

# Voices of the Bay Fisheries Education – From Ocean to Table

## PowerPoint Notes

### Slide 1: From Ocean to Table

Commercial fishing is an integral part of the rich culture and history of Monterey Bay. This lesson introduces the process and the people involved in bringing seafood from the waters of Monterey Bay to your dinner plate.

### Slide 2: California Commercial Fisheries

Here we have highlighted seven common fisheries in California. Below we have provided some information about the different fisheries, more information is available about our website under the Fish & Fishery Fact pages (<http://sanctuaries.noaa.gov/education/voicesofthebay.html>).

1. *Albacore Tuna*- Albacore are a highly migratory species that are found in tropical, subtropical, and temperate zones of the Pacific, Atlantic, and Indian Oceans as well as the Mediterranean Sea. The North Pacific stock extends from the central Pacific coast of Mexico to the Gulf of Alaska and across the Pacific to the north east coast of Japan down to the equator. Juvenile Albacore (2-5 years old) complete extensive annual migrations, while spawning adults (5-6 years and older) make shorter migrations.

Juvenile migrations typically begin in the late spring and early summer off the coast of Japan. By late summer, Albacore have migrated across the Pacific Ocean to the inshore waters of the U.S. west coast and by year-end they have returned to the western Pacific Ocean. It is generally believed that oceanic conditions, like sea surface temperatures and water clarity, have a strong influence on the timing and geographical extent of these migrations. When migrating, Albacore of similar size travel in large aggregations, which sometimes may extend to 19 miles in width. Albacore generally follow water temperature gradients ranging between 15-19.5°C (59-67°F) when migrating. Albacore may live up to 12 years, growing to 140 cm (55 in), and weighing over 45 kg (100 lbs).

In 1903 a packing plant in San Pedro, CA began canning Albacore as an experiment to keep the plant operating due to a lack of Pacific Sardines. The 700 experimental cases were only labeled as “Tuna.” The canned Albacore was a success, because it had a long shelf life and the tastiness of the white meat. In 1925, Japan and other Asian countries entered the global tuna market. High seas fishing for Albacore continued from the mid 1970s through 2000. Since 2000, most vessels have operated no more than 1,000 miles from the west coast due to high fuel costs and market uncertainty.

The U.S. west coast Albacore fishery is an open access fishery, but vessels participating in it must apply for a Highly Migratory Species permit from the Pacific Fishery Management Council (PFMC). Trolling is the primary method of

catching Albacore by U.S. vessels, however foreign vessels use purse seines and longlines. Pelagic longline fishing for Albacore is prohibited within the U.S. Exclusive Economic Zone (EEZ) and shallow-set longline fishing is prohibited both inside and outside of the EEZ.

2. *Sole*- Soles are right-eyed flatfish that are found in general on soft sediment seafloors from Baja California to Alaska. Four species of sole comprise the majority of species landed in California: Dover Sole (*Microstomus pacificus*), English Sole (*Parophrys vetulus*), Petrale Sole (*Eopsetta jordani*), and Rex Sole (*Errex zachirus*). Dover Sole are the longest living of the four species reaching 50 years of age and a body length of 76.2 cm (30 in). Spawning generally occurs in deeper waters during the fall and winter months, with the peak occurring between December and March.

With the introduction of the first trawl net in San Francisco in 1876, flatfish became one of the leading categories of fish landed in California. At first, many sole species were only caught as bycatch and thus they were disregarded. But, advancements in trawl technologies, developed after the war, resulted in directed fisheries for some species of sole. With increased pressures, from larger fleets and more efficient gears, populations of sole declined over the next 30 years. In 1982, the Pacific Fishery Management Council (PFMC) implemented the first Pacific Coast Groundfish Fishery Management Plan (PCGFMP). The PCGFMP includes over 90 species that live on or near the seafloor, including rockfish, flatfish, roundfish, sharks, and skates.

3. *Sardines*- Sardines are a small schooling fish that are found along the west coast of North America from the southern tip of Baja California to southeastern Alaska. Pacific Sardines are highly mobile and move seasonally along the coast. Pacific Sardines may live to 13 years and reach a maximum size of 41 cm (16 in), but most live 5-6 years reaching a size of 23 cm (9 in). Locally in California, the peak of the spawning season occurs between April and August.

