



MONTEREY BAY AQUARIUM®

# Seafood WATCH

In collaboration with



## Pink and Spiny Scallop

*Chlamys rubida* and *Chlamys hastata*



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## Canadian Pacific

Bottom Trawl

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### Disclaimer

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## Final Seafood Recommendation

The British Columbia scallop inshore trawl is a small-scale fishery, currently with less than three active participants, a limited footprint and lands pink scallops (*Chlamys rubida*) and spiny scallops (*Chlamys hastata*). Both species of scallop are considered a **Best Choice** from this fishery.

Stock	Fishery	Impacts on the Stock Rank (Score)	Impacts on other Species Lowest scoring species Rank*, Subscore, Score	Management Rank Score	Habitat and Ecosystem Rank Score	Overall Recommendation Score
Pink scallop	Canadian Pacific Trawl	Green 3.83	Spiny scallop, Pink scallop Green, 3.83,3.83	Green 4	Yellow 2.74	<b>BEST CHOICE 3.56</b>
Spiny scallop	Canadian Pacific Trawl	Green 3.83	Spiny scallop, Pink scallop Green, 3.83,3.83	Green 4	Yellow 2.74	<b>BEST CHOICE 3.56</b>

**Scoring note** – scores range from zero to five where zero indicates very poor performance and five indicates the fishing operations have no significant impact.

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## **Executive Summary**

The British Columbia (B.C.) scallop inshore trawl is a small-scale fishery, currently with less than three active participants, a limited footprint and lands pink scallops (*Chlamys rubida*) and spiny scallops (*Chlamys hastata*). The Pacific scallop trawl industry uses a butterfly trawl, predominantly fished off-bottom, causing minimal impacts to habitat and bycatch. In B.C. this fishery may occur in any of eleven different locations in the inshore waters of the Strait of Georgia dependent on regional biomass survey results.

Pink and spiny scallops are highly resilient. A sufficient time-series to determine stock status is not yet available but this is a management priority. There are no virgin biomass estimates from areas fished and so  $B_0$  and  $B_{msy}$  are unknown. Methods to estimate maximum sustainable yield (MSY) have a high level of uncertainty and are preliminary. Allowable catch is determined based on biomass surveys specific to open fishing areas and harvest rates are well documented.

Discards are very infrequent in the scallop fishery and no species of concern are caught. Anecdotal information suggests that a few individual specimens of sea star, sea urchins and/or shrimp may be caught in one day. Bycatch is so low that species other than the pink and spiny scallops are not considered in this assessment. Pink and spiny scallops are considered retained bycatch and targeted catch in this fishery.

Under an exploratory license the scallop trawl fishery is monitored with collaborative surveying and biological sampling. Management's track record for maintaining a healthy scallop population is short and uncertain. Currently there are clear management goals aimed at achieving a long-term time-series of biological parameters, this should eventually lead to a data-rich, well-surveyed stock and fishery.

A carefully researched small-scale "butterfly" trawl is used in the scallop fishery. This trawl has minimal bycatch issues and is predominantly fished off-bottom, with some contact points, so habitat impacts are negligible. The trawl was specifically designed for this fishery to take advantage of the proclivity of spiny and pink scallops to swim upwards when disturbed. This allows the trawl to mostly fish off-bottom and avoid benthic bycatch species less than 20 cm high. The spatial footprint of this fishery is very limited. No exceptional species are caught but the ecosystem as a whole is not considered in management decisions.

## **Introduction**

The British Columbia (B.C.) scallop inshore trawl is a small-scale fishery, currently with less than three active participants, a limited footprint and lands pink scallops (*Chlamys rubida*) and spiny scallops (*Chlamys hastata*). The Pacific scallop trawl industry uses a butterfly trawl, predominantly fished off-bottom, causing minimal impacts to habitat and bycatch. In B.C. this fishery may occur in any of eleven different locations in the inshore waters of the Strait of Georgia dependent on regional biomass survey results.

## **Management**

The Pacific scallop trawl industry is managed by Fisheries and Oceans Canada (DFO) Pacific Region. This fishery is currently in an exploratory license phase, under Section 7 of the *Fisheries Act* and an average of five licenses are issued annually; three licenses are currently active (DFO 2011). The purpose of an exploratory license is to determine if a stock can sustain a commercially viable fishery and to collect biological data (DFO 2001). Exploratory licenses are part of a three-stage procedure under the *New Emerging Fisheries Policy* (DFO 2001) to identify new fishing opportunities, and in the case of the scallop fishery, to reassess a longstanding fishery. An exploratory license requires that biological data be collected to build a preliminary database of stock abundance and distribution (DFO 2001) while a precautionary fishery takes place. Once it is determined that a species/stock can sustain a commercial fishing operation, an integrated fisheries management plan is introduced and the fishery is eligible for a commercial license (DFO 2001).

