

# Bering Sea Marine Invasive Species Assessment

Alaska Center for Conservation Science

**Scientific Name:** *Schizoporella japonica*

**Common Name** *orange ripple bryozoan*

**Phylum** Bryozoa

**Class** Gymnolaemata

**Order** Cheilostomatida

**Family** Schizoporellidae

## Species Occurrence by Ecoregion

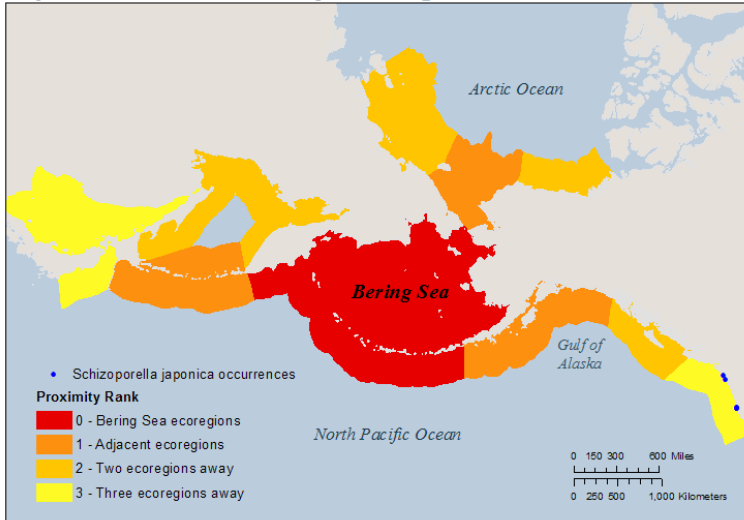


Figure 1. Occurrence records for non-native species, and their geographic proximity to the Bering Sea. Ecoregions are based on the classification system by Spalding et al. (2007). Occurrence record data source(s): NEMESIS and NAS databases.

**Final Rank** 51.78

**Data Deficiency:** 8.75

### Category Scores and Data Deficiencies

Category	Score	Total Possible	Data Deficient Points
Distribution and Habitat:	19.5	26	3.75
Anthropogenic Influence:	6	10	0
Biological Characteristics:	17	25	5.00
Impacts:	4.75	30	0
<b>Totals:</b>	<b>47.25</b>	<b>91.25</b>	<b>8.75</b>

## General Biological Information

### Tolerances and Thresholds

Minimum Temperature (°C)	7	Minimum Salinity (ppt)	15
Maximum Temperature (°C)	19	Maximum Salinity (ppt)	35*
Minimum Reproductive Temperature (°C)	NA	Minimum Reproductive Salinity (ppt)	31*
Maximum Reproductive Temperature (°C)	NA	Maximum Reproductive Salinity (ppt)	35*

### Additional Notes

*Schizoporella japonica* is a colonial bryozoan. It is usually an encrusting species, though colonies can occasionally form leaf-like lobes that are free from the substrate. Colonies range in color from light pink to dark red, and can grow up to 20 cm in diameter. There is taxonomic confusion between *S. unicornis* and *S. japonica*. An examination of Alaskan specimens by Dick et al. (2005) recommended elevating *S. unicornis* var. *japonica* to species status.

**Reviewed by** Linda McCann, Research Technician, Smithsonian Environmental Research Center, Tiburon, CA

**Review Date:** 12/15/2017

## 1. Distribution and Habitat

### 1.1 Survival requirements - Water temperature

Choice: No overlap – Temperatures required for survival do not exist in the Bering Sea

D

Score:  
0 of  
3.75

#### Ranking Rationale:

Year-round temperature requirements do not exist in the Bering Sea.

#### Background Information:

Wood (2016) claims that this species can tolerate temperatures between 7 and 19°C.

#### Sources:

Wood 2016

### 1.2 Survival requirements - Water salinity

Choice: Considerable overlap – A large area (>75%) of the Bering Sea has salinities suitable for year-round survival

A

Score:  
3.75 of  
3.75

#### Ranking Rationale:

This species has been found in waters > 15 ppt, and in marine waters (e.g. the Gulf of Alaska). Although upper salinity tolerances are unknown, we assume that this species can tolerate salinities up to 35 ppt. Salinities required for year-round survival occur over a large (>75%) area of the Bering Sea.

