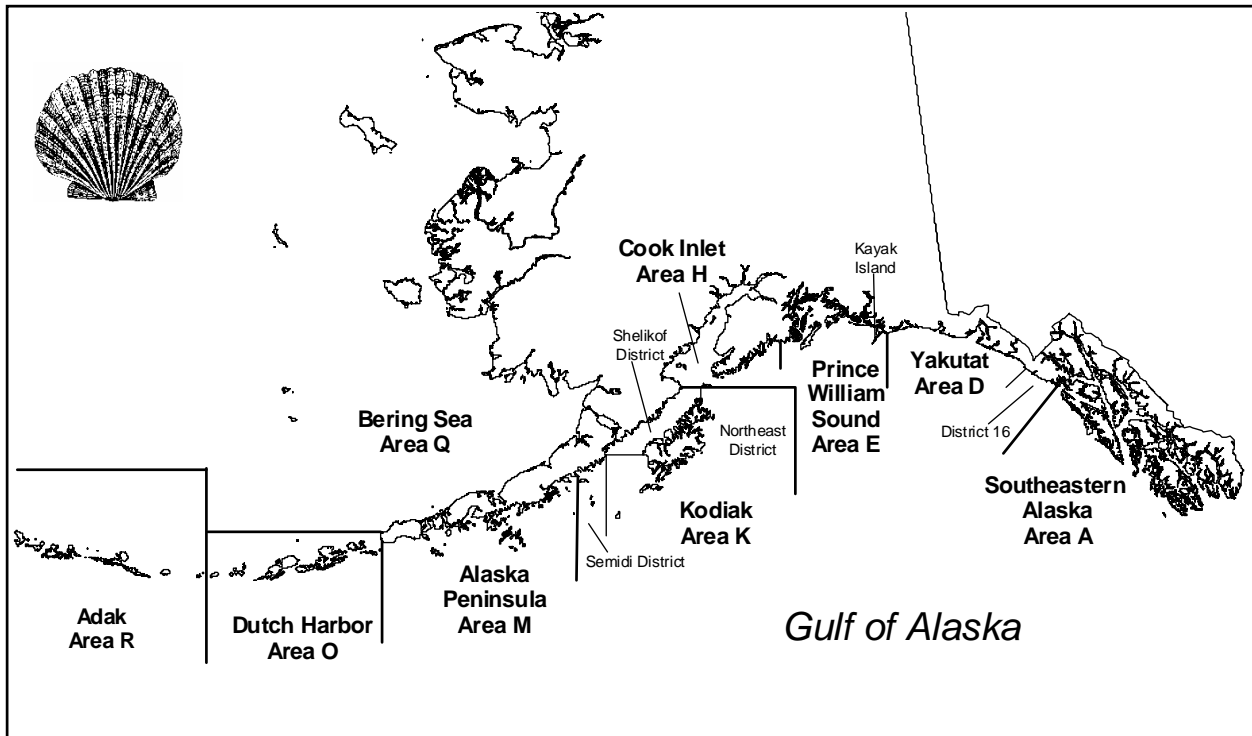


STOCK ASSESSMENT AND FISHERY EVALUATION REPORT FOR THE WEATHERVANE SCALLOP FISHERY OFF ALASKA



Compiled by

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1 Introduction

The *National Standard Guidelines for Fishery Management Plans*, published by the National Marine Fisheries Service, require that a stock assessment and fishery evaluation (SAFE) report is prepared and reviewed annually for each fishery management plan (FMP). The SAFE report summarizes the current biological and economic status of the fishery and analytical information used in fishery management such as guideline harvest levels (GHLs) and harvest strategies. The report is assembled by the Scallop Plan Team (SPT, Plan Team) with contributions from the State of Alaska Department of Fish and Game (ADF&G), the National Marine Fisheries Service (NMFS), and the North Pacific Fishery Management Council (NPFMC, Council). The SAFE report is presented to the Council on an annual basis and is also available to the public.

The Scallop Plan Team met in Anchorage on February 27th, 2012 to review the status of the weathervane scallop stocks, to discuss additional issues of importance in scallop management, and to compile the annual SAFE report. The Plan Team review was based on presentations by staff of the NPFMC, NMFS, and ADF&G with opportunity for public comment and input. Members of the Plan Team who compiled the report were Gregg Rosenkranz (co-chair), Diana Stram (co-chair), Scott Miller, Richard Gustafson, Jie Zheng, and Peggy Murphy.

The scallop fishery in Alaska's Exclusive Economic Zone (EEZ; from 3 to 200 miles offshore) is jointly managed by the state and federal government under the FMP. Most aspects of scallop fishery management are delegated to the State of Alaska (State), while limited access and other federal requirements are under jurisdiction of the federal government. The FMP was developed by the NPFMC under the Magnuson Stevens Act (MSA) and approved by NMFS on July 26, 1995. The NPFMC updated and adopted a revised FMP in 2005.

Although the FMP covers all scallop stocks off the coast of Alaska, including weathervane scallops (*Patinopecten caurinus*), pink or reddish scallops (*Chlamys rubida*), spiny scallops (*Chlamys hastata*), and rock scallops (*Crassadoma gigantea*), the weathervane scallop is the only commercially exploited stock at this time. Commercial fishing for weathervane scallops occurs in the Gulf of Alaska, Bering Sea, and Aleutian Islands. Scallop registration areas used by ADF&G in management of the fishery are shown in Figure 2-1 and general fishing locations are shown in Figure 2-2.

In 1996, optimum yield (OY) was established as 0 to 1.8 million pounds of shucked scallop meats. A more conservative approach was taken in 1998, when OY was defined as 0 to 1.24 million pounds of shucked scallop meats. OY was just recently redefined again in 2012 to 0 to 1.29 million pounds of shucked meats to include known discards over the time frame for which the upper end of the OY range was defined. Statewide scallop harvests have not exceeded OY, and scallop stocks are not overfished.

1.1 Responses to Comments from the SSC

The Scientific and Statistical Committee (SSC) reviewed the 2011 scallop SAFE at the April 2012 Council meeting and provided comments to the Scallop Plan Team (SPT). The SSC comments on the scallop SAFE and area-specific concerns were discussed at the February 27th SPT meeting and a summary of SPT responses is provided after each comment. Note comments repeated from 2011 SSC minutes are included here.

Comment: Regarding the structure of the SAFE, the SSC has the following comments. Section 1.4 should include a general discussion of the issue of weak meats as it affects the stock and economics of the fishery. The Economic section should be moved to the end of the document. The ACL Section 2.10

should be moved to the section on Management (2.1) and focus on the recommendation for the upcoming 2011/12 fishing season. Annual total catch and ACL should be added to Table 2-4. A summary catch table based on appropriate management sub-units should be assembled to evaluate management by sub-area.

Response: The SAFE report has been reorganized as suggested and tables added to relevant sections as appropriate.

Comment: Discards for the 2008/09 and 2009/10 seasons are shown in tables; however the tables should clarify whether the 20% discard mortality has been applied to the estimates. In addition, showing the discard weight and catch in the same weight type (round or shucked weight) or providing an additional column with the converted weights for the discards would be useful for comparison.

Response: Clarifying information has been added to the tables

Comment: The SSC notes that local and traditional knowledge may be a useful source of information to assess the historical incidence of weak meats.

Response: The SPT routinely discusses weak meats with the fleet at each SPT meeting and records information in the SAFE report as well as the SPT minutes.

Comment: Catch recorded in round weights should include the conversion information used to estimate weight.

Response: The table including catch in round weights is now footnoted to explain the conversion information used to estimate weight.

Comment: The ecosystem section should be expanded to include impacts of ocean acidification and dredging effects.

Response: The SPT will expand this section next year.

Comment: The SSC was informed that only preliminary catch estimates will be available to assess management performance relative to the ACL. This issue should be discussed with the ADF&G to identify whether catch estimates can be finalized on a shorter time frame.

Response: Preliminary catch estimates are available for all areas and reported in the SAFE report this year. Discard estimates however are not yet available as data from the fishery are still being processed at the time the SPT meeting occurred and the SAFE report was being compiled.

Comment: While the definitions of OFL and ACL have been established by the NPFMC, the SSC encourages the SPT to continue to explore other methods for estimating biological reference points including Productivity Susceptibility Analysis (PSA), or Depletion-Corrected Average Catch (DCAC), as an example.

