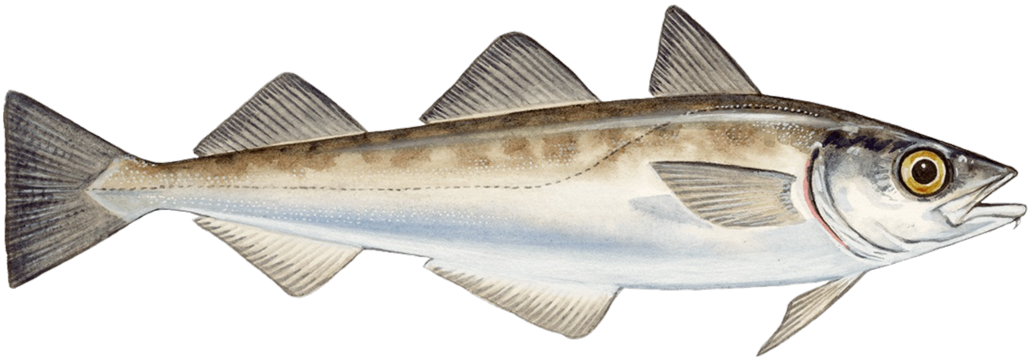
Walleye pollock

Gadus chalcogrammus



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Russia

Midwater trawls, Danish seines

December 4, 2017

Seafood Watch Consulting Researcher

Disclaimer

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Seafood Watch Standard used in this assessment: Standard for Fisheries vF3

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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. 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

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

Summary

This report covers recommendations for walleye pollock *(Gadus chalcogrammus)* landed by non-MSC certified Russian mid-water trawl and Danish seine fisheries in the Northwest Pacific, including the West Bering Sea (WBS), Sea of Okhotsk (SOO), and Sea of Japan (SOJ). The pollock fishery occurs in multiple Russian fishery management "zones" and "subzones." These management geographies, along with the gears used, have been grouped together into eight fishery units for the purpose of generating the recommendations in this report:

1. East Kamchatka Danish seine,
2. East Kamchatka mid-water trawl,
3. Kuril Islands mid-water trawl,
4. Northeast Sea of Okhotsk–West Kamchatka Danish seine,
5. Sea of Japan mid-water trawl,
6. West Bering Sea, East of the 174th Meridian E mid-water trawl,
7. West Bering Sea West of the 174th Meridian E mid-water trawl, and
8. West Sea of Okhotsk–East Sakhalin mid-water trawl.

The eight fisheries were scored for impacts on target species, impacts on other species, management, and impacts on the habitat and ecosystem, with these four scores combining to yield overall recommendations for each of the eight fisheries.

With respect to impacts on target species, one of the stocks targeted in this fishery is depleted (the West Bering stock targeted in the trawl fishery west of 174º E), and therefore received a red (low) score. At the other end of the spectrum, the Navarinsk stock in the West Bering Sea east of 174º E and the Northeast Sea of Okhotsk–West Kamchatka stocks are in stable condition, resulting in green (high) scores for the West Bering Sea East of 174º E mid-water trawl and Northeast Sea of Okhotsk–West Kamchatka Danish seine fisheries. The other stocks have exhibited some fluctuations over the past several years, and their scores reflect their condition at the time of authoring this report according to the most recent publicly available information.

As for impacts on other species, comprehensive, publicly-available information on bycatch is generally lacking for the trawl fisheries. Based on what is known about bycatch species status and habitat overlap with the pollock trawling zone, one fishery, the Kuril Islands mid-water trawl fishery, received a red score for bycatch of Chinook salmon *(Oncorhynchus tshawytscha).* The volume of Chinook salmon bycatch in that fishery is likely small, but depleted Chinook salmon populations located in West Kamchatka may nevertheless be adversely impacted.

On the management criterion, all trawl fisheries received red scores due to poor (red) performance on the Enforcement nested sub-factor. Due to illegal discards of juveniles, catches in the trawl fisheries are thought to have exceeded TACs by double-digit percentages in the 1990s and early 2000s. Although this problem is not considered to be as severe as it once was, catches may still be exceeding TACs, resulting in the red score. Excessive discards of juveniles have been implicated in stock declines, particularly that of the West Bering Sea West of the 174º E stock. Some recent management steps (officially separating the West Bering Sea stock from the neighboring Navarinsk stock to allow for a separate TAC-setting process, and instituting a new fishery closure) are cause for hope that the situation will improve. Nonetheless, the 2017 raising of the ceiling for retention of undersized pollock from 20% to 40% in the West Bering Sea east of the 174º E trawl fishery is concerning, since overfishing of juveniles has been implicated in the crash of the neighboring fishery west of 174º E.

The West Bering Sea west of the 174º E trawl fishery received an additional red score on the nested sub-score of Management Strategy and Implementation because harvest is continuing to target a depleted stock without comprehensive recovery planning.

Finally, with respect to impacts on habitat and ecosystem, all fisheries received red ecosystem scores for inadequate strategies addressing trophic interactions that may adversely impact red-listed Steller sea lions. Two mid-water trawl fishery units also received red habitat scores because they occur in areas that include deep-sea coral habitats: the East Sakhalin and Kuril Islands fisheries. Mid-water trawls are known to contact bottom and may be adversely impacting the corals. Meanwhile, in the other fishery units, it is presumed that the mid-water trawl and Danish seine gears, which are both operated with bottom contact, do not place the ecosystem at undue risk at current levels of fishing.

From the scores on the four criteria, overall recommendations of "good alternative" resulted for the two Danish seine fisheries, with the six trawl units received ratings of "avoid."

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
Walleye pollock East Kamchatka Peninsula, Midwater trawls, Russia	Green (3.32)	Yellow (2.24)	Red (2.00)	Red (2.00)	**Avoid (2.33)**
Walleye pollock East Kamchatka Peninsula, Danish seines, Russia	Green (3.32)	Yellow (2.64)	Yellow (3.00)	Red (2.00)	**Good Alternative (2.69)**
Walleye pollock Kuril Islands, Midwater trawls, Russia	Yellow (2.64)	Red (1.73)	Red (2.00)	Red (2.00)	**Avoid (2.07)**
Walleye pollock East Sakhalin Sea of Okhotsk, Midwater trawls, Russia	Yellow (2.64)	Yellow (2.24)	Red (2.00)	Red (2.00)	**Avoid (2.21)**
Walleye pollock West Kamchatka Peninsula Sea of Okhotsk, Danish seines, Russia	Green (3.32)	Yellow (2.64)	Yellow (3.00)	Red (2.00)	**Good Alternative (2.69)**
Walleye pollock Bering Sea, Midwater trawls, Russia, West Bering Sea, West of 174oE	Red (1.73)	Yellow (2.24)	Red (1.00)	Red (2.00)	**Avoid (1.67)**
Walleye pollock Bering Sea, Midwater trawls, Russia, West Bering Sea, East of 174oE	Green (3.32)	Yellow (2.24)	Red (2.00)	Red (2.00)	**Avoid (2.33)**
Walleye pollock Sea of Japan, Midwater trawls, Russia	Yellow (2.24)	Yellow (2.24)	Red (2.00)	Red (2.00)	**Avoid (2.11)**

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 Concern2, 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.

[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 covers recommendations for walleye pollock (*Gadus chalcogrammus*), referred to as "pollock" throughout the report, landed by non-MSC certified Russian mid-water trawl and Danish seine fisheries in the Northwest Pacific, including the West Bering Sea (WBS), Sea of Okhotsk (SOO), and Sea of Japan (SOJ). The pollock fishery occurs in multiple Russian fishery management "zones" and "subzones." These management geographies, along with the gears used, have been grouped together into eight fishery units for the purpose of generating the recommendations in this report. The eight units have been aggregated in a way that best highlights the key ecological and sustainability differences between the components of the fishery, including the various stocks targeted and their status according to most recent available data (Figure 1, see additional rationale below).

(Additional Rationale)
The population structure of North Pacific pollock is complex, and scientific understanding is evolving, complicating the delineation of fishery units for the purposes of this assessment. Upon review of the North Pacific pollock population structure, described below, it was determined that the fisheries included in the scope of this assessment (non-MSC certified Russian pollock fisheries) target the following seven stocks: 1) West Bering, 2) Navarinsk, 3) East Kamchatka, 4) Northeast Sea of Okhotsk–West Kamchatka, 5) West Sea of Okhotsk–East Sakhalin, 6) Sea of Japan, and 7) Japanese Pacific. Although there is localized spawning in other areas, such as the Kuril Islands, only those populations for which there is evidence of spatially and temporally stable spawning were considered stocks for the purpose of this assessment. Seven distinct stocks harvested in distinct fishery management zones result in a minimum of seven fishery units to be considered separately here. [1] Two gear types are used to target the first of these stocks, resulting in an eighth fishery unit. This is also true for the fourth stock (Northeast Sea of Okhotsk), but the mid-water trawl component of the fishery targeting this stock was not included in this assessment because it is MSC-certified.

Bering Sea, Sea of Okhotsk, and Sea of Japan pollock stocks are considered reproductively isolated, albeit with some inter-migration between them, and are addressed separately from one another by the Russian authorities for purposes of stock assessment (Kotenev and Glubokov 2007) (TINRO 2014). Within those three groupings, the degree of differentiation among various populations is nuanced. Complications in elucidating pollock population structure include life histories that entail different habitats for spawning, overwintering, and feeding; larval drift from one region to another; and different population dynamics at low and high abundance. Periods of high abundance driven by climactic dynamics (such as the warming phase of 1977 to 1989 in the Bering Sea) generate increased competition for space and food, which in turn drives some individuals to seek new areas to inhabit, resulting in population co-mingling. Particular attention has been paid of late toward population mixing in the Northwest Bering where Navarinsk pollock are harvested; this is due to the increased commercial importance of Navarinsk pollock after the Donut Hole fishery closure, and interest in the question of whether or not the stock is transboundary or contained within Russian waters (Kotenev and Glubokov 2007) (Grant et al. 2010) (Bailey 2011) (NMFS 2015).

The Sea of Okhotsk is entirely encompassed within Russian waters, and SOO pollock are managed exclusively by Russia. TINRO scientists consider SOO pollock to be a large population with complex organization, within which the status of population components varies from one to another (Zverkova 2003). For example, the spawning aggregation in the West Kamchatka sub-zone (i.e., the northeast portion of the SOO) is historically and currently considered extremely productive, but that of East Sakhalin (i.e., in the western portion of the SOO) is known to have declined since the 1980s (Bulatov 2015). Because of the stark difference in productivity among these two stably spawning populations, they were considered as two separate stocks in this assessment ("Northeast Sea of Okhotsk–West Kamchatka" and "West Sea of Okhotsk–East Sakhalin").

Unlike Sea of Okhotsk pollock, Bering Sea pollock inhabit US, Russian, and international waters, necessitating some joint US–Russia stock assessment and regulation efforts under the auspices of the 1994 Convention on the Conservation and Management of the Pollock Resources in the Central Bering Sea. Like SOO pollock, Bering Sea pollock are thought to consist of several "temporarily stable, self-regulating pollock groupings" (Kotenev and Glubokov 2007). Pollock aggregations in the Bering Sea with spatially and temporally stable spawning grounds are, from west to east: 1) the Olyutor-Karagin aggregation (in the West Bering Sea west of 174º E), 2) the Navarinsk aggregation (in the West Bering Sea east of 174º E, also known as the North Bering), 3) the Pribilof aggregation (in the East Bering), and 4) the Unimak-Bristol aggregation (in the East Bering Sea off the coast of Alaska) (Kotenev and Glubokov 2007) (Bacheler et al. 2010). The first two of these, located in the West Bering, are important for the Russian fisheries covered in this assessment, and are henceforth termed the "West Bering" and "Navarinsk" stocks. The latter two located in the East Bering, meanwhile, are targeted by American fisheries and not covered here.

In contrast to the four stable spawning populations in the Bering listed above, there is some debate, meanwhile, regarding the presence or absence of stable spawning aggregations in the Koryak (in the West Bering Sea west of 174º E), St. Matthew (East Bering), the Central Bering, Bogoslof (Southeast Bering), the US Aleutian Islands (Southeast Bering), and Russia's Commander Islands (Pacific Ocean off the coast of Kamchatka). For example, the US recognizes Aleutian pollock as a separate stock for management purposes, but acknowledges co-mingling with the neighboring Bogoslof population and inadequate understanding of stock structure. Russian scientists, meanwhile, question the existence of a stable and independent spawning population in the Aleutians. Elucidation of the structure of Central Bering, Bogoslof, and Aleutian Islands populations has been rendered more difficult by the prior overfishing in the now-closed Donut Hole fishery, which depleted these populations (Kotenev and Glubokov 2007) (Bacheler et al. 2010) (Varketin et al. 2012) (Barbeaux et al. 2015) (Bulatov 2015).

Despite uncertainty regarding the stability of the Commander spawning population, stakeholders from the Russian science community that reviewed the draft of this report recommended that a separate fishery unit be split out for East Kamchatka, and this recommendation was followed. Experts cited the fact that biomass trends between the Petropavlovsk-Commander stock and the adjacent West Bering stock have visibly diverged at times over the past 50 years as a rationale for splitting out the East Kamchatka fishery (Zolotov et al. 2012). Furthermore, a "dead zone" of the Kamchatka and Ozernaya Bays in which neither spawning nor a commercially-significant pollock population occurs spatially separates the East Kamchatka and West Bering stocks.

Compared with the Sea of Okhotsk and Bering Sea pollock aggregations, which are the most commercially important for Russia, there is less information available regarding Sea of Japan pollock. Two reproductively-isolated populations have historically spawned in the Russian portion of the Sea of Japan: the South Primorsky and East Korean populations. Only one, South Primorsky, continues to spawn in Russian waters today (Nuzhdin 2008), and is henceforth referred to as the "Sea of Japan" stock.

The Kuril Islands, meanwhile, are an important zone of mixing between the Sea of Okhotsk and the Pacific Ocean, and are consequently an area where multiple pollock stocks commingle. East Kamchatka pollock are thought to be the main contributors to fisheries in the North Kurils, with their habitat extending below 48º N in times of high abundance (Buslov 2001) (Buslov and Tepnin 2007). However, Northeast Sea of Okhotsk (SOO) pollock also contribute to the North Kurils fishery, particularly on the Okhotsk side of the islands. Meanwhile, West SOO pollock are a main contributor to the South Kurils fishery due to Sakhalin's proximity to the southern portion of the archipelago. Furthermore, in the South Kurils, some of the fish are believed to originate in the Japanese EEZ of the Pacific Ocean (Ovsyannikova 2012), and these fish are referred to henceforth as the "Japanese Pacific" stock (fish from the Japanese spawning stock that are caught in the Russian fishery). Besides the migrating stocks, there are localized spawning areas in the Kurils archipelago, particularly in the South Kurils, but they are not adequately temporally stable to consider Kurils pollock a separate stock.

[1] The seventh stock, Japanese Pacific, spawns predominantly in Japanese waters but migrates into Russian waters off of the South Kuril Islands, where some of this stock is harvested by Russian boats. East Kamchatka and Okhotsk (West Kamchatka and East Sakhalin stocks are also harvested in the Kuril Islands fishery. Among the eight fishery units assessed here, the Kuril Islands unit is a distinctly mixed-stock fishery, while the other seven units predominantly target a single pollock stock.

