Chapter 6

The Impact of the EEZ on Pacific Salmon Management

An Examination of Institutional Innovation and Interplay in the US Pacific Northwest

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1. PROLOGUE

In May 2000, a United States Coast Guard airplane spotted the F/V Arctic Wind fishing the waters of the North Pacific Ocean, over 600 miles south of the Aleutian Island of Adak. A Coast Guard cutter intercepted the fishing boat, retrieving nine miles of cast-off driftnet containing 700 salmon, in addition to a number of other fish, bird and marine mammal species. A ton of processed salmon was found on the ship, which was seized for fishing in violation of the United Nation's moratorium on high seas driftnet fishing as well as the Convention for the Conservation of Anadromous Stocks in the North Pacific Ocean (Associated Press, 2000a; Associated Press, 2000b; Loy, 2000).

Owned by a South Korean company, the vessel was registered in Honduras and manned by a crew of 24 Russians. The US National Marine Fisheries Service determined the origins of the salmon found aboard the seized vessel. Of the chum, 63% were estimated to have originated in Russia, 14% in Japan, 11% in western Alaska, 6% in Kodiak and the Alaska Peninsula, 4% in Prince William Sound and Southeast Alaska, and 1% in British Columbia. Twenty-four percent of the sockeye were estimated to have originated in Russia, 75% in Alaska and northern British Columbia, and 2% in southern British Columbia and Washington. Forty-four percent of the chinook originated in Russia, 23% in western Alaska, 6% in southcentral Alaska, and 27% in California, Oregon and Washington (National Marine Fisheries Service, 2000).

2. INTRODUCTION

This case is illustrative because it demonstrates the very international nature of the salmon, salmon fisheries and their management. But it also serves to remind us of the very localised character of the salmon as well. Salmon migrate to marine waters thousands of miles away from the freshwater streams where they are born. There North American salmon mingle with Asian salmon. These salmon are harvested by fishermen hailing from different countries, shipped around the world, and are bought and sold in an international market. But salmon also return to spawn in the river or stream where they were born. Salmon populations are distinguished genetically, morphologically, and

S.A. Ebbin et al. (eds.), A Sea Change:
The Exclusive Economic Zone and Governance Institutions for Living Marine Resources, 78–99.

in the adaptive features of their life histories that have melded to fit the constraints of the specific watersheds in which they dwell. The primary units of salmon species (from an evolutionary and management point of view) are localised stocks or populations of salmon that arise from reproductive isolation associated with geographical and temporal differences in spawning activities.

In order to address the cosmopolitan nature of salmon, a number of multilateral and bilateral treaties and conventions aimed at the management of salmon in international waters have been negotiated and implemented. However, as Young has noted, international regimes are constrained in their ability to alter behaviour within societies because they are top-down arrangements (Young, 1999: 17). The effectiveness of these regimes is determined, at least in part, by the extent to which they complement bottom-up arrangements. Salmon producing countries have established a range of institutions that tackle the management of salmon. In the US, the federal government's role as salmon manager expanded dramatically with the passage of the Fisheries Conservation and Management Act (FCMA) in 1976. Under the FCMA, the US declared management jurisdiction over a 200 nautical mile Fishery Conservation Zone (FCZ) and established eight regional councils to manage the fisheries in this region. The US exclusive economic zone (EEZ), which overlays the FCZ, was established by Presidential Proclamation, effective March 10, 1983.[1]

International and national institutions were not the first to tackle the problem of salmon management. In the preceding decades, a state-based system of management evolved at the same time that intensive commercial salmon fisheries developed. Further, predating these commercial fisheries and state management institutions by hundreds and thousands of years, Native Americans harvested salmon in the rivers and coastal areas of the Pacific Northwest for subsistence, commercial and ceremonial purposes and had established elaborate means for managing these harvests (McEvoy, 1986). These indigenous fisheries and management institutions persisted and continue today. However, despite this rich institutional landscape, I propose to demonstrate in this chapter that the EEZ institution and the federal role in implementing it were pivotal in providing an environment in which regional, state and local level arrangements could function more effectively. The federal presence provided an essential link in the hierarchical regime structure, facilitating the connection of bottom-up and top-down processes.

In this paper I examine the governance impacts of the implementation of the 200-mile EEZ with respect to the management of the anadromous Pacific salmon (Oncorhynchus spp.) in the Northwest Pacific region of the United States. Specifically, I explore the vertical linkages and interactions between national and local level fisheries management institutions with particular focus on the implications of the EEZ on the uses and management of salmon by indigenous peoples. The overarching question asked is: what has been the effect of the implementation of the EEZ on the development and nature of domestic governance institutions engaged in salmon management in the US? This question cannot be answered fully without addressing the distributive implications of the management regimes that preceded and followed the implementation of the 200-mile EEZ. The paper proceeds with an examination of several case studies: the Klamath River, Columbia River, Puget Sound and Washington coast areas.

[1] The FCZ is focused on fisheries resources, while the EEZ focus encompasses a broader suite of resources and economic interests.

3. PACIFIC SALMON FISHERIES AND MANAGEMENT: AN HISTORICAL OVERVIEW

3.1 Fishing for Salmon

From the archaeological record it appears that humans have lived in the Pacific Northwest for approximately 10,000 years (Goble and Hirt, 1999). Prior to European contact, the Natives of the Pacific Northwest were dependent on hunting, fishing and gathering of wild foodstuffs as well as small-scale plant cultivation for their subsistence (Deur, 1999). Among these subsistence foods perhaps none was as important as the Pacific salmon, which was easily procured, and when dried or smoked, had superlative keeping characteristics making it a good winter provision.

Euro-American settlers moved to the Pacific Northwest in increasing numbers in the 1800s. Most of these settlers were farmers but some engaged in fishing. The non-Native fishermen more easily acquired land titles and licenses and obtained the capital necessary to purchase bigger and more efficient fishing gear. They thus gained preferential access to fishing sites and were able to out-compete indigenous fishermen. As a result, the non-Native fleet grew in size and fishing power while Indian fishermen were generally restricted to in-river and near-shore areas.

The 1850s saw a great increase in the worldwide salmon market due to innovations in the canning industry. The US Civil War and the California Gold Rush increased domestic demand for salmon. By the 1900s, the US market, primarily on the east coast, was absorbing most of the domestic canned salmon production. During World War I, salmon processing peaked at a maximum of 300 canneries.

3.2 Institutional and Legal Landscape

Although many of the rivers of the Northwest region had very productive salmon runs, the availability of the returning adult salmon in a given area was often restricted only to several days or weeks of the year. Additionally, salmon rivers were not homogenously distributed throughout the region. Thus, there was temporal and spatial compression and patchiness of resources. This heterogeneity in the environment led to an emphasis on property rights as a means of managing access to resources. Northwest Indians managed the salmon fishery by controlling access, establishing property rights to harvest areas and use rights to the fish within these areas (Cohen, 1989).

