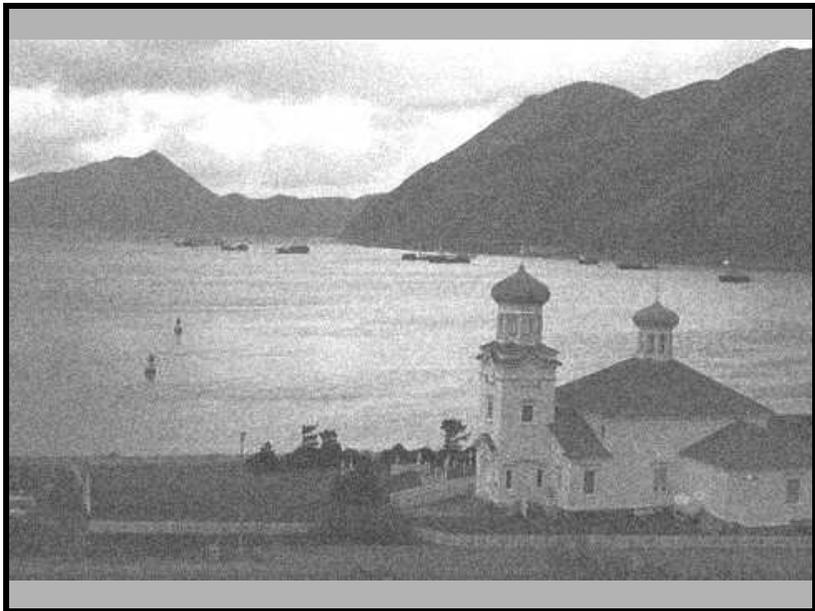

CHAPTER 1

*Introduction to the
Crab Fisheries*



HISTORY OF THE SHELLFISH OBSERVER PROGRAM

In April 1988, the Alaska Board of Fisheries (BOF) adopted regulations requiring onboard observers on all vessels that process king and *C. bairdi* crabs within Bering Sea and Aleutian Islands (BSAI) waters. This requirement was prompted by information collected by the Alaska Department of Fish and Game (ADF&G) which suggested illegal processing of undersize and female crabs by catcher-processors. Processor reports showed consistently higher production rates by catcher-processors compared to catcher-only vessels. At inception, the primary goals of the Mandatory Shellfish Observer Program were to monitor compliance of sex and size regulations of retained crabs and to collect data for in-season management of BSAI fisheries. The first observer deployments occurred in 1988 during the Bristol Bay red king crab fishery (Bowers et al. 2011).

In the spring of 1990, the BOF adopted regulations that broadened observer coverage to include vessels processing *C. opilio* crab. This change was considered necessary based on reports of undersize *C. bairdi* crab processed and labeled as *C. opilio*. The BOF also defined observer qualification standards, observer and observer company conflict of interest guidelines, and observer duties and responsibilities. In the fall of 1991, the BOF adopted new regulations concerning observer certification and decertification (Bowers et al. 2011).

Additional changes were made to the Shellfish Observer Program from 1993 to 1997. In 1993, an observer coverage requirement for all vessels fishing for hair crab in the Bering Sea was enacted. Regulations implemented in 1994 require, as a condition of the fishing permit, 100% observer coverage on all vessels targeting grooved Tanner, triangle Tanner, *Paralomis*, and scarlet king crab. Regulations requiring observers on all vessels fishing for king crab in the Aleutian Islands registration area were enacted in 1995. Separate certifications for crab and scallop observers were put into regulation in 1997 (Bowers et al. 2011).

The Shellfish Observer Program was modified by the BOF in 1999. The Board granted ADF&G full authority and responsibility to deploy observers on any vessel participating in BSAI crab fisheries. Funding for observer deployments through Department cost-recovery fishing was also approved. The BOF established an industry oversight task force to make recommendations for program implementation to the BOF on Shellfish Observer Program issues. The state-funded portion of the program was initiated July 1, 2000 (Bowers et al. 2011).