#### Background Information:

In Washington and in British Columbia, *S. japonica* has been found in brackish waters (Powell 1970; Powell et al. 1970). In Willapa Bay, WA salinities were above 15 ppt (Powell et al. 1970). In Scotland, *S. japonica* was not found in harbors near freshwater outflow with salinities < 10 (Nall et al. 2015). This species has been found in the Gulf of Alaska (Hines and Ruiz 2000).

#### Sources:

Powell 1970 Powell et al. 1970 Nall et al. 2015 Hines and Ruiz 2001

### 1.3 Establishment requirements - Water temperature

Choice: Unknown/Data Deficient

U

Score:  
of

#### Ranking Rationale:

#### Background Information:

No information found.

#### Sources:

NEMESIS; Fofonoff et al. 2003

### 1.4 Establishment requirements - Water salinity

Choice: Considerable overlap – A large area (>75%) of the Bering Sea has salinities suitable for reproduction

A

Score:  
3.75 of  
3.75

High uncertainty?

#### Ranking Rationale:

Although salinity thresholds are unknown, this species is a marine organism that does not require freshwater to reproduce. We therefore assume that this species can reproduce in saltwater (31 to 35 ppt). These salinities occur in a large (>75%) portion of the Bering Sea.

#### Background Information:

No information found.

#### Sources:

NEMESIS; Fofonoff et al. 2003

### 1.5 Local ecoregional distribution

Choice: Present in an ecoregion adjacent to the Bering Sea

B

Score:  
3.75 of

5

#### Ranking Rationale:

*S. japonica* was found in the Gulf of Alaska.

#### Background Information:

This species is found in Tatitlek, AK (Hines and Ruiz 2000), as well as Ketchikan (Dick et al. 2005).

#### Sources:

Hines and Ruiz 2001 Dick et al. 2005

### 1.6 Global ecoregional distribution

Choice: In a moderate number of ecoregions globally

B

Score:  
3.25 of

5

#### Ranking Rationale:

*S. japonica* is native to western Asia. It has been introduced to the western coast of North America, and to northwestern Europe.

#### Background Information:

Its global distribution is uncertain because of confusion with other *Schizoporella* species (Fofonoff et al. 2003). It is native to western Asia (China to northern Japan; Dick et al. 2005). *S. japonica* is considered introduced on the West Coast of North America, where it is found from AK to CA. It has recently been discovered on the Atlantic coast of Europe, including Norway, Scotland, and Wales (Fofonoff et al. 2003; Ryland et al. 2014).

#### Sources:

Dick et al. 2005 NEMESIS; Fofonoff et al. 2003 Ryland et al. 2014

### 1.7 Current distribution trends

Choice: Recent rapid range expansion and/or long-distance dispersal (within the last ten years)

A

Score:  
5 of

5

#### Ranking Rationale:

Rapidly spreading in the UK, where it was first documented in 2011.

#### Background Information:

*S. japonica* was first discovered in western Europe in 2011 (Ryland et al. 2014). Since then, it is undergoing a rapid range expansion in the UK (Nall et al. 2015).

#### Sources:

Nall et al. 2015 Ryland et al. 2014

Section Total - Scored Points:	19.5
Section Total - Possible Points:	26.25
Section Total -Data Deficient Points:	3.75

## 2. Anthropogenic Transportation and Establishment

### 2.1 *Transport requirements: relies on use of shipping lanes (hull fouling, ballast water), fisheries, recreation, mariculture, etc. for transport*

**Choice:** B Has been observed using anthropogenic vectors for transport but has rarely or never been observed moving independent of anthropogenic vectors once introduced

**Score:**  
2 of  
4

#### **Ranking Rationale:**

This species uses anthropogenic vectors for transport. Given its low dispersal potential, introductions are likely the result of transport by human vectors.

#### **Background Information:**

Introduced to the west coast of North America by hitchhiking on Pacific oysters imported from Japan. It likely arrived in western Europe via hull fouling (Nall et al. 2015). Marine debris, including tsunami debris, is also a potential transport vector (L. McCann, pers. comm.). This species has low dispersal potential and expansions in its distributions are likely result from transport by humans (Nall et al. 2015).

