

Dragnetting Coastal Communities

The case for transparency and economic reform in B.C.'s trawler fishery



PACIFIC WILD

A SPECIAL WHITE PAPER PROJECT OF PACIFIC WILD ALLIANCE

BY FELIX MORROW WITH FOREWORD BY DR. BRYCE J. CASAVANT | JANUARY 2023



COPYRIGHT INFORMATION

©Pacific Wild Alliance (2023)
1529 Amelia Street
Victoria, B.C. V8W 2K1
Canada

All rights reserved.

ISBN: 978-1-7752195-3-8

SUGGESTED CITATION FORMAT

Pacific Wild Alliance (2023). *Dragnetting coastal communities: The case for transparency and economic reform in B.C.'s trawler fishery* [policy white paper]. Victoria, B.C.: Pacific Wild.

ALTERNATIVE CITATION FORMAT

Morrow, F. (2023). *Dragnetting coastal communities: The case for transparency and economic reform in B.C.'s trawler industry*. Casavant, B, McAllister, K, & Dixon, S. (Eds). Victoria, B.C.: Pacific Wild Alliance.

ONLINE VERSION

To download the online version, please visit
pacificwild.org/dragnetting-coastal-communities

PRINTING

Printed in Canada on 100% recycled FSC-certified paper.

ACKNOWLEDGEMENTS

This white paper was commissioned by Pacific Wild Alliance. Pacific Wild Alliance is a registered Canadian environmental charity focussing on the protection and conservation of marine and terrestrial ecosystems. The authors are grateful for the preliminary and detailed work of Ecotrust Canada and the various publications of the Standing Committee on Fisheries. We acknowledge the detailed works of the many scholars who have previously engaged on trawler fishery concerns in British Columbia. We note specifically the David Suzuki Foundation and the work of the Cullen Commission on money laundering in British Columbia.

CREDITS

All photos by Ian McAllister unless otherwise noted.
Report design by Geoff Campbell.

QUESTIONS AND COMMENTS

Questions regarding this project or suggestions for future content, revisions, and updates may be submitted to:

Correspondence – Dragnetting Coastal Communities
Pacific Wild Alliance, Canada
1529 Amelia Street
Victoria, B.C. V8W 2K1
Canada

Email: info@pacificwild.org
Phone: +1 250-380-0547

Table of Contents

6	FOREWORD
8	INTRODUCTION
9	TRAWLING'S ECOLOGICAL IMPACT
13	TRAWLING IMPACTS ON CLIMATE CHANGE IN B.C.
16	B.C. FISHERIES
23	A LACK OF TRANSPARENCY
24	THE B.C. FLEET
27	CONCLUSIONS AND POLICY RECOMMENDATIONS
28	REFERENCES



“Trawling is a highly efficient method of producing profit for large fishing firms but does not achieve the social and environmental objectives that Fisheries and Oceans Canada is explicitly expected to consider.”

— DR. BRYCE J. CASAVANT

Director, Conservation Intelligence, Pacific Wild Alliance

Foreword



A trawling vessel operating on Canada's Pacific Ocean.

This white paper (the “report”) is intended as a descriptive policy analysis relating to the trawler fishery in British Columbia (B.C.). The discussions compiled herein review open-source information pertaining to records and holdings of the commercial trawler fleet in B.C.. Further, original public opinion survey data commissioned by Pacific Wild Alliance (2022) is discussed.

It is noted, during the background research for this report, the authors were refused certain records through the federal freedom of information process. This matter is currently subject to appeal through the office of the information commissioner and will be reported on later. In the authors’ view, such refusal underscores the primary importance of this report’s general findings and discussions.

As core concerns, the report finds an over-commercialisation and capitalisation of trawler licences and fishing quota in B.C.. The local impacts of over-commercialisation (on coastal communities and individual fishers) are then compounded by a general lack of transparency and accountability in the B.C. trawler fishery.

The practical result of increasing corporate interest and consolidation (in ownership of the B.C. trawler fishery) is an erosion of the livelihoods of our coastal fishers and collapsing economic opportunities for coastal B.C. communities. This is especially salient in coastal Indigenous communities, which are shown to suffer a disproportionate rate of economic impact. This erosion of coastal livelihoods and local economies is highlighted by a comparison between the reduction in fishers’ wages over time and the increasing values of product, licences, and corporate marine asset ownership as speculative assets.

This report highlights unsatisfactory transparency in the industry and raises serious questions regarding ongoing environmental and marine ecosystem harms, as well as the ability to identify otherwise potentially illegal fishing activities or non-compliant corporate behaviours.

Recent public opinion polling conducted by Research Co. (2022) (commissioned by Pacific Wild Alliance) shows the Canadian public broadly, and B.C. more narrowly, do not completely trust the federal government's management of the trawler fishery. Further, on this single issue of trawling and regardless of political affiliations or past voting practices, members of the public may be willing to change their voting behaviours to align with a policy platform that brings more transparency and accountability to the trawler fishery — notably through the implementation of an outright prohibition on the fishery practice. This highlights the critical importance of policy reform within the management of B.C.'s trawler fishery (Pacific Wild, 2022).

The authors note reference made to the *Cullen Commission*'s recent work on money laundering in B.C. and the similarities between real estate speculation and the use of trawler licences as speculative assets for foreign and corporate holdings. The Commission referred to the trawler fishery in B.C. and made identifying remarks about a single company and owner. The authors here maintain those concerns while noting that the structure of the trawler fishery allows for such loopholes to exist. As such, mere ownership of fishery assets (speculative or not) is not *illegal* per se — barring any identifiable non-compliant individual or corporate behaviours.

The result of treating fishery licences and quotas as speculative assets has been the value of the fishery, on paper, skyrocketing. As an example, fishery assets in B.C., in 2003, reached \$1.8 billion in total value. Of that \$1.8 billion, 14% were vessels and fishing equipment and 86% were licences and quotas. Quotas and licences have highly inflated values which prevent entry into the fishery except by people or firms with considerable financial resources — often foreign entities.

Trawling is a highly efficient method of producing profit for large fishing firms but does not achieve the social and environmental objectives that Fisheries and Oceans Canada is explicitly expected to consider. For free markets to function, access to capital needs to be relatively equal, information freely available, and economic transactions transparent. As this report shows, B.C. has none of these conditions in the trawler fishery.

The continual releasing of the market on environmental and economic problems in B.C.'s fisheries has led to the most powerful economic actors assuming an ever-greater share of the market while small-scale fishers and processors have withered — often disproportionately affecting Indigenous fishers and communities. Various fishery management policies and practices have allowed speculative investors to realize large economic rents while simultaneously downloading risk and operational costs onto fishers, and by extension small coastal communities. This report therefore renews and amplifies previous calls for increased transparency and economic reform of B.C.'s trawler fishery.

A significant increase in transparency is a fundamental component of the policy changes needed. Environmental impact data, including onboard observer reports, should be made publicly available. Both environmental impact data and ownership information can be incorporated into a searchable database that allows the environmental and financial records of companies operating in B.C. fisheries to be openly searched.

A failure to adopt policy reform in B.C.'s trawler industry is expected to contribute to large voter swings, especially in British Columbia. Individual fishers, coastal communities, and Indigenous peoples are feeling the impacts of poor fishery management practices. This is reflected in economic data as well as public opinion surveys.

A large majority of Canadians and British Columbians are concerned with the various impacts bottom trawling has on the environment. Over a quarter of Canadians would vote

for a political party that considered a trawling ban in its platform. 37% of British Columbians would do the same, regardless of past voting preferences. Significant percentages of the voter base in all major political parties express levels of concern about the trawler industry — our public servants and politicians should do the same. Sound management practices would consider the concerns Canadians and British Columbians have expressed.

Dr. Bryce J. Casavant
*Director, Conservation Intelligence
Pacific Wild Alliance*





Trawling has a high rate of bycatch and severely impacts ecosystems.
Photos: Anonymous

Introduction

Trawling is a contentious topic in discussions of fisheries management, economics, and conservation. The technique involves dragging a large net either along the seabed (bottom trawling) or a suspended seine net (midwater trawling), though the water. Due to bottom trawling's severe ecological impacts, the practice has been substantially restricted in multiple jurisdictions around the world including two of B.C.'s neighbors, specifically, Alaska¹ and Washington State.² B.C. has not followed suit despite trawling's high rate of bycatch and severe impact on ecosystems.³

Fishing is a central part of B.C.'s economy with harvesting, fish processing, and aquaculture. Fishing employed 9,722 people in 2020⁴ and, in 2018, extracted 266,800 metric tons (mt) of seafood products valued at a projected \$1.814 billion in wholesale value. B.C.'s ground fisheries accounted for 141,600 mt, or 48%, of landed catch while only accounting for 16% (\$284.5 million) of landed value. Groundfish targeted include hake, halibut, rockfish, arrowtooth flounder, pollock, and lingcod.⁵ Groundfish are primarily caught through trawling, which typically accounts for 90 to 95% of the landed volume of groundfish annually.⁶

Federal fisheries policies and management practices have had negative impacts on B.C. fishers and coastal communities. As this report discusses further, federal fisheries policies and management practices have resulted in long-run processes of economic consolidation and the exploitative practice of quota leasing. This report will review the major policies that have led to the worsening economic position of fishers and coastal communities in B.C. including: the Davis Plan (1968), fleet rationalization (1982), and the Mifflin plan (1996). A severe lack of transparency in the B.C. fishing industry is a consistent theme throughout this report.

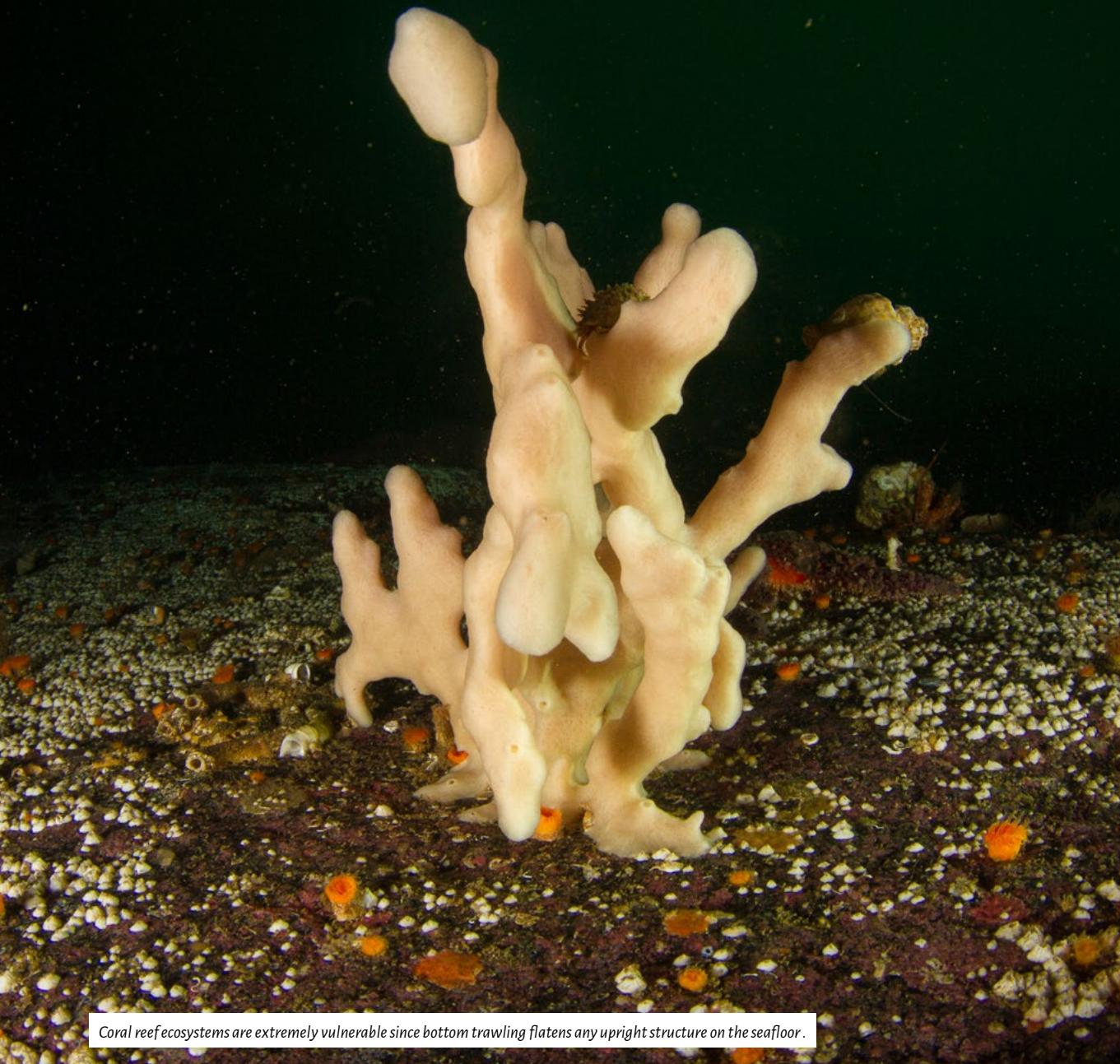
This report argues that fisheries in B.C. need to be reorganized to serve the interests of fishers and coastal communities. Further, that trawling should be phased out due to

its severe ecological effects. The discussions here highlight an immediate need for increased transparency and accountability in the policies and management practices of B.C.'s trawler fishery.

REFERENCES AND FURTHER READING

- ¹ Anna Baxter, "Largest Area of Ocean in the World Saved From Destructive Bottom Trawling," Oceana, 2009, <https://oceana.org/press-releases/largest-area-ocean-world-saved-destructive-bottom-trawling/>.
- ² Craig Welch, "Coral Concerns Spur Vast Trawling Ban," *The Seattle Times*, 2005, <https://www.seattletimes.com/seattle-news/coral-concerns-spur-vast-trawling-ban/>.
- ³ Scott Wallace, "Dragging Our Assets: Towards and Ecosystem Approach to Bottom Trawling in Canada" (David Suzuki Foundation, 2007), 4–8, <https://davidsuzuki.org/science-learning-centre-article/dragging-our-assets-toward-an-ecosystem-approach-to-bottom-trawling-in-canada/>.
- ⁴ "Fishing-Related Employment by Industry and Province, 2017–2020," Fisheries and Oceans Canada, 2022, <https://www.dfo-mpo.gc.ca/stats/cfs-spc/tab/cfs-spc-tab2-eng.htm>.
- ⁵ "British Columbia Seafood Industry: Year in Review 2018.," Government Report (Ministry of Agriculture and Food, 2018), <https://www2.gov.bc.ca/gov/content/industry/agriculture-seafood/statistics/agriculture-and-seafood-statistics-publications>.
- ⁶ "Pacific Region: Integrated Fisheries Management Plan Groundfish" (Fisheries and Oceans Canada, 2022), <https://www.pac.dfo-mpo.gc.ca/fm-gp/ifmp-eng.html>.

Trawling's Ecological Impact



Coral reef ecosystems are extremely vulnerable since bottom trawling flattens any upright structure on the seafloor.

