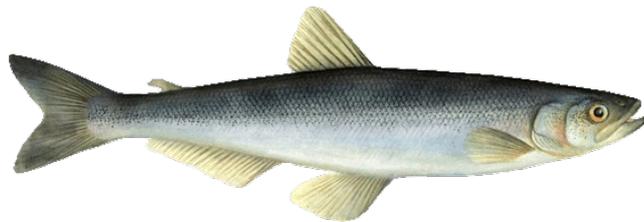


# Monterey Bay Aquarium Seafood Watch®

## Surf smelt

*Hypomesus pretiosus*



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## California and Washington

### Cast nets, Scoop nets, and Beach seines

*December 12, 2018*

*Seafood Watch Consulting Researcher*

#### **Disclaimer**

Seafood Watch and The Safina Center strive to ensure that all our Seafood Reports and recommendations contained therein are accurate and reflect the most up-to-date evidence available at the time of publication. All our reports are peer-reviewed for accuracy and completeness by external scientists with expertise in ecology, fisheries science or aquaculture. Scientific review, however, does not constitute an endorsement of the Seafood Watch program or of The Safina Center or their recommendations on the part of the reviewing scientists. Seafood Watch and The Safina Center are solely responsible for the conclusions reached in this report. We always welcome additional or updated data that can be used for the next revision. Seafood Watch and Seafood Reports are made possible through a grant from the David and Lucile Packard Foundation and other funders.

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## **About The Safina Center**

The Safina Center (formerly Blue Ocean Institute) translates scientific information into language people can understand and serves as a unique voice of hope, guidance, and encouragement. The Safina Center (TSC) works through science, art, and literature to inspire solutions and a deeper connection with nature, especially the sea. Our mission is to inspire more people to actively engage as well-informed and highly motivated constituents for conservation.

Led by conservation pioneer and MacArthur fellow, Dr. Carl Safina, we show how nature, community, the economy and prospects for peace are all intertwined. Through Safina's books, essays, public speaking, PBS television series, our Fellows program and Sustainable Seafood program, we seek to inspire people to make better choices.

The Safina Center was founded in 2003 by Dr. Carl Safina and was built on three decades of research, writing and policy work by Dr. Safina.

### **The Safina Center's Sustainable Seafood Program**

The Center's founders created the first seafood guide in 1998. Our online seafood guide now encompasses over 160-wild-caught species. All peer-reviewed seafood reports are transparent, authoritative, easy to understand and use. Seafood ratings and full reports are available on our website under *Seafood choices*. tsc's sustainable seafood program helps consumers, retailers, chefs and health professionals discover the connection between human health, a healthy ocean, fishing and sustainable seafood.

- Our online guide to sustainable seafood is based on scientific ratings for more than 160 wild-caught seafood species and provides simple guidelines. Through our expanded partnership with the Monterey Bay Aquarium, our guide now includes seafood ratings from both The Safina Center and the Seafood Watch® program.
- We partner with Whole Foods Market (WFM) to help educate their seafood suppliers and staff, and provide our scientific seafood ratings for WFM stores in the US and UK.
- Through our partnership with Chefs Collaborative, we created *Green Chefs/Blue Ocean*, a free, interactive, online sustainable seafood course for chefs and culinary professionals.
- Our website features tutorials, videos, blogs, links and discussions of the key issues such as mercury in seafood, bycatch, overfishing, etc.

Check out our Fellows Program, learn more about our Sustainable Seafood Program and Carl Safina's current work at [www.safinacenter.org](http://www.safinacenter.org) .

The Safina Center is a 501 (c) (3) nonprofit organization based in the School of Marine & Atmospheric Sciences at Stony Brook University, Long Island, NY. [www.safinacenter.org](http://www.safinacenter.org) [admin@safinacenter.org](mailto:admin@safinacenter.org) | 631.632.3763

## **About Seafood Watch**

Monterey Bay Aquarium's Seafood Watch program evaluates the ecological sustainability of wild-caught and farmed seafood commonly found in the United States marketplace. Seafood Watch defines sustainable seafood as originating from sources, whether wild-caught or farmed, which can maintain or increase production in the long-term without jeopardizing the structure or function of affected ecosystems. Seafood Watch makes its science-based recommendations available to the public in the form of regional pocket guides that can be downloaded from [www.seafoodwatch.org](http://www.seafoodwatch.org). The program's goals are to raise awareness of important ocean conservation issues and empower seafood consumers and businesses to make choices for healthy oceans.

Each sustainability recommendation on the regional pocket guides is supported by a Seafood Watch Assessment. Each assessment synthesizes and analyzes the most current ecological, fisheries and ecosystem science on a species, then evaluates this information against the program's conservation ethic to arrive at a recommendation of "Best Choices," "Good Alternatives" or "Avoid." This ethic is operationalized in the Seafood Watch standards, available on our website here. In producing the assessments, Seafood Watch seeks out research published in academic, peer-reviewed journals whenever possible. Other sources of information include government technical publications, fishery management plans and supporting documents, and other scientific reviews of ecological sustainability. Seafood Watch Research Analysts also communicate regularly with ecologists, fisheries and aquaculture scientists, and members of industry and conservation organizations when evaluating fisheries and aquaculture practices. Capture fisheries and aquaculture practices are highly dynamic; as the scientific information on each species changes, Seafood Watch's sustainability recommendations and the underlying assessments will be updated to reflect these changes.

Parties interested in capture fisheries, aquaculture practices and the sustainability of ocean ecosystems are welcome to use Seafood Watch assessments in any way they find useful.

## **Guiding Principles**

The Safina Center and Seafood Watch define sustainable seafood as originating from sources, whether fished<sup>1</sup> or farmed, that can maintain or increase production in the long-term without jeopardizing the structure or function of affected ecosystems.

Based on this principle, Seafood Watch and the Safina Center have developed four sustainability **criteria** for evaluating wild-catch fisheries for consumers and businesses. These criteria are:

- How does fishing affect the species under assessment?
- How does the fishing affect other, target and non-target species?
- How effective is the fishery's management?
- How does the fishing affect habitats and the stability of the ecosystem?

Each criterion includes:

- Factors to evaluate and score
- Guidelines for integrating these factors to produce a numerical score and **rating**

Once a rating has been assigned to each criterion, we develop an overall recommendation. Criteria ratings and the overall recommendation are color-coded to correspond to the categories on the Seafood Watch pocket guide and the Safina Center's online guide:

**Best Choice/Green:** Are well managed and caught in ways that cause little harm to habitats or other wildlife.

**Good Alternative/Yellow:** Buy, but be aware there are concerns with how they're caught.

**Avoid/Red** Take a pass on these for now. These items are overfished or caught in ways that harm other marine life or the environment.

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<sup>1</sup> "Fish" is used throughout this document to refer to finfish, shellfish and other invertebrates

## **Summary**

Surf smelt (*Hypomesus pretiosus*) is a small, pelagic schooling fish species found in coastal areas of the Eastern Pacific from Monterey Bay, California north to Alaska. Its biology and distribution are poorly understood, but it is known to be an important prey item for marine mammals, birds, and predatory fish. Most smelt are landed during their spawning period, which is sporadic and varies throughout their range. Surf smelt are targeted in commercial, recreational, and tribal fisheries with a variety of gears. The commercial fishery in California primarily uses cast nets and A-frame dip nets, occurring almost entirely in portions of FAO region 67 (Northeast Pacific), and landings peak in June and July. The commercial fishery in Washington employs beach seines; an annual quota is limited to 60,000 lb, and most landings occur in the central Puget Sound. Surf smelt is a popular target among recreational fishers, but little is known about the nature of recreational landings. A considerable recreational fishery operates in Burrard Inlet, British Columbia, and it is not known if the stock is separate from the stock in central Puget Sound (for the purposes of this report, we refer to the Washington portion of the Salish Sea as Puget Sound).

There are 124 Marine Protected Areas (MPAs) in California that prohibit or limit commercial and recreational fishing; these MPAs cover a total of 852.02 sq mi, or 16.12% of the state's coastal waters. The coastal waters of Oregon and Washington fall within the Northeast Pacific but have no commercial fishery for surf smelt outside of Puget Sound in Washington. Oregon prohibits commercial fishing of osmerid smelts within state waters and all fishing is prohibited within Oregon's 40.3 sq mi of Marine Reserves. No commercial surf smelt fishing occurs on the Pacific Coast of Washington.

No formal stock assessments have been performed for surf smelt and management agencies have generally taken a precautionary approach for *commercial* fisheries management, given the uncertainty. There are no commercial fisheries for surf smelt in federal waters and future directed fisheries are currently prohibited unless the Pacific Fisheries Management Council (PFMC) and the National Marine Fisheries Service (NMFS) conducts an extensive review. Recreational fisheries are assumed to land equal amounts of surf smelt in Puget Sound, but recent research has suggested that recreational landings may be higher than commercial fisheries in some areas.

Surf smelt are highly fecund, mature at a young age, and are a short-lived species, which offers some resilience to fishing pressure. However, fishers target spawning aggregations, making this species highly vulnerable to fishing. Surf smelt spawn in the upper tidal zones of beaches with sand and gravel substrate. Degradation of spawning habitat is a major concern to natural resource managers in some areas.

Given the high level of uncertainty with basic information for the species biology, distribution, and abundance, the surf smelt fishery in Puget Sound has received a good alternative ranking, while the California fishery should be avoided. The primary reason for the distinction between the two fisheries is that the Pacific stock is believed to separate from the Puget Sound population, and management effectiveness in Washington has been ranked higher than in California. Fisheries managers should continue to proceed with a precautionary approach until further information is available.

# Final Seafood Recommendations

SPECIES/FISHERY	CRITERION 1: IMPACTS ON THE SPECIES	CRITERION 2: IMPACTS ON OTHER SPECIES	CRITERION 3: MANAGEMENT EFFECTIVENESS	CRITERION 4: HABITAT AND ECOSYSTEM	OVERALL RECOMMENDATION
Surf smelt United States of America Puget Sound, Beach seines	Red (1.732)	Green (5.000)	Yellow (3.000)	Green (3.674)	<b>Good Alternative (3.125)</b>
Surf smelt United States of America, Cast nets	Red (1.732)	Green (5.000)	Red (2.000)	Green (3.674)	<b>Avoid (2.824)</b>
Surf smelt United States of America, Scoopnets	Red (1.732)	Green (5.000)	Red (2.000)	Green (3.674)	<b>Avoid (2.824)</b>

## Summary

Surf smelt is a pelagic schooling fish found in coastal areas of the eastern Pacific from central California to Alaska, and within portions of the Salish Sea in British Columbia and Washington. Surf smelt are highly fecund, mature at a young age, and are a short-lived forage fish. These smelt spawn in the upper tidal zones of beaches with coarse sand and gravel substrate. This report focuses on only remaining US commercial fisheries, which occur in California and Washington.