MANAGEMENT OF ALASKA CRAB FISHERIES

Management of the crab resources of the Bering Sea and Gulf of Alaska is a function of the State of Alaska, with oversight by the federal government. The 1976 Magnuson-Stevens Fishery Conservation and Management Act established eight regional fisheries management councils, which developed Federal Fishery Management Plans (FMPs) for each major fishery in the Exclusive Economic Zone (EEZ). The North Pacific Fishery Management Council (NPFMC) manages resources in the EEZ around Alaska. The NPFMC and its advisory bodies are composed of representatives from the region who are knowledgeable or experienced in the fisheries and the economics of the fishing industry (DOC 2007).

Chapter 1 Introduction to the Crab Fisheries

Although the NPFMC has jurisdiction over the king and Tanner crab resources of Alaska, authority for management decisions has been delegated to the BOF. The FMPs are framework documents which provide for three categories of management tools: **Category 1** - management tools which are fixed in the FMP under Council control, **Category 2** - management strategies which the State controls following federal criteria and **Category 3** - management tools under complete discretion of the State (Table 1.1) (NPFMC 2008).

Category 1	Category 2	Category 3
Legal Gear	Minimum Size Limits	Reporting Requirements
Permit Requirements	Guideline Harvest Levels	Gear Placement & Removal
Limited Access	In-Season Adjustments	Gear Storage
Super-exclusive Registration	District, Subdistricts & Sections	Gear Modifications
	Fishing Seasons	Vessel Tank Inspections
	Sex Restrictions	State Observer Requirements
	Closed Waters	Bycatch Limits
	Pot Limits	
	Registration Areas	

TABLE 1.1. Management measures for the BSAI king and Tanner crab fisheries.

The State of Alaska manages the king and Tanner crab resources through the Alaska Department of Fish and Game. ADF&G is responsible for implementation of the regulations developed by the BOF, and for monitoring the fisheries to ensure that management goals are met. The National Marine Fisheries Service (NMFS) contributes to the management of the crab fisheries through research and stock surveys.

Management Objectives and Strategies

Management strategy originally focused on gear restrictions and catch quotas, with the objectives of reducing the risk of over-fishing and minimizing the fishing mortality of undersize (pre-recruit) crabs, which were unmarketable. For example, tangle nets and trawls were prohibited from crab fisheries due to their non-selective fishing. The NPFMC and the BOF have identified three goals in their joint statement of principles on the management of the king and Tanner crab resources:

- * Establish stability in landings,
- * Produce long-term optimal yield, and
- * Protect the reproductive potential of the stocks

To accomplish these goals, the BOF created regulations that set exploitation rates and catch quotas, established registration areas, prohibited the retention of female crabs, restricted amounts and types of legal gear, set fishing seasons, and determined a minimum legal size for male crabs.

Catch Quotas

The crab fisheries are managed with catch quotas, which set the number of pounds of male crab which can be removed from a stock without adversely affecting its reproductive potential. Each year, NMFS and ADF&G conduct surveys to determine the condition of the king and Tanner crab stocks in the registration areas of the Bering Sea and Gulf of Alaska.

The terminology used to describe catch quotas in different registration areas and fisheries differs based on how the fisheries are managed (Table 1-1). In open-access, permit fisheries and some restricted-access fisheries, a Guideline Harvest Level (GHL) is established. The GHL is expressed as a range, allowing the State to make in-season adjustments as necessary. In rationalized fisheries, the amount of crab that can be harvested is referred to as the Total Allowable Catch (TAC). In-season adjustments cannot be made once the TAC is announced. The Individual Fishing Quotas (IFQs), the Community Development Quota (CDQ), and the Adak Community Allocation (ACA) for crabs are distributed to the qualifying parties prior to the opening of the season.

