Monterey Bay Aquarium Seafood Watch

Northern razor clam

Siliqua patula

© Oregon Department of Fish and Wildlife

Oregon, Washington, Quinault Indian Nation, Alaska

Hand implements

Report ID 28236

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Seafood Watch Standard used in this assessment: Fisheries Standard v4

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About Seafood Watch

Monterey Bay Aquarium's Seafood Watch program evaluates the environmental 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. 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.

Seafood Watch's science-based ratings are available at www.SeafoodWatch.org. Each rating is supported by a Seafood Watch assessment, in which the fishery or aquaculture operation is evaluated using the Seafood Watch standard.

Seafood Watch standards are built on our guiding principles, which outline the necessary environmental sustainability elements for fisheries and aquaculture operations. The guiding principles differ across standards, reflecting the different impacts of fisheries and aquaculture.

- Seafood rated Best Choice comes from sources that operate in a manner that's consistent with our guiding principles. The seafood is caught or farmed in ways that cause little or no harm to other wildlife or the environment.

- Seafood rated Good Alternative comes from sources that align with most of our guiding principles. However, one issue needs substantial improvement, or there's significant uncertainty about the impacts on wildlife or the environment.

- Seafood rated Avoid comes from sources that don't align with our guiding principles. The seafood is caught or farmed in ways that have a high risk of causing harm to wildlife or the environment. There's a critical conservation concern or many issues need substantial improvement.

Each assessment follows an eight-step process, which prioritizes rigor, impartiality, transparency and accessibility. They are conducted by Seafood Watch scientists, in collaboration with scientific, government, industry and conservation experts and are open for public comment prior to publication. Conditions in wild capture fisheries and aquaculture operations can change over time; as such assessments and ratings are updated regularly to reflect current practice.

More information on Seafood Watch guiding principles, standards, assessments and ratings are available at www.SeafoodWatch.org.

Guiding Principles

Seafood Watch defines sustainable seafood as originating from sources, whether fished[1] or farmed, that can maintain or increase production in the long term without jeopardizing the structure or function of affected ecosystems.

The following guiding principles illustrate the qualities that fisheries must possess to be considered sustainable by the Seafood Watch program (these are explained further in the Seafood Watch Standard for Fisheries):

- Follow the principles of ecosystem-based fisheries management.
- Ensure all affected stocks are healthy and abundant.
- Fish all affected stocks at sustainable levels.
- Minimize bycatch.
- Have no more than a negligible impact on any threatened, endangered, or protected species.
- Managed to sustain the long-term productivity of all affected species.
- Avoid negative impacts on the structure, function, or associated biota of aquatic habitats where fishing occurs.
- Maintain the trophic role of all aquatic life.
- Do not result in harmful ecological changes such as reduction of dependent predator populations, trophic cascades, or phase shifts.
- Ensure that any enhancement activities and fishing activities on enhanced stocks do not negatively affect the diversity, abundance, productivity, or genetic integrity of wild stocks.

These guiding principles are operationalized in the four criteria in this standard.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, Seafood Watch develops an overall recommendation. Criteria ratings and the overall recommendation are color coded to correspond to the categories on the Seafood Watch pocket guides and online guide:

Best Choice/Green: Buy first; they're well managed and caught or farmed responsibly.

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

Avoid/Red: Take a pass on these for now; they're caught or farmed in ways that harm other marine life or the environment.

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[1] "Fish" is used throughout this document to refer to finfish, shellfish and other invertebrates

Summary

The Pacific razor clam fisheries assessed in this report are small-scale, low volume fisheries that operate in a limited geographic extent within each state/province. The species is typically consumed locally or used as bait in crab fisheries. Pacific razor clam populations in Oregon, Washington, and the Quinault Indian Nation are considered healthy, based on data-limited indicators of abundance; however, there are concerns about the health of razor clam stocks at commercial beaches in Alaska. The impact of fishing mortality on the Pacific razor clam stock is considered unknown in Alaska, Oregon, and Washington. The Quinault Indian Nation manages its fishery with the intent for mortality to remain at or below a sustainable level; therefore, the impact of fishing mortality is considered a low concern.

The commercial razor clam fisheries have no substantial bycatch interactions, nor are there impacts on nontarget species or discards. The hand harvest gears evaluated in this report include clam guns/tubes and shovels. Hand harvest methods allow fishers to be highly selective of the species they harvest, leading to negligible bycatch.

Only the Quinault Indian Nation fishery is considered highly effective for its management strategy, because the fishery is regularly assessed and there is evidence that harvest policies are effective. All U.S. state fisheries receive a moderately effective score for management strategy, because there are management measures in place that are expected to be effective but the fisheries lack reference points and/or harvest control rules. Managers regularly collect data related to the health of razor clam populations for all the fisheries in this report, but only the Quinault Indian Nation fishery has a peer-reviewed assessment.

The impacts of shovels and clam guns/tubes to the habitat/substrate are considered to be low, because the use of hand harvest to capture clams allows nontarget species to be returned to the substrate alive, resulting in negligible bycatch of species that are important for ecosystem functioning. Even though there is negligible bycatch, there is a moderate concern for the management of ecosystem and food web impacts, because there are no current efforts to fully assess the ecological impacts in the fisheries.

Final Seafood Recommendations

SPECIES | FISHERY	C 1 TARGET SPECIES	C 2 OTHER SPECIES	C 3 MANAGEMENT	C 4 HABITAT	OVERALL	VOLUME (MT) YEAR
Northern razor | Gulf of Alaska | Pacific, Northeast | United States | Hand implements	1.732	5.000	3.000	3.240	**Good Alternative (3.029)**	77
Northern razor | Northeast Pacific | United States | Hand implements | Quinault Indian Nation Fishery	4.284	5.000	5.000	3.240	**Best Choice (4.316)**	326
Northern razor | Northeast Pacific | United States | Oregon | Hand implements	3.318	5.000	3.000	3.240	**Best Choice (3.564)**	19
Northern razor | Northeast Pacific | United States | Washington | Hand implements	3.318	5.000	3.000	3.240	**Best Choice (3.564)**	68

Production volumes are annual average landings from the 5 most recent years of available data from all four fisheries (2017–21) for seasons in which fishing occurred (i.e., production volumes of zero are excluded from the averages). There was no commercial fishery in Washington in 2017 due to a domoic acid closure, and no commercial fishery occurred in Alaska in 2020 and 2021 due to a lack of participants.

Summary

Northern razor clam from Alaska is rated Yellow. There are some concerns about recent declines in stock abundance in areas of commercial importance, but overfishing is not occurring. Hand-digging for clams allows fishers to be selective, undersized clams are typically returned alive, and there is no bycatch of other species. The Alaska fishery is managed by the Alaska Department of Fish and Game. All areas of management are considered moderately to highly effective. The use of hand-operated clam tubes/guns and shovels likely causes some habitat impacts, and more information is needed about how the fishery affects the ecosystem.

Northern razor clam from the Quinault Indian Nation (QIN), Oregon, and Washington fisheries are rated green. The QIN stocks have been formally assessed as healthy, and sustainable catch limits are set based on annual fishery-independent surveys. The stocks fished by the Oregon and Washington state fisheries have not been formally assessed, but data-limited indicators suggest that the stocks are healthy. The Quinault Indian Nation scores highly effective for management strategy because the fishery is managed with reference points and harvest control rules that have been shown to be effective, while Oregon and Washington are managed under policies that are expected to be effective. Handheld gears such as clam guns, tubes, and shovels are highly selective, so there are no bycatch concerns. The fisheries likely cause some habitat impacts, and more information is needed about their effect on the ecosystem.

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 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[2], 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.

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[2] 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 for either factor under Management (Criterion 3).

Introduction

Scope of the analysis and ensuing recommendation

This report contains an evaluation of the Pacific razor clam (*Siliqua patula*) in the United States, and focuses on the Alaska, Oregon, Washington, and Quinault Indian Nation (QIN) commercial fisheries. Gears evaluated in this report include hand-operated clam guns/tubes and shovels. The Alaska fishery only occurs at the western Upper Cook Inlet; nearly all the commercial fishing in Oregon is on Clatsop Beach; the Washington fishery occurs on the Willapa Spits, at the mouth of Willapa Bay; and the Quinault Indian Nation fishery typically occurs on three beaches in Washington, though a fourth beach—Kalaloch Beach—is occasionally open to commercial harvest.

Species Overview

The Pacific or northern razor clam is a marine bivalve found along the North American West Coast on intertidal and subtidal exposed sandy beaches from Pismo Beach, California to the Aleutian Islands, Alaska {Lassuy & Simons 1989}. It can range from 4 ft below the high-tide line to 180 ft (55 m) deep (ADFG 2022d). Razor clam feeds on tiny plants and animals called plankton that it filters from the seawater (ADFG 2022d). Pacific razor clam can grow to a length of over 6 in (16 cm) and reaches sexual maturity between 2 and 4 years of age (Berry-Powell et al. 2023). Growth rates vary with latitude, and northern populations typically have slower growth rates and longer life spans than those in more southern latitudes (Weymouth et al. 1931). Predators of razor clam include sea otters, gulls, ducks, crabs, and various fish species (Lassuy and Simons 1989).

The fisheries are managed by state or province and tribal governments because fisheries occur in state or province waters and areas subject to treaty rights. Historically, the state of Alaska had a significant razor clam fishery. By the early 1960s, the razor clam fishery began to decline, and in 1964, Alaska experienced an earthquake near Cordova, where razor clams were heavily harvested. The earthquake caused moderate mortality to razor clams in Cordova; since then, the population has not returned to previous numbers (Nelson 1994)(Bishop and Powers 2003). The only current commercial fishery in Alaska is on the western beaches of the Upper Cook Inlet, and it is managed by the Alaska Department of Fish and Game (ADFG). In Oregon and Washington, the state commercial fisheries are managed by the Oregon Department of Fish and Wildlife (ODFW) and the Washington Department of Fish and Wildlife (WDFW). The tribal commercial fishery in Washington is managed jointly by WDFW and QIN—the latter exclusively manages Point Grenville beach, which lies within the Quinault Indian Reservation. There are closed areas known as "clam reserves" on Copalis and Long beaches; these sites are used to compare clam populations on harvested and nonharvested beaches (Berry-Powell et al. 2023).