Response: The ACL amendment was approved in 2011 and the fishery operated under the ACLs in the 2011/12 fishing year. The SPT discussed other methods for estimating catch in data-poor situations. Team members will explore how data-poor stocks are assessed in other regions and report back in 2013 for a more extensive agenda item on appropriate measures for potentially establishing biological reference points for this stock.

Comment: Table 3-3 shows the scallop density in the west bed was lowest on record in 2010 and has been declining for the past four years. In addition, this region was impacted by weak meats (2.5% in the west bed and 5.8% in the east bed). In response, the PWS West bed region was closed in 2009 and 2010/11. The SSC requests that a table similar to Table 3-4 be developed for the west bed.

Response: Tables have been added to this section showing harvest in each bed.

Comment: Confirm biomass estimates found in Table 3-3. There appears to be a problem with

transposing values associated with different values of q .

Response: This error has been fixed in this version of the SAFE report.

Comment: Overall trends in PWS, shown in Figure 3-5 may indicate the beds are being fished down. The SSC requests that the SPT discuss what level of depletion is sustainable.

Response: The team discussed the decline in survey biomass and the resulting conservative management action to close the bed. Given that the bed is not being fished and that harvest rates prior were much less than estimated natural mortality and less than the GHM maximum, the team did not believe that this should be characterized as a 'fishing down' effect as there is no evidence that it is fishing related but rather inherent variability in the stock as a result possibly of environmental conditions.

Comment: The economic assessment contained within the draft was succinct. The inclusion of the inflation adjusted real price series makes a very nice and informative contribution to the analysis. It would be advisable and appropriate to explicitly note that references to revenues are gross estimates and that all initial sales of scallops, whether fresh or frozen are post-primary processing transactions. That is, the landed product is (presumably) only shucked meats. To the extent practical, the SSC recommends that additional economic data be provided, possibly in an appendix. Examples of potentially useful data include port landings, crew size and wages.

Response: At the 2012 Scallop Plan Team meeting, discussion with industry were held to gather information on crew usage and wages as well as patterns of landings. A synopsis of the information gathered has been added in the paragraphs immediately following table 5-1. In addition, the economic assessment language has been revised to clarify that all initial sales of scallops are of a post-primary processed product and that the revenue earned in these transactions is gross first wholesale revenue.

Comment: Endnote b, attached to Table 5-1, requires further explanation. There also appears a set of sentences, bottom of page 22, that seem to contradict one another and this should be fixed. In Table 5-1, the column headings "Average Price/lb" and "Adjusted Price" should be changed to "Nominal Average Price/lb" and "Real Average Price/lb", respectively. The table should contain a footnote documenting the source of the inflation factor. The SSC has also identified a number of edits, minor errors, and typos that will be communicated directly to the authors.

Response: Endnote b to table 5-1 refers to an infamous incident in the history of the scallop fishery when the vessel Mr. Big, fished illegally in federal waters resulting in closure of the fishery, development of the federal FMP, and the License Limitation Program. The footnote has been clarified to reflect this event.

Headings in table 5-1 have been changed at the SSCs suggestion and a footnote has been added documenting that the gdp price deflator is used to adjust for inflation through 2010.

It is not clear to the authors exactly what text needs to be corrected, as the organization of the document and page numbering have changed. However, a review of the economic assessment does not reveal internally inconsistent language.

Comment: Review stock boundaries using the Stock Structure Workshop Report (P. Spencer, Alaska Fisheries Science Center) and discuss the criteria to manage the scallop population as a unit stock including the potential contribution of each bed.

Response: SPT discussed scallops are managed as unit stock. Scallops are broadcast spawners and larvae drift for several weeks before settling. Scallop beds occur throughout areas of known habitat and vary in size and scallop density. Fishermen indicated beds typically are found in the same geographic area from year to year but boundaries are not definitive and catches are not consistent. Concentrations of scallops can extend across regulatory area and registration boundaries. The team reviewed the stock structure template and discussed its application to weathervane scallop stocks. The team did not have a chance to review the entire report prior to the meeting and the time available for doing so in depth at the meeting

itself was limited. Thus the team plans to review the report individually and fill out a draft stock structure template prior to the 2013 SPT meeting at which time it will be reviewed and finalized and incorporated into the SAFE in 2013.

Comment: The SSC encourages efforts to develop standardized surveys in other areas similar to the approach now used to survey Kayak Island and Cook Inlet areas in the Central Region.

Response: Survey of the scallops in other areas remains a priority on the SPT list of research priorities.

Comment: Additional information on the estimation of gear efficiency derived from the underwater video techniques in the PWS area should be provided.

Response: Video footage from dredge surveys of Kayak Island and Kamishak has been reviewed. Preliminary video footage from sled-dredge trials has also been reviewed. The goal for Central Region scallop surveys is to see if a gear switch from the 8' dredge to the sled dredge is possible. Sled-dredge trials will continue as will using video on the 8' dredge in order to quantify gear efficiency of both gear types. Results of sled-dredge trials will be presented to the SPT once enough data (i.e. large enough sample sizes) are obtained for statistical analysis. Results from this work contribute not only to estimation of gear efficiency, but to survey design as well. Results will be reviewed with the SPT at future meeting.

Comment: The Scallop Plan Team minutes indicate that the camera sled has been deployed in seven regions off Kodiak. This information should be included in the SAFE area summaries.

Response: CamSled data and methods are a work in progress limited by available time and have not undergone ADF&G regional and statewide review. The data are not directly input to estimation of area quotas. Data will be added to SAFE upon approval by ADF&G.

Comment: The SSC continues to encourage the development of a statewide ageing protocol and development of an age structured model for scallop stocks in the Central Region.

Response: Work on the aging protocol continues to move forward. Central Region staff has completed the basic ageing protocol for scallops at Kayak Island and Kamishak Bay and hope to have nuances of ageing scallops from other beds across the state included in the protocol before review and publication. However, if that cannot be completed in a reasonable period of time, Central Region staff will attempt to produce a final ageing protocol for the Kayak Island and Kamishak Bay beds prior to the end of 2012. Staff have also added a GIS component to the database. Biometric support has been arranged to assist in the development of an age-structured model. Central Region staff expects to be able to discuss model results at the 2013 SPT meeting

Comment: Given reliance on CPUE for scallop assessments, the SSC encourages an evaluation of difference in dredge selectivity between fishing regions, including an analysis of the influence of bottom type on performance.

Response: The SPT discussed a number of factors that affect dredge performance and tow CPUE with participating members of the scallop industry. Dredge efficiency depends on bottom type; edge versus flat, mud or sand. Dredge selectivity will change between the two bottom types depending on weighting of the dredge, scope of cable, tow speed, current speed and direction, amount of tidal fluctuation, wave height and frequency. Also, there is a difference in whether the dredge(s) are set amid-ship, staggered or off the stern. Difference in the catch between side by side dredges is typically within two bushels and can be affected for example by patchiness of the bed, and the number and direction of turns made during the tow. The SPT will continue to discuss these issues at subsequent meetings and would look forward to reviewing an analysis of dredge selectivity should one be completed.

1.2 Summary of New Information Included in the SAFE Report

This SAFE Report includes updated information through the 2010/2011 fishing season. New information included in this report since the previous report (NPFMC, 2011) includes the following:

- 1) Updated observer program summary data through 2010/2011 fishing season; including shell height distributions, retained catch, discarded catch, preliminary 2010/11 catch data where available, bycatch information from the directed fishery including Tanner, snow and red king crab bycatch by region;
- 2) Updated information on economic wholesale value of the fishery;
- 3) Annual catch limits (ACL) recommendation for 2012/13 fishing year and preliminary catch through 2011/12;
- 4) Updated survey information in Prince William Sound and Cook Inlet;
- 5) Updated haul composition data indicating bycatch in directed fishery;
- 6) Revised maps of trawl locations and known scallop locations;
- 7) Shell height histograms in addition to the updated age data for the Central district

1.3 Historical Overview of the Scallop Fishery

Alaska weathervane scallop *Patinopecten caurinus* populations were first evaluated for commercial potential in the early 1950s by government and private sector investigators. Interest in the Alaska fishery increased in the late 1960s as catches from U.S. and Canadian sea scallop *Placopecten magellanicus* fisheries on Georges Bank declined. Commercial fishing effort first took place in Alaska during 1967 when two vessels harvested weathervane scallops from fishing grounds east of Kodiak Island. By the following year, 19 vessels including New England scallopers, converted Alaskan crab boats, salmon seiners, halibut longliners, and shrimp trawlers, entered the fishery.