Species Overview

The North Pacific Walleye pollock *(Gadus chalcogrammus*, previously known as *Theragra chalcogramma*) is a groundfish and a member of the cod family. It occurs in dense aggregations throughout the year and is predominantly targeted using mid-water trawls. Pollock are considered to be a benthic-pelagic species, schooling in both mid-water at depths of 100 to 300 m and in benthic habitats down to a maximum depth of 1280 m. They are found in both offshore and near shore locations. The species is considered relatively resilient to fishing pressure due to life history characteristics such as an early age at first maturity and fast growth (Federov et al. 2003) (Froese and Pauly 2004) (Nuzdin 2008) (Ormseth and Spencer 2009).

In the Bering Sea, pollock is the most abundant groundfish, with aggregations located off the coasts of Alaska and Russia and in the high seas between the two countries' exclusive economic zones (an area termed the "Donut Hole," where harvest is currently banned by international agreement following a population crash caused by overfishing in the 1980s). The species is also very abundant in the Sea of Okhotsk, which is entirely encompassed by Russian waters. The Aleutian Islands, Gulf of Alaska, and Kuril Islands are other important geographies for the species. Finally, pollock also occur in waters neighboring Japan, British Columbia, and the Pacific Northwest USA (Froese and Pauly 2004) (NOAA 2016).

Most of the regulatory and scientific bodies engaged in management of this fishery are housed within the Russian Ministry of Agriculture, which annually decrees the pollock total allowable catch (TAC) for each subzone. These TACs are informed by scientific forecasting assessments coordinated by TINRO Center (the Pacific Fisheries and Oceanography Institute) in Vladivostok, which works with its regional affiliates located in Sakhalin, Kamchatka, and Magadan. The forecasts and preliminary TACs are discussed by the scientific councils of each regional affiliate and then by the forecast working group at TINRO Vladivostok. They are subsequently discussed by the Far Eastern Fishery Council (DVNPS) in Vladivostok, first by a working group and subsequently at a general session. At the same meeting, the DVNPS also discusses proposed changes to the Fisheries Rules. Without the approval of DVNPS, these changes cannot be sent to Federal Fishery Agency (FAR, otherwise known as Rosrybolovstvo). Rosrybolovsto ultimately approves the TAC during a meeting of its Scientific Advisory Council for Pollock and Cod. In its meetings two to three times a year, this council also discusses methods for forecasting pollock abundance and setting TACs. After Rosrybolovsto approval of the TACs, they are published in orders of the Ministry of Agriculture.

The pollock TACs undergo public review through hearings conducted at the regional scale and during the DVNPS review, where public input is also welcome.

In addition to all of the above-described processes that are housed under the Ministry of Agriculture, the Federal Security Service (FSB) Coast Guard is charged with prevention of illegal fishing (enforcement), and the Ministry of Natural Resources (RosPrirodnadzor) conducts its own independent review of TACs (the State Ecological Expertise) before they are confirmed and announced (Intertek Moody Marine 2013).

{IMG-9060: Map of the Russian Far East fishery management zones that were used in delineating the eight fishery units for this assessment (map taken from Intertek Moody Marine 2013, Fig 1). The eight fishery units are (with encompassed Russian fishery zones or subzones indicated in parentheses): 1) and 2) East Kamchatka mid-water trawl and Danish seine fisheries (02.2–Petropavlovsk-Commander subzone); 3) Kuril Islands midwater trawl fishery (03.1 and 04.1–Pacific Ocean subzones, 03.2 and 04.2–Sea of Okhotsk subzones); 4) Northeast Sea of Okhotsk–West Kamchatka Danish seine fishery (05.2–Western-Kamchatka subzone, 05.4–Kamchatka-Kuril subzone); 5) Sea of Japan mid-water trawl fishery (06.1–Primorye subzone, 06.2–Western Sakhalin subzone); 6) West Bering Sea, east of the 174th Meridian E mid-water trawl fishery, (01–Western Bering sea zone, eastern portion); 7) West Bering Sea west of the 174th Meridian E mid-water trawl fishery (01–Western Bering sea zone western portion, 02.1–Karaginsk subzone); and 8) West Sea of Okhotsk–East Sakhalin mid-water trawl fishery (05.3–East Sakhalin subzone)}.

Production Statistics

The North Pacific pollock fishery is one of the largest single-species fisheries in the world, with a total global harvest of 3.2 million metric tons (MT) in 2014. Most (92%) of the harvest in that year was accounted for by Russian and Alaskan fleets, with the Russian catch slightly exceeding the American harvest (Figure 2) (FAO 2016). The six main regions where harvest occurs, ordered from most to least harvest, are the East Bering Sea (where the US fleet operates), the Sea of Okhotsk (Russian fishery), the West Bering Sea (predominantly Russian fleet, with a portion of the quota given by Russia to South Korean ships through bilateral agreement), the Kuril Islands (a mostly Russian fishery, with a minor harvest by Japan in the Nemuro Strait), the Pacific Ocean off the coast of Japan (Japanese fishery), and the Sea of Japan (Russian fleet) (Figure 3).

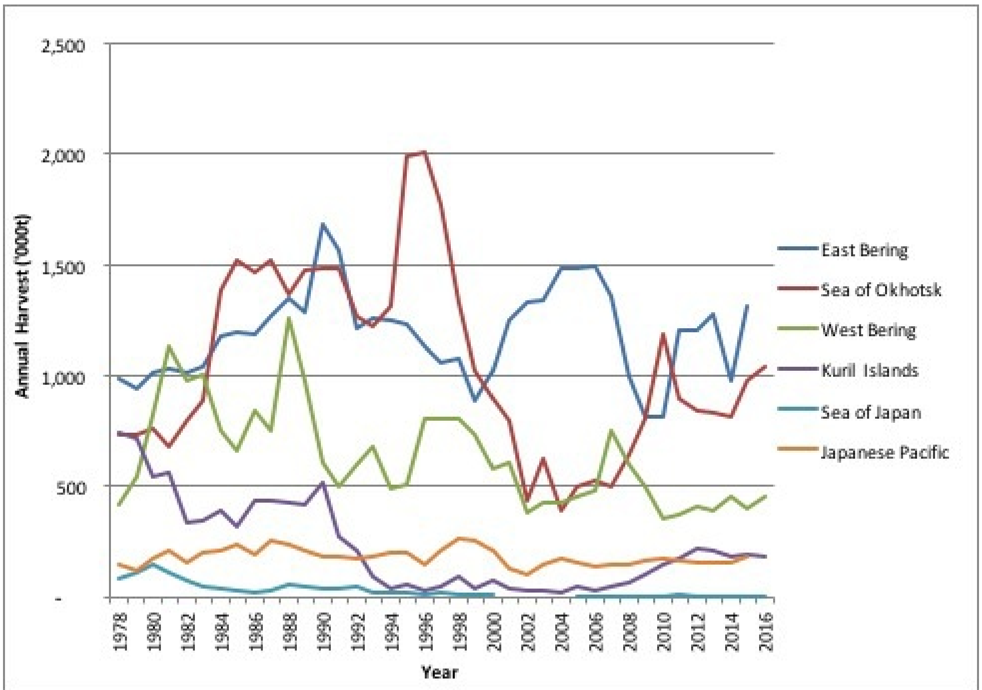

Figure 1 Total annual harvest of walleye pollock by fishery region in thousands of metric tons, 1978–2016. Harvests of the US, Russia, and Japan are included. The East Bering Sea is currently the most productive fishery region, followed by the Sea of Okhotsk and West Bering Sea (Fadeev and Vespestad 2001); (Ovsyannikova 2012); (Intertek Moody Marine 2013); (TINRO 2014); (United States Party 2014); (FAO 2016); (SFP 2016a); (SFP 2016b); (SFP 2016c); (PCA 2017).

(Ovsyannikova 2012) (Intertek Moody Marine 2013) (TINRO 2014) (United States Party 2014) (FAO 2016) (SFP 2016a) (SFP 2016b) (SFP 2016c) (PCA 2017).}

For Russia, the Sea of Okhotsk accounts for the majority (~60%) of the national pollock harvest. Over 80% of this catch is accounted for by fisheries assessed in Marine Stewardship Council's 2013 certification of the Sea of Okhotsk mid-water trawl fishery, and is excluded from this assessment. The East Sakhalin mid-water trawl and West Kamchatka Danish seine fisheries that occur in the Sea of Okhotsk were not included in the MSC assessment, and therefore are included in this assessment. The West Bering Sea is the next largest contributor to the national catch (comprising ~30% of total Russian harvest), with the fishery taking place east of the 174th meridian accounting for the lion’s share (>90%) of West Bering catch (Figure 4). Trawl fisheries account for most of the catch in the West Bering Sea, with Danish seine fishing accounting for a minority share.

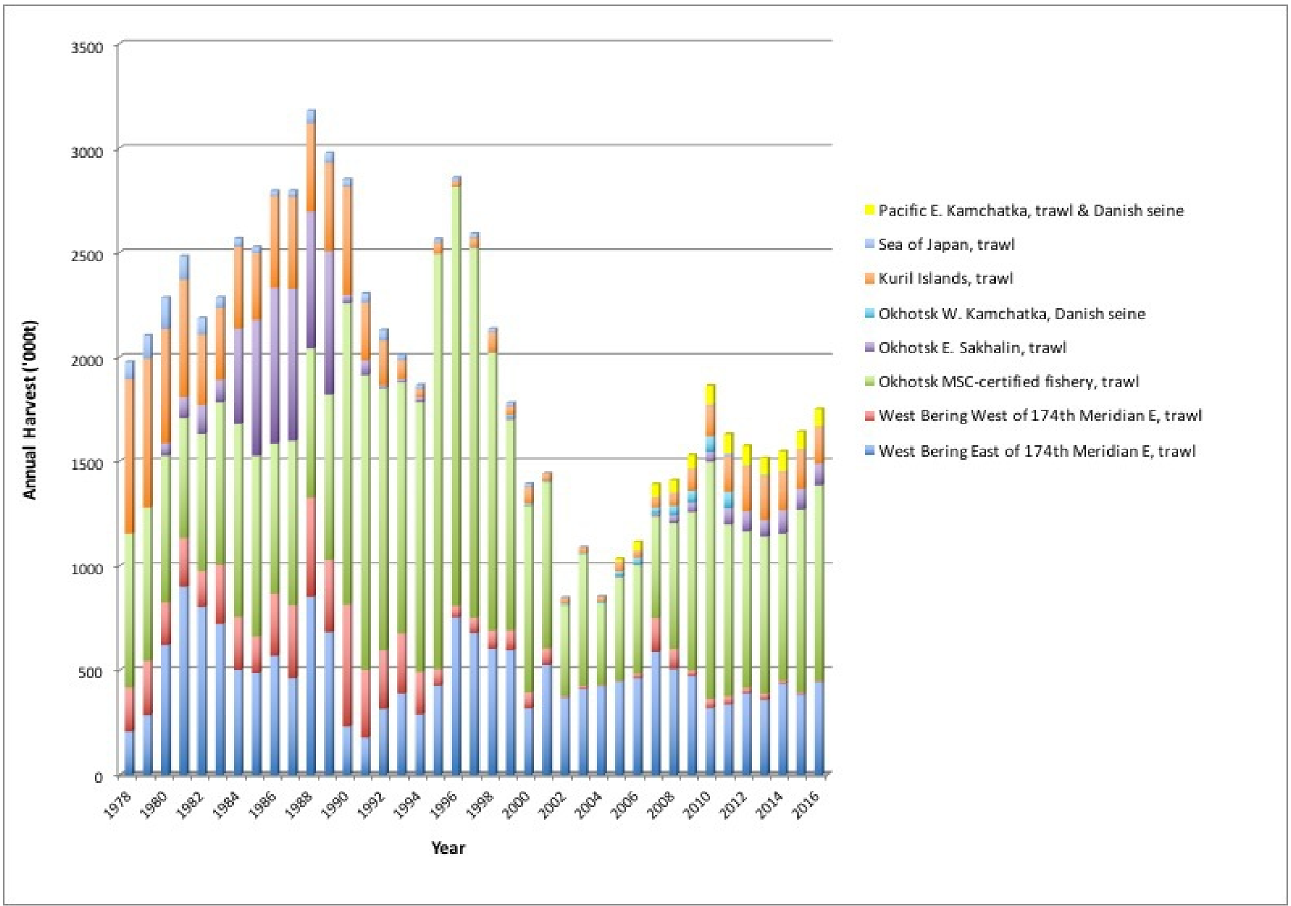

Figure 2 Russian annual harvest of walleye pollock in thousands of metric tons, 1978–2016, broken up by fishery unit. The 1990s-era decline in Sea of Okhotsk pollock is visible here, as is a recent decline in West Bering pollock west of 174oE. Okhotsk pollock has recovered somewhat in the 2000s (Fadeev and Vespestad 2001); (PCA 2010); (Ovsyannikova 2012); (Shirokov et al. 2012); (Intertek Moody Marine 2013); (TINRO 2014); (FAO 2016); (SFP 2016a); (SFP 2016b); (SFP 2016c); (PCA 2017).
(PCA 2010) (Ovsyannikova 2012) (Shirokov et al. 2012) (Intertek Moody Marine 2013) (TINRO 2014) (FAO 2016) (SFP 2016a) (SFP 2016b) (SFP 2016c) (PCA 2017)}.

Importance to the US/North American market.

Russian harvest of pollock reportedly currently accounts for 40% of pollock sold in the US, although direct exports from Russia to the US are not significant (in 2013, Russia exported approximately 827,000 MT of pollock, and only 276 MT were shipped to the US). Most Russian pollock sold in the US passes through China, where it is thawed, processed, and re-frozen for export. The US and Japan also send portions of their harvests to China for processing and re-export. In 2013, China imported approximately 669,000 MT of pollock and re-exported 357,000 MT, or 58% of the imported volume. The US accounted for only 50,572 MT, or 8%, of the Chinese imports, while Japan accounted for 49,050 MT. Once Japanese and US exports to China are subtracted out, the remaining 569,378 MT of Chinese pollock imports can be presumed to be largely accounted for by Russia. In 2013, the US imported 54,000 MT of pollock from China (FAO 2016) (Japanese Ministry of Finance 2016) (NMFS 2016).

Common and market names.

Common and market names for walleye pollock include "Alaska pollock," "whiting," "Pacific tomcod," and "Pacific pollock." Recently, controversy has swirled around marketing of walleye pollock not harvested in Alaskan waters as "Alaska pollock," with the Alaskan industry lobbying for regulations that would prohibit this practice. In 2016, the US Congress mandated that only *Gadus chalcogrammus* caught in Alaskan waters or in the Exclusive Economic Zone adjacent to Alaska can be labeled "Alaska pollock" or "Alaskan pollock" (FDA 2016).

Primary product forms

Pollock is used predominantly in the production of frozen fillets, fish sticks, and a broad range of fish “paste” (surimi) products. In the US, common surimi products include imitation crab, shrimp, and scallops; in Japan, a greater variety of surimi products are available. Pollock roe is also sold in the US, although it is more popular in Asia.

