

Global Resources and Market Impacts on U.S. Pacific Northwest Fisheries

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Abstract

Fish and fishery products represent a dynamic sector of the world's global food economy. Changes in supply, market demands and fishery regulations have major impacts on regional fisheries in the U.S. Many small and mid-size fishing operations have been adversely affected by these changes and have undertaken different strategies to overcome economic hardships and survive in the global marketplace. This paper will discuss two such fisheries in the Pacific Northwest, the Pacific salmon and troll-caught albacore fisheries, and show how they have met the challenges of globalization. The Pacific salmon fishery was adversely affected by the rapid increase in farmed salmon supplies throughout the 1990s. They have waged a successful campaign to differentiate their product, wild-caught salmon from farmed salmon. This has occurred through the help of government and private funding marketing campaigns as well as an uneasy alliance with conservation groups who see farmed salmon as environmentally unsustainable. The West Coast troll-caught albacore industry suffered economic hardships in the late 1990s as large tuna canneries shifted resource purchases to foreign fishing operations that were expanding in the Southern Pacific oceans. This forced the regional industry to develop new markets, improve onboard handling and quality, and brand their product differently from the traditional canned markets. This paper will discuss different global trends in the seafood industry and their impacts on rural coastal fisheries in the Pacific Northwest. Different examples of branding, marketing and responding to market changes have helped mitigate some of the negative impacts. The need for working cooperatively for both resource utilization and marketing is becoming more critical for small and mid-size enterprises to survive and prosper in a global economy.

Introduction

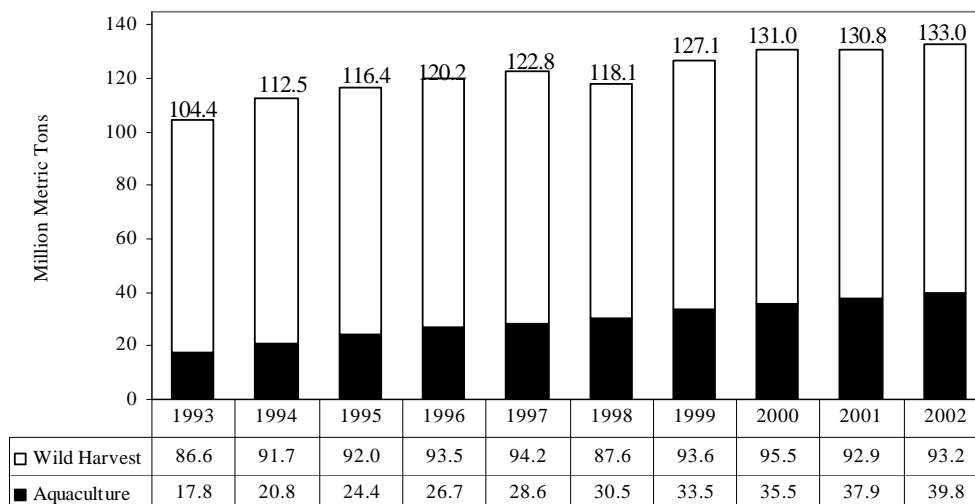
World fisheries have changed dramatically since 1990 and there are several trends worth noting in terms of production, property rights, aquaculture and global markets. If one were in a room of fisheries biologists, economists, social scientists and fishery managers there would be an active debate of what changes are the most important. Although getting any of these disparate groups to come to consensus would be a major achievement, there may be begrudging consensus that the following changes have caused a major impact in fisheries:

1. Recognized limits of open-access ocean fisheries
2. Rise of aquaculture and its importance in world trade
3. Globalization and expansion of markets
4. Importance of property rights in fisheries management
5. Increased voice of environmental groups in fishery policy

Although it is beyond the scope of this paper to discuss these points in detail, there is no question that each of the major fisheries has been impacted by these trends over the past decade and have responded differently. These factors have also had an effect on local fishers and distributors, even those that choose not to enter the global marketplace. This paper will discuss two of these fisheries in the Pacific Northwest, salmon and albacore, and how global market trends have, at first, negatively impacted these fisheries and then force them to develop new strategies to regain market share and price.

The world production of wild-caught species has leveled off since the mid-1990s while aquaculture has increasingly become an important food resource (Fig. 1). The previous fifty years showed unprecedented growth in world seafood production due to strong capital investment in the fishery sector, improved catching technology and the expansion of global markets. However, the 1990s proved that this explosive growth could not

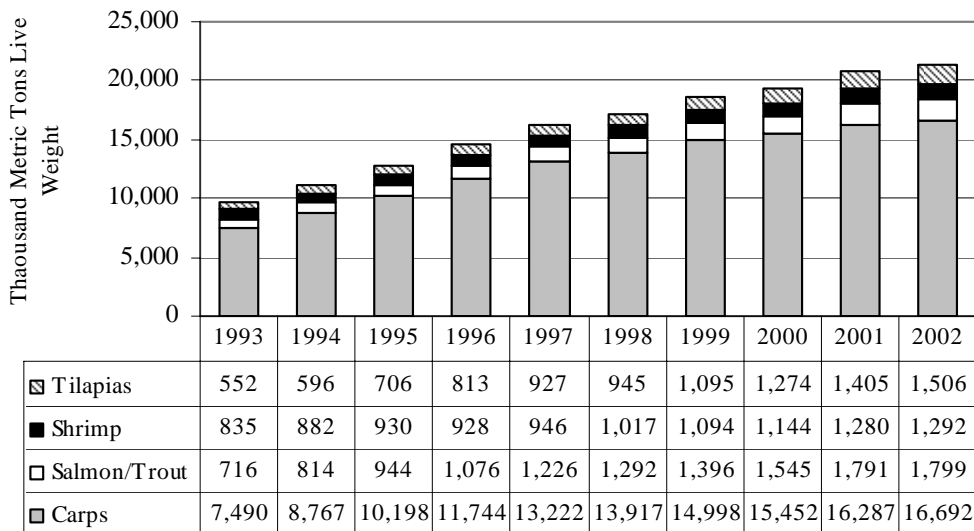
Figure 1. World Commercial Fish and Shellfish Supply 1993-2002