## **History**

The scallop fishery began in 1982 as a dive and trawl fishery but few management controls existed and data were limited. As a result, the Minister of Fisheries and Oceans Canada (DFO) discontinued the Pacific commercial scallop fisheries in 1999. In 2000, DFO initiated a limited exploratory scallop trawl fishery to collect scientific information and develop a management plan for a forthcoming sustainable fishery. Consultations to discuss transitioning the fishery from an experimental fishery to a commercial one began in 2009; consultation is ongoing (DFO, 2011).

Scallop trawl catch has declined since the inception of the exploratory fishery in 2000 (Figure 1). Over the last few years, fewer fishermen have participated in the scallop fishery, possibly due to rising costs and uncertain fishing opportunities. The costs of video monitoring and hiring of biologists to conduct biomass surveys are the responsibility of the industry (DFO 2011). Only two of five licenses reported landings in the 2011/2012 season (Fong pers. comm.).

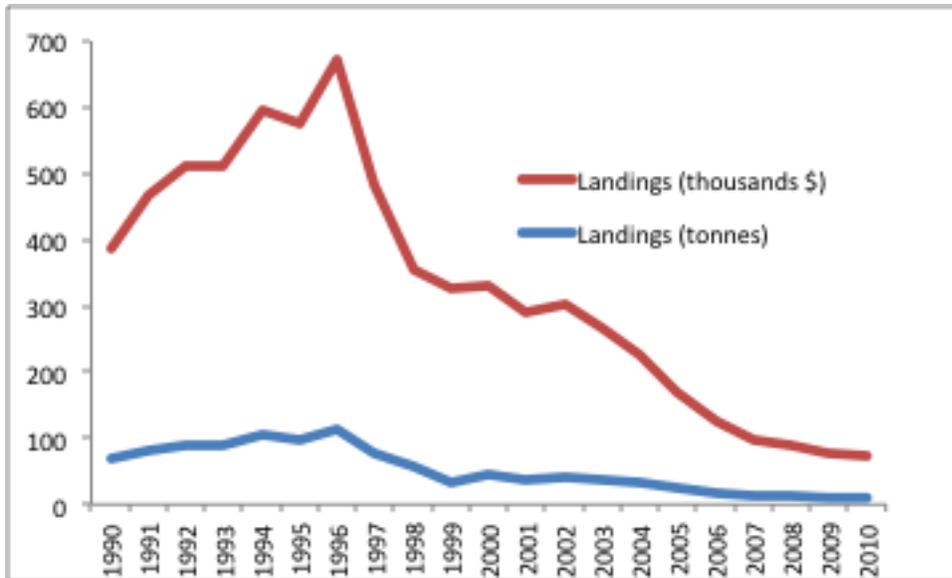


Figure 1. Scallop harvest (trawl and dive, tonnes) and scallop value (thousands) from 1990 to 2010. (DFO commercial fishery statistics)

### Biology

Unlike most bivalves, pink and spiny scallops are epibenthic and free swimming. Scallops occur between 1-200 m depth (Bernard 1983). Pink scallops occur in a range of substrates from soft to rocky and spiny scallops are often found in areas of strong current on hard substrates and rocky reefs (Bourne 1991; Harbo 1997) and occasionally in muddy or sandy substrates (Quayle 1963).

Scallops are filter feeders with highly specialized gills that serve as both feeding and breathing apparatuses (Lauzier and Parker 1999). They primarily filter suspended detrital material and phytoplankton for sustenance. Predators of adult scallops include sea stars, crabs, gastropods, groundfish (Brand 1991) and octopus (B.C. government). Pink and spiny scallops generally mature at age-two or approximately 25-35 mm shell height (Bourne 1991) and have separate sexes with mass fertilization occurring in the water column each year (Lauzier et al. 2000). Swimming scallops undergo asynchronous seasonal spawning; spiny scallops spawn from mid-August to late October while pink scallops spawn twice each year—March and July through August (MacDonald et al. 1991). Fertilized eggs develop into planktonic larvae that drift for three to four weeks and disperse within water currents before they settle (B.C. government). Scallop populations are typically metapopulations. There is likely a high degree of exchange between populations at the larval stage, however, once scallops have settled, exchange is probably limited (Lauzier et al. 2000).

## Market

License restrictions and the persistence of an exploratory fishery designation may have restricted growth in this industry. The domestic demand for trawl-caught scallops is described as very good (B.C. government) and price per tonne has increased (Figure 2).

The market for B.C. trawl-caught scallops is primarily domestic due to limited production at this time (B.C. government).

