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A hundred years of Pacific halibut management in the context of global events and trends in fisheries management

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The Convention for the Preservation of the Halibut Fisheries of the Northern Pacific Ocean, signed between Canada and the United States of America on 2 March 1923 and ratified on 21 October 1924, established the International Fisheries Commission, renamed in 1953 to the International Pacific Halibut Commission (IPHC). It was the first international agreement for joint management of a marine fishery resource and a major milestone for development of modern standards for marine conservation. The IPHC's centennial year is an opportunity to celebrate a remarkable history of the Commission, but also reflect on challenges that shaped its mission. Born from alarms about overfishing during World War I, the Commission gradually gained authority to implement a wide range of conservation measures through established public confidence in its basis for decisions. This paper explores the evolution of management measures applied to Pacific halibut commercial fishing shaped not only by the changing stock conditions and growing demand for seafood, but also global events and trends in fisheries management. It examines the impact of rapid commercialization of fisheries driven by population growth and technological improvements, establishment of exclusive economic zones and altered access to fishing grounds, and adoption of Agenda 21, which highlighted the importance of balancing environmental, economic, and social aspects in fisheries management. It concludes by discussing the lessons learned over the past century and their implications for future fisheries management, emphasizing the importance of international cooperation, adaptive strategies, and science-based policies in sustaining transboundary fish stocks like the Pacific halibut.

KEYWORDS

Pacific halibut, management measures, IPHC, commercial fishery, transboundary stock

1 Introduction

In 1884, naturalist G. Brown Goode pronounced the meat of Pacific halibut (*Hippoglossus stenolepis*) to be “the highest state of perfection” (Goode, 1888), and in the years since, thousands of North Pacific longliners echoed his sentiment (IPHC, 1991). While Pacific halibut has been fished for several thousands of years by Indigenous and First Nations peoples who inhabited what is now known as Alaska, British Columbia, and the United States West Coast (Washington, Oregon, and California) (IPHC, 1988), the late 19th century marks the beginning of unrestrained expansion of the North American Pacific halibut commercial fishery. The fishery officially started with a landing in Tacoma, Washington, in September 1888, by the sailing vessel *Oscar and Hattie* (Keith et al., 2014). The harvest was sent to the East Coast on Northern Pacific Railroad. The fishery extended its operations as far north as Cape Spencer, Alaska, by 1910 (IPHC, 1951) and Gulf of Alaska by 1913. Decades of expansion were enabled by technological advancements such as the ability to make ice (IPHC, 1994). The landings reached nearly record levels by 1915, just under 70 mil. lbs¹ (Figure 1).

The years of unrestricted harvest soon led to stock condition failing to sustain the demand (Iles, 1980). The early 20th century was a period when the human population growth rates in the USA were considerably higher than those observed today, particularly in the Pacific Northwest.² Moreover, there was a notable shift in dietary habits as people moved from a restricted diet to consuming a wider variety of food, taking advantage of access to a broader array of products and new cooking equipment (Williams, 1999).

Seeing decreasing catch rates, the fishing industry began advocating for international control of the Pacific halibut fishery. A clear sign of depletion was the fleet’s shift to increasing power of vessels that could go greater distances, and increasing expenses associated with fishing trips (Province of BC, 1917).³ On the other hand, fish offered attractive margins for retailers. Pacific halibut was sold at the docks in Seattle in 1916 for 5 cents per lb (1.40 in current USD), while retailers were selling it for 25 cents per lb (Province of BC, 1917). This was comparable to the price of beef sold in Seattle, ca. 23 cents per lb in 1916 (BLS, 1917).⁴

It was not until after World War I that Canada and the USA signed a convention appointing the International Fisheries Commission to investigate the fishery and to recommend measures for its preservation. The Convention for the Preservation of the Halibut Fisheries of the Northern Pacific Ocean was signed on 2 March 1923. Following the need for some revisions of enforcement provisions by Canada, ratifications were finally exchanged on 21 October 1924. The action established the International Fisheries Commission, which was renamed in 1953 and became the International Pacific Halibut Commission (IPHC).

Signing the 1923 treaty was remarkable in a number of ways. It was the first convention ever concluded for the purpose of conserving a deep-sea fishery (IPHC, 1951). Collaboration established by the IPHC was ahead of what was mandated in the international law. The conservation and management measures implemented by the Commission set Pacific halibut on a trajectory allowing an increase in landings all the way to the early 1960s. Signing the 1923 Convention also led to effectively the first treaty Canada entered as a nation, with comments at the time going as far as a “formal withdrawal of Canada from the British Empire” (Bell, 1969). Prior to this Convention, all international agreements were signed by Canada in conjunction with envoys of Great Britain (Hillmer and Scott, 2006). In this case, the signed Treaty was signed by Canada, on behalf of “His Majesty, the King of the United Kingdom of Great Britian and Ireland, and of the British Dominions beyond the Seas, Emperor of India” (The Treaty). The signed Treaty was then passed to the King for formal review and ratification.

The 1923 Treaty was revised several times to expand the Commission’s authority, resulting in 1930, 1937, and 1953 Conventions (Bell, 1969). Canada and the USA renegotiated the Convention in 1979 (McCaughran and Hoag, 1992), and the 1979 Protocol amending the Convention was officially enacted in the USA as the Northern Pacific Halibut Act of 1982. These Conventions and the amendment define the governance framework of the IPHC and form the foundation for the management measures described throughout this paper. However, one important caveat is that each Contracting Party (Canada or the USA) may establish additional domestic management measures for Pacific halibut fisheries that are more restrictive than those adopted by the Commission.

The Commission generally operates on an annual cycle, with decision made at the Annual Meeting occurring early in the year, in locations rotating between Contracting Parties. Various regulations, within the Commission’s authority at the time, are adopted. In recent years, major decisions have included season dates and mortality limits. The finalized set of regulations is published in the Canada Gazette and the United States Federal Register, and also provided in the IPHC Fishery Regulations publication for informational purposes.

The Commissions currently consists of six Commissioners, three from each Party, appointed through the national process of the Contracting Party they represent. Decisions are generally made by consensus, defined as the absence of any formal objection. If consensus cannot be achieved, each Commissioner is entitled to one vote, and decisions require a concurring vote of at least two

1 All values are provided as net weight unless otherwise noted. Net weight is defined as the weight of Pacific halibut without gills, entrails, head, ice, and slime.

2 The United States Census Bureau data for the United States indicate growth rate of 21.0% for a decade through 1910 vs current rate of 7.4%. For USA West Coast, the rates were 64.4% vs. 9.2% currently. See [US Census Bureau data](#).

3 Shifting of the area where the most intensive fishing occurs yearly further from shore was a conclusion of early research (1914-1915) by Thompson, future executive director of the Commission.

4 The markup in 1916 was 0.25 USD/0.05 USD=5 vs. 20 USD /5.70 USD=3.5 in 2023.

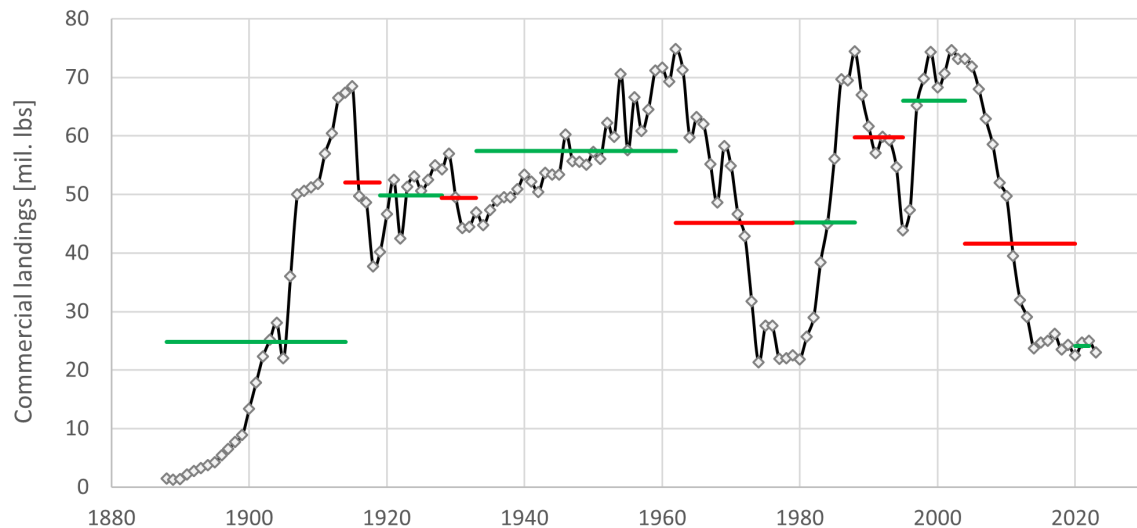


FIGURE 1

Commercial landings (includes FISS; 1988–2023). Green horizontal lines indicate periods of landings increase, while red horizontal lines indicate periods of landings decrease. Source: [IPHC \(2024b\)](#).