Source: FAO 2004

continue as several of the most important commercial species were being harvested at their maximum sustainable levels and several were classified as being overfished (FAO 2000). The steady demand for fish as food has continued and, for the most part, this increased demand is being supplied through aquaculture (Delgado et al. 2003). The dramatic increase in aquaculture production is a two-edged sword as there is unease about environmental damage and impacts in developing countries where most of the growth is occurring. The role of aquaculture in either supplying domestic food needs or being a mechanism for foreign investment and economic benefits through international markets is also a major concern for these countries (Rosegrant et al. 2004). In the U.S. we tend to think of aquaculture in terms of imported farmed shrimp and salmon along with some domestic production of species such as catfish as the principle components of aquaculture. It is worth noting that the production levels of these species are minor compared to the aquaculture of carp and shellfish which are used for domestic consumption in China and Southeast Asia (Fig. 2). Although farmed salmon and shrimp are significantly less than carp in terms of production they are major commodities for international trade. Tilapia has also significantly increased in production recently and is having an impact on the sales of white fish in U.S. and European markets. Even catfish has shown to be affected by imports of competing species. In 2002 there was a bid to place tariffs on imported catfish from Southeast Asia which was affecting domestic sales and the profitability of catfish farms in the Southeast U.S. (Harvey and Blayney 2002).

Figure 2. World Aquaculture Production: Key Species 1993-2002



Source: Johnson 2004

Fish and fishery products have been traded on the global marketplace between the major fishing nations for decades. Approximately 42% of the total fishery production is currently traded through international markets (FAO 2004). Recent trends in globalization has lead to the expansion of sourcing fish from developing countries and increased inter-regional trade for both wild-caught and farmed fish (Ahmed and Delgado

2000). Japan and the U.S. are the largest importers of seafood while China and Thailand are the leading exporters of fish and fishery products in international markets. Even less developed countries, such as Vietnam, have increased their seafood exports by 30% from 2000 to 2002 and have become a major player. What has also changed in the last 10 years is the ability of smaller producers in developed and developing countries to enter the global marketplace as well. The use of the internet to facilitate trade has become a standard for sourcing fish and meeting demands. At a local level, the use of the internet for direct marketing, and establishing niche markets are valuable tools that enable the small producer to compete. However, there are trade-offs and one must be willing to take on the responsibilities of distributors, salesmen, quality assurance personnel, etc. while developing these markets.

Another change that has been noted is the recognition of property rights in world fishery production. This concept actually began in the 1950s with the incorporation of the Exclusive Economic Zone (EEZ) or 200 mile limit off Peru and Chile. It recognized the fishing rights of a country's waters and excluded foreign fishing activities unless agreed upon by the host country. This eventually was incorporated by most nations under the Law of the Sea Treaty in 1982 and became a powerful international tool to preserve fishing opportunities for the host country. As fishery production increased and overcapitalization in fishing fleets placed added pressure on several stocks there was a recognition that property rights could become a valuable tool in managing different species (NAS 1999). Several important commercial species such as the New Zealand hoki, Alaska halibut, and Icelandic cod, etc. are managed by individual transferable quotas (ITQ) or other property-rights systems. Overall, these systems have improved fishery management, increased net profits to the industry, and have mitigated the volatility that often occurs in fisheries (Leal 2004). To a certain degree, property-base rights are one of the factors for success in the aquaculture industry, as fish farmers have better control of harvests and market opportunities (Anderson 2002).

Although there has always been a conservation voice with regard to the utilization of natural resources, including ocean fisheries, the seminal moment for many was the dolphin-free tuna effort that occurred in the 1980s (Russell 2002). This demonstrated how a well-organized campaign focused on the end-user (the consumer) could impact harvest practices of a fishery. There have been a number of similar efforts since then and they continue to grow. One could argue the effectiveness of various conservation-based initiatives but there is no question that their presence is felt in decision making at both the federal and local levels as well as in the marketplace. The development of the Marine Stewardship Council (MSC) which combined the policy arm of the World Wildlife Fund and the economic power of Unilever Corporation (the largest wholesale/retail operation in Europe) was a watershed event where the fishing/seafood industry took notice of conservation-based management. Several key fisheries, e.g. Alaska salmon, have come onboard recognizing the importance of being identified as a sustainable fishery to distinguish oneself in the marketplace. The Pew Oceans Commission is another powerful organization that is making itself heard and demanding change in how fisheries are managed in the U.S. (www.pewoceans.org).

U.S. Fisheries

The U.S. is a major fishing country ranking third in the world behind China and Peru but differs from these countries in several ways. The Peruvian fishery is based on small pelagics such as sardines and anchovies, which are made into fish meal and represent approximately 90% of the country's net production. China has a world-base fleet that fishes in several oceans, but also is the world leader in aquaculture production, primarily several species of carp that are used for domestic markets. The U.S. produces just under 5 million metric tons (mmt) each year of which only a small percentage are farmed species (9%), with catfish production being the largest. The U.S. fishery is primarily a wild-capture fishery based mainly out of Alaska where the major single species is Alaska pollock. The Alaska Pollock fishery represents a harvest between 1-1.4 mmt per year (roughly 30% of total U.S. fisheries production), is well managed and is currently undergoing review for MSC certification as a sustainable fishery. The non-Alaskan fishery that is high in volume but low in value is Atlantic and Gulf menhaden (17%) which is made into fish meal and fish oils. For human consumption the other important species for the U.S. domestic fleets are Pacific salmon (7%), Pacific cod (6%), various flatfish (3%), crab (3%), and wild-caught shrimp (3%). The U.S. is a net importer of seafood, importing ~ 4.4 mmt each year, primarily shrimp and lobster.