Production Statistics

From the 1950s through 1963, Alaska produced the most Pacific razor clams of any U.S. state (Figure 1). In the 1960s, the Pacific razor clam fishery in Alaska began to decline. In 1964, Alaska experienced an earthquake that raised the elevation of high quality razor clam habitat by 1.6 to 2 m and caused moderate mortality (Bishop and Powers 2003). Since then, the Pacific razor clam population has not returned to previous numbers. In the 1990s and from 2016–17, Washington State's fishery was periodically closed due to domoic acid, which causes amnesic shellfish poisoning (WDFW 2019). NOAA's commercial fishing landing dataset—which was used to generate Figure 1—only goes through 2021; more recent landings data are presented in the following text. In the past decade, the average annual landings of Pacific razor clam were

272,251 lb in Alaska (Marston and Frothingham 2022), 22,092 lb in Oregon, and 83,054 lb in Washington (NMFS 2023). Washington's fishery had one of its highest grossing years in 2022 (landings for 2022 are not shown in Figure 1), with a value of $989,625, which was 2½ times the 10-year annual average value of $390,822 (NMFS 2023). Oregon's highest grossing year over the past decade was 2016, with landings valued at $403,603—well above the 10-year average of $129,843 (NMFS 2023). Note that these values should be considered a rough estimate. For example, ODFW reported average landings of 48,994 lb/yr from 2018 to 2021 (Hunter 2024, pers comm) and WDFW reported 151,463 lb/yr (Forster 2024, pers comm), whereas NMFS reported 21,561 lb/yr for Oregon and 68,009 lb/yr for Washington (NMFS 2023).
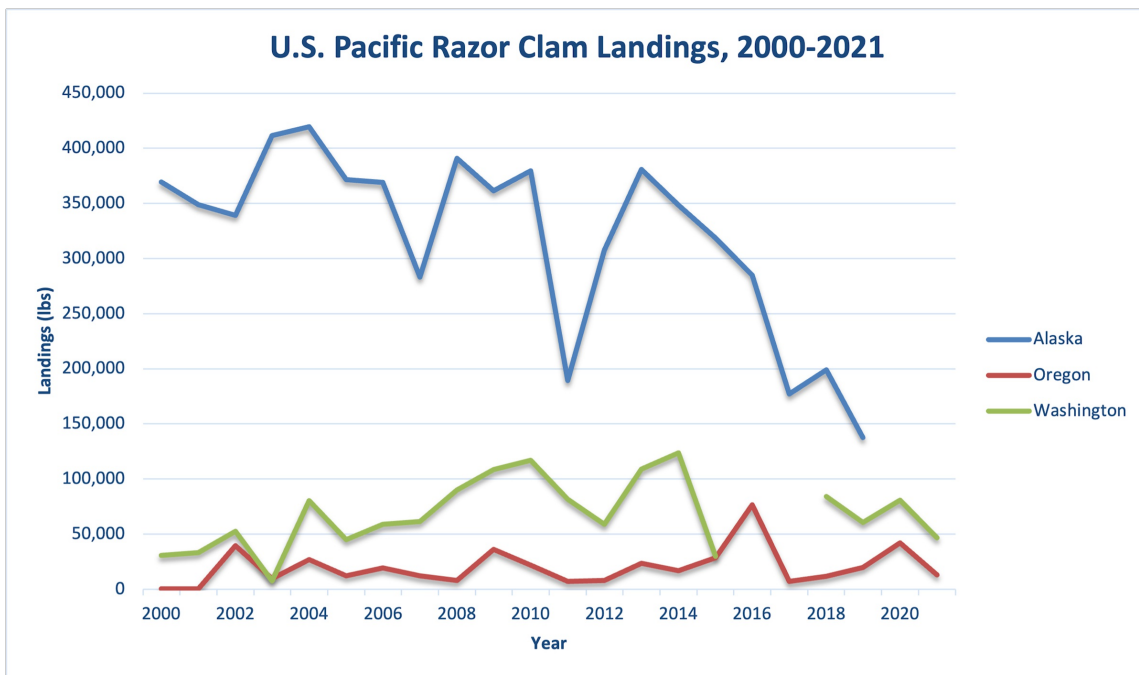

Figure 1: Pacific razor clam landings in the Alaska, Oregon, and Washington commercial fisheries from 2000 to 2021 (Marston and Frothingham 2022)(NMFS 2023). No data were available for Alaska in 2020 and 2021. The Washington fishery was closed in 2016 and 2017.

In Washington State, the QIN signed a treaty with the United States in which the QIN reserves the right to harvest all the razor clams on its reservation, and half the razor clam harvest in its usual and accustomed areas outside of reservation lands. Most of the commercial harvest in the QIN fishery takes place off-reservation, and the usual and accustomed areas off-reservation are comanaged with Washington State. The beaches that are utilized for QIN commercial harvest are Copalis and Mocrocks (WDFW 2022b). The original Quinault Indian Nation dataset provided landings in number of clams rather than pounds of clam. This dataset was converted to pounds by dividing the number of clams landed by 3.33, as advised by expert opinion (Mazzone 2024, pers comm). From 2017 to 2021, the QIN commercial fishery landed an average of 615,961 lb/yr (2.05 million clams per year) from Copalis and Mocrocks beaches combined (Mazzone 2024, pers comm). Landings from Haida Gwaii in British Columbia, Canada (BC) fluctuated over time due to changes in biomass and demand; the commercial harvest in 2015 was 257,941 lb (117 t) but the fishery closed in 2019 and remains closed (DFO 2022). The BC fishery is not rated in this report. Since 2017, the majority of commercial production of the Pacific razor fisheries assessed in this report has occurred in the QIN fishery (Figure 2).
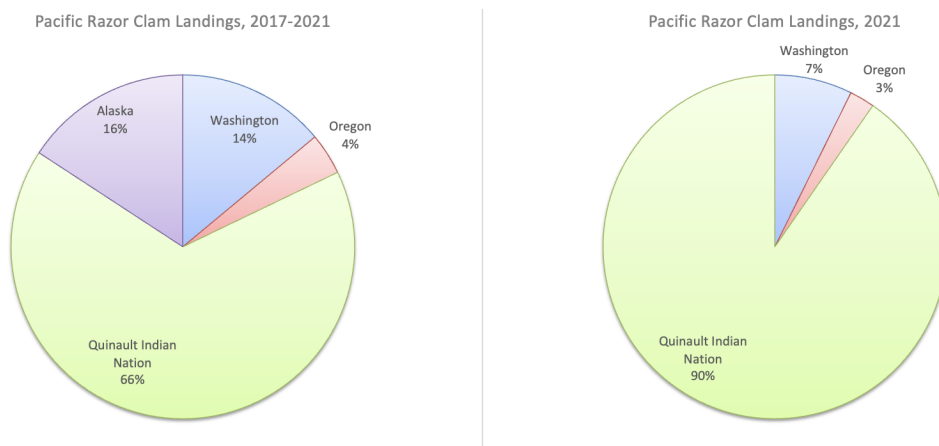
Figure 2: Pacific razor clam landings in the Alaska, Oregon, Washington, and Quinault Indian Nation commercial fisheries from 2017 to 2021 (left) and for the Oregon, Washington, and Quinault Indian Nation fisheries in 2021 (right). Proportions for 2017–21 are based on the average annual landings from years when the fisheries were open. The Alaska fishery was closed in 2020 and 2021; the Washington fishery was closed in 2017, but values of zero are excluded from the averages. Data provided by ODFW, WDFW, QIN, and ADFG.

Importance to the US/North American market.

Import and export records for "clam" do not provide species-level breakdowns of data. Therefore, the specifics on exports of Pacific razor clam are unknown. In Alaska, all clams must be sold for human consumption, except a small proportion (<10% of the total harvest) of broken clams may be sold for bait (Marston and Frothingham 2022). Most of the Oregon catch is consumed locally (ODFW 2022b). Razor clams caught in Washington have historically been used for bait in Dungeness crab fisheries, but the proportion of the catch sold fresh for human consumption has increased in recent years (WDFW 2019). Razor clam is an important cultural food source for members of the Quinault Indian Nation, and the species supports popular recreational fisheries throughout its range.

Common and market names.

Common names include Pacific razor clam, razor clam, and northern razor clam. There is also an Atlantic razor clam (*Ensis directus*) that is unrelated to the Pacific razor clam (*Siliqua patula*). Only the Pacific razor clam is covered in this report.

Primary product forms

Pacific razor clam is commonly fried, baked, used to make clam chowder, and sold as crab bait.

Assessment

This section assesses the sustainability of the fishery(s) relative to the Seafood Watch Standard for Fisheries, available at 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.