Commissioners of each Contracting Party, as specified by the 1979 Protocol. The IPHC Rules of Procedure outline the internal organization and operational rules for the Commission, along with the procedures for its subsidiary bodies, which facilitate stakeholder input into the Commission's decisions.

The IPHC Secretariat, led by an Executive Director and supported by staff, have operated under the Commission since 1923, beginning with the appointment of William F. Thompson as the first Executive Director. Over its one-hundred-year history, the IPHC has had seven Executive Directors. Although the size of the Secretariat has varied, its core function remains to support the Commission in scientific research and decision-making. Currently, this involves administration, fishery-dependent and fishery-independent data collection, biological and ecosystem research, development of fishery regulations, and quantitative analysis. The Secretariat presents a summary of its activities at the Annual Meeting.

2 Management measures

Pacific halibut regulations have been shaped not only by the changing conditions of the stock and a wide range of socioeconomic factors centered on growing demand for seafood, but also global events and trends in fisheries management. During the past 100 years of IPHC's experience, substantial changes have occurred in the international fishery scene.

2.1 Winter closure

The first regulatory measure introduced by the Commission was a three-months long winter closure effective on 15 November 1924. Between 1914 and 1920, the Pacific halibut industry,

particularly in the USA, advocated for the prohibition of fishing during the winter period and in certain nursery grounds. These measures were a part of the Draft Treaty of 1919 which proposed a single International Fisheries Commission to regulate the fisheries for Pacific halibut and the Fraser River sockeye salmon. However, because of the sensitive nature of provisions such as reciprocal port use or tariffs, the agreement failed to be ratified ([Bell, 1969](#)).

While the industry's persistent advocacy for the winter closure paved the way for a broader, conservation-oriented agreement, it's evident that the concept was initially driven by economic factors rather than conservation purposes ([Babcock et al., 1931](#)). The suggestion of a closure was first initiated at a time of Pacific halibut over-production as a means of curbing the volume of fish available. A 1916 Pacific Fisherman article read "*This [the idea of a closure] was more for the purpose of reducing the catch than anything else, as the enormous increase in the fleet and the establishment of new cold storage plants had caused an over-supply of fish, with the result that prices dropped to a low ebb and all were losing money.*" Although there was some evidence that stock abundance was decreasing, the closure was first mentioned in the name of conservation only as a means of gaining acceptance for it.

The winter closure, initially introduced as a conservation measure, was perceived as risky from the start. William Francis Thompson, soon to be the first executive director of the Commission, warned that this may "*simply result in a more intense fishery during the open portion of the year*" ([Province of BC, 1917](#)). At the time, Thompson theorized that rather than reducing supply, with the fishery closed in winter, the increased demand in summer driven by the desire to build frozen inventory would drive prices up, further intensifying effort in the fishery. The pattern of spring price increases holds true to this day due to decreasing inventories over the winter closure, leading to higher prices when the fishing period reopens. Thompson also speculated that this would drive the demand for the more vulnerable fraction of

the population, small Pacific halibut between 5 and 10 lbs, so-called “chickens,” which were easier to freeze (Province of BC, 1917).

In a self-fulfilling prophesy, conservative measures were desperately needed by the time the closure was first implemented in 1924 (IPHC, 1999). By the time the Commission introduced the winter closure, Huxley’s famous statement “*nothing we do seriously affects the number of fish, and any attempt to regulate these fisheries seems consequently, from the nature of the case, to be useless*” (Huxley, 1883)⁵ was largely disproven. From the Commission’s later work, it was clear that the stock was badly depleted by the early 1930s. However, as predicted by Thompson, the closure did not have tangible conservation benefits, nor did provide substantial resource protection (Bell, 1969). Rather, early reports cite modest benefits, including protection from bad weather and the consequent loss of gear and time, improvement to the grade of fish, as fish taken during the summer months were said to be superior, and stabilization of frozen Pacific halibut price that in turn had a favorable effect on the demand for frozen fish (Thompson and Freeman, 1930).

The winter closure also had an unexpected implication that came as a surprise to the Commission in 1998. A discrepancy between the DFO and IPHC regulations was discovered when about 9,000 lbs of live fish landings occurred in British Columbia that year (IPHC, 1999). A requirement to remove gills and entrails was introduced into IPHC regulations in 1995 because of concerns related to missing biological samples for the live fish deliveries. Some of the fish landed live were sold immediately to consumers while other fish were penned, not fed, and sold at a later date at a premium price during the winter closure. The landings sparked controversy in both Canada and the USA, especially with interest groups both for and against aquaculture. In 1999, the Canadian government chose not to adopt this IPHC regulation and thus allowing live penning. This discrepancy in measures between Canada and the USA remains to this day.

Besides a winter closure, the IPHC also implemented spatially-limited closures in areas believed to be important nursery grounds. In 1932, two areas, one in the vicinity of Noyes Island and Timbered Islet (Iphigenia Bay) in the southeastern Alaska and on one in the Masset grounds, off the north coast of Graham Island in British Columbia were closed year-round. This measure was retained until 1960. In 1967, the southeastern part of the Bering Sea was declared a year-round juvenile-protecting closure to the directed commercial sector, mandating the discard of Pacific halibut by other sectors. With some changes to the location, this area remains closed to Pacific halibut fishing to this day.

2.2 Catch limits

While the winter closure was written into the text of the 1923 Convention, the original treaty did not grant the Commission regulatory powers to further the conservation efforts. Initially, the

Commission was largely restricted to the investigation of the condition of the fishery for the purpose of recommending measures for the preservation and development of the stock (1923 Convention, art. III).

The lack of effectiveness of the winter closure for stock preservation led the Commission to request in 1928 authority to establish catch limits. This was granted in the 1930 Convention, effective since 1932 (Skud, 1977b). Active regulation of the Pacific halibut fishery through annual catch limits began the same year, with limits initially applied to two out of four regulatory areas at the time. Under this management regime, the fleet operated as a derby fishery, with all vessels racing to catch as much as possible before the catch limits were reached.

The tenure of Thompson, the first executive director of the Commission, proved to be successful as the stock increased and the Pacific halibut fishery was considered by many a model of a well-managed fishery (Dunn, 2001; Clark, 2003). He, himself, noted that “*the halibut regulation presents the only definite case of sustained improvement of an overfished deep-sea fishery. Thus, I believe, is true and the fact should lend special importance to the principles which have been deliberately used to obtain this improvement*” (Thompson, 1952). However, some questioned Thompson’s explanation of the stock increase after the 1930s, proposing natural changes as a cause - see the Thompson-Burkenroad debate in (Skud, 1975a). Regardless, the fishing fleet’s capacity to trigger stock depletion predating the Convention suggests that favorable environmental conditions alone would have been unlikely to secure the vitality of the fishing industry.

The adjustments to catch limits were intended to be introduced in a way to “*minimize the disturbing effect of regulation upon the economics of the fleets by making any required changes in a gradual manner*” (Southward, 1968). However, the implementation the catch limits effectively started to shorten the fishing period due to quick attainment of the limit, particularly in British Columbia and Southeast Alaska (at the time, Regulatory Area 2) (Figure 2). Soon after the establishment of annual limits, the winter closure became practically irrelevant because of closures resulting from the attainment of the annual limits (Dunlop, 1959). It is worth noting that over the first few decades of implementation of catch limits, it was also not uncommon for the catch to exceed the annual quota set by the Commission. It was difficult, with 12 to 18 days advance notice to the fishing fleet, to estimate the precise date when the quota would be taken (Skud, 1977b). Over the period 1932-1976, Regulatory Area 2 (British Columbia and southeast Alaska), limits were exceeded 78% of the time (29% exceeded by more than 10%) and in Regulatory Area 4 (Gulf of Alaska), limits were exceeded 29% of the time (22% exceeded by more than 10%) (Skud, 1977b). In recent years, attainment of catch limits is often near 100% and rarely exceeds that for any particular sector.

2.3 Gear restrictions

The 1923 Convention addressed the issue of incidental catch of Pacific halibut when fishing for other species, either using longline or other gear types, by allowing the retention only as food for crew.

⁵ Inaugural Address, Fisheries Exhibition, London (1883); see more details [here](#).

