

Shrimp and Prawn Fisheries: managing declining stocks

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What is happening?

Within Átl'ka7tsem/Txwnéwu7ts/Howe Sound, commercial and recreational fisheries have traditionally targeted spot prawn (*Pandalus platyceros*) via trap, and pink (smooth [*Pandalus jordani*] and spiny [*Pandalus borealis*]) and sidestripe shrimp (*Pandalopsis dispar*) via bottom trawl methods. Wild spot prawns in coastal B.C. harvested via trap are considered sustainable as per the Ocean Wise Seafood Program.¹ However, the sustainability of pink and sidestripe shrimp harvested by trawl is still under review due to potential interactions between fishing activity and sensitive marine species and habitats, such as glass sponge reefs and corals.



Pacific Prawn Fishermen's Association survey photos, October 2019. (Credit: Maxwell Hohn)

What is the current status?

Although annual stock sizes can vary, regional declines in pink and sidestripe shrimp stocks have been observed since 2014. Declining stock size has led to the closure of the Fraser River Shrimp Management Area (SMA), which includes Átl'ka7tsem/Txwnéwu7ts/Howe Sound waters.²⁻⁴ Prawn stock status (based on using commercial catch as a proxy of abundance) in Átl'ka7tsem/Txwnéwu7ts/Howe Sound has been more

variable, with a record low catch in 2017, followed by a slight increase in 2018 (Figure 1).

Stock status of pink and sidestripe shrimp is estimated using data collected during annual fishery independent trawl surveys conducted by the Fisheries and Oceans Canada (DFO). In 2017/18, stock size of pink shrimp in the Fraser River SMA was estimated to be below the Limit Reference Point (LRP)¹ and in the critical zone¹.

i) Limit Reference Point (LRP) = ~30% of estimated sustainable yield; Critical zone – stock status falls below the Limit Reference Point (LRP).