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

WALLEYE POLLOCK			
Region | Method | Country | Custom Group	**Abundance**	**Fishing Mortality**	**Score**
East Kamchatka Peninsula | Midwater trawls | Russia	3.67: Low Concern	3.00: Moderate Concern	Green (3.32)
East Kamchatka Peninsula | Danish seines | Russia	3.67: Low Concern	3.00: Moderate Concern	Green (3.32)
Kuril Islands | Midwater trawls | Russia	2.33: Moderate Concern	3.00: Moderate Concern	Yellow (2.64)
East Sakhalin/Sea of Okhotsk | Midwater trawls | Russia	2.33: Moderate Concern	3.00: Moderate Concern	Yellow (2.64)
West Kamchatka Peninsula/Sea of Okhotsk | Danish seines | Russia	3.67: Low Concern	3.00: Moderate Concern	Green (3.32)

Bering Sea | Midwater trawls | Russia | West Bering Sea, West of 174oE	1.00: High Concern	3.00: Moderate Concern	Red (1.73)
Bering Sea | Midwater trawls | Russia | West Bering Sea, East of 174oE	3.67: Low Concern	3.00: Moderate Concern	Green (3.32)
Sea of Japan | Midwater trawls | Russia	1.00: High Concern	5.00: Low Concern	Yellow (2.24)

Scores were attributed using biomass and fishing mortality series for stocks and nested populations targeted by the fisheries under assessment. While there are some variations among stocks (see stock-specific information included in scoring rationales), pollock fishery managers generally consider B_{LIM} to be a historically low mature and/or spawning biomass for the stock in question, the rationale being that this is a biomass from which recovery of the stock has been observed. Meanwhile, B_{TRP}, when used, is equal to the historical average biomass and is intended as an equivalent for B_{MSY}. In the case of SOO, West Bering, and Navarinsk pollock, these proxies are used as reference points rather than Ricker stock-recruitment relationships due to uncertainty in the Ricker models, which suggests that non-stock processes largely determine the strength of incoming year-classes.[1] Although not explicitly stated in references reviewed in the preparation of this report, it is presumed that this is also the case for the other pollock stocks managed by Russia {PCA 2010} {Intertek Moody Marine 2013} {Bulatov 2015}.

Scores for fisheries reflect the following assessment of the status of the stocks that they target:

Low Concern: 1) Japanese Pacific, 2) Navarinsk, 3) Northeast Sea of Okhotsk (West Kamchatka), 4) East Kamchatka

Medium Concern: 1) Sea of Japan, 2) West Sea of Okhotsk (East Sakhalin)

High Concern: 1) West Bering Sea

[1] In accordance with the Seafood Watch guidelines, ratings for abundance are awarded on the basis of how stocks perform against target reference points. If B_{MSY} is not known and proxies are used as target reference points (as is the case for most of the stocks assessed in this report), prior Seafood Watch reports for other fisheries have established a precedent of scoring these stocks more strictly—i.e., if the stock is 75% of the target it receives a "moderate" concern rather than a "low" concern rating. In such cases, a stock must be far above the proxy target reference point and/or near historic high abundance to receive a "low" concern rating.

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.*

WALLEYE POLLOCK

Factor 1.1 - Abundance

EAST KAMCHATKA PENINSULA, MIDWATER TRAWLS, RUSSIA
EAST KAMCHATKA PENINSULA, DANISH SEINES, RUSSIA

Low Concern

Forecast data for 2017 indicates that SSB/B_{LIM} = 1.50 and SSB/B_{TR} = 1.22 for the Petropavlovsk-Komandorskaya population, resulting in a score of "low" concern.

KURIL ISLANDS, MIDWATER TRAWLS, RUSSIA

Moderate Concern

It is mostly the healthy Pacific–East Kamchatka stock that is harvested in the Kuril Islands fishery, but other stocks are also harvested in this mixed-stock fishery, including the depleted Sea of Okhotsk–East Sakhalin stock, which was consistently below B_{LIM} during 1988 to 2013, but has recently bounced back slightly above B_{LIM} (B/B_{LIM} = 1.24 in 2017) (TINRO 2017). This fishery unit therefore shares the East Sakhalin unit's rating of "moderate" concern (Figure 12).

Justification:

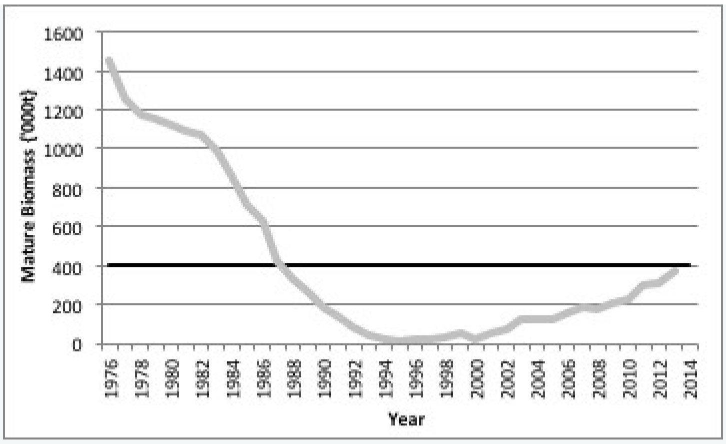

Figure 3 Mature biomass in thousands of metric tons (grey trend line) vs. Blim (black line) for West Sea of Okhotsk–East Sakhalin pollock, 1976–2013 (PCA 2010); (Bulatov 2015). There is no Btrp in place for West Sea of Okhotsk–East Sakhalin pollock.

EAST SAKHALIN/SEA OF OKHOTSK, MIDWATER TRAWLS, RUSSIA

Moderate Concern

The Sea of Okhotsk–East Sakhalin stock was consistently below its B_{LIM} from 1988 to 2013, but in 2015 to 2016 bounced back above B_{LIM} (B/B_{LIM} = 1.24 in 2017), resulting in a rating of "moderate" concern (Figure 12).

Justification:

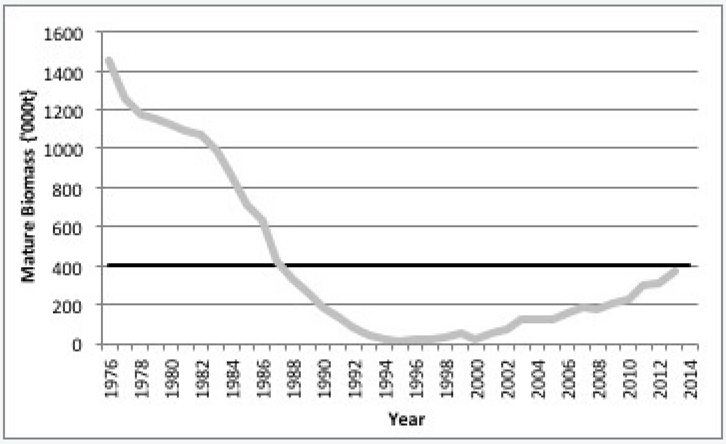

Figure 4 Mature biomass in thousands of metric tons (grey trend line) vs. Blim (black line) for West Sea of Okhotsk–East Sakhalin pollock, 1976–2013 (PCA 2010); (Bulatov 2015). There is no Btrp in place for West Sea of Okhotsk–East Sakhalin pollock.

WEST KAMCHATKA PENINSULA/SEA OF OKHOTSK, DANISH SEINES, RUSSIA

Low Concern

Like the Navarinsk stock, the Northeast Sea of Okhotsk stock has provided stable harvests for several decades now. Spawning biomass for Okhotsk pollock has also been stably above its target reference point dating back to 1963, and the target reference point has been calculated to be higher than B_{MSY} (Intertek Moody Marine 2013), resulting in a rating of "low" concern for this stock (Figure 7). In 2014, SSB/B_{TRP}= 1.06 and SSB/B_{LIM}= 2.09.

Justification:

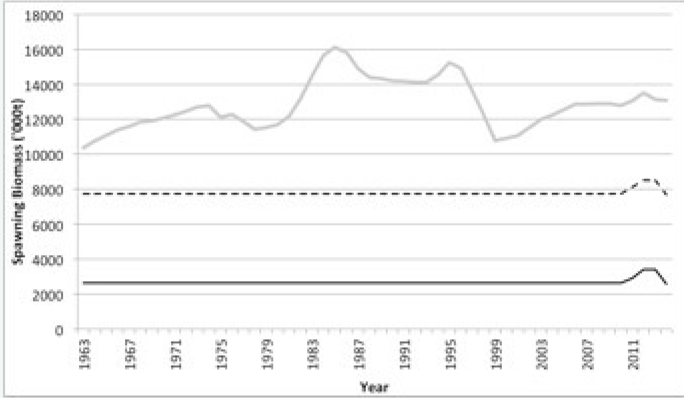

Figure 5 Spawning biomass in thousands of metric tons (grey trend line) vs. Blim (black line) and Btrp (dotted black line) for SOO pollock (within which the West Kamchatka population is a major component), 1963–2014 (Intertek Moody Marine 2013); (SFP 2016a). Biomass for this stock is currently at an historic high.

SEA OF JAPAN, MIDWATER TRAWLS, RUSSIA

High Concern

Sea of Japan pollock is scored a "high" concern, since biomass is less than half of B_{TRP} as of 2015 (B/B_{TRP} = 0.48) and was therefore deemed to likely be below B_{LIM} (Figure 9). Note that there is little public information available on this stock and uncertainty over whether or not there is a B_{LIM} used in management of this stock (literature review and outreach to stakeholders did not indicate that one exists).

Justification:

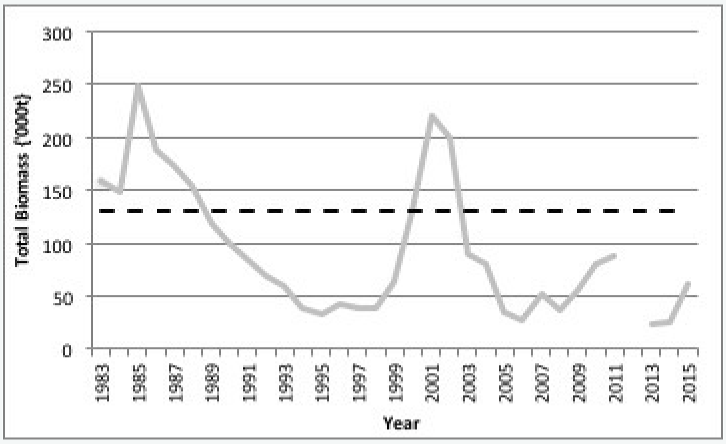

Figure 6 Total biomass in thousands of metric tons (grey trend line) vs. Btrp (dotted black line) for Sea of Japan pollock, 1983–2015 (Primorskiy Regional Administration 2013); (Vdovin and Solomatov 2013); (P24 2014); (Rybak Primoriya 2015).

Factor 1.2 - Fishing Mortality

EAST KAMCHATKA PENINSULA, MIDWATER TRAWLS, RUSSIA

Moderate Concern

In 2017, for the population inhabiting the Petropavlovsk-Kamchatsky and North Kuril subzones, F_{TR} = 0.305 and, if the TAC is completely fished, F would equal 0.305 (F/F_{TR} = 1) (TINRO 2017). As the assessor was uncertain of the relationship between F_{TR} and F_{MSY}, a score of "moderate" concern was given.

EAST KAMCHATKA PENINSULA, DANISH SEINES, RUSSIA
WEST KAMCHATKA PENINSULA/SEA OF OKHOTSK, DANISH SEINES, RUSSIA

Moderate Concern

For the Danish seine fisheries, the assessor did not find public data indicating fishing mortality vs. target reference point. Deeming fishing mortality relative to sustainable level to be generally uncertain, these units were rated "moderate" concern.

KURIL ISLANDS, MIDWATER TRAWLS, RUSSIA

Moderate Concern

The fishing mortality reference point for one of the stocks harvested in this fishery (East Sakhalin) was not published in the most recent TINRO forecast document, and the relationship of F_{TR} to F_{MSY} is unknown for another stock (F_{MSY}). The score of "moderate" concern reflects the resultant uncertainty in fishing mortality of the fishery unit in question.

EAST SAKHALIN/SEA OF OKHOTSK, MIDWATER TRAWLS, RUSSIA

Moderate Concern

F_{TR} has not been published for the East Sakhalin subzone, resulting in a rating of "moderate" concern.

SEA OF JAPAN, MIDWATER TRAWLS, RUSSIA

Low Concern

In the Primorye subzone of the fishery, there is no offshore trawl fishery targeting pollock due to the small size of the pollock population in the Sea of Japan. The contribution to mortality of the small-scale coastal fishery is thought to be low enough to not adversely affect the pollock stock's viability. In support of this conclusion, in the West Sakhalin subzone of the fishery, F/F_{TRP} = 0.12 for 2017 if the entire TAC is fished (TINRO 2017).

WALLEYE POLLOCK

Factor 1.1 - Abundance

BERING SEA, MIDWATER TRAWLS, RUSSIA, WEST BERING SEA, WEST OF 174OE

High Concern

In contrast with the Navarinsk stock, pollock west of 174º E have exhibited steady declines dating back to the 1980s. As of 2017, the stock overall appeared to be hovering slightly above B_{LIM} despite approaching it steadily for the last several years (SSB/B_{TRP} = 0.48 and SSB/B_{LIM} = 1.20 (Figure 10). However, a key component population, Olyotorskiy-Karagin (B/B_{LIM} = 0.31 in 2013) has not exceeded B_{LIM} dating back to 1993 (Figure 11). Because this component population is below its limit reference point, the stock is rated "high" concern.

Justification:

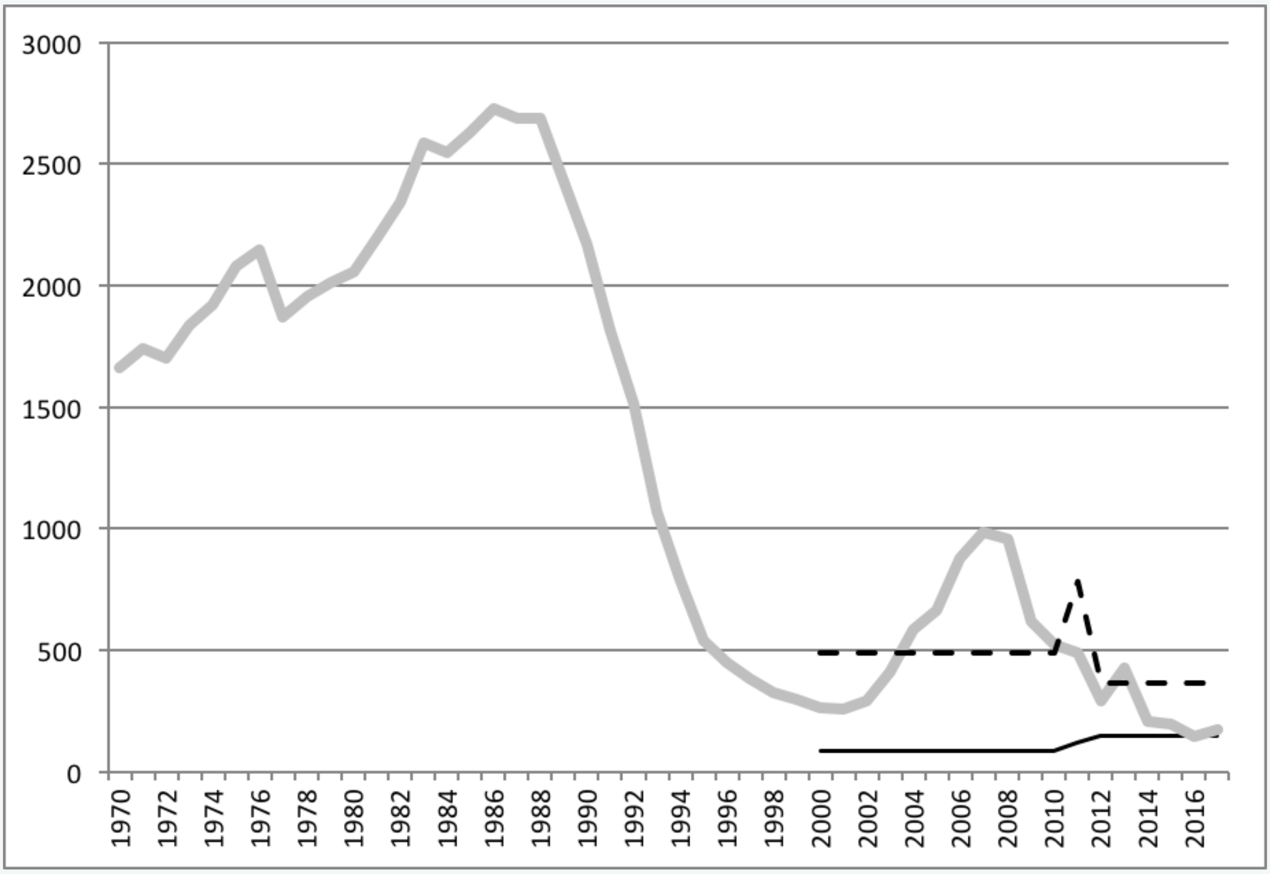

Figure 7 Spawning biomass in thousands of metric tons (grey trend line) vs. Blim (black line) and Btrp (dotted black line) for West Bering pollock, 1970–2015 (Russian Federation 2014); (TINRO 2015).