#### **Sources:**

Nall et al. 2015

### 2.2 *Establishment requirements: relies on marine infrastructure, (e.g. harbors, ports) to establish*

**Choice:** A Readily establishes in areas with anthropogenic disturbance/infrastructure and in natural, undisturbed areas

**Score:**  
4 of  
4

#### **Ranking Rationale:**

This species grows readily on both natural and anthropogenic substrates.

#### **Background Information:**

In Ketchikan, AK, it was found at high densities in natural habitats on rocks and underneath boulders (Dick et al. 2005). It has also been reported growing on buoys, boats, and other floating structures (Ryland et al. 2014).

#### **Sources:**

Dick et al. 2005 Ryland et al. 2014

### 2.3 *Is this species currently or potentially farmed or otherwise intentionally cultivated?*

**Choice:** B No

**Score:**  
0 of  
2

#### **Ranking Rationale:**

This species is not farmed or cultivated.

#### **Background Information:**

#### **Sources:**

NEMESIS; Fofonoff et al. 2003

<b>Section Total - Scored Points:</b>	6
<b>Section Total - Possible Points:</b>	10
<b>Section Total -Data Deficient Points:</b>	0

### 3. Biological Characteristics

#### 3.1 Dietary specialization

**Choice:** Generalist at all life stages and/or foods are readily available in the study area

A

**Score:**

5 of

5

**Ranking Rationale:**

Phytoplankton is readily available in the Bering Sea.

**Background Information:**

*S. japonica* feeds on phytoplankton.

**Sources:**

NEMESIS; Fofonoff et al. 2003

#### 3.2 Habitat specialization and water tolerances

Does the species use a variety of habitats or tolerate a wide range of temperatures, salinity regimes, dissolved oxygen levels, calcium concentrations, hydrodynamics, pollution, etc?

**Choice:** Generalist; wide range of habitat tolerances at all life stages

A

**Score:**

5 of

5

**Ranking Rationale:**

*S. japonica* has a wide salinity tolerance and has been reported from a variety of habitats and water depths.

**Background Information:**

This species has a wide range of salinity tolerances, and has been found in brackish waters (Powell 1970; Powell et al. 1970). It has been found growing on both natural and anthropogenic substrates (Dick et al. 2005; Ryland et al. 2014). In the UK, structures were treated with lethal doses of calcium hypochlorite to control for another bryozoan, *Didemnum vexillum* (Ryland et al. 2014). Colonization of these structures by *S. japonica* was observed within three years (Ryland et al. 2014). This species has been observed at both subtidal and intertidal water depths (Nall et al. 2015).

**Sources:**

Powell 1970 Powell et al. 1970 Dick et al. 2005 Ryland et al. 2014 Nall et al. 2015

#### 3.3 Desiccation tolerance

**Choice:** Unknown

U

**Score:**

of

**Ranking Rationale:**

The desiccation tolerance of this species is unknown.

**Background Information:**

No information found.

**Sources:**

None listed

### 3.4 Likelihood of success for reproductive strategy

- i. Asexual or hermaphroditic ii. High fecundity (e.g. >10,000 eggs/kg) iii. Low parental investment and/or external fertilization iv. Short generation time

Choice: Moderate – Exhibits one or two of the above characteristics  
B

Score:  
3.25 of

High uncertainty?

5

#### Ranking Rationale:

This species exhibits both sexual and asexual reproduction, and internal fertilization. Estimates of fecundity are unknown; however, because larvae are lecithotrophic, some parental investment is required and the number of eggs produced per spawning event is probably not extremely high. Information on related species suggests that this species may die off annually and thus have a short generation time.

#### Background Information:

Bryozoans can reproduce both sexually and asexually. Sperm are released externally, and taken up by females; eggs are brooded inside the female zooid (Temkin 1994; Ostrovsky 2014). Studies on *Schizoporella errata*, a closely related species, suggests a short generation time - most colonies die within a year, although some may survive through the winter (Schopf 1974).

#### Sources:

Temkin 1994 Ostrovsky 2014 Schopf 1974

### 3.5 Likelihood of long-distance dispersal or movements

- Consider dispersal by more than one method and/or numerous opportunities for long or short distance dispersal e.g. broadcast, float, swim, carried in currents; vs. sessile or sink.