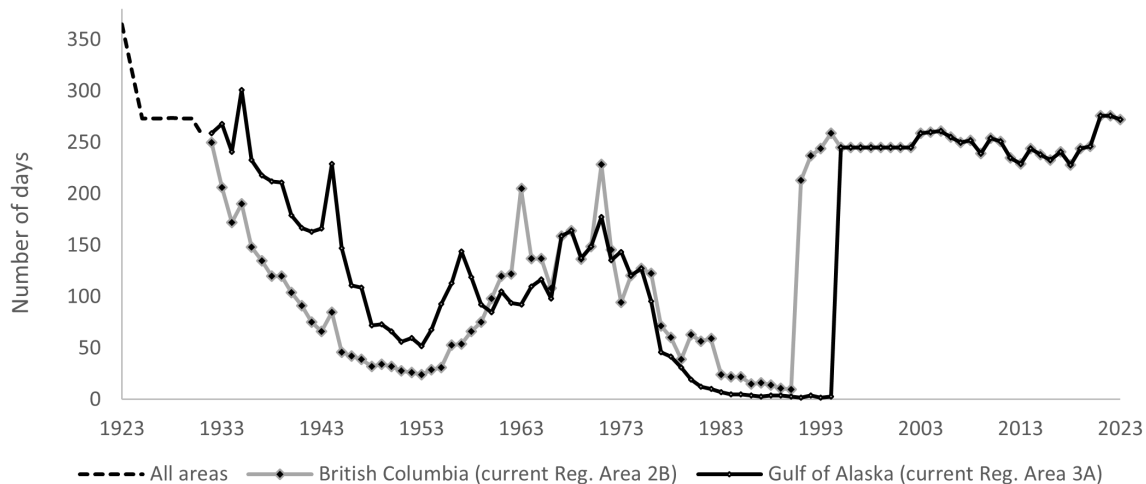


FIGURE 2
Fishing period length (1923–2024). Source: IPHC (2024c).

Gear restrictions authority was granted to the Commission in the 1930 Convention and allowed it to “fix the size and character of halibut fishing appliances to be used therein.” The early commercial fishing was conducted using dories, small, flat-bottomed boats with high sides. This method was dangerous and gradually replaced with longline fishing through 1920s and 1930s. Dory fishing prohibition began in 1935 in limited areas and extended throughout the whole Convention area in 1944. It was the first measure applied to regulate the directed Pacific halibut commercial fishery.

Over the years, gear restrictions evolved to also address emerging challenges of bycatch. The 1937 Convention expanded the Commission’s authority to control the capture of Pacific halibut incidental to fishing for other species in areas closed to Pacific halibut fishing once catch limits were reached (IPHC, 1951). Utilizing this authority, the Commission introduced a permit system in 1937 that allowed setline vessels⁶ to retain and sell a limited volume of Pacific halibut⁷ when the Pacific halibut fishing period was over due to reaching the area limit. This provision lasted through 1948 (IPHC, 1951).

Provisions for limited bycatch retention by the setline sector were in contrast to restrictions imposed on the trawl sector. The retention of trawl-caught Pacific halibut was prohibited by the Commission in 1944 because many of the Pacific halibut caught with demersal trawls were under the marketable size (Bell, 1956; Myhre, 1969; Skud, 1977b). The 1944 prohibition reflected growing anxieties about Pacific halibut sustainability, which were further exacerbated in the 1960s with the entry of foreign trawl fleets into North American waters. Without tight controls, their Pacific halibut bycatch skyrocketed, peaking at 21 million lbs in 1965 (Williams, 2013).

Losses of young Pacific halibut attributed to trawl fisheries, both domestic (Canada and the US) and foreign (Japan and Soviet Union), were recognized as a major contribution to decreased catches later that decade (IPHC, 1970, 1977; Skud, 1977a).

These developments prompted a series of agreements aimed at reducing bycatch. Japan agreed to restrict trawling in the Bering Sea in 1973 and expanded the restrictions to the Gulf of Alaska in 1975 (IPHC, 1975). Similar agreement was reached with the former Soviet Union for implementation in 1976 (IPHC, 1976). Bycatch of juvenile Pacific halibut by the trawl sector became even more contentious going into 1990s (IPHC, 1991). After full Americanization of the North Pacific groundfish fisheries in 1987, bycatch rates shot up again. In 1990, Canadian Commissioners refused to adopt regulations until the US came up with a feasible bycatch reduction plan. In 1990, bycatch mortality topped 17.5 million lbs and bycatch caps called the groundfish trawl sector to a halt for the first time (IPHC, 1993). In the years to follow, the mortality declined (Stewart et al., 2021)⁸. In November 2023, NOAA Fisheries published a final rule to implement regulations that links the Pacific halibut prohibited species catch (PSC) allowance of the Amendment 80 commercial groundfish trawl fleet to indices of Pacific halibut abundance.

Additionally, the fisheries sector has sought to mitigate the economic and environmental impacts of bycatch through innovative programs like seafood donation (Watson et al., 2020). Since 1998, organizations such as SeaShare have been instrumental in repurposing Pacific halibut bycatch, channeling otherwise wasted

⁶ Setline gear is defined as one or more stationary lines that are buoyed and anchored, with hooks attached to them.

⁷ The measure allowed one lb of Pacific halibut per 7 lbs of other sellable species, mainly sablefish, lingcod and rockfish.

⁸ Bycatch mortality rates have been estimated by the IPHC based on holding studies (e.g. Peloten, 1969) and tagging efforts (e.g. Clark et al., 1992; Kaimmer and Trumble, 1998; Loher et al., 2022). This information, combined with observer assessments of individual fish viability at the time of release, provides fleet-specific discard mortality rates in both Canadian and USA waters. These rates currently range from 100% in some trawl fisheries to less than 10% in some hook-and-line fisheries (Cahalen et al., 2024).

resources to support food security for disadvantaged communities throughout the USA, particularly in Alaska. These efforts illustrate a multifaceted approach to fisheries management, balancing the need for economic viability with environmental stewardship and community support.

Gear restrictions have also been responsive to new realities of the directed fisheries. For instance, the 1987 regulations prohibited the use of automated hook strippers (crucifiers), which were found to cause severe injuries to sublegal Pacific halibut, negatively affecting their post-release survival (IPHC, 1989). These devices were legalized again in 1995, but their use was restricted to retained fish to mitigate unintended harm. IPHC Fishery Regulations require careful release of fish that are not being retained.

Furthermore, the Pacific halibut fishery does not operate in isolation; its interactions with other fisheries on occasion prompted changes in regulatory measures. Starting in 1995, harvesters were permitted to conduct mixed Pacific halibut and sablefish (*Anoplopoma fimbria*) trips, enabling them to land Pacific halibut while targeting sablefish to reduce discards (IPHC, 1996). Since 2007 in Canada and since 2016 in the USA, under the IPHC Fishery Regulations, Pacific halibut can be also retained when targeting sablefish using pot gear⁹. The Pacific halibut fishery has also exhibited adaptability to measures restricting bycatch of other species (Forrest et al., 2020).

2.4 Size limits

The Commission also considered as “economically desirable” measures believed to protect small fish until they are of larger size (Babcock et al., 1931). Options considered included size limits, prohibition of the use of small hooks, and closure of nurseries to fishing. These measures were typically introduced because of the belief that older individuals had higher fecundity, which was assumed to be proportional to the weight of the fish (Schmitt and Skud, 1978). Early proponents of size limits included Ricker (Ricker, 1945) who provided a method of estimating minimum size limits for obtaining maximum yield.

Initially, the Commission introduced a weight limit. Since 1940, the fishery was “limited to halibut weighting 5 pounds or over as computed with heads off, entrails removed or to halibut weighting 5 pounds 13 ounces or over as computed with heads on, entrails removed.” This weight was the division between the trade categories of “baby” and “chicken” Pacific halibut. Although the total catch of baby Pacific halibut was small at that time, the measure stopped a few vessels from landing excessive numbers of small Pacific halibut.

The size limit first appeared in the regulations in 1944, initially restricting catches of Pacific halibut under 26 inches, although the 5

lbs weight minimum remained an acceptable measure through 1972. Interestingly, size limits were not specified in the Convention until 1953 (Skud, 1977b). The same size limit was adopted by the International North Pacific Fisheries Commission (INPFC)¹⁰ in the eastern Bering Sea and was applicable to Japanese vessels.

In 1966, the industry proposed an investigation of increasing the size limit. The Commission questioned the anticipated benefits and did not adopt the proposal. Later, a reassessment of stock abundance and a re-examination of other population parameters indicated that potential benefits could be realized by increasing the minimum size (Myhre, 1974). This was mainly due to shifts in weight at age in the stock. The increase to 32 inches was introduced in 1973 (24 inches head-off, equivalent to 10 lbs of dressed weight), but not for the Bering Sea where it remained at 26 inches (IPHC, 1974). The analysis concluded that “fewer chickens will be captured, allowing them to grow and increase in value to the fishermen” (Myhre, 1973). Uniform size limit for all areas was introduced year later, in 1974 (IPHC, 1975).