Abundance and mortality of surf smelt is unknown and no stock assessments have been conducted. Basic information on smelt biology and distribution is lacking. Fishers in California target surf smelt with A-frame dipnets (also referred to as "scoopnets") and cast nets; Washington fishers employ beach seines. Bycatch is very low due to the nature of the fishery, which targets spawning aggregations in the shallow waters of spawning beaches. There is some potential for A-frame dipnets and beach seines to disrupt bottom habitat, but damage is likely minimal. Managers in Washington have taken a precautionary approach to this fishery and recently reduced the annual quota. The state has conducted extensive research into spawning habitats. With little research and no limits on landings, the California fishery is scored "moderate" concern for management effectiveness and "ineffective" for research and monitoring.

## Scoring Guide

Scores range from zero to five where zero indicates very poor performance and five indicates the fishing operations have no significant impact.

Final Score = geometric mean of the four Scores (Criterion 1, Criterion 2, Criterion 3, Criterion 4).

- **Best Choice/Green** = Final Score >3.2, and either Criterion 1 or Criterion 3 (or both) is Green, and no Red Criteria, and no Critical scores
- **Good Alternative/Yellow** = Final score >2.2-3.2, and neither Harvest Strategy (Factor 3.1) nor Bycatch Management Strategy (Factor 3.2) are Very High Concern<sup>2</sup>, and no more than one Red Criterion, and no Critical scores
- **Avoid/Red** = Final Score ≤2.2, or either Harvest Strategy (Factor 3.1) or Bycatch Management Strategy (Factor 3.2) is Very High Concern or two or more Red Criteria, or one or more Critical scores.

<sup>2</sup> Because effective management is an essential component of sustainable fisheries, Seafood Watch issues an Avoid recommendation for any fishery scored as a Very High Concern<sup>2</sup> for either factor under Management (Criterion 3).

## **Introduction**

### **Scope of the analysis and ensuing recommendation**

This report and ensuing recommendations are for surf smelt (*Hypomesus pretiosus*) caught by cast nets and A-frame dipnets in California and beach seines in Washington. A-frame dipnets are labeled under "scoopnets" in this report. These nets were first used by Native Americans along the coast of California, and are still popular in northern California today (Kroeber and Barrett 1960). Surf smelt fisheries occur mostly in the northern California and Puget Sound, and are marginally important for the regions. Commercial landings are monitored in both fisheries, but stock statuses are unknown.

### **Species Overview**

Surf smelt is a small schooling fish in the Osmeridae family found throughout the coastal Eastern Pacific from Monterey Bay, California to Prince William Sound, Alaska (Therriault et al. 2002). Surf smelt are found in the southern portion of the Salish Sea from Burrard Inlet down to Olympia, Washington (Pietsch and Orr 2015). Maximum length of these smelt is variable. Surf smelt in British Columbian waters reach 22.2cm total length (TL), while individuals in California reportedly reach a TL of 30.5cm (Hart 1973). These fish mature as early as age one, but maturity is often reached towards the beginning of their second year (Penttila 1978), and maximum age is five years (Yapchiongo 1949). Females are pursued by up to five males and produce an average of 1,440 to 29,180 eggs during spawning in the upper intertidal zone of mixed sand and gravel beaches (Therriault et al. 2002). Surf smelt are managed by the Washington Department of Fish and Wildlife (WDFW) and California Department of Fish and Wildlife (CDFW).

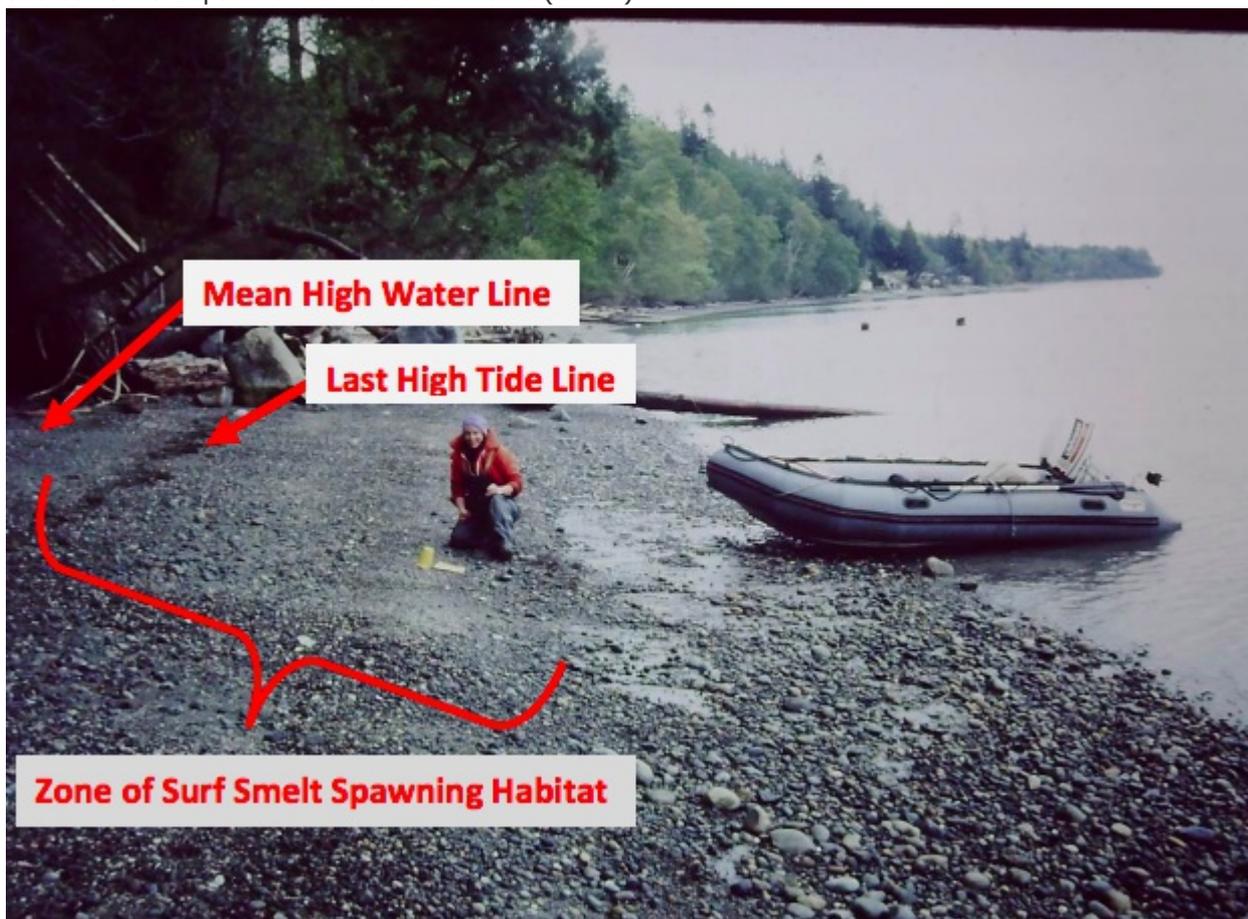


Figure 1 Typical surf smelt spawning habitat (Washington Department of Fish & Wildlife)

Surf smelt support commercial and recreational fisheries throughout their range, and have long been important for First Nation peoples (Therriault et al. 2002). Puget Sound is the most important waterbody for Washington recreational fishers using dip nets and jig gear, and for commercial fishers using beach seines to target surf smelt (Lowry et al. 2015). California commercial fishers use A-frame dip nets and cast nets, while recreational fishers primarily use cast nets (CDFW 2016). The species ranges to Alaska, but little information exists on fisheries in the state.



Figure 2 A-frame dipnet used in commercial smelt fishery in California. From H.T. Harvey & Associates et al. 2015

### **Production Statistics**

Commercial landings for Washington surf smelt fisheries averaged 40.8 MT annually from 2000 to 2014 (Lowry et al. 2015), but commercial harvest quotas of 60,000 lb (27.2 MT) were installed for Puget Sound in 2014 (WDFW 2014). Commercial landings of non-eulachon smelt—which includes surf smelt—in Oregon totaled just 1,053 lb from 2007 to 2016 (ODFW 2017), but there is no longer a commercial smelt fishery in Oregon. Commercial landings of surf smelt peaks in June and July in California's fishery. In 2014, the fishery landed 102.2 MT of surf smelt, with an ex-vessel value of \$157,000 (CDFW 2016). From 2000 to 2016, surf smelt landings averaged 51.21 MT annually. However, commercial landings in California totaled just 5,854 lb and 689 lb in 2016 and 2017 respectively (CDFW 2018c)

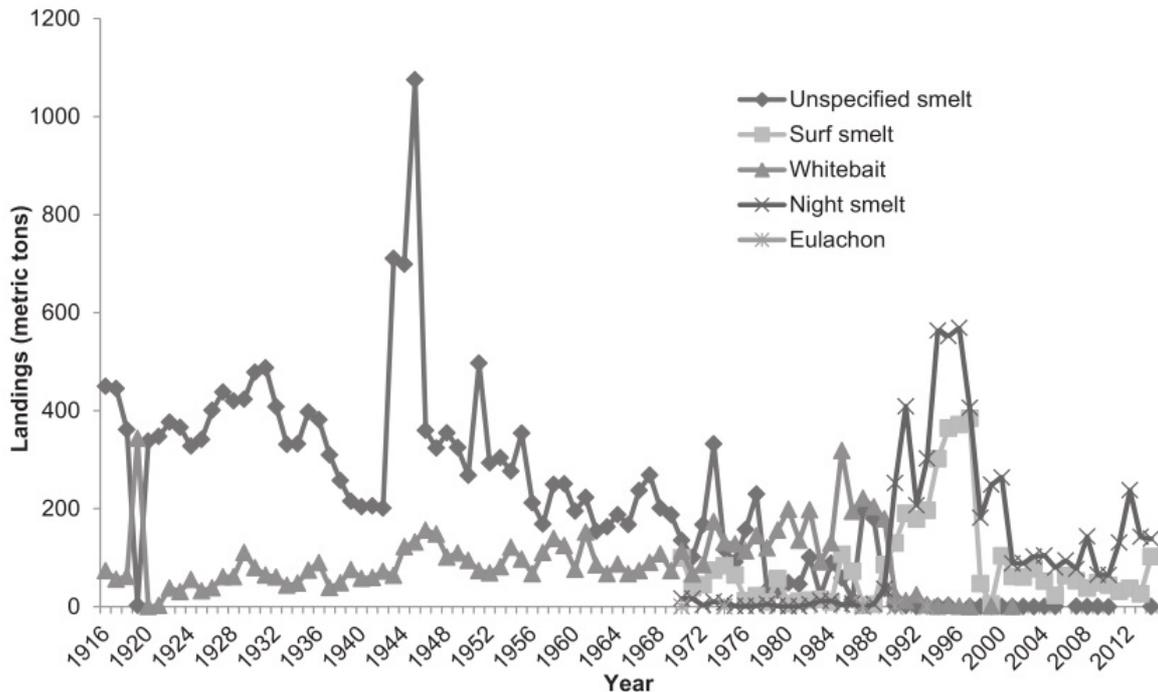


Figure 3 Annual commercial smelt landings in California between 1916-2014 from CDFW 2015.