Choice: Disperses short (< 1 km) distances  
C

Score:  
0.75 of

High uncertainty?

2.5

#### Ranking Rationale:

Given the short-lived, non-feeding larval stage and internal fertilization, this species probably has low dispersal potential (<1 km). Events such as rafting and fragmentation may help disperse this species further; however, the frequency of these events and its effects on overall spread are unknown.

#### Background Information:

Larvae are non-feeding and settle within a day (Schopf 1974; Fofonoff et al. 2003). In a study on *Schizoporella errata*, a closely related species, Schopf (1974) believed that larval dispersal distance was probably (much) less than 1 km. Nall et al. (2015) claims *S. japonica* has low dispersal potential.

#### Sources:

Schopf 1974 NEMESIS; Fofonoff et al. 2003 Nall et al. 2015

### 3.6 Likelihood of dispersal or movement events during multiple life stages

- i. Can disperse at more than one life stage and/or highly mobile ii. Larval viability window is long (days v. hours) iii. Different modes of dispersal are achieved at different life stages (e.g. unintentional spread of eggs, migration of adults)

Choice: Moderate – Exhibits one of the above characteristics  
B

Score:  
1.75 of

2.5

#### Ranking Rationale:

This species has limited dispersal potential and a short-lived larval stage. Larvae and sperm may disperse short distances. Fragments may also break off and be transported passively through the water column.

#### Background Information:

Larvae are lecithotrophic and short-lived (on the scale of hours) (Gooch and Schopf 1971; Nall et al. 2015). Adults are sessile, and fertilized eggs are brooded inside the female zooid (Temkin 1994). Dispersal is limited, but zooid fragments can break off the main colony and spread passively in the water column.

#### Sources:

Nall et al. 2015 Gooch and Schopf 1971 Temkin 1994

### 3.7 Vulnerability to predators

Choice: Multiple predators present in the Bering Sea or neighboring regions

D

Score:

1.25 of

5

#### Ranking Rationale:

This species is predated upon by several taxa found in the Bering Sea.

#### Background Information:

Bryozoans in general are preyed on by grazing organisms such as marine arthropods, sea urchins, nudibranchs and fish. They are also subject to competition and overgrowth from sponges, algae, and tunicates.

#### Sources:

U.S. Geological Survey; Fuller and Benson 2017 Ryland 1977

Section Total - Scored Points: 17

Section Total - Possible Points: 25

Section Total -Data Deficient Points: 5

## 4. Ecological and Socioeconomic Impacts

### 4.1 Impact on community composition

Choice: Limited – Single trophic level; may cause decline but not extirpation  
**C**

Score:  
0.75 of  
2.5

#### Ranking Rationale:

Through overgrowth and competition for space, this species may prevent other organisms (e.g., native bryozoans, tunicates, sponges) from settling.

#### Background Information:

This species can overgrow algae and bivalves on which it settles. In southeast Alaska, Dick et al. (2005) reported *S. japonica* competing for space with a native bryozoan, *Tegella aquilirostris*. Surveys in the UK, where *S. japonica* has been recently introduced, have reported it as a dominant species in harbours (Ryland et al. 2014; Nall et al. 2015). *Schizoporella* species may prevent other organisms from establishing, leading to relatively fewer species at sites dominated by *Schizoporella* (Sutherland 1978).

#### Sources:

Dick et al. 2005 Ryland 1977 Nall et al. 2015 Sutherland 1978

### 4.2 Impact on habitat for other species

Choice: Moderate – Causes or has potential to cause changes to one or more habitats  
**B**

Score:  
1.75 of  
2.5

#### Ranking Rationale:

This species forms encrustations, which can grow very large and can be three-dimensional. These structures can create habitat for some species, but can also limit habitat for others.

#### Background Information:

*S. japonica* has been reported to form colonies up to 20 cm in diameter, and to occur at high densities (Ryland et al. 2014). *Schizoporella* species can form giant colonies, resulting in large three-dimensional masses or "build-ups" (Cocito et al. 2000). Build-ups of *S. errata* in La Spezia, Italy provided habitat for several taxa including barnacles, algae, polychaetes, and hydroids (Cocito et al. 2000).