Bottom trawling is a fishing technique that involves dragging a large, weighted net behind fishing vessels (often large ships). The technique is “non-selective,” meaning that it does not allow specific species to be targeted.⁷ Bottom trawling is responsible for a variety of severe and interconnected ecological problems including high rates of bycatch, habitat destruction and disruption, sediment resuspension, increased oxygen demand in ecosystems, and disrupted food chains. These symptoms of bottom trawling lead to a loss of abundance in marine ecosystems and leave deep ecological scars that are slow to heal. Put simply, “the scientific consensus is clear: bottom trawls are the most damaging type of fishing to benthic populations, communities, and habitats”⁸ (benthic refers to the bottom of a body of water).

An often publicly discussed symptom of trawling is bycatch. Bycatch occurs when non-target species are caught. A report from Fisheries and Oceans Canada (2007) states that an average tow recorded by onboard observers caught between 12 and 20 species.⁹ Non-target species caught in the wake of trawl nets suffer high mortality rates. For example, sea stars are estimated to decline 10 to 30%, molluscs 10 to 50%, and crabs 40 to 60%.¹⁰ These findings are consistent with another study that found between 20 and 50% of benthic invertebrates caught in the path of trawl nets are killed. Larger species, which are often predators, have a higher mortality rate from negative interactions with fishing gear as, due to their typically larger size, they are more likely to be caught or tangled.¹¹

Bycatch is often associated with the discarding of non-target species. Common explanations for discarding include: the species caught has a low economic value, the associated costs of landing the species (e.g., sorting, storage, and processing), and limited storage space either onboard or



Figure 1. Bottom trawling causes damage to habitats by dragging heavy nets across the seafloor. Illustration: Geoff Campbell

onshore.¹² It is important to note that B.C. does impose “trip limits” on bycatch (a cap on how many non-target species can be caught). For B.C.’s groundfish trawl, there is a bycatch mortality cap of 454 mt imposed on vessels. Further, caught non-target species cannot be kept by fishers.¹³ Despite these measures, discarding remains prevalent with estimates in a 2009 report by Oceana Canada indicating that groundfish trawling in the province has a 23% discard rate.¹⁴

A further significant environmental harm of trawling is habitat destruction and disruption. Bottom trawling causes damage to habitats by dragging heavy nets across the seafloor (figure 1). Abrasion from trawl nets causes different kinds and severities of impacts depending on the ecosystem trawling is occurring in. Trawling is destructive to both hard and soft-bottom ecosystems. Notable hard-bottom ecosystems include coral reefs, kelp forests, and seagrass meadows. Soft-bottom ecosystems primarily include soft-sediment habitats.¹⁵ Trawling a coral reef, or any ecosystem for that matter, is destructive because “bottom trawling flattens any upright structure on the seafloor.”¹⁶ This is pertinent to the B.C. context because the province is home to over 80 species of corals that occupy both shallow and deep waters.¹⁷ Impacts on coral reefs are particularly acute. Coral reefs, when intact, provide hiding places for lower trophic-level species and food sources in the form of plants and prey to species at every level of the food chain. Reliance on these features of coral reef ecosystems can be seen in the association between healthy coral reefs and higher levels of abundance of marine species.¹⁸ As a 2009 Oceana report summarizes: “Trawling is the single largest threat to slow-growing seafloor animals such as corals and sponges, and is likely to cause widespread ecological changes and reductions in the diversity of life at all depths.”¹⁹ Making the situation worse, coral reefs can be destroyed much faster than they can recover.²⁰ In the B.C. context, while there are protections that prevent trawling on many coral reefs, there are still vulnerable coral reefs which are allowed to be trawled.²¹ Endangered glass sponge species are particularly vulnerable to trawl nets.

Soft-sediment habitats also suffer severe negative impacts from trawling. It is common for species in soft-sediment habitats to rely on burrowing in the seafloor. Dragging trawl nets over these environments causes changes in sediment particle size, increases the pace sediment particles are resuspended, and affects chemical balances. These impacts cause changes in ecosystem dynamics that lead to population decline in animals like scallops (70%) and anemones and fan worms (20-30%)²² (figure 2). The resuspension of sediment particles leads to ecosystems having less exposure to sunlight, which reduces the amount of available energy.²³ Trawling doubly impacts marine plants through the lethal combination of reduced sunlight and being bulldozed by trawl nets. Further, trawl nets create deep grooves/trenches in the seafloor that expose resident organisms to greater risk from predators.²⁴

Sediment resuspension causes more problems than merely reducing sunlight exposure. First, trawling decreases the amount of dissolved oxygen by mixing it with methane and hydrogen sulfide. Second, the resuspension of sediment also resuspends bacteria from the seabed leading to increased oxygen demand in water columns. Oxygen availability is further depleted by sediment clouds created in the wake of trawl nets that alter the natural chemical balances of ecosystems. Further, sediment resuspension can also lead to contaminants being flushed out of the seabed. This subsequently results in lethal gases like ammonia, methane, and hydrogen sulfate being released into the ecosystem.²⁵ As an international example, “chronically trawled” soft-sediment regions along the continental slope of the Mediterranean Sea have seen a “significant decrease in organic matter.” Over the long term, the practical result of such situations is lower quality food being available to benthos —this, in turn, negatively affects ecosystem productivity (the rate at which new biomass is generated).²⁶

It can be generally argued that trawling disrupts food chains on a macro level. As discussed above, trawl nets select for larger species, which are typically predators. This warps the trophic structure of ecosystems as predators are removed

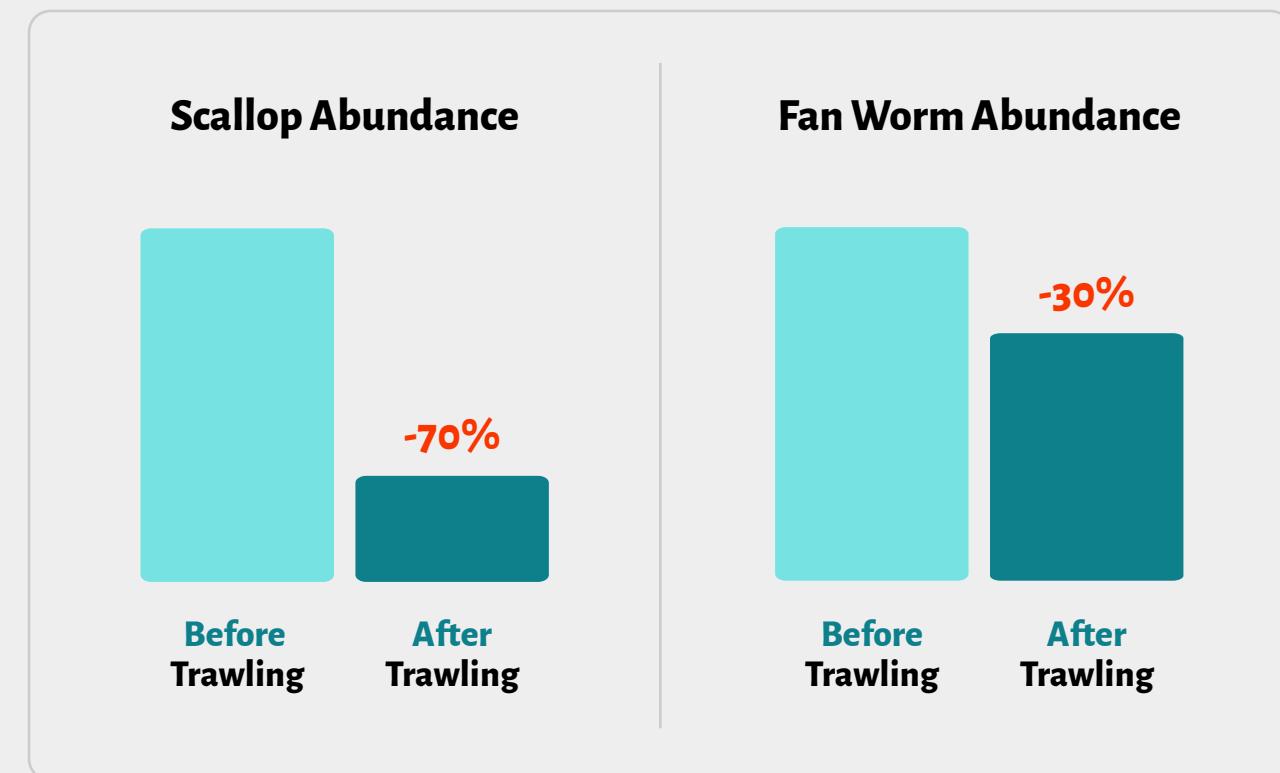


Figure 2

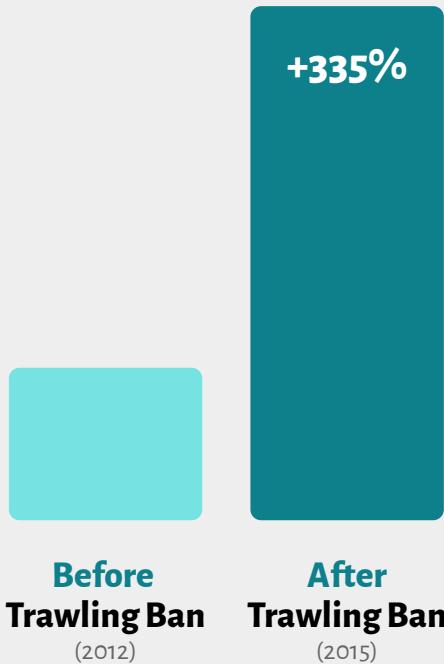
at a higher rate than prey. An important caveat to this impact is limited data on what the natural balance of ecosystems actually is. This data gap occurs because benthic habitats around the world have been extensively fished for centuries. As a result, available data represents less-fished ecosystems, not unfished ecosystems.²⁷ The decline of predators can lead to an increase in the abundance of prey. This is tied to reductions in predator populations and increased opportunities to scavenge for food due to bycatch discarding. Temporary increases in food availability are typically enjoyed by pelagic species (those residing between the surface and seafloor) as they can easily scavenge but are at a lower risk of negative interactions with trawl nets. As a result, trawling can have an asymmetrical effect

on abundance with some species seeing severe decline at the same time others see increased abundance.²⁸ That said, as Collie et al. note, “the negative effects of bottom trawling on target fish species outweigh the positive effects.”²⁹ In sum, trawling creates significant changes in the structure of food chains, thus creating imbalanced ecosystems.

The cumulative effects of trawling are summed up by Collie et al.’s literature review that estimates, based on an aggregation of data from 33 studies, that a single tow causes an average 55% reduction in abundance of animals in the trawled area. When specific species were considered, trawling was estimated to lead to upwards of 68% reduction in abundance of anemones, urchins, gastropods, ophiuroids,

Overall Marine Abundance

(Hong Kong Waters)



Carnivore Marine Abundance

(Hong Kong Waters)

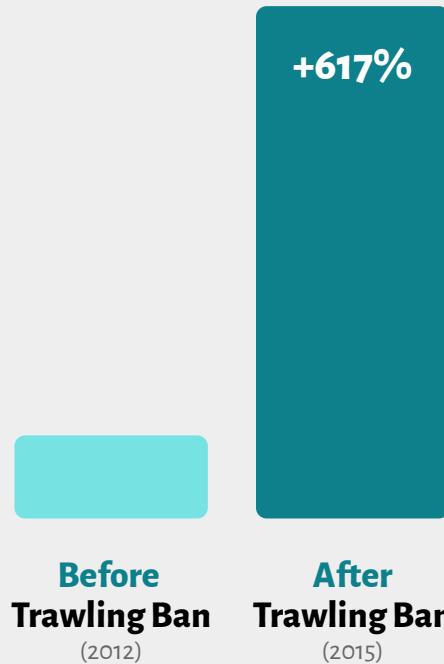


Figure 3

and malacostracans; and a 21% reduction in the abundance of sea stars, bivalves, sponges, and polychaetes.³⁰ Further, Hiddink et al. estimates that trawling in the North Sea has led to a 56% reduction in benthic community biomass in trawled ecosystems. This finding is consistent with Collie et al's study.³¹ More recently, a study of the Gulf of Alaska found that large sponge density decreased 21.1% in ecosystems one year after being trawled.³²

That said, there is a way forward that does not create conflict between the economy and the environment. Research by Wang et al. found that Hong Kong's trawling ban led to significant increases in abundance of marine populations. Their study compared data from 28 sites when they were trawled in 2012 and three years after the practice was banned in 2015. Average abundance increased 335% (figure 3) and the average number of observed species rose from 27.5% to

48.3%. Positive effects were universally observed in collectors, burrowers, carnivores, surface deposit feeders, omnivores, and suspension feeders. Consistent with previously discussed data, carnivores saw a dramatic 617% increase in abundance (figure 3). The authors conclude by recommending the use of trawling bans as an effective measure for benthic ecosystem rehabilitation. An important jurisdictional difference between Hong Kong and B.C. is that trawling represented 80% of fishing in Hong Kong³³ compared to only 48% (2018 data) in B.C..³⁴ Nonetheless, the remarkable rate of recovery in Hong Kong's fishery indicates that a ban or severe restriction of trawling in B.C. would have a positive effect on the health of B.C.'s marine ecosystems and therefore the abundance of fish stocks in B.C..

REFERENCES AND FURTHER READING

- ⁷ "An Overview of Bottom Trawling in Canada," Pacific Wild, 2021, <https://pacificwild.org/an-overview-of-bottom-trawling-in-canada/>.
- ⁸ Scott Wallace, "Dragging Our Assets: Towards an Ecosystem Approach to Bottom Trawling in Canada," v.
- ⁹ "West Coast Queen Charlotte Islands Groundfish Bottom Trawl Survey, September 11th to October 17th, 2007" (Nanaimo, BC: Fisheries and Oceans Canada, 2008), 6, <https://waves-vagues.dfo-mpo.gc.ca/library-bibliotheque/40757791.pdf>
- ¹⁰ Paul K. Dayton et al., "Environmental Effects of Marine Fishing," *Aquatic Conservation* 5, no. 3 (1995): 211, <https://doi.org/10.1002/aqc.3270050305>.
- ¹¹ Jeremy Collie et al., "Indirect Effects of Bottom Fishing on the Productivity of Marine Fish," *Fish and Fisheries (Oxford, England)* 18, no. 4 (2017): 19–22, <https://doi.org/10.1111/faf.12193>.
- ¹² A. Biju Kumar and G. R. Deepthi, "Trawling and By-Catch: Implications on Marine Ecosystem," *Current Science (Bangalore)* 90, no. 7 (2006): 922.
- ¹³ "Pacific Region: Integrated Fisheries Management Plan Groundfish."