The 32-inch size limit, introduced in 1973 and 1974, has remained in regulations even after numerous analyses investigating alternative size limits (e.g. Clark and Parma, 1995; Martell et al., 2015; Stewart and Hicks, 2017; Valero and Hare, 2012), and despite the latest results indicating that the fishery would benefit from the removal of the size limit (Stewart et al., 2020; Hicks et al., 2023). The prevailing conclusion was that lowering the size limit would likely lead to a reduction in the landings of Pacific halibut over 32 inches and an overall increase in landings primarily realized through landings of Pacific halibut under 32 inches. Subject to model assumptions, for the commercial fishery without a size limit to maintain economic parity to the fishery with a 32-inch size limit¹¹, the market price for Pacific halibut under 32 inches would need to approach only about half that of Pacific halibut over 32 inches. Concerns raised about the potential for high grading and the lower market prices for smaller Pacific halibut were pivotal in the decision to retain the size limit.

Since 1998, sublegal Pacific halibut (less than 32 inches) have been retained by the IPHC Regulatory Area 4E commercial Pacific halibut fishery, under the exemptions provided by the Community Development Quota (CDQ) program, which supports economic development in western Alaska. Beginning in 2002, the retention allowance was expanded to include IPHC Regulatory Area 4D vessels that land all of their annual catch in Regulatory Areas 4D or 4E (IPHC, 2007). Beginning in 2020, sublegal Pacific halibut

¹⁰ The Convention establishing the INPFC was signed in 1952 by Canada, Japan and the United States of America and entered into force 12 June 1953. The INPFC dissolved when the Convention for the Conservation of Anadromous Stocks in the North Pacific Ocean came into effect on February 16, 1993, and the North Pacific Anadromous Fish Commission (NPAFC) came into existence.

¹¹ Economic parity is defined here as the equivalence in estimated commercial landing value realized by direct resource users, i.e. fishers, when comparing two policy alternatives.

⁹ The measure applicable to the USA was further relaxed in 2018, when the IPHC authorized the use of longline or single pot gear for the retention of Pacific halibut, removing the previous restriction that Pacific halibut caught in pot gear could only be retained when using pot gear in the sablefish quota fishery.

selected for otolith sampling during the IPHC Fishery-Independent Setline Survey (FISS) are also retained and sold to offset the cost of the survey.

2.5 Split fishing period

During the Second World War, the fishing period became shorter, and by early 1950s, it lasted less than one month in the southern part of the Convention area (Dunlop, 1959). These years were marked by subsidized post-war expansion supported by new technologies such as radar, sonar, fish-finding electronics and sea-bed mapping (Finley and Oreskes, 2013). This caused conservation concerns over concentrated harvest. In 1949, the Commission proposed a split fishing period and gained considerable support from the fishing industry (IPHC, 1951). As noted, it was “*the only method of distributing fishing that appeared to be within the Commission’s present treaty authority*”. However, the proposal was deferred as some stakeholders believed it to be “*economically disastrous*.” One argument was that a shorter fishing period would lead to more economical use of landing and freezing facilities as the peak of the fishing period did not coincide with the salmon and sablefish peaks. Frozen Pacific halibut was also considered a viable collateral for participation in other fisheries (Bell, 1959). The US interpretation of the treaty was also that the split fishing period measure was not authorized by the treaty. Instead, the USA started advocating for the implementation of between trip lay-ups applicable to each vessel individually, not multiple open and closed periods applied to all vessels simultaneously. The treaty at the time did not give the authority for such action either, so implementation of such a measure was outside the Commission’s mandate. Other options considered included rotating fishing periods from year to year and opening sections of fishing grounds at different times of the year.

From 1951 to 1953 inclusive, pending action upon the Commission’s recommendations, three underfished sections of the coast were closed to fishing during the regular fishing period and opened only when other sections were closed. A substantial increase in the utilization of underfished stocks on underfished grounds resulted in the total annual catch reaching 60 million lbs (IPHC, 1959).

Under the authority of the 1953 Convention, provisions were finally made for multiple fishing periods. The split fishing period approach spread fishing over an extended period throughout the year. The use of multiple openings was adopted in 1954 but was discontinued in some areas where the fishing period has been sufficiently extended by a voluntary between-trip lay-up program instituted by the fleet in 1956. Commercial landings continued to increase to over 70 mil. lbs through the early 1960s. This was also a time when the length of the fishing period started increasing to several months (Figure 2).

In the late 1950s, Pacific halibut “*remains a staple, not a luxury like many other fishery products*” (Bell, 1959). By the mid-1960s, Pacific halibut landings started falling. Indirect augmentation of the Commission’s responsibilities by establishing the INPFC and a new determination of the Pacific halibut origin led to Japan commencing participation in the fishery in 1963 after a period of abstention previously guaranteed by the INPFC (INPFC, 1964). In anticipation

of this change, joint conservation measures were agreed upon and included eastern Bering Sea catch limits for all three nations. Japan was allowed Pacific halibut fishing in the eastern Bering Sea, east of 175° W longitude and commenced fishing in the region in May 1963. This had severe consequences for the fishery occurring in the eastern part of the Pacific. The change was labelled “*the Bering Sea halibut giveaway*” and received extensive press attention (IPHC, 1978b). The IPHC advised shortening the fishing period in 1965 to only 5 days (Bell, 1969).

In 1972, when the harvest started decreasing, the volume of Pacific halibut imported from Japan reached a record high (20 mil. lbs vs. 3-6 mil. lbs in previous years). Close examination revealed that the fillets were typically from fish under 5 lbs, thus typically below IPHC’s minimum size. Because of the volume typically exceeding domestic production, it was also suspected the fish were harvested in the Bering Sea, thus circumventing the IPHC measures.

In 1974, the landings dropped to just a little over 20 mil. lbs, levels last seen in 1905. The situation in the fishery was just somewhat counteracted by record high prices, on par with prices seen only later in 2010s when adjusted for inflation (Figure 3). This was driven by a decreasing supply of Pacific halibut, but also radical divergence in price trend between seafood and other food products, indicating increasing interest in consumption of seafood (Figure 4; BLS, 2024). Many more small vessels entered the fishery during this time, altering its economic structure. Moreover, by 1976, measures to reduce foreign catches led to Japan starting to seek Pacific halibut from North American sources, leading to increased demand (IPHC, 1977).

In 1977, the Commission implemented a split fishing period that was a radical departure from past practices in major areas (IPHC, 1978a). A single fishing period was only possible under voluntary lay-ups that provided rest periods between fishing trips since 1950s. But during the 1970’s many new and part-time fishers, who either were unaware of the objective of the plan or disagreed with the rules, did not follow the lay-up system. As participation waned, support for the program weakened and the *Lay-Up Committee* decided to abandon the lay-up system in 1977. Fishers urged the IPHC to implement comparable measures, but this proved unfeasible due to enforcement concerns. Many fishers reported that the split fishing period worked better than anticipated, but soon problems were raised with respect to the fishing periods coinciding with unfavorable weather (IPHC, 1978a). Limiting fishing to short periods decided in advance without consideration for weather patterns posed issues for safety at sea.

While the condition of the stock improved in the early 1980s allowing larger harvest, the number of fishing days continued to decrease. A lot of this had to do with more effective fishing gear due to a rapid increase in the use of circle hooks in 1983 and 1984 (IPHC, 1984). This new gear resulted in catch rates that were roughly 2.2 times that of the ‘J’ hooks that had been used since the beginning of the commercial fishery (Leaman et al., 2012). The result was a fleet far too large for the allowable catch and fishing time reduced from many months to a few 24-hour openings despite the stock at almost record high levels (IPHC, 1988)¹². Shorter

¹² The first 24-hour Pacific halibut openings were in 1984 (IPHC, 1991).