### *Common and market names:*

Pink scallop—smooth pink, reddish and the swimming scallop

Spiny scallop—pink, Pacific pink and the swimming scallop

### *Primary product forms:*

Fresh whole, fresh shucked, and frozen (B.C. government)

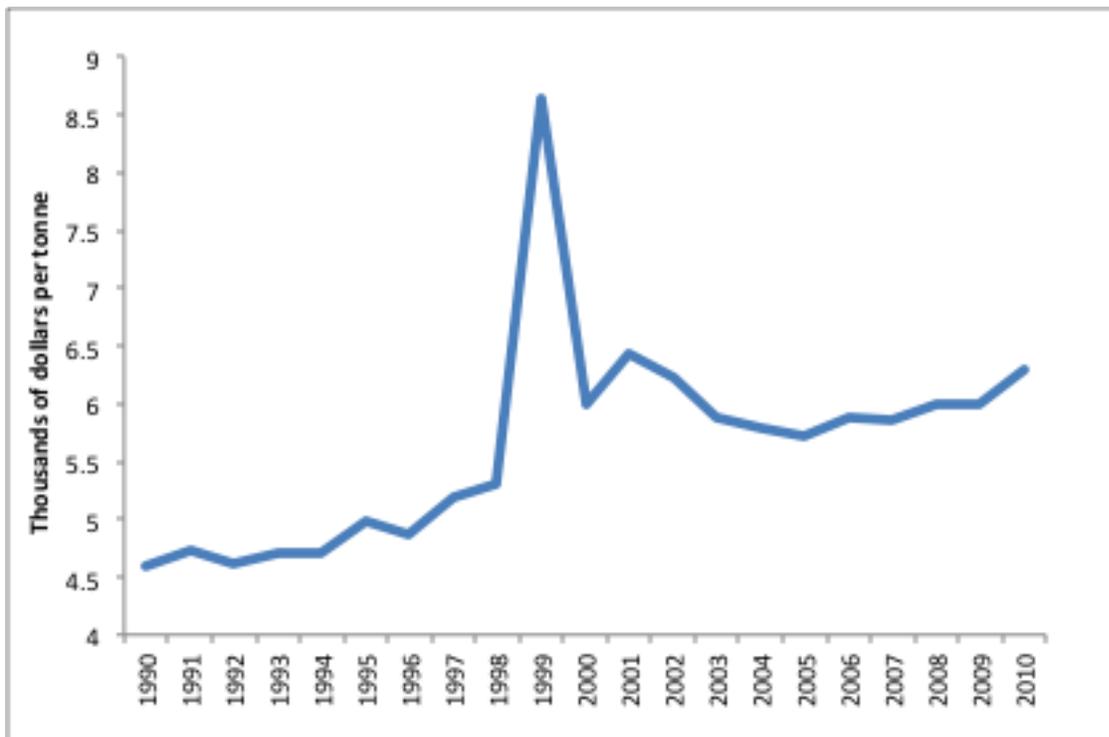


Figure 2. Landed value (thousands of dollars) per tonne in the dive and trawl commercial scallop fishery (1990-2010) (DFO commercial fishery statistics).

## Analysis

### Scoring guide

- All scores result in a zero to five final score for the criterion and the overall final rank. A zero score indicates poor performance, while a score of five indicates high performance.
- The full Seafood Watch Fisheries Criteria that the following scores relate to are available on our website at [www.seafoodwatch.org](http://www.seafoodwatch.org).

### Criterion 1: Stock for which you want a recommendation

#### Guiding principles

- The stock is healthy and abundant. Abundance, size, sex, age and genetic structure should be maintained at levels that do not impair the long-term productivity of the stock or fulfillment of its role in the ecosystem and food web.
- Fishing mortality does not threaten populations or impede the ecological role of any marine life. Fishing mortality should be appropriate given current abundance and inherent resilience to fishing while accounting for scientific uncertainty, management uncertainty, and non-fishery impacts such as habitat degradation.

#### Summary

Stock	Fishery	Inherent Vulnerability Rank	Stock Status Rank (Score)	Fishing Mortality Rank (Score)	Criterion 1 Rank (Score)
Pink scallop	Canadian Pacific Trawl	Low	Low Concern (4)	Low Concern (3.67)	Green (3.83)
Spiny scallop	Canadian Pacific Trawl	Low	Low Concern (4)	Low Concern (3.67)	Green (3.83)

Pink and spiny scallops are highly resilient. A sufficient time-series to determine stock status is not yet available but this is a management priority. There are no virgin biomass estimates from areas fished and so  $B_0$  and  $B_{msy}$  are unknown. Methods to estimate MSY have a high level of

uncertainty and are preliminary. Allowable catch is determined based on biomass surveys specific to open fishing areas and harvest rates are well documented.