From the inception of the fishery in 1967 through mid-May 1993, the scallop fishery was passively managed with minimal management measures. Closed waters and seasons were established to protect crabs and crab habitat. When catches declined in one bed, vessels moved to new areas. While this management strategy may have been acceptable for a sporadic and low intensity fishery, increased participation inevitably led to boom and bust cycles (Barnhart, 2003).

In the early 1990s, the Alaska weathervane scallop fishery expanded rapidly with an influx of boats from the East Coast of the United States. Concerns about overharvest of scallops and bycatch of other commercially important species such as crabs prompted the ADF&G Commissioner to designate the weathervane scallop fishery a high-impact emerging fishery on May 21, 1993. This action required ADF&G to close the fishery and implement an interim management plan prior to reopening. The interim management plan contained provisions for king and Tanner crab bycatch limits (CBLs) for most areas within the Westward Region. Since then, crab bycatch limits have been established for the Kamishak District of the Cook Inlet Registration Area and for the Prince William Sound Registration Area. The commissioner adopted the regulations and opened the fishery on June 17, 1993, consistent with the measures identified in the interim management plan. The interim management plan included a provision for 100% onboard observer coverage to monitor crab bycatch and to collect biological and fishery data. In March 1994, the Alaska Board of Fisheries (BOF) adopted the interim regulations identified as the Alaska Scallop Fishery Management Plan, 5 AAC 38.076.

From 1967 until early 1995, all vessels participating in the Alaska scallop fishery were registered under the laws of the State of Alaska. Scallop fishing in both state and federal waters was managed under state jurisdiction. In January 1995, the captain of a scallop fishing vessel returned his 1995 scallop interim use

permit card to the State of Alaska Commercial Fisheries Entry Commission in Juneau and proceeded to fish scallops in the EEZ with total disregard to harvest limits, observer coverage, and other management measures and regulations. In response to this unanticipated event, federal waters in the EEZ were closed to scallop fishing by emergency rule on February 23, 1995.

The initial emergency rule was in effect through May 30, 1995, and was extended for an additional 90 days through August 28, 1995. The intent of the emergency rule was to control the unregulated scallop fishery in federal waters until an FMP could be implemented to close the fishery. Prior to August 28, NPFMC submitted a proposed FMP which closed scallop fishing in the EEZ for a maximum of one year with an expiration date of August 28, 1996. The final rule implementing Amendment 1 to the FMP was filed July 18, 1996 and published in the Federal Register on July 23, 1996. It became effective August 1, 1996, allowing the weathervane scallop fishery to reopen in the EEZ. Scallop fishing in state waters of the Westward Region was delayed until August 1, 1996 to coincide with the opening of the EEZ. The state continued as the active manager of the fishery with in-season actions duplicated by the federal system (Barnhart, 2003).

In March 1997, NPFMC approved Amendment 2, a vessel moratorium under which 18 vessels qualified for federal moratorium permits to fish weathervane scallops in federal waters off Alaska. By February 1999, the Council recommended replacing the federal moratorium program with a Federal License Limitation Program (LLP), which became Amendment 4 to the FMP. The Council's goal was to reduce capacity to approach a sustainable fishery with maximum net benefits to the Nation, as required by the Magnuson-Stevens Act. NPFMC's preferred alternative created a total of nine licenses with no area endorsements; each vessel is permitted to fish statewide. However, vessels that fished exclusively in the Cook Inlet Registration Area where a single 6-foot dredge was the legal gear type during the qualifying period were also limited to fishing a single 6-foot dredge in federal waters outside Cook Inlet. The NPFMC later modified the gear restriction in Amendment 10 to allow these vessels to fish 2 dredges with a combined maximum width of 20 feet. Amendment 10 was approved on June 22, 2005. NMFS published final regulations on July 11, 2005, which were effective August 10, 2005. NMFS implemented Amendment 10 by reissuing the two LLP licenses with the larger gear restriction.

1.4 Weathervane Scallop Biology

There are eight known species of scallops in Alaskan waters (Hennick, 1973), but only the Pacific Weathervane scallop is commercially fished. Exploratory fishing for the pink scallop *Chlamys rubida* has not found commercial concentrations and the species is not targeted commercially off Alaska. Weathervane scallops are distributed from Point Reyes, California, to the Pribilof Islands, Alaska. The highest known densities in Alaska have been found to occur along the eastern Gulf of Alaska coast from Cape Spencer to Cape St. Elias, off Kodiak Island and in the Bering Sea. Weathervane scallops are found from intertidal waters to depths of 300 m, but abundance tends to be greatest between depths of 40-130 m on beds of mud, clay, sand, and gravel. Beds tend to be elongated along the direction of current flow. A combination of large-scale (overall spawning population size and oceanographic conditions) and small-scale (site suitability for settlement) processes influence recruitment of scallops to these beds.

External Anatomy. Scallops are bivalves, referring to the right and left valves of a scallop's shell. The weathervane scallop is a large scallop with prominent, heavy, widely spaced, smooth ribs. The valves are wider than long and slightly convex. Weathervane scallops naturally lie on their right valve (bottom valve) which is white in color when scallops are small and light brown to golden yellow in mature scallops. The right valve is typically larger than the left valve (top valve), has less discrete color patterns, and flattened ridges.

The left valve is typically brown in color and may have barnacles and other marine flora and fauna

attached to it. The left valve is normally always brown in color but, on occasion, an all white scallop may be found in the catch. A ligament along the dorsal margin at the hinge holds the two valves together. This ligament is a dark, elastic pad called the resilium and is located in a pit in the center of the hinge, at a point referred to as the umbo. The resilium will spring the valves open when the adductor muscle relaxes. Two protrusions at the hinge called auricles (sometimes called ears or wings) lengthen the hinge line. The auricles on individual weathervane scallops are nearly the same size. In a scallop, the hinge area of the shell is dorsal and the edge of the shell opposite the hinge is the ventral margin.

Internal Anatomy. A scallop's soft inner parts can be viewed if the left (top) valve is carefully removed by cutting the adductor muscle away from the valve. The mantle is a thin, almost transparent sheet of tissue that envelops the body. It is normally attached to the valves except near the edges. The functions of the mantle are to secrete the shell, assist in respiration, control the inflow and outflow of water, and control movement when the animal swims. A row of tentacles emerge from the mantle and act primarily as feeding organs. A second row of shorter, more proximal tentacles are chemoreceptors. Numerous eyes occur along the margin of the mantle, capable of sensing shadows or movement.

The large, white, circular adductor muscle is centrally located on the valves. The adductor is composed of a large anterior smooth muscle (known as the "quick muscle") which contracts to snap the valves closed when the scallop is disturbed or swimming, and a smaller posterior striated muscle (known as the "catch muscle") which holds the valves in position after they have been closed by the smooth muscle. The adductor is known as the meat of the scallop and is normally the only part retained. Crescent-shaped gills encircle the adductor muscle and are composed of four demibranchs, two on either side of the body. Along with the mantle, they are used for respiration. The gills are also important in feeding.

The urogenital system is conspicuous upon dissection of a scallop, with the gonad lying in a semicircle around the anterior and ventral portions of the adductor. Sex is easily distinguished by the appearance of the gonad, unless it is completely empty of reproductive cells. The female gonad is orange-red to red in color and the male gonad is creamy white. Two kidneys, seen as small, thin, brown sac-like bodies lie flattened against the anterior part of the adductor muscle. The kidneys empty through large slits into the mantle chamber. Eggs or sperm are likewise extruded through ducts into the lumen of the kidney and then flow into the mantle chamber and expelled.

The small, white-colored foot is located anterior and ventral to the gonad. In the larval and juvenile stages, the foot is used for locomotion but in the adult, the foot is rudimentary and has little function. The opening of the byssal gland is halfway along the foot. Weathervane scallops often attach themselves to surfaces with an abysal thread until they are about one year old.

The digestive system consists of a mouth (located anteriorly near the hinge), a short esophagus, a stomach, an intestine that loops through the gonad and around the adductor muscle and an anus. Lying partly in the stomach and partly in the section of the intestine that enters the gonad is a structure called the crystalline style. This organ is amber colored, translucent, and rod-shaped. The crystalline style churns food in the stomach and releases an enzyme that assists in digestion. A simple circulatory system carries blood throughout the soft tissues. The heart lies in a transparent sac (the pericardium) dorsal to the adductor muscle. Blood flows through the anterior and posterior aorta to all parts of the body, and returns via a series of thin walled sinuses which form the venous system.