- ¹⁴ John Driscoll, Carrie Robb, and Karin Dotker, “Bycatch: In Canada’s Pacific Groundfish Bottom Trawl Fishery” (Oceana Canada, 2009), 6, https://www.livingoceans.org/sites/default/files/bycatch_BC_Bottom_Trawl_Fishery_0.pdf
- ¹⁵ Simon F. Thrush and Paul K. Dayton, “Disturbance to Marine Benthic Habitats by Trawling and Dredging: Implications for Marine Biodiversity,” *Annual Review of Ecology and Systematics* 33, no. 1 (2002): 450, <https://doi.org/10.1146/annurev.ecolsys.33.010802.150515>.
- ¹⁶ Margot L. Stiles et al., “Impacts of Bottom Trawling on Fisheries, Tourism, and the Marine Environment” (Oceana, 2010), <https://oceana.org/reports/impacts-bottom-trawling-fisheries-tourism-and-marine-environment/>.
- ¹⁷ Fisheries and Oceans Canada, “Cold Water Corals and Sponges,” 2018, <https://www.dfo-mpo.gc.ca/oceans/publications/soto-rceo/2012/page07-eng.html>.
- ¹⁸ F. Althaus et al., “Impacts of Bottom Trawling on Deep-Coral Ecosystems of Seamounts Are Long-Lasting,” *Marine Ecology Progress Series (Halstenbek)* 397, (2009): 287, <https://doi.org/10.3354/meps08248>.
- ¹⁹ “Deep Sea Life: On the Edge of the Abyss” (Oceana, 2009), 16, <https://oceana.org/reports/deep-sea-life-edge-abyss> [emphasis added].
- ²⁰ Althaus et al., “Impacts of Bottom Trawling on Deep-Coral Ecosystems of Seamounts Are Long-Lasting,” 284.
- ²¹ Scott Wallace et al., “Canada’s Pacific Groundfish Trawl Habitat Agreement: A Global First in an Ecosystem Approach to Bottom Trawl Impacts,” *Marine Policy* 60, (2015): 246, <https://doi.org/10.1016/j.marpol.2015.06.028>.

- ²² Thrush and Dayton, “Disturbance to Marine Benthic Habitats by Trawling and Dredging: Implications for Marine Biodiversity,” 459.
- ²³ Collie et al., “Indirect Effects of Bottom Fishing on the Productivity of Marine Fish,” 626.
- ²⁴ Kumar and Deepthi, “Trawling and By-Catch: Implications on Marine Ecosystem,” 924.
- ²⁵ Kumar and Deepthi, 925.
- ²⁶ Collie et al., “Indirect Effects of Bottom Fishing on the Productivity of Marine Fish,” 626–27.
- ²⁷ Dayton et al., “Environmental Effects of Marine Fishing,” 216.
- ²⁸ Collie et al., “Indirect Effects of Bottom Fishing on the Productivity of Marine Fish,” 622–33.
- ²⁹ Collie et al., 633.
- ³⁰ Jeremy S. Collie et al., “A Quantitative Analysis of Fishing Impacts on Shelf-Sea Benthos,” *The Journal of Animal Ecology* 69, no. 5 (2000): 790–92, <https://doi.org/10.1046/j.1365-2656.2000.00434.x>.
- ³¹ J. G. Hiddink et al., “Cumulative Impacts of Seabed Trawl Disturbance on Benthic Biomass, Production, and Species Richness in Different Habitats,” *Canadian Journal of Fisheries and Aquatic Sciences* 63, no. 4 (2006): 733, <https://doi.org/10.1139/f05-266>.
- ³² Patrick Malecha and Jonathan Heifetz, “Long-Term Effects of Bottom Trawling on Large Sponges in the Gulf of Alaska,” *Continental Shelf Research* 150, (2017): 22–23, <https://doi.org/10.1016/j.csr.2017.09.003>.
- ³³ Zhi Wang et al., “Recovery of Tropical Marine Benthos after a Trawl Ban Demonstrates Linkage between Abiotic and Biotic Changes,” *Communications Biology* 4, no. 1 (2021): 1–8, <https://doi.org/10.1038/s42003-021-01732-y>.
- ³⁴ “British Columbia Seafood Industry: Year in Review 2018.”

Trawling Impacts on Climate Change in B.C.

Marine ecosystems have a vast capacity to sequester and store carbon dioxide (CO₂), which is critical in the fight against climate change. Globally, seagrass meadows, salt marshes, and mangroves (B.C. does not have mangroves) sequester and store an amount of CO₂ equivalent to the world’s forests,³⁵ yet account for 70% of the carbon storage and capture capacity of the world’s oceans (despite covering only 0.2% of the ocean’s surface).³⁶ Economically, these rich biodiverse areas provide “ecosystem services” valued between US\$6 and US\$42 billion (2007 US\$). This figure only reflects the value markets place on emissions reductions. When the full value of ecosystem services is considered, the estimated value increases to a figure between US\$7 and US\$81 billion. This larger figure reflects the costs of protecting and managing ecosystems, maintaining water quality, and lost economic opportunities caused by ecosystem decline.³⁷ A similar study that examined the value of ecosystem services provided by the North Atlantic Ocean estimated that the total value provided, between 2010 and 2099, will be between US\$170 billion to US\$3 trillion. This projection accounts for what it would cost to mitigate the emissions sequestered by these ecosystems through alternative means and the social costs of ecological decline and collapse.³⁸

Another central aspect of the carbon sequestration is phytoplankton. Globally, phytoplankton are estimated to fix between 30 and 50 gigatons of carbon annually, which amounts to approximately 40% of total carbon fixation. Carbon fixation is the process through which inorganic CO₂ is converted into organic matter.³⁹ Further, phytoplankton form the base of marine food webs meaning that their decline will have impacts felt across ecosystems and trophic levels.⁴⁰ Un-

fortunately, phytoplankton are negatively impacted by ocean acidification,⁴¹ to which bottom trawling contributes.⁴²

In the B.C. context, the province's approximate 745 km² of estuaries, salt marshes and seagrass meadows, sequester 180,200 metric tons (mt) of CO₂ every year. A mere 400 km² (53%) of B.C.'s estuaries have the same carbon storage capacity as B.C.'s entire segment of the boreal forest and sequester an amount of carbon equivalent to the annual emissions of 200,000 passenger vehicles. Despite the critical importance of these ecosystems, only 13.5% of B.C.'s estuaries are protected. Further, the world's estuaries are disappearing at an alarming rate (2 to 15 times faster than forests) with one-third of global estuaries disappearing in the past sixty years alone.⁴³ Additionally, B.C.'s 190 km² of kelp forests sequester an estimated 7,775 mt of CO₂ annually. This equates to the annual emissions created by heating 3,900 B.C. homes with natural gas. Further, the carbon sequestration of kelp forests, in conjunction with winter storm cycles, transports sequestered carbon to deep sea sediments which are much more resilient to sediment disruptions that cause stored CO₂ to be released.⁴⁴

Seabed sediments face a wide range of human pressures including shipping, fishing, construction, and trawling. Although estuaries are not "trawled" per se, the industrial practice of trawling does directly impact B.C.'s estuaries and kelp forests. This is evidenced by trawling's significant contribution to the primary marine ecosystem threats of rising marine temperatures and increasing ocean acidification:⁴⁵ actions that disrupt sediments, thereby releasing stored organic carbon (OC).⁴⁶ Seabed sediments hold an immense amount of OC, with the top five centimetres alone containing an estimated 44 to 130 gigatons of OC — one gigaton being equivalent to one billion metric tons.⁴⁷ It can be argued that the ocean is one of the earth's largest carbon sinks, storing between 700 and 1000 gigatons of OC with over 37,000 gigatons in intermediate and deep sea regions. For comparison, the atmosphere only holds an estimated 780 gigatons of CO₂.⁴⁸

By disturbing marine sediments, bottom trawling emits a significant amount of CO₂, releasing an estimated 0.58 to 1.47 gigatons each year purely through the disruption of ocean sediments — an equivalent or greater amount of annual CO₂ emissions than the entire aviation industry. As regions are repeatedly trawled, OC is released, decreasing the amount stored in sediments. Regions that are continuously trawled for nine years are projected to have their annual emission stabilize at 40% of initial emissions. As a result, the 1.47 gigaton figure reflects trawling in areas that still have large carbon stores and the 0.58 figure reflects trawling in regions with depleted carbon stores. These emissions represent between 15 and 20% of the CO₂ absorbed by the oceans each year meaning that trawling is not only destroying ecosystems with carbon sequestration capacity but also offsetting the ecological benefits they presently provide.⁴⁹

These underwater CO₂ emissions not only intensify climate change but also have "far-reaching and complex effects" on marine ecosystems as they warp carbon cycles, reduce marine productivity (the rate new biomass is created), reduce biodiversity, and drive ocean acidification.⁵⁰ Ocean acidification is a particularly acute problem that is being driven by both trawling's underwater CO₂ emissions and emissions generally. Ocean acidification will reduce the ability of marine organisms to biocalcify. Biocalcification is the process through which sea life forms shells and calcareous (calcium-based) skeletons and is how corals grow and thrive. Undermining these processes negatively impacts a wide range of organisms including plankton species that build calcareous shells, corals, crustaceans, and sea urchins. Further, organisms that are able to adapt to harsher conditions will also be hurt as their shells and skeletons will be weaker and require more energy to grow and maintain.⁵¹ Non-calcifying plankton are negatively impacted as acidification has been found to cause diatoms to reduce in size and develop less resilient cell walls which leads to increased CO₂ levels in ecosystems and longer blooms.⁵²

In the B.C. context, ocean acidification will have a wide

range of negative impacts. Specifically, ocean acidification is predicted to cause ecosystem changes that will critically impact juvenile fish; undermine B.C.'s prawn fishery by hampering biocalcification processes; warp hunting and foraging behaviors of fish across trophic levels; and reduce salmon production, wild caught and farmed, due to an increase in the frequency of lethal algae blooms. Trawling, while not the only driver of ocean acidification, is a significant contributor to these harms.⁵³

Trawling also emits CO₂ through the usage of fossil fuels to power vessels. Despite global fishery yields consistently decreasing since the 1990s, the fuel usage of industrial fishing fleets have continually increased, rising from 39 million tons of CO₂ in 1950 to 159 million tons in 2016.⁵⁴ In terms of industrial fishing techniques, bottom trawling has by far the greatest emissions tied to fuel usage and is estimated to emit 2.8 times more than non-trawl fishing gear.⁵⁵ While these emissions contribute to ocean acidification less directly than underwater emissions, they should not be understated as the oceans absorb roughly 30% of anthropogenic CO₂ emissions.⁵⁶

Further, the heat waves and temperature increases that are being caused by climate change have direct negative effects on the health of marine ecosystems and sea life. Globally, rising temperatures are projected to cause an average 3.6% decline in marine biomass every decade. In the worst case scenario (no emissions mitigation), extreme temperatures are projected to cause an annual 6% decline in potential catch and a 77% decrease in the biomass of exploited species.⁵⁷ Trawling, by being a major emitter, is directly contributing to these harms.

A central theme of this white paper is an apparent lack of transparency and accountability in the trawl fishery, broadly speaking. Presently, publicly available data relating the climate and ecological impacts of B.C.'s groundfish trawler fishery is limited, dated, or absent in numerous areas. These limitations on available information result in further concerns about Canada's approach to the management of public fisheries assets. As has been covered previously in this report, other jurisdictions (for example, Alaska and Washington State) have taken

the proactive step of significantly restricting the practice of trawling in their waters. Arguably, policy decisions like these are founded (correctly) in precautionary principles and public transparency, while also further assisting in the fight against global climate change. Conversely, Canada appears to take an insular approach that is advised by, and controlled through, industry affiliations. Baring public access to critical information (as the authors here have experienced during the research phase of this white paper) is an ongoing concern. Not doing climate change and impact research so one can say “there is no data supporting a link between climate and trawling in Canada” can be perceived by the public (and other stakeholders) as hiding the true costs and impacts of the decisions being made. While few profit in the short term, the ecosystems, species, and Canadian society bear the brunt of long-term impacts and recovery costs. Such an approach arguably undermines the public’s trust in federal decision-making processes and places various marine ecosystems and species at further risk. A significant part of transparency in fisheries management is public access and proactive research in areas of environmental harms and climate change.

REFERENCES AND FURTHER READING

- ³⁵ Carlos M. Duarte et al., “The Role of Coastal Plant Communities for Climate Change Mitigation and Adaption,” *Nature Climate Change* 3, no. 11 (2013): 961–68.
- ³⁶ Tristan J. Douglas, Geotz Schuerholz, and S. Kim Juniper, “Blue Carbon Storage in a Northern Temperate Estuary Subject to Habitat Loss and Chronic Habitat Disturbance: Cowichan Estuary, British Columbia Canada,” *Frontiers in Marine Science* 9 (2022): 1–24.
- ³⁷ Linwood Pendleton et al., “Estimating Global ‘Blue Carbon’ Emissions from Conversion and Degradation of Vegetated Coastal Ecosystems,” *PLoS One* 7, no. 9 (2012): 243542.
- ³⁸ Manuel Barange et al., “The Cost of Reducing the North Atlantic Ocean Biological Carbon Pump,” *Frontiers in Marine Science* 3 (2017): 1–10.
- ³⁹ P. G. Falkowski, “The Role of Phytoplankton Photosynthesis in Global Biogeochemical Cycles,” *Photosynthesis Research* 39, no. 3 (1995): 225–58, <https://doi.org/10.1007/BF00014586>.
- ⁴⁰ T. Guyondet et al., “An Ecological Carrying Capacity Assessment for Shellfish Aquaculture in Baynes Sound, British Columbia” (Canadian Science Advisory Secretariat, 2022).
- ⁴¹ Katherine Petrou et al., “Acidification Diminishes Diatom Silica Production in the Southern Ocean,” *Nature Climate Change* 9, no. 10 (2019)
- ⁴² Enric Sala et al., “Protecting the Global Ocean for Biodiversity, Food and Climate,” *Nature* (London) 592, no. 7854 (2021): 397–402, <https://doi.org/10.1038/s41586-021-03371-z>; Karen McVeigh, “Bottom Trawling Releases as Much Carbon as Air Travel, Landmark Study Finds,” *The Guardian*, 2021, <https://www.theguardian.com/environment/2021/mar/17/trawling-for-fish-releases-as-much-carbon-as-air-travel-report-finds-climate-crisis>.
- ⁴³ Colin R. Campbell, “Blue Carbon - British Columbia: The Case for the Conservation and Enhancement of Estuarine Processes and Sediments in B.C.” (Sierra Club BC, 2010), <https://sierraclub.bc.ca/wp-content/uploads/2015/08/Blue-Carbon-British-Columbia-Report.pdf>.
- ⁴⁴ A Lang-Wong et al., “Seaforestation: Benefits to the Climate, the Ecosystems, and the People of British Columbia,” 2021–2030 United Nations Decade of Ocean Science for Sustainable Development (Ocean Wise, 2022).
- ⁴⁵ Lang-Wong et al.; Campbell, “Blue Carbon - British Columbia: The Case for the Conservation and Enhancement of Estuarine Processes and Sediments in B.C.”
- ⁴⁶ Graham Epstein et al., “The Impact of Mobile Demersal Fishing on Carbon Storage in Sea Beds,” *Global Change Biology* 28, no. 9 (2022): 2875–94, <https://doi.org/10.1111/gcb.16105>.
- ⁴⁷ Taylor R. Lee, Warren T. Wood, and Benjamin J. Phrampus, “A Machine Learning (KNN) Approach to Predicting Global Seafloor Total Organic Carbon,” *Global Biogeochemical Cycles* 33, no. 1 (2019): 37–46.
- ⁴⁸ R. A. Houghton, “Balancing the Global Carbon Budget,” *Annual Review of Earth and Planetary Sciences* 35, no. 1 (2007): 313–47, <https://doi.org/10.1146/annurev.earth.35.031306.140057>.
- ^{49,50} Sala et al., “Protecting the Global Ocean for Biodiversity, Food and Climate.”
- ⁵¹ Christian Nellemann, Stefan Hain, and Jackie Alder, “In Dead Water: Merging of Climate Change with Pollution, Overharvest, and Infestations in the World’s Fishing Grounds” (United Nations Environment Program, 2008).
- ⁵² Petrou et al. “An Ecological Carrying Capacity Assessment for Shellfish Aquaculture in Baynes Sound, British Columbia”
- ⁵³ Rowan Haigh et al., “Effects of Ocean Acidification on Temperate Coastal Marine Ecosystems and Fisheries in the Northeast Pacific,” *PLoS One* 10, no. 2 (2015): e0117533.
- ⁵⁴ Krista Greer et al., “Global Trends in Carbon Dioxide (CO₂) Emissions from Fuel Combustion in Marine Fisheries from 1950 to 2016,” *Marine Policy* 107 (2019): 103382.
- ⁵⁵ Daniel Steadman et al., “New Perspectives on an Old Fishing Practice: Scale, Context and Impacts of Bottom Trawling,” 2021.
- ⁵⁶ Haigh et al., “Effects of Ocean Acidification on Temperate Coastal Marine Ecosystems and Fisheries in the Northeast Pacific.”
- ⁵⁷ William Cheung et al., “Marine High Temperature Extremes Amplify the Impacts of Climate Change on Fish and Fisheries,” *Applied Ecology* 7, no. 40 (2021): eabho895, <https://doi.org/10.1126/sciadv.abho895>; The Canadian Press, “Marine Heat Waves Could Wipe out Fish Stocks, UBC Study Finds,” 2021, <https://www.cbc.ca/news/canada/british-columbia/marine-heat-waves-could-wipe-out-fish-stocks-ubc-study-finds-1.6197798>.