### Importance to the US/North American market.

Surf smelt have long been considered a popular local food fish. Today, surf smelt support commercial, recreational and/or tribal fisheries in Washington, Oregon, California, and British Columbia to a limited degree. (CDFW 2016) (Fisheries and Oceans Canada 2015) (Penttila 2007). In addition to direct consumption, smelts are sold to aquariums as food for birds, fish, and mammals (CDFW 2016). Overall, the Pacific Fishery Management Council describes surf smelt as having "minor to moderate commercial significance" (Pacific Fishery Management Council 2011), and landings are limited by the privatization of shorelines in Washington state (Penttila 2007).

From 2000 to 2017, the US imported an average of 2,832.6 t of fresh and frozen smelts each year, with an annual average value of just over \$6 million (NMFS 2017). National Marine Fisheries Service (NMFS) data for smelt are not classified to species level. The majority (81% on average) of smelts is imported from Canada (NMFS 2017). However, given that Canadian commercial landings of surf smelt have not exceeded 10 tons since the early 1960s (Fisheries and Oceans Canada 2015), it can be presumed that only a small fraction of imported smelt are actually surf smelt. The California commercial fishery landings have averaged a value of \$44,832 annually from 2000 to 2016 (CDFW 2017). The average annual total catch value for Washington is \$46,748 (SeaDoc Society 2014).

### Common and market names.

*Hypomesus pretiosus*, or surf smelt, is also known as silver smelt and day smelt. It's considered a "true smelt" species of the family Osmeridae.

### Primary product forms

Surf smelt are primarily served pan fried after being headed and gutted, or sold whole to aquariums.

## Assessment

This section assesses the sustainability of the fishery(s) relative to the Seafood Watch Standard for Fisheries, available at [www.seafoodwatch.org](http://www.seafoodwatch.org). The specific standard used is referenced on the title page of all Seafood Watch assessments.

### Criterion 1: Impacts on the Species Under Assessment

*This criterion evaluates the impact of fishing mortality on the species, given its current abundance. When abundance is unknown, abundance is scored based on the species' inherent vulnerability, which is calculated using a Productivity-Susceptibility Analysis. The final Criterion 1 score is determined by taking the geometric mean of the abundance and fishing mortality scores. The Criterion 1 rating is determined as follows:*

- Score >3.2=Green or Low Concern
- Score >2.2 and ≤3.2=Yellow or Moderate Concern
- Score ≤2.2=Red or High Concern

*Rating is Critical if Factor 1.3 (Fishing Mortality) is Critical*

#### Criterion 1 Summary

SURF SMELT			
Region   Method	Abundance	Fishing Mortality	Score
United States of America/Puget Sound   Beach seines	1.00: High Concern	3.00: Moderate Concern	Red (1.732)
United States of America   Cast nets	1.00: High Concern	3.00: Moderate Concern	Red (1.732)
United States of America   Scoopnets	1.00: High Concern	3.00: Moderate Concern	Red (1.732)

#### Criterion 1 Assessment

##### SCORING GUIDELINES

##### Factor 1.1 - Abundance

Goal: Stock abundance and size structure of native species is maintained at a level that does not impair recruitment or productivity.

- 5 (Very Low Concern) — Strong evidence exists that the population is above an appropriate target abundance level (given the species' ecological role), or near virgin biomass.
- 3.67 (Low Concern) — Population may be below target abundance level, but is at least 75% of the target level, OR data-limited assessments suggest population is healthy and species is not highly vulnerable.
- 2.33 (Moderate Concern) — Population is not overfished but may be below 75% of the target abundance level, OR abundance is unknown and the species is not highly vulnerable.
- 1 (High Concern) — Population is considered overfished/depleted, a species of concern, threatened or endangered, OR abundance is unknown and species is highly vulnerable.

## Factor 1.2 - Fishing Mortality

Goal: Fishing mortality is appropriate for current state of the stock.

- 5 (Low Concern) — Probable (>50%) that fishing mortality from all sources is at or below a sustainable level, given the species ecological role, OR fishery does not target species and fishing mortality is low enough to not adversely affect its population.
- 3 (Moderate Concern) — Fishing mortality is fluctuating around sustainable levels, OR fishing mortality relative to a sustainable level is uncertain.
- 1 (High Concern) — Probable that fishing mortality from all source is above a sustainable level.

## SURF SMELT

### Factor 1.1 - Abundance

UNITED STATES OF AMERICA/PUGET SOUND, BEACH SEINES

#### High Concern

There is limited data on the stock status of surf smelt in Puget Sound (Lowry et al. 2015) (Penttila 2007) and it's hypothesized that the Puget Sound population is distinct from those on the coast (Fisheries and Oceans Canada 2015) (Therriault and Hay 2005). A recent study of forage fish abundance in Puget Sound found a decline in abundance of surf smelt and Pacific herring by up to two orders of magnitude over the last 40 years in surface waters of two of the four sub-basins studied, while abundance of other forage species increased; human population density and commercial harvest were the strongest predictors of forage fish declines (Green et al. 2015). However, current abundance relative to reference points is unknown. The International Union for Conservation of Nature (IUCN) has not rated surf smelt. In the absence of detailed information of abundance, we conducted a PSA for this fishery and rated as "high" concern due to the high vulnerability of the stock.

#### Justification:

Productivity attribute	Relevant Information	Risk (1 = low risk, 2 = medium risk, 3 = high risk)
Average age at maturity	2 years (Penttila 1978)	1
Average maximum age	5 years (Therriault et al. 2002)	1
Fecundity	20,000 eggs/year (Fisheries and Oceans Canada 2002)	2
Average maximum size (fish only)	30.5 cm (Hart 1973)	1
Average size at maturity (fish only)	15–16 cm (Penttila 1978)	1
Reproductive strategy	Demersal egg layer (Miller and Kendall 2009)	2
Trophic level	3.4 (Fishbase 2018)	3

<b>Habitat quality</b>	Moderately altered from shoreline armoring, which affects spawning habitat (Quinn et al. 2012)	2
<b>Productivity score = 1.63</b>		
<b>Susceptibility Attribute</b>	<b>Relevant Information</b>	<b>Risk (1 = low risk, 2 = medium risk, 3 = high risk)</b>
<b>Areal overlap</b> (considers all fisheries)	No direct evidence that >70% of species range is unfished. Default score awarded	3
<b>Vertical overlap</b> (considers all fisheries)	Default score for target species	3
<b>Selectivity of fishery</b>	Fishery targets spawning aggregations	3
<b>Post-capture mortality</b> (specific to fishery under assessment)	Default score for retained species	3
<b>Susceptibility score = 3.00</b>		
<b>Total vulnerability score = 3.41 (high)</b>		

UNITED STATES OF AMERICA, CAST NETS  
UNITED STATES OF AMERICA, SCOOPNETS

**High Concern**

Limited quantitative data exists for stocks of surf smelt throughout its range (Pew 2013) (Selleck and Gibson 2011)(Therriault et al. 2002), and the species has not been assessed by the International Union for Conservation of Nature (IUCN). Although landings are reported to the California Department of Fish and Wildlife (CDFW), no formal stock assessments are performed and the state has not set stock reference points. Therefore, a Productivity-Susceptibility Analysis (PSA) was used for this fishery and scored 3.41, high vulnerability. This species is highly vulnerable and there is no evidence to suggest that the stock is above or below reference points, which results in a score of "high" concern.

**Justification:**

As a group, abundance of true smelts along coastal California has severely declined (Ainley et al. 2014). Anecdotal accounts suggest that California surf smelt populations are at a historic low and that the few remaining spawning sites are explicitly targeted by commercial fishers with little oversight by CDFW (pers. comm., Drew Barrett 2018). Likewise, through ethnographic interviews and a smelt habitat assessment, the researchers with the *Tolowa Dee-ni' Nation* have found that while spawning habitat is present and suitable, smelt populations are declining at a rapid rate (pers. comm., Jaytuk Steinruck [Tolowa Dee-ni' Nation] 2018). Although there is insufficient quantitative data to support these observations, the PSA indicates that surf smelt are highly vulnerable to fishing pressure.

<b>Productivity attribute</b>	<b>Relevant Information</b>	<b>Risk (1 = low risk, 2 = medium risk, 3 = high risk)</b>
<b>Average age at maturity</b>	2 years (Penttila 1978)	1
<b>Average maximum age</b>	5 years (Therriault et al. 2002)	1
<b>Fecundity</b>	20,000 eggs/year (Fisheries and Oceans Canada 2002)	2
<b>Average maximum size (fish only)</b>	30.5 cm (Hart 1973)	1
<b>Average size at maturity (fish only)</b>	15–16 cm (Penttila 1978)	1
<b>Reproductive strategy</b>	Demersal egg layer (Miller and Kendall 2009)	2
<b>Trophic level</b>	3.4 (Fishbase 2018)	3
<b>Habitat quality</b>	Coastal development, pollution, freshwater diversion (CDFG 2001) (Halpern et al. 2014) (Pew 2013)	2
<b>Productivity score = 1.63</b>		
<b>Susceptibility Attribute</b>	<b>Relevant Information</b>	<b>Risk (1 = low risk, 2 = medium risk, 3 = high risk)</b>
<b>Areal overlap</b> (considers all fisheries)	No direct evidence that >70% of species range is unfished. Default score awarded	3
<b>Vertical overlap</b> (considers all fisheries)	Default score for target species	3
<b>Selectivity of fishery</b>	Fishery targets spawning aggregations	3
<b>Post-capture mortality</b> (specific to fishery under assessment)	Default score for retained species	3
<b>Susceptibility score = 3.00</b>		
<b>Total vulnerability score = 3.41 (high)</b>		

Although it is feasible that fishing pressure in the eastern and northeastern Pacific (central California to Alaska) is low, we do not have direct evidence to support that more than 70% of the species concentration is unfished by any fishery. The coastal waters of British Columbia were important for commercial landings in the early 1900s, but commercial and recreational effort is centered in the Vancouver area and lower mainland region, with the commercial fishery now occurring within the Salish Sea at Burrard Inlet (Fisheries and Oceans Canada 2002) (Fisheries and Oceans Canada 2015). Oregon has banned a commercial fishery for the species (ODFW 2016), and Washington has no commercial fishery in coastal waters (pers. comm., Lindquist, A., [WDFW], 9 Mar. 2018). Additionally, marine protected areas (MPAs) cover over 16% of California's coastal

waters (CDFW 2018). However, the recreational and tribal effort throughout the range of coastal populations of surf smelt is unknown.