COMMERCIAL LANDINGS OF PRAWN AND SHRIMP BY TRAP AND TRAWL FROM ÁTL'KA7TSEM / TXWNÉWU7TS / HOWE SOUND

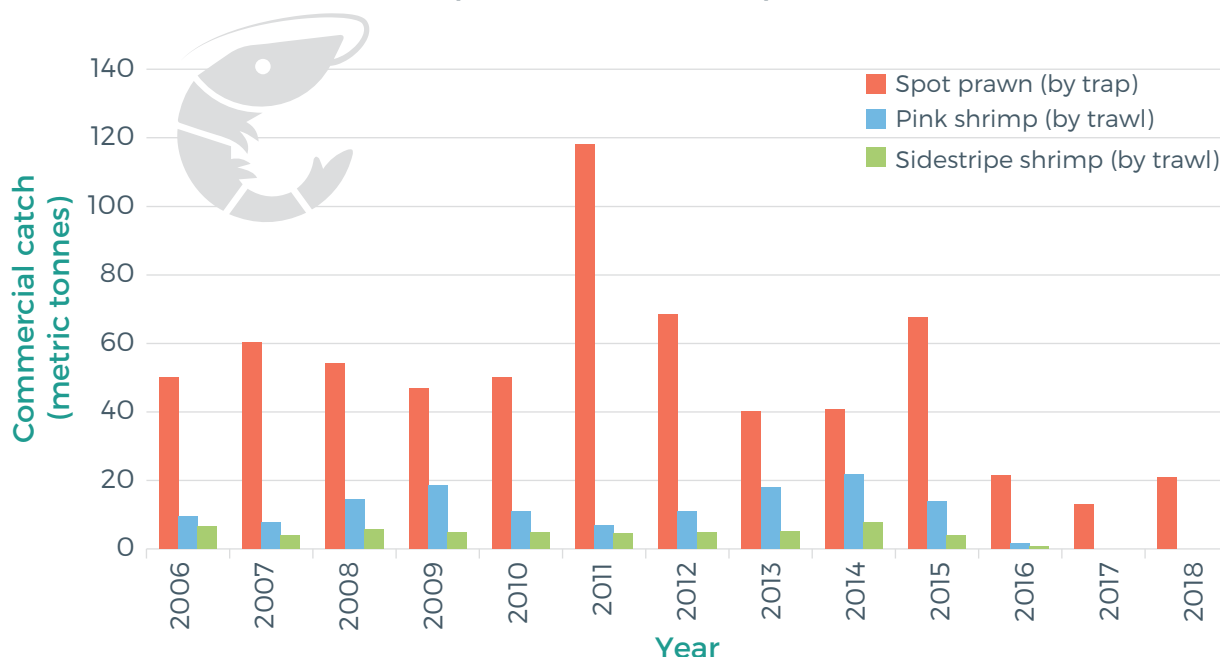


Figure 1. 2006–2018 Commercial catch (tonnes) of prawn and shrimp by trap and trawl methods from Átl'ka7tsem/Txwnéwu7ts/Howe Sound.



Spot prawn (*Pandalus platyceros*). (Credit: Maxwell Hohn)

Sidestripe shrimp stock size was estimated to be above the Upper Stock Reference (USR)ⁱⁱ and in the healthy zoneⁱⁱ.^{5,6} When either pink or sidestripe shrimp stocks fall into the critical zone, no harvesting is allowed for either species due to the difficulty of species-specific targeting using trawl gear.

In 2017, as a result of pink shrimp being in the critical zone, the shrimp fishery using bottom trawl methods was closed and has remained closed (Figure 1).^{5,6} As of 2019, pink shrimp stocks for the Fraser River SMA are still in the critical zone.² The estimated sidestripe stock biomass has decreased from ~153.5 t in 2018 to ~123.1 t in 2019, now falling below the USR and into

the cautious zoneⁱⁱⁱ.² For stocks in the healthy zone, a 35% catch rate of total estimated biomass is set; for the cautious zone, a declining catch rate is set based on proximity to the LRP^{iv}. For the critical zone, a 0% catch rate is set.⁷

The status of prawn stock size is monitored during the commercial trap fishery that occurs during May and June. When numbers of breeding females approach or reach the management target, the trap fishery closes for the season.³ The management target is akin to a USR; therefore prawn stocks are considered to be in the healthy zone. DFO conducts a post-season prawn stock survey in November each year. The recreation-

ii) Healthy zone – stock status is above the Upper Stock Reference (USR); USR = ~80% of estimated sustainable yield.

iii) Cautious zone – stock status falls between LRP and USR.

iv) Limit Reference Point – the LRP is the stock size delineating the cautious and the critical zones.

al prawn trap fishery is open all year; however, if the number of breeding females drops below target based on the November survey, portions of Átl'ka7tsem/Txwnéwu7ts/Howe Sound are closed to fishing for the remainder of the recreational fishing season.

In addition to fisheries closures, other government efforts to increase the sustainability of shrimp trawl and prawn trap fisheries include:

- Improved technology, gear and bait. Increased recreational participation in recent years has led to discussions with DFO and the Sport Fishing Advisory Board on decreasing the daily recreational catch limit for prawns.³ As of April 2020, the recreational prawn daily catch limit reduced to 125^v.
- The semi-annual DFO survey of prawn stocks in Átl'ka7tsem/Txwnéwu7ts/Howe Sound continued in February and November 2016, 2017 and 2018.³ This study commenced in 1985 and contributes to a long-term data set of valuable information on the fluctuating prawn stock status in Átl'ka7tsem/Txwnéwu7ts/Howe Sound. Current reports do not mention 2019, and no data are available.
- Any interactions between commercial fishers and marine mammals is now required to be reported, including accidental drowning, bycatch, entanglements, collisions and fatalities.^{2,4} This can be done via the Marine Mammal Incident Hotline (1-800-465-4336).

Bycatch is inevitable with trap and trawl fisheries and is a significant issue throughout the world's oceans. Programs to minimize bycatch include increased by-

catch monitoring by observers, area closures and seasonal closures. There were 18 fishery-independent at-sea observers deployed for the 2018 prawn trap fishing season along the B.C. coast.³ These observers undertake sampling, which helps with decision-making related to in-season closures, as well as assisting with enforcement. As was reported in Ocean Watch Howe Sound Edition (OWHS) 2017, 80% of the total commercial fleet was checked for compliance during the fishing season throughout the B.C. coast.³ Bycatch reduction devices^{vi} for trawl nets are also mandatory throughout the Pacific Northwest.