Registration Requirements

Crab vessels are required to register with the State by obtaining licenses and permits, and to register for particular fisheries and registration areas (Figure 1-1.) Vessels may not register to fish in more than one area at a time (5AAC 39.120).

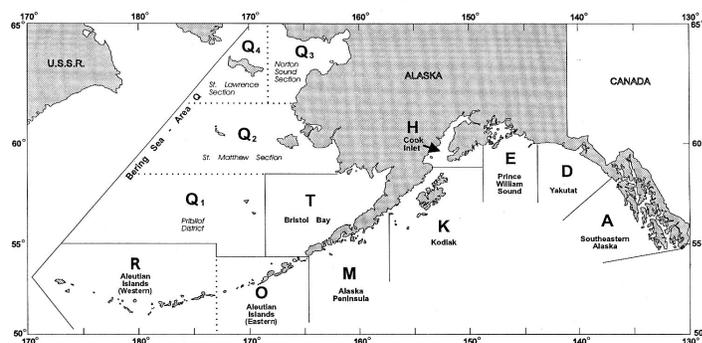


FIGURE 1-1. Registration areas for king crab.

Male-only Harvest

To protect the reproductive potential of the stocks, retaining female crab is prohibited (5AAC 34.065). Male-only restrictions were established to provide maximum female reproductive capacity and ensure conservation of the resource, but the industry is also resistant to harvesting females because of lower market value due to the smaller size of females.

Minimum Size Limits

A minimum size is the smallest size of crabs which can be legally retained in a fishery. To maintain a reproductive stock of male crabs, minimum size limits are set at a size greater than the average size at maturity to allow males the opportunity to mate at least once before being harvested. Because of differences in environmental conditions and size at maturity in various areas, size limits for a given species may not be the same in all registration areas.

Fishing Seasons

Fishing seasons are established during the periods that minimize handling mortality of newly molted crabs and disruption of mating. For example, *C. opilio* molt in the late spring and early summer, so the fishing season begins in the fall and lasts until late spring, just prior to the molting period. This also promotes optimal product quality, in that the carapace is hardened and meat fill is higher. The various regulatory seasons are listed in the Appendix.

Gear Restrictions

Crab may only be taken in BSAI commercial fisheries by pot gear. This gear type minimizes bycatch of fish and non-targeted portions of the crab stocks. Given proper handling by fishermen, bycatch taken in pots suffer only minor injuries, minimizing the incidental mortality. Mandatory escape mechanisms for bycatch are required on all pots and pot limits may be a requirement in permit fisheries.

Multiple Species Retention

As some of the current crab fishing seasons overlap, it is now possible for vessels to retain some incidentally taken species as up to 5% of the vessel's harvest in certain fisheries. The vessel operator must have the correct Commercial Fisheries Entry Commission (CFEC) permit cards and a quota for each species retained. See the Appendix for a list of which species may be retained incidentally in certain fisheries.

Crab Rationalization

The high number of vessels participating in Alaska's crab fisheries and declining catch quotas resulted in an overcapitalized industry. In 2005, a new quota system for BSAI crab fisheries was implemented. The BSAI Crab Rationalization Program addressed overcapitalization with an Individual Fishing Quota (IFQ) system, allocating harvest quota shares to individual vessels and crew based on their fishing history during a specified period. Crab Rationalization is unique from other individual fishery quota systems in that it allocates processing quota shares (Bowers, et al. 2011).

Processors that took deliveries during the qualifying period for a specific crab fisheries are guaranteed to receive deliveries equal to 90% of the percentage of quota that they processed during that period. Vessels are required to deliver a certain portion of their harvest, commonly referred to as "shares," to a particular processor (Bowers, et al. 2011).

This new system of allocating quota has changed the harvest strategies of the fleet. With individual quotas, fishing may be spread throughout the season at the discretion of the fishermen and processors. Vessels can form cooperatives to combine and share IFQ, and can lease their quota. This has resulted in fewer vessels and longer seasons. Observers are now needed throughout the year instead of many at one time for major fishery openers (Bowers, et al. 2011).