Much of the U.S. fleet consists of larger ocean-going vessels that can withstand the rigorous fishing conditions off Georges Bank in the winter or the Bering Sea any time of the year as well as other ocean fisheries. In addition, there is a substantial small-boat fleet that is important to income generation for small coastal communities. The larger vessels are mainly trawlers that have large capture and storage capacity and are often capable of fishing for mixed species. These can be further categorized into larger factory trawlers (>150 ft in length) that can stay out in waters for months at a time and often have processing capacity on board the vessel and coastal trawlers (60-150 ft.) that usually have a home port where they fish and off-load. For the purposes of this paper, small-boats are defined as vessels under 60 ft. that fish primarily for a single species during a specific season, usually by trolling or using fishing pots or vertical lines. On the West Coast, these vessels range from Northern California to SE Alaska and vary in their fishing strategies, species they target and approaches to changes in the marketplace. This paper will describe two different small-boat fisheries to show how global effects can impact local industry and markets.

Pacific Northwest Salmon Fishery

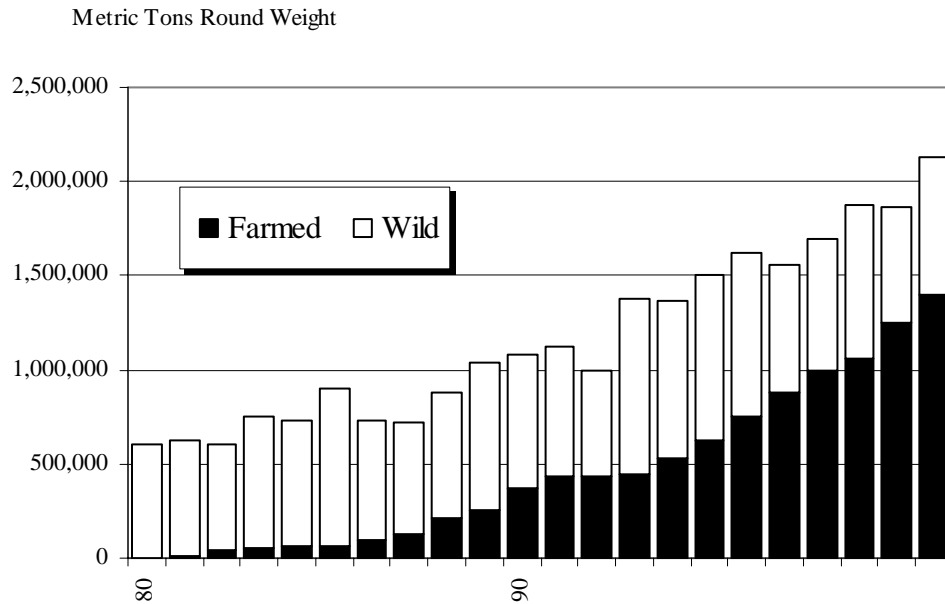
The small-boat salmon fishery has a long tradition in the Pacific Northwest. Pacific salmon are an anadromous fish that spend their early life-cycle in fresh water rivers and streams and then their major grow-out period in the open ocean, returning to their native streams for spawning. Fishermen take advantage of the seasonal return of the salmon and have their own strategies in maximizing their harvests. Although there are five species of Pacific salmon (Chinook, Coho, Sockeye, Chum and Pink), the major salmon fishery in the Pacific Northwest is the Chinook and Coho fishery. These species exhibit their highest quality traits as they congregate at the mouths of rivers before their

homeward migration. The fish often stop eating once they enter their spawning river and will use stored lipids and protein for energy as they migrate upstream. At this point, the oil content is the highest and its flesh has not begun to deteriorate and usually has a lustrous red-pink color that is highly prized in the marketplace. The most active salmon trolling season is during the summer months although several Chinook populations will enter streams in the spring. Small vessels equipped with ice or freezing capacity will work the coastal waters trolling artificial lures and hooking fish and landing the fish on a weekly basis. When the boat hold is full, the vessels return to their home port, off-load at coastal processing plants and then head back to sea. Until the later 1980s one could derive a small but sustainable income from this type of fishery.

There are several factors that will affect small-boat fishers and their ability to generate income. The first is the natural abundance of fish in the ocean (Radtke and Davis 2000). Pacific salmon survival is a complicated process that depends on environmental factors, spawning habitat, ocean conditions and fishing effort that affect fish stocks and their ability to spawn and migrate to the ocean each year. The second factor is regulations (Morishima and Henry 2000). With the passing of the endangered species act (ESA), much attention has been given to wild salmon its recovery. Due to the decline in the fish abundance throughout mid-century because of dams and habitat destruction, a major emphasis was place on salmon hatchery production to mitigate wild-stock declines. These have proven to be reasonably successful (and increasingly controversial) and allowed a viable commercial fishery for several decades. With the passing of the ESA more attention was given to incidental catch of wild salmon and strong regulations hindered commercial fishing during peak salmon runs when wild fish were mixed in with the hatchery fish. Allowable fishing days were curtailed and it was difficult to maintain a viable commercial business through the 1990s in terms of number of fish one could capture. During this same time period, poor ocean conditions hindered the survival success of both wild and hatchery fish in the ocean. Scientists have correlated climate changes with the number of returning salmon off the Oregon coast. Cool wet cycles (often over a 20-30 year period) favor increased salmon returns. During the 1970s a dry warm climate pattern emerged and there was a corresponding drop in salmon runs (Taylor and Hannan 1999). El Niño events will also have an adverse effect on ocean survival for outgoing and returning salmon. These weather variations are related to ocean food productivity and the number of upwelling events that occur off coastal areas. There are recent indications that global and atmospheric conditions are the primary causes of long-term climate changes that will directly affect ocean productivity. As the Pacific Ocean enters a new favorable phase, salmon returns have been recorded the highest since the mid-1930s (pre-dam era) in the Columbia. A third and critical impact to success of small-boat salmon fishermen is the global marketplace. During the 1990s, salmon prices declined due to increased supply from farmed salmon in the U.S. market.