Growth. Embryonic and larval scallop development is highly affected by temperature. The embryo normally develops into a larva within 72 hours. In the early stage, the larva has two valves, a complete digestive system and a velum. The velum is an organ peculiar to molluscan larvae, and is ciliated along its outer margin enabling the larva to swim well enough to maintain itself in the water column though it drifts with tides and currents. The velum also collects unicellular phytoplankton on which the larva feeds.

Adult scallops are filter feeders, feeding on plankton and other organic materials. Growth is very rapid in the first few years and is minimal after age 10. In general, weathervane scallops are long lived and individuals with shell height of 250 mm and 28 years have been reported.

Most scallops have concentric rings (circuli) on the shell and by studying these it is possible to tell their approximate age. Annuli are compressions of circuli that form during periods of very little growth; an annulus begins to develop on the margin of the scallop shell around October or November. These slow growth periods may correspond to gonad development and spawning activity (November to June) and changes in water temperatures in winter. Growth in young scallops, as indicated by the distances between the first three annuli is rapid, but slows down progressively afterward.

Prior to sexual maturity, annuli are not distinct because growth is relatively rapid for immature scallops. However, an annulus can often be found during the first three years by examining a scallop shell under a microscope and looking for a slowdown in growth. By the ten-ring stage and beyond, the gaps between succeeding annuli are often less than one millimeter. Very little growth takes place after the seventeenth annulus. In the Bering Sea, shells with up to twenty-nine annuli have been noted. Accurate shell aging of scallops is most easily accomplished after a biologist has a wide range of experience with scallop shells. Average shell heights of weathervane scallops vary from population to population (Figure 1-1).

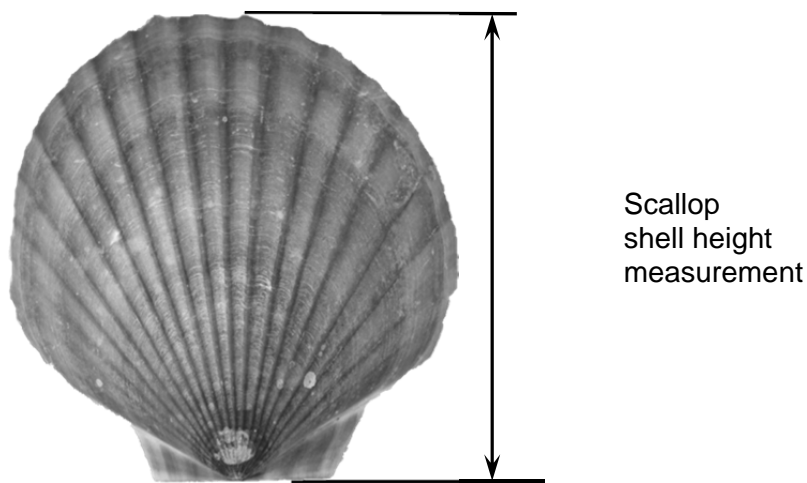


Figure 1-1 Left (upper) valve of weathervane scallop shell showing orientation of shell height measurement.

Reproduction. Weathervane scallops sexually mature around age 3 or 4. They spawn annually, usually in early summer between May and early June and are generally about 100mm in shell height when they are sexually mature. Scallops are dioecious (the sexes are separate) although one hermaphroditic specimen has been reported (Kaiser, 1986). The sexes can be distinguished by the color of the gonads; female gonads are orange-red to red in color, and male gonads are creamy white. Otherwise, male and female gonads are similar in size and shape.

The mechanisms that initiate production and release of eggs and sperm are poorly understood, but water temperature is likely important. Spawning occurs over a protracted period of time and timing of spawning varies based on geographical location. Scallops discharge millions of eggs and sperm, which leave the gonads, pass through the lumen of the kidney, and are expelled from the mantle cavity. Fertilization occurs at random in the water; eggs that are fertilized drift with the tides and currents for several weeks.

Within two to three weeks, metamorphosis takes place and the larva settles to the bottom. Metamorphosis is a time of high mortality, because the animal must rely on food reserves accumulated during the larval period. Over a two-week period, the gills develop into feeding organs. At this stage the larva is mature, with a well-developed foot, a pair of eyespots, rudimentary gills and a transparent shell. The juvenile scallop, or spat, may attach itself to the substrate, use its foot to move around, or swim. Within a few months, the shell becomes pigmented as they become adults.

Behavior. Scallops generally lie on the bottom on their right valve with the valves open about 10-15 mm at the ventral margins. The tentacles are extended and the eyes can be seen. If the scallop is disturbed, the valves are quickly snapped shut. Often, a disturbed scallop will spin in place and end up faced in a different direction. Scallops are the only bivalve mollusks capable of swimming. The scallop uses a water jet action by opening its valves and taking in water, then closing its valves and forcing the water out - propelling the animal forward, ventral margin first. Repetition of this action lifts the scallop off the bottom, allowing it to swim forward. Swimming is most likely used to avoid predators and distances covered are short, no more than about 10 meters.

2 Overview of Scallop Fishery and Management

The scallop fishery is managed jointly by NMFS and ADF&G under the federal FMP for the Scallop Fishery off Alaska. Most management measures under the FMP are delegated to the State for management under Federal oversight. ADF&G management of the weathervane scallop fishery covers both state and federal waters off Alaska. The following sections provide background on the fishery and its management, including registration areas, season, guideline harvest ranges and levels, the onboard observer program, crab bycatch limits, and the Federal License limitation program.

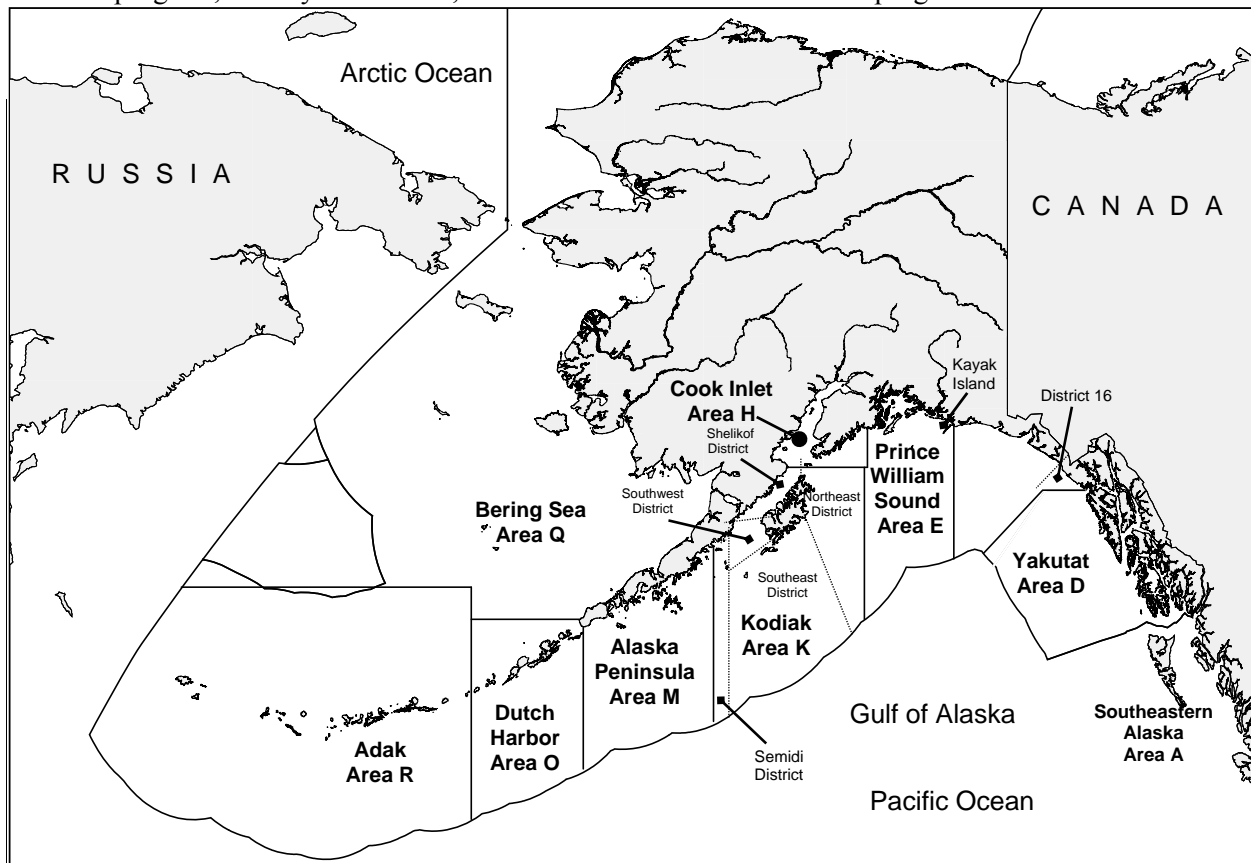


Figure 2-1 Alaska Weathervane Scallop Commercial Fishing Registration Area.