Extra concern surrounds Committee on the Status of Endangered Wildlife in Canada (COSEWIC) listed species within the B.C. shrimp trawl and prawn trap fisheries. Eulachon bycatch in the shrimp trawl fishery and some species of rockfish in the prawn trap fishery are a concern.^{4,8} As mentioned previously (see [Prawn and Shrimp Fisheries](#), OWHS 2017), Rockfish Conservation Areas are closed to trawl fishing but open to commercial and recreational prawn trap fishing (see



Checking for eggs. (Credit: Maxwell Hohn)

v) Recreational catch limits listed here: www.pac.dfo-mpo.gc.ca/fm-gp/rec/tidal-maree/a-s28-eng.html.

vi) Bycatch reduction devices are used to reduce the amount of non-target species caught.

[Marine Protected Areas](#), OWHS 2017). The number of juvenile rockfish caught as bycatch varies annually. Although rockfish mortality by the prawn trap fishery is considered low relative to all other sources of mortality, the commercial prawn industry is proactively working to reduce bycatch mortality.

One way to reduce mortality of bycatch is by using devices called rockfish descenders. They have been shown to be very effective at reducing barotrauma^{vii} by allowing the rockfish to quickly be lowered back down and released at the depth they were caught. From April

1, 2019, recreational fishers are now required to use these devices.⁹ The commercial prawn industry will be encouraged to start using descenders, particularly for the COSEWIC-listed Quillback (*Sebastes maliger*) and Yelloweye (*S. reuberrimus*) species in the 2020 season.

Overall, Rockfish Conservation Areas and the activities permitted in them are under review. Rockfish Conservation Areas, sponge reef closures and no take zones are distributed throughout Átl'ka7tsem/Txwnéwu7ts/Howe Sound (Figure 2).

What are the potential impacts of climate change on these fisheries?

Shrimp and other crustaceans are at medium risk from climate change largely due to their low mobility, meaning they are less able to move to more suitable areas, and their high dependency on environmental conditions for their life cycle.^{10,11} However, predicting the specific impact of climate change to prawn and shrimp stocks within Átl'ka7tsem/Txwnéwu7ts/Howe Sound and the Strait of Georgia is difficult.

Shrimp populations off the west coast of B.C. have been seen to decrease in number with increasing sea surface temperatures,¹² suggesting they prefer cooler water. Growth rates of similar shrimp species to those mentioned here have been closely linked with water temperature, with faster growth rates observed in cooler temperatures.¹³ As water temperature increases, possible negative impacts on a variety of

functions may be seen, including a reduction in the number of reproducing females, growth rates, developmental rates, egg production and larval survival of spot prawns.^{11,13} Thus, any increase in water temperature may be detrimental to shrimp and prawn size and stocks. Pink shrimp species are also experiencing a northward range expansion in the Canadian Pacific because of ocean warming.¹⁴ Additionally, more acidic conditions have been shown to result in delayed development of juvenile spiny pink shrimp.¹⁵

vii) Barotrauma – injury related to changes in pressure, caused by ascending too quickly to the water's surface.