### **Justification of Ranking**

Under an exploratory license, sampling and surveying are required before fishing can commence in a given area or before an unfished total allowable catch (TAC) from a previous season may be transferred. A long-term record of historical stock health is unavailable but developing a robust stock status time-series is a management priority (Lauzier et al. 2005). The high level of data collection and the small-scale of the fishery make the insufficient stock information and preliminary MSY estimates less of a conservation concern.

### **Factor 1.1 Inherent Vulnerability: Low vulnerability**

#### Key relevant information:

Bourne and Harbo (1987), MacDonald et al. (1991) and CSAS (2010) report the resilience attributes of pink and spiny scallops as:

#### *Pink and spiny scallops*

<b>Resilience attribute</b>	<b>Spiny and pink scallop attributes</b>	<b>Score</b>
Average age at maturity	2 yrs	3
Average maximum age	6 yrs	3
Reproductive strategy	Broadcast spawner	3
Density dependence	Compensatory (Lauzier et al. 2005)	3
<b>Average score</b>		<b>3</b>

According to the Seafood Watch PSA analysis, pink and spiny scallops are considered to have low inherent vulnerability.

#### Detailed rationale (optional)

None needed

### **Factor 1.2 Stock status: Low concern**

#### Key relevant information:

A sufficient time-series to determine long-term stock status is not available. There are no virgin biomass estimates from areas fished and so  $B_0$  and  $B_{msy}$  are unknown. Quantitative analyses

conducted by DFO scientists consistently indicate sufficient stock for harvest in some areas as harvest is permitted by DFO each year.

Detailed rationale (optional):

Prior to May 2000, there was very little information available on the status of scallop stocks in British Columbia, and data were only fishery-dependent (Lauzier et al. 2005).

The first priority under the scallop exploratory license was to collect biological samples to update previous samples from the mid-1980s and to assemble a biomass estimate time-series. Currently, when a harvester expresses interest to fish an area, a biomass survey must be completed at the expense of the harvester, unless unfished TAC from the previous season is carried over (DFO 2011). Results from the biomass survey are used to determine whether the stock in this area can support a fishery. If an area is considered able to support a fishery, TAC is calculated based on a 4% harvest rate of the estimated legal-sized ( $\geq 48$  mm shell height) scallop biomass (Lauzier et al. 2005). The biomass survey process provides a comprehensive, detailed assessment on the stock to be harvested but there are no baseline biomass estimate and the survey process has not persisted long enough to produce a sufficient time-series. The overall area fished is small but the proportion of the coast-wide scallop population being fished is unknown. Harvest occurs only in areas where biomass surveys have been conducted (DFO 2011).

**Factor 1.3 Fishing mortality: Low concern**

Key relevant information:

$F_{msy}$  is considered unknown because biological reference points for fishing mortality have not been defined and so the  $F_{curr} : F_{msy}$  ratio is also unknown. Estimations of MSY are calculated but are considered preliminary due to a short time-series. Fishing effort is small and fishing mortality is likely at a sustainable level since biomass surveys are completed in the proposed fishing area prior to fishing.

Detailed rationale (optional):

Beginning in 2001, the exploratory trawl fishery TAC was allocated based on annual biomass survey results in all areas fished (Wylie 2006). Currently, a biomass survey takes place in a potential fishing area before fishing can occur. Two methods to estimate maximum sustainable yield (MSY) are being tested and compared but a high degree of uncertainty in the results exists due to the paucity of available biological and time-series data. As a result, all estimates are considered preliminary at this point (Surry et al. 2011).

The two methods used to estimate MSY are the Gulland (Gulland 1971) and Fox (1970) models (Garcia et al. 1989). Gulland's model was originally used as a preliminary means to estimate MSY (Lauzier et al. 2000) while more sophisticated modeling techniques were being developed and more data were collected (Surry et al. 2011). Gulland's model (Gulland 1971) has the

fewest data requirements, including natural mortality, vulnerability, fishing mortality and unexploited biomass (Lauzier et al. 2005). Unexploited biomass ( $B_0$ ) is estimated using scallop beds where no harvest has occurred for 2 to 3 years (Lauzier et al. 2005). The second model is based on the Fox (1970) surplus production model (Garcia et al. 1989). A single year of biomass and catch data is used. This model is valid for a population undergoing exploitation where virgin biomass is unknown (Surry et al. 2011). Estimates of MSY from the Gulland and Fox models were found to be in the same range (Surry et al. 2011)

Harvest rate estimates of 8% of the original unexploited biomass for pink scallops and 11% for spiny scallops were derived from Gulland's model. Since these two scallop species are harvested together, 8% is used as a precautionary measure. As the original unexploited biomass is unknown, a precautionary harvest rate of 4% of legal-sized biomass is recommended for the trawl experimental fishery (Lauzier et al. 2005).