With the influx of increasing numbers of Euro-American settlers in the 1800s, conflicts between them and the indigenous population increased. To remedy this, a series of treaties were signed between Northwest Indian tribes and the territorial authorities in the 1850s. Treaties assigned property rights, setting aside specific areas for the use of tribal peoples and effectively making most of the region available for non-Indian use and settlement. In exchange for ceding much of their territory, the Northwest tribes reserved specific sections of land for their use, received a payment of money and in Article 3 of the Treaty of Medicine Creek stipulated that:

> the right of taking fish, at all usual and accustomed grounds and stations, is further secured to said Indians, in common with all citizens of the Territory, and of

> erecting temporary houses for the purpose of curing, together with the privilege of hunting, gathering roots and berries, and pasturing their horses on open and unclaimed lands: *Provided, however*, that they shall not take shellfish from any beds staked or cultivated by citizens, and that they shall alter all stallions not intended for breeding-horses, and shall keep up and confine the latter. (Kappler, 1904)

After the US territories in the Pacific Northwest achieved statehood in the last decades of the nineteenth century, salmon fisheries were under the *de jure* control of the state legislatures. The legislatures, generally without technical assistance and with little knowledge of salmon biology, managed the fisheries. Eventually they formed fisheries management commissions and an organisational infrastructure to support them. In 1870, the State Board of Fish Commissioners was established in California and in 1909 the California Department of Fish and Game was formed. In Oregon, the first Fish Commissioner for the Columbia River was appointed in 1878, replaced in 1887 by the state legislature when they formed the three-member Fish Commission. This commission went through many changes before eventually becoming the present Oregon Fish and Wildlife Commission, which is part of the Oregon Department of Fish and Wildlife. Similarly, in 1921 the Washington Department of Fisheries was formed and the Washington State Fisheries Board took over the task of regulating the salmon fishery. The Department of Fisheries has now been reorganised as the Department of Fish and Wildlife, managing in conjunction with the Washington Fish and Wildlife Commission. In 1918, the states of Washington and Oregon formed the Columbia River Compact to coordinate the management of fisheries in the Columbia River.

3.3 Development of the Ocean Salmon Fishery

The technique of trolling[2] for salmon was first developed by California sport fishermen in the 1890s. At the end of that decade gasoline engines were promoted to replace the use of sails on Columbia River gillnet boats. The technology was quickly adopted and nine years later one half of the boats operating out of Astoria, Oregon were equipped with gasoline engines (Lichatowich, 1999). Gas engines allowed fishermen to travel more quickly and farther from shore, to cross the notorious Columbia River bar more safely, and to stay at sea for many days, thus expanding the geographical range of fishing. The advent of cold storage and the growth of the 'mild-cure' market for US salmon in northern Europe created year-round demand, in both open and closed seasons (Smith, 1979). This led fishermen to fish outside state waters where they effectively avoided state regulations such as closed seasons.

World War I interrupted the 'mild-cure' trade with Europe in addition to trade in other commodities, such as the supply of flax, which was used by gillnetters to fashion their nets. As the cost of making gillnets increased, many switched to the relatively less expensive method of trolling (Lichatowich, 1999). The troll fishery grew and by 1920, approximately 2,000 trollers are estimated to have entered the fishery off the Columbia. In addition, a series of restrictive fishing regulations in rivers and coastal areas on

[2] Trolling involves dragging lines, usually two to six, strung with multiple 'spreads' which consist of a leader, flasher and lure or baited hook. The lines are held in place with a large weighted 'cannon ball'. Troll gear is an effective way to harvest feeding chinook and coho salmon.

various commercial gears, such as fish traps, fish wheels, purse seines, and gillnets, pushed the commercial fishery farther offshore outside the state's jurisdiction and gave more fishermen incentive to switch to troll gear, effectively increasing troll catches at the expense of other gear types (Taylor III, 1999).

The states of Oregon and Washington banned ocean fishing in state waters within three miles of their coasts but they could not regulate fishing outside of three miles in federal and international waters, nor could they regulate their fishermen who fished in other states or countries such as Canada (Lichatowich, 1999: 110). In 1928, sports fishermen in California asked the US Bureau of Fisheries to regulate the oceans but 'federal managers were powerless' (Taylor III, 1999: 201). Oregon eventually repealed its ban on trolling in state waters under pressure from the large ranks of trollers and began to focus management efforts at the point of sale instead (Smith, 1979). In 1927 canners[3] tried to convince states to prohibit the sale of salmon caught outside state waters, however, because the troll fishery took place outside of state waters it was not possible for states to regulate it (Taylor III, 1999: 201).

After World War II, the troll fishery expanded, becoming one of the predominant fishing gears along the entire Pacific coast, from Alaska to California. The offshore troll fleet was unregulated, operating without restriction until the year following the formation of the Pacific Marine Fisheries Commission. The Pacific Marine Fisheries Commission was formed in 1947 as the result of a tri-state compact among the states of Oregon, Washington and California.[4] At their annual meeting in 1948, the Commission recommended a November 1 through March 14 closure for the troll fishery, which went into effect in 1949 (Salmon Technical Team, 1993). The Pacific Marine Fisheries Commission had no regulatory authority over salmon on its own, instead serving to coordinate the regulations enacted by the three states. The open season of the ocean troll fishery extended from March through the end of October.[5] The fishery continued to grow with no catch quotas or checks on participation, constrained only by a size limit on fish landed and season closures. By 1971 it is estimated that 5,600 trollers off the Pacific coast were taking about 4,536 tons of salmon each year or about one quarter of the total Washington commercial catch (Netboy, 1974). These catches came at the expense of spawning escapements or other fisheries located in 'inside' waters, within rivers and other freshwater areas as well as nearshore areas such as Puget Sound.

Growth in the offshore troll fishery stimulated fisheries scientists to expand their efforts to understand the salmon's life history and migratory nature. Canadian tagging experiments in the 1920s and '30s showed that many salmon off the Canadian coast of Vancouver Island were actually of Columbia River origin, thus corroborating the idea that salmon undertake long migrations and are found offshore in runs composed of many discrete populations. This kind of information coupled with the ever-increasing fleet size and catches in the troll fishery meant that 'gear wars' were elevated 'from

[3] The canning industry disliked the troll fishery as they did not consider troll-caught salmon to be good for canning and the fresh fish and mild-cure markets competed with their own products.

[4] The Pacific Marine Fisheries Commission was renamed the Pacific States Marine Fisheries Commission and now includes the states of Idaho and Alaska in addition to Oregon, California and Washington.

[5] From 1950 to 1955, the open period for all salmon species except coho extended from March 15 to June 14 when the fishery was opened to all species, closing on October 31. From 1956 to 1975, the fishery for all species, except coho, opened on April 15 (Salmon Technical Team, 1993).

fights between fishermen using different kinds of gear within a river to battles between fishermen from different states and countries' (Lichatowich, 1999: 110).

To jointly manage fisheries targeting Fraser River sockeye stocks, the US and Canada ratified a treaty establishing the International Pacific Salmon Fisheries Commission in 1937.[6] The treaty laid out sharing arrangements aimed primarily at Fraser River stocks of sockeye salmon. Gillnet fishing in the ocean was banned by an agreement between the US and Canada in the late 1950s (US General Accounting Office, 1978).