Guiding principles

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

Criterion 1 Summary

NORTHERN RAZOR			
REGION / METHOD	ABUNDANCE	FISHING MORTALITY	SCORE
Gulf of Alaska | Pacific, Northeast | United States | Hand implements	1.000: High Concern	3.000: Moderate Concern	Red (1.732)
Northeast Pacific | United States | Hand implements | Quinault Indian Nation Fishery	3.670: Low Concern	5.000: Low Concern	Green (4.284)
Northeast Pacific | United States | Oregon | Hand implements	3.670: Low Concern	3.000: Moderate Concern	Green (3.318)
Northeast Pacific | United States | Washington | Hand implements	3.670: Low Concern	3.000: Moderate Concern	Green (3.318)

Criterion 1 Assessments

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.*

Northern razor (Siliqua patula)

Factor 1.1 - Abundance

Gulf of Alaska | Pacific, Northeast | United States | Hand implements

High Concern

Currently, the only commercial razor clam fishery in Alaska occurs on the western shore of Cook Inlet (WCI) on a 19-mile section of intertidal beach from Harriet Point to Crescent River Bar (Figure 3) (Booz et al. 2019). The commercial razor clam fishery in WCI has not been open since 2019 due to a lack of participants and processors (Lipka and Stumpf 2024). ADFG collects information on the number of diggers, number of days fishing occurs, and total catch to monitor CPUE; however, no formal population studies have been published. ADFG initiated studies in 2016 and 2017 to estimate clam abundance, but the project has been discontinued (Marston and Frothingham 2022). The razor clam population on the eastern shore of Cook Inlet (ECI)—which is closed to commercial fishing—is closely monitored by ADFG. The recreational and personal use fisheries at ECI have been closed to harvest since 2015 due to low abundances of adult razor clam (Booz and Dickson 2022), and this sector has recently shifted to WCI (Booz and Dickson 2023). Historically, the WCI population did not show signs of the declines observed at ECI, but recent changes in CPUE (Figure 4), landings, and age and size compositions show signs of change in productivity for this population as well (Booz et al. 2022)(Booz and Dickson 2023). For example, the mean age of razor clams at Polly Creek from 2016 to 2018 was 5.9 years, compared to 7.2 years from 2013 to 2016; the mean length also declined from 136.7 mm to 114.5 mm over the same period (Booz et al. 2019). The decline continued from 2019 to 2021, with the mean age of 5.0 years and the mean length of 109.4 mm (Booz and Dickson 2023). Similarly, the mean age and size of razor clam at Crescent River were lower across 2016–18 and 2019–21, compared to 2013–15 (Booz and Dickson 2023). Finally, the CPUE for the commercial razor clam fishery was below the long-term average in recent years (Figure 4). Because >97% of the commercial harvest has occurred from Polly Creek to Crescent River (Booz and Dickson 2023), abundance is scored against the status of that population. There are multiple data-limited stock indicators suggesting that the status of the stock is poor at Polly Creek and Crescent River clam beds, so we have awarded a high concern score.
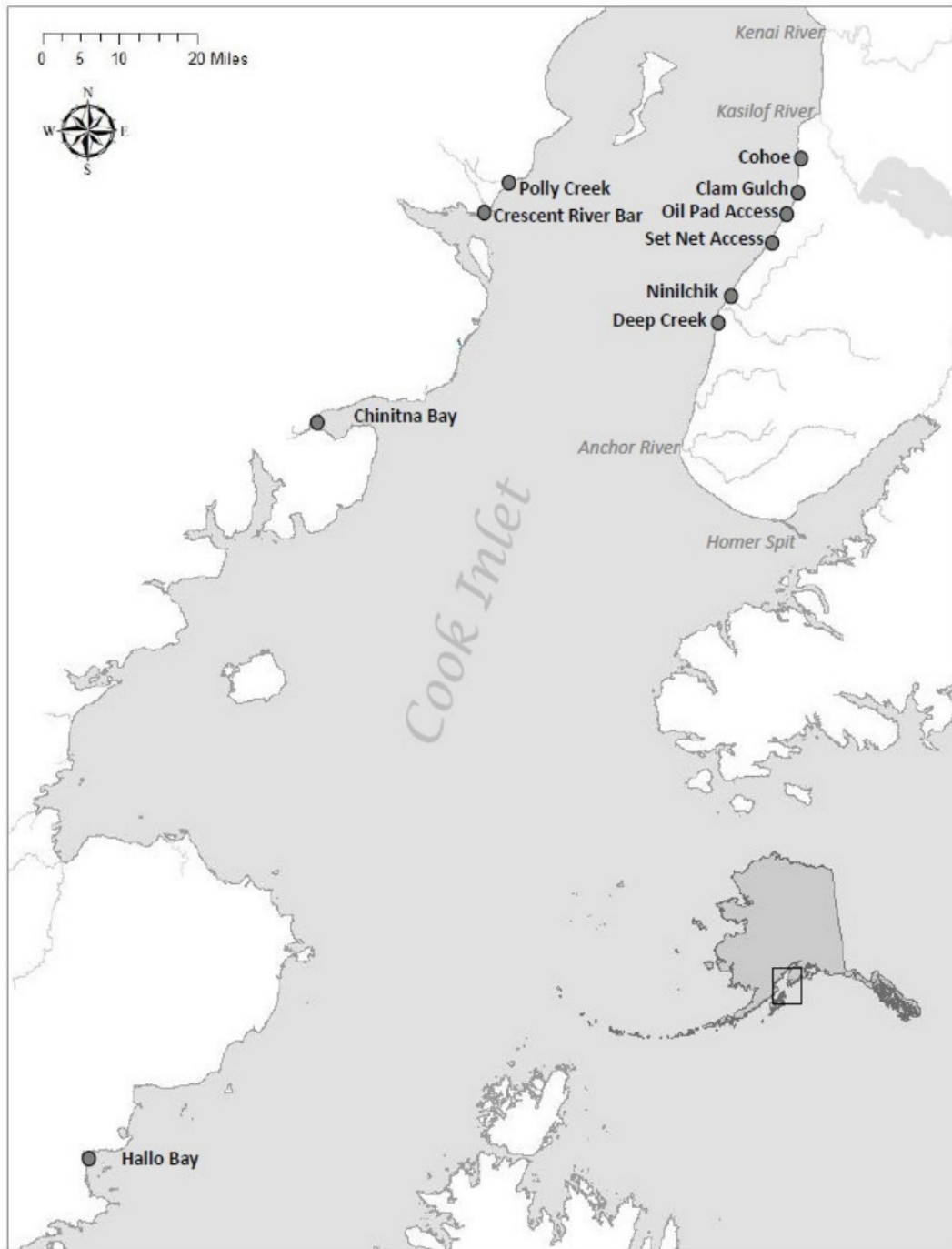
Figure 3: Map of Cook Inlet and Alaska Peninsula razor clam sampling beaches.
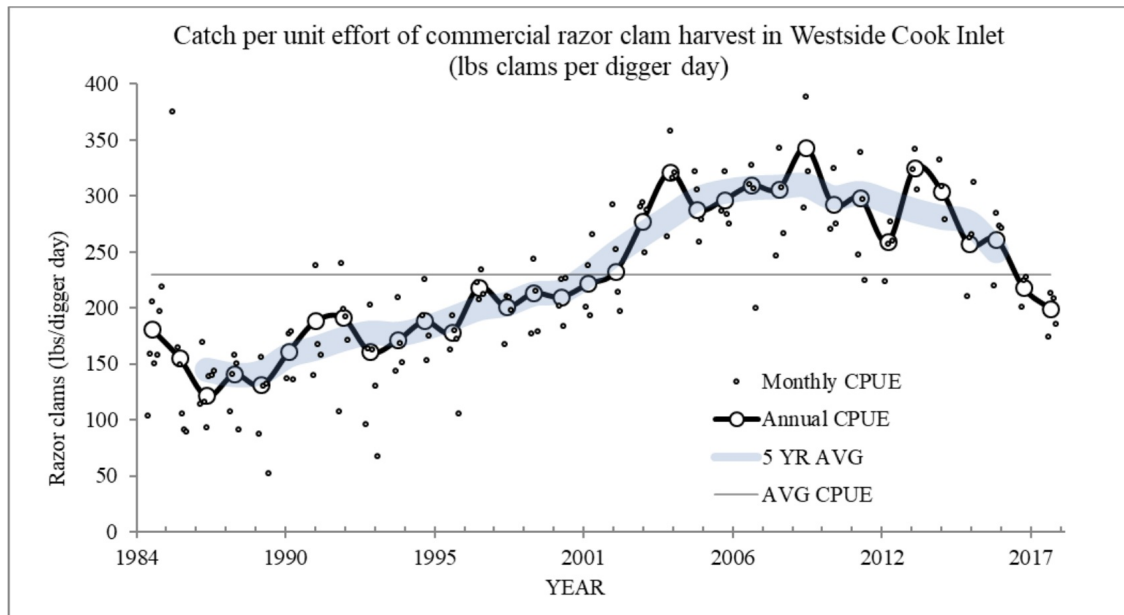
Figure 4: Catch per unit effort of the commercial razor clam fishery in west LCIMA, 1984–2018.

ADFG began monitoring the populations of clam in Cook Inlet in 1965 after an earthquake in 1964 adversely affected razor clam populations and halted commercial fishing (Nelson 1994)(Kerkvliet and Booz 2013). The cause of the decline in the Pacific razor clam populations in ECI is related to as high rate of natural mortality and the lack of recruitment, but the causes of these changes remain unknown (Booz et al. 2019). There is some suggestion that the return of the sea otter to the ECI (e.g., Clam Gulch) possibly contributed to the razor clam population decline and subsequent fisheries closure, but research within Cook Inlet is ongoing. Specifically, annual sampling is occurring within ADFG, but the commercial fish division is not likely to conduct studies on razor clam until there is renewed interest in the fishery (Lipka 2024, pers comm).

Sea otter (*Enhydra lutris*) spends most of its life within the nearshore zone and feeds on intertidal and subtidal invertebrates (Estes and Palmisano 1974). Commercial and recreational fisheries have developed for sea otter prey (e.g., razor clam, geoduck clam, and abalone) across their range from California to Alaska. As sea otter populations have rebounded, conflicts with human activities (i.e., commercial fisheries, subsistence and personal use fisheries) have occurred (Davis et al. 2019). Otters were extirpated from most of Cook Inlet by the early 1900s; remnant populations may have persisted in remote areas of Cook Inlet, and otters began recolonizing the east side of Lower Cook Inlet by the 1960s, eventually reaching Clam Gulch by the early 2000s. Recent aerial surveys show significant sea otter presence along ECI, and, while otters were virtually absent from WCI before 2019, researchers did observe higher otter abundance in the summer of 2019 (Coletti et al. 2021). Although sea otter density is not currently high in areas of commercial razor clam harvest on the WCI, sightings near these clamming areas is cause for concern for fisheries managers (Shields 2018, pers comm).

Northeast Pacific | United States | Hand implements | Quinault Indian Nation Fishery

Low Concern

Razor clam populations in Washington are assessed jointly between WDFW and QIN at five beaches, though the QIN commercial fishery occurs only at Copalis, Mocrocks, and Kalaloch beaches. The latest abundance trends (as measured by average density on razor clam beds) for these beaches are variable but generally higher than long-term levels (Figure 5) (WDFW 2024)(Berry-Powell et al. 2023). In 2023, the total number of recruits (defined as clams >76 mm) and pre-recruits (clams <76 mm) was above the long-term mean for the Copalis and Mocrocks populations (Table 1). There has been no commercial fishery on Kalaloch in recent years because of low abundance of clams; population declines at this beach are thought to be driven by sea otter predation and other environmental factors and conditions (Mazzone 2024, pers comm). Likewise, the recreational fishery at Kalaloch was closed in 2021 because of low population levels dominated by immature clams (WDFW 2022b).