Figure 4 Native distribution of surf smelt. Range of colors indicate degree of suitability of habitat which can be interpreted as probabilities of occurrence. Red indicates highest probability of occurrence, yellow indicates lowest. From Fishbase.org, available at: [https://www.aquamaps.org/receive.php?type\\_of\\_map=regular](https://www.aquamaps.org/receive.php?type_of_map=regular)

## Factor 1.2 - Fishing Mortality

UNITED STATES OF AMERICA/PUGET SOUND, BEACH SEINES

### Moderate Concern

It's unknown whether the populations in Washington and British Columbia represent different stocks and there is little information on mortality. In the face of uncertainty, Washington has opted for a precautionary approach to fisheries management (WDFW 2018). British Columbia has not applied a precautionary approach, since no reference points have been defined nor limits set (Fisheries and Oceans Canada 2015). A 2005 study in Burrard Inlet, British Columbia estimated natural mortality to be 0.4, but found varying results for fishing mortality due to uncertainty that prohibited a definitive conclusion on whether overfishing was occurring (Therriault and Hay 2005). Without the basic information on the number of stocks, some still question whether the current policy that allows for an open access surf smelt fishery in Canada is justified (Fisheries and Oceans Canada 2015).

As mentioned previously, WDFW has limited landings to 60,000 lb and mortality from recreational fishers is unknown, but assumed to be at least an equal contributor to mortality from commercial fishing (Lowry et al. 2015). However, a large portion of shoreline is privately owned and/or has difficult access, which would effectively limit fishing opportunities and create de-facto refuges on some spawning beaches (pers. comm., D.

Penttila 2018). WDFW and its partners have documented approximately 259 lineal statute miles of surf smelt spawning habitat (WDFW 2015). Around 90% of the landings in the commercial smelt fishery in Washington comes from northern shores of Camano Island (areas 24A and 24C in figure below). (Lowry et al. 2015) (pers. comm., P. Dionne 2018). Because fishing mortality is limited by seasonal and spatial closures, restrictive beach access to some spawning beaches, and catch limits, and because 90% of commercial catch occurs in an area that represents <11% of documented spawning habitat (pers. comm., P. Dionne 2018), cumulative fishing mortality for inland smelt in Washington is likely low. Therefore, we award a score of "moderate" concern.

**Justification:**

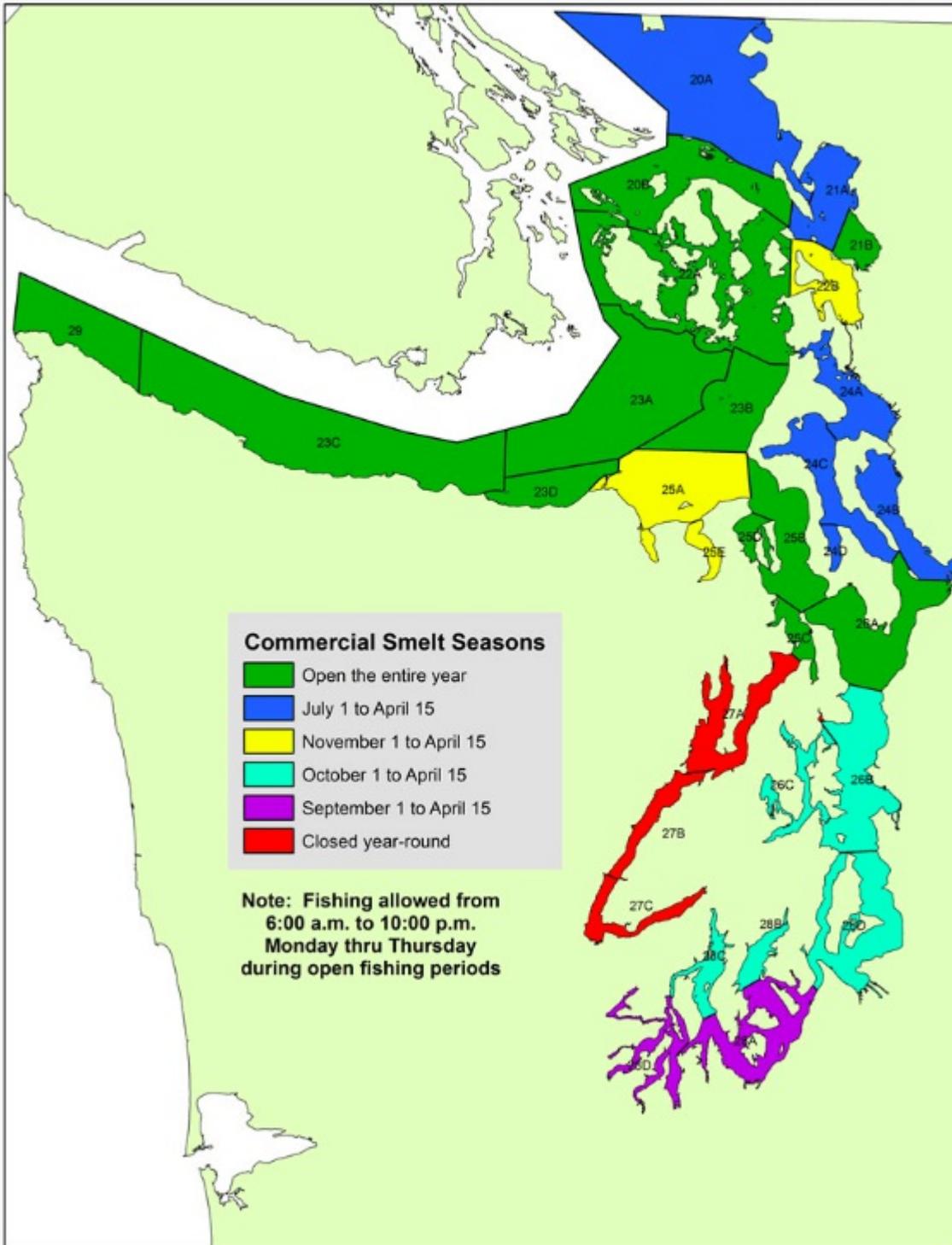


Figure 5 Commercial smelt season in different areas of Puget Sound in Washington state. From WDFW 2018a.

UNITED STATES OF AMERICA, CAST NETS  
UNITED STATES OF AMERICA, SCOOPNETS

**Moderate Concern**

Commercial landings of surf smelt are reported to the California Department of Fish and Wildlife (CDFW) and have averaged 51.21 MT since 2000 (CDFW 2017a). However, landings totaled just 5,854 lb and 689 lb in 2016 and 2017 respectively (CDFW 2018c). California has not established a total allowable catch for surf smelt. There are no tribal-directed fisheries in Federal waters, but surf smelt are targeted in small, near-shore fisheries, and California recreational fishers target surf smelt near or from shore (Pacific Fishery Management Council 2016). Fishing mortality is unknown relative to reference points. We award a score of "moderate" concern because cumulative fishing mortality is expected to be low and surf smelt in the Pacific Ocean occur over an extensive geographic range.

**Justification:**

Seafood Watch uses Lenfest Forage Fish Task Force guidelines (Pikitch et al. 2012) to score mortality for forage species (p. 14 in (Seafood Watch 2016)). Though there are no reference points for surf smelt, and an appropriate precautionary strategy that accounts for the needs of dependent predators (see detailed management information in Criteria 3.1 and 4.3) is lacking, the commercial fishery for surf smelt occurs almost exclusively within one region of northern California and cumulative fishing mortality is likely to be low.

Various birds, fish, and mammals feed on surf smelt (Therriault et al. 2002). Notably, surf smelt are important to the diet of chinook salmon (*Oncorhynchus tshawytscha*) in northern California, with index of importance values (based on percentage of total weight, percentage of total number, and percentage frequency of occurrence) of 21% and 25% in late summer and late spring respectively (Hunt et al. 1999). Two populations of chinook salmon on the west coast of the US are currently listed as endangered, while several are listed as threatened under the Endangered Species Act (NOAA 2018).

## **Criterion 2: Impacts on Other Species**

All main retained and bycatch species in the fishery are evaluated under Criterion 2. Seafood Watch defines bycatch as all fisheries-related mortality or injury to species other than the retained catch. Examples include discards, endangered or threatened species catch, and ghost fishing. Species are evaluated using the same guidelines as in Criterion 1. When information on other species caught in the fishery is unavailable, the fishery's potential impacts on other species is scored according to the Unknown Bycatch Matrices, which are based on a synthesis of peer-reviewed literature and expert opinion on the bycatch impacts of each gear type. The fishery is also scored for the amount of non-retained catch (discards) and bait use relative to the retained catch. To determine the final Criterion 2 score, the score for the lowest scoring retained/bycatch species is multiplied by the discard/bait score. The Criterion 2 rating is determined as follows:

- Score >3.2=Green or Low Concern
- Score >2.2 and ≤3.2=Yellow or Moderate Concern
- Score ≤2.2=Red or High Concern

Rating is Critical if Factor 2.3 (Fishing Mortality) is Critical

### **Guiding Principles**

- Ensure all affected stocks are healthy and abundant.
- Fish all affected stocks at sustainable level.
- Minimize bycatch.

### **Criterion 2 Summary**

Only the lowest scoring main species is/are listed in the table and text in this Criterion 2 section; a full list and assessment of the main species can be found in Appendix A.