B.C. Fisheries

This section will broadly review the economic development and transformation of fisheries in B.C. to provide historical context for how the present inequitable, highly financialised, and overcapitalised situation developed. The authors here suggest that these outcomes are not the result of a well-functioning market, but rather the direct outcome of questionable government policies aimed at rationalizing the fishery.

First, it is important to establish what is meant by “equity” in the context of B.C.’s fisheries. This white paper defers to McCay’s definition of equity as “a shorthand for social matters such as how a regime affects the distribution of rights, power, opportunities and wealth or how it affects the quality of life and the function of communities, households and families.”⁵⁸ In our view, the role of any fisheries management regime, market or command-and-control system, is not only to produce economic value efficiently but also to create sustainable environmental outcomes, economic and political equity, gainful employment, and prosperity for communities. Assertions that societies must choose between *environmental sustainability* and *economic prosperity* are false dichotomies that only ring true when economic growth is pursued in isolation. Put simply, who sees the economic benefit from the fishery is as important as the fishery generating economic growth. When the economic well-being of coastal communities and fishers is pursued, conflicts with the environment are mitigated. With these presuppositions in mind, the economic history of B.C.’s fisheries will now be discussed.

Our account starts in 1968 with the Davis Plan, a policy named after then-fisheries minister Jack Davis. The stated purpose of the Davis Plan was to reduce “overcapitalisation” and “excess labour usage” in B.C.’s salmon fishery. The policy levers used to pursue these goals included: freezing the fleet size at a stable level, buying back fishing licences and fishing boats, improving the efficiency of fishing through inspec-

tions that would determine the quality of licence one could access (long-term A licenses were available to fishers that met desired standards and subpar fishers were given B licenses which were temporary), and, lastly, regulations on gear and fishing location were imposed to increase the usage of “economically optimal gear.”

It is noteworthy that C licences were also issued to non-salmon fishers. These licenses were initially not restricted and later became subject to license restrictions. These policy measures failed to reduce the capital intensiveness of the fishery as they resulted in skyrocketing license prices, fishers investing in boats with more tonnage (a greater fishing capacity), and transferring their quotas to larger boats. In response to these developments, limits were imposed on the size of vessels quotas could be transferred to.⁵⁹

The Davis Plan resulted in ownership becoming concentrated in the fishery. This was a result of the plan’s overarching aim of creating a “leaner” processing sector with fewer plants and greater efficiency. Vertical integration was a common element of the fishing industry with fish processors owning 2,100 (40%) of commercial fishing vessels in the province at the time of the Davis Plan. Smaller processing firms were closed down and sold off. The outcome of the pursuit of a leaner industry was the rise of fish-processing conglomerates. Notably, Canfisco, a company that still operates today, saw a significant increase in market share. Further, workers lost market share with fishing cooperatives seeing serious decline. The decline of fishery cooperatives was not a new phenomenon (worker-owned and -operated fishing and processing operations started to decline in the 1920s). The Davis Plan further relegated cooperatives to the margins of the fishery, making matters worse for coastal communities and fishers. Put bluntly, the practical result of the Davis Plan was the concentration of market power in the hands of a few large firms, a situation which has caused ramifications that are still felt today.

In terms of the stated goals of the plan, it was an utter failure. Between 1969 and 1980, total capital investment in the B.C. salmon fishing fleet quadrupled. This worsening of over-

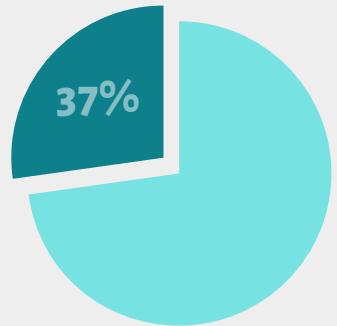
capitalisation coincided with the number of commercial fishing vessels in the fishery decreasing from 7,000 to 5,000. The issue was that the policy pushed primarily small-scale fishers out of the fishery, in favour of larger and more intensive vessels. In sum, the Davis Plan was an “expensive failure.”⁶⁰

These changes led to economic hardship for Indigenous peoples (communities and individual fishers) and non-Indigenous fishers. Marked by additional declines in spin-off labour and manufacturing markets, the financial situation for fishers (Indigenous and non-Indigenous alike) was defined by spiralling debts and declining incomes. Multiple interconnected factors drove these harsh realities. First, the skyrocketing price of licences and quotas in addition to increased boat prices caused the overhead costs of fishing to increase. Increased costs combined with unchanged landed values produced an effective pay decrease for fishers. Further, the increasing costs associated with financing fishing operations forced fishers to assume significantly higher debt burdens. The combination of high debt burdens and declining incomes caused severe problems for fishers. The situation for Indigenous people working in the fishery was even worse. Indigenous fishers, at this time, typically leased quotas and fishing boats from processors. Part of the Davis Plan involved pushing processors out of fishing. This led to Indigenous fishers losing the opportunity to lease quotas, licences, and boats from processors. Compounding the effects on Indigenous coastal communities, Indigenous fishers who were able to remain in the fishery suffered from the same economic pressures faced by fishers generally. Further, Indigenous people working in fish processing saw significant job losses due to the consolidation of the sector tied to the pursuit of a “leaner” processing industry. Consolidation led to 37% of Indigenous men and 45% of Indigenous women employed in processing losing their jobs between 1968 and 1971 (figure 4).⁶¹

In 1980, B.C. fishers went on strike in protest of declining income and oppressive debt burdens. The strike meant that fish landings were very limited, forcing smaller processors to fold and declare bankruptcy. This only intensified the concentration of the processing sector with larger fish processors, that had

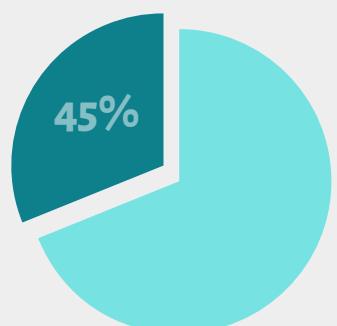
37% of Indigenous men

employed in processing lost their jobs between 1968 and 1971.



45% of Indigenous women

employed in processing lost their jobs between 1968 and 1971.



the capital to weather a reduced supply of raw fish, able to purchase the now available assets from bankrupt companies and assume an even larger market share. Further hampering smaller fish processing operations, higher health standards were imposed on fish canneries. Financial supports were not offered to help smaller businesses pay for the expenses associated with upgrading equipment. As a result, fish processors had to pay upwards of \$100,000 (over \$300,000 in 2022 dollars) per plant. This produced a new wave of plant closures allowing the larger firms to take advantage again. The resulting loss of employment disproportionately impacted Indigenous peoples.⁶²

In 1982, the federal government again sought to solve the problems of overcapitalisation and overcapacity in the B.C.'s fisheries. This took the form of so-called "fleet rationalization." In a 1982 report on the policy, the federal Fleet Rationalization Committee begins their argument by asserting a false dichotomy, specifically that:

Commercial fishing on the Pacific Coast of Canada is more than just an industry; it is a way of life, and is the only stable economic base for many coastal communities that still have relatively large fishing fleets.

However, commercial fishing is no different than any other industry in this respect: in the current atmosphere towards centralization, which narrows control down to a few companies, it could be efficiently arranged so that very few people with nets and traps would wipe out the need for, and therefore the existence of a fishing fleet. We are faced with fatal decisions: *do we want a coast with no fishermen, or at best, a few large seiners?* The majority of our coastal communities will then become dependent on one, frequently unstable, limited-season tourist resort for an economic base, with the fishermen added to the welfare rolls?⁶³

The committee asserts that there is a conflict between letting fishers have access to the fishery and environmental sustainability. The issue is that an equivalence is drawn between small-scale fishers and large industrial vessels that cause disproportionately severe environmental impacts. The problem is not, as the committee explicitly argues, "individual ambitions" but rather the use of highly destructive fishing techniques (e.g., trawling) and external economic pressures (high debt burdens, increased overhead costs, and depressed incomes) that push economically strained fishers to increase their incomes by any means possible.

Fleet rationalization served to further cement the economic interests of licence holders and processors — the economic actors in the fishery which hold the majority of economic power. The capitalization of the fishery only increased, leading to significant advancements in quota and licence prices, and thus preventing small-scale fishers from entering the fishery due to them having insufficient capital. In effect, the policy fully transformed fishing quotas and licences into speculative assets. The fishery became dominated by urban fishers and large companies who had the ability to outbid rural and Indigenous fishers. Between 1994 and 2002 rural ownership of fishing rights severely declined. A major factor driving inequality between large firms and fishers is the ability of companies and individuals that do not actively fish or own a fishing vessel to purchase fishing rights.⁶⁴

Investors were able to see economic returns of purchased licences and quotas due to the implementation of Individual Transferable Quotas (ITQs) in B.C.'s fisheries. ITQs were implemented in B.C. fisheries starting in the 1990s,⁶⁵ and for groundfish trawlers in 1997.⁶⁶ ITQs are an approach to fisheries management that involve allocating portions of a cap on the amount of fish, and other marine products, that can be caught each year — termed Total Allowable Catch (TAC) — into quotas that are purchasable by private individuals or corporations. These fishing rights are then tradable on the secondary market. The goal of ITQs is to simultaneously

Figure 4

increase economic efficiency and conserve natural resources. The core assumption of the approach is that giving fishers a direct economic stake in the fishery, in the form of privately owned quotas, will incentivize them to engage in long-term thinking that will lead to environmentally sustainable behaviors. In short, the aim is to download both responsibility and economic risk onto fishers to induce rational behavior.⁶⁷

The implementation of ITQs resulted in the separation of fishing rights from fishers as investors and shifted towards processors as investors through licence and quota owners. Subsequently, processors would purchase licenses and quotas and lease them back to fishers. Quota leasing typically involves right holders renting their fishing rights to fishers at 70 or 80% of the expected landed value. This set up guarantees an annual return on investment for licence and quota holders as the value of the quotas is realized in the form of liquid capital at the start of the fishing season. Further, licence holders are sidestepping the economic risks and overhead costs of fishing. In terms of avoiding risk, fish and other marine products do not have a stable value and fluctuate in price. Because the value of the quotas is paid upfront, licence holders suffer no negative consequences of caught fish being worth less than their estimated value. Additionally, fishing is an expensive business. Fishers have to purchase and maintain a vessel and equipment, pay for fuel, hire staff, and pay taxes. ITQs have allowed investors to realize large economic rents while simultaneously downloading risk and operational costs onto fishers.⁶⁸ In effect, “the current structure completely insulates quota owners from price fluctuations during the season and leaves 100% of the risk on fishermen and fish buyers.”⁶⁹

Edwards and Pinkerton of the University of British Columbia’s Resource and Environmental Management program argue that this lucrative arrangement for investors and processors does not provide an economic benefit to the fishery and, in fact, is an economic detriment. By siphoning off economic rents from fishers, investors stifle reinvestment in the infrastructure of the fishery (vessels and equipment). This is a major problem for the long-term economic viability

of the fishery as the assets which fishing is dependent upon continually depreciate and see reduced reinvestment due to how fishing rights are structured. Secondarily, the high costs of quotas (rented or purchased) produces unsustainable economic conditions for fishers in the fishery and prevents others from entering the fishery. This leads to fishers facing higher debt burdens, which, due to their lower incomes, they will have a hard time repaying. Lastly, this arrangement produces inequitable outcomes where fishers are seeing less and less of the economic benefits of fishing while investors are thriving.⁷⁰

Concern was previously expressed about this economic outcome. The Federal Fisheries Committee (1982) wrote that “an ever-present danger is the eventual control of such quotas [ITQs] by other than genuine or bona fide fishermen.”⁷¹ This acknowledgement of concerns about economic concentration is just that: an acknowledgement. The possibility of prohibiting concentrated ownership is immediately hand waved away because “actual enforcement of this restriction would be extremely difficult.”⁷² They suggest that such restrictions on ownership would be better suited to trade practices instead and proceed to argue that such policies would be easily avoided by “a battery of lawyers and accountants” and tax arrangements designed to superficially divvy up ownership.⁷³ It is true that these options being available to companies make it difficult to effectively regulate economic concentration in B.C.’s fisheries. That said, antitrust measures exist for a reason and a necessary policy being difficult to pursue is not grounds for the government to not attempt to fulfill its mandate to manage fisheries in a way that creates economic prosperity for fishers and coastal communities, supports small-scale fishers, and equitably distributes the benefits of the fishery.⁷⁴ Despite these outcomes, the federal government doubled down in the form of the 1996 Mifflin Plan.

The goal of the Mifflin Plan was to reduce the capacity of B.C.’s commercial salmon fleet by 50%. This was approached by restricting entry to the fishery, allowing multiple licences to be stacked on a single vessel, the allocation of funds to buy-back licences and quotas from fishers, and

the government purchasing a portion of the fishing rights that would be available in the upcoming fishing season. The impetus for these policies was an economic downturn in the B.C. salmon fishery due to increased competition from farmed salmon and international producers which led to considerable decline in landed values.⁷⁵

This policy produced further financialisation of the fishery, reduced employment, and had a questionable environmental impact. The government-sanctioned licence stacking favoured large firms with more financial resources. Specifically, licence stacking allowed two fishing licences to be applied to the same vessel. Licences could either be transferred from one vessel to another or an additional licence could be purchased. Once licences were stacked they could not be unstacked. This led to two main environmental issues. First, the gear specifications of licences being stacked did not need to match, meaning fishers could shift how they were fishing to more intensive techniques. Second, there were not, at first, size restrictions on moving a licence from a small vessel to a considerably larger one. After this issue was identified, the policy was changed to require licences be transferred to vessels no more than 30% longer. Reducing the number of licences (while not reducing the total value) leads to access issues, not overcapitalisation problems. This is due to licences effectively doubling in price by being merged. As a result, the capital required to enter the fishery and purchase a licence significantly increased.⁷⁶ This policy approach reflected the government’s disposition to rely on market-based approaches as “stacking provided a mechanism for reducing fleet size by private activity among licence holders and without government subsidies.”⁷⁷ The purpose of this plan was to “further rationalize the fleet” by enabling “fishermen with more efficient boats—and more money—[to] buy out smaller, marginal operators.”⁷⁸

In 1997, the broad set of measures that fall under the category of fleet rationalization were applied to groundfish trawlers in B.C.. Specifically, ITQs were implemented, and the fleet was reduced from 142 vessels to between 60 and 80 (de-

pending on the year).⁷⁹ The cumulative effect of the Davis Plan, Fleet Rationalization, and the Mifflin Plan (among other policies) has been the privatization of B.C.'s fisheries, increasing costs of entry, worsening economic standing for fishers, and a continuous process of economic concentration leading to fishing rights being held by a small number of large companies — to the detriment of fishers, coastal communities, and Indigenous peoples.