On the high seas outside of the territorial waters of coastal states, Japanese gillnet boats began fishing for salmon in 1932, and until the late 1980s they were the only country with directed high seas salmon fisheries (Burke, 1994). They fished in the Bering Sea, intercepting salmon bound for Canadian, Russian and US waters. The fishery was discontinued during World War II and then resumed in 1952 (Wilkinson, 1983). In response to this perceived threat to salmon stocks and the recognition that a coordinated response was necessary, the US, Canada and Japan negotiated the International North Pacific Fisheries Convention in 1952. In negotiating this agreement, the US sought to control the Japanese interceptions of North American origin salmon. The agreement established the International North Pacific Fisheries Commission.

The International North Pacific Fisheries Convention embodied the 'abstention principle' championed by the US. This principle arose from the Truman Proclamation (No. 2668, 3 CFR 68 (1943-8)), which specifically targeted Japanese salmon fisheries that harvested US stocks (Burke, 1994). With respect to salmon, this principle gave the country in which salmon stocks originate the authority to manage them wherever they are found, even allowing the country of origin to prohibit high seas fisheries on these stocks by other countries. The abstention principle led to the drawing of an 'abstention line' at 175° West longitude, to the east of which Japanese salmon fishing was prohibited. A 1956 agreement between the Soviet Union and Japan established the Japan-Soviet Northwest Fisheries Commission and led to additional restrictions on Japan's high seas salmon fishery (National Research Council, 1995).

4. THE EEZ AND THE US EXPERIENCE

In 1945, the US claimed jurisdiction over all resources on the continental shelf adjoining the coast of the US. This was followed the next year by Argentina and soon after Peru and Chile extended their control over the 200-mile coastal zones adjacent to their mainlands. Ecuador and several other countries made similar proclamations in 1950. Conflicts and concerns over fisheries, minerals, oil and gas resources and other marine resources led Arvid Pardo, Malta's Ambassador to the United Nations (UN), to request that diplomatic efforts focus on the state of the oceans and in 1973 the third UN Law of the Sea Conference (UNCLOS) got underway with the goal of developing a treaty for the oceans (Division for Ocean Affairs and the Law of the Sea, 2003). The UN Convention on the Law of the Sea (LOSC) that resulted from UNCLOS III was

[6] The International Pacific Salmon Fisheries Commission was transformed into the Pacific Salmon Commission under the Pacific Salmon Treaty, ratified in 1985 and renegotiated and ratified again in 1999.

completed in 1982 and entered into force in 1994. The LOSC contains a section focusing on anadromous fishery resources. Article 66 of the LOSC stipulates that:

> 1. States in whose rivers anadromous stocks originate shall have the primary interest in and responsibility for such stocks.
>
> 2. The State of origin of anadromous stocks shall ensure their conservation by the establishment of appropriate regulatory measures for fishing in all waters landward of the outer limits of its exclusive economic zone and for fishing provided for in paragraph 3(b). The State of origin may, after consultations with the other States referred to in paragraphs 3 and 4 fishing these stocks, establish total allowable catches for stocks originating in its rivers.
>
> 3. (a) Fisheries for anadromous stocks shall be conducted only in waters landward of the outer limits of exclusive economic zones, except in cases where this provision would result in economic dislocation for a State other than the State of origin. With respect to such fishing beyond the outer limits of the exclusive economic zone, States concerned shall maintain consultations with a view to achieving agreement on terms and conditions of such fishing giving due regard to the conservation requirements and the needs of the State of origin in respect of these stocks.
> (b) The State of origin shall cooperate in minimising economic dislocation in such other States fishing these stocks, taking into account the normal catch and the mode of operations of such States, and all the areas in which such fishing has occurred.
> (c) States referred to in subparagraph (b), participating by agreement with the State of origin in measures to renew anadromous stocks, particularly by expenditures for that purpose, shall be given special consideration by the State of origin in the harvesting of stocks originating in its rivers.
> (d) Enforcement of regulations regarding anadromous stocks beyond the exclusive economic zone shall be by agreement between the State of origin and the other States concerned.
>
> 4. In cases where anadromous stocks migrate into or through the waters landward of the outer limits of the exclusive economic zone of a State other than the State of origin, such State shall cooperate with the State of origin with regard to the conservation and management of such stocks.
>
> 5. The State of origin of anadromous stocks and other States fishing these stocks shall make arrangements for the implementation of the provisions of this article, where appropriate, through regional organizations.

Although the US has not ratified the LOSC due to disagreements by the Reagan administration over the provisions on deep seabed mining (Wilkinson, 1983), it has by presidential proclamation endorsed the fishery provisions of the LOSC and ratified the 1995 Fish Stocks Agreement, which entered into force in 2001. Moreover, in 1976, prior to the completion of the LOSC negotiations, the US Congress passed the FCMA (Public Law 94-265). In addition to establishing a 200 nautical mile FCZ, the FCMA set a schedule to phase-out of foreign fishing in this zone thereby 'Americanising' the fisheries off the coasts of the US.[7]

[7] The FCMA was reauthorized and significantly altered in 1996.

In Title 1, Section 101 of the FCMA, the US claims rights within the EEZ as follows, '…sovereign rights and exclusive fishery management authority over all fish, and all Continental Shelf fishery resources, within the exclusive economic zone…' The Act goes further and claims rights beyond the EEZ in three specific instances that encompass, '(1) All anadromous species throughout the migratory range of each such species beyond the exclusive economic zone; except that that management authority does not extend to any such species during the time they are found within any waters of a foreign nation. (2) All Continental Shelf fishery resources beyond the exclusive economic zone...'.

The FCMA also established eight regional fishery management councils to manage fisheries in federal waters (3-200 nautical miles offshore). The regional councils are charged with developing Fishery Management Plans for the various fisheries under their jurisdiction. To facilitate the development of these Fishery Management Plans and the management of fisheries, the councils established a series of advisory committees and development teams. The Pacific Fishery Management Council (PFMC) and the North Pacific Fishery Management Council (NPFMC) are the two councils with jurisdiction over fisheries targeting Pacific Salmon. The salmon Fishery Management Plan developed by the PFMC is a framework plan requiring the development of specific fishing levels for specific ocean fisheries on a yearly basis. For the most part, salmon fisheries in Alaska occur in state waters and therefore do not come under the jurisdiction of the NPFMC.[8] Because of this, I focus primarily on the role of the PFMC in managing salmon in the Pacific Northwest.