The west coast fishery for Pacific Sardines began in 1916, as the demand for new food sources increased during World War I. During the 1930s and 1940s, the Pacific Sardine fishery was the largest fishery in the western hemisphere, accounting for almost 25% of all the fish landed in the United States. At its peak in 1936-37, more than 100 canneries existed between San Diego and San Francisco. The Pacific Sardine stocks began to disappear in the late 1940s due to the compounding impacts of natural oceanographic cycles and fishing pressures. Fossil evidence going back 1,700 years suggests that Pacific Sardine abundance naturally fluctuates over time. These cycles average about 60 years, with a period of recovery lasting on average 30 years. The most recent period of abundance began in the late 1970s.

The most commonly used method of catching Pacific Sardines in California waters is the use of purse seines. Seiners are typically 15-25 m (49-82 ft) in

length. The typical crew size is 5-7 members, and the vessels can hold 18-36 t (40,000-80,000 lbs) of fish. The Pacific Sardine fishery is federally managed by the Pacific Fishery Management Council (PFMC). The U.S west coast fleet that once had over 200 fishing vessels participating in the Pacific Sardine fishery has now been restricted to 61 vessels.

4. *Dungeness Crab*- The largest edible *Cancer* crab species is the Dungeness Crab, which can be found from the eastern Aleutian Islands, AK to Santa Barbara, CA. The range of the crab is temperature dependent; therefore they are rarely found in the waters south of Point Conception, CA. The species may be found on any substrate type on the seafloor from the intertidal zone to depths of 228 m (750 ft). However, they show a preference for sandy to sandy-mud substrates and seldom are found in large quantities beyond depths of 107 m (350 ft).

The first commercial take of Dungeness Crab in California occurred in 1848 off of San Francisco. Initially, hoop nets were used to capture the crabs, but in the early 1940s they were replaced with pots, which significantly increased the landings.

The Dungeness Crab fishery occurs in two areas of California: northern and central. The central California fishery is focused primarily in three areas: Avila-Morro Bay, Monterey, and San Francisco-Bodega Bay. The central California fleet reached a maximum of 230 vessels during the 1950s, but by 2001, the central California fleet consisted of approximately 100 vessels. The northern California fishery extends from Fort Bragg, CA to the Oregon border. From the early 1950s to the mid 1970s the northern California fishery followed a 10-11 year cycle, in which there would be 6 years of substantial landings followed by 4-5 years of poor or extremely poor landings. The northern California fleet peaked at 410 vessels during the 1976-77 season and by 2001 was approximately 33 vessels.

The California State Legislature regulates the commercial Dungeness Crab. The fishery operates from November 15 – June 30 in central California and from December 1- July 15 in northern California. The commercial fishery is managed on the “3-s” principles: sex, season, and size.

5. *Spot Prawns*- Spot Prawns are found along the west coast of North America from San Diego, CA to Alaska’s Aleutian Islands. Spot Prawns are characterized by four distinct white spots on their carapace, a pair of spots behind their head, and a pair of spots in front of the tail. Spot Prawns may live up to 6 years, reaching lengths of 25 cm (9.8 in). As juveniles grow older they migrate into deeper waters, spending most of their adult life between 195 and 235 m (640-770 ft). The species is a protandric hermaphrodite, meaning that they begin their lives as males and after reaching a certain age or size they change sex to be females.

The first commercial prawn trap fishery developed in British Columbia around 1914, but it did not become commercially significant until the mid 1970’s.

Similarly, a California Spot Prawn fishery was first established in Monterey in the 1930s when prawns were caught as incidental bycatch in octopus traps. The California Spot Prawn fishery existed as a minor fishery until the early 1970s. Increased market prices for live Spot Prawns, advancements in gear technologies, and increased fishing efforts by fishermen displaced from other fisheries all contributed to a decline in landings in the 1990s. Fishermen requested further regulations to address the decline in landings, which resulted in the implementation of a limited access plan, which limits the number of fishermen that can fish for Spot Prawns.

Spot Prawn trap vessels range from 6 to 23 m (20-75 ft) in length. Trap designs are limited either to oval or rectangular-shaped traps. Normally, a fisherman will set multiple trap strings, with 10 to 50 traps attached to a common groundline with anchors and a buoy at one end or both ends. The Spot Prawn fishery of California is managed by the state. CDFG has adopted a statewide closure between November and January, which is the peak egg-bearing months, for the Spot Prawn fishery and a May to August closure for the trap fishery north of Point Arguello (south of Lompoc, CA).