In-Season Management

Guideline Harvest Levels for non-rationalized fisheries are announced before the opening of each fishery, and ADF&G monitors the progress of the fishery to determine when the GHM has been taken so that a season closure may be announced. Observer reports are one of the primary tools used to monitor the catch (Bowers, et al. 2011).

Catch per unit effort (CPUE) is used to monitor the fishery while it is in progress seawaters to determine if the stock is as strong as predicted. If it appears that CPUE is falling, the fishery can be closed by Emergency Order. Fisheries may also be closed by Emergency Order if large numbers of molting or non-targeted crabs are being taken, if ADF&G believes that catches are being under-reported, or for a variety of other reasons that may represent a risk to the stocks.

FISHING OPERATIONS AND GEAR

Fishing Vessels



FIGURE 1-2. Typical C/P (top), house forward CV, and house aft C/V.

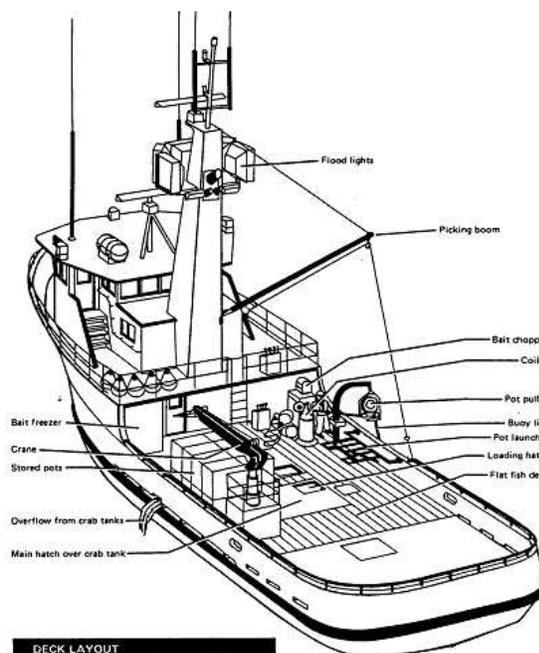
The vessels in Alaska's crab fisheries fall into three categories depending on how they handle the crab: catcher-only vessels (C/Vs), catcher-processor vessels (C/Ps) and floating processors (F/Ps) (Figures 1-2 and 1-3).

Catcher vessels retain crab in a live tank. Fresh seawater is circulated through the tank to provide a constant flow of oxygen for the crabs. When the live tank is full, catcher vessels deliver their crab to either a shoreside plant or a floating processor.

Catcher-processors butcher, cook and freeze their catch on board. Because of their ability to process crab and keep it in large freezers, they can remain at sea for extended periods. The length of the trip is determined by how fast the vessel fills its freezer.

Floating processors do not fish. They take and process deliveries at sea from catcher vessels.

FIGURE 1-3. Deck layout of a “house-forward” vessel.



Fishing Gear

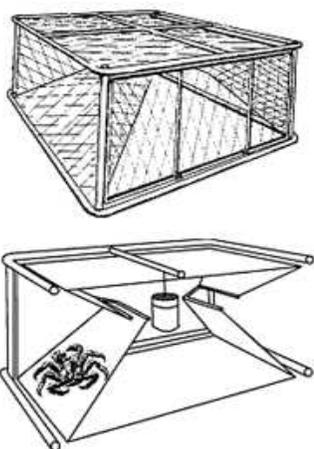


FIGURE 1-4. Typical rectangle pot with cut-away view.

Crab pots are a live trap. Rectangular crab pots typically range in size from 5 feet by 5 feet to 10 feet by 10 feet square and three feet deep. Some boats will custom-build pots to fit their decks, and they are made in all rectangular combinations between 5 and 10 feet, with 3 feet deep being standard.

Crab pots are enclosed with a synthetic mesh similar to trawl mesh. Crab find their way to the "tunnel," fall into the pot and are trapped.

