

Sablefish (*Anoplopoma fimbria*)

A large fish in a small family, sought for its oily flesh by equipment-laden fishermen, descending deeper and deeper with age, to finally rest near the dark ocean floor, where it may live to an age longer than the oldest human, from the surface to the depths the Sablefish ranges widely over the northern Pacific. Here the cold waters provide such a rich and varied diet that the sablefish occasionally reaches nearly four feet in length and weighs in at a hefty 50 pounds. Such large fish are uncommon, but the fish grow quickly, offering an added attraction to those who would catch it. Sablefish prey takes many forms, as do its hunters, for although humans may have a variety of uses for a cleaned Sablefish, other predators such as larger fish, big mammals, hefty invertebrates, and members of the avian community take it whole, bones and all.

Not surprisingly, the Sablefish, also known as “black cod” and several other names as well, is the target species for a large commercial fishery, particularly in Alaska. Over the years, regulations have been enacted to ensure its future, but as with other species continuance is subject to the economies of humans.

Distancing herself from the concerns of life above, an old survivor of hunting and change moves downward, her millions of eggs distant memories. Now, in the company of other aged cousins she answers an internal call to go deeper, where rest is finally possible.

The Anoplopomatidae family consists of only two species, each in its own genus. Yet it is not a particularly ancient group, reduced in size by eons of existence, but rather more recently evolved in the north Pacific, perhaps only five million years ago. That is the age of the oldest (and only) known family fossil. Anoplopomatidae evolution roughly coincided with the opening of the Bering Strait, or even the closing of the Panama Strait, in which oceanic circulation alterations may have triggered adaptations to new ecological niches. These are subjects of research as investigators try to tease out the factors that contributed to the rise of the family.

Of the two species, the sablefish (*Anoplopoma fimbria*) is the most numerous and widely dispersed, while its cousin, the Skilfish (*Erilepis zonifer*), a potentially larger fish with a maximum size of 72 inches, is much more restricted in range. Both are deep-dwelling species that overlap at a few locations in the central Pacific. Sablefish range from Honshu to Kamchatka, across the Aleutians and Bering Sea, where they are most common, and southward along the coast to central Baja California. They are resident in the Salish Sea, including the Strait of Juan de Fuca, and were at one time present in sufficient numbers in Puget Sound to support a recreational fishery. There are two recognized stocks, one in Alaska south to northwest Vancouver Island, and the other ranging from southwestern Vancouver Island waters to California. Some mixing of the stocks does occur along the Washington coast.

The family name is derived from the Greek, meaning “unarmed” and “operculum” (the plate-like flap that covers the gills). *Fimbria* is Latin for “fringe.” Named “Gindara” in Japan, its other names include “coal-fish,” “skil,” and “beshow.”

Sablefish have a fusiform body with two spiny dorsal fins and armed anal fins as well. Juveniles are bluish to blue-green with a white belly, maturing to a darker gray or greenish color in adults; sometimes there is a latticework, while the underside of the older fish is gray. Average size is approximately 24 inches (60 cm), with a weight of 8.8 pounds (4 kg), although commercially caught fish are typically smaller.

This is a “bathydemersal” species, meaning it inhabits waters deeper than 656 feet (200 m), with a maximum depth of approximately 8,990 feet (2,740 m), possibly more. Also spawning at depth,

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Sablefish is an oviparous fish; after hatching the larvae drift upwards and are often dispersed by surface currents.



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Juveniles inhabit more shallow waters than adults and are the most often encountered age group in the Salish Sea, although adults are known throughout the region. When less than 12 inches, the juveniles are pelagic, occupying waters above the ocean floor; by the time they achieve a length of 24 inches (61 cm) the fish have moved downwards to the ocean floor.

Thus, since the Sablefish matures by five years or so, much of its long adult life is spent at

depth, with occasional reported forays a few hundred feet above the bottom. They rest on a variety of surfaces, including mud and rocks. Spawning is also apparently in deep water, where females lay as many as three clutches each year. The number of eggs can be quite astounding, with numbers estimated at over 1,300,000. Perhaps such fecundity explains why females move downward, but whatever the reason, at the deepest limits of their range few large males are found.

Spawning dates are not completely understood, although early winter is the optimal time in California; Sablefish in this region are smaller on the average than northern fish. Peak season in other regions has been hard to determine, although one study indicates that along the Washington coast Sablefish spawn in January and February. Depths of at least 2625 feet (800 m) for spawning activity have been reported there. Opportunistic feeders as they mature, Sablefish pursue a wide variety of prey, including crustaceans, shrimps, squids, and octopus; they also consume detritus.

History of human use – local subsistence to exports by the ton

As a deepwater species the Sablefish did not play as large a role as salmon and other more accessible species for the Indigenous people living along the Strait, the outer coast, and the inland waters as well. But the fish were taken, most likely juveniles which could reach considerable size before moving seaward; evidence is present in middens along the coast.