A peer-reviewed assessment of razor clam at several beaches (including Copalis, Mocrocks, and Kalaoch populations) in Washington was published in 2023 (Berry-Powell et al. 2023). The assessment compared abundance and clam size within harvested areas to nonharvested areas, and found only small differences, though the stock statuses relative to the $B_{MSY-proxy}$ reference point was not explicitly stated (Berry-Powell et al. 2023). The $B_{MSY-proxy}$ is defined as the highest population estimate on record for each beach, and this target was recently updated based on the historic high population estimates from 2020 to 2022 (Forster 2024, pers comm). This target reference point is used by WDFW and QIN to determine annual recreational and tribal quotas, which is reflected in the score for Factors 1.2 and 3.1 for the QIN commercial fishery. But we consider this target value uncertain because razor clam populations are highly variable and trends are largely driven by environmental variables (Berry-Powell et al. 2023). Therefore, the abundance score is based on data-limited indicators relative to the long-term mean (Figure 5 and Table 1). Because the QIN commercial fishery has only occurred at Copalis and Mocrocks beaches in recent years and there are data-limited indicators of healthy clam populations at those beaches, we award a score of low concern.
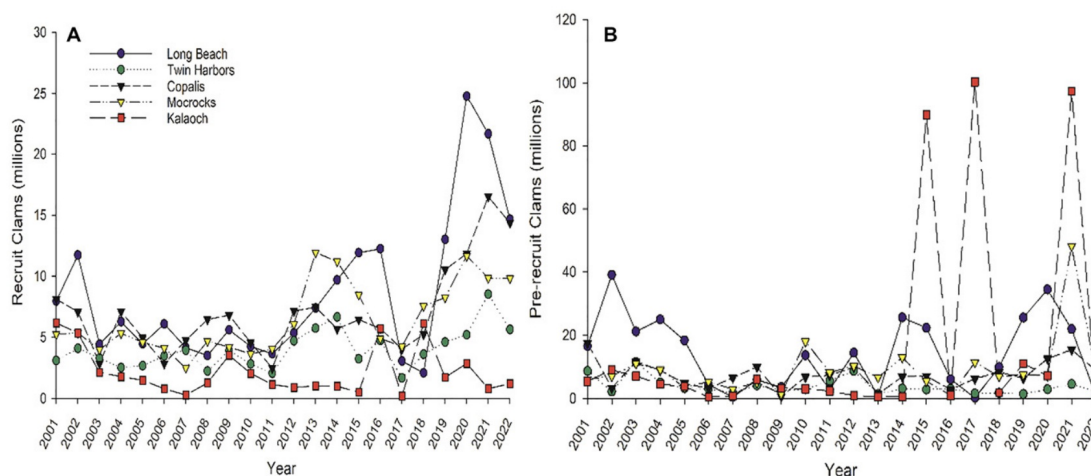
Justification:

Figure 5: Annual Pacific razor clam (*Siliqua patula*) (A) recruit and (B) pre-recruit abundance from 2001 to 2022 along Washington coast management beaches (Berry-Powell et al. 2023).

Table 1. Razor clam population metrics from the 2023–24 surveys relative to the mean from 2001 to 2023 (WDFW 2024) (Mazzone 2024, pers comm).

	Number of recruits (million)			Number of pre-recruits (million)		
Population	2023–24	Mean	Percent of mean	2023–24	Mean	Percent of mean
Copalis	6.92	6.95	100	9.38	7.64	123
Mocrocks	7.01	6.46	108	9.62	9.24	104
Kalaloch	0.53	2.10	25	4.72	16.12	29

Northeast Pacific | United States | Oregon | Hand implements

Low Concern

Oregon conducts annual assessments to estimate abundance, but the last peer-reviewed stock assessment report was in 2006 (Hunter 2008). Although there is no formal stock assessment, Seafood Watch obtained fishery-independent data from ODFW to assess abundance against a data-limited indicator. The density (measured in clams per square meter) of razor clam at Clatsop beaches has fluctuated since the assessment began in 2004 (ODFW 2022c), but the density of all razor clam in each of the last 3 years was above the average of the entire time series (Figure 6) (ODFW 2022d). Because there is a data-limited assessment that indicates that the stock is healthy and there are no conflicting indicators, abundance is scored a low concern.
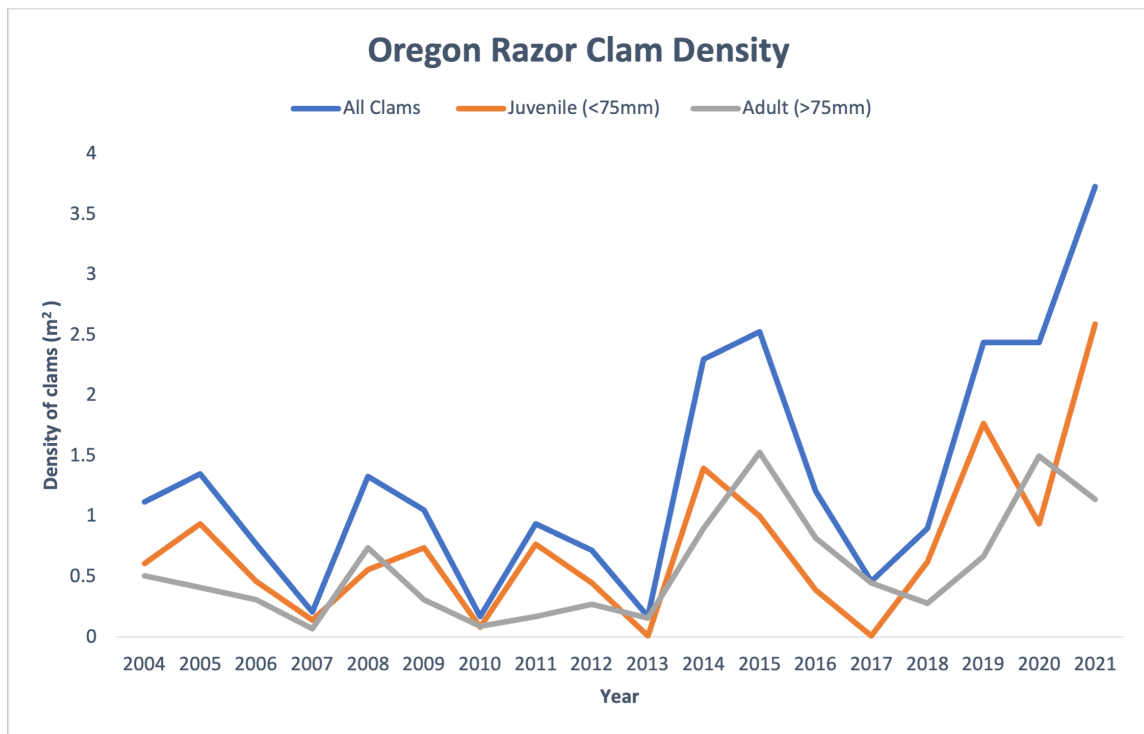
Justification:

Figure 6: Density of adult, juvenile, and all (juvenile and adult combined) razor clam at Clatsop beaches in Oregon 2004–21 (ODFW 2022d).

Northeast Pacific | United States | Washington | Hand implements

Low Concern

The Washington commercial razor clam fishery occurs at the mouth of Willapa Bay, and WDFW monitors catch and effort at this site. The CPUE at Willapa Bay has fluctuated in recent years, but the overall trend from 2009 to 2019 remained relatively stable (Figure 7) (WDFW 2019). The CPUE remained stable at 111–112 lb per digger/day in 2020, 2021, and 2022, and at 83 lb per digger/day in 2023 (unpublished data 2024). Although there is no quantitative stock assessment, a data-limited assessment indicates that the stock is healthy and there are no conflicting indicators. Therefore, we have awarded a low concern score.

Justification:

*no harvest 2016-2017
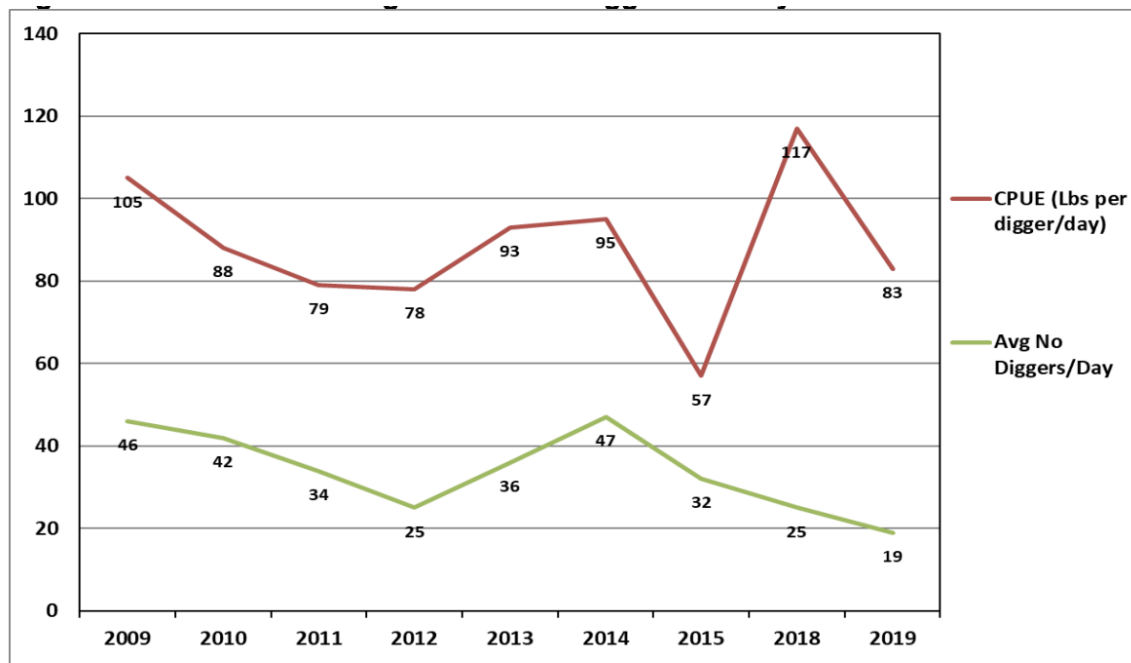
Figure 7: Average number of diggers per day and catch per unit effort (CPUE) in the Washington commercial razor clam fishery (WDFW 2019). The CPUE values (not shown in the figure) were 111 lb in 2020, 112 lb in 2021 and 2022, and 82 lb in 2023 (unpublished data 2024).