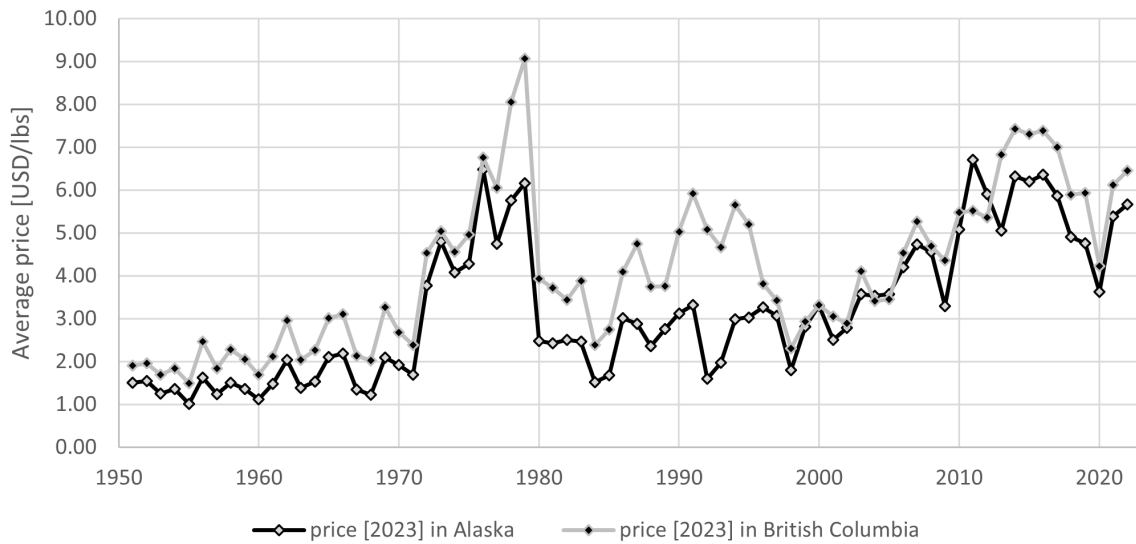


FIGURE 3
Pacific halibut average price (1951-2022), adjusted for inflation and presented in real 2023 USD. Sources: [DFO \(2024\)](#); [NOAA Fisheries \(2024\)](#); [Province of BC \(2024\)](#).

fishing periods also made it more challenging to specialize in the Pacific halibut fishery, prompting diversification in fishing activities leading to changes in fishing vessel design ([Johnson, 1959](#)).

2.6 Sharing the stock and fleet separation

The concept of shared stocks was popularized following the ratification of the UN Convention on the Law of the Sea (UNCLOS) and the claiming of Exclusive Economic Zones (EEZs) by Coastal States ([United Nations, 1982](#)). Under UNCLOS, countries are

responsible for the management of stocks within their EEZs and encouraged to cooperate when stocks are shared ([United Nations, 1982](#)). UNCLOS was adopted in 1982 to codify widely accepted international customary law regarding navigational freedom and rights of vessels on the high seas while defining a state’s jurisdiction over resources in their EEZs and coastal continental shelves.

Canada and the USA extended their jurisdiction of fisheries resources to 200 miles in 1977 through legislation from 1976 ([IPHC, 1977](#)). In the USA, extended jurisdiction over fisheries resources was codified in the Magnuson-Stevens Fishery Conservation and Management Act (MSA) which came into force

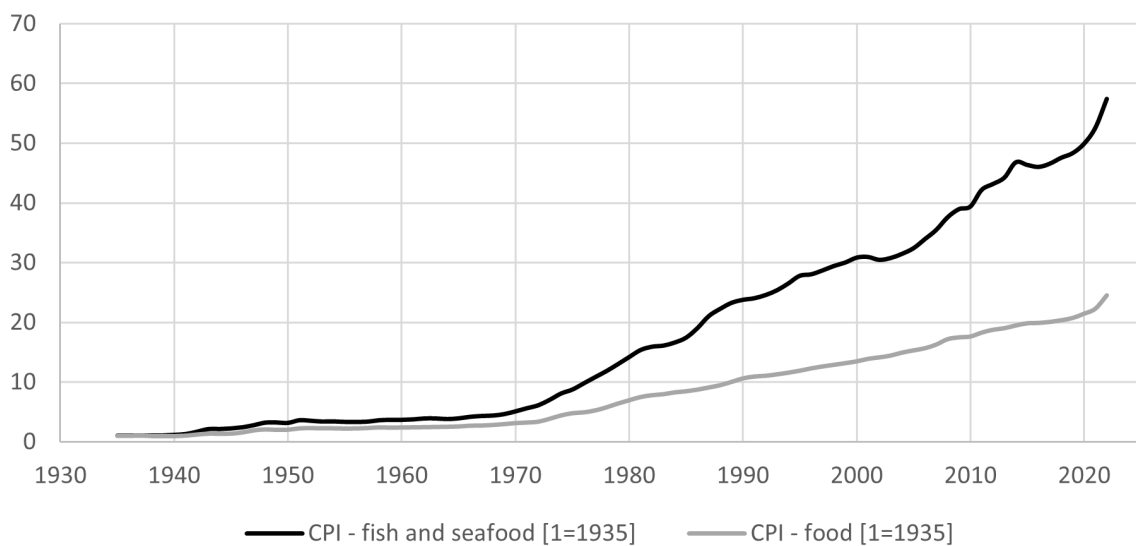


FIGURE 4
Comparison of Consumer Price Index (CPI) between food, and fish and seafood. Source: [BLS \(2024\)](#).

on 1 March 1977¹³. Canada did this under the authority of The Territorial Sea and Fishing Zones Act, first enacted by Canada's Parliament in 1964 and amended in 1970, through the so-called Order-in-Council. Canada also later accepted the concept of a 200-mile EEZ that emerged from UNCLOS negotiations by signing the Convention, but ratification did not happen until 2003 (Global Affairs Canada, 2019). Before, Canada formally established its EEZ domestically in 1997 when the Oceans Act entered into force.

Until the extension of the jurisdiction to fisheries resources within 200 nm from the coastline in 1977, Pacific halibut management measures were recommended by both the IPHC and the INPFC, thus with input from Japan (IPHC, 1978a; INPFC, 1979). What followed was Pacific halibut management and stock sharing between Canada and the USA, excluding Japan.

The MSA initiated the process of renegotiating all treaties pertaining to fisheries, including the IPHC, to ensure they conform to the MSA's objectives. The most significant change caused by the 1979 renegotiated Convention was that reciprocal fishing privileges ended (McCaughran and Hoag, 1992). The USA fishers were no longer allowed to fish in Canadian waters, and Canadian fishers were to be phased out of the USA waters over two years beginning with 1979. Reciprocal port privileges dated back as early as 1897 (Skud, 1977b)¹⁴.

The 1979 Protocol also required the Area 2 (Figure 5) catch limit to be divided 60/40 between Canada and the USA. Although this division was required only during 1979 and 1980, the Commission did not depart from this division until 1985 (Hoag et al., 1993).

In the first year of the new regime specifying catch sharing between Contracting Parties, the USA overfished its allocation. This highlighted the need for close monitoring under the current management system operating based on a limited number of days available for fishing. It also prompted the Commission to "develop a procedure to ensure catches are kept within the quotas prescribed by the Commission" (IPHC, 1980). The imbalance of harvest was

reflected in the 1980 allocation. The year saw the most significant drop in prices recorded for Pacific halibut (Figure 4).

2.7 Limited entry

Until the 1970s, both the Canadian and USA's Pacific halibut fisheries were managed without access restrictions, with harvest limited by the timing of openings. High prices motivated increasing effort. With fishing opportunity restricted to its own territorial waters, Canada introduced a limited entry program in 1979 in response to rapid fleet growth and limited opportunities for fishing previously largely dependent on fishing in Alaskan waters (Hoag et al., 1993). At the time, the Canadian fleet became limited to 435 vessels, but the capacity continued to increase due to larger crews and more efficient gear (Knapp, 1996). The fishing period decreased to 10 days in total spread over 3 openings in 1990 (Figure 2).

In Alaskan waters, the fleet also experienced rapid growth in the 1970s, from 1,000 vessels in 1975 to 3,600 vessels in 1983 and 3,700 by 1993. By the mid-1980s, most of the harvest in the most productive areas (IPHC Regulatory Areas 2C, 3A and 3B) was taken in two or three 24-hour openings. Limited entry was discussed in the early 1980s by the NPFMC, which recommended a moratorium on Pacific halibut licenses in 1983 (NPFMC, 1983). However, the USA government deemed the moratorium unacceptable and rejected the proposal.¹⁵ The increase in license applications was also likely motivated by the expectation of upcoming transition to individual quotas and future potential for cashing in on the individual allocations.

The IPHC fully recognized the social and economic problems associated with the overcapitalized fleet in the USA managed by limited openings. The situation was pronounced by the executive director at the time, Donald A. McCaughran, as "short-term thinking under favorable conditions," and noted "we expect a natural downward trend to begin within the next few years. As we are forced to reduce quotas, many vessels will not earn enough to continue fishing and an economic disaster may well befall the U.S. halibut fleet" (IPHC, 1987). Issues were also raised about incentivizing illegal fishing, wastage related to poor processing of fish and excess of lost gear.