Presently, B.C.'s fisheries are in an economic state that prevents fishers and communities from seeing significant economic benefits from fishing. The fishery remains consolidated, worker safety has decreased, the number of jobs in the fishery is shrinking, fishers have minimal political representation, and the economic prospects of fishers have gotten worse, not better. Tasha Sutcliffe, of Ecotrust Canada, described the severity of the problem of consolidation, stating:

First and foremost, this is extremely difficult to track, even for government, due to the *lack of transparency in the licensing system*. However, through an information request to DFO for 2017 data, we can see that of the 345 licence and quota holders in the groundfish trawl, halibut and sablefish fisheries, the top 26, or 7.4%, hold 50% of the quota value, and the top four, or 1.2%, hold 50% of all the quota pounds. We can also see that the majority of groundfish quota pounds are not fished by owner-operators. They are held by processors, overseas companies and even fishing family companies that for the most part no longer fish the majority of their quota.⁸⁰

The issue of transparency will be addressed in the next section of this report. This level of economic concentration has been, in part, driven by fishing quotas and licences being treated like speculative assets by industry and government policies. The result has been the value of the fishery, on paper, skyrocketing with fishery assets in



A trawling vessel operating on Canada's Pacific Ocean.

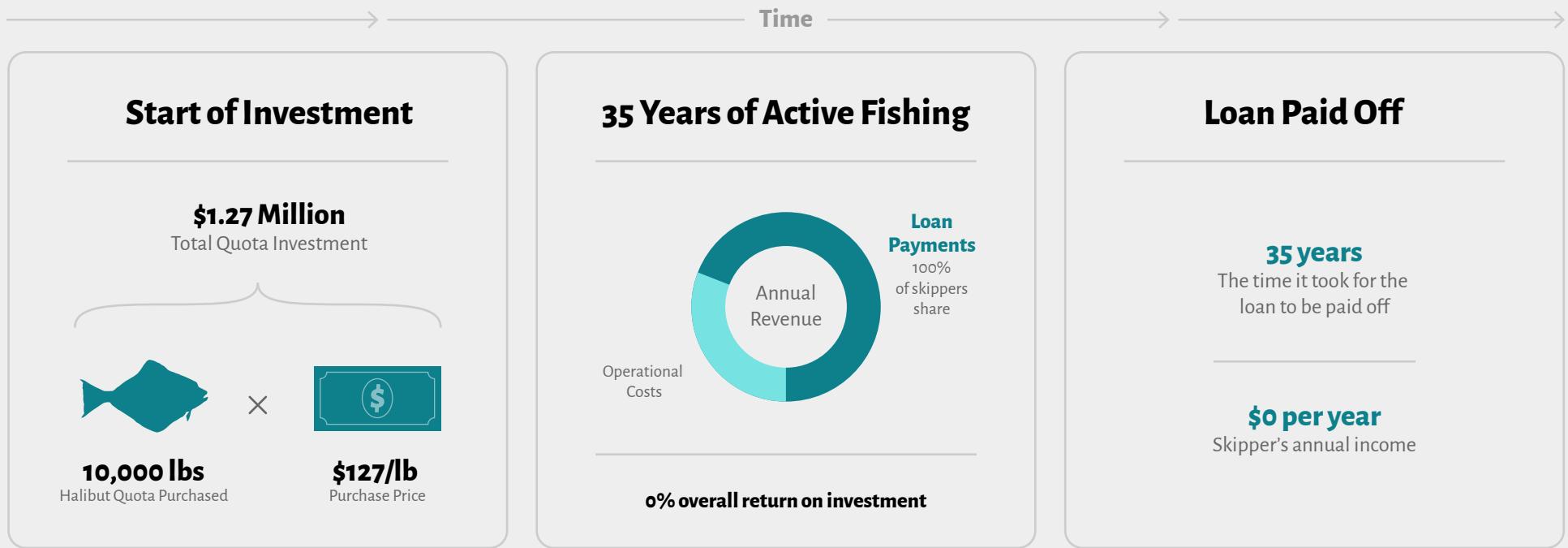


Figure 5

2003 reaching \$1.8 billion in total value. Of that \$1.8 billion, 14% is vessels and fishing equipment and 86% is licences and quotas. Quotas and licences have highly inflated values which prevent entry into the fishery except by people or firms with considerable financial resources.⁸¹

The inaccessibility of the fishery has been shown by Ecotrust Canada, which calculated how long it would take a fisher, who took out a loan to purchase 10,000 lbs of halibut quotas, to pay off their debt. The fisher is assumed to have \$250,000 available to cover 20% of the \$1.27 million they will need to purchase the quotas. The situation is bleak as this hypothetical fisher is estimated to only be able to pay off their debt after 35 years — this calculation is based on the fisher putting 100% of their income from fishing towards debt repayments, meaning that their effective annual income will be \$0 for that 35-year period (figure 5).⁸²

The situation for fishers leasing quotas is comparably poor with fishers subjected to high rents and exploitative contracts. Common aspects of contracts include:

- (a) fines being imposed on fishers when injury or death occurs,
- (b) that the fisher forfeits all their equity if they terminate the contract before a certain period,
- (c) that the fisher agrees to pay additional damages if a payment is missed,
- (d) that the fisher agrees to not have a right to see financial documents associated with their joint venture,
- (e) that the fisher has to sell their catch to the firm leasing the quotas at a price set by the quota holder,
- (f) that the quota holder can end the agreement at anytime without penalty,
- (g) and that the fisher has to keep their contract details confidential to everyone except legal advisors.⁸³

It can be generally argued that it is an effective impossibility for fishers to make a profit after adhering to the conditions of such contracts while paying the operational costs of fishing (fuel, maintenance, wages, etc.). As a result, it is not surprising that fishers in B.C. have seen an average 29% decrease in their incomes (this figure accounts for changes in the value of the Canadian dollar) between 2000 and 2015. This loss of economic standing is an issue unique to the Pacific B.C. fishery, as fishers in Atlantic Canada saw a 45% rise in their incomes over the same period.⁸⁴

The economic pressures faced by fishers have forced them to choose to engage in unsafe fishing practices to reduce expenses. Dangerous cost-saving measures include fishing for longer in poor weather to reduce the fuel costs associated with frequent trips to and from port and having smaller crews than are needed to properly operate their vessels. Such activities have resulted in the number of fatal injuries on trawlers doubling and a 76% increase in the number of onboard injuries between 2003 and 2008. Additionally, the number of disability claims increased 48% over this period.⁸⁵

Further, the number of people employed in B.C.'s fisheries generally decreased 18% with an estimated 5,860 to 7,190 job losses between 2000 and 2015, which were primarily associated with small boats leaving the fishery. Between 1985 and 2015, 121 larger vessels (longer than 20 meters) left the fishery causing 545 job losses and 10,360 jobs were lost due to 4,144 small vessels (shorter than 20 meters) leaving B.C.'s fisheries. Large vessels do not employ significantly more people as the average large vessel creates 4.5 jobs compared to 2.5 from small vessels.⁸⁶

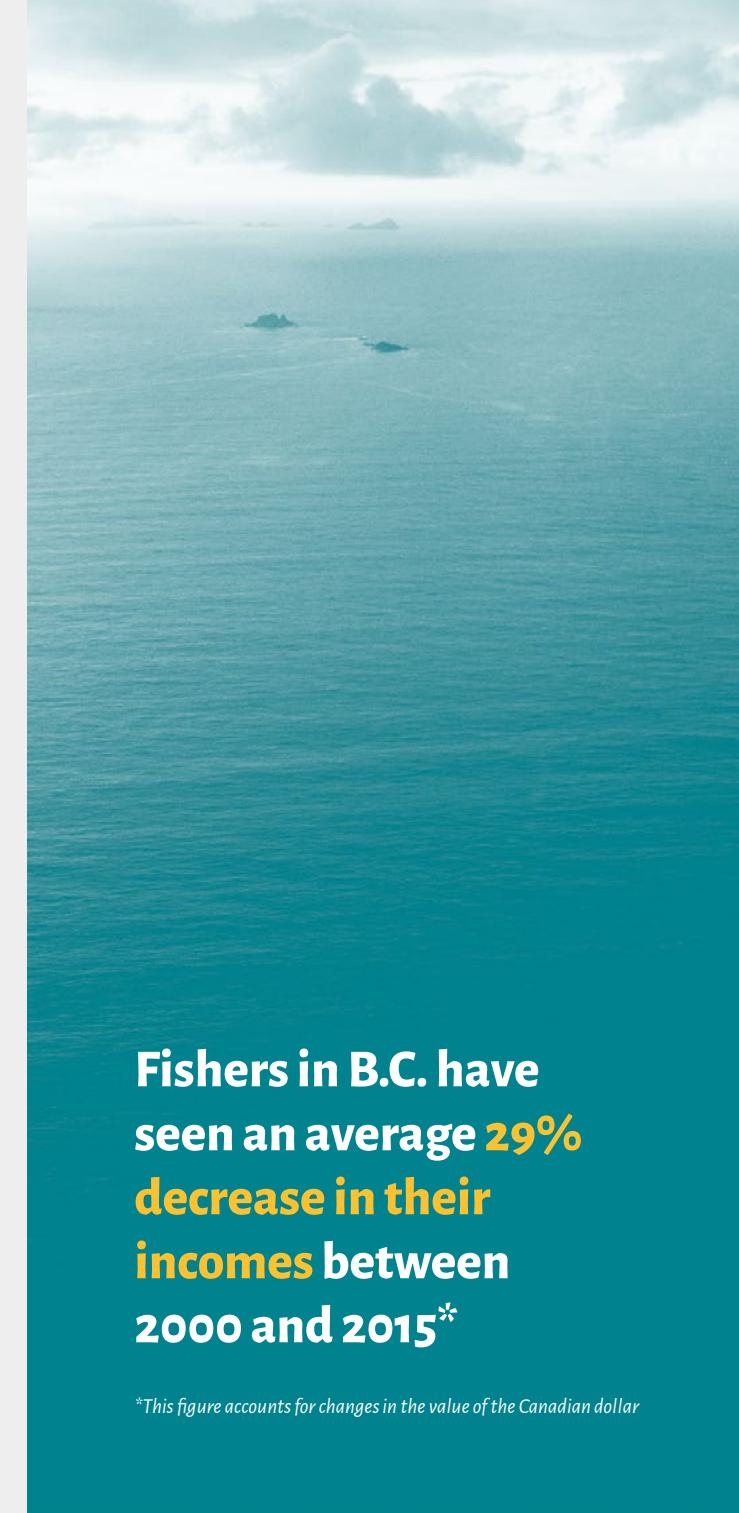
The escalating capital costs associated with fishing disproportionately impact small-scale fishers who have fewer financial resources. By pushing small-scale fishers out of the fishery at a higher rate, the more ecologically destructive fishing techniques, including trawling, associated with larger vessels remain prevalent, while boats using less intensive and impactful fishing methods leave the fishery. Further, a fleet comprised of smaller-scale vessels has the ability to employ considerably more people while using less obtrusive fishing techniques. The central issue is that emphasis is placed on continually increasing the efficiency of production in the fishery and efficiency in terms of dollars produced, not community well-being, sustainability, and the economic viability of small-scale fishers. These harms to communities, fishers, and the environment are not merely unethical but also against the mandate of Fisheries and Oceans Canada as, due to section 2.5 of the *Fisheries Act*, the following factors are to be considered in policy decisions:

- (a) the application of a precautionary approach and an ecosystem approach;
- (b) **the sustainability of fisheries;**
- (c) scientific information;
- (d) Indigenous knowledge of the Indigenous peoples of Canada that has been provided to the Minister;
- (e) community knowledge;
- (f) cooperation with any government of a province, any Indigenous-governing body and any body—including a comanagement body—established under a land claims agreement;
- (g) **social, economic and cultural factors in the management of fisheries;**
- (h) the preservation or promotion of the independence of licence holders in commercial inshore fisheries; and
- (i) the intersection of sex and gender with other identity factors.⁸⁷

Trawling is a highly efficient method of producing profit for large fishing firms but does not achieve the social and environmental objectives that Fisheries and Oceans Canada is explicitly expected to consider.

Exacerbating these issues is Fisheries and Oceans Canada's tendency to consult with quota holders, not fishermen, about fisheries policy. As a result, fishers have little to no influence in policy decisions while the investors and processors that predominantly control fishing rights are given access to the regulator.⁸⁸ This leads to political inequality in the fishery that entrenches the inequitable distribution of economic and social benefits from B.C.'s fisheries. The harsh economic reality of fishing in B.C., for fishers and communities, needs to be addressed as the severe social and economic problem that it is.

The economic non-viability of small-scale fishing operations is not a rational outcome of a functioning market that can be explained as an externality. Rather, it is the direct outcome of government policy dating back to the Davis Plan.



Fishers in B.C. have seen an average 29% decrease in their incomes between 2000 and 2015*

*This figure accounts for changes in the value of the Canadian dollar

For free markets to function, access to capital needs to be relatively equal, information freely available, and economic transactions transparent.⁸⁹ B.C. has none of these conditions meaning that the continual releasing of the market on environmental and economic problems in B.C.'s fisheries has led to the most powerful economic actors assuming an ever greater share of the market while small-scale fishers and processors have withered.