SURF SMELT - UNITED STATES OF AMERICA - CAST NETS					
<b>Subscore:</b>	<b>5.000</b>	<b>Discard Rate:</b>	<b>1.00</b>	<b>C2 Rate:</b>	<b>5.000</b>
Species	Abundance	Fishing Mortality	Subscore		
No other main species caught					

SURF SMELT - UNITED STATES OF AMERICA - SCOOPNETS					
<b>Subscore:</b>	<b>5.000</b>	<b>Discard Rate:</b>	<b>1.00</b>	<b>C2 Rate:</b>	<b>5.000</b>
Species	Abundance	Fishing Mortality	Subscore		
No other main species caught					

SURF SMELT - UNITED STATES OF AMERICA/PUGET SOUND - BEACH SEINES					
<b>Subscore:</b>	<b>5.000</b>	<b>Discard Rate:</b>	<b>1.00</b>	<b>C2 Rate:</b>	<b>5.000</b>
Species	Abundance	Fishing Mortality	Subscore		
No other main species caught					

The commercial surf smelt fishery in Puget Sound reaches its annual quota in just two to three months, and based on WDFW seine surveys, has very little bycatch (pers. comm., A. Lindquist, [WDFW] 9 Mar. 2018). Species encountered in WDFW seining efforts (which uses similar gear to the commercial fishery) include shiner surfperch, juvenile salmon, bull trout, sea run cutthroat trout, Pacific herring, and northern anchovy (pers. comm., A. Lindquist, [WDFW] Mar. 9, 2018). Bull trout, a "Threatened" species, was not included because it is only sporadically caught. When encountered, these species are not removed from the water and are released alive.

There is limited information available on interactions of other species in the surf smelt fishery in California. Anecdotally, dipnets and cast nets targeting surf smelt have very low bycatch (less than 1% of catch) (pers. comm., D. Barrett 2018). Night smelt (*Spirinchus starksi*) are targeted in very similar habitats with identical gear and have very low incidences of bycatch (H.T. Harvey & Associates et al., 2015) (pers. comm., K. Oda 2018), but no equivalent study has been done for surf smelt.

Overall, bycatch for both fisheries is extremely low and a score of five is awarded.

## 2.4 - Discards + Bait / Landings

UNITED STATES OF AMERICA / PUGET SOUND, BEACH SEINES  
UNITED STATES OF AMERICA, CAST NETS  
UNITED STATES OF AMERICA, SCOOPNETS

**< 100%**

This fishery targets spawning aggregations and does not use bait. Bycatch is generally considered very low (pers. comm., A. Lindquist, [WDFW] 9 Mar. 2018), but discard estimates are not available for this fishery. Since spawning adults are targeted, it's unlikely that undersized surf smelt are encountered. There are no other main species in the fisheries for surf smelt; therefore, we award a score 1 for Factor 2.3.

## **Criterion 3: Management Effectiveness**

Five factors are evaluated in Criterion 3: Management Strategy and Implementation, Bycatch Strategy, Scientific Research/Monitoring, Enforcement of Regulations, and Inclusion of Stakeholders. Each is scored as either 'highly effective,' 'moderately effective,' 'ineffective,' or 'critical'. The final Criterion 3 score is determined as follows:

- 5 (Very Low Concern) — Meets the standards of 'highly effective' for all five factors considered.
- 4 (Low Concern) — Meets the standards of 'highly effective' for 'management strategy and implementation' and at least 'moderately effective' for all other factors.
- 3 (Moderate Concern) — Meets the standards for at least 'moderately effective' for all five factors.
- 2 (High Concern) — At a minimum, meets standards for 'moderately effective' for Management Strategy and Implementation and Bycatch Strategy, but at least one other factor is rated 'ineffective.'
- 1 (Very High Concern) — Management Strategy and Implementation and/or Bycatch Management are 'ineffective.'
- 0 (Critical) — Management Strategy and Implementation is 'critical'.

The Criterion 3 rating is determined as follows:

- Score >3.2=Green or Low Concern
- Score >2.2 and ≤3.2=Yellow or Moderate Concern
- Score ≤2.2 = Red or High Concern

Rating is Critical if Management Strategy and Implementation is Critical.

### **GUIDING PRINCIPLE**

- The fishery is managed to sustain the long-term productivity of all impacted species.

### **Criterion 3 Summary**

<b>Fishery</b>	<b>Management Strategy</b>	<b>Bycatch Strategy</b>	<b>Research and Monitoring</b>	<b>Enforcement</b>	<b>Stakeholder Inclusion</b>	<b>Score</b>
Fishery 1: United States of America   Cast nets	Moderately Effective	Highly Effective	Ineffective	Highly Effective	Highly Effective	Red (2.000)
Fishery 2: United States of America   Scoopnets	Moderately Effective	Highly Effective	Ineffective	Highly Effective	Highly Effective	Red (2.000)
Fishery 3: United States of America / Puget Sound   Beach seines	Moderately Effective	Highly Effective	Moderately Effective	Highly Effective	Highly Effective	Yellow (3.000)

### **Criterion 3 Assessment**

#### **Factor 3.1 - Management Strategy and Implementation**

*Considerations: What type of management measures are in place? Are there appropriate management goals, and is there evidence that management goals are being met? Do managers follow scientific advice? To achieve a highly effective rating, there must be appropriately defined management goals, precautionary policies that are*

*based on scientific advice, and evidence that the measures in place have been successful at maintaining/rebuilding species.*

UNITED STATES OF AMERICA, CAST NETS  
UNITED STATES OF AMERICA, SCOOPNETS

### **Moderately Effective**

The current commercial surf smelt fishery in the Northeast Pacific Ocean only occurs within California waters. California commercial fishers target surf smelt with A-frame dipnets and cast nets. All persons involved in taking fish for commercial purposes must be licensed and submit landing receipts. Dipnets may not measure more than six feet in greatest breadth in districts 1, 1.5, 2, 3, and 4 (inland waters or land areas). However, there is no fisheries management plan for surf smelt in California and the species was not included in a recent Productivity Susceptibility Analysis (PSA) of the state's most significant fisheries (MRAG Americas 2016). Surf smelt is considered low priority, there are no limitations on landings weight or season (H. T. Harvey & Associates et al., 2015) and recreational landing estimates are highly variable (CDFW 2015). There are measures in place to prohibit future directed fisheries in federal and state waters for species like surf smelt (Pacific Fishery Management Council 2016). However, given that fishers target spawning aggregations nearshore, a fishery outside state waters is unlikely to develop. Management within state waters is given a score of "moderately effective" because effectiveness is unknown and it is unlikely that the fishery is having a serious negative impact on the stock.

### **Justification:**

Nearly all of commercial smelt landings in northern California come from one area within the Redwood National and State Park (RNSP) and fishers are dependent on vehicles to transport their catch (pers. comm., K. Oda 2018). The RNSP General Management Plan was implemented in 2000. The Plan prohibits off-road vehicles within the National and State Park boundaries, but exempts smelt fishers who had a permit to access beaches prior to 2000 (California State Park and Recreation Commission 2000). Permits are non-transferable, so this access exemption will expire when current fishers stop using their permit, effectively limiting the access of the fishery in this region.

UNITED STATES OF AMERICA / PUGET SOUND, BEACH SEINES

### **Moderately Effective**

In the absence of formal stock assessments, the fishery is monitored and regulated by policies that control the intensity of commercial fishing activity. The Washington Department of Fish and Wildlife (WDFW) oversees fisheries within Puget Sound. Commercial fishing is limited to Monday through Thursday during daylight hours (WDFW 2014). Fisheries managers recently modified catch limits based on consecutive years of high landings, which indicates a level of adaptive management. Washington's Forage Fish Management Plan outlines a conservation approach for forage species exploitation (Bargmann 1998), monitors landings by fish tickets that document sales to licensed vendors (Lowry et al. 2015), and now limits annual commercial landings to 60,000 lb in Puget Sound (WDFW 2018a), which is usually reached in just two to three months (pers. comm. A. Lindquist [WDFW], 9 Mar. 2018). WDFW does not consider achievement of maximum yield a goal for forage fish management (WDFW 1998), and the recent precautionary quota was implemented that serves as a strategy for protecting spawning stock (since spawning stock is targeted). The current TAC of 60,000 lb is 65% of the average catch from 2000 to 2014 and 52% of the average catch from 1980e to 1996 (Bargmann 1998), which is considered at an appropriate level for data-poor stocks (Seafood Watch 2016).

However, data is limited on recreation landings of surf smelt (Lowry et al. 2015) and recreational harvest of forage fish is not rigorously controlled (Greene et al. 2015). WDFW assumes that recreational landings are

roughly equal to commercial landings, but Lowry et al. (2015) suggest there is a substantial chance that recreational landings exceed the assumed amount and more study is needed to address the knowledge gap. WDFW has demonstrated that adaptive management and exploitation rates are at low levels, but assumptions of recreational harvests may be inaccurate, which warrants a score of "moderately effective."

**Justification:**

Recreational licenses are not currently required to fish for surf smelt; fishing occurs throughout the year, and recreational effort on private beaches is difficult to monitor (Lowry et al. 2015). WDFW recently restricted recreational dipnetting to daytime only, Friday through Tuesday, but jig gear can be used seven days per week, 24 hours per day (WDFW 2014). Jig gear is usually used to target juveniles (Lowry et al. 2015) and there are no restrictions on minimum size limit for smelt (WDFW 2018b). The current daily limit is 10 lb on forage species (smelt, herring, and sand lance) combined. Of anglers who were surveyed and who caught fish the day of the survey, 13% harvested more than the legal limit (Lowry et al. 2015).

**Factor 3.2 - Bycatch Strategy**

*Considerations: What type of management strategy/measures are in place to reduce the impacts of the fishery on bycatch species and when applicable, to minimize ghost fishing? How successful are these management measures? To achieve a Highly Effective rating, the fishery must have no or low bycatch, or if there are bycatch or ghost fishing concerns, there must be effective measures in place to minimize impacts.*

UNITED STATES OF AMERICA, CAST NETS  
UNITED STATES OF AMERICA, SCOOPNETS

**Highly Effective**

This fishery explicitly targets spawning aggregations from shore, but data on bycatch is absent. Anecdotally, this fishery has less than 1% bycatch (by weight or numbers) and only occasionally catches redbelt surfperch (*Amphistichus rhodoterus*) (pers. comm., D. Barrett 2018). There are no known encounters with species of concern and bycatch is very low, resulting in a score of "highly effective."