#### Sources:

Ryland et al. 2014 Cocito et al. 2000

### 4.3 Impact on ecosystem function and processes

Choice: No impact  
**D**

Score:  
0 of  
2.5

#### Ranking Rationale:

No impacts have been reported for this species. A long-term study on a similar species found that the effects of *S. errata* on community composition were short-lived. We therefore expect limited consequences on ecosystem functions and processes.

#### Background Information:

Field experiments on a closely related species, *Schizoporella errata*, found that this species was able to invade new sites and grow rapidly, preventing other species from establishing (Sutherland 1978). While these traits may reduce species' richness and change community composition, Sutherland (1978) remarked that *S. errata*'s competitive abilities were short-lived. Within two years, colonies were outcompeted and played a minor role in the community.

#### Sources:

Sutherland 1978



#### 4.4 Impact on high-value, rare, or sensitive species and/or communities

**Choice:** Limited – Has limited potential to cause degradation of one more species or communities, with limited impact and/or within a very limited region **Score:** 0.75 of 2.5

##### Ranking Rationale:

No impacts have been reported for this species. Through overgrowth and competition, may affect native bryozoans.

##### Background Information:

Alaska is home to a high diversity of native bryozoa (Dick et al. 2005). The Aleutian Islands has the highest diversity of *Monoporella* species, with six new species described in the last decade (Dick 2008). *S. japonica* is known to compete with native bryozoans in Southeast Alaska (Dick et al. 2005). Although it may grow on bivalves, it does not seem cause to significant damage (Fofonoff et al. 2003).

##### Sources:

Dick et al. 2005 Dick 2008 NEMESIS; Fofonoff et al. 2003

#### 4.5 Introduction of diseases, parasites, or travelers

What level of impact could the species' associated diseases, parasites, or travelers have on other species in the assessment area? Is it a host and/or vector for recognized pests or pathogens, particularly other nonnative organisms?)

**Choice:** No impact **Score:** 0 of 2.5

##### Ranking Rationale:

This species is not known to transport diseases, parasites, or hitchhikers.

##### Background Information:

##### Sources:

NEMESIS; Fofonoff et al. 2003

#### 4.6 Level of genetic impact on native species

Can this invasive species hybridize with native species?

**Choice:** No impact **Score:** 0 of 2.5

##### Ranking Rationale:

Hybridization in bryozoans is poorly studied and rendered difficult by the lack of taxonomic resolution. There are no native *Schizoporella* species in the Bering Sea. No impacts of hybridization have been reported for this or other *Schizoporella* species.

##### Background Information:

Little is known about the frequency of hybridization in bryozoans (Lidgard and Buckley 1994). Studying hybridization in *Schizoporella* may be complicated by the taxonomic confusion that exists amongst species (Fofonoff et al. 2003).

##### Sources:

NEMESIS; Fofonoff et al. 2003 Lidgard and Buckley 1994 O'Clair and O'Clair 1998

#### 4.7 Infrastructure

**Choice:** Moderate – Causes or has the potential to cause degradation to infrastructure, with moderate impact and/or within only a portion of the region  
**B**

**Score:**  
1.5 of  
3

##### Ranking Rationale:

*S. japonica* is a common fouling organism. Fouling organisms on ships can cause drag and reduce maneuverability.

##### Background Information:

This species has been reported at high densities on many anthropogenic structures, including buoys, docks, and ships (Fofonoff et al. 2003; Ryland et al. 2014). Fouling organisms are estimated to cost the U.S. Navy over \$50 million a year in fuel costs due to increased drag (Cleere 2001).

##### Sources:

Ryland et al. 2014 NEMESIS; Fofonoff et al. 2003

#### 4.8 Commercial fisheries and aquaculture

**Choice:** No impact  
**D**

**Score:**  
0 of  
3

##### Ranking Rationale:

This species is not expected to impact commercial fisheries in the Bering Sea.

##### Background Information:

Powell (1970) observed that *S. japonica* preferred to settle on dead, rather than live, oyster shells, and predicted that this species would therefore have little effect on the commercial shellfish industry. No impacts on fisheries have been reported, although *S. japonica* can foul fishing gear (Fofonoff et al. 2003).

##### Sources:

Powell 1970 NEMESIS; Fofonoff et al. 2003

#### 4.9 Subsistence

**Choice:** No impact  
**D**

**Score:**  
0 of  
3

##### Ranking Rationale:

This species is not expected to impact subsistence resources in the Bering Sea.