REFERENCES AND FURTHER READING

- ⁵⁸ Bonnie J. McCay, "Social and Ecological Implications of ITQs: An Overview," *Ocean & Coastal Management* 28, no. 1 (1995): 7, [https://doi.org/10.1016/0964-5691\(96\)00002-6](https://doi.org/10.1016/0964-5691(96)00002-6).
- ⁵⁹ Dianne Newell, "Rights Reconsidered: From the Davis Plan to Sparrow, 1969–1993," in *Tangled Webs of History* (University of Toronto Press, 1999), 148–51, <https://doi.org/10.3138/9781442680357.12>.
- ⁶⁰ Newell, 150–53.
- ⁶¹ Newell, 152–58.
- ⁶² Newell, 154–57.
- ⁶³ "Fleet Rationalization Committee (Canada) Report," *Illumina Biological Content - Unstructured*, 1982, 1, <https://waves-vagues.dfo-mpo.gc.ca/library-bibliotheque/60512.pdf>.
- ⁶⁴ Astrid Scholz et al., "Catch-22: Conservation, Communities and the Privatization of the B.C. Fisheries: An Economic, Social and Ecological Impact Study," 2004, 17–25, <https://ecotrust.ca/latest/research/catch-22-2004/>.
- ⁶⁵ Danielle N. Edwards, "Addressing questions on the social and economic outcomes of an individual transferable quota fishery" (PhD, Vancouver, BC, University of British Columbia, 2009), iii, <https://open.library.ubc.ca/soa/circle/collections/ubctheses/24/items/1.0385500>.
- ⁶⁶ Ken McDonald et al., *West Coast Fisheries: Sharing Risks and Benefits*, Report of the Standing Committee of Fisheries and Oceans (Government of Canada, 2019), 12.
- ⁶⁷ Evelyn Pinkerton and Reade Davis, "Neoliberalism and the Politics of Enclosure in North American Small-Scale Fisheries," *Marine Policy* 61. (2015): 303, <https://doi.org/10.1016/j.marpol.2015.03.025>; Danielle N. Edwards and Evelyn Pinkerton, "The Hidden Role of Processors in an Individual Transferable Quota Fishery," *Ecology and Society* 24, no. 3 (2019): 36, <https://doi.org/10.5751/ES-11148-240336>; Christopher M. Dewees, "Effects of Individual Quota Systems on New Zealand and British Columbia Fisheries," *Ecological Applications* 8, no. 1 (1998): S133, <https://doi.org/10.2307/2641371>.
- ⁶⁸ Scholz et al., "Catch-22: Conservation, Communities and the Privatization of the B.C. Fisheries: An Economic, Social and Ecological Impact Study," 13.
- ⁶⁹ McDonald et al., "West Coast Fisheries: Sharing Risks and Benefits," 25.
- ⁷⁰ Danielle N. Edwards and Evelyn Pinkerton, "Rise of the Investor Class in the British Columbia Pacific Halibut Fishery," *Marine Policy* 109. (2019): 6, <https://doi.org/10.1016/j.marpol.2019.103676>.
- ⁷¹ "Fleet Rationalization Committee (Canada) Report," *Illumina Biological Content - Unstructured*, 1982, 4, <https://waves-vagues.dfo-mpo.gc.ca/library-bibliotheque/60512.pdf>
- ⁷² "Fleet Rationalization Committee (Canada) Report," 4.
- ⁷³ "Fleet Rationalization Committee (Canada) Report," 4.
- ⁷⁴ Edwards and Pinkerton, "The Hidden Role of Processors in an Individual Transferable Quota Fishery."
- ⁷⁵ Ben Muse, "Fleet Reduction in British Columbia's Commercial Salmon Fisheries: 1996–1998" (Alaska Commercial Fisheries Entry Commission, 1999), 1–8, https://cfec.state.ak.us/RESEARCH/buyback/BC_BB_2.PDF.
- ⁷⁶ Muse, iii–v.
- ⁷⁷ Muse, 1–12.
- ⁷⁸ Scholz et al., "Catch-22: Conservation, Communities and the Privatization of the B.C. Fisheries: An Economic, Social and Ecological Impact Study," 7.
- ⁷⁹ Scholz et al., 7.
- ⁸⁰ "1st Session, 42nd Parliament; No.132: Wednesday, February 20, 2019," Pub. L. No. 132, § Standing Committee on Fisheries and Oceans (2019), <https://publications.gc.ca/site/eng/430326/publication.html>.
- ⁸¹ Scholz et al., "Catch-22: Conservation, Communities and the Privatization of the B.C. Fisheries: An Economic, Social and Ecological Impact Study," ii.
- ⁸² Tasha Sutcliffe et al., "Just Transitions: Towards Truly Sustainable Fisheries in British Columbia" (Ecotrust Canada, 2018), 31, <https://ecotrust.ca/latest/research/just-transactions-just-transitions-towards-truly-sustainable-fisheries-in-british-columbia-2018/>.
- ⁸³ Sutcliffe et al., 32–33.
- ⁸⁴ Sutcliffe et al., 26–27.
- ⁸⁵ "A Cautionary Tale about ITQs in BC Fisheries" (Ecotrust Canada, 2009), 7–8, <https://ecotrust.ca/latest/research/a-cautionary-tale-about-itqs-in-bc-fisheries-2009/>.
- ⁸⁶ Sutcliffe et al., "Just Transitions: Towards Truly Sustainable Fisheries in British Columbia," 21–26.
- ⁸⁷ Canada, "Act to Amend the Fisheries Act and Other Acts in Consequence: Loi Modifiant La Loi Sur Les Pêches et d'autres Lois En Conséquence," Pub. L. No. C-68 (2019), <https://publications.gc.ca/site/eng/9.858020/publication.html?wbdisable=true>.
- ⁸⁸ McDonald et al., "West Coast Fisheries: Sharing Risks and Benefits," 41.
- ⁸⁹ McDonald et al., 21.

A Lack of Transparency

The above-described issues in B.C.'s groundfish trawl, and fisheries generally, are worsened by the lack of transparency that surrounds economic and environmental matters. In the process of researching for this report, the authors here filed an access to information request for: "All observer reports for registered factory trawlers in the Pacific Coast region. Date range of records requested (January 1st 2020-April 1st 2022)." The government refused our request citing section 20(1)(b) and 21(1)(b) of the *Access to Information Act*. Section 20(1)(b) reads:

Subject to this section, the head of a government institution shall refuse to disclose any record requested under this Act that contains financial, commercial, scientific or technical information that is confidential information supplied to a government institution by a third party and is treated consistently in a confidential manner by the third party.⁹⁰

And section 21(1)(b) reads:

The head of a government institution may refuse to disclose any record requested under this Act that contains an account of consultations or deliberations involving officers or employees of a government institution, a minister of the Crown or the staff of a minister of the Crown.⁹¹

The authors are in the process of appealing the government's decision. Due to the severe ecological harms bottom trawling poses to B.C.'s marine resources and environments, it is contended that it is in the public's interest to have access to information on the ecological impact trawlers are causing

in B.C.. The lack of transparency surrounding the ecological impact of factory trawlers and their operators in B.C. serves to shield a part of the fishing industry from public scrutiny and accountability, despite the fishing technique being known to cause great ecological harm.

The economic dynamics of the fishery are also obscured with specific information on who owns quotas and licences being unavailable. The lack of public ownership information is not the only transparency issue. It is common practice for companies to divide their assets across convoluted chains of subsidiaries. This makes it even more difficult to ascertain what is going on in B.C.'s fisheries. The heart of the issue is that fisheries, a natural resource under the purview of the Canadian government (which ostensibly represents the Canadian public), is arranged in a way that makes it nearly impossible to untangle what is actually happening in B.C.'s fisheries.⁹² The lack of financial transparency in B.C.'s fisheries has led the Standing Committee on Fisheries and Oceans recommending that:

- (a) The beneficial holder of all fishing quota and licences in British Columbia, including penalties for failing to accurately disclose the holder of fishing quotas and/or licences, and that Fisheries and Oceans Canada work with Finance Canada to achieve this goal.
- (b) All sales or leasing of quota and licence holdings be reported and made public by Fisheries and Oceans Canada, including buyer, seller and sale/leasing price.⁹³

This policy recommendation was endorsed by every witness whose testimony contributed to the committee's report including quota and licence holders and processors.⁹⁴

The harms of not instituting meaningful transparency for both environmental impact assessments and who owns what are presently being felt at the level of broad public concern and trust. A poll conducted by Research Co. (com-

misioned by Pacific Wild Alliance) found that significant numbers of Canadians and British Columbians are concerned about various impacts bottom trawling may have on the marine environment (*Pacific Wild, 2022*). Consequently, the public, both Canadian and British Columbian, do not have complete confidence in the federal government's ability to manage the trawler industry. To increase public confidence in fisheries management, the government must take the public's concerns seriously.

REFERENCES AND FURTHER READING

⁹⁰ Joyce Murray and Canada, "Act to Amend the Access to Information Act and the Privacy Act and to Make Consequential Amendments to Other Acts: Loi Modifiant La Loi Sur l'accès à l'information, La Loi Sur La Protection Des Renseignements Personnels et d'autres Lois En Conséquence," Pub. L. No. C-58 (2019), <https://publications.gc.ca/site/eng/9.858020/publication.html?wbdisable=true>.

⁹¹ Murray and Canada.

⁹² 1st session, 42nd Parliament; No.132: Wednesday, February 20, 2019.

⁹³ McDonald et al., "West Coast Fisheries: Sharing Risks and Benefits," 32.

⁹⁴ McDonald et al., 31.



Trawling in British Columbia. Photos: Anonymous

The B.C. Fleet

For this report, the authors set out to review what information was available about the companies operating groundfish trawlers in B.C.. There are 74 groundfish trawlers presently registered in B.C. owned by 50 companies and individuals. An important note is that Tinshi Holdings Ltd and Tinlet Holdings Ltd are considered a single company as they are both subsidiaries of Tinlet Fishing Ltd. When only trawlers longer than 20 metres (m) are considered, the number of boats and companies drop considerably with the fishery having 36 vessels 20 m or longer owned by only 23 companies. Of larger trawlers, Jim Pattison Enterprises Ltd and Canadian Fishing Company Limited, a division of Jim Pattison Enterprises Ltd, own 11 of 36 (30.6%) of large trawlers in the province. Jim Pattison Enterprises Ltd likely controls a larger portion of B.C.'s groundfish trawl, as this figure only represents registered trawlers owned, not quota and licence holdings and quotas being leased. Three notable cases will now be discussed followed by a review of the general transparency issues observed.

Tinlet Fishing Ltd, Tinlet Holdings Ltd, and Tinshi Holdings Ltd: Tinlet Fishing Ltd and associated companies own two registered trawlers: the Nemesis and the Karenora. The Nemesis, a 33.38 m trawler, is held by Tinshi Holdings Ltd while the Karenora is a 23.16 m trawler owned by Tinlet Holdings Ltd. Two other stern trawlers are listed on their website, the first, referred to simply as "Boat 3" is 32.9 m long and the second, referred to as "Boat 4" is 49.99 m long. *Boat 3* is listed as owned by Tinlet Holdings Ltd and *Boat 4* by Tinshi Holdings Ltd.⁹⁵ No identifiable information is provided on their vessel and a search in the Vessel Registration Query System for both "Tinlet Holdings Ltd" and "Tinshi Holdings Ltd" only yields listings for the Nemesis and the Karenora. This lack of transparency is not evidence of wrongdoing as the absence of a listed vessel in Canada's federal registry could simply mean that these are boats that have been ordered but not yet put into use.

A B.C. government report on money laundering and corruption discusses Guo Tai Shi, the sole director of Tinshi and Tinlet Holdings. The report does not allege he or any of his companies are engaged in any illegal activities. Rather, it is noted that his involvement in financial dealings in the ground fishery and B.C. real estate are difficult to trace⁹⁶ and that:

The issue is that it is possible for our natural resources to find their way into the hands of a small number of owners, without a requirement that there be a vetting of individuals and their source of funds. This would appear to be a minimum expectation if we are to protect our natural resources for future generations.⁹⁷

In sum, the issue is the absence of transparency in investments made in B.C. fisheries, the unclear origins of funds, ownership not being publicly available, and the economic consolidation of natural resources in the hands of a few investors.

In 2018, the company Tenshi Seafood Ltd, a seafood processing company based in Richmond, Vancouver, was fined \$75,000 for obstructing a Department of Fisheries and Oceans (DFO) investigation (by literally eating certain paper records as enforcement officers entered the building) and lacking the necessary paperwork for undersized Dungeness crabs found in a processing plant in violation of the *Fisheries Act*. A company official was also fined \$25,000 along with a \$10,000 fine being imposed on one of their suppliers.⁹⁸

Arctic Ocean Holdings Inc. and Viking Storm Holdings Ltd.: Arctic Ocean Holdings Inc owns the *Arctic Ocean* a 22.63 m trawler; and Viking Storm Holdings Ltd owns the *Viking Storm* a 31.59 m trawler. Both companies have direct ties to a business officer named Steve Spencer of SW&W Registered Agents Inc. Through SW&W Registered Agents Inc. and Steve Spencer, both Arctic Ocean Holdings Inc and Viking Storm Holdings Ltd are tied to Pac Seafood Quota Holdings Inc. A common aspect of these companies is a history of incorpora-

tion in the United States and British Columbia.⁹⁹ Corporate records for Arctic Ocean Holdings, Viking Storm Holdings Ltd, and Pac Seafood Quota Holding Inc share 16797 Se 130th Ave, C/O Pacific Seafood, Clackamas, Oregon, as a listed business address.¹⁰⁰ This information was found through corporate record websites external to any of the listed companies, not information provided by the companies themselves. Further, none of the listed companies have a website. Lastly, it seems highly probable, based on the address shared by these companies, that these companies are associated (in some capacity) with Pacific Seafoods: a US seafood company headquartered at 16797 SE 130th Ave Clackamas.¹⁰¹ By arranging an enterprise into a complex chain of subsidiaries, the process of disentangling corporate activities and arrangements is made difficult or impossible. Lastly, Viking Storm Holdings Inc received \$48,000 of funding from the federal government through the Fisheries and Aquaculture Clean Technology Adoption Program to upgrade the *Viking Storm's* trawl doors to reduce towing time. Another, unrelated trawler, the *Tantrum No. 1*, also received \$81,405 to reduce their energy consumption by replacing their onboard freezers.¹⁰² It is irresponsible to fund trawling operations through sustainability initiatives due to the ecological harms caused by the practice.

Jim Pattison Enterprises Ltd: Jim Pattison Enterprises Ltd is a conglomerate of many companies, five of which are tied to various aspects of B.C. fisheries including: Bella Coola Fisheries, Premier Seafoods, Canfisco, Delta Pacific Seafoods, and the Canadian Fishing Company Limited. Canadian Fishing Company Limited is a division of Jim Pattison Enterprises Ltd. However, unlike the other four companies listed, they register vessels separately. The Vessel Registration Query System lists Jim Pattison Enterprises Ltd as owning 104 active fishing vessels all of which are in B.C.. Of these, 15 are registered as groundfish trawlers. Boats registered as trawlers include: the *Big Bay* (26.52 m); *Sea Crest* (23.84 m); *E.J. Safarik* (19.81m); *Ocean Rebel* (18.59 m); *Canadian #1* (26.88 m); *Frosti* (38.85 m); *Storm Bay* (22.25 m); *Naas Bay* (22.25 m); *Northisle*

(20.88 m); *Royal Canadian* (28.59 m); *Western Surf* (16.55 m); *Mini Pride* (5.03 m); *Point 4* (5.18 m) *Power Skiff Point No. 25* (5.09 m); *Ling Bank* (37.68 m); and *Point 6* (5.18 m). The *Mini Pride*, *Point 4*, *Power Skiff Point No. 25*, and *Point 6* are likely support vessels given their small size.