Tunnels may include excluder devices to help keep unwanted crab species out of the pots. “Tanner boards” are used in the Tanner crab fishery to prohibit king crab from entering. Another type of alteration is the use of "fingers" or "triggers" in the tunnel openings so the pots can be used to fish for Pacific cod or golden king crab.

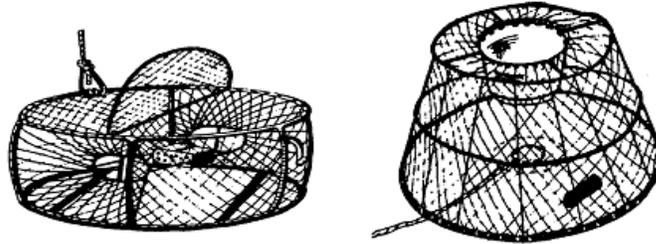


FIGURE 1-5. Circular and conical crab pots.

Circular pots (Figure 1-5) similar to Dungeness pots, pyramid pots, and conical pots are rarely used in observed fisheries. Both pyramid and conical pots are truncated and have tunnels that are located on top.

Escapement Mechanisms

Pots are sometimes lost at sea, potentially causing sea life to die needlessly from "ghost fishing." To prevent ghost fishing, each pot must have some form of built-in escape mechanism.

There are two types of escape mechanisms currently used. The most common is a strand of 30-thread cotton twine (referred to as rotten cotton or biotwine). The cotton twine closes an opening in the mesh webbing that is at least 18 inches long, parallel to and within six inches of the bottom of the pot. The cotton in a lost pot decomposes over time, causing a gap in the mesh and allowing crabs to exit freely. A galvanic timed release device, which is a ring of metal attached to twine sealing an opening in the mesh that dissolves over time, may be used in place of the untreated twine (5AAC 39.145).

Pot Fishing Operations

While each vessel may operate somewhat differently, the overall pattern is the same. On the way to the fishing grounds, the crew will assemble bait sets. Pots are usually baited with chopped herring, octopus, squid or frozen halibut heads; herring oil is sometimes added and whole Pacific cod are sliced open and hung next to the bait jar. When setting the gear, the crew will use a crane to drag the pots to the pot launcher. Once on the launcher, a crew member climbs into the pot to hang the bait set. When the bait is in place, the door is closed and secured. Meanwhile, the buoys and shots of line are readied by other crew members.

Next, the pot launcher is raised and the pot slides off into the sea. Some of the buoy line goes over with the pot, while the remainder of the line is thrown over with the buoys. Usually a pot is marked with two or three brightly colored buoys. By regulation, one of the buoys must bear the vessel's ADF&G registration number. If there is a pot limit in the area, one of the buoys must also bear a pot tag.

Pots are often set in a discrete string (Figure 1-6). A string of pots will usually include about 20 pots and will cover several miles of the ocean floor. Typically, several strings of pots will be fished in good crab grounds while others are used to prospect for crab in other areas.

After a soak time of several hours to several days, the pots are retrieved. The wide range of soak times is due to fishing strategy, the amount of gear used, the tides, or the weather.

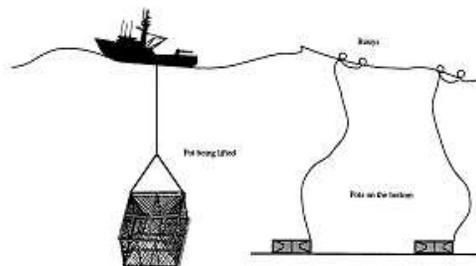


FIGURE 1-6. Single-pot fishing.

The vessel will usually work a string of gear in the direction that provides the easiest maneuverability and best protection from the weather. Since most vessels are rigged to haul gear from the starboard side, the gear is usually hauled with the weather on the port bow. As a vessel comes alongside the buoy setup, the crew member working the rail throws a grapple, hooking the trailer buoy line. After retrieving the buoys, the line is placed in the power block or pot-hauler that pulls the pot from the water.