UNITED STATES OF AMERICA / PUGET SOUND, BEACH SEINES

**Highly Effective**

This fishery has very low bycatch, with anecdotal evidence from WDFW suggesting that shiner perch makes up less than 5% of the catch; five other fish species combine to be less than 1% of total catch, and all non-targeted species are typically discarded (pers. comm. A. Lindquist [WDFW] 9 Mar. 2018). Bull trout (*Salvelinus confluentus*), which is rated as "Vulnerable" by the IUCN and "threatened" by the state of Washington, is one of the fish included in this low level of bycatch. However, seines are not pulled onshore, which allows for the easy release of live bycatch (pers. comm., A. Lindquist [WDFW], 9 Mar. 2018). Post-release survival of bull trout is not known, but the schooling behavior of smelt allows fishermen to dip net these fish as they push against the seine, while other species are released without leaving the water (pers. comm. A. Lindquist, [WDFW] 23 Apr. 2018). Because bycatch is low and impacts on protected species is minimal, we award a score of "highly effective."

**Justification:**

WDFW conducted a mark-recapture study to try and attain a population estimate and understand aspects of surf smelt movement and spawning timing (pers. comm., A. Lindquist [WDFW] 2018). This study used beach seines and provided the anecdotal evidence for bycatch.

### Factor 3.3 - Scientific Research and Monitoring

*Considerations: How much and what types of data are collected to evaluate the fishery's impact on the species? Is there adequate monitoring of bycatch? To achieve a Highly Effective rating, regular, robust population assessments must be conducted for target or retained species, and an adequate bycatch data collection program must be in place to ensure bycatch management goals are met.*

UNITED STATES OF AMERICA, CAST NETS  
UNITED STATES OF AMERICA, SCOOPNETS

#### Ineffective

There is currently no commercial surf smelt fishery in federal waters, and any future directed fishery would require research and review by the Pacific Fishery Management Council of "potential impacts to existing fisheries, fishing communities, and the greater marine ecosystem" (Pacific Fishery Management Council 2016). The California Fish and Game Commission (CFGC) has a precautionary policy in place to base management decisions on the best available science (CFGC 2012). As part of this policy, the CFGC has outlined the need to improve the understanding of essential information for forage fisheries and incorporate this information into current management practices (CFGC 2012). Although a recent research collaboration investigated life history information and assessed bycatch in the commercial night smelt (*Spirinchus starksi*) fishery, similar research has yet to occur for surf smelt. In fact, most smelt species have no population size estimates (Pew 2013). The state has adopted a precautionary policy, but surf smelt has not been assessed and there are no limits on landings or other regulations to constrain mortality, resulting in a score of "ineffective."

UNITED STATES OF AMERICA / PUGET SOUND, BEACH SEINES

#### Moderately Effective

The Washington Forage Fish Management Plan was adopted by WDFW in 1998, resulting in efforts to survey and map surf smelt spawning grounds, and annually review stock status, fishery results, and regulations (Bargmann 1998). In a data-limited study of surface-trawling over a 40 year period, researchers found that surf smelt and Pacific herring have declined in the Central and South Puget Sound by up to two orders of magnitude; human population density and commercial harvest were the strongest predictors of this decline (Greene et al. 2015). To date, the State has active research programs for surf smelt and other species, including a recent mark-recapture study and periodic spawning habitat surveys for surf smelt, along with quarterly fish surveys in southern Puget Sound (pers. comm., A. Lindquist [WDFW] 2018).

Although accurate abundance estimates for surf smelt are not available, two consecutive years of high landings prompted the State to issue more restrictive regulation, which included a reduced annual quota of 60,000 lb and one less day per week of commercial fishing (WDFW 2018). Under the State's Hydraulic Code Rules (WAC 220-110), known forage fish spawning sites are protected under "no net loss" regulations (Friends of the San Juans 2004). These regulations will protect 12.66 linear mi of 63 discrete spawning beaches that were surveyed by WDFW and its partners between 1989 and 2003 (Friends of the San Juans 2004) along with all other documented spawning sites surveyed since surveys began in 1972. Though not directly related to fisheries effort, the Hydraulic Code Rules would prevent shoreline modification that has been shown to adversely affect surf smelt embryos (Rice 2006). This fishery has active research activities and a process for monitoring annual landings, but does not meet the criteria for a "highly effective" score; therefore, we award a score of "moderately effective."

### Factor 3.4 - Enforcement of Management Regulations

*Considerations: Do fishermen comply with regulations, and how is this monitored? To achieve a Highly Effective rating, there must be regular enforcement of regulations and verification of compliance.*

UNITED STATES OF AMERICA, CAST NETS  
UNITED STATES OF AMERICA, SCOOPNETS

#### Highly Effective

California Fish and Wildlife officers patrol and enforce regulations. CDFW recently upgraded their fisheries reporting system to include a web-based logs system, centralized data management, and an electronic repository for law enforcement, which will help the agency to monitor and enforce fisheries more efficiently and effectively (CDFW 2018 (b)). Surf smelt is often caught on the same fishing trip as night smelt (which is caught at night) (CDFW 2015), and much of the smelt landed in California is loaded into trucks on the beach to hold and transport them to markets (Pacific Fishery Management Council 2016). Nearly all commercial smelt landings in northern California are landed in Redwood National and State Park (RNSP (pers. comm., K. Oda 2018)). Since the commercial fishery effort is so concentrated, CDFW likely has the capacity to ensure compliance of the appropriate regulations and we award a score of "highly effective."

UNITED STATES OF AMERICA / PUGET SOUND, BEACH SEINES

#### Highly Effective

Commercial fishing permits are issued through WDFW, and commercial fishing for surf smelt is closed after the 60,000 lb quota has been met (WDFW 2018a). There are fewer than ten licensed commercial smelt fishers in Washington and fish tickets must be reported to the WDFW by 14:00 the day following harvest. Enforcement officers monitor fishing activities (pers. comm. A. Lindquist [WDFW] 9 Mar. 2018). The capacity to control, ensure, and report compliance is appropriate given the scale of the commercial fishery and we award a "highly effective" score.

### Factor 3.5 - Stakeholder Inclusion

*Considerations: Are stakeholders involved/included in the decision-making process? Stakeholders are individuals/groups/organizations that have an interest in the fishery or that may be affected by the management of the fishery (e.g., fishermen, conservation groups, etc.). A Highly Effective rating is given if the management process is transparent, if high participation by all stakeholders is encouraged, and if there a mechanism to effectively address user conflicts.*

UNITED STATES OF AMERICA, CAST NETS  
UNITED STATES OF AMERICA, SCOOPNETS

#### Highly Effective

The California Fish and Game Commission hosts public meetings, and meetings with fishers to address industry challenges and fisheries management (CFGC 2018). Fishers and other members of the public can attend these meetings and/or submit written comments on agenda items. Meetings and comment forums provide mechanisms to address user conflicts. The National Marine Fisheries Service (NMFS) provided notice of a public comment on the Comprehensive Ecosystem-Based Amendment 1 (CEBA 1) and took into account the strong public support in the final approval of the rule, including letters of support from environmental groups and two fisher organizations (NOAA 2106). The CDFW also provided notice of a public hearing for the proposed regulations for unmanaged forage fish within state waters. Finally, the updated management plan for the Redwood National and State Parks recognized the importance of vehicular beach access for smelt fishers, and grandfathered in access to these fishers while prohibiting all other off-road vehicle use within the

park system (California State Park and Recreation Commission 2000). The management process is transparent, involves multiple user groups, and demonstrates a constructive relationship between stakeholders and managers, resulting in a score of "highly effective."

#### UNITED STATES OF AMERICA / PUGET SOUND, BEACH SEINES

##### **Highly Effective**

Surf smelt is considered a priority species in the Puget Sound. Under the Overarching Legislative Mandate (RCW 77.04.012) Washington Department of Fish and Wildlife (WDFW) staff meet with tribal, fishing, and conservation stakeholders to develop management plans for priority habitats and fisheries (Hennessey and the State Ocean Caucus 2011). This was demonstrated in a 2012 research symposium to re-evaluate forage fish management, which was attended by tribal co-managers, conservation organization members, federal and state authorities, and academic partners (Liedtke et al. 2013). The Washington Fish and Wildlife Commission holds public meetings and informal hearings to provide mechanisms for user groups to participate in fisheries management (WDFW 2018d). These efforts demonstrate that the management process is transparent and encourages participation from various stakeholders, resulting in a score of "highly effective."

## **Criterion 4: Impacts on the Habitat and Ecosystem**

*This Criterion assesses the impact of the fishery on seafloor habitats, and increases that base score if there are measures in place to mitigate any impacts. The fishery's overall impact on the ecosystem and food web and the use of ecosystem-based fisheries management (EBFM) principles is also evaluated. Ecosystem Based Fisheries Management aims to consider the interconnections among species and all natural and human stressors on the environment. The final score is the geometric mean of the impact of fishing gear on habitat score (factor 4.1 + factor 4.2) and the Ecosystem Based Fishery Management score. The Criterion 4 rating is determined as follows:*

- *Score >3.2=Green or Low Concern*
- *Score >2.2 and ≤3.2=Yellow or Moderate Concern*
- *Score ≤2.2=Red or High Concern*

*Rating cannot be Critical for Criterion 4.*

### **Criterion 4 Summary**

<b>Region / Method</b>	<b>Gear Type and Substrate</b>	<b>Mitigation of Gear Impacts</b>	<b>EBFM</b>	<b>Score</b>
United States of America / Cast nets	4	+0.5	Moderate Concern	Green (3.674)
United States of America / Scoopnets	4	+0.5	Moderate Concern	Green (3.674)
United States of America / Puget Sound / Beach seines	4	+0.5	Moderate Concern	Green (3.674)

### **Criterion 4 Assessment**

#### **SCORING GUIDELINES**

#### **Factor 4.1 - Physical Impact of Fishing Gear on the Habitat/Substrate**

Goal: The fishery does not adversely impact the physical structure of the ocean habitat, seafloor or associated biological communities.

- *5 - Fishing gear does not contact the bottom*
- *4 - Vertical line gear*
- *3 - Gears that contacts the bottom, but is not dragged along the bottom (e.g. gillnet, bottom longline, trap) and is not fished on sensitive habitats. Or bottom seine on resilient mud/sand habitats. Or midwater trawl that is known to contact bottom occasionally. Or purse seine known to commonly contact the bottom.*
- *2 - Bottom dragging gears (dredge, trawl) fished on resilient mud/sand habitats. Or gillnet, trap, or bottom longline fished on sensitive boulder or coral reef habitat. Or bottom seine except on mud/sand. Or there is known trampling of coral reef habitat.*
- *1 - Hydraulic clam dredge. Or dredge or trawl gear fished on moderately sensitive habitats (e.g., cobble or boulder)*
- *0 - Dredge or trawl fished on biogenic habitat, (e.g., deep-sea corals, eelgrass and maerl)*

*Note: When multiple habitat types are commonly encountered, and/or the habitat classification is uncertain, the score will be based on the most sensitive, plausible habitat type.*

## Factor 4.2 - Modifying Factor: Mitigation of Gear Impacts

Goal: Damage to the seafloor is mitigated through protection of sensitive or vulnerable seafloor habitats, and limits on the spatial footprint of fishing on fishing effort.