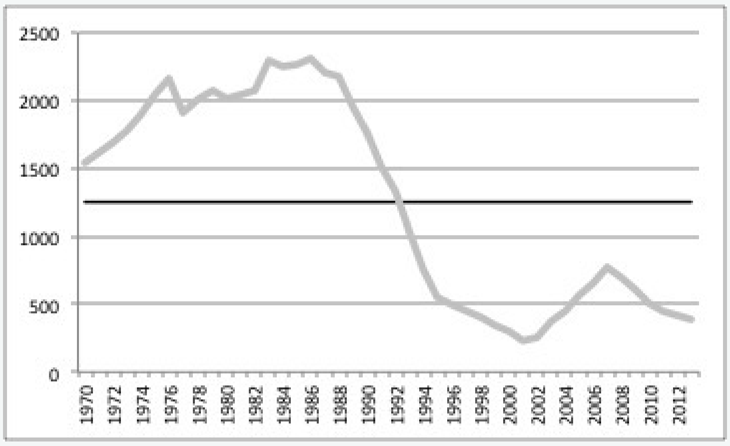

Figure 8 Mature biomass in thousands of metric tons (grey trend line) vs. Blim (black line) for Olyotorskiy-Karagin pollock (a component population of West Bering pollock), 1970–2013 (Bulatov 2015). There is no Btrp in place for Olyotorskiy-Karagin pollock.

Factor 1.2 - Fishing Mortality

BERING SEA, MIDWATER TRAWLS, RUSSIA, WEST BERING SEA, WEST OF 174OE

Moderate Concern

In 2017 in Karaginsk, the only portion of the WBS west of 174º E where fishing is allowed, F_{TR} = 0.126 and, if the TAC is fished, F would equal 0.028 (F/F_{TR} = 0.22) (TINRO 2017). Although the projected fishing pressure is therefore well below its target, the decision to allow any fishing in Karaginsk is questionable, as the rest of the fishery west of 174º E is closed to allow this long-depleted stock to recover. A score of "moderate" concern reflects this concern and lack of confidence that the fishing mortality reference point is adequately conservative.

WALLEYE POLLOCK

Factor 1.1 - Abundance

BERING SEA, MIDWATER TRAWLS, RUSSIA, WEST BERING SEA, EAST OF 174OE

Low Concern

The Navarinsk stock has been notable among West Bering stocks in generating stable catches over the past 35 years (Figure 4). As for biomass trends, there has been some variability, with several peaks and troughs occurring since 1993 (Figure 6). According to the most recent estimates, spawning biomass is above the target reference point and achieved an historic high in 2014 (SSB/B_{TRP} = 1.41 and SSB/B_{LIM} = 1.58). Biomass was slightly less in 2017 (SSB/B_{TRP} = 1.21, SSB/B_{LIM} = 1.36), but still meriting a rating of "low" concern (Figure 6).

Justification:

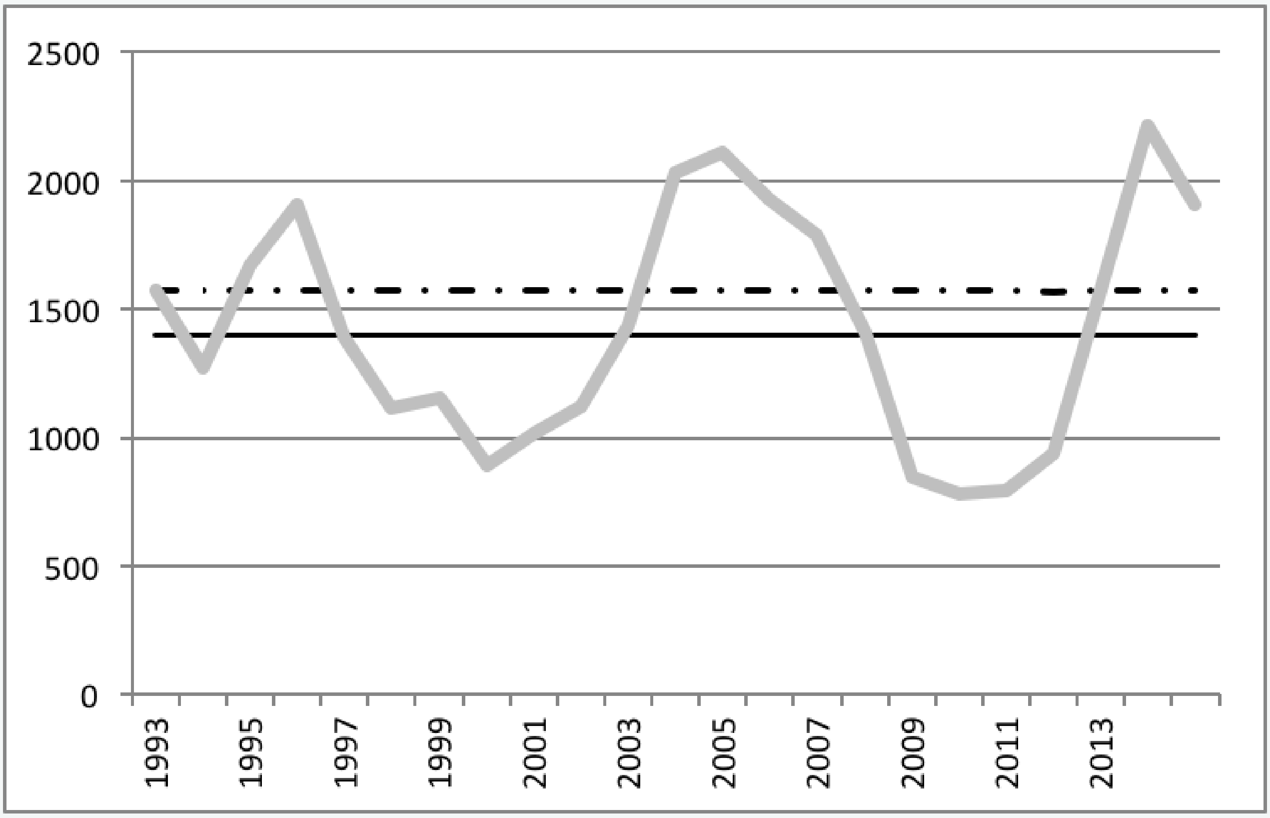

Figure 9 Spawning biomass in thousands of metric tons (grey trend line) vs. Blim (black line) and Btrp (dotted black line) for Navarinsk pollock, 1993–2014 (Bulatov 2015), (SFP 2016c). Biomass for this stock reached an historic high in 2014.

Factor 1.2 - Fishing Mortality

BERING SEA, MIDWATER TRAWLS, RUSSIA, WEST BERING SEA, EAST OF 174OE

Moderate Concern

F_{TR} for this stock is 0.25 according to the most recent forecast document for the fishery, but the current fishing mortality did not appear to be published in the document, nor was the assessor certain of the relationship between F_{TR} and F_{MSY}. Deeming fishing mortality relative to sustainable level to be uncertain, the fishery unit was rated "moderate" concern.

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

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.

WALLEYE POLLOCK - BERING SEA - MIDWATER TRAWLS - RUSSIA - WEST BERING SEA, EAST OF 174OE					
Subscore:	**2.24**	**Discard Rate:**	**1.00**	**C2 Rate:**	**2.24**

Species	Abundance	Fishing Mortality	Subscore
Steller's sea lion	1.00:High Concern	5.00:Low Concern	Yellow (2.24)

WALLEYE POLLOCK - BERING SEA - MIDWATER TRAWLS - RUSSIA - WEST BERING SEA, WEST OF 174OE					
Subscore:	**2.24**	**Discard Rate:**	**1.00**	**C2 Rate:**	**2.24**

Species	Abundance	Fishing Mortality	Subscore
Steller's sea lion	1.00:High Concern	5.00:Low Concern	Yellow (2.24)
Chinook salmon	2.33:Moderate Concern	3.00:Moderate Concern	Yellow (2.64)
Pacific herring	2.33:Moderate Concern	3.00:Moderate Concern	Yellow (2.64)

WALLEYE POLLOCK - EAST KAMCHATKA PENINSULA - DANISH SEINES - RUSSIA					
Subscore:	**2.64**	**Discard Rate:**	**1.00**	**C2 Rate:**	**2.64**

Species	Abundance	Fishing Mortality	Subscore
Great sculpin	2.33:Moderate Concern	3.00:Moderate Concern	Yellow (2.64)
Atka mackerel	2.33:Moderate Concern	3.00:Moderate Concern	Yellow (2.64)
Other flatfish complex	2.33:Moderate Concern	3.00:Moderate Concern	Yellow (2.64)
Pacific cod	3.67:Low Concern	3.00:Moderate Concern	Green (3.32)

WALLEYE POLLOCK - EAST KAMCHATKA PENINSULA - MIDWATER TRAWLS - RUSSIA					
Subscore:	**2.24**	**Discard Rate:**	**1.00**	**C2 Rate:**	**2.24**

Species	Abundance	Fishing Mortality	Subscore
Steller's sea lion	1.00:High Concern	5.00:Low Concern	Yellow (2.24)
Chinook salmon	2.33:Moderate Concern	3.00:Moderate Concern	Yellow (2.64)

WALLEYE POLLOCK - EAST SAKHALIN/SEA OF OKHOTSK - MIDWATER TRAWLS - RUSSIA					
Subscore:	**2.24**	**Discard Rate:**	**1.00**	**C2 Rate:**	**2.24**

Species	Abundance	Fishing Mortality	Subscore
Steller's sea lion	1.00:High Concern	5.00:Low Concern	Yellow (2.24)

WALLEYE POLLOCK - KURIL ISLANDS - MIDWATER TRAWLS - RUSSIA					
Subscore:	**1.73**	**Discard Rate:**	**1.00**	**C2 Rate:**	**1.73**

Species	Abundance	Fishing Mortality	Subscore
Chinook salmon	1.00:High Concern	3.00:Moderate Concern	Red (1.73)
Steller's sea lion	1.00:High Concern	5.00:Low Concern	Yellow (2.24)

WALLEYE POLLOCK - SEA OF JAPAN - MIDWATER TRAWLS - RUSSIA					
Subscore:	**2.24**	**Discard Rate:**	**1.00**	**C2 Rate:**	**2.24**

Species	Abundance	Fishing Mortality	Subscore
Steller's sea lion	1.00:High Concern	5.00:Low Concern	Yellow (2.24)

WALLEYE POLLOCK - WEST KAMCHATKA PENINSULA/SEA OF OKHOTSK - DANISH SEINES - RUSSIA					
Subscore:	**2.64**	**Discard Rate:**	**1.00**	**C2 Rate:**	**2.64**

Species	Abundance	Fishing Mortality	Subscore
Other flatfish complex	2.33:Moderate Concern	3.00:Moderate Concern	Yellow (2.64)
Saffron cod	5.00:Very Low Concern	5.00:Low Concern	Green (5.00)

Mid-water trawl pollock fisheries have historically reported very low discard ratios while generating globally-significant yields (Alverson et al. 1994). It is for this reason (to limit bycatch) that Russian and other fleets targeting North Pacific pollock switched from bottom trawls to mid-water trawls in the 1990s. Bottom trawl bans were put into place subsequently and continue to be in effect on both the Russian and American sides. Information available on species composition in different fishery zones indicates a low (<3%) bycatch (retained and discarded species) proportion of harvest in the East Sakhalin, West Bering (excluding the Karaginsk subzone), and East Kamchatka trawl fisheries {Terentev 2006}. The Karaginsk subzone (West Bering west of 174oE trawl fishery) is an exception to this norm of pollock dominating trawl catch, as Pacific herring here accounts for 86% of trawl catch according to Terentev (2006), and was therefore conferred "main species" status for this analysis. Information was not available for the Sea of Japan and Kuril Islands fisheries, but they were presumed to have low bycatch proportions like their closest neighbor fisheries for which information was available.

The Danish seine fisheries in West and East Kamchatka represent a different scenario, as they occur in deeper, coastal areas rather than mid-water, offshore areas; use a less selective gear type; and target multiple species. Terentev (2006) indicates that the following species account for more than 5% of the harvest in either or both of the Danish seine fishery subzones: Pacific cod (*Gadus macrocephalus*—16% of the East Kamchatka catch), flatfish species (15.8% of the East Kamchatka catch and 26% of the West Kamchatka catch), great sculpin (*Myoxocephalus polyacanthocephalus*—10.4% of the East Kamchatka catch), Atka mackerel (*Pleurogrammus monopterygius*—6.2% of the East Kamchatka catch, and Saffron cod (*Eleginus gracilis*—7% of the West Kamchatka catch) {Terentev 2006}, {Shirokov et al. 2012}. These six fishes were included in the assessment as 'main' bycatch species for the Danish seine fishery.

ETP species for which the fishery might represent a conservation concern are also to be included in the assessment as 'main' bycatch species. Endangered species listings under CITES; the Russian red book; or the regional red books of Kamchatka, Sakhalin, and Primoriya were reviewed to identify species that have overlapping habitat with the fishery and may be impacted. As the likelihood of large marine mammals or fish being fouled or drowned in mid-water trawl or Danish seine nets is low, the handful of whale and shark species that reside in the region were not considered for 'main' status {Intertek Moody Marine 2013}. This leaves harbor porpoise (*Phoca phocoena*), harbor seal (*Phoca vitulina*), bearded seal (*Erignathus barbatus nauticus*), Okhotsk and Arctic ring seal (*Phoca hispida*), Steller sea lion (*Eumetopias jubatus*), sea otter (*Enhydra lutis*), northern fur seal (*Callorhinus ursinus)* and finless porpoise (*Neophocaena phocaenoides*) as marine mammals meriting further consideration. Among these, only interaction with Steller sea lions by the trawl fleet has been documented, and hence *Eumetopias jubatus* was considered a 'main' species for the trawl fishery units {Acoura Marine Ltd. 2015). A 2014 report describes the results of surveys indicating that nearshore seine fisheries in Kamchatka likely have little or no effect on SSL populations, and therefore *Eumetopias jubatus* was not considered a 'main' species for the Danish seine fishery units (Fomin et al. 2014a).

As for fish, various depleted populations of anadromous salmonids are listed in regional red books—of these, Kamchatka Chinook salmon bycatch by the East Kamchatka and West Bering fisheries has been documented (and bycatch by the Northern Kurils fishery is presumed), and therefore the species was considered 'main' (PCA 2010). It is also possible to catch rockfish in Danish seines. Two rockfish species that are in the Kamchatka red book are found off the coast of Kamchatka— shortraker rockfish (*Sebastes borealis*) and rougheye rockfish (*Sebastes aleutianus*) {Shirokov et al. 2012}. However, they were not included among 'main' species due to stakeholder feedback regarding overlap between Danish seine fisheries and rockfish habitat. Danish seines fish mainly in coastal waters on the shelf and on "convenient" areas of bottom, while these rockfish species inhabit deep, rocky waters beyond the shelf that are dangerous to fish with a Danish seine because gear can be damaged or lost.