2.8 Quota management

In 1987, the IPHC noted that "implementation of an individual transferable quota system would seem necessary. By resisting such a system, fishermen only hurt themselves economically in the long run" (IPHC, 1988). That year, for the first time, the Commission deemed it impossible to allow an additional 24-hour fishing period for fear of exceeding the catch limit. Instead, it chose to amend the regulations in-year to allow for fishing periods of less than 24 hours, and to establish fishing period limits that restricted the catch

13 The USA claimed a 200 nm EEZ in 1983 via a Presidential Proclamation (Presidential Proclamation No. 5030 of March 10, 1983), but never signed UNCLOS, initially because of President Reagan objections to its limits on future seabed mining (Gwertzman, 1982). The MSA also created regional councils, including the North Pacific Fishery Management Council (NPFMC), to oversee fisheries within the USA EEZ. The NPFMC is responsible for recommending management measures for fisheries off Alaska, including domestic regulations for Pacific halibut that complement management at the IPHC level.

14 In 1897, Canada granted a US company, the New England Fish Company, special privileges after it had established an office in Vancouver, British Columbia. The company's vessels were allowed to land Pacific halibut without paying duties and resupply in Vancouver. These privileges were renewed in the following years via Order-in-Council, and by 1915, extended to all US flag vessels landing in Prince Rupert. In 1918, the US Secretary of Commerce authorized Canadian vessels to land and obtain supplies in the US, as per directive to the Collector of Customs (USA Department of State, 1920).

15 Objections were raised specifically by the USA Office of Management and Budget.

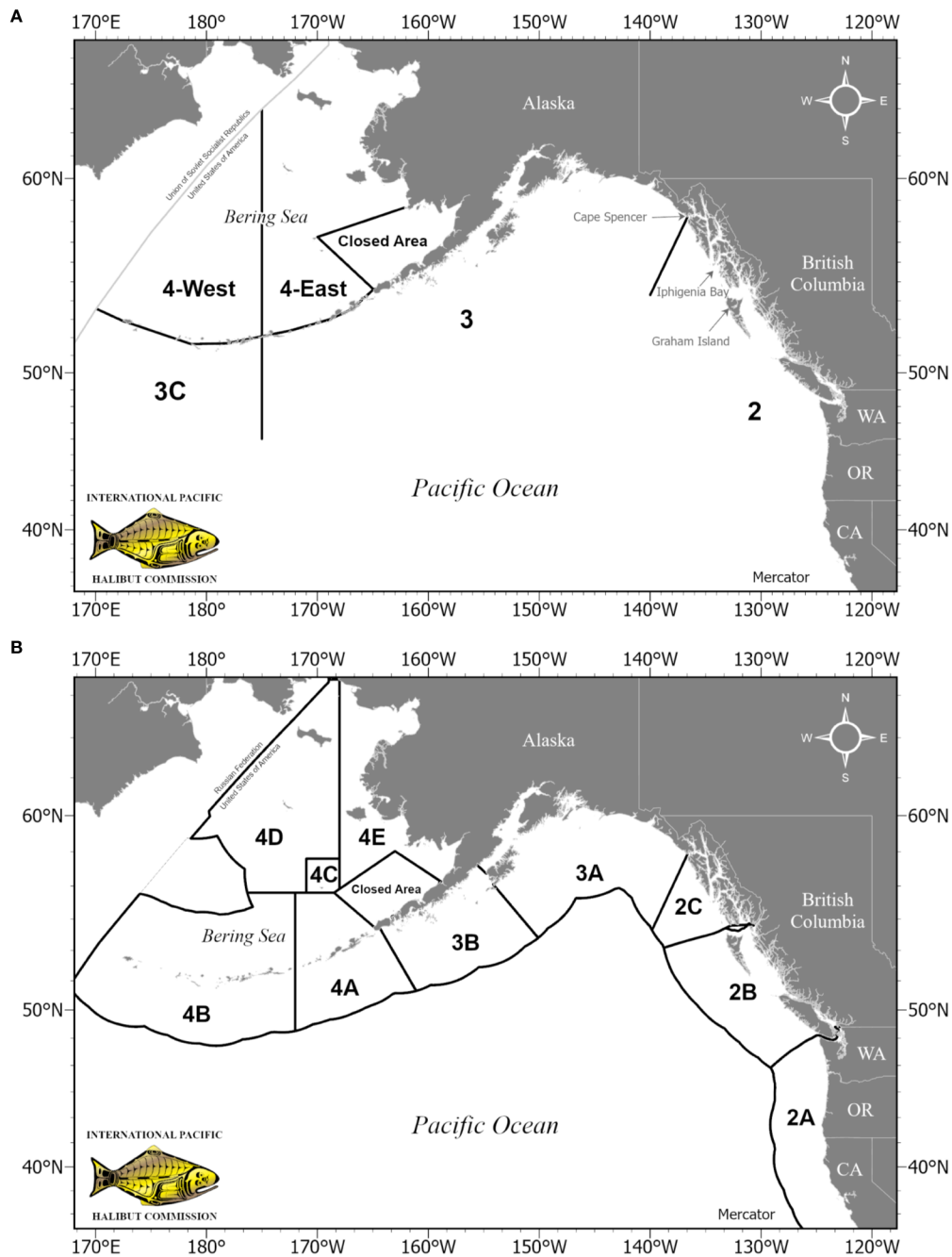


FIGURE 5
 IPHC Regulatory Areas in 1979 (A) and today (B). The 1979 regulatory boundaries have been redrawn from the original 1980 document for clarity.
 Sources: [IPHC \(1980, 2024a\)](#).

of individual vessels. This measure was labelled unfair and allocative (Hoag et al., 1993). This paved the path to quota management introduced at the national level throughout most of the Convention area.

A quota system in British Columbia was proposed in 1990 with the support of 70% of license holders (Knapp, 1996). Opposed were large processing companies and the crew member union. A trial was conducted in 1991 and 1992, with no transfer option, and the system was implemented on a permanent basis in 1993 with transferability of Individual Vessel Quota (IVQ) allowed, with a

limit on the amount of Pacific halibut quota that can be on a single license (between 1% and 1.25% of the total limit). In 1992, the Commission also approved an overage plan for the Canadian IVQ fishery. Fishers who under-harvest their vessel’s quota may add up to 5% of their quota to the following year’s catch. Fishers who overharvest must subtract their overage from the following year (IPHC, 1993).

When the IVQ system was introduced, fishers in British Columbia started to be charged approximately 8 cents per lb of landed Pacific halibut to cover the administrative and increased

enforcement costs (IPHC, 1992). The new system resulted in a few years of considerable advantage of the Canadian fleet that started supplying the market with high quality fresh product and earned on average nearly 2 USD more per lb (60%) in comparison with the commercial sector in Alaska (Figure 3). The introduction of property rights in the form of quotas in British Columbia led to the transformation of the industry and the behavior of fishers (Grafton et al., 2000). The new regulatory system allowed for increased fresh fish sales, better product quality, and a wider choice of processing options for fishers, including the option of directly marketing their catches to wholesalers, retailers, institutional purchasers, and restaurants (Casey et al., 1995; Squires et al., 1995; Hackett et al., 2005). The ownership profile of the fishery changed dramatically under the new quota system, transitioning from a predominantly owner-operated fleet to absentee owners and lessee fishers (Edwards and Pinkerton, 2020). While there is limit on the allocation that can be held on a license, there are no restrictions on the number of licenses an individual or company can own. The concentration of industry control (House of Commons Canada, 2019; Gardner and Pinfold, 2021) has been recently a subject of parliamentary committee investigation (Baker, 2023; SCOFO, 2023).

As part of Canadian government's efforts to repatriate fisheries access to First Nations people, the First Nation communal license 'FL' designation was created and the Government of Canada has been purchasing 'L' licenses and quota and transferring them to the 'FL' designation since the 1990s, with the first 'FL' licenses created in 1997.

The NPFMC started discussing individual quota-based management in Alaska back in 1988. The individual fishing quota (IFQ) system was formally recommended in 1993 and went into effect in 1995. With more than 3,000 participating vessels at the time, this was the largest fishery for which an IFQ system had been introduced (Knapp, 1996). This had profound implications on the fishing period length, effectively putting an end to the glut of Pacific halibut landed in a short timeframe. Concerns over the quality of fish were raised as early as the 1940s (IPHC, 1951). However, based on a telephone survey conducted in 1994 by the University of Alaska Anchorage's Institute of Social and Economic Research (ISER), only 23% of captains thought they would be better off financially with IFQs, and only 20% thought the system would allocate Pacific halibut fairly (Knapp, 1996). That said, the fleet observed a substantial increase in ex-vessel prices as a result of the introduction of the individual quota system, with the majority of the gains accruing to the fishers (Criddle and Herrmann, 2004). The IFQs aligned the Alaskan fleet's earnings more closely with those of the British Columbia fleet and the upward trend in prices remained relatively stable through the mid-2010s throughout the Convention area.