Salmon aquaculture is, from a world market viewpoint, an economic success story. The farming of salmon began in the early 1980s and has increased steadily each year until by 2003, production was at 1.5 mmt and represented two-thirds of the world's supply (Fig. 3). Growth has been the most dramatic in Norway and Chile and together these two countries produce more than 1 mmt, far eclipsing wild salmon production in the U.S.

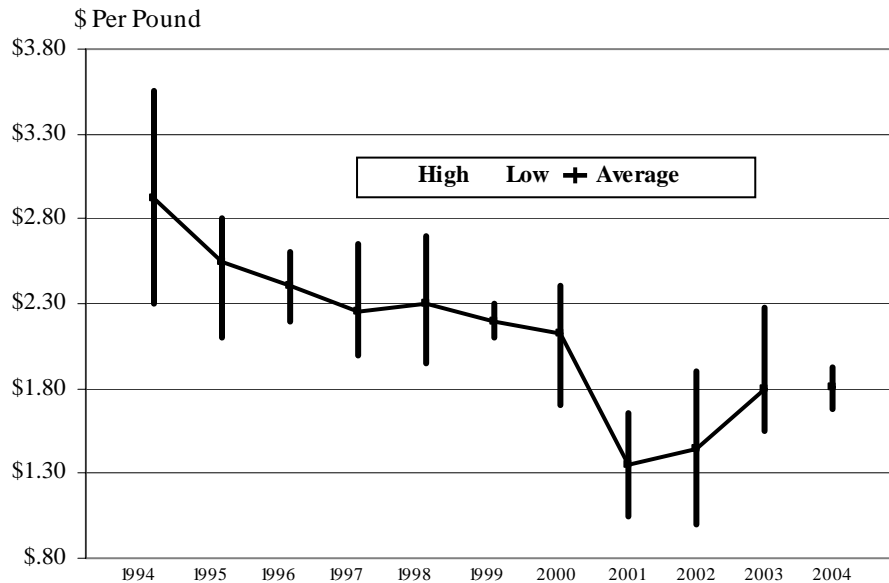
Figure 3. World Salmon Supply 1980-2003



Source: FAO 2004

The effects of imported salmon into the U.S. began to affect local markets in the mid-1990s. Farmed salmon is primarily Atlantic salmon which competes well with coho salmon in the U.S. Whole farmed Atlantic salmon prices decreased steadily through the 1990s from \$3/lb to a low of \$1.35/lb by 2001 (Fig. 4). Even more important to the marketplace was the price decrease for Chilean Atlantic farmed salmon fillets from a high of \$4/lb in 1993 to \$2.20/lb by 2001. The import of these fresh boneless salmon fillets during the mid 1990s increased dramatically and consumption of salmon in the U.S. tripled to from 0.7 lbs/person/yr to 2.2 lbs/person/yr. Salmon is now the third most consumed seafood product in the U.S. behind shrimp and canned tuna. However, this increased in demand did not increase ex-vessel prices to U.S. fishers. The ex-vessel price to fishermen dropped from close to \$1/lb in the early 1990s to \$0.36/lb by 2002. For Oregon and Washington salmon trollers this proved to be disastrous. During the 1990s, Pacific Northwest salmon trollers were affected by environmental, regulatory and market factors that put many long-term fishers out of business. The 1990s saw diminishing returns due to changing climatic patterns and several El Niño years that kept salmon numbers low and caused concern about the viability of the fishery. These low numbers in turn forced federal and state governments to protect wild stocks and incidental catch and severely limit the commercial fishing days. The dramatic increase in imports, especially of salmon fillets, continued to decrease the price for the few fish that fishers were allowed to catch.

Figure 4. West Coast Farmed Atlantics 10-12 Pound



Source: Johnson 2004

The beginning of the new millennium showed some signs of hope for the small-boat salmon fishermen. Ocean conditions were improving each year and salmon returns were increasing dramatically. For example, the Oregon Coast coho returns increased in numbers from a count of 66,096 in 2000 to 264,316 by 2002, an increase of 300%. Other salmon species were seeing similar recoveries (NOAA 2003). This allowed fishery managers to release more fish to the commercial fisheries without endangering salmon recovery. The increase in salmon demand and consumption that occurred through the 1990s was also beginning to generate interest in wild salmon. Furthermore, the small-boat industry was becoming more savvy in marketing their fish. During the 1990s there was little distinction between farmed fish and wild-caught salmon. To the average consumer this lack of distinction allowed them to price shop salmon as a commodity that favored farmed salmon. A watershed event happened in the late 1990s with the brand marketing of “Copper River Salmon”. These salmon (primarily chinook) are an early season salmon, captured in the spring in waters that empty into the Gulf of Alaska. Through a brilliant marketing campaign (pristine waters, rugged Alaska River, firm flesh, etc.), this fish is rated as the embodiment of the culinary experience that is salmon. Chicago restaurants vie for the first Copper River Chinook to be flown out of Alaska each year. Retail prices for these salmon are often 2-3 times the price of others. This demonstrated to the wild-capture salmon industry the power of brand marketing and the developing of niche markets. At the same time the environmental community mounted a campaign against farmed salmon.