Among seabirds, bycatch of the endangered short-tailed albatross (*Diomedea albatrus*), yellow-billed loon (*Gavia adamsii*), red-legged kittiwake (*Rissa brevirostris*)**,** Kittlitz's murrelet **(***Brachyramphus brevirostris***)**, and marbled murrelet **(***Brachyramphus marmoratus***)** has been documented in the driftnet salmon fishery, which occurs in the SOO, SOJ, West Bering Sea, and Kuril Islands like the mid-water trawl pollock fishery (Artukhin

2011). However, as there are no known encounters of the pollock fishery with these species, they were not listed as 'main.'

The Kuril Islands trawl fishery received a "high concern" rating for bycatch of Chinook salmon that may include fish from the Bolshaya River that are depleted and failing to recover. All trawl fishery units also received "moderate concern" ratings for Steller sea lion bycatch.

Criterion 2 Assessment

SCORING GUIDELINES

Factor 2.1 - Abundance

(same as Factor 1.1 above)

Factor 2.2 - Fishing Mortality

(same as Factor 1.2 above)

GREAT SCULPIN

Factor 2.1 - Abundance

EAST KAMCHATKA PENINSULA, DANISH SEINES, RUSSIA

Moderate Concern

There is no publicly available stock assessment for great sculpin. This factor was rated using a Productivity Susceptibility Assessment (PSA), which generated a "moderate" concern rating.

Justification:

Productivity-Susceptibility Analysis (Sealife Base 2017) (Brogan and Anderl 2012):

Scoring Guidelines

1.) Productivity score (P) = average of the productivity attribute scores (p1, p2, p3, p4 (finfish only), p5 (finfish only), p6, p7, and p8 (invertebrates only))

2.) Susceptibility score (S) = product of the susceptibility attribute scores (s1, s2, s3, s4), rescaled as follows: $S = [(s1 * s2 * s3 * s4) – 1/ 40] + 1.$

3.) Vulnerability score (V) = the Euclidean distance of P and S using the following formula: $V = \sqrt{(P^2 + S)}$

Productivity-Susceptibility Analysis for Great Sculpin:

PRODUCTIVITY ATTRIBUTE	RELEVANT INFORMATION	SCORE (1 = LOW RISK, 2 = MEDIUM RISK, 3 = HIGH RISK)
Avg age at maturity	6 years old	2
Avg max age	13 years old	2
Avg max size	80 cm	1
Avg size at maturity (Lm)	56 cm	2

Fecundity	200,000 eggs	1
Reproductive strategy	Live bearer	2
Trophic level	3.8	3
SUSCEPTIBILITY ATTRIBUTE	RELEVANT INFORMATION	SCORE (1 = LOW RISK 2 = MEDIUM RISK, 3 = HIGH RISK)
Aerial overlap (considers all fisheries)	Unknown	3
Vertical overlap (considers all fisheries)	Unknown	3
Selectivity of fishery (specific to fishery under assessment)	Unknown	2
Post-capture mortality (specific to fishery under assessment)	Unknown	3
PSA SCORE:		**2.98, Medium risk**

Factor 2.2 - Fishing Mortality

EAST KAMCHATKA PENINSULA, DANISH SEINES, RUSSIA

Moderate Concern

Publicly available information indicating fishing mortality for this species was not found, resulting in a rating of "moderate" concern.

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

EAST KAMCHATKA PENINSULA, DANISH SEINES, RUSSIA

< 100%

In this fishery, the permitted bycatch of non-commercially valuable species that are discarded is limited to 49% of total harvest weight.

CHINOOK SALMON

Factor 2.1 - Abundance

EAST KAMCHATKA PENINSULA, MIDWATER TRAWLS, RUSSIA
BERING SEA, MIDWATER TRAWLS, RUSSIA, WEST BERING SEA, WEST OF 174OE

Moderate Concern

Chinook salmon have Category 3 (rare species) listing in the Kamchatka Red Book. Population status varies by region (East Kamchatka vs. West Kamchatka) and individual river system. The East Kamchatka pollock trawl fishery intercepts Chinook salmon migrating to East Kamchatka, where the Kamchatka River, the largest river in Kamchatka, accounts for ≥70% of the Kamchatka region's production of the species. Chinook salmon migrating to West Kamchatka rivers may also be intercepted. The annual Chinook salmon escapement goal for the Kamchatka River river is 50,000 spawners, and in 1980 to 2010, the average escapement was 54,000 spawners (i.e., above the goal). However, from 2011 to 2014, escapements far under the goal—historic lows—were recorded (4,000 returnees in 2011, 7,000 in 2012, 4,000 in 2013, and 8,000 in 2014). Local scientists opined in forecast documents that reductions in escapement monitoring capacity rather than actual declines in abundance were responsible for the low escapements (FAR and TINRO 2015). In 2016, however, Kamchatka River Chinook salmon escapements rebounded according to local stakeholders and fishing industry media. A September 2016 media report indicated a longer Chinook spawning season in 2016 than in previous years and full use of spawning areas in the river (FishNews 2016). Despite the absence of a firm escapement number indicating a rebound from the low numbers of 2011 to 2014, the Kamchatka River is assumed to have recovered sufficiently for the East Kamchatka trawl fishery to receive a "moderate" concern rating for abundance of Chinook salmon.

In addition to the commercially-important Chinook salmon populations of the Kamchatka River, depleted Chinook salmon populations are also reported in the smaller Penzhina, Talovka, Avacha, Paratunka, and Lisinskaya (Bering Island) river basins on both sides of the peninsula (Kamchatka Regional Government 2016). Information on the current status of these populations is not available.

Stakeholders reviewing this report pointed to the salmon driftnet fishery, poaching in rivers, bycatch of West Kamchatka populations in East Kamchatka salmon fishery set nets (which amounts to a few hundred tons per year), and mining pollution in rivers as primary causes of poor Chinook salmon population status. Closure of the salmon driftnet fishery from 2016 onward has sparked hopes of recovery, and preliminary reports on the 2017 salmon season indicate that Chinook salmon returns were strong. However, there is still cause for concern about the plight of Kamchatka Chinook salmon and the role of the pollock trawl fishery in its unstable status.

Justification:

(Additional Rationale for Chinook Salmon "Main" Status for Three Trawl Fishery Units)

The main spawning grounds for Chinook salmon in Russia are located on both sides of the Kamchatka peninsula, with minor spawning also occurring in Magadan Oblast, Chukotka, and the North Kurils. Chinook salmon are anadromous, meaning that they are born in rivers, migrate to the ocean, and return to their natal rivers to spawn. Of the fishery units included in this assessment, the East Kamchatka, West Bering Sea west of 174ºE, and Kuril Islands trawl (particularly in the northern portion of the archipelago) fisheries overlap temporally and spatially with the summer Chinook salmon spawning migration. Fish returning to East Kamchatka to spawn pass through the West Bering Sea, and those returning to West Kamchatka pass through the Northern Kuril Islands, where they can be intercepted by the pollock trawl fishery. The Sea of Okhotsk fishery also stands between Pacific Ocean feeding areas and West Kamchatkan spawning grounds, but unlike the other two fisheries, it is closed during the summer months, thereby limiting quantities of Chinook bycatch.

[1] Although there is no comprehensive data available on Chinook salmon bycatch by the trawl fisheries assessed in this report, catch data from the salmon offshore driftnet fishery that overlaps spatially and temporally with the pollock fishery in the WBS, East Kamchatka, and the Kurils can be used to indicate the likelihood of meaningful Chinook salmon bycatch in a particular fishery subzone. In 2014, the driftnet fishery harvested 86 tons of Chinook salmon, 31% of which was taken in Karaginsk sub-zone, 25% in Petropavlovsk-Commander sub-zone, and 42% in the North Kurils zone (i.e., the areas in which the East Kamchatka, WBS west of 174ºE, and Kuril pollock trawl fisheries take place account for 98% of the Chinook driftnet harvest) (FAR and TINRO 2015). This information reinforces the decision to score these two fisheries for Chinook salmon bycatch in the absence of comprehensive data.

There is likely limited bycatch of Chinook salmon in the WBS east of 174ºE pollock fishery, but the West Bering zone accounted for only 1% of Chinook salmon driftnet harvest in 2014, and that zone includes a portion west of 174ºE. Chinook migrating through the WBS east of 174ºE are likely headed toward Chukotka, where a small population of Chinook salmon are in stable condition (TINRO and FAR 2015). In light of the likely small amount of Chinook salmon bycatch in this fishery and good condition of the Chinook salmon population that migrates through the area, it was deemed that the WBS east of 174ºE fishery is unlikely to negatively impact Chinook salmon.

[1] The Federal Fisheries Agency's "Fishing Rules for the Far Eastern Fishing Basin" establish seasonal closures to protect spawning pollock. The closures vary by zone and sub-zone. Closures separate both the Bering Sea and SOO fisheries into "A" and "B" seasons, but the closure in the SOO fishery is much longer than that of the Bering Sea and spans the entire summer and early fall. The Bering Sea season "B," meanwhile, opens in mid-May. There are no closures described in the Rules for the Kuril Island sub-zones and the Sea of Japan (FAR 2016).

KURIL ISLANDS, MIDWATER TRAWLS, RUSSIA

High Concern

Particular concern about Chinook salmon stock status has been paid over the last decade toward the Bolshaya River population in Southwest Kamchatka. In this traditional Pacific salmon stronghold among west Kamchatka river basins, Chinook salmon escapement has declined precipitously since 2007 (Figure 13), and according to the most recent stock assessment, continues to be well below escapements recorded from 1970 to 2006 (FAR and TINRO 2015), resulting in a "high" concern abundance rating for the Kuril Islands fishery, which intercepts Chinook salmon migrating toward West Kamchatka.

Justification:

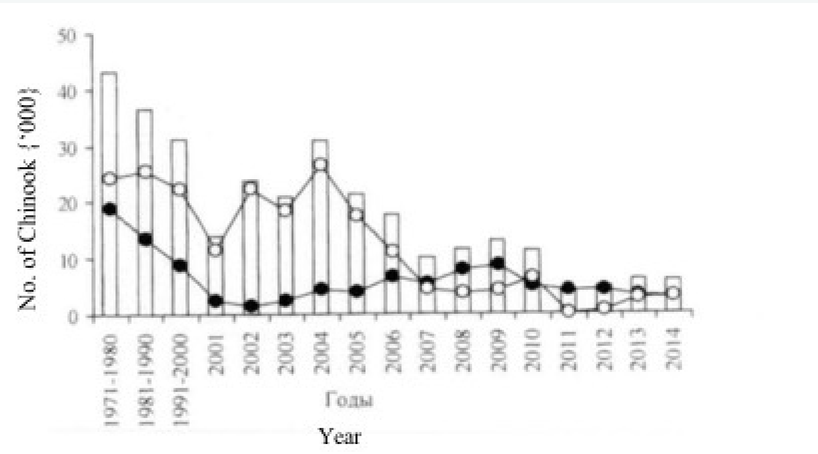

Figure 10 Chinook salmon returns to the Bolshaya River (white bars), harvest (black circles), and escapement (white circles), 1971–2014, in thousands of individuals (FAR and TINRO 2015).

Factor 2.2 - Fishing Mortality

EAST KAMCHATKA PENINSULA, MIDWATER TRAWLS, RUSSIA
BERING SEA, MIDWATER TRAWLS, RUSSIA, WEST BERING SEA, WEST OF 174OE

Moderate Concern

Information on the species composition and volume of bycatch is monitored through vessel logbooks, observers, and test fisheries. However, annual data is not made public. The Pollock Catcher's Association's 2010 submission to the Marine Stewardship Council regarding ecosystem impacts of the West Bering Sea fishery indicated that "yearly yield of this species by the pollock fishery.....amounts to a few tons" (PCA 2010). The Kamchatka and offshore driftnet salmon fisheries reported a harvest of 725 tons of Chinook salmon in 2014, meaning that "a few tons" could amount to 1 to 2% of the fishing mortality of particular Chinook populations (FAR and TINRO 2015). Depending on the number of Chinook salmon from the Bolshaya River, Kamchatka River, and other depleted populations that are harvested in the pollock fishery, which is unknown, this bycatch may or may not be significant, and therefore was rated "moderate" concern.

KURIL ISLANDS, MIDWATER TRAWLS, RUSSIA

Moderate Concern

Mortality of depleted Chinook populations in pollock trawls is particularly of concern for the North Kurils fishery, as Kamchatka's most depleted Chinook populations (those of West Kamchatka) migrate annually past the Kurils en route to their spawning rivers. During review of this report, stakeholders opined that Chinook salmon bycatch in the North Kurils is small-scale and seasonal, occurring primarily in the winter months of November to December. Annual test fishery data from 1996 to 1998 indicates that, on average, 5.7% of trawl catch consisted of Chinook salmon in those months (KamchatNIRO 1997 to 1999). Unfortunately, these test fisheries did not continue into summer months, when Chinook salmon migrate, and other data was not found to back up stakeholder feedback regarding the seasonality of Chinook salmon bycatch. In the absence of adequate information indicating otherwise, the Kuril Islands fishery is rated "moderate" concern for fishing mortality of Chinook salmon.

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

EAST KAMCHATKA PENINSULA, MIDWATER TRAWLS, RUSSIA
KURIL ISLANDS, MIDWATER TRAWLS, RUSSIA
BERING SEA, MIDWATER TRAWLS, RUSSIA, WEST BERING SEA, WEST OF 174OE

< 100%

In this fishery, the permitted bycatch of non-commercially valuable species that are discarded is limited to 49% of total harvest weight.

STELLER'S SEA LION

Factor 2.1 - Abundance

EAST KAMCHATKA PENINSULA, MIDWATER TRAWLS, RUSSIA
KURIL ISLANDS, MIDWATER TRAWLS, RUSSIA
BERING SEA, MIDWATER TRAWLS, RUSSIA, WEST BERING SEA, EAST OF 174OE
BERING SEA, MIDWATER TRAWLS, RUSSIA, WEST BERING SEA, WEST OF 174OE
SEA OF JAPAN, MIDWATER TRAWLS, RUSSIA
EAST SAKHALIN / SEA OF OKHOTSK, MIDWATER TRAWLS, RUSSIA

High Concern

Steller sea lions have been listed in the Russian Federal Red Book in 1994 since 1994. Because they continue to merit protected status, this score is rated "high" concern.

Justification:

Steller sea lion habitat stretches from Northern Japan up around the Pacific Rim and back down the other side to California. Rookeries in Russia are located in Northern Kamchatka, Southern Kamchatka, Northern Okhotsk, the Kuril Islands, and the Commander Islands. Of the roughly 16,000 sea lions in Russia, approximately half reproduce on the Kuril Islands, the largest population within the umbrella Asian stock. The second-largest population is located on the Yamskie Islands in the northern SOO (Intertek Moody Marine 2013).

According to the most recent assessments, Steller sea lion populations in the Russian Far East still merit protected status (and thus receive a “high" concern rating here), but have exhibited recovery from the historic lows reached in the 1990s. For example, the Kuril Islands population dropped from a peak of 20,000 individuals in the 1960s to a low of 6,000 in the 1990s, and currently stands at approximately 8,000 (Intertek Moody Marine 2013). Surveys of the larger populations take place frequently. Comparing results of 2011 and 2013 surveys, the Eastern Sakhalin sea lion population has exhibited modest growth, while the northern Okhotsk population is either stable or has declined slightly (Burkanov et al. 2014).