In 1995, for the first time, harvesters were able to conduct mixed Pacific halibut and sablefish trips, and land Pacific halibut while targeting sablefish (IPHC, 1996). Since 1997, fishers have also been able to keep the same log for recording both sablefish and Pacific halibut catches, adding to efficiencies introduced by the quota system. A unique feature of the IFQ program in Alaska is also that, with a few exceptions, the quota share holder must be on

board. This contributed to the retention of an owner-operated fleet (Menges, 2019). Part of the Alaska quota is also allocated to communities along the coast of the Bering Sea and Aleutian Islands through the CDQ program. However, despite these efforts, the measures have faced mixed success in promoting intergenerational equity. Many initial quota share recipients have strong incentives to lease their annual IFQ allocations to hired skippers rather than selling their quota shares, which has led to challenges in maintaining long-term access for new entrants and small-scale operators in the fishery (Szymkowiak and Himes-Cornell, 2015).

2.9 Evolving market and stock realities for Pacific halibut

The turn of the millennia marked years of unprecedented catches of Pacific halibut. Commercial landings were over 70 million pounds, seen before only briefly in the early 1960s (Figure 1). At the same time, growing demand for seafood that started in the 1980s continued through the 2000s and led to strong prices and thus record landed value of Pacific halibut landings of over 392 mil USD (in 2023 USD) in 2007 (Figure 6).

Between 2004 and 2014, the fishery limits started decreasing, with the largest decrease of 19% between 2010 and 2011, followed by an additional decrease of 18% in the following year (IPHC-TSD-13¹⁶). Concerns started arising regarding the stock condition estimates. This re-estimation, called a retrospective bias, resulted in progressively lower estimation of previous stock biomass over time, as more information on the strength of incoming recruitment was obtained and, in the case of the Pacific halibut stock, continuing decrease in size at age (IPHC, 2012). The opposite had been true during the 1980s and again in the 1990s as biomass in the stock was trending upward and the assessments produced successively higher biomass estimates. The ultimate effect was that historical exploitation rates were higher and catch limits were set higher than they would have been if subsequent estimates of biomass had been available at the time. These technical issues occurred at a time when the productivity of the stock was also decreasing rapidly; the fishery would have experienced a large reduction even with more accurate trend information at the time (Stewart and Martell, 2014). In the most recent decade, the Commission has sustained relatively stable fishery limits, fluctuating within a 10% range, although at the levels last seen around the 1970s.

Management tools over the period that saw the shift from high landings of the early 2000s to the lower levels seen recently remained largely the same. Fishing was controlled by catch limits set by the Commission and distributed between resource users. However, the real success was beginning a Management Strategy Evaluation program in 2013, investigating dynamic reference points (MacCall et al., 1985; Berger, 2019), and moving to a Spawning Potential Ratio (SPR)-based harvest policy (Goodyear, 1993) that

¹⁶ Table IPHC-2024-TSD-013 is available at <https://www.iphc.int/data/time-series-datasets/>.

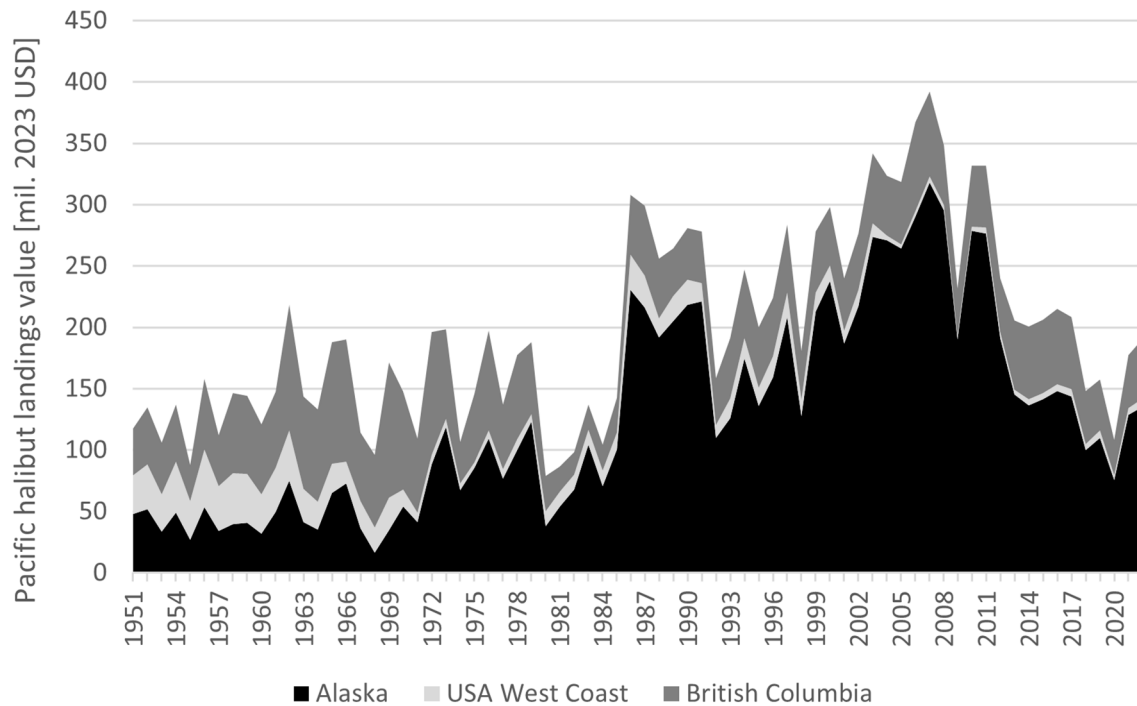


FIGURE 6

Pacific halibut landings value (1951–2022). Sources: DFO (2024); NOAA Fisheries (2024); Province of BC (2024).

accounts for the mortality of Pacific halibut across all sizes and from all sources in 2017 (IPHC, 2018). In other words, full accounting of mortality and managing to maintain a spawning potential. Building a robust foundation for decision-making was crucial in enhancing stakeholder confidence in the Commission's processes and fostering acceptance among stakeholders that a commercial limit of 20–30 million lbs reflects the current environmental regime and stock productivity.

At the same time, Pacific halibut is a part of a globalized seafood commodity market, as increasingly evident in recent years. Local products compete on the market with a large variety of imported seafood, including recently increasing Atlantic halibut (*Hippoglossus hippoglossus*) landings (Shackell et al., 2022). High exposure to international markets makes seafood accessibility fragile to perturbations, as shown by the COVID-19 pandemic (OECD, 2020). Seafood production is also highly dependent on the production and price of imports. The IPHC's socioeconomic study showed that Pacific halibut contribution to households' income dropped by a quarter throughout the pandemic (Hutniczak, 2022).

3 Foundation of implemented measures

The 1923 Convention language focused on better understanding of the stock, specifically directing the Commission to conduct “thorough investigation into the life history of the Pacific halibut” to “make recommendations as to the regulation of the halibut fishery of the North Pacific Ocean, including the Bering Sea, which may seem desirable for its preservation and development.” However, one may

argue that the original text of the Convention's proclaimed goal of “securing the preservation of the halibut fishery” suggests that the Contracting Parties were mainly concerned with the commercial exploitation aspect. Like the first management measure introducing the winter closure, conservation was viewed as a strategy to secure wider acceptance of control over the resource. This approach aligned with the context of the time, as rapidly dwindling wildlife populations sparked interest in their preservation, accelerating the American conservation movement (Reiger, 1975).

The 1953 Convention formally charged the Commission with developing and maintaining the stock to produce maximum sustainable yield (MSY). In population ecology and economics, MSY is the largest average yield that can theoretically be taken from the stock over an indefinite period under constant environmental conditions. The concept was popularized as the goal of American fisheries management by Wilbert M. Chapman who was appointed in 1948 as Under Secretary of State for Fisheries (Chapman, 1949). An ichthyologist from the University of Washington, Chapman had spent 18 months in the eastern Pacific during the war, scouting for fish to feed American troops. He returned to the USA convinced that American fisheries had to move deeper into the Pacific (Finley and Oreskes, 2013).