Factor 1.2 - Fishing Mortality

Gulf of Alaska | Pacific, Northeast | United States | Hand implements

Moderate Concern

There have been no formal assessments of Pacific razor clam at western Cook Inlet Alaska where the commercial fishery occurs, so fishing mortality is uncertain. ADFG manages the commercial razor clam fishery to achieve a catch of no more than 350,000–400,000 lb (158.8–181.4 t [metric tons]) (Marston and Frothingham 2022). The average commercial catch from 2010 to 2019 was 123.5 t, but the annual catch has been below 90.7 t since 2016 (Lipka and Stumpf 2024). There was no commercial fishery from 2020 to 2023 (Booz and Dickson 2023). Because there are no estimates of fishing mortality relative to sustainable fishing reference points, fishing mortality is considered unknown, so we have awarded a score of moderate concern.

Northeast Pacific | United States | Hand implements | Quinault Indian Nation Fishery

Low Concern

The QIN conducts a joint stock assessment with the WDFW (recreational fishery). Together, they determine the total allowable catch (TAC) for the comanaged beaches (Copalis, Mocrocks, and Kalaloch). The QIN distributes its half of the harvest between its commercial fishery, harvest for home use, and harvest for ceremonial purposes. Before the 2013–14 season, TAC was set at 30%, with half the catch going to the QIN and half to the Washington recreational fishery {WDFW 2015}. In 2013–14, the WDFW and the QIN changed their management strategy to use a variable harvest rate that is based on the maximum exploitable yield, and they set a harvest rate ceiling at 35%. Presently, the TAC is based on a maximum harvest rate of 40% of B_{MSY}, where B_{MSY} is the highest historical abundance of clams for each beach (Berry-Powell et al. 2023). Management also has the ability to decrease TAC or even cease the allowable harvest during low abundance years; the fishery is closed when the population drops below 10% of B_{MSY}; and there is no indication that harvest levels have affected the populations' ability to reproduce (Berry-Powell et al. 2023).

The commercial fishery has consistently remained below the TAC at Copalis and Mocrocks, except for the 2018–19 season (Table 2). Because management reacts to abundance with the intent for mortality to remain at or below a sustainable level and the TAC is rarely exceeded, fishing mortality is considered a low concern.

Justification:

Table 2. Commercial razor clam catch in number of clams and percentage of the commercial TAC taken (Mazzone 2024, pers comm).

	2017–18	2018–19	2019–20	2020–21	2021–22
Copalis	716,214 (99%)	954,774 (95%)	2,134,667 (98%)	382,783 (16%)	2,470,257 (75%)
Mocrocks	638,881 (84%)	1,532,560 (102%)	1,425,215 (86%)	419,502 (18%)	1,311,613 (69%)
Kalaloch	0	0	0	0	0

Northeast Pacific | United States | Oregon | Hand implements

Moderate Concern

ODFW does not use fishing mortality reference points to manage harvest, but does monitor CPUE and conducts an annual stock assessment on Clatsop beaches, which host both commercial and recreational diggers. Nearly all (95%) of the commercial harvest occurs in this area (ODFW 2022c). From 2017 to 2021, the commercial harvest averaged 42,397 lb/year, with an average of 4.5 clams/lb or approximately 189,579 clams/year; the recreational clammers harvested 809,600 clams/year over the same period (ODFW 2022d). Because the sustainability of total fishing mortality is unknown, we score this factor a moderate concern.

Northeast Pacific | United States | Washington | Hand implements

Moderate Concern

WDFW monitors CPUE and conducts a joint stock assessment with the QIN for beaches where recreational harvest occurs (WDFW 2022), but does not use fishing mortality reference points to manage harvest of the state's commercial fishery at Willapa Bay. The Washington commercial fishery landed 191,637 lb and 137,877 lb of razor clam in 2018 and 2019, respectively (Figure 8) (WDFW 2019). For comparison, commercial landings averaged ≈90,000 lbs from 1976 to 2019 and ≈212,000 lbs from 2009 to 2019 (WDFW 2019); note that years when the fishery had domoic acid closures are

excluded from these averages. WDFW does not use fishing mortality reference points to manage commercial harvest and the sustainability of current fishing levels is unknown, so we award a moderate concern score.
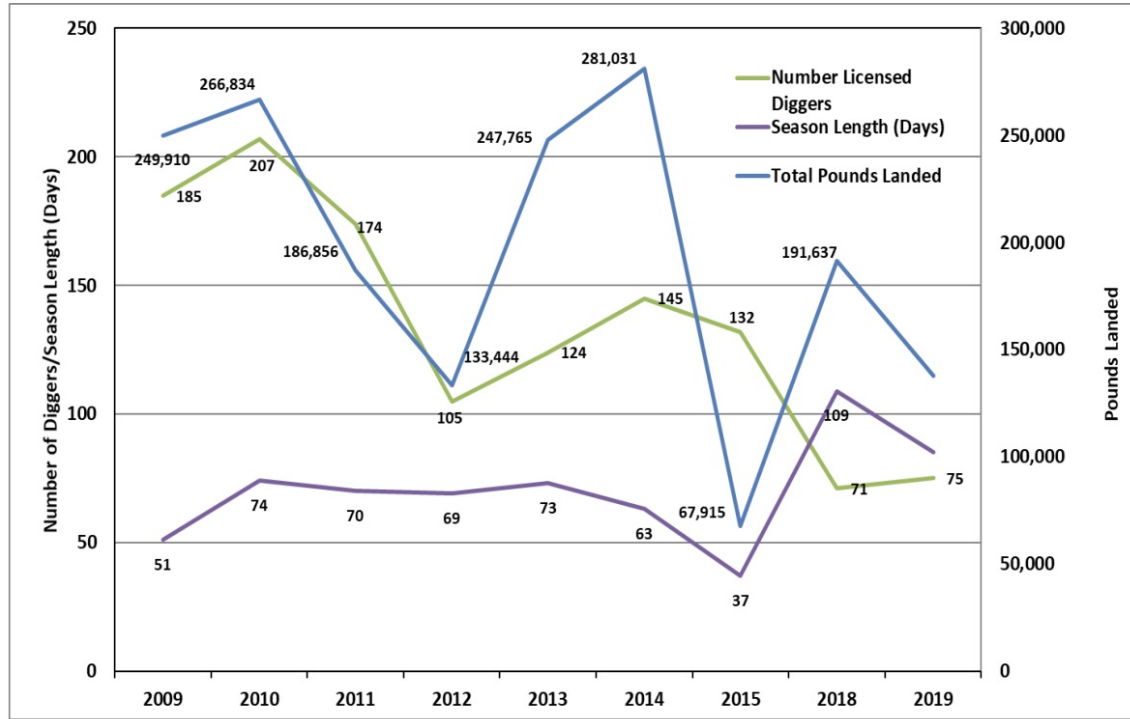
Justification:

Figure 8: Total pounds landed vs. number of licensed diggers and season length in the Washington commercial fishery from 2009 to 2019 (WDFW 2019).

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 Crtitical

Guiding principles

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

Criterion 2 Summary

Criterion 2 score(s) overview

This table(s) provides an overview of the Criterion 2 subscore, discards+bait modifier, and final Criterion 2 score for each fishery. A separate table is provided for each species/stock that we want an overall rating for.

NORTHERN RAZOR			
REGION / METHOD	**SUB SCORE**	**DISCARD RATE/LANDINGS**	**SCORE**
Gulf of Alaska | Pacific, Northeast | United States | Hand implements	5.000	1.000: < 100%	Green (5.000)
Northeast Pacific | United States | Hand implements | Quinault Indian Nation Fishery	5.000	1.000: < 100%	Green (5.000)
Northeast Pacific | United States | Oregon | Hand implements	5.000	1.000: < 100%	Green (5.000)
Northeast Pacific | United States | Washington | Hand implements	5.000	1.000: < 100%	Green (5.000)

Criterion 2 main assessed species/stocks table(s)

This table(s) provides a list of all species/stocks included in this assessment for each 'fishery' (as defined by a region/method combination). The text following this table(s) provides an explanation of the reasons the listed species were selected for inclusion in the assessment.

GULF OF ALASKA | PACIFIC, NORTHEAST | UNITED STATES | HAND IMPLEMENTS			
SUB SCORE: 5.000	DISCARD RATE: 1.000		**SCORE: 5.000**
SPECIES	**ABUNDANCE**	**FISHING MORTALITY**	**SCORE**
Northern razor	1.000: High Concern	3.000: Moderate Concern	Red (1.732)

NORTHEAST PACIFIC | UNITED STATES | HAND IMPLEMENTS | QUINAULT INDIAN NATION FISHERY			
SUB SCORE: 5.000	DISCARD RATE: 1.000		**SCORE: 5.000**
SPECIES	**ABUNDANCE**	**FISHING MORTALITY**	**SCORE**
Northern razor	3.670: Low Concern	5.000: Low Concern	Green (4.284)

NORTHEAST PACIFIC | UNITED STATES | OREGON | HAND IMPLEMENTS			
SUB SCORE: 5.000	DISCARD RATE: 1.000		**SCORE: 5.000**
SPECIES	**ABUNDANCE**	**FISHING MORTALITY**	**SCORE**
Northern razor	3.670: Low Concern	3.000: Moderate Concern	Green (3.318)

NORTHEAST PACIFIC | UNITED STATES | WASHINGTON | HAND IMPLEMENTS			
SUB SCORE: 5.000	DISCARD RATE: 1.000		**SCORE: 5.000**
SPECIES	**ABUNDANCE**	**FISHING MORTALITY**	**SCORE**
Northern razor	3.670: Low Concern	3.000: Moderate Concern	Green (3.318)

Legal clam fishing gear is restricted to hand-operated clam guns/tubes and shovels. Guns/tubes are 4- to 6-

inch diameter pipes or tubes with a handle or vent, and shovels are typically narrow-bladed. Digging is highly labor-intensive. A razor clam is found by a small depression ("show") in the sand, left by the clam when it retreats its siphon. The digger covers the tube's air hole or vent with a finger while using the handle to pull the tube of sand and the clam up and onto the beach. The digger then removes the finger from the air hole and shakes the sand and the clam out of the tube (ODFW 2009a). Hand-digging for clams allows fishers to be quite selective about their catch and to return unwanted species alive to their habitats, resulting in negligible bycatch.