The issues associated with the case of Jimmy Pattison Enterprises Ltd is less reflective of their practices being worse than others in the industry but rather the structural problems of how fisheries in B.C. are economically arranged. According to a now-outdated estimate by Scholz et al. of Ecotrust Canada, Canfisco owned \$105 million worth of quotas in 2002.¹⁰³ There is no up-to-date information of Canfisco and the other companies tied to Jimmy Pattison Enterprises Ltd, due to the secretive nature with which quota and licence ownership is treated. Further Jimmy Pattison Enterprises Ltd enjoys high levels of vertical integration with parts of the conglomerate involved in fishing, processing, and retailing fishery products. In effect, Jimmy Pattison Enterprises Ltd has investments in every part of the fishery supply chain as they have a massive fishing capacity, can process their catch, and then retail the processed product directly to consumers across B.C.. Corporate records show that Jimmy Pattison Enterprises Ltd enjoys a large market share which is, in turn, associated with the long-run trends of consolidation in the B.C. fishing industry. The success of fishing industry conglomerates in B.C. has been at the expense of small-scale fishers and fishing communities.

Common transparency issues: This section will cover the common transparency issues of smaller companies that are worth mentioning but do not warrant an individual case description. Firstly, it is common for smaller companies to have no website or other profile that can be found online. Two notable examples include 0863091 B.C. Ltd. and Viking Alliance Seafoods Ltd.. 0863091 B.C. Ltd. owns a 33.32m trawler named the *Western Shore* and has no online presence outside of a listing in a corporate registry that states their date of incorporation in B.C.. Similarly, Viking Alliance Seafoods Ltd had no website and owns a 40.77m trawler named the *Viking Alliance*. The lack

of any visible presence is problematic given the size of the vessels these companies operate. The complete absence of an online presence was especially common for numbered companies, which tended to only have information available on government web pages indicating when they were incorporated. Non-numbered companies with short (and/or small numbers of) vessels also frequently did not have an online presence. As a result of most companies operating in B.C.'s groundfish trawl not providing information on their operations, it is very difficult to assess much of B.C.'s trawling industry. Larger companies do occasionally receive attention from news media or Non-Governmental Organizations (NGOs) aiming to get a grasp on what is happening in the fishery, but this is rarely the case for smaller companies. The information that is available is typically on government registries of corporations and commercial fishing vessels. These registries essentially only tell you if a company is presently active, when it was incorporated, the size of their vessel(s), and which company owns the vessel(s). This last data point is typically not revealing of anything substantive as the owners of the companies are not listed. Fishing operations are only transparent if a company chooses to relinquish information freely or as the result of extensive investigative work by journalists and NGOs. Further, as our attempt to get information through freedom of information channels shows, some basic and critically important information simply cannot be gained. This lack of publicly-available and specific information about the companies operating in BC's fisheries is not abnormal and is consistent with the information that is publically available in other sectors of the Canadian economy. That said, because fisheries are publicly-managed and regulated resources, specific information about who owns fishing rights and is engaged in fishing should be publicly available.

REFERENCES AND FURTHER READING

- ⁹⁵ "Fleet," Tinlet Fishing, n.d., <http://tinletfishing.com/fleet>.
- ⁹⁶ Peter German, "Dirty Money Report - Part 2: Turning the Tide – An Independent Review of Money Laundering in B.C. Real Estate, Luxury Vehicle Sales & Horse Racing," 2019, 264–65, <https://iclcr.org/publications/dirty-money-report-part-2/>; 1st session, 42nd Parliament;- No.132:Wednesday;February 20, 2019.
- ⁹⁷ German, "Dirty Money Report - Part 2;" 265.
- ⁹⁸ "Richmond Crab Processing Factory Fined More than \$110K for Obstructing Inspection, Other Violations," Canadian Broadcasting Corporation, 2021, <https://www.cbc.ca/news/canada/british-columbia/richmond-crab-processing-factory-fined-more-than-110k-for-obstructing-inspection-other-violations-1.5984662>; "Obstructing DFO Fishery Officers From Carrying Out Their Duties Is Illegal, & Results In Over \$110,000 In Fines For A Richmond Seafood Processing Company, Its Co-Owner, & A Supplier," Cision, 2021, <https://www.newswire.ca/news-releases/obstructing-dfo-fishery-officers-from-carrying-out-their-duties-is-illegal-amp-results-in-over-110-000-in-fines-for-a-richmond-seafood-processing-company-its-co-owner-amp-a-supplier-852566294.html>; Valerie Leung, "Richmond Seafood Company Fined over \$110,000 for Hindering Fishery Officer," Richmond News, 2021, <https://www.richmond-news.com/local-business/richmond-seafood-company-fined-over-110000-for-hindering-fishery-officer-3625995>.
- ⁹⁹ "Pac Seafood Quota Holding Inc." BusinessWiki, n.d., <https://businesswiki.info/company/wa/603211578/pac-seafood-quota-holding-inc>.

¹⁰⁰ "Viking Storm Holdings Inc," OpenGovWa, accessed June 27, 2022, <https://opengovwa.com/corporation/603211566>;

"Pac Seafood Quota Holding Inc." OpenCorporate, 2022, https://opencorporates.com/companies/us_wa/603211578; "Arctic Ocean Holdings Inc," OpenGovWa, accessed June 27, 2022, <https://opengovwa.com/corporation/603281212>.

¹⁰¹ "Contact Us," Pacific Seafood, n.d., <https://www.pacificseafood.com/contact-us/>.

¹⁰² PR Newswire, "Government of Canada Announces over \$5M in Clean Tech Funding for British Columbia Fisheries and Aquaculture Projects," Markets Insider, n.d., <https://markets.businessinsider.com/news/stocks/government-of-canada-announces-over-5m-in-clean-tech-funding-for-british-columbia-fisheries-and-aquaculture-projects-1030283316>.

¹⁰³ Scholz et al., "Catch-22: Conservation, Communities and the Privatization of the B.C. Fisheries: An Economic, Social and Ecological Impact Study," 24.

Conclusions and Policy Recommendations

B.C.'s groundfish trawl, and other fisheries, suffer from economic and political inequality, extreme levels of financialisation and over-capitalisation, and a problematic absence of transparency. Fishers are seeing their incomes decline and are being pushed into a choice between exploitative quota leases or untenable debt burdens incurred by purchasing their own fishing rights. The increasingly precarious economic position of fishers has been driven by the continual financialisation of the fishery. This financialization, in turn, has transformed quotas and licenses into speculative assets from which investors and processors may extract economic rents while assuming little to no economic risks themselves. Lastly, the true state of the fishery is obscured from the public, advocates, and fishers. This is due to financial information (such as who owns licences and quotas) and the environmental records of fishing companies being hidden.

It is high time that Fisheries and Oceans Canada, in accordance with section 2.5(g) of the *Fisheries Act*, meaningfully considers the economic, social, and cultural impact of their policy decisions on fishers and coastal communities. B.C.'s fisheries (if managed with the interests of communities, fishers, and the environment in mind) can again be a source of jobs and economic prosperity for people across B.C.. The use of small-scale and less intensive fishing methods will make the fishery less capital intensive and reduce the fishing industry's environmental impact. Fishing techniques like trawling are simply not compatible with sustainable fishing practices and should be phased out sooner rather than later.

A significant increase in transparency is a fundamental component of the policy changes needed. Environmental

impact data, including onboard observer reports, should be made publicly available. This should be in addition to the creation of a public database of who owns licences and quotas as well as other financial information like penalties and to whom quotas are being leased or sold. This has already been proposed by the Standing Committee on Fisheries and Oceans.¹⁰⁴ Ideally, both environmental impact data and ownership information can be incorporated into a searchable database that allows the environmental and financial records of companies operating in B.C. fisheries to be searched.

A failure to adopt policy reform in B.C.'s trawler industry is expected to contribute to large voter swings, especially in British Columbia. Individual fishers, coastal communities, and Indigenous peoples are feeling the impacts of poor fishery management practices. This is reflected in economic data as well as public opinion surveys. A large majority of Canadians and British Columbians are concerned with the various impacts bottom trawling has on the environment. Over a quarter of Canadians would vote for a political party that considered a trawling ban in its platform. 37% of British Columbians would do the same, regardless of past voting preferences. Significant percentages of the voter base in all major political parties express levels of concern about the trawler industry—our public servants and politicians should do the same. Sound management practices would consider the concerns Canadians and British Columbians have expressed.¹⁰⁵

As a closing comment, this white paper draws attention to Ecotrust Canada's previous call for: (1) access to licences and quotas being guaranteed for small-scale fishers and fishing communities; (2) non-fishers, including processors and investors, being banned from purchasing licences and quotas; (3) the present market-centric ITQ system being moved away from; and (4) communities and fishers being given a meaningful say in how fisheries are economically, socially, and environmentally managed.¹⁰⁶

REFERENCES AND FURTHER READING

¹⁰⁴ McDonald et al., "West Coast Fisheries: Sharing Risks and Benefits," 32.

¹⁰⁵ Pacific Wild. "Trawling for truth: Understanding public perspectives on the bottom trawl fishery in Canada," 31 October 2022 [web log]. <https://pacificwild.org/trawling-for-truth/>

¹⁰⁶ Sutcliffe et al., "Just Transitions: Towards Truly Sustainable Fisheries in British Columbia," 6.

References

- 1st session, 42nd Parliament; No.132: Wednesday, February 20, 2019, Pub. L. No. 132, § Standing Committee on Fisheries and Oceans (2019). <https://publications.gc.ca/site/eng/430326/publication.html>.
- "A Cautionary Tale about ITQs in BC Fisheries." Ecotrust Canada, 2009. <https://ecotrust.ca/latest/research/a-cautionary-tale-about-itqs-in-bc-fisheries-2009/>.
- Althaus, F. A. Williams, T. A. Schlacher, R. J. Kloser, M. A. Green, B. A. Barker, N. J. Bax, P. Brodie, and M. A. Schlacher-Hoenlinger. "Impacts of Bottom Trawling on Deep-Coral Ecosystems of Seamounts Are Long-Lasting." *Marine Ecology Progress Series* (Halstenbek) 397, no. Journal Article (2009): 279–94. <https://doi.org/10.3354/meps08248>.
- Pacific Wild. "An Overview of Bottom Trawling in Canada," 2021. <https://pacificwild.org/an-overview-of-bottom-trawling-in-canada/>.
- OpenGovWa. "Arctic Ocean Holdings Inc." Accessed June 27, 2022. <https://opengovwa.com/corporation/603281212>.
- Barange, Manuel, Momme Butenschon, Andrew Yool, Nicola Beaumont, Jose A. Fernandes, Adrian P. Martin, and J. Icarus Allen. "The Cost of Reducing the North Atlantic Ocean Biological Carbon Pump." *Frontiers in Marine Science* 3 (2017): 1–10.
- Baxter, Anna. "Largest Area of Ocean in the World Saved From Destructive Bottom Trawling." Oceana, 2009. <https://oceana.org/press-releases/largest-area-ocean-world-saved-destructive-bottom-trawling/>.
- "British Columbia Seafood Industry: Year in Review 2018." Government Report. Ministry of Agriculture and Food, 2018. <https://www2.gov.bc.ca/gov/content/industry/agriculture-seafood/statistics/agriculture-and-sea-food-statistics-publications>.
- BusinessWiki. "PAC SEAFOOD QUOTA HOLDING INC." n.d. <https://businesswiki.info/company/wa/603211578/pac-seafood-quota-holding-inc>.
- Campbell, Colin R. "Blue Carbon - British Columbia: The Case for the Conservation and Enhancement of Estuarine Processes and Sediments in B.C." Sierra Club BC, 2010. <https://sierraclub.bc.ca/wp-content/uploads/2015/08/Blue-Carbon-British-Columbia-Report.pdf>.
- Canada. Act to amend the Fisheries Act and other Acts in consequence: Loi modifiant la Loi sur les pêches et d'autres lois en conséquence, Pub. L. No. C-68 (2019). <https://go.exlibris.link/571J2ton>.
- Canadian Broadcasting Corporation. "Richmond Crab Processing Factory Fined More than \$110K for Obstructing Inspection, Other Violations," 2021. <https://www.cbc.ca/news/canada/british-columbia/richmond-crab-processing-factory-fined-more-than-110k-for-obstructing-inspection-other-violations-1.5984662>.
- The Canadian Press. "Marine Heat Waves Could Wipe out Fish Stocks, UBC Study Finds." 2021. <https://www.cbc.ca/news/canada/british-columbia/marine-heat-waves-could-wipe-out-fish-stocks-ubc-study-finds-1.6197798>.
- Cheung, William, Thomas Frolicher, Vicky W. Y. Lam, Muhammad Oyinlola, Gabriel Reygondeau, U. Rashid Sumaila, Travis Tai, Lydia C. L. Teh, and Colette C. C. Wabnitz. "Marine High Temperature Extremes Amplify the Impacts of Climate Change on Fish and Fisheries." *Applied Ecology* 7, no. 40 (2021): eabho895. <https://doi.org/10.1126/sciadv.abh0895>.
- Collie, Jeremy, Jan Geert Hiddink, van Kooten Tobias, Aiaan D. Rijnsdorp, Michel J. Kaiser, Simon Jennings, and Ray Hilborn. "Indirect Effects of Bottom Fishing on the Productivity of Marine Fish." *Fish and Fisheries (Oxford, England)* 18, no. 4 (2017): 619–37. <https://doi.org/10.1111/faf.12193>.
- Collie, Jeremy S., Stephen J. Hall, Michel J. Kaiser, and Ian R. Poiner. "A Quantitative Analysis of Fishing Impacts on Shelf-Sea Benthos." *The Journal of Animal Ecology* 69, no. 5 (2000): 785–98. <https://doi.org/10.1046/j.1365-2656.2000.00434.x>.
- Dayton, Paul K., Simon F. Thrush, M. Tundi Agardy, and Robert J. Hofman. "Environmental Effects of Marine Fishing." *Aquatic Conservation* 5, no. 3 (1995): 205–32. <https://doi.org/10.1002/aqc.3270050305>.
- "Deep Sea Life: On the Edge of the Abyss." Oceana, 2009. <https://oceana.org/reports/deep-sea-life-edge-abyss/>.
- Deweese, Christopher M. "Effects of Individual Quota Systems on New Zealand and British Columbia Fisheries." *Ecological Applications* 8, no. 1 (1998): S133. <https://doi.org/10.2307/2641371>.
- Douglas, Tristan J., Geotz Schuerholz, and S. Kim Juniper. "Blue Carbon Storage in a Northern Temperate Estuary Subject to Habitat Loss and Chronic Habitat Disturbance: Cowichan Estuary, British Columbia Canada." *Frontiers in Marine Science* 9 (2022): 1–24.
- Driscoll, John, Carrie Robb, and Karin Dotker. "Bycatch: In Canada's Pacific Groundfish Bottom Trawl Fishery." Oceana Canada, 2009. https://www.livingoceans.org/sites/default/files/bycatch_BC_Bottom_Trawl_Fishery_o.pdf.
- Duarte, Carlos M., I. J. Losada, Iris Hendricks, and Ines Mazarrasa. "The Role of Coastal Plant Communities for Climate Change Mitigation and Adaption." *Nature Climate Change* 3, no. 11 (2013): 961–68.
- Edwards, Danielle N. "Addressing Questions On The Social And Economic Outcomes Of An Individual Transferable Quota Fishery." PhD, University of British Columbia, 2009. <https://open.library.ubc.ca/soa/clrcle/collections/ubctheses/24/items/1.0385500>.
- Edwards, Danielle N., and Evelyn Pinkerton. "Rise of the Investor Class in the British Columbia Pacific Halibut Fishery." *Marine Policy* 109, no. Journal Article (2019): 103676. <https://doi.org/10.1016/j.marpol.2019.103676>.