There are currently only three active licenses in Pacific scallop trawl fishery, and in the 2011/2012 season two vessels reported landings (Fong pers. comm.). Fishing effort is small and fishing mortality is likely at a sustainable level since biomass surveys are completed in the proposed fishing area prior to fishing. Nonetheless, stock health and  $F_{msy}$ , are unknown and MSY estimations are preliminary.

## **Criterion 2: Impacts on other retained and bycatch stocks**

### **Guiding principles**

- The fishery minimizes bycatch. Seafood Watch® defines bycatch as all fisheries-related mortality or injury other than the retained catch. Examples include discards, endangered or threatened species catch, pre-catch mortality and ghost fishing. All discards, including those released alive, are considered bycatch unless there is valid scientific evidence of high post-release survival and there is no documented evidence of negative impacts at the population level.
- Fishing mortality does not threaten populations or impede the ecological role of any marine life. Fishing mortality should be appropriate given each impacted species' abundance and productivity, accounting for scientific uncertainty, management uncertainty and non-fishery impacts such as habitat degradation.

### **Summary**

<b>Stock</b>	<b>Inherent Vulnerability</b> Rank	<b>Stock Status</b> Rank (Score)	<b>Fishing Mortality</b> Rank (Score)	<b>Subscore</b>	<b>Score</b> (subscore*discard modifier)	<b>Rank</b> (based on subscore)
Spiny scallop	Low	Low Concern (4)	Low Concern (3.67)	3.83	3.83	Green
Pink scallop	Low	Low Concern (4)	Low Concern (3.67)	3.83	3.83	Green

Discards are very infrequent in the scallop fishery and no species of concern are caught. Anecdotal information suggests that a few individual specimens of sea star, sea urchins and/or shrimp may be caught in one day. Bycatch is so low that species other than the pink and spiny scallops are not considered in this assessment. Pink and spiny scallops are considered retained bycatch and targeted catch in this fishery.

#### **Factor 2.1 Inherent Vulnerability: Low vulnerability**

See Factor 1.1

#### **Factor 2.2 Stock status: Low concern**

See Factor 1.2

**Factor 2.3 Fishing mortality: Low concern**

See Factor 1.3

**Factor 2.4 Overall discard rate: 0%–20%**Key relevant information:

Bycatch is minimal with a few specimens caught each day, generally less than 1% of landed biomass (West Coast Scallop Harvesters Association no date). Pink and spiny scallops are considered retained bycatch and assessed as such under Criterion 2.

Detailed rationale (optional):

Anecdotal information suggests that, on average, a scallop fisherman makes eight tows per day and may pull in one to two small sea stars, shrimp, and/or sea urchins (McGuffie pers. comm.). They may also catch one finfish per year and an octopus once every ten years (McGuffie pers. comm.). Very little bycatch was seen in the trawl survey or in results from continuous monitoring of the experimental fishery (Lauzier et al. 2005). Video surveys show very little collateral damage and the few animals that are caught are easily released with minimal damage (Lauzier et al. 2005), however, video data have not yet been fully analyzed (Rogers, pers. comm.). Discard mortalities for sublegal scallops are 2%–3% (Lauzier et al. 2005) and the absence of codend liners on the trawl allows some undersize scallops to pass through the codend (Fong, pers. comm.) without being captured. The butterfly trawl efficiently captures the targeted scallop species due to the unique gear design that takes advantage of the pink and spiny scallop's proclivity to swim upwards when disturbed. The trawl gear hovers just above (20 cm) the ocean floor and scallops are captured while benthic organisms less than 20 cm high are avoided. The small 2 m opening of the butterfly trawl makes it easily avoidable by pelagic and demersal finfish (Lauzier et al. 2005).

## **Criterion 3: Management effectiveness**

### **Guiding principle**

- The fishery is managed to sustain the long-term productivity of all impacted species. Management should be appropriate for the inherent resilience of affected marine life and should incorporate data sufficient to assess the affected species and manage fishing mortality to ensure little risk of depletion. Measures should be implemented and enforced to ensure that fishery mortality does not threaten the long-term productivity or ecological role of any species in the future.

### **Summary**

<b>Fishery</b>	<b>Management: Harvest Strategy Rank (Score)</b>	<b>Management: Bycatch Rank (Score)</b>	<b>Criterion 3 Rank (Score)</b>
Canadian Pacific Trawl	Low Concern (4)	All species retained (N/A)	Green (4)

Under an exploratory license the scallop trawl fishery is monitored with collaborative surveying and biological sampling. Management's track record for maintaining a healthy scallop population is short and uncertain. Currently there are clear management goals aimed at achieving a long-term time-series of biological parameters. This should eventually lead to a data-rich, well-surveyed stock and fishery.