The implementation of the US EEZ did not greatly alter the legal or jurisdictional nature of salmon management in international waters. Efforts to reign in high seas salmon fisheries pre-dated the expansion of the EEZ to 200 nautical miles. In 1976, Pacific salmon were already protected from directed high seas harvests under the 1952 trilateral salmon treaty. However the FCMA made this treaty obsolete and it was renegotiated in 1978. The provisions for salmon were essentially the same. However, as a result of research conducted on behalf of the International North Pacific Fishery Commission, which confirmed the presence of US salmon stocks in waters west of the abstention line and because of the newly expanded US EEZ, which contained an area 200 miles around the Aleutian Island chain, the abstention line was moved west by 10° of longitude (Wilkinson, 1983). The International North Pacific Fisheries Commission was ultimately dissolved when the Convention for the Conservation of Anadromous Stocks in the North Pacific Ocean went into force in 1993. This convention included the Russian federation in addition to Japan, Canada and the US and created the North Pacific Anadromous Fish Commission. The convention further gave 'primary interest in and responsibility' to the states in whose waters the salmon originate. In addition, by stipulating that salmon fisheries occur only within the 200-mile EEZs of these countries, it effectively outlawed high seas salmon fisheries.

[8] The salmon troll fishery is the primary exception, occurring in federal waters off the coast of southeast Alaska. This fishery has been managed 'without regard to the [Fishery Conservation Zone]-State jurisdictional boundary line' (NPFMC, 1978: 38). West of Cape Suckling, the False Pass, Copper River and Cook Inlet net fisheries occur in federal waters but are managed by the State of Alaska as inside fisheries. For the most part, the NPFMC does not address salmon management except as it pertains to salmon bycatch in groundfish fisheries (Oliver, 2001).

The implementation of the EEZ gave the US more leverage in controlling high seas salmon catches and permitted the eventual restriction of fisheries with large salmon bycatches, such as the Japanese squid fishery. Although some foreign fleets continued to fish within the US EEZ in the decade following passage of the FCMA, salmon were classified as a 'prohibited species' and as such no salmon fishing by these fleets was permitted and the retention of incidentally caught salmon in fisheries targeting other species was also prohibited.

With respect to salmon, however more significant ramifications were felt in domestic fisheries. The establishment of the 200-mile EEZ gave the federal government a greater role in the management of Pacific salmon, especially the ocean troll fishery. In the mid 1970s when the FCMA came into being, the offshore commercial troll fisheries had been unregulated for decades and Pacific salmon fisheries were in a state of 'chaos' according to a 1978 report by the US General Accounting Office.

The landmark decision by Justice Boldt in the *US v. Washington* case[9], affirming tribal management authority and their right to harvest up to 50% of the harvestable salmon run, had only recently been handed down and was still being appealed by various user groups and the State of Washington. Indian fisheries in Washington state harvested approximately 15% of the harvestable run (Cohen, 1986). The FCMA mandates consistency with 'other applicable law' and requires a description of 'the nature and extent of…Indian treaty fishing rights, if any' (Section 303 (a)). In 1977, President Carter established a Federal Task Force on Washington State Fisheries Problems to gain an understanding of the implications of the Boldt decision for the federal management regime and to propose recommendations for resolving outstanding conflicts. The PFMC made fulfilling Indian treaty obligations one of its interim objectives in 1977 and 1978. This was achieved, in part, through a PFMC mandated reduction in the non-Indian troll fishery 'to provide greater ocean escapement of salmon to inside waters, affording Indian fishermen increased harvest opportunities' (US General Accounting Office, 1978: iii).

Federal management of ocean fisheries facilitated a significant redistribution of salmon away from the non-Indian commercial troll fishery to the treaty Indian troll fishery as well as other fisheries in freshwater and coastal areas. In 1977, the PFMC closed the troll fishery for several weeks in June to increase the ocean escapement of chinook and additionally increased the chinook size limit from 26 inches to 28 inches in waters north of Tillamook Head to the Canadian border.[10] The PFMC also implemented a requirement for the use of barbless hooks by the commercial troll fishery and perhaps most importantly, the PFMC declared its intent to limit entry to the commercial troll and charterboat fisheries by means of a moratorium on new entrants to the fisheries if the states of California, Oregon and Washington did not implement their own.

Figures 6.1 and 6.2 show the growth in the ocean troll fishery catches of chinook and coho salmon from the 1950s to 1977 when the PFMC began regulating the fishery.

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[9] The *US v. Washington* ruling or Boldt decision, as it is often called, is discussed in greater detail in the following section.

[10] The southern boundary for the 28 inch size limit regulation was changed by the PFMC in 1978 from Tillamook Head to Cape Falcon, 11 nautical miles to the south. This was a controversial change, strongly opposed by trollers who claimed they would be prohibited from trolling on large concentrations of chinook and coho in the area between Tillamook Head and Cape Falcon as a result (US General Accounting Office, 1978).

Figures 6.3 and 6.4 depict chinook and coho catches by the Washington state recreational, non-Indian and treaty Indian commercial troll salmon fisheries. In all four cases, the average troll catch before the advent of the FCMA was higher than that in the years following. In recent years, some of the decreased harvest is attributable to very low returns of salmon runs. Nevertheless the figures do demonstrate that the PFMC effected a significant redistribution of salmon harvest away from the offshore non-Indian troll fishery.

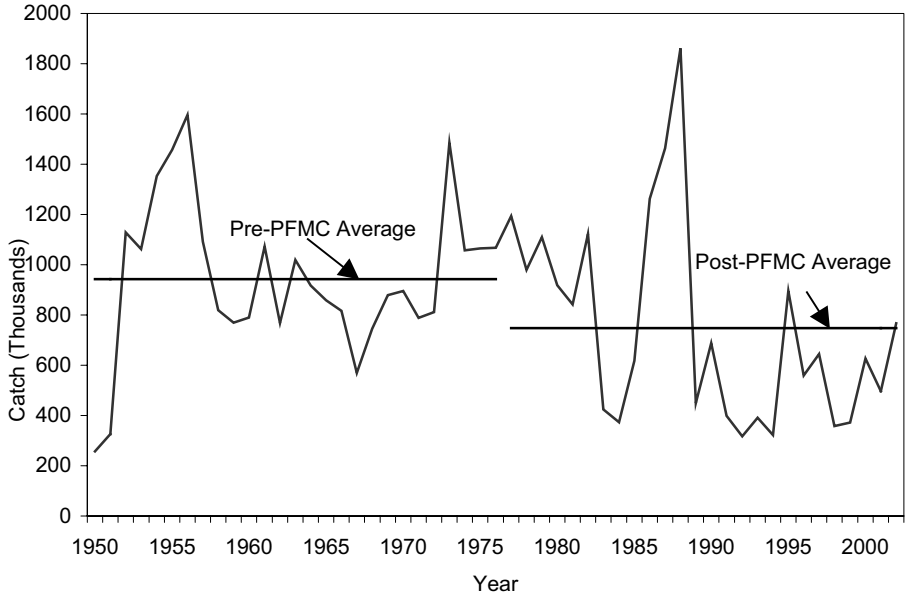

Fig. 6.1. Chinook harvests in the Pacific coast non-Indian commercial troll fishery from 1950 to 2002. The data includes catches by trollers licensed in California, Oregon and Washington states. Data derived from the PFMC (Salmon Technical Team, 1993; PFMC, 2003).