The 1953 Convention also explicitly required that regulations be based on the results of scientific investigations. As the broader goal of achieving MSY was operationalized, the need for a research program that would provide a better understanding of the stock became evident. At the time, the MSY objective was understood as “the solution of two complex interrelated biological problems: determination of the most profitable age at capture in order to obtain maximum yield from recruits; and, determination of the supply of matures required to

provide optimum recruitment” (IPHC, 1955). In 1954, the Commission approved a 10-year research program that was considered necessary for developing the research base for implementation of MSY (Chapman et al., 1962). However, while necessary funds were approved by Canada, matching contributions were not secured from the USA, and the funding of the plan was delayed into the second half of 1955.

Pacific halibut landings increased to nearly 75 million lbs through 1962 (Figure 1). The following year, the Commission announced “a total catch that was close to the maximum sustainable yield” and called it “the culmination of over three decades of scientific management” that “placed the Pacific halibut fishery in a unique position among the marine fisheries of the world” (IPHC, 1964). Ironically, 1963 was the first year of a decade-long decline in catches. By 1965, the catch in 1963 was called “excessive” (IPHC, 1966). However, this was not the classic “tragedy of the commons” (Hardin, 1968) where human self-interest inevitably leads to natural resources depletion. The decline in the 1960s, in part because of reduced recruitment due to environmental conditions (Clark and Hare, 2002), was also a result of intentionally increasing the catch to test estimates of maximum sustained yield. This action was necessary to demonstrate that stocks were fully utilized by Canada and the USA, a requisite for Japanese abstention under the International Convention for the High Seas Fisheries of the North Pacific Ocean that established the INPFC (Skud, 1977a). Under the Convention, Japan agreed to abstain from fishing for Pacific halibut in the eastern Bering Sea. This resulted in the fisheries of Canada and the USA, which had declined to an unprofitable state, being restored to highly profitable conditions (IPHC, 1961). At the time, the fishery was getting compared with the Atlantic halibut stock on the East Coast and presented as an exemplary use of regulations and investments in the Commission by Canada and the USA as “returned 100-fold to the people and to the economies of the two countries” (IPHC, 1961). Localized overfishing was considered an “imperfection” of the MSY-based management regime that “cannot be regarded as failures to fully or properly utilize the stock” (IPHC, 1961).

It was not until the 1970s that the MSY approach received more scrutiny (Larkin, 1977; Kesteven, 1997; Finley and Oreskes, 2013). By 1975, both governments considered MSY inadequate as a management objective and began to foster principles aimed at reducing overcapitalization in fisheries (IPHC, 1976). The IPHC began using more sophisticated methods to assess the stock and available yield in 1978 and pioneered new developments in fisheries modelling over the subsequent decades (Clark, 2003).

In 1984, the Commission concluded that “it is well documented that catch limits based on the calculation of maximum sustainable yield (MSY) applied to naturally fluctuating stocks can result in overfishing” (IPHC, 1985). By then, the Commission operated under a revised Convention requiring optimum yield and started advocating for management based on constant exploitation yield. This was intended to generate “sustainable yields” that “create stability in the industry and produce a constant supply to the consumer at reasonable prices” (IPHC, 1985). The 1979 Protocol¹⁷

was motivated by inconsistency with the extended jurisdiction management principles advocated by the federal fishery agencies in the two countries (IPHC, 1976). Optimum yield was a management objective of the MSA.

The 1979 Protocol altered the Commission’s mandate, directing it towards developing and maintaining the stock to levels permitting optimum yield. This change signaled a shift to more comprehensive approach to resource management. The changes emphasized a broader perspective that could encompass not only biological but also socioeconomic considerations in the Commission’s decision-making process. This was ahead of the principles outlined in Agenda 21 adopted at the Earth Summit (United Nations Conference on Environment and Development) held in Rio de Janeiro, Brazil, from 3-14 June 1992. The summit’s purpose was to advance sustainable development. In the context of marine resources, it underscored the need for “marine species at levels that can produce the maximum sustainable yield as qualified by relevant environmental and economic factors” (UN, 1992). However, the fact that biological and socioeconomic objectives are often in conflict, and that socioeconomic objectives typically vary by country or region (Dunlop, 1959; Hilborn, 2007), has led to continued focus on conservation, although considerable progress has been made in terms of fostering integration and synergies among the various research and support activities of the IPHC Secretariat (IPHC, 2023).

4 Conclusions

The journey of the IPHC since its inception in 1923 illustrates the complex and evolving nature of fisheries management shaped by advances in fisheries science, technological developments, environmental viability, and the globalization of seafood supply chains. As the first international agreement for the joint management of a marine fishery resource, the IPHC set a precedent in marine conservation and fisheries management. The Commission’s centennial year not only offers an opportunity to celebrate its achievements but also to reflect on the myriad of challenges it has navigated over the decades.

Initially focused on combating overfishing, the IPHC’s mandate expanded to address a broad spectrum of issues affecting the Pacific halibut commercial fishery. Global events and trends in fisheries management, and changing socioeconomic conditions have all influenced the Commission’s strategies and regulatory measures. From the introduction of the winter closure and gear restrictions to the establishment of catch limits and quota systems, the IPHC has adapted its approaches to ensure sustainable management of the Pacific halibut stock. This was attainable due to the Commission and its Secretariat collaborating with every segment of the fishery, which solidified public trust in the IPHC’s decision-making process and secured robust political backing for its autonomy from national fisheries agencies (Royce, 1985).

These experiences offer valuable insights into effective fisheries management of transboundary stocks. Many of the management decisions described here were successful in sustaining the viable Pacific halibut fishery, yet they were also reflective of the unique

¹⁷ The Protocol amending the Convention for the Preservation of the Halibut Fishery of the Northern Pacific Ocean and Bering Sea.

stock, fishery, and market conditions of their time. Some measures implemented decades ago would not work as well today or have become irrelevant. For example, shifts in Pacific halibut growth have reduced the effectiveness of the 32-inch size limit in maximizing yield; however, market dynamics drove the decision to retain this limit.

While not all measures were entirely successful, the IPHC's dedication to basing its decisions on rigorous scientific research and reconciling research conclusions with fishers' on-the-water experience through its open and transparent public process enabled responsive measures and effective adaptation to changes in stock productivity. The initial implementation of the winter closure did not necessarily yield direct conservation benefits; however, it served as a proof of concept that an international fishery could be jointly managed by two countries. Moreover, the measure has been retained to this day despite not reducing fish supply, as secondary benefits, such as improved safety at sea, were realized.

The history of Pacific halibut management also highlights the importance of balancing conservation objectives with socioeconomic considerations. The introduction of quota management systems helped address issues of overcapacity and economic inefficiency, transforming the fishery into a more sustainable and profitable industry. However, these systems also revealed challenges, such as quota concentration and the effects on small-scale fishers and communities, underscoring the need for management approaches that not only sustain the resource but also support the well-being of fishing communities. With the Commission's evolving mandate toward a more holistic approach that integrates biological, economic, and social factors, the IPHC is now better equipped to tackle the complex challenges of fisheries management.

Of course, the commercial sector reviewed here is just one facet of the narrative. There are a number of other sectors that compete for the resource and gradually became part of the Pacific halibut management system. The recreational fishery, once considered "inconsequential" and not "a factor in the management of the Pacific halibut stocks" (Bell, unpublished; see Skud, 1975b for details), has been an integral part of the annual regulatory process since 1973. Fishing by US Treaty Tribes first became a direct part of the IPHC process in 1986, when the USA, after consulting with the Commission, approved allocation and fishing periods for several treaty tribes. This step was taken only after the Commission adjusted the catch limits for the non-tribal commercial fishery limits to account for the additional removals. Ceremonial and subsistence fishing was accounted for and officially authorized for tribal members, commencing in 1986. By 1988, tribal regulations were formally incorporated into the IPHC Fishery Regulations. Subsistence and personal use fishing remains important for all stakeholders and is factored into the setting of annual mortality limits.

As we look to the future, the challenges facing the IPHC and the Pacific halibut fishery continue to evolve. Climate change and the need for anticipatory policies to address potential shifts in transboundary stocks, or equity and environmental justice concerns associated with catch share programs, are just a few of the issues that will require innovative and adaptive management

strategies. The IPHC's century-long legacy offers valuable lessons in resilience and adaptability, underscoring the importance of science-based decision-making, stakeholder engagement, and international cooperation in the stewardship of marine resources. As we move forward, the lessons learned from the past century will undoubtedly inform the Commission's strategies, ensuring the sustainable management of the Pacific halibut stock for future generations.

Author contributions

BH: Conceptualization, Data curation, Formal analysis, Writing – original draft, Writing – review & editing. DW: Writing – review & editing, Supervision. IS: Writing – review & editing. AH: Writing – review & editing.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Supplementary material

The Supplementary Material for this article can be found online at: <https://www.frontiersin.org/articles/10.3389/fmars.2024.1424002/full#supplementary-material>

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