Criterion 2 Assessment

Factor 2.1 - Abundance
(same as Factor 1.1 above)

Factor 2.2 - Fishing Mortality
(same as Factor 1.2 above)

Factor 2.3 - Modifying Factor: Discards and Bait Use
Goal: Fishery optimizes the utilization of marine and freshwater resources by minimizing post-harvest loss. For fisheries that use bait, bait is used efficiently.

Scoring Guidelines: The discard rate is the sum of all dead discards (i.e. non-retained catch) plus bait use divided by the total retained catch.

Ratio of bait + discards/landings	Factor 2.3 score
<100%	1
>=100	0.75

Factor 2.3 - Discard Rate/Landings

Gulf of Alaska | Pacific, Northeast | United States | Hand implements
Northeast Pacific | United States | Hand implements | Quinault Indian Nation Fishery
Northeast Pacific | United States | Oregon | Hand implements
Northeast Pacific | United States | Washington | Hand implements

< 100%

Pacific razor clam must be a minimum of 4.5 in (114 mm) for commercial harvest in Alaska, and all clams below this limit must be reburied, except those with broken shells (a limit of 10% shell breakage is allowed), which must be dyed and sold as bait (Marston and Frothingham 2022). In Oregon, the minimum size limit is 3.75 in (95 mm), only shovels are allowed (i.e., no clam tubes or guns), and all undersized clams must be immediately returned to the area where they were dug, with the hinge oriented toward the ocean (ODFW 2022). Because of the selective nature of this fishing method and that discarded animals are likely returned to the water alive, the ratio of dead discards to landings is scored as <100%.

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.

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:

Criterion 3 Summary

FISHERY	MANAGEMENT STRATEGY	BYCATCH STRATEGY	DATA COLLECTION AND ANALYSIS	ENFORCEMENT	INCLUSION	SCORE
Gulf of Alaska | Pacific, Northeast | United States | Hand implements	Moderately Effective	Highly effective	Moderately Effective	Highly effective	Highly effective	**Yellow (3.000)**
Northeast Pacific | United States | Hand implements | Quinault Indian Nation Fishery	Highly effective	Highly effective	Highly effective	Highly effective	Highly effective	**Green (5.000)**
Northeast Pacific | United States | Oregon | Hand implements	Moderately Effective	Highly effective	Moderately Effective	Highly effective	Highly effective	**Yellow (3.000)**

Northeast Pacific | United States | Washington | Hand implements	Moderately Effective	Highly effective	Moderately Effective	Highly effective	Highly effective	**Yellow (3.000)**

Criterion 3 Assessment

<u>SCORING GUIDELINES</u>

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 manages 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.

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.

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.

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.

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.

Factor 3.1 - Management Strategy And Implementation

Gulf of Alaska | Pacific, Northeast | United States | Hand implements
Northeast Pacific | United States | Oregon | Hand implements
Northeast Pacific | United States | Washington | Hand implements

Moderately Effective

There are no defined reference points or harvest control rules for state razor clam fisheries in Alaska, Oregon, or Washington. Each fishery is managed by the state's Fish and Wildlife/Game department with measures in place that exceed those for an "ineffective" score.

Alaska

ADFG manages the commercial fishery for Pacific razor clam in Alaska. All commercial fishing for razor clam in Alaska occurs on the west side of Cook Inlet just north of Tuxedni Bay, while the east side of the inlet is reserved for recreational clamming (Booz et al. 2022). There is no catch limit, but ADFG manages the fishery to achieve a harvest of no more than 350,000–400,000 lb (Booz et al. 2022). Additional regulations include license requirements, a prohibition on mechanical harvest (i.e., dredges), minimum size requirements, and a 10% limit on shell breakage (Marston and Frothingham 2022)(ADFG 2023). Because the razor clam commercial fishery is limited to a small area, there is a single processing plant for clams caught in the fishery, and ADFG works closely with the plant to monitor catches and catch per unit effort (CPUE) in the fishery (Shields 2015, pers comm). In addition, in areas where razor clams are caught with the intent for human consumption, they are analyzed weekly for paralytic shellfish poisoning (PSP) (Shields 2015, pers comm).

Oregon

Oregon's commercial razor clam fishery is open by permanent regulation for a set period of time. The fishery is not managed by using reference points or conservation targets, though the ODFW does have the authority to enact emergency closures when necessary. ODFW uses a stock assessment for informational purposes and to monitor the strength of annual recruitment (Hunter 2024, pers comm). Commercial clam harvesters are required to fill out logbooks, there are spatial closures and limited seasonal closures, gear is restricted to digging by hand or shovel, and a minimum size limit (ODFW 2022). There is a requirement that undersized razor clam be immediately returned to the hole from which it was dug, with the hinge oriented toward the ocean (ODFW 2022). The recreational razor clam fishery in Oregon accounts for the majority of the harvest, while the commercial fishery only accounts for approximately 15% of the statewide razor clam harvest (ODFW 2022b).

Washington

Although the WDFW has not set reference points or conservation targets for the state commercial razor clam fishery, the state has implemented precautionary policies by setting a fixed season of 8 to 12 weeks and restricting commercial harvest to Willapa Spits (WDFW 2022c)(WDFW 2019). There are also license, registration, and reporting requirements in place (WDFW 2022c), allowing for WDFW to regularly monitor CPUE (WDFW 2019).

Although the effectiveness of management is unknown, it is unlikely that the state fisheries are having a negative impact on the razor clam populations. Therefore, the management strategy and implementation for Alaska, Oregon, and Washington is considered moderately effective.

Northeast Pacific | United States | Hand implements | Quinault Indian Nation Fishery

Highly effective

Most of the QIN's commercial razor clam harvest occurs in the nation's usual and accustomed areas (fishing areas) where razor clams are comanaged with the WDFW (WDFW 2024). The two governments perform annual stock assessments and determine TAC for these areas. The variable harvest rate of 30–40% (Figure 9) is based on the maximum exploitable yield and adjusted based on abundance levels (WDFW 2024)(Berry-Powell et al. 2023). The maximum harvest rate is 40% of exploitable biomass, and the total allowable catch is split evenly between the QIN and Washington's fisheries (WDFW 2024). The state's portion of the TAC has not been exceeded in any of the last three seasons at any of the three comanaged beaches, and the fishery at Kalaloch has been closed due to low abundance in recent years (WDFW 2022b), showing that management is responsive to changes in stock biomass. The QIN commercial fishery exceeded the TAC by 2% (27,426 clams) at Mocrocks in the 2018–19 season, but has otherwise consistently remained under the TAC (Mazzone 2024, pers comm). The cause of the decline at Kalaloch is thought to be a result of poor adult survivorship due to a bacterial pathogen (NPS 2022)(Groner et al. 2022). Also, there is evidence that current harvest policies are maintaining stable razor clam abundance at Copalis and Mocrocks. For these reasons, we score this factor highly effective.

Variable Exploitation Rate for Razor Clams
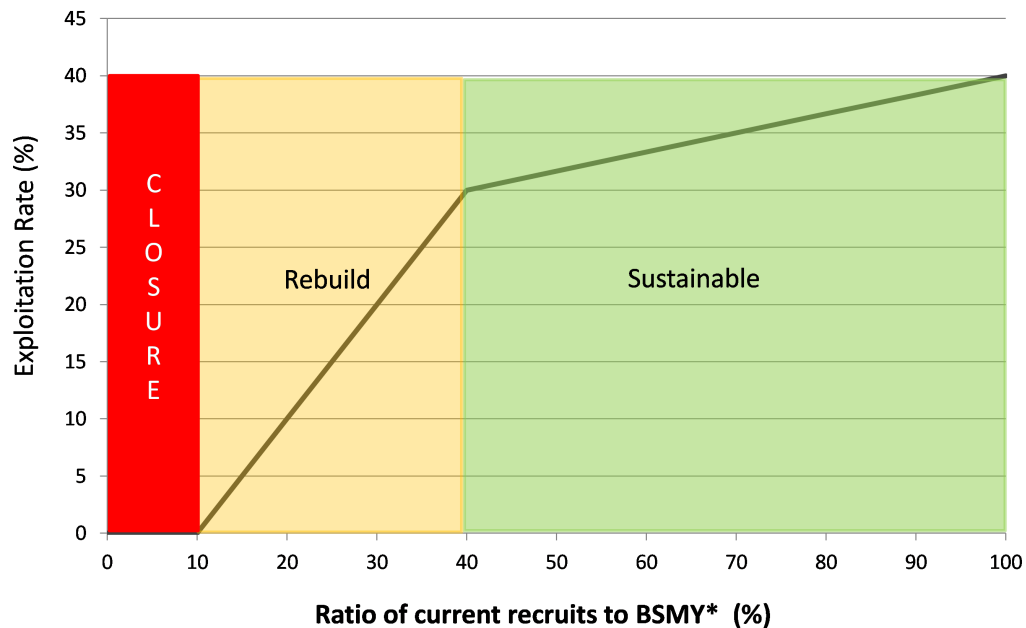
* BSMY is defined as the biomass that allows maximum sustainable yield to be taken

Figure 9: Variable exploitation rate for the QIN (WDFW 2022b).