- *+1 —>50% of the habitat is protected from fishing with the gear type. Or fishing intensity is very low/limited and for trawled fisheries, expansion of fishery's footprint is prohibited. Or gear is specifically modified to reduce damage to seafloor and modifications have been shown to be effective at reducing damage. Or there is an effective combination of 'moderate' mitigation measures.*
- *+0.5 —At least 20% of all representative habitats are protected from fishing with the gear type and for trawl fisheries, expansion of the fishery's footprint is prohibited. Or gear modification measures or other measures are in place to limit fishing effort, fishing intensity, and spatial footprint of damage caused from fishing that are expected to be effective.*
- *0 —No effective measures are in place to limit gear impacts on habitats or not applicable because gear used is benign and received a score of 5 in factor 4.1*

## Factor 4.3 - Ecosystem-Based Fisheries Management

Goal: All stocks are maintained at levels that allow them to fulfill their ecological role and to maintain a functioning ecosystem and food web. Fishing activities should not seriously reduce ecosystem services provided by any retained species or result in harmful changes such as trophic cascades, phase shifts or reduction of genetic diversity. Even non-native species should be considered with respect to ecosystem impacts. If a fishery is managed in order to eradicate a non-native, the potential impacts of that strategy on native species in the ecosystem should be considered and rated below.

- *5 — Policies that have been shown to be effective are in place to protect species' ecological roles and ecosystem functioning (e.g. catch limits that ensure species' abundance is maintained at sufficient levels to provide food to predators) and effective spatial management is used to protect spawning and foraging areas, and prevent localized depletion. Or it has been scientifically demonstrated that fishing practices do not have negative ecological effects.*
- *4 — Policies are in place to protect species' ecological roles and ecosystem functioning but have not proven to be effective and at least some spatial management is used.*
- *3 — Policies are not in place to protect species' ecological roles and ecosystem functioning but detrimental food web impacts are not likely or policies in place may not be sufficient to protect species' ecological roles and ecosystem functioning.*
- *2 — Policies are not in place to protect species' ecological roles and ecosystem functioning and the likelihood of detrimental food impacts are likely (e.g. trophic cascades, alternate stable states, etc.), but conclusive scientific evidence is not available for this fishery.*
- *1 — Scientifically demonstrated trophic cascades, alternate stable states or other detrimental food web impact are resulting from this fishery.*

## Factor 4.1 - Physical Impact of Fishing Gear on the Habitat/Substrate

UNITED STATES OF AMERICA, CAST NETS

4

Cast nets are deployed in the surf zone when fishers spot a school of smelt, resulting in some bottom contact. However, bottom damage is likely to be insignificant and temporary because of natural surf turbulence (pers. comm., K. Oda 2018).

UNITED STATES OF AMERICA, SCOOPNETS

**4**

These scoopnets (A-frame dipnets) are placed into the sand; the net is tilted up, and the catch falls through the throat of the net (CDFW 2016). Fishing occurs in the surf zone with high natural disturbance, impact from dipnets is likely to be minimal, and we award a score of "4."

UNITED STATES OF AMERICA / PUGET SOUND, BEACH SEINES

**4**

Surf smelt are typically targeted in shallow waters during their spawning in the sand-gravel mix upper tidal zone (Penttila 2007). Lightweight beach seines are used in areas that have tidal and some wave energy. The gear makes contact with bottom habitats, but impact is minimal, and we award a score of "4."

**Factor 4.2 - Modifying Factor: Mitigation of Gear Impacts**

UNITED STATES OF AMERICA, CAST NETS  
UNITED STATES OF AMERICA, SCOOPNETS

**+0.5**

According to Seafood Watch's Standard for Fisheries, a fishery can receive bonus points based on gear modifications or other measures that are expected to be effective (Seafood Watch 2016). This fishery only operates in a small portion of the species range. Although 50% of the representative habitat is not actively protected from fishing gear and there are no gear modifications, the footprint of this fishery is extremely small and we award a "+0.5" score for other measures that are reasonably expected to be effective.

UNITED STATES OF AMERICA / PUGET SOUND, BEACH SEINES

**+0.5**

There is little impact on bottom substrates, given that fish aggregate in gravel sand mixtures to spawn in the shallow, upper subtidal zone (Moulton and Penttila 2000). Nets used in the fishery are fairly lightweight, can easily be pulled by two people, and fishers tend to avoid areas with vegetation (pers. comm., A. Lindquist, [WDFW] 9 Mar. 2018). There are only nine licensed fishers for the commercial surf smelt fishery in Washington, two of which land approximately 90% of the annual quota in a two to three month window (pers. comm., A. Lindquist, [WDFW] 9 Mar. 2018). Most of the fishery occurs around Camano Island in Puget Sound, so the footprint of beach seines is relatively small compared to the available spawning habitat. According to Seafood Watch's Standard for Fisheries, a fishery can receive bonus points based on gear modifications or other measures that are expected to be effective (Seafood Watch 2016). Though there are no gear modifications, we award a +0.5 score because the scale of the fishery and nature of the gear are expected to be reasonably effective measures to mitigate any damage to the seafloor from the beach seine fishery in Puget Sound.

**Factor 4.3 - Ecosystem-Based Fisheries Management**

UNITED STATES OF AMERICA, CAST NETS  
UNITED STATES OF AMERICA, SCOOPNETS

**Moderate Concern**

Surf smelt are an important food source for marine mammals, shorebirds, and salmon (Therriault et al. 2002). The California Fish and Game Commission is working to incorporate Essential Fishery Information (EFI) into ecosystem-based management of forage fish (Ainley et al. 2014), but EFI for surf smelt is not yet known. Although recent adoption of Comprehensive Ecosystem-Based Amendment 1 (CEBA 1) by the Pacific Fishery Management Council (PFMC) aims to protect the ecological role of surf smelt, this species is a nearshore pelagic fish whose basic biology and distribution is poorly understood (Penttila 2007) (Therriault et al. 2002) and may require stronger policies for fisheries within state waters. California has marine protected areas (MPAs) that are within the range of surf smelt habitat and the remoteness of some beaches makes access for fishing difficult (pers. comm. K. Oda 2018). However, given the importance of surf smelt to the diet of marine mammals, birds, and predatory fish, detrimental food web impacts are possible and stronger policies are needed to protect this forage fish species, resulting in a "moderate" score for Factor 4.3.

**Justification:**

The management bodies overseeing the surf smelt fishery have taken a partially risk-averse path and have rules that restrict fishing intensity. In 2013, PFMC created the Fishery Ecosystem Plan (FEP) for the California Current Ecosystem (CCE) across all Fishery Management Plans. A 2015 amendment to this plan, CEBA 1, prohibits new directed fisheries on any unfished Shared Ecosystem Component (EC) Species, which includes all members of Osmeridae (Pacific Fishery Management Council 2016). This prohibition covers all Federal waters 3 to 200 nautical miles offshore and was recently adopted by CDFW for instate waters (CDFW 2017 (c)). It's important to note that this is not a moratorium on new fisheries. The amendment outlines a review process through National Marine Fisheries Service (NMFS) and the PFMC that evaluates the potential impact of a proposed fishery (Pacific Fishery Management Council 2016). EC species do not require specified reference points, but, based on available data, PFMC can change the management category to "Actively Managed," "Monitored," or "Prohibited Harvest" (Pacific Fishery Management Council 2017).

CDFW expanded the policies of CEBA 1 to state waters (between zero and three nautical miles from the coast), and set bycatch limits for forage species incidentally caught in existing commercial fisheries (CDFW 2017 (c)). However, these policies do not cover existing commercial smelt fisheries.

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**Moderate Concern**

Surf smelt are an important food source for marine mammals, shorebirds, and salmon (Therriault et al. 2002). The Washington Department of Fish and Wildlife (WDFW) uses an ecosystem-based approach rather than a single species approach for forage fish, and considers yield a secondary goal (Bargmann 1998). Currently, there are 25 marine protected areas and conservation areas in Puget Sound, 14 of which are closed to fishing for forage species (WDFW 2018c). However, MPAs cover just 381.5 acres of intertidal areas and 1,723.4 acres of subtidal areas (WDFW 2018c), which constitutes a small portion of the total intertidal and subtidal zones in Puget Sound. Although at least one third of the linear shoreline in Puget Sound has been altered by humans (Rice 2006), the state has instituted a policy of no-net-loss of spawning habitat (Langness et al. 2014). The Surf smelt fishery in Puget Sound received a "moderate" score for ecosystem-based fisheries management because 1) detrimental food web impacts are possible and 2) although some management policies are in place, stronger regulations and/or enforcement is needed to preserve the ecological role of surf smelt.

**Justification:**



Figure 6 Marine Protected Areas of the Puget Sound WDFW 2018c.