Factor 2.2 - Fishing Mortality

EAST KAMCHATKA PENINSULA, MIDWATER TRAWLS, RUSSIA
KURIL ISLANDS, MIDWATER TRAWLS, RUSSIA
BERING SEA, MIDWATER TRAWLS, RUSSIA, WEST BERING SEA, EAST OF 174OE
BERING SEA, MIDWATER TRAWLS, RUSSIA, WEST BERING SEA, WEST OF 174OE
SEA OF JAPAN, MIDWATER TRAWLS, RUSSIA
EAST SAKHALIN / SEA OF OKHOTSK, MIDWATER TRAWLS, RUSSIA

Low Concern

There have been very few documented cases of direct interactions between the pollock fishery and Steller sea lions (SSLs). However, there is anecdotal evidence that the trawl fishery does interact with SSLs, suggesting that observer coverage might be too low to adequately reflect the situation on the water (see description below). To follow up on the anecdotal evidence, marine mammal bycatch surveys were conducted in the Okhotsk component of the fishery in 2015, and observers working in 2016 used a new protocol for marine mammal observations derived from the surveys in the prior year. These two years of work only yielded one known case of SSL bycatch by a mid-water trawl fishing for Pacific herring in the northern Sea of Okhotsk. Because the two years of work focused on marine mammal interactions suggest there is no substantial bycatch, this subfactor is rated "low" concern.

Justification:

A 2014 report exploring the possible role of groundfish trawl bycatch mortality in the 1980s-era decline of SSL in the West Bering Sea included results from interviews with 108 fishermen regarding bycatch rates on their boats in the 1980s. The interviews indicated a wide range of bycatch rates in that decade: 6% of hauls exhibited a high SSL bycatch rate (an average of 10 SSLs per haul) and the other 94% a low SSL bycatch rate (1 SSL per 613 trawls). Overall, the interviews reflect an average bycatch rate at that time of 0.62 SSLs per haul that varied considerably among different geographies (the highest bycatch rates occurred in the nearshore—<50 km—portion of the WBS west of 174º E during fall and winter, with minimal rates in the offshore portion of the WBS east of 174º E fishery) (Fomin et al. 2014b).

SSL numbers declined precipitously between the 1980s and early 2000s, and therefore lower bycatch rates would be expected in the 2000s. 2002 observer data from another WBS trawl fishery, the herring fishery, indeed indicated an SSL bycatch rate of 0.0113 SSLs per haul (Fomin et al. 2014b). Meanwhile, in recent years, fisher logbooks in the pollock fishery indicate that there are no interactions between gear and SSLs. Unfortunately, the observer coverage in the fishery is too low to adequately corroborate the logbooks, and, furthermore, there is recent anecdotal evidence of SSL bycatch: a 2015 study conducted in response to outstanding conditions of the MSC SOO fishery certification included one fisher's revelation that he recently caught 20 sea lions in a single trawl. However, the on-the-water component of the study, which consisted of three observers deployed on vessels in the northern SOO in the winter 2015 fishing season, did not note any bycatch of sea lions, and fishery interactions with sea lions were limited to two instances of sea lions approaching boats to feed (Burkanov et al. 2015). MSC assessors considered this research "extensive," but also noted that "data documented are sparse, seasonally and geographically constrained, and cover a very small percentage of the total hauls" (Acoura Marine Ltd. 2016).

Due to limited observer coverage in the Russian fishery, we also have considered the bycatch of SSLs in the Alaska Bering Sea/Aleutian Island fishery as a proxy. Although the two fisheries may have different bycatch rates, the data-rich Alaska fishery provides some evidence of the level of interaction between midwater trawls and SSLs, as similar gear types are used in both fisheries. In Alaska, the bycatch of SSLs amounts to less than 10% of the PBR (Potential Biological Removal) for the affected stock, the western stock of SSLs, and the overall PBR is not exceeded (NOAA 2016b). This would result in a score of "low" concern for fishing mortality for this species. Although this does not guarantee that bycatch in the Russian pollock fishery is similarly low, it supports the two years of observer studies from the Russian fishery and is further supported by stakeholder input and understanding of the interactions between SSLs and the gear during fishing.

Stakeholders who reviewed this report indicated that Steller sea lions do interact with pollock trawls, but that capture in nets is unlikely. SSLs swim in search of food around boats, as wastes (heads, entrails) of primary processing are thrown overboard. However, the occurrence of SSLs in the trawl is unlikely when immersed, as it drops down to its fishing depth with great speed. Bycatch can only occur in the trawl cod end when the nets are being raised, resulting in minimal time trapped in the net and the good possibility of return to the water alive.

Although bycatch events for SSLs in this fishery are evidently rare, there are concerns with the effect on SSLs due to food web effects. This concern is addressed separately under Criterion 4.3.

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

EAST KAMCHATKA PENINSULA, MIDWATER TRAWLS, RUSSIA
KURIL ISLANDS, MIDWATER TRAWLS, RUSSIA
BERING SEA, MIDWATER TRAWLS, RUSSIA, WEST BERING SEA, EAST OF 174OE
BERING SEA, MIDWATER TRAWLS, RUSSIA, WEST BERING SEA, WEST OF 174OE
SEA OF JAPAN, MIDWATER TRAWLS, RUSSIA
EAST SAKHALIN / SEA OF OKHOTSK, MIDWATER TRAWLS, RUSSIA

< 100%

In this fishery, the permitted bycatch of non-commercially valuable species that are discarded is limited to 49% of total harvest weight.

ATKA MACKEREL

Factor 2.1 - Abundance

EAST KAMCHATKA PENINSULA, DANISH SEINES, RUSSIA

Moderate Concern

Trawl surveys for the purpose of assessing the East Kamchatka Atka mackerel stock were conducted from 2012 to 2013, but were subsequently declared to not have overlapped with the most important mackerel stocks, and therefore were not used for the purpose of forecasting and setting catch limits. In the absence of a stock assessment, the species is rated "moderate" concern on the basis of a Productivity Susceptibility Analysis (see below).

Justification:

Productivity-Susceptibility Analysis (Sealife Base 2017)

Scoring Guidelines

1.) Productivity score (P) = average of the productivity attribute scores (p1, p2, p3, p4 (finfish only), p5 (finfish only), p6, p7, and p8 (invertebrates only))

2.) Susceptibility score (S) = product of the susceptibility attribute scores (s1, s2, s3, s4), rescaled as follows: $S = [(s1 * s2 * s3 * s4) - 1/ 40] + 1$.

3.) Vulnerability score (V) = the Euclidean distance of P and S using the following formula: $V = \surd(P^2 + S)$

Productivity-Susceptibility Analysis for Atka Mackerel:

PRODUCTIVITY ATTRIBUTE	RELEVANT INFORMATION	SCORE (1 = LOW RISK, 2 = MEDIUM RISK, 3 = HIGH RISK)
Avg age at maturity	4 years	1
Avg max age	12 years	2
Avg max size	62 cm	1
Avg size at maturity (Lm)	28 cm	1
Fecundity	42,000 eggs / year	1
Reproductive strategy	broadcast spawner	1
Trophic level	3.6	3
SUSCEPTIBILITY ATTRIBUTE	RELEVANT INFORMATION	SCORE (1 = LOW RISK 2 = MEDIUM RISK, 3 = HIGH RISK)
Aerial overlap (considers all fisheries)	Unknown	3
Vertical overlap (considers all fisheries)	Unknown	3
Selectivity of fishery (specific to fishery under assessment)	Unknown	2
Post-capture mortality (specific to fishery under assessment)	Unknown	3
PSA SCORE:		**2.73, Medium risk**

Factor 2.2 - Fishing Mortality

EAST KAMCHATKA PENINSULA, DANISH SEINES, RUSSIA

Moderate Concern

Publicly available information indicating fishing mortality for this species was not found, resulting in a rating of "moderate" concern.

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

EAST KAMCHATKA PENINSULA, DANISH SEINES, RUSSIA

< 100%

In this fishery, the permitted bycatch of non-commercially valuable species that are discarded is limited to 49% of total harvest weight.

OTHER FLATFISH COMPLEX

Factor 2.1 - Abundance

EAST KAMCHATKA PENINSULA, DANISH SEINES, RUSSIA

Moderate Concern

Flatfish species harvested commercially off of Kamchatka's coast include yellowfin sole (*Limanda aspera*), Alaska plaice (*Pleuronectes quadrituberculatus)*, Northern rock sole (*Lipidopsetta polyxystra*), Bering flounder (*Hippglossoides robustus*), starry flounder (*Platichthys stellatus)*, longhead dab (*Myzopsetta proboscidea*), Pacific halibut (*Hippoglossus stenolepis*), and Sakhalin sole (*Limanda sakhalinensis*). In East Kamchatka, northern rock sole is the main commercial species. SSB at F_{MSY} for flatfish in East Kamchatka = 47,040 t, and B_{LIM} = 24,910 t. In 2014, TINRO estimated that SSB would be at 37,390 t at the beginning of 2015, i.e., in between SSB at F_{MSY} and B_{LIM} (TINRO 2014). A score of "moderate" concern reflects that the biomass is within 75% of the target reference point.

WEST KAMCHATKA PENINSULA / SEA OF OKHOTSK, DANISH SEINES, RUSSIA

Moderate Concern

In West Kamchatka, Alaska plaice, yellowfin sole, and Pacific halibut are the three main commercial species. Reference points for biomass don't appear to be in place, although stock assessments are conducted. Abundance has varied from year to year in 2005 to 2015. In the absence of reference points, the score of "moderate" concern is generated using a Productivity Susceptibility Analysis (see below).

Justification:

Productivity-Susceptibility Analysis (Sealife Base 2017):

Scoring Guidelines

1.) Productivity score (P) = average of the productivity attribute scores (p1, p2, p3, p4 (finfish only), p5 (finfish only), p6, p7, and p8 (invertebrates only))

2.) Susceptibility score (S) = product of the susceptibility attribute scores (s1, s2, s3, s4), rescaled as follows: $S = [(s1 * s2 * s3 * s4) - 1/ 40] + 1$.

3.) Vulnerability score (V) = the Euclidean distance of P and S using the following formula: $V = \sqrt{(P^2 + S)}$

Productivity-Susceptibility Analysis for Alaska plaice, yellowfin sole, and Pacific halibut:

PRODUCTIVITY ATTRIBUTE	ALASKA PLAICE	YELLOWFIN SOLE	PACIFIC HALIBUT	SCORE (1 = LOW RISK, 2 = MEDIUM RISK, 3 = HIGH RISK)
Avg age at maturity	10 years	9.8 years	9 years	2
Avg max age	37 years	35 years	55 years	3
Avg max size	87 cm	58 cm	258 cm	1.33
Avg size at maturity (Lm)	31.9 cm	34.7 cm	100 cm	1.33
Fecundity	185,000 eggs	2,300,000 eggs	2,000,000 eggs	1
Reproductive strategy	broadcast spawner	broadcast spawner	broadcast spawner	1
Trophic level	3.6	3.81	4.1	3
SUSCEPTIBILITY ATTRIBUTE	ALASKA PLAICE	YELLOWFIN SOLE	PACIFIC HALIBUT	Score (1 = low risk, 2 = medium risk, 3 = high risk)
Aerial overlap (considers all fisheries)	Unknown	Unknown	Unknown	3
Vertical overlap (considers all fisheries)	Unknown	Unknown	Unknown	3
Selectivity of fishery (specific to fishery under assessment)	Unknown	Unknown	Unknown	2
Post-capture mortality (specific to fishery under assessment)	Unknown	Unknown	Unknown	3
PSA Score:				**2.95, medium concern**

Factor 2.2 - Fishing Mortality

EAST KAMCHATKA PENINSULA, DANISH SEINES, RUSSIA

Moderate Concern

In East Kamchatka, for flatfish, F_{MSY} = 0.259 and F_{LIM} = 0.311. In 2014, F = 0.266, i.e., fluctuating around F_{MSY} (TINRO 2014). A score of "moderate" concern reflects this.

WEST KAMCHATKA PENINSULA / SEA OF OKHOTSK, DANISH SEINES, RUSSIA

Moderate Concern

Publicly available information indicating fishing mortality for the West Kamchatka population of this species was not found, resulting in a rating of "moderate" concern.

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

EAST KAMCHATKA PENINSULA, DANISH SEINES, RUSSIA
WEST KAMCHATKA PENINSULA / SEA OF OKHOTSK, DANISH SEINES, RUSSIA

< 100%

In this fishery, the permitted bycatch of non-commercially valuable species that are discarded is limited to 49% of total harvest weight.

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

Fishery	Management Strategy	Bycatch Strategy	Research and Monitoring	Enforcement	Stakeholder Inclusion	Score
Fishery 1: East Kamchatka Peninsula | Danish seines | Russia	Moderately Effective	Moderately Effective	Moderately Effective	Moderately Effective	Moderately Effective	Yellow (3.00)
Fishery 2: East Kamchatka Peninsula | Midwater trawls | Russia	Moderately Effective	Moderately Effective	Moderately Effective	Ineffective	Moderately Effective	Red (2.00)
Fishery 3: Kuril Islands | Midwater trawls | Russia	Moderately Effective	Moderately Effective	Moderately Effective	Ineffective	Moderately Effective	Red (2.00)
Fishery 4: Bering Sea | Midwater trawls | Russia | West Bering Sea, East of 174oE	Moderately Effective	Moderately Effective	Moderately Effective	Ineffective	Moderately Effective	Red (2.00)

Fishery 5: Bering Sea | Midwater trawls | Russia | West Bering Sea, West of 174oE	Ineffective	Moderately Effective	NA	NA	NA	Red (1.00)
Fishery 6: Sea of Japan | Midwater trawls | Russia	Moderately Effective	Moderately Effective	Moderately Effective	Ineffective	Moderately Effective	Red (2.00)
Fishery 7: East Sakhalin / Sea of Okhotsk | Midwater trawls | Russia	Moderately Effective	Moderately Effective	Moderately Effective	Ineffective	Moderately Effective	Red (2.00)
Fishery 8: West Kamchatka Peninsula / Sea of Okhotsk | Danish seines | Russia	Moderately Effective	Moderately Effective	Moderately Effective	Moderately Effective	Moderately Effective	Yellow (3.00)

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 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.

EAST KAMCHATKA PENINSULA, DANISH SEINES, RUSSIA
EAST KAMCHATKA PENINSULA, MIDWATER TRAWLS, RUSSIA
KURIL ISLANDS, MIDWATER TRAWLS, RUSSIA
BERING SEA, MIDWATER TRAWLS, RUSSIA, WEST BERING SEA, EAST OF 174OE
SEA OF JAPAN, MIDWATER TRAWLS, RUSSIA
EAST SAKHALIN / SEA OF OKHOTSK, MIDWATER TRAWLS, RUSSIA
WEST KAMCHATKA PENINSULA / SEA OF OKHOTSK, DANISH SEINES, RUSSIA

Moderately Effective

The management approach in the Russian pollock fishery is a mix of a generally strong management framework (described below) accompanied by some persistent gaps: the absence of effective regulations regarding the issue of juvenile discards, and the absence of a stock recovery planning process triggered when stocks show signs of being depleted. This mix of positive and negative elements results in a “moderately effective” score for the seven fishery units that target healthy stocks.

Justification:

The primary tool for management of the Russian Far East pollock fishery (trawl and Danish seine components) is Total Allowable Catch limits set annually for each subzone by the Federal Fishery Agency upon the basis of recommendations made by TINRO Center (the Pacific Fisheries Center, Vladivostok), which in turn take into account scientific assessments coordinated by Rosrybolovstvo Moscow and conducted by TINRO’s regional branches in Sakhalin, Kamchatka, and Magadan. This thorough, cyclical process takes almost two years to accomplish and entails consultation with industry and other interested stakeholders. The current stability of the Navarinsk and SOO stocks can be seen as evidence of success of measures in place.