Although environmentalists were waging some very bitter battles during the 1990s concerning wild salmon and fishing activities, there was a gradual change at the end of

the 1990s. Alaska salmon received MSC certification in 2000 and the increase of salmon numbers in the West Coast of the U.S. eased some concerns about salmon recovery (MSC 2004). There was also common ground in terms of habitat recovery and other environmental issues that would increase salmon survival and numbers. Moreover, there were shared concerns among fishers and environmental groups about salmon aquaculture in the Pacific Northwest. Although there are a few farms in the Puget Sound region of Washington and none in Oregon, there is growing aquaculture activity in British Columbia (BC), Canada. Farmed Atlantic salmon are raised in floating pens in numerous inlets and fjords along the BC coast. Escapement is a problem in the industry, and it raises a special concern where the escaped species might survive and displace indigenous species. This is a major concern for environmentalists and fishers throughout the Pacific Northwest. There is also concern about transfer of disease from farmed salmon to wild stocks as well as the use of antibiotics and chemicals in the rearing of farmed salmon. Several campaigns condemning farmed salmon have begun from both fishing organizations as well as environmental groups. An example of this is the Ecotrust organization based out of Portland, OR who initiated the Salmon Nation campaign in 2001. They are a conservation-based organization in Portland, OR working the geographic region of temperate rain forests from Northern California to Alaska (Ecotrust 2005). One of the goals in building Salmon Nation is "...to produce new models for socio-economic and ecological analysis, and protect and restore critical salmon habitat." They realized that salmon fishermen in small scale communities could serve as allies in their articulation of the ideas of Salmon Nation and that their survival was critical for the success of their mission. Thus began an uneasy alliance between the two disparate groups. Although there is certainly a degree of mistrust of conservation groups by commercial fishers, the small-scale salmon fleet welcomed the positive publicity for their wild-caught salmon. In the beginning, much of the publicity centered on attacks against farmed salmon e.g. a 4-page insert in major newspapers in Portland and Seattle with headlines such as 'What lurks behind that farmed salmon steak?'. The insert describes the "hidden costs of eating farmed salmon" such as dyes, toxins, waste, and disease. Websites such as www.farmedanddangerous.org also urged the public to refrain from purchasing farmed salmon. At times, more alarmist than scientific, it did promote the consumption of wild salmon and generate support for local fishers and food producers.

Although there had been confusion among consumers, more conservation groups were supporting wild-salmon. After Alaska wild salmon received MSC certification, groups such as the Monterey Aquarium seafood watch and the Chef's Alliance placed several species of Pacific salmon on their "Best Choice" category (www.mbayaq.org). There was also a strong movement among small-boat fishers to direct market their fish into restaurants or large city retail outlets. There was strong support from notable restaurateurs such as Greg Higgins from the Chef's Collaborative to support local produce including salmon (Barnard 2003). After a decade of declining prices salmon fishers saw their ex-vessel price dramatically increase. Young's Bay coho salmon fishery (near Astoria, OR) increased in price from \$0.30/lb in the mid-1990s to \$.50/lb in the early 2000s (Jones 2004). There was a second sharp increase in demand and price for wild-caught salmon following the negative publicity and nation-wide newspaper coverage of a *Science* article about PCB levels in farmed salmon (Hites et al. 2004).

Traditionally seafood had been treated as a commodity and most fishers directly off-loaded to a processor who seldom differentiated fish on basis of quality or sensory attributes. The value of branding and direct marketing has gradually become apparent to fishers and the local seafood industry over the past decade. Direct marketing can be defined as a method for fishers to sell their products directly to a user at a higher point in the distribution chain than the primary processor (Johnson 2003). This can take on many forms including bringing fish or seafood products to urban farmer's markets, direct sales to restaurants and sales on the internet. Although seafood products such as fresh fish fillets are not usually sold in farmer's markets, processed local fish such as smoked and canned salmon are being introduced into local and urban farmer's markets at an increasing rate. Urban restaurants are now doing direct sales with specific fishers who guarantee the quality and the safety of the product. The internet trade has dramatically improved the opportunities for fresh and frozen seafood as well as processed product through direct marketing. There are numerous companies that are now branding their individual products and the internet has allowed numerous individuals to expand their geographical markets as well. Direct market sales allows the fishers to tell their story, which is especially advantageous to small-boat owners who harvest seafood in local areas (Knapp 2004). Even with pending traceability legislation, fishers can use this information for marketing their product through the internet as a locally caught product harvested in a sustainable fishery (Thompson et al. 2004).

Paul Heilika, an Oregon Sea Grant extension agent and part-time fisher, reports there were several factors for the dramatic increase in prices in the 2004 season. There has been a steady improvement in fish quality over the past five years, through the use of slush ice and standard onboard handling methods. This was reinforced by buyers who began to grade fish on quality and pay a price differential for quality factors (bled and eviscerated, 0°C core temperature, intact scales and good general appearance). Slush ice (a combination of ice, sea water and salt), rapidly brings down the core temperature within a few hours of capture inhibiting microbial and enzymatic spoilage. A second factor was an increase in the number of small buyers willing to work with small-boat fishers. During the 1990s there was consolidation of the seafood industry in Oregon and the number of seafood processing plants and primary buyers were reduced from 12 to 5 by the year 2000. Some of the smaller rural areas lost their buyer/processing stations completely and they were often forced to off-load in other ports. With the increased demand for wild salmon, there was an increase of small buyers who were focused on high-value markets (restaurants and large urban areas). In 2000 there were 40 licenses for limited buyers (small-scale) for fish on dockside in Oregon; by the summer of 2004 this had increased to 100 limited buyer licenses (Fitzpatrick 2004). Their demand for high quality and willingness to pay for that quality was a major incentive for the small-boat fisher and reinvigorated the industry. A third factor was the positive publicity for wild caught salmon. It was viewed as a sustainable fishery, environmentally sound with minimal by-catch, important for local communities and high in omega-3 fatty acids, which have been shown to improve cardiac health as well as have positive effects on depression, and the immune system (Nettleton 2003). For the first time in a decade, small-scale salmon fishers of the Pacific Northwest felt good about the future of their

industry. They also understood the importance of working cooperatively for marketing purposes. The Oregon Salmon Commission joined with other Oregon fishery commissions to initiate an Oregon Seafood campaign in 2004 named “Oregon Wild”. More than 40 billboards in the principle metro areas as well as point of purchase information for retail outlets touted the benefits of buying local. This generic advertising of Oregon salmon products demonstrates the importance of branding and working collectively.

