and salt marshes including associated channels and ponds

#### **Tidal Height**

High to mid-intertidal zones

#### **Salinity**

n/a

#### **Temperature**

n/a



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#### **Similar Native Species**

None

## European Green Crab - *Carcinus maenas*

### Description

European native found on outer coast of Washington and British Columbia - not yet in Puget Sound. Hairless shorecrab with 5 distinct points on leading edge of carapace, radiating from eye to forearm - hind legs (last pair) flat – not always green.

**Size:** small first-year 3-6 cm carapace width - adult up to 10 cm or 3.5 inches - males are larger in same age class - measure carapace at widest point

**Color:** carapace dorsum (back) mottled dark green with yellowish spotting - variable - ventrum (underbody) lighter greenish, yellow to red or orange

### Habitat

Protected shorelines, shallow bays, mudflats, lagoons, estuaries or near fresh water seeps and outfalls - associated w/ spartina, eelgrass and oyster beds - may seek cover of shell bags, rocks or large debris. Young settle in saltmarsh margins.

### Tidal Height

From high intertidal saltmarsh to subtidal - moves seasonally: shallow subtidal to intertidal in summer - deeper water (subtidal) in winter – young recruits found in higher zones in/near saltmarsh

### Salinity

Tolerates wide range 4-54 ppt – optimal 15-34 ppt

### Temperature

Tolerates wide temperature range but requires >10 deg.C to grow - moves seasonally with temperature fluctuations



### Similar Native Species

Most often confused with Helmet crab *Telmessus cheiragonus* – also native shore crabs, young Dungeness and others – see comparative ID sheet for green crab.

## Mitten Crab - *Eriocheir sinensis*

### Description

Native to China - not yet in Puget Sound. Catadromous species - display distinct hairy mit-like appendages - claws equal in size with white tips and hair. Four spines on carapace either side of eye stalk – u-shaped intend between eyes. Migrates great distances along streams, rivers and estuaries.

**Size:** 20-45 mm – max 80 mm

**Color:** Light brown to olive green in color.

### Habitat

Spend 2-5 yrs upstream in fresh water. Migrate downriver to reproduce in estuaries. Will borrow in banks and levees along estuaries and streams/rivers.

### Tidal Height

Riverine and estuarine associated but may drift into neighboring shorelines with outflow

### Salinity

In fresh and salt water – reproduces in salt water, offspring migrate to fresh water

### Temperature

n/a



### Similar Native Species

None with mitts or tolerant of fresh water

## Japanese Shore Crab - *Hemigrapsus sanguineus*

### Description

Native to coastal western Pacific (Japan-Russia) - not yet in Puget Sound. Small shorecrab with distinctly striped legs and spotted claws - carapace has 3 points on each side of eye along leading edge. Males have distinctive fleshy, bulb-like structure at the base of the moveable finger on the claws. Easily confused with native *H. nudus* or *H. oregonensis*.

**Size:** 35-42 mm carapace width

**Color:** pink to green to brown to purple – dark bands on legs - red spots on claws

### Habitat

Aggregate under rocks. Can also live on artificial structures and on mussel beds and oyster reefs.

### Tidal Height

Versatile species ranging from upper intertidal to subtidal, rocky areas, shallow hard bottom.

### Salinity

Tolerates wide range of salinities

### Temperature

Tolerates wide range of temperatures



### Similar Native Species

*Hemigrapsus nudus*



*Hemigrapsus oregonensis*



## Harris Mud Crab - *Rhithropanopeus harrisi*

### Description

Native to Atlantic Coast of North America – known in Oregon, not yet in Puget Sound. Small crab - asymmetrical claws with white tips - 4 irregular spines on carapace either side of eye - legs with sparse hair.

**Size:** max size 20 mm

**Color:** Brown to olive green

### Habitat

Found in brackish estuaries and fresh water - shallow water with mud or sand substrates.

### Tidal Height

n/a

### Salinity

Brackish to fresh water – may complete life cycle in fresh water

### Temperature

n/a



### Similar Native Species

None - no native crabs utilize fresh water

## Bamboo Worm - *Clymenella Torquata*

### Description

Native to Asian Pacific – present in Puget Sound. Subsurface marine worm concentrates in high densities creating soft pockets in sediment and mounding of sediment. When stepped on infested area feet sink to about ankle height. Infested sediment feels lumpy to touch and is filled with worms and tubes.

**Size:** 10 cm long bodies - tubes up to 20 cm

**Color:** light color - difficult to see - tubes are made of consolidated sediment

### Habitat

Associated with eelgrass (*Z. marina*) and fine silt or sand substrate - may be associated with clam and oyster beds

### Tidal Height

Low intertidal to shallow sub-tidal

### Salinity

Optimum 25-35 ppt – low tolerance 15 ppt or less

### Temperature

Spawns in temps of 12-14°C (53-57°F) tolerant of higher temps



## **Tunicate (sea grapes) - *Molgula manhattensis***

**Description:** Pending

**Size:** 10-30 mm, can occur in dense clusters

**Color:** Gray or greenish-blue

### **Habitat**

Attached to bedrock, boulders, stones and shells. Found in ports/harbors.