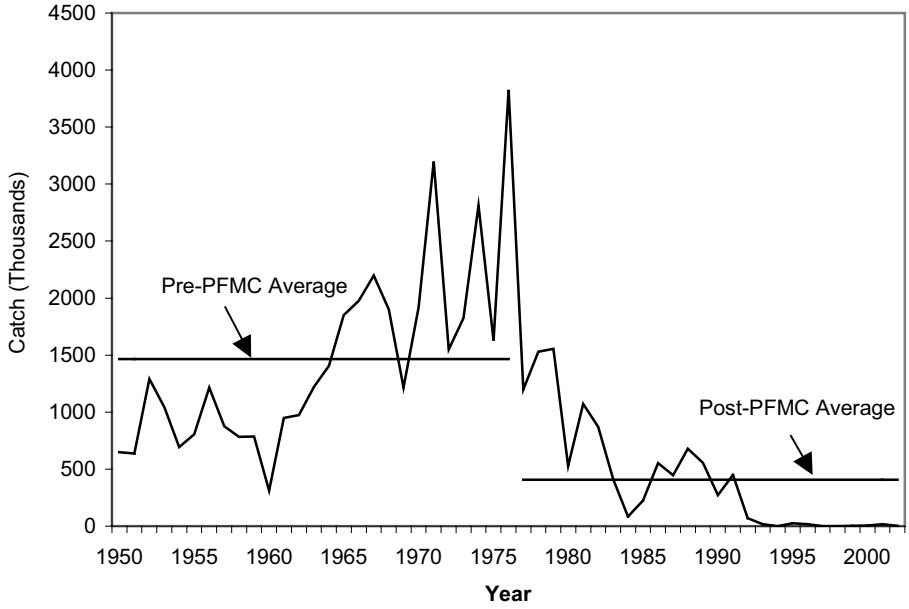

Fig. 6.2. Coho harvests in the Pacific coast non-Indian commercial troll fishery from 1950 to 2002. The data includes catches by trollers licensed in California, Oregon and Washington states. Data derived from the PFMC (Salmon Technical Team, 1993; PFMC, 2003).

5. THE EEZ AND INSTITUTIONAL INNOVATION

The FCMA and EEZ also stimulated a major transformation of the institutional landscape in the Pacific Northwest. Because of the technical challenges and extensive knowledge requirements inherent in coordinating multiple geographically and temporally dispersed fisheries on mixed stocks of salmon, salmon management must occur at different scales of social and political organisation. The regional councils established under the FCMA needed to be connected to local area management regimes. As a result of years of litigation by Indian tribes in the Pacific Northwest, state-tribal co-management regimes were established in western Washington and the Columbia River areas.[11] In order to create an interface between the regional councils and these locally based co-management regimes several new institutions were created. These institutions are nested below the PFMC and facilitate the transfer of information and the negotiation of complex allocation agreements among stakeholders.

[11] Co-management regimes are institutional hybrids, combining aspects of state and local or traditional management. Much has been written in recent years about these types of institutions. For a broad overview of fisheries co-management regimes in different settings see Jentoft and McCay (1995) and Pinkerton (1994).

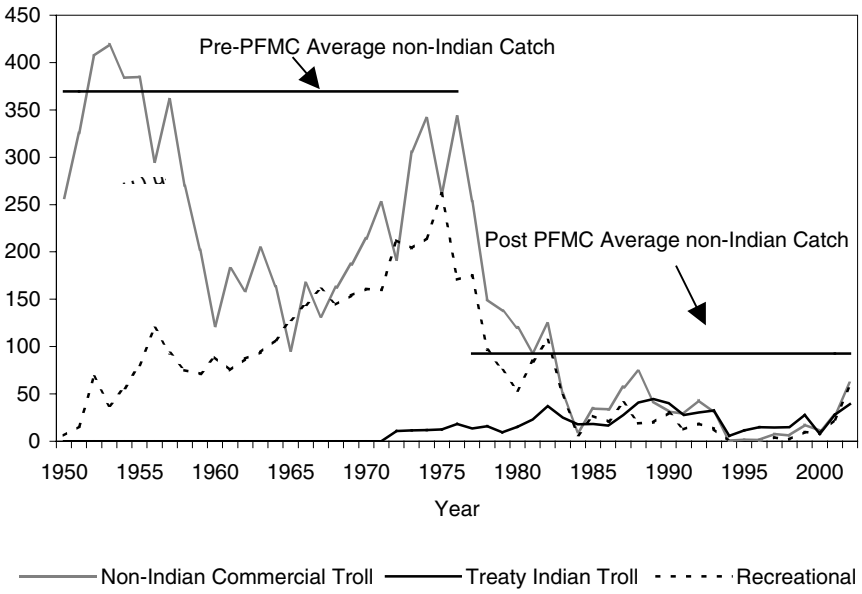

Fig. 6.3. Chinook harvests in the Washington state ocean recreational, non-Indian commercial troll fishery and treaty Indian troll fisheries from 1950 to 2002. Data derived from the PFMC (Salmon Technical Team, 1993; PFMC, 2003).

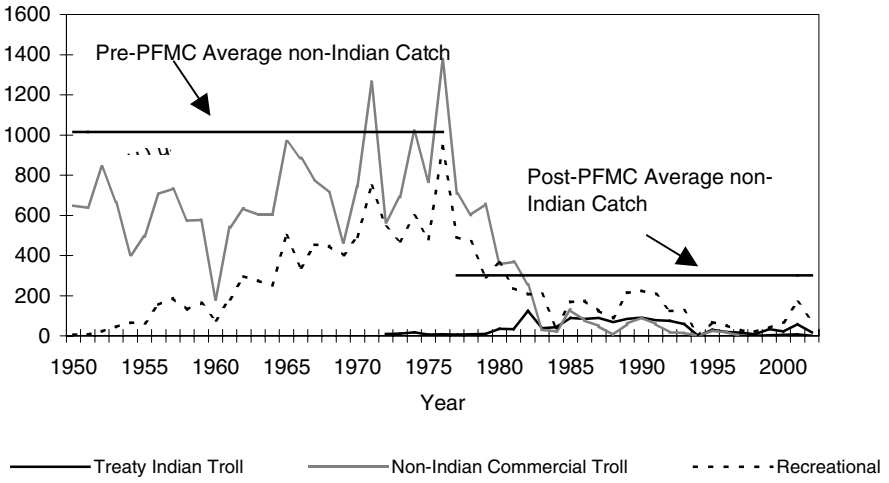

Fig. 6.4. Coho harvests in the Washington state ocean recreational, non-Indian commercial troll fishery and treaty Indian troll fisheries from 1950 to 2002. Data derived from the PFMC (Salmon Technical Team, 1993; PFMC, 2003).

Since the PFMC's management actions influence ocean escapement, which in turn determines, at least in part, the magnitude of the salmon harvest in 'inside' fisheries, an institutional mechanism was needed to link inshore (Indian and non-Indian) and offshore (non-Indian) fisheries. The convergence of court affirmed tribal rights to use and manage salmon, the state's interest and authority over resources found within its waters, and the federal mandate to conserve and manage fisheries in the US EEZ, has produced a complex institutional environment in which new institutions were needed to mediate the nexus of overlapping authorities and to coordinate the management of salmon along the Pacific coast. What follows are brief historical sketches of events leading up to the development of new management institutions in four areas: the Klamath River, Columbia River, Puget Sound and Washington Coast.