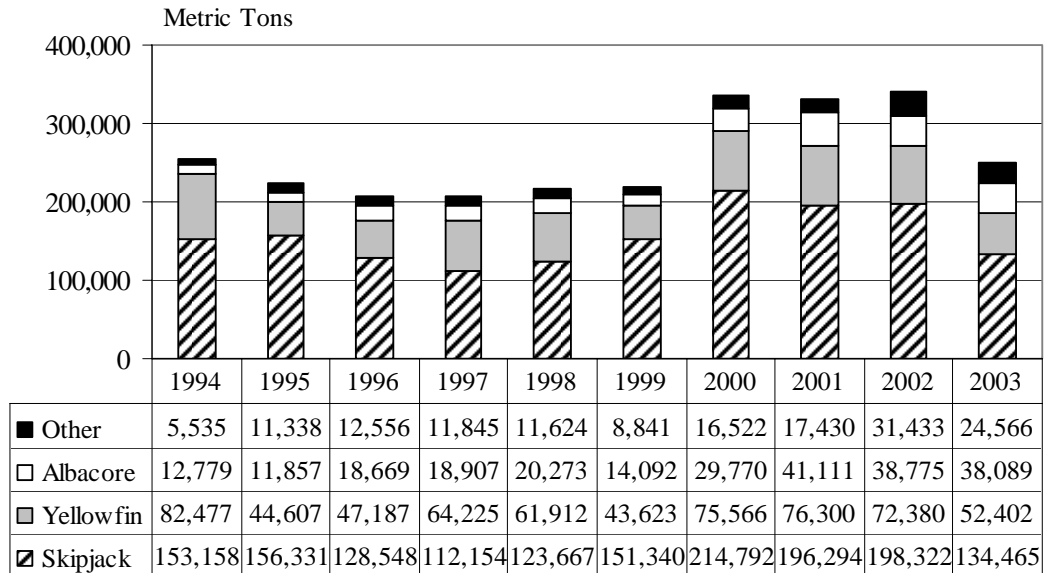
How will the wild-caught salmon industry compete in the future against farmed salmon to retain its market share? Sylvia et al. (2000) outlines 4 strategies that could be used by local fishers and entrepreneurs in marketing wild-caught salmon. These strategies are incorporated into the latest trend in watershed management of salmon, which is critical for “protecting weak stocks and establish sustainable fisheries of diverse salmon populations in the Pacific Northwest.” The important concept is to integrate managing with marketing which will create incentives for “return of investment” for watershed-based management approaches. These marketing programs would include 1) *marketing and sales of watershed salmon*, where watershed-based management groups could recoup investment by controlling access of salmon through various fees. To a certain degree this is what is already occurring in Alaska through regional salmon hatchery operations. Following this scenario there would be a 2) *marketing management unique to each watershed*, which would depend on the characteristics of the watershed. For example, watersheds close to metropolitan areas (within a few hours drive), may have a combination of both commercial and recreational fishers that pay user fees that support management. A third method could be 3) *branding and marketing of sustainable watershed-based salmon product*, where the salmon exhibit unique sensory characteristics to distinguish themselves in the marketplace. This has proven to be successful for “Copper River” salmon and there will be increased marketing and branding focused at niche markets in the future. A fourth idea is to 4) *develop inter-watershed management cooperatives*, which would incorporate several of the ideas already stated but on a cooperative basis that would minimize destructive competition from specific watershed regions. These scenarios move fishers away from the “hunter mentality” and the “tragedy of the commons” that has often plagued open-access fisheries to more of a rights-based fishery which integrates markets and sustainability and benefits the consuming public and the environment.

Troll-caught Albacore Industry

The U.S. tuna industry is one of the major fisheries in the U.S. and the only one which fishes intensively in international waters. There are 5 main species of tuna that are used on a commercial basis world-wide while 3 of the species (skipjack, yellowfin and albacore) are dominant in the U.S. fishery (Fig. 5). Bluefin tuna is a high-grade tuna that can weight up to 500 kg or more and is directed to the high-valued sashimi markets. Big-eye tuna, although weighing considerably less (50-70 kg) also fetches good prices in the Asian sashimi markets. Yellowfin tuna which varies in size from 20-50 kg has become very popular in restaurants as ahi tuna, where it is seared on the outside and a red-raw in the middle. Skipjack tuna is a smaller tuna (3-5 kg), has darker, inferior quality meat and

is the most common tuna used for canned commercial brands. The world harvest of skipjack tuna is about 1.9 mmt (FAO 2003). These are mainly caught through purse-

Figure 5. Tuna Landings by U.S. Vessels 1994-2003



Source: Johnson 2004

seining operations in the Southern Pacific and then transshipped to tuna canning operations in American Samoa, Ecuador and Puerto Rico. Finally, there is the U.S. albacore tuna fishery, which is a mixed fleet fishery using either deep long-lines or troll-caught gear. Albacore is often referred to as the white tuna, has a delicate taste, firm texture and more of a cream-colored appearance. While the majority of the long-line fishery occurs in the South Pacific ocean, there is a significant harvest that occurs off the West Coast of the U.S. by the troll-caught fishery. The albacore troll-fishery captures about 14,000 mt per year and is important to coastal economies. For example, in the small town of Ilwaco, in southwestern Washington, the albacore fishery is a major economic engine as boats off-load at this port, re-supply and sell their catch. The albacore troll fishery have vessels that have 40-80 ft in length and the majority of the boats have either blast or brine-freezing systems onboard. This allows them to stay out several weeks at a time and follow schools of fish and water thermoclines. Many of the boats are family boats and there are several husband-wife fishing teams in the troll-caught fleet.