6. *Chinook Salmon*- The largest of these five species of Pacific Salmon is the Chinook Salmon, also known as King Salmon. Like other species of Pacific salmon, Chinook are anadromous, which means they begin their lives in freshwater streams and rivers, migrate to the ocean and spend the majority of their lives there, before they return to their natal waters where they spawn once before dying. Historically, Chinook were found as far south as the Ventura River in Southern California, but their current range is estimated to be from the Sacramento-San Joaquin delta north to the Bering Strait off Alaska. They are also in the western Pacific along the coast of Siberia south to Hokkaido Island, Japan.

The ocean stage of a Chinook may last from 2 to 5 years. Some central California fish have been tracked to Alaska, whereas others remain closer to their natal streams. Chinook Salmon may grow up to 147 cm (58 in) and weigh 57.5 kg (127 lbs), but on average they are 91.4 cm (36 in) and 13.6 kg (30 lbs).

The first commercial salmon fishery began in the early 1850s. By 1860, gillnet salmon fisheries had been established in the lower Sacramento and San Joaquin Rivers and the surrounding bays. The first cannery opened along the Sacramento River in 1864. The inland fishery soon collapsed due to increased fishing efforts, pollution, and the degradation of the rivers due to mining, agriculture, and logging operations. As the inland cannery industry for salmon was declining, a commercial ocean troll fishery for salmon also was developing in Monterey Bay in the 1880s. Initially small sailboats using two rods deployed off of each side of the boat, with one hook per rod were used to catch the fish, were used but around 1908, fishermen began using small powered boats.

Landings remained relatively high and consistent throughout the 1960s and 1970s in California. However, in the following decades landings varied considerably. The consistently lower numbers of landings throughout the remainder of the century and the beginning of the 2000s lead to increased management efforts of the Chinook Salmon fishery in the last half of the decade. Drought conditions, which caused poor water flow in the Klamath River, lead to a decline in the Klamath River fall Chinook (KRFC) populations from 2001 to 2005. Continued low landings as well as the failure of the Sacramento-San Joaquin River fall-run Chinook Salmon to meet the Fishery Management Plan conservation objective lead to a statewide closure of the California ocean salmon fisheries in 2008 and 2009 and an 8-day season in 2010.

Salmon are currently managed by three agencies in California. Trolling is the primary method of catching salmon in the commercial fisheries. Vessels are limited to use a maximum of 6 lines when trolling for salmon and are required to use barbless hooks.

7. *Market Squid*- California Market Squid are small pelagic mollusks that inhabit the waters of the eastern Pacific Ocean from the southern tip of Baja California to southeastern Alaska. The highest abundance of squid occurs between Punta Eugenia, Baja California and Monterey Bay, California.

Squid can be found in open waters above the continental shelf from the surface to depths of at least 700 m (2,300 ft). Market Squid have a life span of approximately one year and reach a maximum total length of 30 cm (12 in). When adults reach maturity they move into shallow waters, usually semi-protected bays, where they congregate in dense schools over sandy bottoms. Spawning seasons are dependent on environmental conditions, like water temperature and water clarity. In Monterey Bay, mass spawning during the night usually occurs in April through November, while in southern California it occurs in October through April or May.

The California Market Squid fishery began in 1863, when Chinese immigrants began to harvest small quantities of Market Squid from Monterey Bay. Using simple surrounding nets, torches (as a light attractants), and small skiffs, the Chinese would harvest the squid, dry it, and export most of the catch to China. By 1905, Italian immigrants began fishing for squid using lampara nets and soon after surpassed the Chinese in landings. In the late 1970s, purse seines were introduced in the southern California fishery and annual landings increased, however they were not introduced in Monterey Bay until 1989. The purse seine was a more efficient gear for high volume catches, thus fishermen stopped using lampara nets. In 1993, the Market Squid fishery became the largest California commercial fishery by volume and by 1996 it was the most valuable fishery resource in the state. The Market Squid fishery is managed by the California Fish and Game Commission.

### **Slide 3: Seafood**

Use these prompting questions and others to have a discussion about what kind of seafood the students eat and what they know about it.