### **Justification of Ranking**

The major issue in this fishery is a short time-series of population trends. Management under an exploratory license requires close monitoring of scallop biomass and biological parameters by fishing area with clear management goals present. There are no bycatch concerns in this fishery largely due to the industry's effort to design a highly selective trawl gear.

### **Factor 3.1 Management of fishing impacts on retained species: Low concern**

<b>Fishery</b>	<b>Critical?</b>	<b>Mgmt strategy and implement.</b>	<b>Recovery of stocks of concern</b>	<b>Scientific research and monitoring</b>	<b>Scientific advice</b>	<b>Enforce.</b>	<b>Track record</b>	<b>Stakeholder inclusion</b>
Canadian Pacific Trawl	No	Highly Effective	N/A	Moderately Effective	Highly Effective	Highly Effective	Moderately Effective	Highly Effective

Key relevant information:

This fishery is managed under an exploratory license requiring surveys for each fishing location prior to fishing, or an unfished quota can be carried-over from a previous season. There are concerns over the short biological parameter and biomass time-series; exploratory license conditions are intended to rectify this issue.

Detailed rationale:*Management Strategy and Implementation: Highly effective*

This fishery is managed under an exploratory license. The scallop assessment and management framework under an exploratory license includes the following key requirements: redevelopment of the scallop fishery is to follow a phased, precautionary approach; stakeholders are responsible for demonstrating the potential for fishery expansion; stock assessment areas must be defined, and until then each aggregation of scallops is assessed as a separate stock; the primary assessment tool is initially to be abundance trends from fishery-dependent data and from fishery independent surveys; biological reference points are to be developed; unharvested populations are to be monitored along with harvested populations (Surry et al. 2011).

These conditions are being met. Surveys are initiated by a harvester's desire to fish in a location (DFO 2011). DFO biologists regularly reassess methods for deriving fisheries management parameters (e.g., MSY) as more biological data accrues (Lauzier et al 2005; CSAS 2010; Surry et al. 2011). As the biological database develops, biological reference points will be developed (DFO 2011) and biological parameter and stock status estimates will become more reliable. Survey data are used to determine management area-based TACs, collect biological information and assess trawl impacts (DFO 2011).

A harvest strategy compliant with the precautionary approach is being developed. The minimum elements required for the strategy include a removal reference for three stock status zones delineated by a limit reference point (LRP) and an upper stock reference (USR) (DFO 2011). Due to a paucity of biological and time-series data, development of this strategy will be in the data-gathering phase for several years (DFO 2011). Under an exploratory license this fishery is kept small-scale and license conditions are easily implemented.

*Recovery of stocks of concern: N/A*

There are no species or stocks of concern caught in this fishery.

*Scientific Research and Monitoring: Moderately effective*

Biomass surveys are conducted prior to fishing to estimate the total legal-sized ( $\geq$  48 mm shell height) biomass of pink and spiny scallops in specific harvestable scallop beds. Surveys provide data for the creation of a long-term biomass database and to measure other population and biological parameters (CSAS 2010). A harvest rate is applied to the estimated legal biomass to

determine TACs for the season. Regular data collection occurs in this fishery but the data are insufficient to assure stocks are maintained.

*Scientific Advice: Highly effective*

In order for the scallop trawl fishery to reopen as a commercial fishery or proceed with the development of an integrated management plan, an understanding of the stock distribution is required. Biological sampling continues each season and catch allowances are directly determined based on a precautionary predetermined harvest rate of the estimated legal-sized biomass. Science and management seem to be effectively working together.

*Enforcement: Highly effective*

A hail system has been implemented to ensure effort and catch is tracked and recommended catch ceilings are not exceeded. Vessel captains who fail to hail properly each day before and after fishing will be required to have a DFO certified at-sea observer onboard at their own expense (DFO 2011). This fishery currently has three active licenses with only two license-holders participating in the 2011/2012 season (Fong pers. comm.). Regulations are relatively straight forward to enforce and there are clear penalties for failing to meet license conditions.

*Track Record: Moderately effective*

Prior to the fishery closure in 1999, the scallop fishery was unlimited with no monitoring or stock assessments. In 2000, the experimental fishery was initiated and seasonal sampling to create a long-term database and determine TACs was implemented (DFO 2011). These measures have not been in place long enough to ensure preservation of healthy stock abundance and productivity overtime.

*Stakeholder inclusion: Moderately effective*

The scallop industry is in consultation with DFO to move forward with transferring exploratory licenses to commercial fishing licenses. The process is slow-moving and biomass surveys and video monitoring are costly to fishermen and there is no guarantee that this investment will result in a commercial fishing license (McGuffie pers. comm.).