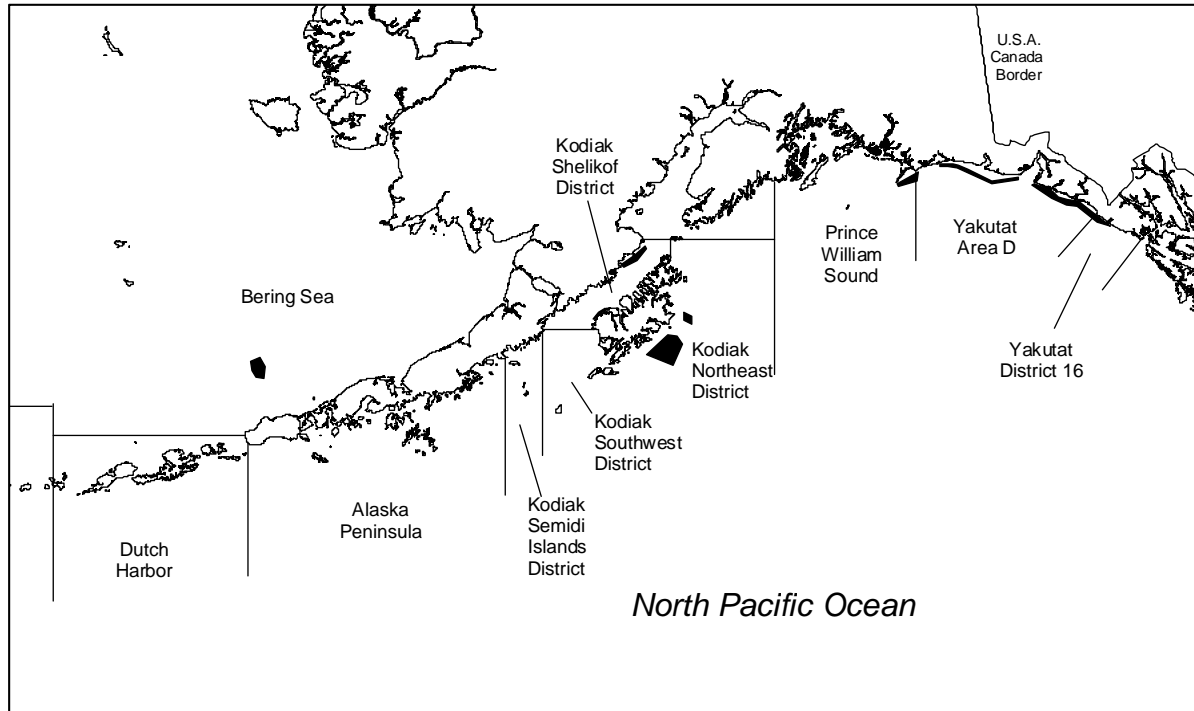


Figure 2-2 Map showing Alaska scallop fishery registration areas. General areas of effort during the 2010/11 season are overlaid by black polygons.

2.1 Management

2.1.1 Overfishing Definition

Overfishing is a level of fishing mortality that jeopardizes the long-term capacity of a stock or stock complex to produce MSY on a continuing basis. MSY is defined as the largest long-term average catch that can be taken from a stock under prevailing ecological and environmental conditions. Amendment 6 to the scallop FMP established MSY for weathervane scallops at 1.24 million lbs of shucked meats based on the average catch from 1990-1997 excluding 1995. Optimum Yield (OY) was defined as 0–1.24 million lbs, and the overfishing control rule was defined as a fishing rate in excess of the natural mortality rate, which has been estimated as $F_{\text{overfishing}} = M = 0.13$ (12% per year) statewide. OY was just recently redefined again in 2012 to 0 to 1.29 million pounds of shucked meats to include known discards over the time frame for which the upper end of the OY range was defined. Catch towards the OFL (and ACL, see Section 2.1.2 below) is a total catch and thus includes discards. Statewide scallop harvests have not exceeded OY, and scallops are not overfished.

At this time, abundance is estimated for only two of the nine registration areas and a determination of MSST cannot be made. The fishery is managed conservatively with harvest levels well below MSY. Figure 2-3 shows statewide scallop catch and MSY levels both prior to amendment 6 and following inception of the new MSY level in 1996. Since 1996, catches have averaged from 39% to 66% of MSY (

Table 2-1). Control rules for other Alaskan scallop species have not been developed as no commercial harvests occur. Catch by individual registration area is shown in Figure 2-14.

Table 2-1 Alaska weathervane scallop harvest and Maximum Sustainable Yield from FMP, 1993/94—2010/11 seasons.

Season	Harvest (lbs meat)	MSY	% MSY
1993/94	984,583	1,800,000	55
1994/95	1,240,775	1,800,000	69
1995/96	410,743	1,800,000	23
1996/97	732,424	1,800,000	41
1997/98	818,913	1,800,000	45
1998/99	822,096	1,240,000	66
1999/00	837,971	1,240,000	68
2000/01	750,617	1,240,000	61
2001/02	572,838	1,240,000	46
2002/03	509,455	1,240,000	41
2003/04	492,000	1,240,000	40
2004/05	425,477	1,240,000	34
2005/06	525,357	1,240,000	42
2006/07	487,473	1,240,000	39
2007/08	458,313	1,240,000	37
2008/09	342,434	1,240,000	28
2009/10	488,059	1,240,000	39
2010/11	459,759	1,240,000	37

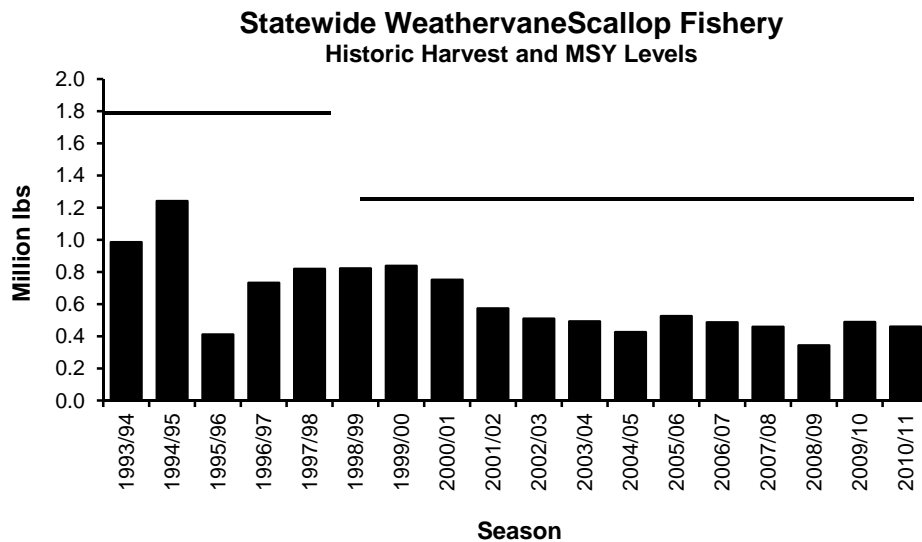


Figure 2-3 Statewide scallop harvest (pounds shucked scallop meats) and MSY levels from FMP

2.1.2 Annual Catch Limits and Accountability Measures

On January 16, 2009, NMFS issued final guidelines for National Standard 1 of the Magnuson-Stevens Fishery Conservation and Management Act (MSA). These guidelines provide guidance on how to comply with new annual catch limit (ACL) and accountability measure (AM) requirements for ending overfishing of fisheries managed by federal fishery management plans. Annual catch limits are amounts of fish allowed to be caught in a year. A legal review of the Alaskan Scallop FMP found there were inadequacies

in the FMP that needed to be addressed to facilitate compliance with requirements of the MSA to end and prevent overfishing, rebuild overfished stocks and achieve optimum yield.