In addition to having a strong yet adaptable TAC-setting process, further evidence of Russia's precautionary approach to management of this fishery includes a strong body of national legislation that governs the fishery, long-term monitoring of environmental conditions, Russia's ratification of and adherence to the Convention on the Conservation and Management of Pollock Resources in the Central Bering Sea, and long-term study of the linkages between ecosystem conditions and pollock productivity advanced through Russia's membership in the North Pacific Marine Science Organization (PICES) (Intertek Moody Marine 2013).

A "stop-move on" rule for bycatch of undersized juveniles is in effect for the pollock trawl fleet. Retention of undersized pollock is limited to a maximum of 20% of total harvest in weight. When this threshold is exceeded, the vessel must immediately move at least five miles from its previous position and report the situation to the Federal Fisheries Agency. Discarding rather than retention of undersized pollock (up to the 20% threshold) has been identified as an issue in this fishery, as this allows fishers to maximize the weight and value of their catch, albeit at the expense of those juvenile pollock that do not survive the discarding (Ganapathiraju 2014). Unauthorized discards were reportedly quite sizeable in the late 1990s and early 2000s (note that the concept of "discards" has not to date been introduced into Russian legislation). According to one author, during the winter WBS fishery of 2001 to 2005, discards actually rivaled the reported catch, suggesting that discards may have played a key role in the decline of the stock west of 174º E (Badaev 2011). Actual harvests have consistently exceeded TACs by 8 to 20% throughout the 2000s according to Melnikov et al. (2011), although the amount of excess has become more moderate over that time period. Granting observers enforcement status in Russian fishery legislation and requiring that harvests be weighed on board with independent verification are two regulatory measures that could be put into practice to limit the problem.

In 2017, subzone-specific adjustments to the undersized retention limit went into effect: the limit was raised to 40% for the West Bering Sea east of 174º E and lowered to 8% for the West Sakhalin subzone. According to stakeholders, these measures are temporary and put into effect on the basis of surveys indicating strong juvenile populations in one area (WBS east of 174º E) and weak in another (West Sakhalin) (FAR 2017). The change to the highly productive WBS east of 174º E fishery renders the likelihood of exceeding TACs due to juvenile discards more unlikely, but doubling the limit in the productive portion of the WBS when juvenile discards may have contributed to the decline of the adjacent fishery west of 174º E is a questionable decision.

Besides the gap in regulations with respect to the issue of juvenile discards, another inadequacy of the Russian management system is that there are no required mechanisms in place for the recovery of depleted stocks (i.e., stock-specific recovery plans are not developed when a stock is depleted). These problems, tempered by the strong elements of the management approach described above, result in a rating of "moderately effective" for the seven fishery units that target healthy stocks.

BERING SEA, MIDWATER TRAWLS, RUSSIA, WEST BERING SEA, WEST OF 174OE

Ineffective

This fishery unit targets the depleted West Bering Sea stock. The continued targeting of this stock in the Karaginsk subzone despite declines below limit reference points call into question management effectiveness in the West Bering west of 174º E fishery unit (and hence, it receives a rating of "ineffective"). There is no recovery plan in place for the stock—the main approach for stock recovery in the Russian management system has traditionally been conservative, annual setting of TACs. However, since 2017, the Federal Agency for Fisheries and VNIRO do require that, regarding stocks for which TACs are established, the TAC documentation must include "Rules for Regulating Fisheries," which consists of a long-term management strategy that includes standard statistical parameters and mathematical modeling (FAR 2017). This new practice is meant to encourage adjustments to TACs depending on abundance and fishing mortality status. Improvements in the amount of detail included in the annual TAC/forecast document due to the new practice are also visible in the 2017 document (TINRO 2017).

Regarding TAC-setting, conservative TACs have been set for the Sea of Japan and East Sakhalin fisheries for several years now, but there is a more recent history of lack of precaution in management of the WBS fishery, where the depleted west of 174º E stock was lumped together with the east of 174º E stock into a single stock assessment, masking the problems of the western stock and allowing for higher-than-prudent fishing pressure. A recent decision to formally divide WBS populations east and west of 174º E into separate stocks with distinct stock assessments and TACs represents a step in the right direction according to state scientists, and could result in the West Bering stock no longer facing unsustainable fishing pressure (FishNews 2012) (SFP 2016b). In October 2015, a section of the Fishing Rules was also amended to entirely close the pollock fishery in the West Bering zone west of 174º E (see Figure 1, zone "01"), another action focused upon recovery. However, commercial fishing is still allowed in the Karaginsk subzone (FAR 2016).

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.

EAST KAMCHATKA PENINSULA, DANISH SEINES, RUSSIA
EAST KAMCHATKA PENINSULA, MIDWATER TRAWLS, RUSSIA
KURIL ISLANDS, MIDWATER TRAWLS, RUSSIA
BERING SEA, MIDWATER TRAWLS, RUSSIA, WEST BERING SEA, EAST OF 174OE
BERING SEA, MIDWATER TRAWLS, RUSSIA, WEST BERING SEA, WEST OF 174OE
SEA OF JAPAN, MIDWATER TRAWLS, RUSSIA
EAST SAKHALIN / SEA OF OKHOTSK, MIDWATER TRAWLS, RUSSIA
WEST KAMCHATKA PENINSULA / SEA OF OKHOTSK, DANISH SEINES, RUSSIA

Moderately Effective

There are fishery closures, "stop-move on" rules, and an observer program in the Sea of Okhotsk component of the fishery in effect to limit bycatch and evaluate success. The regulations are in line with best practices, but the observer program is limited to the Okhotsk, of limited coverage, and therefore likely inadequate.

Justification:

There are 57 permanent and seasonal fishery closures in effect for the various Russia Far East commercial fisheries, including nine closures relevant to the pollock fishery, to protect valuable biotopes including marine mammals' rockeries and the forage grounds around them. An additional 44 seasonal fishery closures across the various fisheries are intended to protect spawning and early development of commercial species, including pollock.

In addition to the "stop-move on" rule for retention of undersized pollock, there are also thresholds in place for bycatch species. Retention of non-pollock species that are TAC-managed (e.g. commercially valuable species) and Pacific salmon is limited to 2% of the harvest in weight (excluding marine mammals, crabs, and shrimp, of which retention is prohibited), and the permitted bycatch of non-commercially valuable species that are discarded is limited to 49% of total harvest weight. When the 2% and 49% thresholds are exceeded, all bycatch in excess of the threshold has to be immediately returned to its natural habitat with minimal associated mortality. Relevant entries must also be made in the fishing log. Furthermore, as with the undersized pollock retention threshold, when the 2% or 49% threshold is exceeded, the vessel must immediately move at least five miles from its previous position and report the situation to the Federal Fisheries Agency.

There is a scientific test fishery and a longstanding (dating back to the 1960s) scientific observer program in the trawl fishery, but it is concerned primarily with collecting data to justify TACs rather than tracking implementation of the bycatch regulations. The Danish Seine fishery is sampled and monitored at similar rates as the trawl fishery. The trawl fishery observer program to date has not been demonstrated to provide adequate spatial and temporal coverage of the fishery to inspire full confidence in its findings. In the SOO trawl fishery from 2006 to 2010, 12 deployed observers provided 4% observer coverage of large vessels' hauls and 1% coverage of mid-size vessels' hauls. Similar statistics were not available for the WBS, but since only three observers were working in the fishery at that time, one can assume that coverage rates were correspondingly lower. Information on observer coverage in the SOJ and Kurils was not available. Through the MSC certification of the SOO trawl component, the fishery has implemented a separate observer program for bycatch and has put into place protocols for observation of marine mammal and seabird bycatch. Surveys were also commissioned in 2015 to address stakeholder concerns about possible bycatch of Steller sea lions, short-tailed albatross, and juvenile pollock (Acoura Marine Ltd. 2016).

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.

EAST KAMCHATKA PENINSULA, DANISH SEINES, RUSSIA
EAST KAMCHATKA PENINSULA, MIDWATER TRAWLS, RUSSIA
KURIL ISLANDS, MIDWATER TRAWLS, RUSSIA
BERING SEA, MIDWATER TRAWLS, RUSSIA, WEST BERING SEA, EAST OF 174OE
SEA OF JAPAN, MIDWATER TRAWLS, RUSSIA
EAST SAKHALIN / SEA OF OKHOTSK, MIDWATER TRAWLS, RUSSIA
WEST KAMCHATKA PENINSULA / SEA OF OKHOTSK, DANISH SEINES, RUSSIA

Moderately Effective

There is an adequate stock assessment system in place for the target species, but gaps in bycatch monitoring result in the rating of "moderately effective."

Justification:

A number of survey programs are used to generate stock abundance indices for assessments and monitor stock status. These consist of: 1) Winter/Spring ichthyoplankton / trawl spawning biomass survey, 2) Winter/Spring acoustic surveys (mid-water and bottom trawls), and 3) Fall ecosystem ichthyoplankton / trawl spawning biomass survey.

The winter/spring surveys predominantly generate the data to be used in fall stock assessment meetings that kick off the process of generating the fishery TACs. During the surveys, approximately 8,500 biological samples are collected per subzone. Estimates of female maturity, fecundity at length, and absolute pollock biomass result from these surveys. In recent years, trawl surveys with mid-water trawls in different areas have been conducted at intervals of 1 to 4 years. Bottom trawl surveys estimating pollock abundance at depths of 20 to 400 m are conducted with the same periodicity.

The fall survey uses the same protocol and study design as that of the winter/spring survey, and is used to corroborate the findings of the winter/spring survey. Meanwhile, the acoustic survey is generally not used to generate information for the stock assessment, but provides an alternative means of assessing biomass (Intertek Moody Marine 2013).

Although the three surveys provide researchers with the information that they need to set sustainable TACs, incomplete information regarding bycatch does not allow managers to make fully-informed decisions. There are currently no effective programs for studying bycatch and accounting for its catch volumes implemented by Rosrybolovstvo or the regional fishery research institutes. Previous programs operated out of KamchatNIRO and TINRO, but were subsequently discontinued. At present, Rosrybolovstvo assumes that fishermen themselves report information on the volumes of bycatch of TAC-managed species. However, fishermen generally report the catches only if they can sell the fish, and try to evade reporting catch of ETP species.

Local stakeholders are aiming to use certification as a lever for encouraging bycatch monitoring programs that can fill the bycatch information gap. In the MSC-certified SOO trawl fishery (including East Sakhalin), a tandem effort of World Wildlife Fund, Pollock Catcher's Association, and TINRO is deploying observers focused particularly on documenting marine mammal and seabird bycatch.

With respect to the WBS west of 174º E, East Kamchatka, and North Kuril trawl fisheries, stock identification methods need to be applied to determine whether or not Chinook salmon harvested as bycatch are from depleted populations.

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.

EAST KAMCHATKA PENINSULA, DANISH SEINES, RUSSIA
WEST KAMCHATKA PENINSULA / SEA OF OKHOTSK, DANISH SEINES, RUSSIA

Moderately Effective

The Danish seine units are rated "moderate" concern for enforcement because concerns raised about juvenile discards have focused on the trawl fishery, and no cases of unpunished poaching in the Danish seine fishery were brought to our attention by stakeholders. The score of "moderate" concern balances the known persistence of illegal seafood in Russia's supply chains with recent regulatory improvements and bilateral IUU treaties.

EAST KAMCHATKA PENINSULA, MIDWATER TRAWLS, RUSSIA
KURIL ISLANDS, MIDWATER TRAWLS, RUSSIA
BERING SEA, MIDWATER TRAWLS, RUSSIA, WEST BERING SEA, EAST OF 174OE
SEA OF JAPAN, MIDWATER TRAWLS, RUSSIA
EAST SAKHALIN / SEA OF OKHOTSK, MIDWATER TRAWLS, RUSSIA

Ineffective

Russian fisheries including the pollock fishery traditionally have a problem with illegal fishing, but in recent years have taken some meaningful steps toward improvement including domestic regulatory measures and bilateral agreements with trade partners. Nonetheless, illegal Russian seafood (crab) continues to make its way into supply chains, raising the question of whether or not illegal fishing in the pollock fishery has been effectively halted or not. Particularly, stakeholders indicate that the problem of juvenile discards in trawl fisheries that exceed undersized pollock discard limits and result in fishery units actually exceeding their TACs (although not on paper), may persist. Furthermore, there is a recent, documented case of poaching (a Russian trawler fishing in American waters) going unpunished. A rating of "ineffective" is therefore attributed to the trawl fishery units.

Justification:

Operational regulations for the Russian pollock fishery, including rules defining catch limits, seasons, gears, and open/closed areas, are contained in the Federal Fisheries Agency's "Fishing Rules for the Far Eastern Fishing Basin." In accordance with this document, boats in the pollock fleet are required to submit daily vessel reports to maintain a serviceable and operating vessel monitoring system (VMS), and to follow rules on bycatch, prohibited areas, seasons, target species, fishing gears, and minimum size of retained fish.

Enforcement inspectors from the Border Control Department (FSB) operate at sea and have a primary mandate of enforcing the Fishing Rules and prevent illegal fishing. The enforcement inspectors are a separate body from the scientific observers described above, and generally have better temporal and spatial coverage of the fleet (e.g. 14.3% of hauls in 2010) than the scientific observers. They have authority to stop and board pollock vessels to ensure that fishing regulations are being adhered to. Common violations include quota-overfishing, fishing in prohibited areas, exceeding pollock roe output limits, and failures to use logbooks. Perpetrators are to be fined and excess or illegal product is to be confiscated. The MSC certifier of the SOO trawl fishery deemed the fishery to be "at acceptable levels of control and compliance" during the fall 2015 performance audit, and the relevant certification condition was closed at that time (Intertek Moody Marine 2013) (Acoura Marine Ltd. 2015).

Despite these positive signs, critiques of enforcement in the Russian pollock fishery have been made by NGO and academic stakeholders. Stakeholder submissions in the MSC certification process for the SOO trawl fishery consistently bring up the issue of juvenile discards and suggest that this problem, which likely played a key role in the decline of the WBS west of 174º E stock, persists. Observers and inspectors do not publish information quantifying the current scale of the problem, reporting only the extent of their coverage. In absence of this information (which is called for in the case of the SOO trawl fishery under MSC certification outstanding conditions and presumed to be forthcoming), one can only rely on the most recently available information on this problem, which indicates that it persists, although not at the same scale as in the 1990s and early 2000s (Melnikov et al. 2011). In 2017, subzone-specific adjustments to the undersized retention limit went into effect: the limit was raised to 40% for the West Bering Sea east of 174º E and lowered to 8% for the West Sakhalin subzone. According to stakeholders, these measures are temporary and put into effect on the basis of surveys indicating strong juvenile populations in one area (WBS east of 174º E) and weak in another (West Sakhalin) (FAR 2017). The change to the highly productive WBS east of 174º E fishery renders the likelihood of exceeding TACs due to juvenile discards more unlikely, but doubling the limit in the productive portion of the WBS when juvenile discards may have contributed to the decline of the adjacent fishery west of 174º E is a questionable decision.

With respect to IUU fishing, it was also noted in the U.S. National Oceanic and Atmospheric Administration's biennial report to Congress that a Russian trawler, the Admiral Kolchak, was detected fishing without authorization 0.5 nautical miles within the U.S. EEZ by a U.S. Coast Guard helicopter. According to the report, "in accordance with international law, the United States sent the notice to the Russian Ministry of Justice for service of process on the vessel owner. The Russian Ministry of Justice returned the charging document unserved, without explanation. To the best of our knowledge, the Russian Federation has not undertaken an investigation or taken any domestic enforcement action against the owner of the Admiral Kolchak" (NOAA 2017). It is unclear whether the failure to punish the Admiral Kolchak is reflective of a systemic problem with enforcement or rather due to the complicated geopolitics of the US–Russia relationship (early 2014 events in Crimea, complicated negotiation of the bilateral US–Russia IUU fishing agreement with particular respect to how illegal transboundary fishing would be handled).