Factor 3.2 - Bycatch Strategy

Gulf of Alaska | Pacific, Northeast | United States | Hand implements
Northeast Pacific | United States | Hand implements | Quinault Indian Nation Fishery
Northeast Pacific | United States | Oregon | Hand implements
Northeast Pacific | United States | Washington | Hand implements

Highly effective

The Pacific razor clam fisheries have little to no bycatch (<5%) because they use gear that minimize bycatch (hand harvest methods). Therefore, we score this factor highly effective.

Factor 3.3 - Scientific Data Collection and Analysis

Gulf of Alaska | Pacific, Northeast | United States | Hand implements
Northeast Pacific | United States | Oregon | Hand implements
Northeast Pacific | United States | Washington | Hand implements

Moderately Effective

The fisheries in Alaska, Oregon, and Washington have some level of data collection to monitor the status of razor clam stocks, including informal stock assessments; however, there are no peer-reviewed stock assessments for these state fisheries, which precludes a score of highly effective. Because some data are collected to monitor razor clam stocks in each fishery (see Justification), the three fisheries meet the threshold for a moderately effective score.

Justification:

Alaska

A stock assessment has not been completed for the Pacific razor clam populations on WCI, where commercial fishing occurs. Although a stock assessment was identified as a goal by the ADFG, projects that were started in 2017 and 2018 are no longer active (Marston and Frothingham 2022). Managers monitor catches and fishing effort in the commercial fishery and track the trends of CPUE over time, providing some indication of the health of the population. ADGF collects size and age data at WCI (ADFG 2022) and has monitored the sport, personal use (SPU), and commercial fisheries at WCI since 1986 (Booz and Dickson 2022).

A stock assessment was completed for the ECI Pacific razor clam populations, where there is a large recreational fishery, but surveys have been suspended because the recreational fishery has been closed since 2015 (Booz and Dickson 2022). The east and west beaches are considered separate populations, but recent declines in the abundance of razor clam on the east beaches that were shown by the stock assessment could indicate some cause for concern for the health of razor clam on the WCI beaches.

Oregon

The ODFW has been conducting annual razor clam stock assessments since 2004 (ODFW 2022c). The stock assessment occurs on Clatsop beaches, where more than 95% of the catch and effort occurs (ODFW 2022c). The stock assessment estimates abundance of pre-recruits, recruits, and all clams. One transect is sampled per mile of the 18-mile beach (Hunter 2008). Also, ODFW has set a goal to sample a minimum of 5% of commercial landings for length frequencies and number of clams per pound. Even though the stock assessment is used to monitor the stock, it is not peer reviewed, it is used for informational purposes only, and management does not reflect changes in population (Hunter 2024, pers comm).

Washington

WDFW conducts a joint annual scientific stock assessment with the QIN to determine the population of Pacific razor clam on Washington's ocean beaches (WDFW 2022b). Only the recreational and QIN harvest occur at the locations included in the stock assessment, although factors driving recruitment at nearby assessed beaches (Long Beach and Twin Harbors Beach) are likely similar to the commercial Willapa Spits population (Forster 2024, pers comm). The commercial fishery occurs on the Willapa Spits, and managers collect some data related to stock health (e.g., CPUE) (WDFW 2019).

The Willapa Spits are dynamic, and the width and location of sandbars vary by year (WDFW 2019), making it too difficult to include the area in stock assessment efforts (Kauffman 2016, pers comm). Razor clams on the ocean beaches and the Willapa Spits are considered to be a single stock, and management considers the stock assessment to be applicable to commercially harvested razor clam (Kauffman 2016, pers comm). Although Washington's stock assessment efforts are robust, they lack inclusion of the commercially fished areas on the Willapa Spits and consideration of the commercial fishery in the TAC.

Northeast Pacific | United States | Hand implements | Quinault Indian Nation Fishery

Highly effective

The QIN conducts fishery-independent biomass surveys and a joint annual scientific stock assessment with the WDFW in usual and accustomed areas (WDFW 2022b), and managers have used the Pumped Area Method (Figure 10) to monitor clam populations since 1996 (Berry-Powell et al. 2023). Historically, these reports are not peer reviewed, but a peer-reviewed assessment for this fishery was published in 2023 (Berry-Powell et al. 2023). All areas of harvest by the QIN are included in the assessment, which is used to set the TAC for the QIN commercial fishery. The TAC is based on a variable exploitation rate calculated annually for each beach, except Kalaloch beach, which is managed with a fixed exploitation rate of 25.4% (Berry-Powell et al. 2023). There are no concerns with bycatch or ghost gear in this fishery. Because the management process uses an up-to-date stock assessment and the 2023 assessment is peer-reviewed, this factor is scored highly effective.
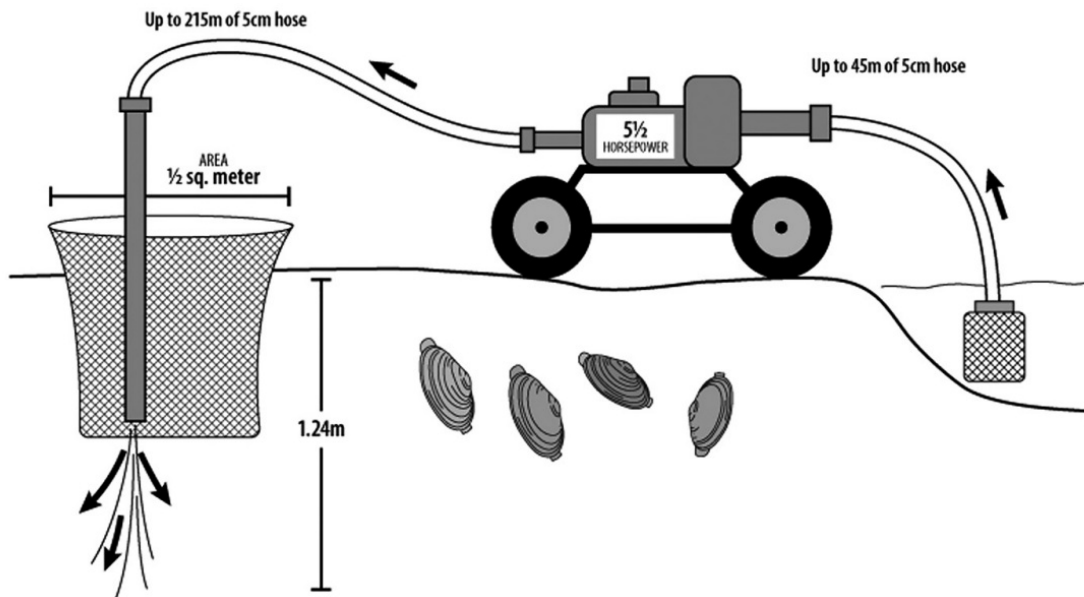
Justification:

Figure 10: Schematic of equipment setup used to enumerate Pacific razor clam (*Siliqua patula*) at sample plots in Washington State (Berry-Powell et al. 2023).

Factor 3.4 - Enforcement of and Compliance with Management Regulations

Gulf of Alaska | Pacific, Northeast | United States | Hand implements

Highly effective

Alaska commercial fishery regulations are enforced by the Division of Alaska Wildlife Troopers. The commercial razor clam fishery on the west side of Cook Inlet is in a remote area and diggers reside in a small remote camp during the fishing season, so in-person enforcement is difficult and the west side fishery is not as closely monitored as the east side fishery (Booz et al. 2019). Clams are transported to the nearby town of Nikiski, where they are processed immediately. Catch and effort information is monitored by ADFG through fish tickets provided by the processing plant where the clams are sold. ADFG is in constant communication with the processing plant about razor clam catch levels in relation to the maximum catch goal of 350,000–400,000 lb (Lipka and Stumpf 2024). All commercial catches, including fish and shellfish, are required by law to be reported within 7 days of landing (ADFG 2022b). But ADFG occasionally requires preliminary catch reports to be sent immediately, to allow for quick decision-making (Shields 2018, pers comm). The Alaska Department of Public Safety occasionally conducts unannounced visits to processing plants, and officials periodically fly over clam beaches to check diggers (Shields 2018, pers comm). Enforcement is largely based on a voluntary system with periodic independent scrutiny, and we award a score of highly effective.

Northeast Pacific | United States | Oregon | Hand implements

Highly effective

Enforcement is done by the Oregon State Police Fish and Wildlife Division, which enforces the laws governing commercial fisheries, inspects processing facilities, and conducts deterrent patrols (Oregon State Police 2022). Fish & Wildlife Troopers patrol Clatsop beaches during the open season and in the closed season, and violations are typically in the recreational fishery (Oregon State Police 2019). Commercial regulations are regularly enforced and independently verified through logbooks (ODFW 2022b). The Oregon commercial fishery for razor clam is regularly enforced, and the capacity to ensure compliance is appropriate to the scale of the fishery. Thus, a highly effective score is given.

Northeast Pacific | United States | Washington | Hand implements

Highly effective

Commercial clam diggers in Washington are required to obtain a license and register with a certified razor clam dealer, and wholesale dealers must complete fish tickets (WDFW 2022c). Enforcement by the WDFW occurs by checking diggers at the point of landings to ensure that catch is recorded and that they are in compliance with license and certification requirements (Kauffman 2016, pers comm). The Washington commercial fishery for razor clam is regularly enforced, and the capacity to ensure compliance is appropriate to the scale of the fishery. Therefore, a highly effective score is given.

Factor 3.5 - Stakeholder Inclusion

Gulf of Alaska | Pacific, Northeast | United States | Hand implements

Highly effective

ADFG allows for public and stakeholder input when management regulations are considered and developed. The Board of Fisheries is the state's regulatory authority that passes regulations and makes regulatory decisions. There are also advisory committees, which are local groups that provide recommendations to the board on fishing issues. Meetings are open to the public and other stakeholders, with the option to provide comments on agenda topics (ADFG 2022c). Because the regulatory process is transparent and open to stakeholder input, inclusion is considered highly effective.

Northeast Pacific | United States | Hand implements | Quinault Indian Nation Fishery

Highly effective

The QIN has a tribal fisheries policy spokesperson who works with the WDFW to determine the number of clams available for harvest each year; this spokesperson then works with tribal members to best represent their interests when working with WDFW (WDFW 2022b). Tribal members are also able to participate in management with the Overall Committee, which determines how much of the QIN's share of clams goes to the commercial fishery, which generally receives a majority of the harvest. Although the opportunities for stakeholder inclusion are constrained by legal requirements and government-to-government negotiation, there are a number of opportunities for stakeholder participation in the management process. Therefore, stakeholder inclusion is considered highly effective.