The new requirements include provisions intended to prevent overfishing by requiring that: FMPs establish a mechanism for specifying ACLs in the plan (including a multiyear plan); implementing regulations, or annual specifications, at a level such that overfishing does not occur in the fishery; and including measures to ensure accountability (AMs). Scallop fisheries must have ACL and AM mechanisms by the 2011/2012 scallop fishing year. The MSRA includes a requirement for the SSC to recommend fishing levels to the Council, and provides that ACLs may not exceed the fishing levels recommended by the SSC. NMFS's National Standard 1 Guidelines state that the ABC is the fishing level recommendation that is most relevant to ACLs.

Procedurally, the SSC must recommend amounts of acceptable biological catch for the stocks in the fishery on an annual basis, and the annual catch limits may not exceed the SSC's fishing level recommendations. The Scallop FMP must also designate which stocks are "in the fishery", as all target stocks in the fishery must have established MSY and OY, as well as ACLs, AMs and ABC control rules. Alaska weathervane scallops are treated as one scallop stock.

In October 2010, the Council took final action on an amendment analysis to meet these requirements. The Council recommended establishing a maximum ABC control rule equal to 90% of the OFL. The Council also recommended that in conjunction with this the OFL will be redefined to account for all estimated sources of fishing mortality. The OFL is re-estimated to include known discards at the time of the average catch calculation employed in establishing this level. The current OFL was estimated based upon retained catch only, thus the re-estimation is necessary to account for discards occurring over that time period and for consistency with current regulation to account for all sources of mortality. The OFL is considered to be a conservative estimate due to the fact that there are areas of known scallop beds that are not included in the catch calculation as they are currently closed to fishing although they have supported historic harvests in the past. This would result in an OFL = 1.29 million pounds.

Management of an ACL at a statewide level rather than a regional level is a fundamental aspect to this recommendation. The statewide management approach was recommended by both the SPT and the SSC given that the registration areas and their regional groupings themselves are not biologically-based and thus a statewide ACL is more biologically meaningful and consistent with current understanding of stock structure than a regional ACL.

In order to establish adequate accountability measures, the Council recommended that the annual GHL for each scallop management area be established by the State of Alaska at a level sufficiently below the ACL so that the sum of the estimated discard mortality in directed scallop and groundfish fisheries as well as the directed scallop fishery removals does not exceed the ACL. Anytime an ACL is exceeded the overage will be accounted for through a downward adjustment to the GHL during the fishing season following the overage.

Directed fishing only occurs on weathervane scallops and the FMP only provides an estimate of MSY and OY for weathervane scallops. Under the new reorganization of the FMP, the weathervane scallop stock is by default defined as being 'in the fishery'. The remaining species of scallops under the Alaska Scallop FMP include pink scallops, spiny scallops and rock scallops. The Council recommended moving these non-target scallops (pink, spiny and rock scallops) into Component of the FMP as their preferred management approach "Ecosystem component (EC) species" generally are not retained for any purpose, although *de minimis* amounts might occasionally be retained. This approach is preferred as it eliminated the risk of over-harvesting these species should they be removed from the FMP, while acknowledging

that information is not sufficient to establish ACLs for these species at this time, nor is harvest of these species currently occurring.

To be considered for possible EC classification, species should, among other considerations, conform to the following criteria; conversely, failure to satisfy these criteria could eliminate some groups from further consideration as EC species.

- Be a non-target species or non-target stock;
- Not be determined to be subject to overfishing, approaching overfished, or overfished;
- Not be likely to become subject to overfishing or overfished in the absence of conservation and management measures; and
- Not generally be retained for sale or personal use.

Additional information on the non-target scallop stocks is contained in Section 4.1.

2.1.2.1 ACL recommendation for the 2011/12 Scallop fishing season

The SPT recommended that the ACL for the weathervane scallop stock in the 2012/13 fishing year be established as the maximum ABC equal to 90% of the new statewide OFL. The SPT will evaluate total catch (including discards) against this statewide ACL level in the 2013 SAFE report for the 2011/12 fishing year to determine if this ACL has been exceeded. The Scallop SAFE and data therein is lagged one year (although preliminary data from the current year is presented to the extent available but final catch numbers are not available until the subsequent year). As an interim step, while the ACL was not implemented in the 2010/11 fishing year, this SAFE report includes information on total catch including discards in conjunction with the recommended ACL had this rule been in place in that fishing year.

2.1.2.2 Catch in relation to ACLs

The following tables summarize the total catch in relation to the area-specific GHs (retained catch), discards by area and the total statewide retained catch, discards and total catch. The total catch is then compared against the ACL which is applied statewide. Note that the ACL was not implemented until the 2011/12 season thus the 2010/11 data is used here merely for example purposes. Final catch in relation to the ACL for 2011/12 will be provided in the 2013 Scallop SAFE report. Preliminary retained catch from the 2011/12 fishery is also provided in Table 2-3 but discard estimates are not yet available for comparison. This information will be provided in the 2013 SAFE report.

Table 2-2 GHLS and summary statistics from 2010/11 Alaska weathervane scallop fishery.

Area/District	GHL (lbs meat)	Retained catch (lbs meat)	CPUE (lbs meat per dredge hr)	Est scallop discard mortality (lbs meat)^a
Yakutat Area D	160,000	156,412	45	10,181
Yakutat District 16	25,000	1,778	37	493
Prince William Sound	8,400	8,460	52	165
Cook Inlet				
Kodiak Northeast District	65,000	61,107	64	1,512
Kodiak Shelikof District	170,000	136,791	49	7,477
Kodiak Southwest District	25,000	0		
Dutch Harbor	10,000	5,570	68	57
Bering Sea	50,000	50,275	52	1,288
Statewide total	513,400	445,503	49	21,143

^aConversion of scallop discard estimates to discard mortality in lbs meat uses 8.8% meat recovery estimate based on statewide retained catch (lbs meat) and estimated retained round catch from 2010/11 season and assumption of 20% mortality of discarded scallops as previously used in scallop ACL analysis.

Table 2-3 GHLS and preliminary catch from the 2011/12 Alaska weathervane scallop fishery.

Area/District	GHL (lbs scallop meats)	Retained catch (lbs scallop meats)
Yakutat Area D	160,000	156,412
Yakutat District 16	25,000	1,778
Prince William Sound	8,400	8,460
Cook Inlet		
Kodiak Northeast District	65,000	61,107
Kodiak Shelikof District	170,000	136,791
Kodiak Southwest District ^a	25,000	25,110
Dutch Harbor	10,000	5,570
Bering Sea	50,000	50,275
Statewide total	513,400	445,503

^a Exploratory fishery prosecuted under ADF&G Commissioner's Permit

2.1.3 Registration Areas

The State of Alaska Scallop Fishery Management Plan established 9 scallop registration areas in Alaska for vessels commercially fishing scallops (Figure 2-1). These include the Southeastern Alaska Registration Area (Area A); Yakutat Registration Area (Area D and District 16); Prince William Sound Registration Area (Area E); Cook Inlet Registration Area (Area H); Kodiak Registration Area (Area K), which is subdivided into the Northeast, Shelikof and Semidi Districts; Alaska Peninsula Registration Area (Area M); Dutch Harbor Registration Area (Area O); Bering Sea Registration Area (Area Q); and Adak

Registration Area (Area R). Scallop seasons have never been opened in Area A, and effort occurred in Area R during 1995 only.

2.1.4 Seasons

The regulatory fishing season for weathervane scallops in Alaska is July 1 through February 15 except in the Cook Inlet Registration Area. In the Kamishak District of Cook Inlet, the season is August 15 through October 31, and in all other districts of Cook Inlet, the season is from January 1 through December 31 under conditions of an exploratory permit. Scallop fishing in any registration area in the state may be closed by emergency order prior to the end of the regulatory season. Scallop GHLs and CBLs are typically announced by ADF&G approximately one month prior to the season opening date.

2.1.5 Guideline Harvest Ranges (GHR)

ADF&G manages the fishery by registration areas and districts. Guideline harvest ranges (GHRs) are hard caps established in State of Alaska regulations for each registration area and are not to be exceeded. Guideline harvest limits (GHLs) are pre-season targets set for each fishing area (registration area, district, or statistical area) prior to each season. Total harvest for each fishing area during a given season will typically be near or below the GHL but may exceed it.