By the 1880s, when white settlements had expanded and fishing on a much larger scale begun, the Sablefish inevitably attracted attention. It was large, the flesh was oily and sweet, and fishing, as the native peoples knew, was possible from the shore or small boats in shallow water. A “setline” fishery

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began in the Salish Sea and within a short time an off-coast commercial fishery was established. While the American fishery along the coast was relatively small, it was the presence of foreign fisheries, in particular those of the Soviet Union and Japan, that brought the Sablefish to the attention of the American fishing industry.

The result? Entering the market with boats and lures, within a few years, thanks in part to promotion of the Sablefish for its flesh and oil, the United States and Canada were harvesting the fish by the ton, such that by 2019 commercial landings were over 20,400 tons, valued at more than \$89 million dollars. Particularly abundant in the Bering Sea, with a catch of approximately 57,870 tons in 1972, reaching a high again in 1988, then declining, then eventually back up once again, the Sablefish was indeed a very lucrative catch. Introduction of new gear such as “pot fishing”, legalized in 2017, accelerated the pace and within a short time this method accounted for 40% of the catch. A worrisome figure of a decrease in female biomass by 2002, and then another rise, and drop, is indicative of the complicated dynamics of the Sablefish and the fishery.

Ups and downs aside, NOAA considers the Sablefish at target or above-target levels and that the gear used to harvest them is having minimal impact on their habitat, and on other species subject to bycatch. Both the Pacific Coast stock and the Eastern Bering Sea stocks are considered “healthy”; that is, not overfished. In Alaska, commercial fisheries are required to keep all fish, to the allowed limit, rather than only the largest. When the limit is reached, the remaining fish are returned to the ocean. Yet these rules are negotiable, and it seems likely that the Sablefish numbers and age composition will oscillate. At the very least, it is a species of variable recruitment, a key indicator of fish populations. Complicating predictions, research on the species is limited and estimates of abundance depend in large part on general marine surveys.

Another issue is that of discarded fish (those caught incidentally in longline fisheries). Creating uncertainties in population data, in one study, discard mortality rate was calculated at 11.71 percent, much of it from hook injuries or from predation while on the line. Sablefish are legally discarded by other fisheries, such as the halibut fishery.

One of the most pressing issues for Sablefish fishing is the desire of commercial fisheries to discard smaller fish in favor of larger, thus increasing the value of the catch. However, an obvious impact of such a change would be the increased take of older fish as well as the need for more monitoring, a strain on available resources. Flexibility may be desired in managing fisheries, including allowable catch; predicting the outcome is difficult, particularly with the Sablefish.

These issues, whether they are amenable to modified regulations or not, contribute to feelings of uncertainty in the future of the Sablefish fishery. And it is in part the desirability of the fish, as well as the fluctuations in numbers and the incomplete knowledge of its requirements that has attracted the attention of aquaculture enthusiasts. Yet as a species of deep habitat, with a poorly understood spawning cycle, Sablefish has until recently proved challenging to those interested in farming it. Larval survival in hatcheries was difficult to ensure.

Near the Strait: Port Angeles Harbor

On December 14, 2021, a Court of Appeals ruling upheld the termination of the Cooke Aquaculture lease in Port Angeles Harbor, originally ended in 2017. In January of 2022, the State Supreme Court overturned this judgment. Thus, the aquaculture firm, in partnership with the Jamestown S’Klallam

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tribe, may proceed with its plans to develop pens for the rearing of several fish species, including the Sablefish.

Cooke is the large international company, headquartered in New Brunswick, Canada, whose open pens, located at Cypress Island in the San Juan Islands, accidentally released approximately 250,000 non-native Atlantic Salmon (*Salmo salar*) into the waters of the central Salish Sea in the summer of 2017. Recovery efforts fell upon the surrounding communities and local tribes, but the damage was difficult to repair, despite exhaustive efforts. Cooke claimed unusual tide and weather events, a proposition rejected by several more knowledgeable people untainted by the muddy waters of investment. The pens were closed, but the environmental damage, as well as the violations and apparent disregard for safety resulted in the company losing the lease for that site, although it retained three others. Meanwhile, in 2019, the Washington State legislature passed laws to phase out non-native fish marine farming. A little late, but it seemed at least a partial response to concerns over release events such as the one at Cooke's site in the San Juan Island chain.

It seemed that after the events of 2017, the loss of a lease, and a new law, that the company might reconsider its interests in Washington state facilities for rearing fish. This was not the case, however, for in response, Cooke Aquaculture applied to raise sterile female steelhead, a fish industry already in place in smaller hatcheries. Much to the surprise of those involved with the issue of large-scale fish farming, in 2019 the Washington State Department of Fish and Wildlife (WDFW) issued a permit for Cooke to use its remaining pens, located at three sites, for the native, altered fish. No environmental impact statement was required.