5.1 Puget Sound

The Lummi Tribe was first to bring the issue of tribal fishing rights to court in 1897 in *United States et al. v. Alaska Packer's Association*. Prior to this, non-Indian salmon traps had encroached on Lummi reef nets in the San Juan Islands. In 1894 the Lummi tribe petitioned the Commissioner of Indian Affairs writing,

> ...Several years ago white men began to encroach on our ground. We were willing to have them share with us the right to fish but not satisfied with equal rights they have yearly made additional obstructions to prevent our catching fish, by setting traps, and placing piling around the grounds. They have driven us from our old camping ground on the beach and have so treated us that we feel we must now appeal to you for assistance... (from Lummi Tribal Archives 1894, cited in Boxberger, 1989: 50)

The subsequent ruling did not favour the Lummis and the US Supreme Court chose not to hear the case. Much litigation ensued over the following years, increasing in frequency in the 1960s.

In 1970, the Puget Sound tribes filed a complaint against the state of Washington seeking a judgment concerning off-reservation fishing rights and enforcement of those rights as determined. They additionally sought relief for environmental destruction that had impaired their treaty fishing rights (384 F.Supp. 312, 327 1974). The Supreme Court subsequently affirmed the landmark decision rendered by Judge Boldt of the Western District Court in 1974. Phase I, as the first portion of the decision has been labelled, addressed treaty fishing rights and established an Indian allocation of salmon. Phase II addressed the environmental aspects of the complaint as well as whether hatchery fish are to be counted in the allocation. Some of the environmental questions raised in Phase II are still before the courts.

The court found that the state may not interfere with treaty protected rights to fish on or off-reservation in usual and accustomed fishing areas, for religious, ceremonial or subsistence purposes. The tribal allocation was determined to be an equal share of the salmon, or 50% of the harvestable run.

The Supreme Court affirmed Boldt's decision in *US v. Washington*, leaving intact his determination that the tribes could exercise their governmental powers by self-regulating their on and off-reservation tribal fisheries without any state regulation provided that the tribe met several qualifications which included, among others, the

presence of competent leadership, an organised government, fisheries enforcement, and trained fishery scientists and managers. The tribes were required to give the state copies of their fishing regulations, permit monitoring of off-reservation fisheries by state management officials, and provide harvest reports. As in prior decisions, the state was permitted to regulate tribal fisheries to the extent reasonable and necessary for conservation purposes.

This decision effectively conferred management authority over tribal fisheries to the tribes themselves and set up a framework for the cooperative management of salmon between the state and tribes of western Washington. It was not until the early 1980s that a truly cooperative relationship between the tribes and state began to develop (Ebbin, 1998).

The North of Falcon institution (NOF) was created in the mid-1980s to provide a connection between the federal management process and the emerging state-tribal co-management regimes in Washington and Oregon. NOF encompasses fisheries that occur north of Cape Falcon on the coast of Oregon, and provides a forum for representatives of state and tribal management agencies, various industry and environmental organisations, fishermen and other interested stakeholders from Washington and Oregon to meet face to face to design inshore fisheries in conjunction with ocean salmon fishing levels set by the PFMC. Participants discuss the constraints and opportunities involved in the management and allocation of salmon, in relation to estimates of stock status and the desires and needs of stakeholders. In this way, managers are provided with an institutional arena in which fishing plans for ocean and terminal fisheries in waters north of Cape Falcon, including the Columbia River, Puget Sound, and the Washington coast are developed and coordinated.

In the past decade, the NOF has become more formalised, rules of engagement are distributed at meetings. Additionally, the scope of the meetings has broadened and there is an expanded effort to work out the regulatory details of a greater number of fisheries. NOF meetings encompass a series of smaller break-out caucuses involving sub-sets of the stakeholders present such as Washington state and tribal fisheries managers and stakeholders from Puget Sound. State and tribal technical and policy representatives meet both individually and collectively, separating from the larger group of NOF participants to meet on a manager-to-manager basis. At these smaller meetings state and tribal representatives establish interim escapement goals for weak stocks, develop stock specific fishing plans and court-reviewed Memoranda of Understandings for critical salmon stocks and discuss other management concerns.

5.2 Washington Coast

The tribes of the Washington coast were party to much of the litigation described in the previous section. In addition, one seminal case, the *Hoh v. Baldrige* decision bears relating. Even after the Boldt decision was handed down, large, non-Indian fisheries continued to harvest salmon runs comprised of mixed stocks in areas off the coast of Washington. This caused some stocks of salmon to return at or below their escapement goals, thereby forcing the closure of in-river tribal fisheries for conservation reasons. Especially vulnerable were the coastal rivers of Washington where three coastal tribes, the Hoh, Quileute and Quinault lived and fished. These tribes sued to stop this practice.

The 1981 decision in *Hoh v. Baldrige* mandated a management policy termed 'weak stock management'. Prior to this ruling, the 50% allocation shares had been calculated on the basis of stock aggregates within a species. The Court ruled that tribe's have a right 'to take approximately fifty percent of each run of salmon, managed on a river-system by river-system, run-by-run basis' (522 F. Supp. 683, 690). The Court directed the state and tribes to develop mutually agreed upon 'practical and flexible rules' for the management and allocation of salmon. The Court indicated that flexibility in setting escapement goals was needed so that the burden of overly optimistic run-size estimates would not be borne entirely by tribal and other inside fisheries (522 F. Supp. 683, 688).

Although aimed primarily at coastal stocks, the management precepts outlined in the case have transformed the way in which other Washington state fisheries are managed. Wild stocks that are deemed to be at risk of not achieving escapement goals, that have 'conservation problems', are considered 'driver' stocks. These stocks constrain the harvest levels of the fisheries that catch them. In Washington there are often several driver stocks that place constraints upon fisheries. Fisheries may be 'shaped' to avoid impacts on these driver stocks, which refers to some combination of time, area and gear restrictions. In addition, because of the numbers of different salmon stocks and the complexity of their migratory routes, 'shaping' a fishery to avoid impacts on one stock may shift them onto other stocks of concern. Escapement objectives for driver stocks are jointly negotiated by the state and tribal management agencies on a yearly basis in an attempt to balance legal and allocative requirements with the biological needs of the resource. Tribal representatives from Washington coastal tribes and state managers meet as part of the NOF. They also meet separately and with other Washington coastal stakeholders to address fisheries of specific concern to Washington coast salmon stocks. These meetings and the agreements that emerge from them constitute an important institutional mechanism in gaining consensus agreements that are then passed on to the NOF process and PFMC.