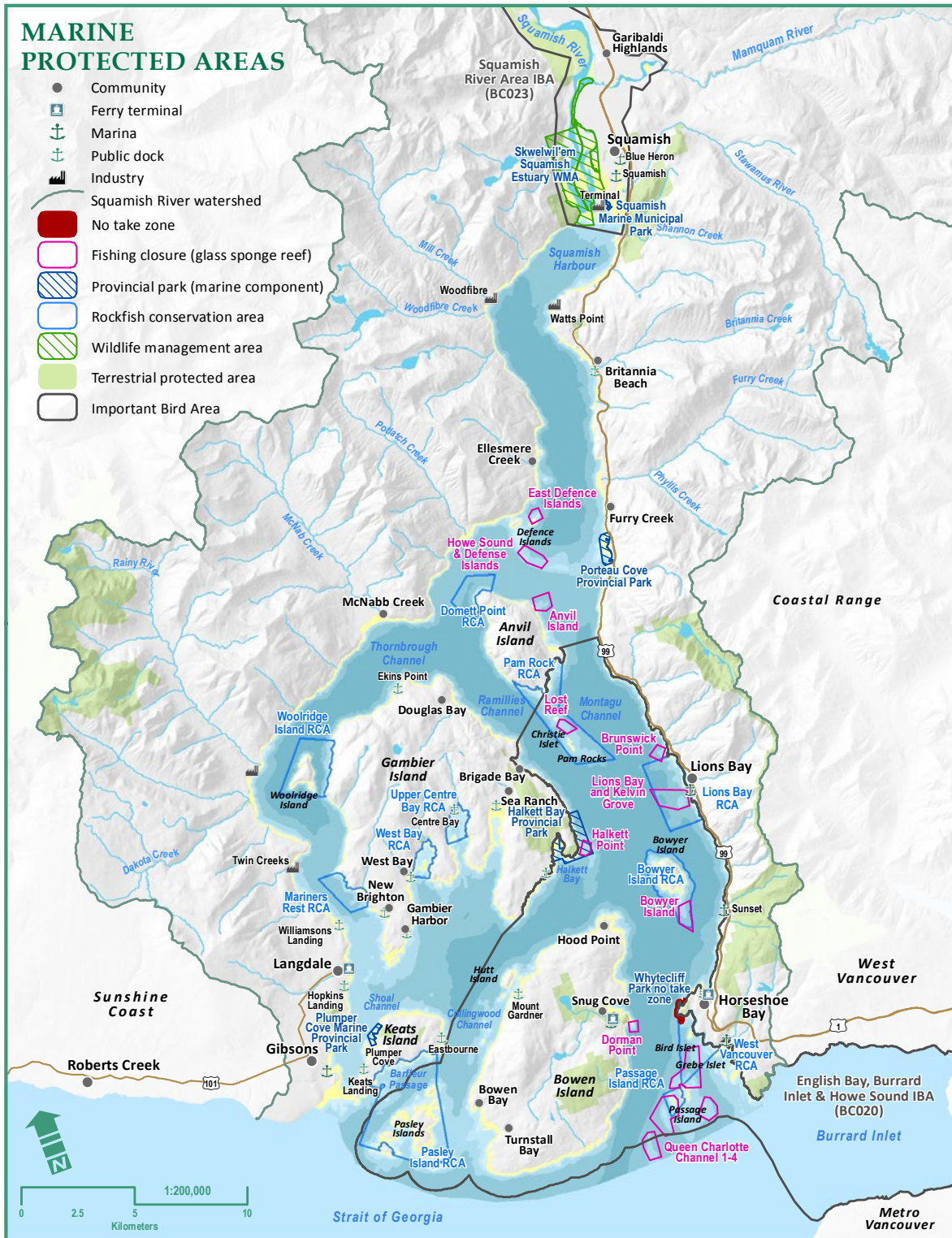


Figure 2. Rockfish conservation areas, glass sponge reefs and sponge reef fishing closures within Átl'ka7tsem/Txwnéwu7ts/Howe Sound.¹⁶

What has been done since 2017?

The table below reports on progress made on recommended actions from the previous 2017 article, where identified. Many of these require ongoing action.

2017 ACTION	ACTION TAKEN
INDIVIDUAL AND ORGANIZATION ACTIONS	
Use “rot cords” (a biodegradable escape mechanism) on your traps to allow bycatch to escape in the event traps are lost.	An amendment to the B.C. Sport Fishing Regulations will likely soon require a biodegradable escape mechanism, or “rot cord,” on all recreational prawn and crab traps, allowing bycatch to escape.
Make sure your buoys are clearly identified with your name.	This is now mandatory, along with a phone number or unique Fisher Identification Number (FIN). DFO is working towards adopting standardized buoys. Talks continue in 2019, in consultation with the Sports Fishing Advisory Board. When adopted, this will eliminate the use of Styrofoam and other plastic containers that break down and contribute to ocean plastic pollution.
Release prawns and shrimp that are carrying eggs under their tails (known as berried prawn and shrimp) as soon as possible at the fishing location.	As of April 2018, prawns with eggs are no longer allowed to be kept. This is in addition to seasonal closures in some areas during critical spawning and larval hatching times (January 1 to March 31). ³