Despite the persistent presence of concerns, it is noted that the fishery has made regulatory improvements over the past several years. Trade of illegal harvest by the trawl fleet abroad via transshipments at sea was a problem until 2009, when transshipment was banned by the Russian government and product henceforth needed to be landed at a Russian port before export. Furthermore, subsequent bilateral agreements with China, Japan, Korea, and the U.S. (as mentioned above) aimed at curbing trade in illegal fish built upon the transshipment ban, as did the 2013 Russian National Plan of Actions to Prevent, Deter, and Eliminate IUU Fishing. Despite these improvements, unaccounted-for crab of Russian origin continues to enter the Japanese market, suggesting that illegal harvest of other species might also be ongoing, accomplished through illegal transshipment and/or misrepresenting the amounts of seafood landed at Russian ports (this can be done through inaccurate reporting of raw-to-processed fish conversion coefficients) (Ganapathiraju 2014) (WWF 2014).

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.

EAST KAMCHATKA PENINSULA, DANISH SEINES, RUSSIA
EAST KAMCHATKA PENINSULA, MIDWATER TRAWLS, RUSSIA
KURIL ISLANDS, MIDWATER TRAWLS, RUSSIA
BERING SEA, MIDWATER TRAWLS, RUSSIA, WEST BERING SEA, EAST OF 174OE
SEA OF JAPAN, MIDWATER TRAWLS, RUSSIA
EAST SAKHALIN / SEA OF OKHOTSK, MIDWATER TRAWLS, RUSSIA
WEST KAMCHATKA PENINSULA / SEA OF OKHOTSK, DANISH SEINES, RUSSIA

Moderately Effective

The Russian fishery management process provides opportunities for stakeholder engagement at multiple steps in the TAC-setting process. However, transparency is traditionally a weak point of fisheries management in Russia, and stock assessments are generally not published electronically. The rating of "moderately effective" reflects the solid capacity of the management system to consult with stakeholders, balanced by the weak record of data transparency.

Justification:

There have been some promising steps taken toward improved transparency in the pollock fishery in the last few years, including creation of a Pollock Catcher's Association (PCA) website (http://russianpollock.com/) that includes sections where fishery data is to be housed, and ongoing discussions with PCA regarding publication of stock assessments with a one-year lag on the PCA website. These discussions are taking place within the context of the SOO MSC certification and an ongoing Fishery Improvement Project focused on the Bering Sea fishery. Yet, many of the data sections of the website remain unpopulated. Furthermore, according to local stakeholders, information made available in advance of the 2016 public hearings regarding Far East commercial fishery TACs was more limited than in previous years, indicating that data availability may be growing more limited rather than improving.

Although not factored into scoring, recent moves among companies with government ties to further consolidate the pollock industry is another cause for concern with respect to transparency of management. Blurred lines between government and business in this fishery have historical precedence in that fishery science institutions engaged in management of the fishery have traditionally been funded partly through sale of fish harvested for research and management purposes (this is no longer the case at present). The industry is fairly consolidated in its present structure, with six companies currently accounting for 58% of the fishery's quota. Owners of these companies include former and current Oblast governors and senators. Reports that one of these companies, Gidrostroy, will finalize a deal in early 2017 to purchase the quota of another of the six companies, Preobrazhenskaya Base of Trawling Fleet, indicate that further consolidation may be imminent (Undercurrent News 2016).

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

Region / Method	Gear Type and Substrate	Mitigation of Gear Impacts	EBFM	Score
Bering Sea / Midwater trawls / Russia / West Bering Sea, East of 174oE	2	0	High Concern	Red (2.00)
Bering Sea / Midwater trawls / Russia / West Bering Sea, West of 174oE	2	0	High Concern	Red (2.00)
East Kamchatka Peninsula / Midwater trawls / Russia	2	0	High Concern	Red (2.00)
East Kamchatka Peninsula / Danish seines / Russia	2	0	High Concern	Red (2.00)
East Sakhalin / Sea of Okhotsk / Midwater trawls / Russia	2	0	High Concern	Red (2.00)
Kuril Islands / Midwater trawls / Russia	2	0	High Concern	Red (2.00)
Sea of Japan / Midwater trawls / Russia	2	0	High Concern	Red (2.00)

West Kamchatka Peninsula / Sea of Okhotsk / Danish seines / Russia	2	0	High Concern	Red (2.00)

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

EAST KAMCHATKA PENINSULA, DANISH SEINES, RUSSIA
WEST KAMCHATKA PENINSULA / SEA OF OKHOTSK, DANISH SEINES, RUSSIA

2

Danish seines used off the shores of Kamchatka in the pollock fishery are rated "2" per the Seafood Watch method, i.e., bottom seines that are being fished on varied habitat.

EAST KAMCHATKA PENINSULA, MIDWATER TRAWLS, RUSSIA
KURIL ISLANDS, MIDWATER TRAWLS, RUSSIA
BERING SEA, MIDWATER TRAWLS, RUSSIA, WEST BERING SEA, EAST OF 174OE
BERING SEA, MIDWATER TRAWLS, RUSSIA, WEST BERING SEA, WEST OF 174OE
SEA OF JAPAN, MIDWATER TRAWLS, RUSSIA
EAST SAKHALIN / SEA OF OKHOTSK, MIDWATER TRAWLS, RUSSIA

2

The trawl fishery uses mid-water nets that are presumed to come into contact with the bottom on the basis of studies of the mid-water trawl pollock fishery in Alaska, through which it has been estimated that pelagic trawls in Alaska fisheries contact the seafloor across some substrates for 44% of the duration of a tow (NMFS 2010). Comparable studies have not been conducted in Russia, but the Alaskan fishery takes place in environments with similar seabed floor habitats as those of the Russian fishery; therefore, a similar rate of bottom contact is presumed. In its submission to MSC during the certification process for the Sea of Okhotsk fishery, the Pollock Catcher's Association indicated that the fishery occurs beyond the continental shelf where water is 200 to 500 m deep, and therefore does not impact the seafloor (PCA 2010). However, at these depths the trawl footrope will come into contact with the seafloor habitat regardless, and can damage animals anchored on or in the sediment (NMFS 2010).

Factor 4.2 - Modifying Factor: Mitigation of Gear Impacts

EAST KAMCHATKA PENINSULA, DANISH SEINES, RUSSIA
WEST KAMCHATKA PENINSULA / SEA OF OKHOTSK, DANISH SEINES, RUSSIA

0

Shirokov et al. (2012) describe how, in the last decade, the Kamchatka Danish seine fishery has begun targeting pollock more specifically. Up until 2010, in its 60 years of operation, the Danish seine fishery was more of a true multispecies fishery, targeting flatfish, Pacific cod, and Saffron cod in addition to pollock. The recent transition to targeting pollock more specifically has been facilitated by some gear changes that make the gear more likely to have negative bottom habitat impacts. The article recommends regulations that outlaw the use of hard ground ropes with rollers, rockhoppers, lamellar ground ropes and horizontal pillars in the Danish seine fishery. These recommendations have not been incorporated into the most recent version of the Fishing Rules (FAR 2017).

As for closed areas to protect habitat, there are some coastal areas closed to Danish seining, but it is not clear that a substantial and representative proportion of habitats are protected from bottom contact. Therefore, no modifying factor is applied to improve the Danish seine fishery's habitat impact rating.

EAST KAMCHATKA PENINSULA, MIDWATER TRAWLS, RUSSIA
KURIL ISLANDS, MIDWATER TRAWLS, RUSSIA
BERING SEA, MIDWATER TRAWLS, RUSSIA, WEST BERING SEA, EAST OF 174OE
BERING SEA, MIDWATER TRAWLS, RUSSIA, WEST BERING SEA, WEST OF 174OE
SEA OF JAPAN, MIDWATER TRAWLS, RUSSIA
EAST SAKHALIN / SEA OF OKHOTSK, MIDWATER TRAWLS, RUSSIA

0

None of the spatial and temporal closures in force for the mid-water trawl fishery appear to be focused on conservation of bottom habitat; therefore, no modifying factor is applied to improve the mid-water trawl fishery's rating.

Factor 4.3 - Ecosystem-Based Fisheries Management

EAST KAMCHATKA PENINSULA, DANISH SEINES, RUSSIA
EAST KAMCHATKA PENINSULA, MIDWATER TRAWLS, RUSSIA
KURIL ISLANDS, MIDWATER TRAWLS, RUSSIA
BERING SEA, MIDWATER TRAWLS, RUSSIA, WEST BERING SEA, EAST OF 174OE
BERING SEA, MIDWATER TRAWLS, RUSSIA, WEST BERING SEA, WEST OF 174OE
SEA OF JAPAN, MIDWATER TRAWLS, RUSSIA
EAST SAKHALIN / SEA OF OKHOTSK, MIDWATER TRAWLS, RUSSIA
WEST KAMCHATKA PENINSULA / SEA OF OKHOTSK, DANISH SEINES, RUSSIA

High Concern

As mentioned in Criterion 3, a network of areas closed to fishing were selected to protect particular species' ecological roles, including juveniles and spawners of commercial species, as well as marine mammals. The closed areas, together with TAC-management of commercial species and trawl bycatch thresholds (2%/20%/49%), represent a general strategy to maintain ecosystem functioning. A recent report that focused upon the MSC-certified SOO fishery used ecosystem modeling to indicate that current levels of fishing do not place the SOO ecosystem at risk, but that trophic flows would be disrupted lest the commercial harvest volume double (Kulik 2015).

Although the strategy appears to be functioning in a general sense, it does not specifically address trophic interactions between the fishery and Steller sea lions. The possible link between groundfish fisheries, including those targeting pollock in the Aleutian Islands (Alaska) and declines in the sea lion population there, is a subject of ongoing scrutiny; some scientists believe that nutritional stress due to groundfish removal is responsible for the declines. Protective measures are in place in the Alaska fishery that particularly target the issue of trophic impacts on Steller sea lions (NOAA 2017b), and biological opinions are regularly commissioned that hold sway over the fishery management plan (for example, a 2010 "jeopardy" biological opinion deemed that groundfish fisheries jeopardize Aleutian Steller sea lion populations, and closed the Atka mackerel and Pacific cod fisheries in the western Aleutians in 2011, although it was reversed in 2014).

In the absence of similar targeted measures in Russia addressing ecosystem impacts upon Steller sea lions, and existing scientific concern around potential for groundfish fisheries to have detrimental food impacts upon Steller sea lions, a rating of "high" concern is granted to all fishery units.

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

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Appendix A: Extra By Catch Species

PACIFIC COD

Factor 2.1 - Abundance

EAST KAMCHATKA PENINSULA, DANISH SEINES, RUSSIA

Low Concern

The most recent, publicly available stock assessment for West Bering Sea cod indicates that spawning biomass was well above B_{MSY} in 2013 (TINRO 2014).

Factor 2.2 - Fishing Mortality

EAST KAMCHATKA PENINSULA, DANISH SEINES, RUSSIA

Moderate Concern

An annual average of 7,000 tons of Pacific cod harvest by Danish seines from 2010 to 2011 amounts to approximately 9% of the total Russian harvest of the species—a fairly significant contribution to the stock's fishing mortality (FAO 2016). This catch is regulated under the same TAC that applies to the main component of the Pacific cod fishery, the long line fleet. In 2014, the most recent year for which data was available, the cod fishery's F of 0.284 was above F_{MSY} of 0.245 but far below F_{LIM} of 0.323. The fishery's F fluctuating within range of F_{MSY} results in the rating of "moderate" concern (FAR and TINRO 2015).

Factor 2.3 - Discard Rate

EAST KAMCHATKA PENINSULA, DANISH SEINES, RUSSIA

< 100%

In this fishery, the permitted bycatch of non-commercially valuable species that are discarded is limited to 49% of total harvest weight.

PACIFIC HERRING

Factor 2.1 - Abundance

BERING SEA, MIDWATER TRAWLS, RUSSIA, WEST BERING SEA, WEST OF 174OE

Moderate Concern

Pacific herring in the West Bering Sea (particularly in the Karaginsk subzone) exhibited declines in biomass from 2011 to 2015. However, due to the absence of a biomass reference point, the score of "moderate" concern was attributed using a Productivity Susceptibility Analysis (see below).

Justification:

Productivity-Susceptibility Analysis (Sealife Base 2017)

Scoring Guidelines

1.) Productivity score (P) = average of the productivity attribute scores (p1, p2, p3, p4 (finfish only), p5 (finfish only), p6, p7, and p8 (invertebrates only))

2.) Susceptibility score (S) = product of the susceptibility attribute scores (s1, s2, s3, s4), rescaled as follows: $S = [(s1 * s2 * s3 * s4) - 1/ 40] + 1.$

3.) Vulnerability score (V) = the Euclidean distance of P and S using the following formula: $V = \sqrt{(P^2 + S)}$

Productivity-Susceptibility Analysis for Pacific herring:

PRODUCTIVITY ATTRIBUTE	RELEVANT INFORMATION	SCORE (1=LOW RISK, 2=MEDIUM RISK, 3=HIGH RISK)
Avg age at maturity	3.5 years	1
Avg max age	19 years	2
Avg max size	46 cm	1
Avg size at maturity (Lm)	21.4 cm	1
Fecundity	20,000 eggs	2
Reproductive strategy	broadcast spawner	1
Trophic level	3.2	2
SUSCEPTIBILITY ATTRIBUTE	RELEVANT INFORMATION	SCORE (1=LOW RISK, 2=MEDIUM RISK, 3=HIGH RISK)
Aerial overlap (considers all fisheries)	Unknown	3
Vertical overlap (considers all fisheries)	Unknown	3
Selectivity of fishery (specific to fishery under assessment)	Unknown	2
Post-capture mortality (specific to fishery under assessment)	Unknown	3
PSA Score:		**2.73, medium vulnerability**

Factor 2.2 - Fishing Mortality

BERING SEA, MIDWATER TRAWLS, RUSSIA, WEST BERING SEA, WEST OF 174OE

Moderate Concern

Publicly available information indicating fishing mortality for this species was not found, resulting in a rating of "moderate" concern.

Factor 2.3 - Discard Rate

BERING SEA, MIDWATER TRAWLS, RUSSIA, WEST BERING SEA, WEST OF 174OE

< 100%

In this fishery, the permitted bycatch of non-commercially valuable species that are discarded is limited to

49% of total harvest weight.

SAFFRON COD

Factor 2.1 - Abundance

WEST KAMCHATKA PENINSULA / SEA OF OKHOTSK, DANISH SEINES, RUSSIA

Very Low Concern

Abundance of saffron cod in West Kamchatka was very high in the last year for which data was available (2013), with biomass over twice the average (TINRO 2014). A rating of "very low" concern is granted because the stock is at a historic high.

Factor 2.2 - Fishing Mortality

WEST KAMCHATKA PENINSULA / SEA OF OKHOTSK, DANISH SEINES, RUSSIA

Low Concern

In 2014, F= 0.189, while F_{TARGET} = 0.334 (TINRO 20214). Because fishing pressure is far below the target, a score of "low" concern is given.

Factor 2.3 - Discard Rate

WEST KAMCHATKA PENINSULA / SEA OF OKHOTSK, DANISH SEINES, RUSSIA

< 100%

In this fishery, the permitted bycatch of non-commercially valuable species that are discarded is limited to 49% of total harvest weight.