**Factor 3.2 Management of fishing impacts on bycatch species: N/A**

Fishery	All Species Retained?	Critical?	Mgmt strategy and implement.	Scientific research and monitoring	Scientific advice	Enforce.
Canadian Pacific Trawl	Yes					

Key relevant information:

The butterfly trawl causes minimal damage to co-occurring species and captures little to no non-target species. The butterfly trawl was specifically designed to avoid non-target species (Lauzier et al. 2005). A heavy rubber mat is attached to the trawl net to prevent the net bag from snagging on any bottom surface, and allows any sessile organisms to slip under the trawl relatively easily (Lauzier et al. 2005). Information from scallop trawl surveys, close monitoring of the experimental fishery and trawl efficiency estimates made from video monitoring footage showed little to no bycatch retained in the trawl net (Lauzier et al. 2005). Discarded undersized scallops showed very low mortality for 1-2 weeks after capture and handling (Lauzier et al. 2005).

Management of fishing impacts on bycatch species is not applicable, as there is little to no bycatch in the fishery (Lauzier et al. 2005).

## **Criterion 4: Impacts on the habitat and ecosystem**

### **Guiding principles**

- The fishery is conducted such that impacts on the seafloor are minimized and the ecological and functional roles of seafloor habitats are maintained.
- Fishing activities should not seriously reduce ecosystem services provided by any fished species or result in harmful changes such as trophic cascades, phase shifts or reduction of genetic diversity.

### **Summary**

<b>Fishery</b>	<b>Impact of gear on the substrate Rank (Score)</b>	<b>Mitigation of gear impacts Rank (Score)</b>	<b>EBFM Rank (Score)</b>	<b>Criterion 4 Rank (Score)</b>
Canadian Pacific Trawl	Moderate Concern (2)	Moderate mitigation (0.5)	Moderate Concern (3)	<b>Yellow (2.74)</b>

A carefully researched small-scale “butterfly” trawl is used in the scallop fishery. This trawl has minimal bycatch issues and is predominantly fished off-bottom, with some contact points, so habitat impacts are negligible. The trawl was specifically designed for this fishery to take advantage of the proclivity of spiny and pink scallops to swim upwards when disturbed. This allows the trawl to fish mostly off-bottom and avoid benthic bycatch species less than 20 cm high. The spatial footprint of this fishery is very limited. No exceptional species are caught but the ecosystem as a whole is not considered in management decisions.

### **Justification**

This fishery uses a specialized small-scale trawl called the butterfly trawl that is fished off-bottom and designed to minimize bycatch and habitat impacts. This gear has been closely monitored and impacts have been observed with video surveys. The spatial extent is limited to a few small areas and so benthic impacts are limited due to the nature of the gear and the extent of the fishery.

#### **Factor 4.1 Impact of the fishing gear on the substrate: Moderate concern**

##### Key relevant information:

The B.C. scallop trawl fishery uses a small, off-bottom trawl called the “butterfly trawl” that was specifically developed for this fishery (Figure 3). The butterfly trawl was modified to fish off-bottom and so is considered a semi-pelagic trawl for the purpose of this assessment. The butterfly trawl has a maximum width of 2 m (DFO 2011) and is mostly fished off-bottom with some bottom contact points along the trawl runners. Pink and spiny scallops occur in a range of substrates from muddy and sandy to rocky reefs and so may, theoretically, be fished in any of these habitats. This trawl was specifically developed to minimize gear impacts. This trawl gear has been thoroughly tested and monitored and impacts are considered benign (Lauzier et al. 2005).

##### Detailed rationale:

The butterfly trawl (Figure 3) used in the B.C. scallop trawl fishery was specifically designed to maximize scallop catch while minimizing bycatch and habitat impacts specific to the range of habitats fished by capturing scallops as they are swimming in the water column rather than off the bottom. The butterfly trawl can have a rotating piece attached that clicks as it turns (McGuffie pers. comm.) or tickler chains contacting the bottom (Fong pers. comm.) to disturb the scallops causing them to swim upwards. The scallops swim until they reach exhaustion and the trawl catches them as they fall back towards the bottom. The crossbar and bottom of the trawl net usually sit 20 cm off the bottom so there is minimal impact to the benthos. A heavy rubber mat is attached to the trawl net to prevent the net bag from snagging on any bottom surface if contact is made, and allows sessile organisms to slip under the trawl relatively easily (Lauzier et al. 2005). The trawl is towed on a very steep angle of 1.2-1.3 aspect resulting in only a small portion of the trawl weight contacting the bottom (Lauzier et al. 2005). When butterfly trawl impacts were assessed using video monitoring, minimal habitat impacts and very little damage to co-occurring species were observed (Lauzier et al. 2005).

#### **Factor 4.2 Modifying factor: Mitigation of fishing gear impacts: Moderate mitigation**

##### Key relevant information:

Fishing effort is strongly limited and constrains the spatial footprint of the fishery. In the future, habitat assessments via video survey will be required to fish new areas.