Regulatory GHRs for traditional scallop fishing areas were first established by the State of Alaska in 1993 under the Interim Management Plan for Commercial Scallop Fisheries in Alaska. Regulatory GHRs (lbs of shucked scallop meats) were set at 0–250,000 lbs. for Yakutat, 0–50,000 lbs. for Prince William Sound, 0–20,000 lbs for the Kamishak District of Cook Inlet, 0–400,000 lbs for Kodiak, and 0–170,000 lbs for Dutch Harbor. These area GHR ceilings were determined by averaging historic catches from 1969 to 1992 excluding years when there was no fishing or a “fishing-up effect” occurred (Barnhart, 2003).

Prior to the August 1, 1996 re-opening of the weathervane scallop fishery, the State of Alaska established GHRs for non-traditional registration areas, including 0–200,000 lbs for the Alaska Peninsula, 0–600,000 lbs for the Bering Sea, 0–35,000 lbs for District 16, and 0–75,000 lbs for Adak. The combined total of the upper limits from traditional and non-traditional areas was 1.8 million lbs, which was defined as maximum sustainable yield (MSY) in Amendment 1 to the federal FMP.

In 1998, the scallop plan team recommended a more conservative definition of MSY. Based on average landings from 1990–1997 excluding 1995 when the fishery was closed for most of the year, MSY was subsequently established in Amendment 6 of the FMP at 1.24 million lbs, with optimum yield defined as the range 0–1.24 million pounds. To accommodate the new definition, regulatory GHR ceilings were reduced by the State of Alaska from 400,000 to 300,000 lbs for Kodiak, from 170,000 to 110,000 for Dutch Harbor, and from 600,000 to 400,000 lbs for the Bering Sea. Hence, MSY and the regulatory GHR ceiling written into Alaska law are both 1.24 million lbs.

2.1.6 Inseason data

Observers that are required on all vessels fishing for scallops in Alaska outside Cook Inlet monitor the fishery during the season and transmit data to ADF&G at least thrice weekly. Fishing may be closed in any area before the GHL is reached due to concerns about localized depletion, trends in CPUE, or bycatch rates. Inseason data are also used by the scallop industry to avoid areas of high bycatch.

2.2 Stock Assessments and GHLS

Management of the Alaska scallop fishery is handled by ADF&G biologists from the three regions where scallop fishing occurs. In general, the state's approach to management is conservative, with large areas known to contain scallops closed to fishing (see Section 0) and onboard observers required on all vessels operating outside Cook Inlet.

Dredge surveys are conducted only in Central Region and data are used to set GHLS for Kayak Island (Area E) and Cook Inlet (Area H). Scallop observer program data are the primary information source for setting GHLS in all other areas. These data consist of time series of scallop harvest and fishing effort, including catch per unit effort (CPUE), fishing locations, size structure of the catch, discard of scallops, and crab bycatch. Spatially explicit catch and effort data that cannot be displayed in the SAFE report due to State of Alaska confidentiality requirements are examined by ADF&G staff each year when GHLS are set.

ADF&G and the SPT recognize inherent weaknesses in using fishery data for management purposes. CPUE may be an unreliable index of scallop abundance due to factors such as market conditions, weather on the grounds, tides, gear efficiency, bycatch avoidance, captain and crew performance, etc. Industry participants have noted that the time of year when fishing occurs can drastically affect CPUE due to differences in weather and sea state between summer and winter. Size composition data from the commercial catch are affected by choice of fishing locations and gear selectivity and hence may not be representative of the true size composition of any scallop population.

ADF&G is developing methodology to survey scallop beds with a towed imaging system, ADF&G CamSled (Rosenkranz et al, 2008). Currently, efforts are focused on collection of baseline data from primary fishing areas in the Gulf of Alaska (GOA), training personnel to operate the equipment, manual review of images, and statistical techniques for abundance estimation. Fieldwork planned for 2010 includes an NPRB-funded project examining Tanner crab habitat in the Kodiak vicinity and a survey of Kodiak scallop beds on a chartered industry vessel. Due to the large volumes of data collected, another priority is a workshop on computer processing of benthic image data tentatively planned for Kodiak in 2013.

2.2.1 Southeast Alaska Region

No regular assessment surveys are conducted in the Southeast Alaska Region.

Management of the fishery relies solely on fishery dependent data. Separate GHLS are assigned for Area D and District 16, both of which fall into Scallop Registration Area D (Yakutat). Southeast shellfish management staff meets annually with the scallop biometrician to go over his analysis of the most recent scallop observer data. Data considered when adjusting GHLS include: total harvest and CPUE for the entire registration area; total harvest and CPUE by scallop bed; daily CPUE versus cumulative catch in each bed where effort occurred; shell height histograms for Area D and District 16; and Tanner crab bycatch for the entire registration area. The GHLS are set prior to each fishing season based on these data. There are no crab bycatch limits in Scallop Registration Area D. The fishery is managed by Joe Stratman (Petersburg office) and Adam Messmer (Douglas office).

2.2.2 Central Region

ADF&G conducts biennial dredge surveys for weathervane scallops in the Kamishak District of the Cook Inlet Management Area and near Kayak Island in the Prince William Sound Management Area (Add fig refs here). Data from these surveys are used to set guideline harvest limits (GHLS) for two scallop beds at each location. In the Kamishak District fishery, observers are not required, but vessels are limited to a single 6 ft dredge, and ADF&G staff is regularly deployed as observers when fishing occurs. The Cook

Inlet fishery is managed by Charlie Trowbridge from the Homer office and the Kayak Island fishery is managed by Maria Wessel from the Cordova office and Charlie Trowbridge from the Homer office.

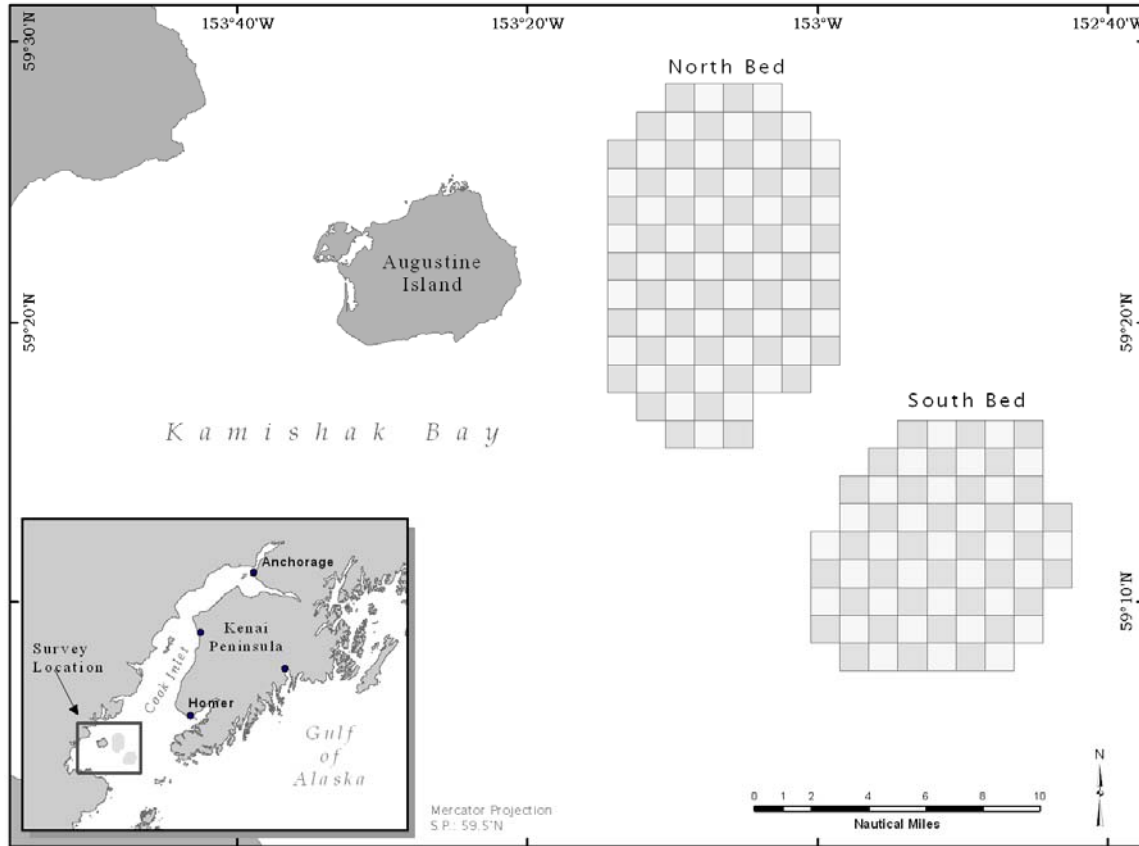


Figure 2-4 Location of main scallop beds in Kamishak Bay with the delineated edge of each scallop bed and black and white checkerboard sampling grid shown.