## **Acknowledgements**

*Scientific review does not constitute an endorsement of The Safina Center or Seafood Watch® program, or its seafood recommendations, on the part of the reviewing scientists. The Safina Center and Seafood Watch® are solely responsible for the conclusions reached in this report.*

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## **Appendix A: Documented Surf Smelt Spawning Habitat and Fishing Areas in the Puget Sound**

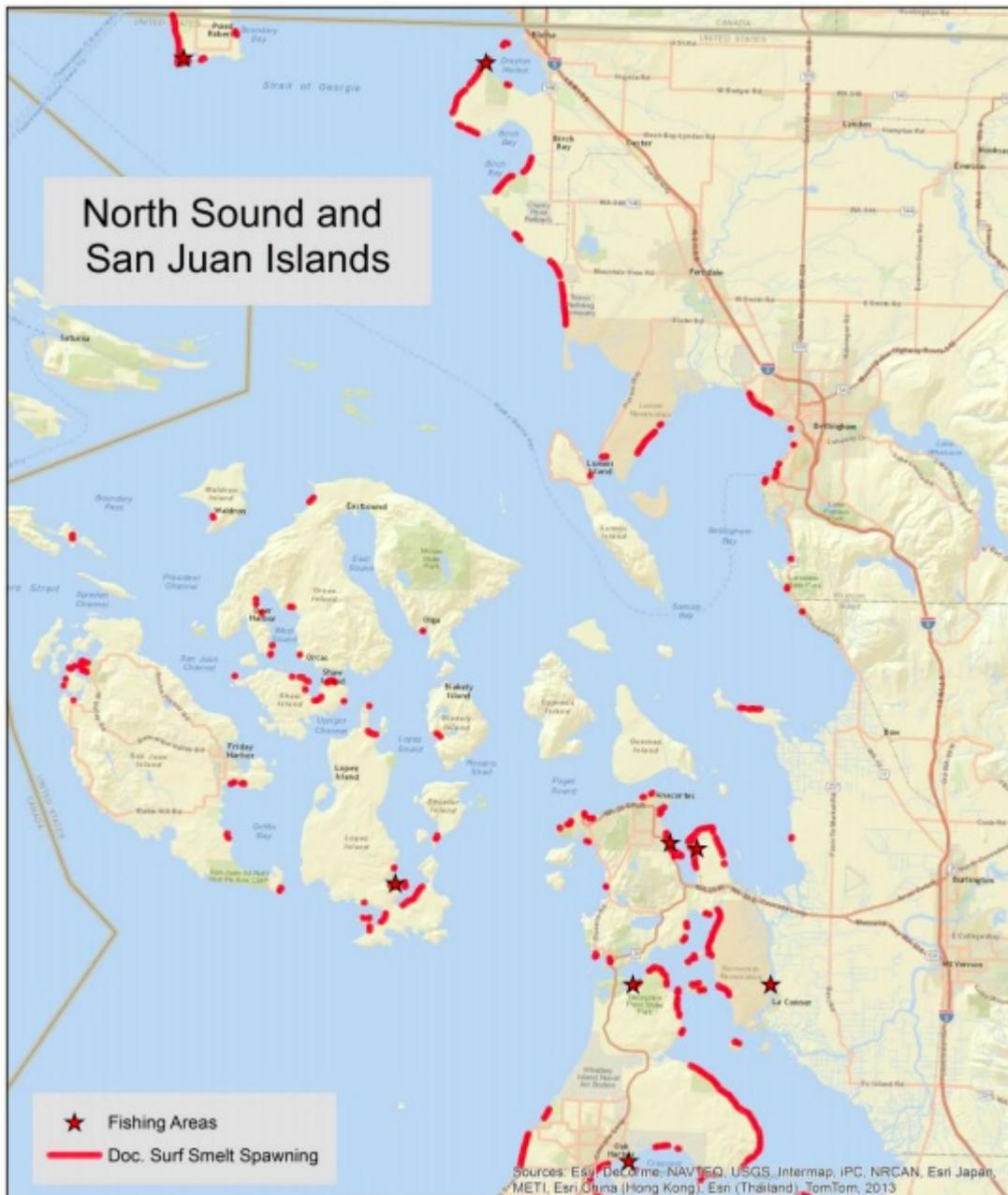


Figure 7 Surf smelt spawning habitat in the North Sound and San Juan Islands. From WDFW 2015.

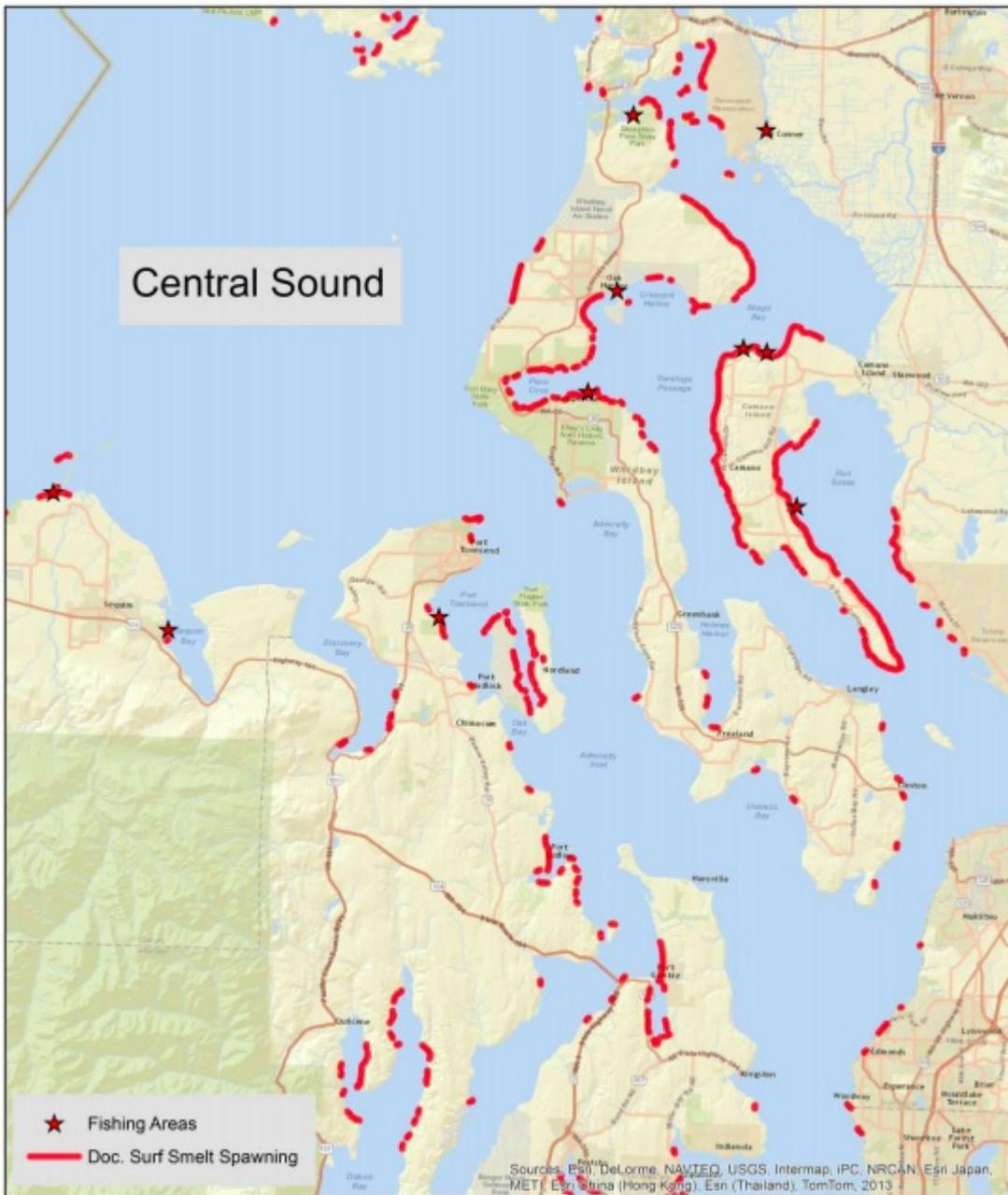


Figure 8 Surf smelt spawning habitat in the Central Sound. From WDFW 2015.

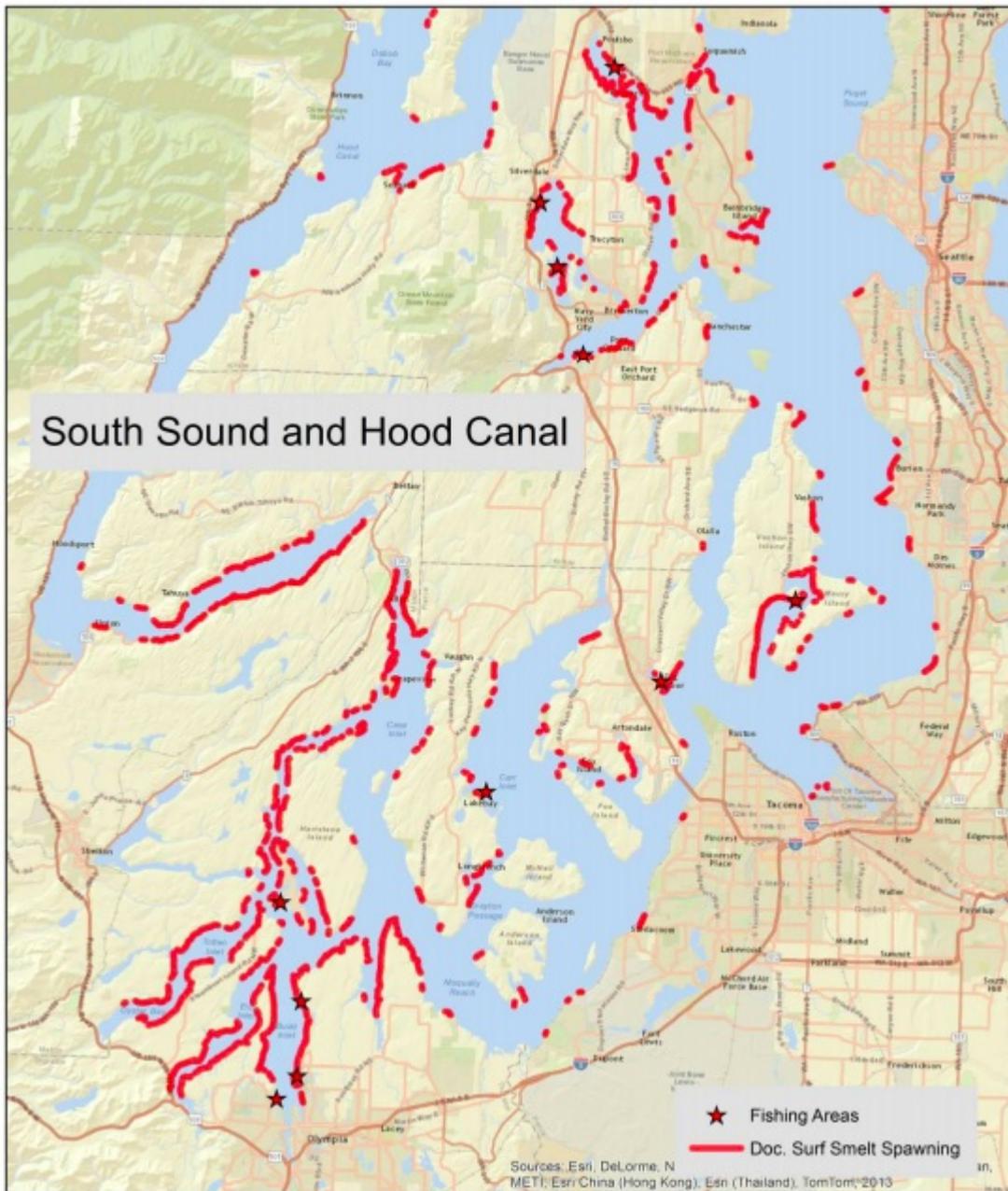


Figure 9 Surf smelt spawning habitat in the South Sound. From WDFW 2015.