5.3 Columbia River

In the Columbia River, a series of lawsuits initiated by the tribes also proceeded over the last century. The pivotal case in the development of cooperative management in this area is what has been come to be known as either the Sohappy case, Belloni decision or *US v. Oregon* (*Sohappy v. Smith*, 302 F.Supp. 899 (D.Or. 1969)). David Sohappy was arrested for fishing in the Columbia River in violation of the state of Oregon's fishery regulations. Fourteen individual members of the Yakima Tribe filed against the Oregon Fish Commission to determine the tribal right to fish as well as the manner and extent to which the state could regulate tribal fishing activities. Eventually the four Columbia River tribes, Yakima, Umatilla, Nez Perce and Warm Springs intervened in the case. This case has determined the nature of salmon fisheries management in the Columbia River and set the stage for the more far-reaching Boldt decision.

The Federal district court upheld the defendant's position citing the three criteria defined in Puyallup I (that the regulation must be necessary for conservation of fish, must not discriminate against Indians, and must meet appropriate standards) as requisite for the state to assert management authority over Indian fishing. The court ordered that the protection of treaty fishing rights must be a priority of state regulations co-equal with

conservation of the runs for other users. The court further found that the tribes have an 'absolute right to that fishery', and 'are entitled to a fair share of the fish produced by the Columbia River system'. The court continued its jurisdiction in the case since it couldn't prescribe in advance all regulations that might be appropriate. It suggested that the state consult the tribes with respect to regulations affecting them and should 'yield to tribal preference'. Finally, the court encouraged the tribes and state to pursue 'a cooperative approach' to fisheries management. Although the Belloni decision fell short of granting the Columbia River tribes full management authority over their off-reservation fisheries as the Boldt decision did, it did give the tribes and the Columbia River Intertribal Fish Commission a strong role in Columbia River fisheries management. Tribal and state managers from the Columbia River region, including the states of both Oregon and Washington, meet as part of the NOF process. They also meet separately and with other Columbia River stakeholders to address fisheries of specific concern to Columbia River salmon stocks. The agreements that emerge from these meetings are then passed on to the NOF process and PFMC and are important in moving towards consensus positions.

5.4 Klamath River

Although treaties were made with the California tribes on the Klamath River in 1851, the US Senate refused to ratify them because of opposition from the California delegation (Heizer, 1978). The Hoopa Reservation was established without a treaty but rather by authority of an act of Congress in 1864. Legally, no California tribe ever entered into relations with the US government based on a treaty (Heizer, 1978). The character of the fisheries of the Yurok, Hoopa Valley (or Hupa) and Karok Tribes on the Klamath, and the emerging co-management institution has a different history and character as a result of this legal history.

In 1933, the state of California closed the commercial fishery on the Klamath River, in which tribal fishermen had participated (Pierce, 1991). In September 1969, a California Game Warden seized five gillnets that had been stored near the river and were owned by Raymond Mattz who used them for subsistence fishing. Mattz claimed he was an enrolled member of the Yurok Tribe, that the nets had been seized within Indian country and that state statutes outlawing the use of gillnets were not applicable (412 US 481; 93 S. Ct. 2245; 1973 US Lexis 57; 37 L. Ed. 2d 92). The case was decided against Mattz in state court but eventually was heard by the US Supreme Court, which overturned the state court decision in *Mattz v. Arnett*. The US Supreme Court reversed the decision of the lower court, finding that the region of the Klamath River where the nets were seized was still reservation land. The case was remanded for a determination of 'the existence of Mattz' fishing rights and to the applicability of California law notwithstanding reservation status' (412 U.S. at p. 485 [37 L.Ed.2d at p. 95]). In 1975 the Supreme Court declined to hear the appeal, *Arnett v. Five Gill Nets et al.,* thereby affirming the lower court's decision, which acknowledged the rights of Indians to fish on tribal reservations free of state intervention (48 Cal. App. 3d. 454; 1975 Cal. App. Lexis 1127; 121 Cal. Rptr. 906).

After these decisions, the Bureau of Indian Affairs developed the first set of regulations guiding on-reservation fishing by Klamath River tribes (Pierce, 1991). However, local anger from sport fishing and business groups over the Indian fishery led

to a closure of the fishery in 1978 until an environmental impact statement could be conducted. In the meantime, large ocean fisheries also took their toll on Klamath River salmon stocks and they declined. These declines led the PFMC in 1985 to bring together a group of Klamath River stakeholders, including tribal representatives, to discuss and develop a long-range agreement to manage Klamath River salmon stocks (Klamath River Salmon Management Group, 1986). From these discussions, the Klamath River Salmon Management Group (KRSMG) was formed under the aegis of the PFMC. The group continues to meet several times a year to cooperatively negotiate mutually acceptable management and allocation strategies (Jordan, 1989). The agreements that emerge from this institution are passed on to the PFMC for incorporation into the yearly quota- and regulation-setting process for salmon.

6. AN ECOLOGICAL APPROACH TO UNDERSTANDING INSTITUTIONAL INTERPLAY

An explicitly organic approach to understanding institutions as opposed to a mechanistic approach emerged in the 1950s and 60s as a means of examining the structure and function of organisations. Different fields, including the biological sciences, contributed insights to this perspective, which elaborates on the idea that organisations are similar to organisms in many ways and emphasises the importance of the organisational 'environment' (Aldrich, 1979; Lawrence and Lorsch, 1986; Perrow, 1986). Organisations, in this way of thinking, are open to their environments, which include the organisation's direct task environment, its interactions with other organisations as well as the broader societal context. Organisations must fit within their environment if they are to survive, either adapting to it or reconfiguring the environment to suit their needs (Perrow, 1986).[12] Similarly, institutions, like organisations, can be portrayed as open to their environments, matching or moulding them to enhance survival. Here, institutions refer not to material entities such as organisations, although some organisations may indeed be institutions in their own right, but rather to the rules and codes of conduct that define social practices, decision-making procedures, assign roles to participants, and guide social interactions (Young, et al., 1999).

In the case of natural resource management institutions, the environment includes social and institutional as well as biophysical dimensions. The social dimension refers to the broader societal context. The institutional dimension is defined by the institution's relationship to other institutions with which it interacts, overlaps, competes or co-exists. The biophysical dimension is delineated by the institution's jurisdiction, its intersection with the natural system. There are linkages between these dimensions, as Trist has noted, 'The denser the organizational population in the social habitat (and the more this itself is limited by the increasing constraints emanating from

[12] Perrow (1986) provides an example of a warlike Indian tribe that expands its territory through violent conflict. In time, other tribes must become warlike or be conquered. A functionalist would explain that the tribe encounters a hostile environment and military force is needed to defend against aggressive tribes. 'The society, like the organization has adapted. But what has happened, of course, is that those with power made sure that their skills would be the primary requisites for the community. They have shaped the environment, not the other way around' (1986: 174).

the physical environment – whose resources are no longer perceived as boundless), the more frequently do the many causal strands become enmeshed with each other' (Trist, 1983: 272).

Following this line of thought, we can conceive of an ecology of human institutions, in which the spatial, temporal, and functional dimensions of these systems are considered. Institutions may be more or less well adapted to the particular characteristics of the natural systems they seek to interact with. This congruence between institutional structures and biophysical systems has been termed 'fit' and the interactions among different institutions in these various spaces have been referred to as 'interplay' (Young, et al., 1999). Vertical interplay refers to those situations where interactions cross different levels of social organisation. Institutional activities may be influenced or redirected and outcomes may be altered, enhanced or impeded due to these interactions.