- Edwards, D. N. & Pinkerton, E.. "The Hidden Role of Processors in an Individual Transferable Quota Fishery." *Ecology and Society* 24, no. 3 (2019): 36. <https://doi.org/10.5751/ES-11148-240336>.
- Epstein, Graham, Jack J. Middleburg, Julie P. Hawkins, Catrin R. Norris, and Callum M. Roberts. "The Impact of Mobile Demersal Fishing on Carbon Storage in Sea Beds." *Global Change Biology* 28, no. 9 (2022): 2875–94. <https://doi.org/10.1111/gcb.16105>.
- Falkowski, P. G. "The Role of Phytoplankton Photosynthesis in Global Biogeochemical Cycles." *Photosynthesis Research* 39, no. 3 (1995): 225–58. <https://doi.org/10.1007/BF00014586>.
- Fisheries and Oceans Canada. "Cold Water Corals and Sponges," 2018. <https://www.dfo-mpo.gc.ca/oceans/publications/soto-rceo/2012/page07-eng.html>.
- Fisheries and Oceans Canada. "Fishing-Related Employment by Industry and Province, 2017-2020," 2022. <https://www.dfo-mpo.gc.ca/stats/cfs-spc/tabs/cfs-spc-tab2-eng.htm>.
- Tinlet Fishing. "Fleet," n.d. <http://tinletfishing.com/fleet>.
- "Fleet Rationalization Committee (Canada) Report." *Illumina Biological Content - Unstructured*, 1982. <https://go.exlibris.link/q2dYv62v>.
- "Fleet Rationalization Committee (Canada) Report." *Illumina Biological Content - Unstructured*, 1982. http://uvic.summon.serialssolutions.com/2.0.0/link/o/eLvHCXMwY2AwNtzoEUrE4C5yCQxGdhEAvgZx-k1lsk4C1spFhioGZhWGqpXFsiqXqbjLGf9jWGGhovop-JcNGdkp8MGjXXNzQGJjZgf9y-oFAXdlsUaLYVdqV-GIvSqhRRbYHPfxlyZgRWYds1A-cA8xA-j2AXXJW4C-DLCxB9gaEvjEMmS_C9pBjVRonyADG6S9LcTAjJon-wqAPjLTUEoUi6HggdEemAtD03MySktRUBQ3w2QW-JmgqQmQVRBjU31xBnD12YQ-KBiQQo8p-Yl5pfWhwP-c4qRGANvImjlF4JelddigSDQmoisA43TjYC5m4jE7MU-woRT81TzRIMkk0TQpKyspSSDPAFTpQiqkGbgAka8EW-ToQoaBNQ2YtVJllesyoHjRA5oQGc4AAAnQr5Y
- German, Peter. "Dirty Money Report - Part 2: Turning the Tide – An Independent Review of Money Laundering in B.C. Real Estate, Luxury Vehicle Sales & Horse Racing," 2019. <https://icclr.org/publications/dirty-money-report-part-2/>.
- Guyondet, T., M. V. Krassovski, T. F. Sutherland, M. G. G. Foreman, and R. Filgueira. "An Ecological Carrying Capacity Assessment for Shellfish Aquaculture in Baynes Sound, British Columbia." Canadian Science Advisory Secretariat, 2022.
- Greer, Krista, Dirk Zeller, Jessika Woroniak, Angie Coulter, Maeve Winchester, M. L. Deng Palomares, and Daniel Pauly. "Global Trends in Carbon Dioxide (CO₂) Emissions from Fuel Combustion in Marine Fisheries from 1950 to 2016." *Marine Policy* 107 (2019): 103382.
- Haigh, Rowan, Debby Ianson, Carrie A. Holt, Holly E. Neate, and Andrew M. Edwards. "Effects of Ocean Acidification on Temperate Coastal Marine Ecosystems and Fisheries in the Northeast Pacific." *PLoS One* 10, no. 2 (2015): e0117533.
- Hiddink, J. G., S. Jennings, M. J. Kaiser, A. M. Queiros, D. E. Duplisea, and G. J. Piet. "Cumulative Impacts of Seabed Trawl Disturbance on Benthic Biomass, Production, and Species Richness in Different Habitats." *Canadian Journal of Fisheries and Aquatic Sciences* 63, no. 4 (2006): 721–36. <https://doi.org/10.1139/f05-266>.
- Houghton, R. A. "Balancing the Global Carbon Budget." *Annual Review of Earth and Planetary Sciences* 35, no. 1 (2007): 313–47. <https://doi.org/10.1146/annurev.earth.35.031306.140057>.
- Kumar, A. Biju, and G. R. Deepthi. "Trawling and By-Catch: Implications on Marine Ecosystem." *Current Science (Bangalore)* 90, no. 7 (2006): 922–31.
- Lang-Wong, A, C Drews, N Schulz, R McDonald, T Plant, P Heavyside, A Mora-Soto, and M. Sattler. "Seaforestation: Benefits to the Climate, the Ecosystems, and the People of British Columbia." 2021-2030 United Nations Decade of Ocean Science for Sustainable Development. Ocean Wise, 2022.
- Lee, Taylor R., Warren T. Wood, and Benjamin J. Phrampus. "A Machine Learning (KNN) Approach to Predicting Global Seafloor Total Organic Carbon." *Global Biogeochemical Cycles* 33, no. 1 (2019): 37–46.
- Leung, Valerie. "Richmond Seafood Company Fined over \$110,000 for Hindering Fishery Officer." Richmond News, 2021. <https://www.richmond-news.com/local-business/richmond-seafood-company-fined-over-110000-for-hindering-fishery-officer-3625995>.
- Malecha, Patrick, and Jonathan Heifetz. "Long-Term Effects of Bottom Trawling on Large Sponges in the Gulf of Alaska." *Continental Shelf Research* 150, no. Journal Article (2017): 18–26. <https://doi.org/10.1016/j.csr.2017.09.003>.
- McCay, Bonnie J. "Social and Ecological Implications of ITQs: An Overview." *Ocean & Coastal Management* 28, no. 1 (1995): 3–22. [https://doi.org/10.1016/0964-5691\(96\)00002-6](https://doi.org/10.1016/0964-5691(96)00002-6).
- McDonald, Ken, Todd Doherty, Gord Johns, Mel Arnol, Blaine Calkins, Sean Casey, Pat Finnigan, Ken Hardie, Roberts J. Morrissey, and Churence Rogers. "West Coast Fisheries: Sharing Risks and Benefits." Report of the Standing Committee of Fisheries and Oceans. Government of Canada, 2019.
- McVeigh, Karen. "Bottom Trawling Releases as Much Carbon as Air Travel, Landmark Study Finds." The Guardian, 2021. <https://www.theguardian.com/environment/2021/mar/17/trawling-for-fish-releases-as-much-carbon-as-air-travel-report-finds-climate-crisis>.
- Murray, Joyce and Canada. Act to amend the Access to Information Act and the Privacy Act and to make consequential amendments to other Acts: Loi modifiant la Loi sur l'accès à l'information, la Loi sur la protection des renseignements personnels et d'autres lois en conséquence, Pub. L. No. C-58

- (2019). http://uvic.summon.serialssolutions.com/2.0.0/link/o/eLvHCXMwRZ1LT8MwDIAAtBBckJECAYDwUfkC7l-JQ2PU6liSMHDnCqTB5oYmvH2iEm8eOj07lVEJy4VY4b-tYlqu4k_BoBchDz4ZhPQll9oFutMo4q4TaywKYr0Mb-KcK4lfabllaDftLF2FT56zo-HxSupF1bnOnR_L-uNy-VAUE4sxdrmNZ_ul8DEgeRDKfakpl24TohJnSWw-bLGZ-tKhtw3q2R8LZY7Ss3uMvPOo3_Xg7sGEIb9iF-NVPswctA1awuGU5MoZmlBdnAH6BlshZUoo4ZqW-GrcTsbvaJarGQlm-CzYeozL9vZJHHTo8fnSMFjXnRHtQ-nw-u7q5uAXjcXCadaGrn_MEUi4tR5NXEAWoiJ9oX-tAT19CExylApj48Jl92eVGpSXolqVRkYI7VqOoPd7h72_Gogho4-PX-84gfV6Njenzbyd-Un8AEvxvUk.
- Muse, Ben. "Fleet Reduction in British Columbia's Commercial Salmon Fisheries: 1996-1998." Alaska Commercial Fisheries Entry Commission, 1999. https://cfec.state.ak.us/RESEARCH/buyback/BC_BB_2.PDF.
- Nellemann, Christian, Stefan Hain, and Jackie Alder. "In Dead Water: Merging of Climate Change with Pollution, Over-harvest, and Infestations in the World's Fishing Grounds." United Nations Environment Program, 2008.
- Newell, Dianne. "Rights Reconsidered: From the Davis Plan to Sparrow, 1969–1993." In *Tangled Webs of History*, 148. University of Toronto Press, 1999. <https://doi.org/10.3138/9781442680357.12>.
- Cision. "Obstructing DFO Fishery Officers From Carrying Out Their Duties Is Illegal, & Results In Over \$110,000 In Fines For A Richmond Seafood Processing Company, Its Co-Owner, & A Supplier," 2021. <https://www.newswire.ca/news-releases/obstructing-dfo-fishery-officers-from-carrying-out-their-duties-is-illegal-and-results-in-over-110-000-in-fines-for-a-richmond-seafood-processing-company-its-co-owner-and-a-supplier-852566294.html>.
- OpenCorporates. "PAC SEAFOOD QUOTA HOLDING INC.," 2022. https://opencorporates.com/companies/us_wa/603211578.
- OpenGovWa. "VIKING STORM HOLDINGS INC." Accessed June 27, 2022. <https://opengovwa.com/corporation/603211566>.
- "Pacific Region: Integrated Fisheries Management Plan Groundfish." Fisheries and Oceans Canada, 2022. <https://www.pac.dfo-mpo.gc.ca/fm-gp/ifmp-eng.html>.
- Pacific Wild. "Trawling for truth: Understanding public perspectives on the bottom trawl fishery in Canada," 31 October 2022 [web log]. <https://pacificwild.org/trawling-for-truth/>
- Pacific Seafood. "Contact Us," n.d. <https://www.pacificseafood.com/contact-us/>.
- Pendleton, Linwood, Daniel Donato, Brian C. Murray, Stephen Croocks, W. Aaron Jenkins, Samantha Sifleet, Christopher Craft, et al. "Estimating Global 'Blue Carbon' Emissions from Conversion and Degradation of Vegetated Coastal Ecosystems." *PLoS One* 7, no. 9 (2012): 243542.
- Petrou, Katherine, Kirralee G. Baker, Daniel A. Nielsen, Alyce M. Hancock, Kai G. Schulz, and Andrew T. Davidson. "Acidification Diminishes Diatom Silica Production in the Southern Ocean." *Nature Climate Change* 9, no. 10 (2019).
- Pinkerton, Evelyn, and Reade Davis. "Neoliberalism and the Politics of Enclosure in North American Small-Scale Fisheries." *Marine Policy* 61, no. Journal Article (2015): 303–12. <https://doi.org/10.1016/j.marpol.2015.03.025>.
- PR Newswire. "Government of Canada Announces over \$5M in Clean Tech Funding for British Columbia Fisheries and Aquaculture Projects." Markets Insider, n.d. <https://markets.businessinsider.com/news/stocks/government-of-canada-announces-over-5m-in-clean-tech-funding-for-british-columbia-fisheries-and-aquaculture-projects-1030283316>.
- Sala, Enric, Juan Mayorga, Darcy Bradley, Reniel B. Cabral, Trisha B. Atwood, Arnaud Auber, William Cheung, et al. "Protecting the Global Ocean for Biodiversity, Food and Climate." *Nature (London)* 592, no. 7854 (2021): 397–402. <https://doi.org/10.1038/s41586-021-03371-z>.
- Scholz, Astrid, Eric Enno Tamm, Andrew Day, Danielle N. Edwards, and Charles Steinback. "Catch-22: Conservation, Communities and the Privatization of the B.C. Fisheries: An Economic, Social and Ecological Impact Study," 2004. <https://ecotrust.ca/latest/research/catch-22-2004/>.
- Steadman, Daniel, John B. Thomas, Vanessa R. Villanueva, Forrest Lewis, Daniel Pauly, M. L. Deng Palomares, Max Levine, John Virdin, Steve Rocliffe, and Tom Collinson. "New Perspectives on an Old Fishing Practice: Scale, Context and Impacts of Bottom Trawling," 2021.
- Stiles, Margot L., Julie Stockbridge, Laude Michelle, and Michel F. Hirshfield. "Impacts of Bottom Trawling on Fisheries, Tourism, and the Marine Environment." Oceana, 2010. <https://oceana.org/reports/impacts-bottom-trawling-fisheries-tourism-and-marine-environment/>.
- Sutcliffe, Tasha, Dyhia Belhabib, Jim McIsaac, Eliana Macdonald, Devlin Fernandes, Des Nobels, Ian Gill, and Brenda Reid Kuecks. "Just Transitions: Towards Truly Sustainable Fisheries in British Columbia." Ecotrust Canada, 2018. <https://ecotrust.ca/latest/research/just-transactions-just-transitions-towards-truly-sustainable-fisheries-in-british-columbia-2018/>.
- Thrush, Simon F., and Paul K. Dayton. "Disturbance To Marine Benthic Habitats By Trawling And Dredging: Implications for Marine Biodiversity." *Annual Review of Ecology and Systematics* 33, no. 1 (2002): 449–73. <https://doi.org/10.1146/annurev.ecolsys.33.010802.150515>.
- Wallace, Scott, Bruce Turris, John Driscoll, Karin Bodtker, Brian Mose, and Gordon Munro. "Canada's Pacific Groundfish Trawl Habitat Agreement: A Global First in an Ecosystem Approach to Bottom Trawl Impacts." *Marine Policy* 60, no. Journal Article (2015): 240–48. <https://doi.org/10.1016/j.marpol.2015.06.028>.
- Wallace, Scott. "Dragging Our Assets: Towards an Ecosystem Approach to Bottom Trawling in Canada." David Suzuki Foundation, 2007. <https://davidsuzuki.org/science-learning-centre-article/dragging-our-assets-toward-an-ecosystem-approach-to-bottom-trawling-in-canada/>.

Wang, Zhi, Kenneth M. Y. Leung, Yik-Hei Sung, David Dugan, and Jian-Wen Qiu. "Recovery of Tropical Marine Benthos after a Trawl Ban Demonstrates Linkage between Abiotic and Biotic Changes." *Communications Biology* 4, no. 1 (2021): 212–18. <https://doi.org/10.1038/s42003-021-01732-y>.

Welch, Craig. "Coral Concerns Spur Vast Trawling Ban." News Paper. The Seattle Times, 2005. <https://www.seattle-times.com/seattle-news/coral-concerns-spur-vast-trawling-ban/>.

"West Coast Queen Charlotte Islands Groundfish Bottom Trawl Survey, September 11th to October 17th, 2007." Nanaimo, BC: Fisheries and Oceans Canada, 2008. <https://waves-vagues.dfo-mpo.gc.ca/library-bibliothque/40757791.pdf>.



PACIFIC **WILD**