One of those three sites is in Port Angeles harbor where this aquaculture company has a lease. There, the open pen nets were of sufficient size to hold 700,000 salmon. Cooke had plans to open a larger farm near Morse Creek on the harbor.

The pens remained for a time, until removal after a lawsuit filed by the Department of Natural Resources (DNR) began its march through the courts. The DNR had terminated Cook's lease in 2017, specifying several violations as the reason for the action, including constructing pens outside of the leased waters and failing to pay rent. Cooke appealed, losing in the Thurston County Superior Court in March, 2020. And although the Washington State Court of Appeals rejected Cooke's appeal, as mentioned above the State Supreme Court allowed the development to proceed.

Meanwhile, in 2020 the Jamestown S'Klallam Tribe had partnered with Cooke in the Port Angeles lease. Under this joint endeavor to raise triploid steelhead, Sablefish would also be grown in the pens, and Chinook salmon as well. It was the tribe's plan to buy land along the nearby shore and build a processing facility. In the pens, it was estimated that 5 million pounds of the triploid steelhead could be raised and a half-million salmon. Tribal members could be employed to work at the pens; Cooke Aquaculture would bring its experience to the marketing side of the partnership.

Not all western Washington tribes agreed with the Jamestown S'Klallam's efforts to farm fish. In August, 2021, the Swinomish Tribe filed a brief in support of a lawsuit filed against WDFW to prohibit the transfer of sterile steelhead to Cooke's facility on Hope Island, located near the tribe's traditional fishing grounds. Hope Island is one of remaining leases held by the company.

Cooke Aquaculture has big plans for new technology, monitoring, and building "advanced" pen facilities in Port Angeles harbor. The track record is not sterling, however. Failure to improve conditions in Port Angeles, after the release in 2017 at Cypress Island, seems to indicate a lack of positive intent. Meanwhile, the pens in Port Angeles had been removed after the suspension of the lease.

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For the Sablefish that are proposed to be raised in Port Angeles Harbor, it is not clear how necessary deep waters are for the lifecycle of the fish. But in the fish farms, like a cattle ranch, the fish perhaps never reach an age in which the question becomes important.

Vancouver Island, a partnership

Located at Kyuquot on Vancouver Island, the Gindara Sablefish company, in partnership with the Kyoquot-Chewcoseht First Nations, was established in 2007. Brood stock was taken from local, wild British Columbia Sablefish. Challenges in raising the larvae to juvenile size were met through practice and experimentation, as well as access to increasing knowledge about food and habitat for hatchery fish.

At the site, larvae are fed a diet consisting of invertebrates, and, as they mature, a dry so-called "micro-diet," and at a weight of an ounce (30 grams) transferred to net pens which number 20 in total, with a maximum depth of 125 feet. The maturing juveniles are fed wild fish, fish and land byproducts, and plant proteins, all this mix pumped underwater. Two years after hatching, at weights of 4 to 8 pounds (1.8 to 3.63 kg) the fish are harvested. Half of the mature fish from this Vancouver Island enterprise are exported to Japan where the Sablefish is known as Gindara and is particularly desirable for sushi, with its oily content contributing to taste, and the farmed fish considered parasite-free, an important consideration.

The Sablefish industry has been the beneficiary of academic studies, supported by institutions such as Sea Grant, which have addressed the various problems of raising the larvae of this deep water fish. With knowledge of Sablefish biology more limited before the advent of aquaculture, such studies were necessary for the economic success of Sablefish farms.

Thus, in collaboration with various groups, including the Jamestown S'Klallam Tribe, and the University of Washington, researchers have amassed sufficient knowledge to enhance the possibilities for economic success in growing and harvesting Sablefish. Among other results, it was determined that farming females was the best approach (they grow faster) and that a vaccine would protect against disease. In at least one case, success was measured by numbers of female fingerlings (60,000), raised in a research station in Manchester, Washington, and shipped to the Golden Eagle Sablefish company in Canada, and, at a much more southerly location, the Texas-based Perciformes Group, a large commercial enterprise. Now the young fish could be marketed for "top" restaurants. Meanwhile, supplying the large sushi market provided even more assurance in the viability of Sablefish aquaculture.

How much the world of fish for subsistence and ancient connection, sometimes spiritual, has changed!

Along the ocean floor, aged female Sablefish rest, secure in darkness, at home in the pressures of the deep, partaking of whatever prey may come their way. As the years pass, age slowly takes its toll, but in truth all is as it should be. These fish have contributed to survival of their species according to the dictates of nature, hopefully guaranteeing it for eons to come. Hundreds of feet above, near relatives probe the sides and bottom of a shallow pen. They lay no eggs, delight no angler. Their destiny is the dinner plate, a fitting end perhaps to a shortened life, one altered in ways never anticipated by evolutionary processes that shaped their form and function.