### **Tidal Height**

Low intertidal? to subtidal 90 m depth

### **Salinity**

### **Temperature**



### **Similar Native Species**

## Club Tunicate (solitary) - *Styela clava*

### Description

Native to Japan & Korea - found in Puget Sound. Solitary tunicate - club shape with cylindrical body tapering to narrow stalk at base – often found with other fouling organisms

**Size:** 8-12cm long - up to 20cm max - stalk 1/3 of total length

**Color:** brown to yellowish leathery often wrinkled with stout stalks at base - two siphons w/ light-dark streaking

### Habitat

Attached to bedrock, boulders, stones, shells, pilings, docks or other hard surfaces - predominately artificial substrates. Found in protected waters including harbors and marinas.

### Tidal Height

Low intertidal to shallow subtidal

### Salinity

Tolerant of wide range above 21ppt, generally 22-36ppt - may be found in estuaries

### Temperature

11-27°C



### Similar Native Species

*Styela montereyensis* – longer, up to 30cm – siphons closely spaced, one is curved, no banding

*Styela gibbsii* – short <4cm - stalkless

## Tunicate (solitary) - *Ciona savignyi*

### Description

Native to Japan - found in Puget Sound. Solitary with long clear tubular body - tunic is thin and easily damaged - siphons scalloped - forms dense aggregations.

**Size:** 6 cm

**Color:** body is translucent with yellow dots/stripes on both siphons

### Habitat

Primarily on docks and floats

### Tidal Height

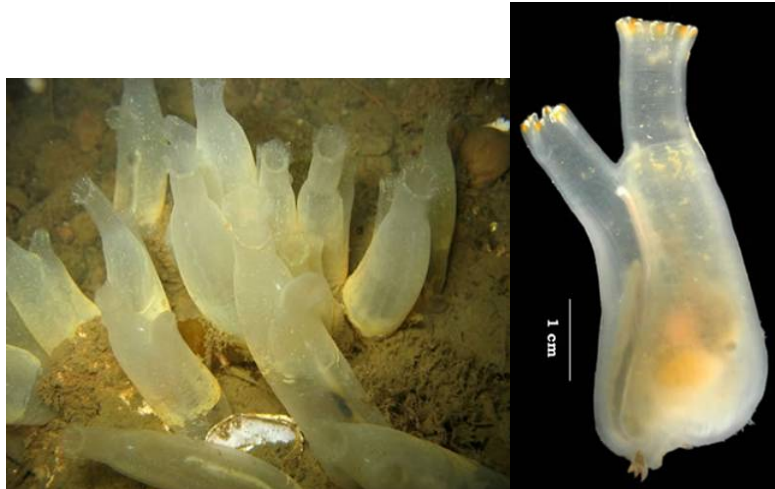
Subtidal only

### Salinity

Tolerant of wide range above 21ppt, generally 22-36ppt - may be found in estuaries

### Temperature

11-27°C



### Similar Native Species

## Tunicate (colonial) - *Botrylloides violaceus*

### Description

Native to Japan - found in Puget Sound. Colonies form irregularly shaped mats made up of systems of zooids in chain, row or other patterns - colonies adhere to solid substrates.

**Size:** Colonies range in size up to 0.3 m diameter

**Color:** Solid color - varies from orange, red, yellow, purple or tan. - occasionally brown or lavender.

### Habitat

Grows in protected waters - on a variety of surfaces: docks, boat hulls, buoys, ropes, pilings, underside of rocks, eelgrass blades and seaweeds. Overgrows mussels, barnacles, encrusting bryozoans and solitary sea squirts. Tolerates polluted water.

### Tidal Height

Shallow subtidal <50 m

### Salinity

26-34 ppt

### Temperature

8-25 deg C



### Similar Native Species

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## Tunicate, golden star - *Botryllus schlosseri*

### Description

Native to Mediterranean - found in Puget Sound - colonial - colonies organized into star or flower shaped patterns

**Size:** Forms flat irregular sheets 3-4 mm thick and up to 100 mm across

**Color:** Orange, yellow, red, white, gray-green, purple, dark gray or black or combinations of these colors. All zooids in a colony are the same color.

### Habitat

Docks, boat hulls, buoys, ropes, pilings, the underside of rocks, on mussels, solitary sea squirts, seaweeds and eelgrass.

### Tidal Height

Subtidal to 200 m

### Salinity

3-44+ ppt - found in marine and estuarine habitats

### Temperature

Die below 3 deg C, need at least 11 deg C to reproduce.



### Similar Native Species

## Tunicate (colonial) - *Didemnum* sp. A

### Description

Native to Japan - found in Puget Sound - colonial, dense mat-forming growth - gelatinous texture

**Size:** Sheets, forming irregular lobes as much as a meter in length. Extensively lobed.

**Color:** Tan, cream, yellow, orange, pinkish with dark lines separating colonies of zooids

### Habitat

Bays & harbors on docks, boat hulls, ropes, piling and other surfaces. Also grows on seafloor of rocks, gravel, boulders. Not reported on mud or sand. It will form dense mats smothering other organisms including seaweeds, sponges, anemones, shellfish, barnacles and other species of sea squirts.

### Tidal Height

Subtidal

### Salinity

In San Francisco Bay, only collected at salinities above 26 ppt

### Temperature

-2 deg C to 24 deg C



### Similar Native Species



native sponge

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