##### Background Information:

Powell (1970) observed that *S. japonica* preferred to settle on dead, rather than live, oyster shells, and predicted that this species would therefore have little effect on the shellfish industry. No impacts on fish or fish habitat have been reported, although *S. japonica* can foul fishing gear (Fofonoff et al. 2003).

##### Sources:

Powell 1970 NEMESIS; Fofonoff et al. 2003

#### 4.101 Recreation

Choice: No impact  
D

Score:  
0 of  
3

##### Ranking Rationale:

This species is not expected to affect recreational opportunities in the Bering Sea.

##### Background Information:

##### Sources:

NEMESIS; Fofonoff et al. 2003

#### 4.11 Human health and water quality

Choice: No impact  
D

Score:  
0 of  
3

##### Ranking Rationale:

No impacts on human health or water quality have been reported.

##### Background Information:

##### Sources:

NEMESIS; Fofonoff et al. 2003

Section Total - Scored Points:	4.75
Section Total - Possible Points:	30
Section Total -Data Deficient Points:	0

## 5. Feasibility of prevention, detection and control

### 5.1 History of management, containment, and eradication

Choice: Not attempted

**B**

Score:  of

#### Ranking Rationale:

Control or eradication has not been attempted for this species.

#### Background Information:

#### Sources:

Molnar et al. 2008

### 5.2 Cost and methods of management, containment, and eradication

Choice: Major long-term investment, or is not feasible at this time

**A**

Score:  of

#### Ranking Rationale:

Methods to control the spread of marine invasive species are being developed, and currently require major long-term investments.

#### Background Information:

This species can be transported via several anthropogenic vectors, including ballast water, fouling, hitchhiking, and marine debris. Methods to control the spread of marine invasive species are being studied, and currently necessitate major long-term investments (Zagdan 2010; Hagan et al. 2014).

#### Sources:

Zagdan 2010 Hagan et al. 2014

### 5.3 Regulatory barriers to prevent introductions and transport

Choice: Regulatory oversight, but compliance is voluntary

**B**

Score:  of

#### Ranking Rationale:

This species can be transported via ballast water, fouling, and hitchhiking. No species-specific regulations are currently in place. Although there are federal regulations for both ballast water and hull fouling, compliance with federal fouling regulations remains voluntary.

#### Background Information:

#### Sources:

CFR 2017

#### 5.4 Presence and frequency of monitoring programs

**Choice:** Surveillance takes place, but is largely conducted by non-governmental environmental organizations (e.g., citizen science programs)  
**B**

**Score:**  
 of

##### Ranking Rationale:

Monitoring for invasive tunicates is conducted by Plate Watch and KBNERR, which are non-governmental agencies.

##### Background Information:

In Alaska, Plate Watch and Kachemak Bay National Estuarine Research Reserve (KBNERR) conduct monitoring for non-native tunicates and other invasive or harmful species. These programs involve teachers, students, outdoor enthusiasts, environmental groups and professional biologists to detect invasive species.

##### Sources:

iTunicate Plate Watch 2016

#### 5.5 Current efforts for outreach and education

**Choice:** Educational materials are available and outreach occurs only sporadically in the Bering Sea or adjacent regions  
**C**

**Score:**  
 0 of

##### Ranking Rationale:

Identification guides are available, but outreach activities occur sporadically.

##### Background Information:

Plate Watch and the Kachemak Bay National Estuarine Research Reserve (KBNERR) provide training opportunities for identifying and detecting non-native fouling organisms, and public education events on coastal and marine ecosystems more generally. "Bioblitzes" were held in Southeast AK in 2010 and 2012; these events engage and educate the public on marine invasive species. Outreach activities were conducted on the Pribilof Islands for Bering Sea Days in 2017. Field identification guides for native and non-native tunicates, as well as common fouling organisms, are readily available.

##### Sources:

iTunicate Plate Watch 2016

**Section Total - Scored Points:** 0

**Section Total - Possible Points:**

**Section Total -Data Deficient Points:**

# Bering Sea Marine Invasive Species Assessment

Alaska Center for Conservation Science

## Literature Cited for *Schizoporella japonica*

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