##### Detailed rationale:

In addition to the footprint being extremely limited, the habitat assessment requirements prior to fishing new areas are strengthening. A new habitat assessment protocol is being developed by DFO that will require harvesters to conduct a video survey of a proposed harvest location. Fisheries Management and Habitat staff from DFO will evaluate the video to determine if trawl activity poses a risk to each specific benthic community (DFO 2011).



Figure 3. Photo of the off-bottom butterfly trawl used in the Pacific scallop trawl fishery (Photo credit, DFO)

#### **Factor 4.3 Ecosystem and Food Web Considerations: Moderate concern**

##### Key relevant information:

No exceptional species are caught in the fishery. There are efforts to assess some ecological impacts of the fishery but harvest decisions are not ecosystem-based.

##### Detailed rationale (optional):

The scallop trawl was designed to minimize impacts to habitat and bycatch (Lauzier et al. 2005). Biomass surveys are undertaken before fishing occurs. Total allowable catch, derived from biomass estimates, considers the health of the scallop population but not the health of the ecosystem as a whole.

## **Acknowledgements**

*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.*

Seafood Watch would like to thank three anonymous reviewers for graciously reviewing this report for scientific accuracy.

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## **Appendix A: Review Schedule**

The fishery is currently very small-scale and is undertaken under an exploratory license, but it may expand into new areas. While there is no full stock assessment planned, biomass data is improving as monitoring continues under the exploratory license. It is recommended to review the status of the fishery in three years (2015) and update the report accordingly.

## **About SeaChoice®**

SeaChoice, Canada's most comprehensive sustainable seafood program, is about solutions for healthy oceans. Launched in 2006, SeaChoice was created to help Canadian businesses and shoppers take an active role in supporting sustainable fisheries and aquaculture at all levels of the seafood supply chain. Based on scientific assessments, SeaChoice has created easy-to-use tools that help you make the best seafood choices.

Working in collaboration with the Monterey Bay Aquarium's acclaimed Seafood Watch program, SeaChoice undertakes science-based seafood assessments, provides informative resources for consumers, and supports businesses through collaborative partnerships.

The SeaChoice program is operated by the Canadian Parks and Wilderness Society, David Suzuki Foundation, Ecology Action Centre, Living Oceans Society and Sierra Club BC. Our work is funded by the David and Lucile Packard Foundation, the Webster Foundation, and the Eden Foundation.

## **About Seafood Watch®**

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

Each sustainability recommendation on the regional pocket guides is supported by a Seafood Report. Each report 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." The detailed evaluation methodology is available upon request. In producing the Seafood Reports, 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 Seafood Reports 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 Reports in any way they find useful. For more information about Seafood Watch® and Seafood Reports, please contact the Seafood Watch® program at Monterey Bay Aquarium by calling 1-877-229-9990.

### **Disclaimer**

Seafood Watch® strives to have all Seafood Reports reviewed for accuracy and completeness by external scientists with expertise in ecology, fisheries science and aquaculture. Scientific review, however, does not constitute an endorsement of the Seafood Watch® program or its recommendations on the part of the reviewing scientists. Seafood Watch® is solely responsible for the conclusions reached in this report.

Seafood Watch® and Seafood Reports are made possible through a grant from the David and Lucile Packard Foundation.

## Guiding Principles

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

The following **guiding principles** illustrate the qualities that capture fisheries must possess to be considered sustainable by the Seafood Watch program:

- *Stocks are healthy and abundant.*
- *Fishing mortality does not threaten populations or impede the ecological role of any marine life.*
- *The fishery minimizes bycatch.*
- *The fishery is managed to sustain long-term productivity of all impacted species.*
- *The fishery is conducted such that impacts on the seafloor are minimized and the ecological and functional roles of seafloor habitats are maintained.*
- *Fishing activities should not seriously reduce ecosystem services provided by any fished species or result in harmful changes such as trophic cascades, phase shifts, or reduction of genetic diversity.*

Based on these guiding principles, Seafood Watch has developed a set of four sustainability **criteria** to evaluate capture fisheries for the purpose of developing a seafood recommendation for consumers and businesses. These criteria are:

1. Impacts on the species/stock for which you want a recommendation
2. Impacts on other species
3. Effectiveness of management
4. Habitat and ecosystem impacts

Each criterion includes:

- Factors to evaluate and rank
- Evaluation guidelines to synthesize these factors and to produce a numerical score
- A resulting numerical score and **rank** for that criterion

Once a score and rank has been assigned to each criterion, an overall seafood recommendation is developed on additional evaluation guidelines. Criteria ranks and the overall recommendation are color-coded to correspond to the categories on the Seafood Watch pocket guide:

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

**Best Choices/Green:** Are well managed and caught or farmed in environmentally friendly ways.

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

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