What types of seafood have you eaten?

Where did it come from?

How was it caught? Who caught it?

How long was its journey from ocean to table?

### **Slide 4: Commercial Fishery Stakeholders**

How does it get from a fisherman's net to your dining table? There are many people and businesses involved...fisherman and their crew bring their catch into the harbor where it is processed (filleted, packaged, iced), then distributors send their trucks to come pick up the seafood and take it to retail markets and restaurants.

There are many markets for Monterey's fisheries. Sometimes the catch may only travel a few miles to a local store or restaurant, and sometimes it may travel across the world to other countries like China, Europe, and Japan. How can you tell if the seafood you are eating was caught locally?

### **Slide 5: Boat Owner/Fisherman**

A person who depends on natural resources from the ocean to make a living. They bring their catch to the harbor to be sold to a dockside buyer.

Commercial fishing is a business! In addition to the income made from fishing, there are also a large number of expenses. What do you think some of the expenses might be?

Some of the expenses include: fuel, gear and supplies, licenses & registrations, moorage fees, insurance, loan payments, wages for your crew, etc.

### **Slide 6: Dockside Buyer**

A person or company, located on a popular fishing dock or wharf, which buys fish and seafood directly from fishermen.

The price that the dockside buyer pays for the fish depends on the market demand for that fish and on the availability of the fish. For example, in the 1997-98 squid season dockside buyers paid more than \$500 per ton of squid, because there were not many squid as it was an El Nino year. However, in the 2000-2001 season when there were a lot of squid the dockside buyer only paid \$100 per ton of squid. Also, the time in the season affects the price that a dockside buyer will pay for the fish. The dockside buyer often pays more at the start of the season, again when the supply is low, but will pay less as the season progresses.

### **Slide 7: Processor**

A company that buys fish from a dockside buyer, processes the catch, and sells to a wholesaler/distributor. There are two types of processors:

**Primary processors:** clean, fillet, and freeze fresh fish.

**Secondary processors:** take product from the primary processor and further process by cutting into smaller pieces, further freezing, and/or canning fish for retail markets.

Processors usually purchase their fish from dockside buyers who serve as intermediate brokers but they may also purchase fish directly from fishermen, especially if large quantities are involved.

Because processing of fish involves cleaning and removing of unwanted parts, the edible or marketable product that remains for sale is referred to as the yield. Yield is the percent of original product available for sale after processing.

### **Slide 8: Wholesaler/Distributor**

A business that sells, transports, and delivers goods to a retailer or other entity that then sells to the end customer or consumer. Price conscious consumers often try to avoid further retail mark-ups by purchasing directly from a wholesaler.

Wholesalers and distributors may distribute their products locally, regionally, nationally, or globally.

### **Slide 9: Retail Market Owner**

A person or business that purchases fish products from a wholesaler/distributor and sells directly to the consumer. This is how we go buy fish.

### **Slide 10: Restaurant Owner**

A person or business that purchases fish products from a wholesaler/distributor and sells directly to the consumer.

### **Slide 11: Customer**

The ultimate buyer and user of a product, this could be an organization or an individual like you!

### **Slide 12: From Ocean to Table Activity**

Now that you are familiar with the various stakeholder roles involved in a commercial fishery, it is time to learn more about the many factors influencing a fish product's journey from ocean to table.

Each of you will be one of the different stakeholders we just talked about.

### **Slide 13: Fishery Calculations**

Break the class into groups of six students. Have the groups choose a fishery that they would like to do the calculations for, then have the students choose a Role Card.

Explain how they will use the Background Data Tables to complete the Income/Expense worksheets for each role (make sure they have the correct Income/Expense

worksheet). Stress the importance of working together to determine the calculations; they need information from each other.

**Slide 14: Final Season Profit**

Did you make a profit or did you lose money?

Which stakeholder made the most profit?

Do you think these patterns are the same for every fishery? At every time of the season?

Every year?

**Slide 15: Fate Cards**

No two fishing seasons are the same. Fate can impact any and all stakeholders in a given fishery at any time.

What factors might affect your expenses or income?

What step from the ocean to the table might these factors affect your job?

After a discussion, have someone from each team choose a card from you. They will use this in the next round of calculations.

**Slide 16: Acknowledgements**