Albacore tuna is a migratory fish found in the temperate and tropical oceans of the world. Three to four year-old albacore begin their journey off the coast of Japan and migrate across the Pacific Ocean where they arrive off the coast of California in the spring (Kimura et al 1997). They work their way northward feeding along the West Coast upwelling front. Their offshore range is approximately 20 to more than a hundred nautical miles off the Pacific Coastline. It is this close proximity that allows small-scale troll fishing vessels to harvest albacore during summer months. The West Coast troll-caught albacore fishery season lasts from June through October each year and the

albacore is primarily sold as frozen, whole fish that is further processed as a canned product in foreign and domestic markets. Albacore has good market value compared to other fisheries in the Pacific Northwest, as there are several extrinsic and intrinsic factors that contribute to its potential. Troll-caught albacore is a small-scale fishery based out of rural coastal port cities aiding to its marketability as a locally caught seafood product. There is very little by-catch as compared to many other fisheries, and the stock is considered sustainable (Cox et al. 2002). These green marketing factors should be promoted and help distinguish the fishery. Furthermore, albacore has high nutritional value in both its protein content and omega-3 fat content. Omega-3 fatty acids have recently gained public attention for their numerous health benefits (Kris-Etherton et al., 2003; Nettleton 1995).

One of the problems, however, is that the majority of the West Coast albacore industry adds very little to the value of harvest. Prior to 1998, 90% of the harvest was shipped as whole frozen product to three canneries outside the continental United States. During the 1998 season, these canneries chose not to purchase West Coast albacore and prices dropped from an average of \$1450/mt to as low as \$800/mt. One reason was attributed to a large inventory of previously purchased tuna (primarily from Asian countries with weak currency values relative to the dollar) that eliminated the need for additional raw material for canning operations. It was also reported that the canneries preferred the long-line albacore caught in the South Pacific due to their large size and lower fat content and had begun phasing out purchases from West Coast albacore fishermen. The situation was so acute in 1998 that an estimated 4,000 mt of albacore was kept frozen in fishing vessels in warehouses in the Pacific Northwest waiting for markets to develop. A \$4 million USDA buyout was initiated to purchase albacore and move it into the marketplace. Although these factors contributed to the crisis in 1998, the fundamental cause of the crisis was the industry's over-reliance on producing a single product which is purchased by a limited number of buyers. Although albacore has superb culinary attributes suitable for producing a wide range of value-added food products, the West Coast industry has been unable to develop production and marketing approaches that standardize and improve quality, reduce costs, and integrate production, processing, and marketing strategies.

A comprehensive, multidisciplinary project was needed to link onboard handling practices to final product quality, safety and marketing strategies. This would include research to determine the relationship between handling and at-sea refrigeration practices for albacore quality; establish cost effective at-sea handling guidelines for high quality, safe albacore products; develop value-added products, determine the shelf-life of packaged products; and undertake an economic and market management analysis to develop efficient and diversified market-driven production and processing systems. Ideally, the development of demand-driven quality assurance programs to provide an efficient market-based mechanism for improved market quality and market opportunities for Pacific albacore would occur. Funds were received from the U.S. Department of Agriculture (Funds for Rural America) and the Kellogg Foundation Food and Society program. The Community Seafood Initiative (CSI) was formed as a partnership between Oregon State University (primarily the OSU Seafood Laboratory) and Shorebank Enterprise Pacific, a community development financial institution (CDFI). The goals of

the project are to assist small and mid-size businesses in the development and marketing of value-added products with an emphasis on shellfish and albacore.

A major constraint in developing new products is the onboard handling of albacore. Traditionally, fish that was destined for canners underwent minimal treatment onboard the vessels. Basically, they were landed and either packed in ice or frozen whole. There was little workmanship involved and there was often high variability in quality. The major focus in the fishery was on volume as there was no price differential between high and low quality fish. Research on fish handling, time-temperature control and freezing methods has helped the industry develop guidelines for improving quality onboard the vessel. There was a gradual shift from dependency on cannery buyers. High-valued fish (bled, blast-frozen) were being shipped to sashimi markets and a slightly higher price was being paid. At the same time an important export market was being developed for Spain and Japan. One of the factors that is important for this market is albacore lipid content. Ironically, the name brand canneries preferred a low fat large albacore for their canned “white tuna in spring water” product. This was viewed as a high protein, low calorie product used for person interested in restricting calories in their diet. Studies showed (Morrissey 2003), that coastal troll-caught albacore have much higher fat levels and migrate to the West Coast of the U.S. to actively feed and gain weight. The fat levels in troll-caught albacore often run between 8-10% fat levels and can be as high as 17% in the muscle tissue and 24% in the belly flaps (Wheeler and Morrissey 2003). This is highly prized in the Japanese sashimi market as well as specialty canned products in Europe. Albacore tuna also has one of the highest levels on docosahexaenoic fatty acid (DHA) in its lipid. There has been numerous scientific reports of the health benefits of DHA in human disease (Horrocks and Yeo 1999).