With respect to US salmon management, the PFMC has facilitated the development of several co-management regimes along the Pacific coast: the NOF, the KRSMG, the Columbia River and the Washington coastal caucuses. One might be tempted to portray the PFMC as the 'top' of a hierarchically nested domestic salmon management regime. However, in each of these four sub-regional regimes discussed, the PFMC acts more as a mediating forum, allowing each subsystem to negotiate local and regional agreements within its overarching structure. These agreements are subject to discussion and approval by the PFMC. However, if a consensus among stakeholders emerges from the discussions, even though tenuous, PFMC members are more likely than not to incorporate these agreements into their annual fishing plans. The PFMC has facilitated the business of co-management by providing an institutional structure that has allowed and encouraged stakeholders from different geographic regions to meet together and develop local-level allocation and management agreements, which are then incorporated into PFMC actions.

The relationship between the PFMC and the nested co-management institutions can be characterised as mutualistic and symbiotic. Similar in structure to a lichen[13], the PFMC infrastructure represents the fungal organism, providing structured space and time, protection from the external environment, and access to limited physical resources. The NOF, KRSMG, and smaller breakout caucuses for Puget Sound, Washington Coast and Columbia River stakeholders play the role of algal organisms, utilising the PFMC structure to bring together disparate components such as technical resources, information, and relevant stakeholders to negotiate and produce locally based allocation and management agreements. The PFMC provides connections among the different regional associations through which technical and policy information flow, both vertically and horizontally. The PFMC then integrates these local agreements into coastwide fishing plans, developing comprehensive and coordinated regulatory packages for outside and inside fisheries along the Pacific coast (which includes the fisheries in the 3-200 mile EEZ as well as those in state waters).

Work in organisational ecology has focused on the relationship between the action of elements in the environment and organisational structures and outcomes

[13] A lichen is comprised of an algal organism and fungus living in close association in which both organisms benefit. The fungus provides structure and protection, allowing the algae to survive in environments where it otherwise would not be able to, and the algae in turn provides the fungus with food (Wright and Nebel, 2002).

(Thompson, 1967). Organisations operating in turbulent and uncertain environments[14] need a relatively high degree of internal differentiation and also an appropriate degree of integration (Lawrence and Lorsch, 1986). They require flexibility to promote a good fit and facilitate positive forms of interplay within a changeable environment. Collaborative relationships between institutions are a way of managing this turbulence and enhancing institutional resilience.[15]

Turbulent describes the environment of the Pacific coast salmon management regime. Salmon management takes place in the context of an uncertain and rapidly changing information base on which management decisions are based, and a highly diverse group of stakeholders with competing interests. In addition, there exist numerous cross-cutting cleavages amongst these stakeholders which complicates management and creates the potential for various forms of political interplay, as well as a large field of overlapping institutions whose activities negatively impact the production of Pacific salmon and concomitantly the interests of the various stakeholders. Further, the four local co-management institutions allow stakeholders, encompassing individual fishermen (Native, non-Native, commercial and recreational), industry, environmental and Native organisations and tribal governments to have some control over the regulatory environment in which they operate. They also allow the PFMC to coordinate the way in which stakeholders (part of the PFMC's external environment) provide input for management decisions. These co-management institutions facilitate and formalise the transfer and sharing of information as well as the crafting of consensus positions on complex allocation questions. Ultimately, they create an institutional space in which shared understandings of common problems and innovative solutions to these problems are developed and elaborated upon by stakeholders.

7. CONCLUDING THOUGHTS ON PACIFIC SALMON MANAGEMENT AND THE 200 MILE EEZ

The primary impact of the imposition of the 200 nautical mile EEZ in the US with respect to Pacific salmon has been the elimination of foreign interceptions of Pacific salmon as incidental bycatch within the EEZ. More importantly, the expansion of the EEZ was accompanied by the creation of eight regional management councils, such as the PFMC, which resulted in a much greater federal presence in fisheries management. Notably, the PFMC has worked to stabilise and reduce domestic interceptions of Pacific salmon. In conjunction with the emerging case law regarding treaty fishing rights, this

[14] Trist (1983: 273) describes turbulence in the institutional environment as a kind of 'contextual commotion' where 'large, competing organizations all acting independently, in many diverse directions, produce unanticipated and dissonant consequences in the overall environment which they share. These dissonances mount as the field becomes more densely occupied'.

[15] Trist (1983) elaborates on the concept of 'referent organizations', associations of competing or interdependent organizations whose goal is to internalize what were once external relations. These organizations are involved in regulation: setting ground rules of engagement, conflict resolution and sanctioning as well as promoting common values from which goals are derived. They engage in resource and information sharing. Finally, they are also implicated in tracking emergent issues and facilitating interactive planning and the development of shared images of a common and desirable future (Trist, 1983: 275-276).

has led to a significant redistribution of socio-economic benefits from the offshore troll fishery to the treaty troll and inside fisheries notably other tribal fisheries.

Through international treaties, the federal government has also worked to eliminate the harvest of salmon in international waters. The EEZ proclamation in the US strengthened the US's authority over US origin salmon even in international waters, thereby strengthening existing treaties. These actions have enhanced customary and traditional uses of Pacific salmon by increasing ocean escapements of salmon to near-shore and riverine fisheries and spawning areas. Additionally, the federal government has worked to ensure that customary and traditional uses are given management priority in state waters (within three miles of the coast).

Along the Pacific coast, the federal government has facilitated the emergence of cooperative management regimes between state governments and indigenous groups. It has also been the catalyst for some very creative institutional innovation. The NOF, the Columbia River, Puget Sound and Washington coastal breakout groups as well as the KRSMG are examples of this. Thus through interplay between the PFMC and these nested co-management regimes it is possible to coordinate geographically and temporally dispersed salmon fisheries and develop integrated knowledge derived from different scales of analysis (Ebbin, 2002). The locally based co-management regimes provide the regional council with a better 'fit' with both the biophysical and institutional dimensions of its environment, creating a finer scale at which different types of information such as scientific, traditional and experiential knowledge, stakeholder interests and preferences, are generated for use in management and allocation decisions. In these respects, federal oversight of the EEZs has enhanced equitable access, use and management of salmon resources by indigenous fishermen.

The collision of cultures that occurred in the Pacific Northwest led ultimately to conflicts over the use and management of the region's natural resources, particularly the economically, spiritually and culturally valued Pacific salmon. These conflicts have been addressed in various ways, through treaties, congressional authorisations, and litigation and more recently through negotiation. The US EEZ regime converged with these various initiatives facilitating a redistribution of resources and the formation of co-management regimes. In this region of the world where great tribal cultures flourished, built substantially on and around the bounty of the salmon, these co-management institutions have worked to link different cultures, different watersheds, different ways of managing, to provide a connection between the diverse scales of human and natural systems.

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