Northeast Pacific | United States | Oregon | Hand implements

Highly effective

The governor appoints seven members to the ODFW Commission to 4-year terms, and the Commission is responsible for programs and policies related to fisheries management (ODFW 2023). The ODFW Commission holds regular meetings with opportunities for in-person and virtual stakeholder testimony (ODFW 2023). Agenda items are posted ahead of meetings, members of the public can submit topics not on the agenda, and meeting minutes are provided online (ODFW 2023). ODFW provides in-season regulation updates for temporary or emergency changes, including information on open and closed razor clam beaches. There are a number of opportunities for stakeholder participation in the management process and managers make transparent decisions. Therefore, stakeholder inclusion is considered highly effective.

Northeast Pacific | United States | Washington | Hand implements

Highly effective

The management process is transparent and includes stakeholder input in accordance with Washington State's Administrative Procedures Act (Washington 2016). The WDFW has a hotline and webpage dedicated to commercial razor clam harvest. It also regularly conducts preseason planning meetings to discuss relevant seasonal issues with diggers and buyers (Kauffman 2016, pers comm). There are a number of opportunities for stakeholder participation in the management process, and managers make transparent decisions. Therefore, stakeholder inclusion is considered 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*

Guiding principles

- Avoid negative impacts on the structure, function or associated biota of marine habitats where fishing occurs.
- Maintain the trophic role of all aquatic life.
- Do not result in harmful ecological changes such as reduction of dependent predator populations, trophic cascades, or phase shifts.
- Ensure that any enhancement activities and fishing activities on enhanced stocks do not negatively affect the diversity, abundance, productivity, or genetic integrity of wild stocks.
- Follow the principles of ecosystem-based fisheries management.

Rating cannot be Critical for Criterion 4.

Criterion 4 Summary

FISHERY	FISHING GEAR ON THE SUBSTRATE	MITIGATION OF GEAR IMPACTS	ECOSYSTEM-BASED FISHERIES MGMT	FORAGE SPECIES?	SCORE
Gulf of Alaska	Pacific, Northeast	United States	Hand implements	Score: 3	+.5	Moderate Concern		**Green (3.240)**
Northeast Pacific	United States	Hand implements	Quinault Indian Nation Fishery	Score: 3	+.5	Moderate Concern		**Green (3.240)**
Northeast Pacific	United States	Oregon	Hand implements	Score: 3	+.5	Moderate Concern		**Green (3.240)**
Northeast Pacific	United States	Washington	Hand implements	Score: 3	+.5	Moderate Concern		**Green (3.240)**

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

Gulf of Alaska | Pacific, Northeast | United States | Hand implements
Northeast Pacific | United States | Hand implements | Quinault Indian Nation Fishery
Northeast Pacific | United States | Oregon | Hand implements
Northeast Pacific | United States | Washington | Hand implements

Score: 3

Hand gear (including guns/tubes, rakes, hoes, and shovels) may have habitat impacts on the intertidal and subtidal habitats, depending on how much disturbance the habitat is subject to from wave, tidal, or current action (Brown & Wilson 1997)(Kaiser et al. 2001). A study on the habitat impacts of raking mudflats in Maine found that commercial digging can have a negative impact on several intertidal species, although these impacts are likely due to cumulative effects {Brown and Wilson 1997}. In addition, when digging for clams, the pile of sediment left on the beach may damage many other types of intertidal species if the hole created is not refilled, and if the beach is not exposed to high-energy waves and tides. Overall, shovels (Figure 11) and clam tubes (Figure 12) are considered to cause low to moderate damage to the beach habitat. This factor receives a score of 3 because the gear contacts the bottom, but has a small footprint and is not fished on sensitive habitats.

Figure 11: Clam shovel. Photo from Washington Department of Fish and Wildlife, located at: http://wdfw.wa.gov/fishing/shellfish/razorclams/recipes.html

Figure 12: Clam gun/tube. Photo from: http://www.jackscountrystore.co/stainlesssteelclamgun.aspx

Factor 4.2 - Modifying Factor: Mitigation of Gear Impacts

Gulf of Alaska | Pacific, Northeast | United States | Hand implements
Northeast Pacific | United States | Hand implements | Quinault Indian Nation Fishery
Northeast Pacific | United States | Oregon | Hand implements
Northeast Pacific | United States | Washington | Hand implements

+.5

The fisheries under assessment are relatively small-scale in nature and occur over only a small portion of the entire range of Pacific razor clam, which extends from Pismo Beach, CA to the Aleutian Islands, AK (Lassuy and Simons 1989). All fisheries in this report limit razor clam harvest to specified areas and limit the gear type; fishery-specific information is provided in Table 3. The footprint of the fisheries is small relative to the geographic range of the species under assessment, and we award a +0.5 score for other measures that are reasonably expected to be effective.

Justification:

Table 3. Area restrictions and fishery information for razor clam fisheries assessed in this report.	
Fishery	**Relevant information**
Alaska	The commercial fishery for Pacific razor clam in Alaska currently occurs in upper west Cook Inlet, at one 19-mile section on a remote beach (Booz et al. 2022). Digging at this beach usually occurs between May and August, which may limit the overall effects of digging in the area (Shields 2015, pers comm).
Oregon	Oregon has only one beach, Clatsop Beach, open to commercial razor clam harvest for human consumption (ODFW 2022b). Other beaches supporting razor clams include Cannon, Short Sands, Cape Mears, Agate, North and South, Waldport, North Umpqqua Spit, Bastendorff and North Spit, Whiskey Run, and Meyers Creek (ODFW 2023b).
Quinault Indian Nation	Most of the QIN's commercial razor clam digs occur in usual and accustomed areas off the reservation beaches (Mazzone 2016, pers comm).
Washington	Washington's commercial Pacific razor clam fishery is spatially restricted to the Willapa Spits; thus, the WDFW does not require holes to be filled in because the tide will cover the digging area in this active coastal surf zone (WDFW 2022b).

Factor 4.3 - Ecosystem-based Fisheries Management

Gulf of Alaska | Pacific, Northeast | United States | Hand implements
Northeast Pacific | United States | Hand implements | Quinault Indian Nation Fishery
Northeast Pacific | United States | Oregon | Hand implements
Northeast Pacific | United States | Washington | Hand implements

Moderate Concern

The razor clam is a filter feeder, and its diet includes animal and plant plankton that are filtered from the surrounding seawater (DFO 2022c). Species-specific ecosystem linkages are difficult to identify (DFO 2022c). Recruitment success is highly dependent on environmental conditions and varies considerably from year to year (Booz et al. 2019). Predators of large razor clam include various types of seabirds,

crabs, sea otters, and a few fish species {Lassuy & Simons 1989}(Bishop and Powers 2003). Brown bear and sea otter predation, along with human harvest, may be top-down drivers of razor clam abundance, but there is no evidence to suggest that fishing pressure is implicated in areas of razor clam population decline (e.g., at ECI in Alaska) (Coletti et al. 2021).

It is likely that the removal of razor clam at low volumes has low impacts on the ecosystem, and food web impacts are not likely; however, there are no efforts to fully assess or manage the ecological impacts of the removal of Pacific razor clam through the fisheries under assessment. Therefore, ecosystem-based fisheries management is rated a moderate concern.

Acknowledgements

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Appendix A: Review Schedule

Oregon State conducts annual stock assessments. The joint stock assessment for the Quinault Indian Nation commercial fishery and the Washington Department of Fish and Wildlife recreational fishery also occurs annually.

Oregon Department of Fish and Wildlife

www.dfw.state.or.us/mrp/shellfish/razorclams/

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Washington Department of Fish and Wildlife

www.wdfw.wa.gov/fishing/commercial/razorclams/

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Quinault Indian Nation

http://nwifc.org/member-tribes/quinault-nation/

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Appendix B: Updates to the Pacific Razor Clam Report

Updates to the August 5, 2019 U.S. (Quinault Indian Nation, Oregon, and Washington) and Alaska and British Columbia Reports were made on July 10, 2024:

The two reports were combined into a single report. The British Columbia rating was removed from the updated report because the fishery has been closed since 2019 due to low abundance of clams at commercially important beaches (DFO 2022). The overall ratings for northern razor clam caught by hand implements in Washington and Oregon were upgraded from yellow to green. The ratings for Alaska (Yellow) and Quinault Indian Nation (Green) remained unchanged. The individual criterion updates are outlined as follows:

Seafood Watch made the following updates:

- **Criterion 1, Factor 1.1**
    - Alaska downgraded from moderate concern to high concern, because a data-limited assessment indicates that the stock health is poor.
    - Oregon, Washington and Quinault Indian Nation upgraded from moderate concern to low concern, because a data-limited assessment indicates that the stocks are healthy and there are no conflicting indicators.
- **Criterion 3, Factor 3.3:** Quinault Indian Nation downgraded from highly effective to moderately effective because there is no peer-reviewed stock assessment.

Appendix C: Ratings Review Summary Table

Criteria	Previous Report (2019)	Current Review (2023)
Who conducted the stock assessment?	Alaska, Oregon, Quinault Indian Nation, and Washington: no stock assessment	Alaska, Oregon, Quinault Indian Nation, and Washington scored based on data-limited assessments with data from ODFW (ODFW 2022d), WDFW (WDFW 2019)(WDFW 2022b), and ADFG (Booz et al. 2019).
When was the stock assessment conducted?	NA	Same as previous
Where/what are the catch composition data sources?	ODFW and ADFG	Same as previous
Who manages the fishery?	State agencies (ADFG, ODFW, and WDFW) and tribal/federal agencies (QIN)	Same as previous
What is the date of the published management plan?	No official management plans for Alaska, Oregon, or Washington. Quinault Indian Nation: 2015	Alaska, Oregon, and Washington: same as previous Quinault Indian Nation: 2022 (WDFW 2022b)
Are there any amendments?	NA	Same as previous