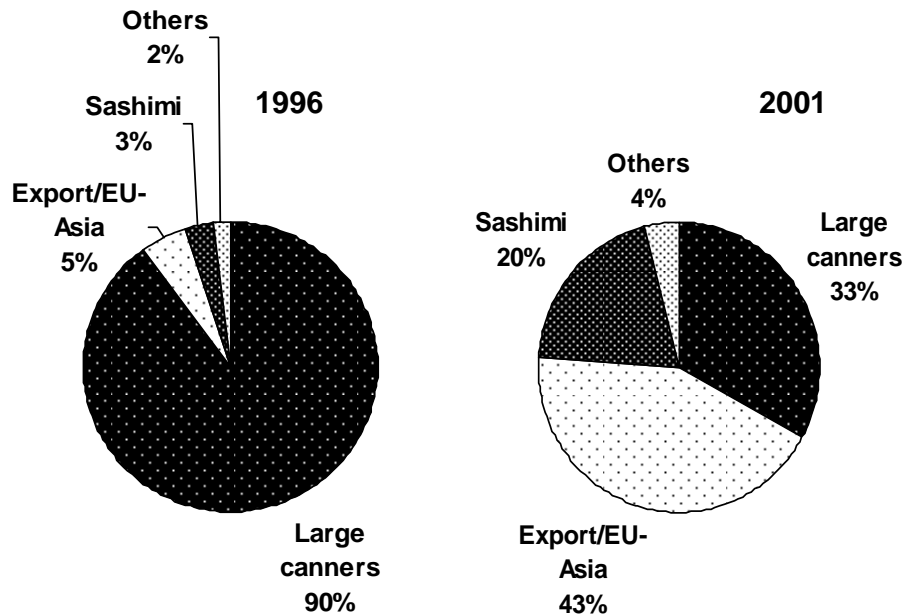
The troll-caught albacore industry has recognized these marketing opportunities and the importance of setting themselves apart from traditional canned tuna products. A demand for sashimi-grade albacore began in the Vancouver, BC market and has led to the development of high-grade frozen loins that are cut directly from blast-bled fish. This higher grade fish has also led to new markets in Europe, especially northern Spain. The acknowledged higher oil content of troll-caught albacore has also led to new gourmet markets for albacore which did not exist five years ago. There has also been a growth in micro-canneries in the Pacific Northwest. These are small businesses that custom-can locally caught salmon and albacore. They differentiate themselves from the name-brand canned tuna operations by their process of retorting raw pack tuna directly rather than having twice-cooked tuna which is regularly done in the large canning operations. The micro-canneries product has a unique flavorful taste, is usually higher in fish oils, commands a premium price, and lends itself well to internet marketing. They have expanded their markets and are now actively promoting their product in areas outside their regions. While national brand canned tuna has traditionally occupied a niche for a high protein, low calorie (low fat) food that was marketed for the weight conscious segment of the U.S. population, micro-canneries focused their markets on a high protein, high omega-3 product that has health benefits and superior taste. They have also weathered the recent storm about mercury in seafood and have developed a reputation as the low- mercury alternative.

The mercury story is an interesting one and highlights the problems that can arise from external forces on local markets. Mercury has always been an issue in seafood and there are strict regulations about its content. It comes from natural and anthropogenic sources and has been a concern in the seafood industry over the past fifty years. Acute toxicity of mercury is well documented, however potential detrimental effects from chronic low level exposure was largely unknown, especially for sensitive populations. Although two large epidemiological studies in the Seychelles and Faroe Islands gave conflicting results on cognitive effects of children (Jacobsen 2001), the US Food and Drug Administration (FDA) and the Environmental Protection Agency (EPA) issued a joint advisory about mercury in fish including the statement that pregnant women and children should limit their weekly intake of canned white tuna to 6 oz. per week (FDA 2004). In an accompanying study the FDA found that canned “white” tuna (albacore) had three-times the amount of mercury in “light” tuna (mainly skipjack). The idea that consumption of tuna was dangerous for human health was advanced by environmental groups that had separate agendas. The “Mercury Policy Project” (www.mercurypolicy.org) was casting a wide net of negative publicity toward the issue of seafood and mercury to bring attention to the alleged dismantling of the Clean Air Act by the Bush Administration especially with regard to coal-fired power plants that emit mercury. The “Turtle Island Restoration Network” (www.gotmercury.org) was using this information to fight the use of long-lines in the tuna fishery as this harvest method can result in incidental catches of turtles. This negative exposure was having an impact for local albacore fishers as well as micro-canners who had been promoting their product as a healthy choice for tuna consumers. Fortunately, a study was soon undertaken on the smaller troll-caught albacore and showed that the levels in these fish were significantly below those reported in the FDA study (Rasmussen et al. 2004). This information was readily used by the local industry to further distinguish their product from the national brands. Although it is too early to tell whether the final impacts have been positive, there has been considerable positive press and recognition among food writers and health experts distinguishing troll-caught albacore from other brands (Rojas-Burke 2004).

Overall the albacore troll-caught industry has learned the importance of diversifying its markets which not only lessens sector impacts but also has the positive effect of positive publicity about the fisheries and the high quality of the product. In 1996 90% of the albacore was sent to large brand-name canners (Fig. 5). By 2001, this had changed dramatically and only 33% went to large canners, while 43% was exported overseas and another 20% entered the high-grade sashimi market (WFOA 2004). A combination of events occurred over the past year that had a positive impact on the ex-vessel price of albacore during the 2004 season. The recognition of the different eating and health qualities of this tuna population versus the larger open-ocean albacore has created unique market opportunities that have allowed small and mid-size business to distinguish their product as different and in some ways superior. Ex-vessel prices held strong throughout the summer months at \$1700/mt and then received a dramatic boost at the end of the season as Japanese buyers were active in U.S. ports and the price doubled for blast-bleed frozen troll-caught albacore. Whether this was a one-season aberration due to a supply

shortage or an actual purchasing trend remains to be seen. What is obvious though is that the local fleet has benefited from changing from a commodity grade product destined as cannery grade to a high quality grade fish that could command good prices in the marketplace when the opportunity arose.

Figure 6. Troll-caught albacore markets. Source: WFOA 2004



Conclusions

The economies of rural coastal communities of the Pacific Northwest, are dependent upon, and have been dominated by, the fishing, forestry and farming sectors. Because of declines in the natural resource base and changes in management, regulations and influences of global markets, these communities are at a crossroad. They can choose to fight the changes taking place around them, sticking to traditional practices, approaches and products – or – choose to embrace this change and adapt new methods and marketing strategies. The former choice will almost certainly lead towards continued economic decline. The later choice, if embraced, will lead to renewed effort and economic security in a changing marketplace. To meet the challenges ahead, these communities, and the small to mid-size companies that support them, must rely on innovation. Innovations in production and harvest practices, in processing and products, and in approaches to market development and promotion are critical for maintaining market share. A conservation-based economy, centered on sound science and aggressive marketing, can survive and thrive in the global marketplace. Innovative management ideas and changes in property-rights could provide individuals or community groups with opportunities to brand their products and develop niche markets. Distinguishing oneself from commodity driven products and understanding consumer needs while providing a high quality food will allow for avenues to economic success for small-scale fishers and businesses alike.

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