As the pot is raised toward the vessel, the line is coiled by hand or by an autocoiler. Once the pot is at the rail, the rope bridle is hooked to a crane (commonly called a picking boom), the pot is placed on the pot launcher, the doors are opened, and the catch removed.

Regulations prohibit the retention of sublegal (undersize) males and all females, so the crew must sort the catch and return all unwanted crab immediately to the sea unharmed (5AAC 34.065, 5AAC 35.035). Some crews sort the crab while they are in plastic totes while other vessels have more elaborate sorting tables and methods.

If fishing is good, pots will commonly be baited and set back in the same spot. If fishing is poor, the captain may decide to set in a new area. The pots are stacked on deck and are set again when the vessel reaches what is hoped to be a more fruitful area. At the end of the season, pots may be stored in the water with bait containers removed and doors secured open. The location and manner of pot storage allowed is defined by regulations (5AAC 39.675).

While single-pot fishing is employed for most crab fisheries, regulations permit longlining of pots for golden king crab and several other smaller crab fisheries. Longlining makes the most sense when harvesting species in depths greater than 100 fathoms. For example, at depths of 400 fathoms, 40 pots can be longlined with 6 miles of line while single pot fishing of 40 pots at the same depth would require 27 miles of line.

Processing Operations

Processing operations are similar for catcher-processors, shore-based and floating processors.

Cooked and frozen "sections" are the predominant product of domestic crab processors. A section includes the legs and the attached ventral side of the crab, minus the viscera and the carapace. Whole cooked and frozen crab is a rare and specialized product that is usually produced only in hair crab fisheries. Canned crab is rarely produced at sea, but some frozen sections are reprocessed on shore and the meat is canned.

Crabs are usually held in a live tank to await processing. At the butcher station, the live crabs are split ventrally against a dull blade along the axis of symmetry, which separates the sections. The viscera and carapace fall away, leaving the butcher holding the two halves of the crab. The gills are then removed by holding them against a rapidly spinning bristle brush or cogged wheels.

Once gilled, the sections are tightly packed into wire cages for cooking. The cages are immersed in a boiling brine tank and cooked for about 15 minutes. The sections are gradually cooled in a recirculating seawater tank, then frozen in a chilled, super-saturated brine freezer. The frozen sections are dipped in a tank of fresh water for an ice glaze to seal them from the air. The sides of cages in which the sections are cooked fold down, allowing an inverted cardboard box to fit over them. The box is then turned right side up, the cages are removed and the box is closed. The cases are weighed and stored in a freezer hold.

Most of the crab product undergoes some form of reprocessing or grading before finally entering the marketplace. Shoulder sections are sometimes separated from the legs, and the body meat is removed, then canned or packaged. Legs and sections are graded as 1s, 2s and 3s based on percentage of meat fill, any discoloration, and the presence of barnacles.

References

- Bowers, F.R., M. Schwenzfeier, K. Herring, M. Salmon, J. Shaishnikoff, H. Fitch, J. Alas and B. Baechler. 2011. Annual management report for the commercial and subsistence shellfish fisheries of the Aleutian Islands, Bering Sea and the Westward Region's Shellfish Observer Program, 2009/10. Alaska Department of Fish and Game, Fishery Management Report No. 11-05. Anchorage.
- DOC (U.S. Department of Commerce). 2007. Magnuson-Stevens Fishery Conservation and Management Act as amended by the Magnuson-Stevens Fishery Conservation and Management Reauthor. Act (P.L. 109-479). NOAA. May 2007 printing.
- NPFMC. 2008. Fisheries Management Plan for the King and Tanner Crab Fisheries of the Bering Sea and Aleutian Islands.

Chapter 1 Introduction to the Crab Fisheries

NOTES

Chapter 1 Introduction to the Crab Fisheries