2017 ACTION	ACTION TAKEN
GOVERNMENT ACTIONS AND POLICY	
<p>Expand sponge reef closures to include all sponge reefs and bioherms identified in Átl'ka7tsem/Txwnéwu7ts/Howe Sound, in accordance with the Sensitive Benthic Areas Policy.</p>	<p>The previous report detailed nine glass sponge reef areas where bottom contact fishing was prohibited (as of 2015) (see Prawn and Shrimp Fisheries, OWHS 2017). In March 2019, DFO formed eight marine refuge areas to encompass the nine additional glass sponge reefs placed under voluntary protection in 2017.³ DFO Fishery closures were implemented, which included all fishing activities likely to damage the reefs, including fishing activities for shrimp and prawn. Nine additional glass sponge reef areas in Átl'ka7tsem/Txwnéwu7ts/Howe Sound still require verification in order to determine their ecological importance.</p>
<p>Allocate more resources to enforcement of fishing regulations, including protected area closures.</p>	<p>The Pacific Prawn Fishermen's Association (PPFA) provides funding annually to DFO for enhanced enforcement; in 2018, \$29,000 was provided. At-sea observers in the prawn trap fishery conducted gear inspections and licence compliance checks (i.e., trap tagging, trap mesh size, buoy identification and logbook completion) on 80% of active vessels during the 2018 season along the B.C. coast.² Currently, DFO lists the investigation of illegal prawn sales as a top enforcement priority.³</p> <p>The PPFA received funding support to purchase and supply every commercial prawn vessel with a rockfish descender for the 2020 season.</p>

What can you do?

A detailed overview of recommended actions relating to climate change is included in *The path to zero carbon municipalities* (OWHS 2020). In some cases, no progress was identified on previous recommended actions; these remain listed below. Additional actions marked as **NEW** also follow.



Individual and Organization Actions:

- Make sure your licence is up to date and comply with catch limits when you are sport fishing.
- Keep your traps away from sensitive areas including sponge reefs, bioherms, and RCAs.
- Release live catch (i.e. bycatch) in waters where caught.
- Report any gear theft and the theft of catch from traps to the police.
- Report accurate fishing activity and catch to DFO when requested to do so.
- **NEW** Carry a rockfish descender when fishing within Átl'ka7tsem/Txwnéwu7ts/Howe Sound, and if accidental bycatch of rockfish occurs, make sure to release it back to the depth caught within two minutes.
- **NEW** Choose to buy Ocean Wise recommended shrimp and prawn.



Government Actions and Policy:

- **NEW** Verify the remaining glass sponge reefs and set up marine refugia and associated fisheries closures.
- **NEW** Establish citizen enforcement officers throughout the Sound, who are granted limited enforcement powers, such as checking catch size, species, and fishing method, and handing out fines for fisheries infringements.

Methods

Information and data were obtained from the DFO website (i.e., fishery notices, Integrated Fisheries Management Plans,³⁻⁶ Sport Fishing Guides); from personal communication with DFO staff who provided Shrimp Survey Bulletins² and unpublished data; and from members of the Pacific Prawn Fishermen's Association.

PRE-SEASON FORECASTS

A five-year running average model is used to forecast shrimp stock size within SMAs with ongoing surveys. This is used to set an initial catch ceiling, which can then be modified with data collected from in-season surveys. SMAs with no survey history have catch ceiling.

ings calculated from 10th or 25th percentile^{viii} of the pre-1997 catch history.³

IN-SEASON SURVEYS

DFO monitors prawn trap fishing vessels in real time and uses this information to deploy at-sea-observers. In the 2018 season, 186 of the 205 active fishing vessels were sampled coast wide. This equated to a total of 2,177 strings, 54.4 strings/fishery day, and a total of 468 person-days of direct monitoring. Átl'ka7tsem/Txwnéwu7ts/Howe Sound has been identified as one

of the priority areas of interest, and therefore sampling commences early. The commercial fishery for prawns in Átl'ka7tsem/Txwnéwu7ts/Howe Sound in 2018 lasted 36 days, with portions of the area closed earlier based on sampling. In 2018, Pacific Fishery Management Area subarea 28-2 in Átl'ka7tsem/Txwnéwu7ts/Howe Sound closed after 12 days, 28-3 after 26 days, 28-1 after 29 days and 28-4,5 after 36 days.¹⁷ Coastwide, the longest an area was open for was 40 days in 2018. In-season closures of subareas are implemented on three days' notice.^{3,4}

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viii) 10th percentile – larger than 10% of the datapoints; 25th percentile – larger than 25% of the datapoints.