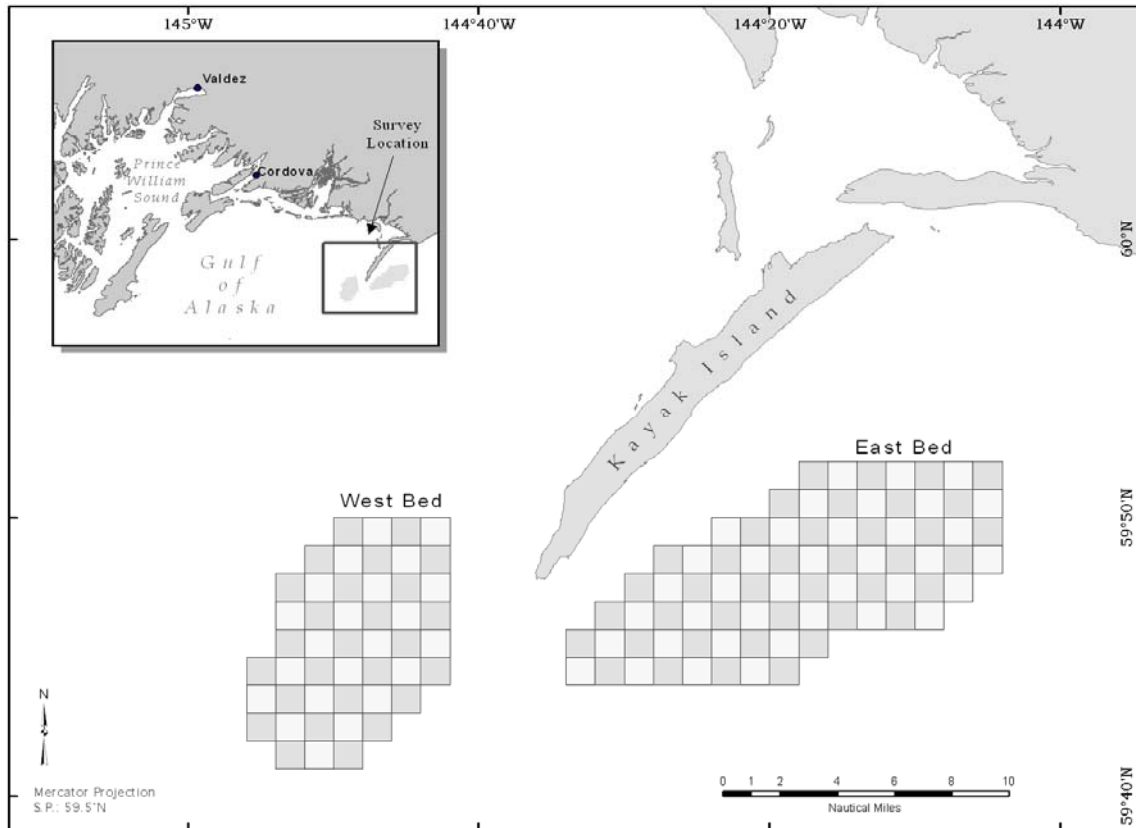


Figure 2-5 Location of main scallop beds at Kayak Island with the delineated edge of each scallop bed and black and white checkerboard sampling grid shown.

2.2.2.1 Surveys through 2006

Central Region conducts fishery independent, area-swept, dredge surveys with a systematic sampling design. From 1996 through 2006, this systematic survey design was accompanied by an adaptation for delineating the edge of the scallop beds. Sampling stations were defined by overlaying a checker-board grid of 1,855 m² (1.0 nmi²) squares over a chart of the study area (Figure 2-4 and Figure 2-5). A systematic design was used in which every other station was designated for sampling after the primary sampling unit (light or dark squares) was randomly selected to give an equal probability of selecting either set of grid cells. The vessel skipper, in cooperation with the project leader, determined the specific tow location within each sample station. The dredge was towed for a distance of approximately 1,855 m (1.0 nmi) within the sample station. To delineate the scallop bed margin, stations (light or dark) were added diagonally when catches along the edge of the initial sampled stations exceeded a threshold level of 9.1kb (20 lb). The edge of a scallop bed was considered delineated when catch in a given station was below the threshold amount.

2.2.2.2 Surveys since 2007

The 2007 Kamishak Bay and 2008 Kayak Island surveys were set to standardized areas, which will continue to be used. The survey designs were done in a manner that enables all previous years of survey data to be standardized and comparable; all historical survey catch data was entered into ARC GIS and, for each year, a polygon was drawn around all stations where the catch exceeded the threshold of 9.1 kg/nm (20 lbs). Ancillary stations will be conducted outside these standardized areas to look for changes in bed size or shape. Central Region staff has also developed a sled-dredge, which is analogous to the video sled used by the statewide scallop program in Kodiak; however, instead of only allowing for video

and counts to be made, this sled has a pinning system on the back to allow for an ~6' wide dredge setup to be attached. The sled-dredge setup allows for video cameras to look forward and aft to obtain counts of scallops before the sled reaches them and looking aft at the foot of the dredge bag to examine the efficiency of the gear (i.e. how many scallops go in vs. under the dredge) and collects scallops for obtaining data on shell height, age and meat weight, which are critical to pursuing an age-structured model and for setting the GHL's at Kayak Island and in Kamishak Bay. The sled-dredge continues to undergo field tests with the goal of comparing catches to the 8' dredge and eventually replacing the 8' dredge with the sled dredge for all scallop surveys in Central Region.

2.2.2.3 Guideline Harvest Levels (GHLs) in Central Region

Regular assessments have been conducted biennially on Central Region scallop beds at Kamishak Bay and at Kayak Island since 1996. Data from the assessments are used to set GHLs which are then in effect for the subsequent two seasons. Following several surveys designed to establish the extent of the beds, the department standardized the survey area for each bed beginning in 2007 for Kamishak and in 2008 for Kayak. The Kayak Island estimate was adjusted using a dredge efficiency of 0.83, which is based upon the relative efficiency from a small amount of dredge/video comparison work conducted in 2004. Comparison between the video sled and the dredge was conducted at Kamishak in 2007 but has not been incorporated into management decisions. The department has applied a 5% harvest rate to the final survey estimates of abundance and used whole weight to meat weight conversions to assign the GHL for each area. Typically, the fishery remains open until the GHL is achieved. However, through its emergency order authority the department may close a season or area in response to declines in CPUE or even apparent die-offs as occurred at Kamishak in 2002. Additionally, in setting GHLs the department may consider such factors as a narrow size or age distribution or truncation of sizes observed within an area.

2.2.3 Westward Region

Regular scallop stock assessment surveys are not conducted in Westward Region. GHLs are set after review of observer data collected during recent seasons. For some areas, GHLs are set by statistical area to spread effort and reduce the likelihood of localized depletion. Management staff also set CPUE benchmarks for some areas prior to the season, and if CPUE falls below the benchmark level during fishing, management staff meets to review inseason observer data and the fishery may be closed or allowed to continue. In all areas, crab bycatch and CPUE are closely monitored during the season, and scallop harvest may be stopped due to high crab bycatch or poor fishery performance. State regulation 5 AAC 39.975(27) defines guideline harvest level (GHL) as the preseason estimated level of allowable fish harvest which will not jeopardize the sustained yield of the fish stocks. In general, ADF&G manages scallops without biomass estimates. Therefore, inseason management should be precautionary given the lack of biomass information. An area, district, section or portion thereof may close to fishing before or after the GHL has been reached if principles of management and conservation dictate such action.

In the Westward Region, stock information consists of previous seasons' fishery data (catch per unit effort or CPUE, retained shell height, discard quantity and discard shell height) and inseason information on CPUE and crab bycatch. CPUE is assumed to decline as the stock declines.

Concern over declining harvest prompted a review of fishery performance. Westward Region implemented a minimum performance standard as part of inseason management assessment. Beginning with the 2003/2004 season ADF&G began establishing minimum performance standards. All major harvest areas now have standards developed.

CPUE is tracked throughout the season by management area and compared to the minimum performance standard. If the inseason cumulative CPUE is less than or equal to the minimum performance standard, at approximately half the upper end of GHL, the fishery may close prior to achieving the upper end of the GHL. If CPUE is higher than the minimum performance standard, the fishery may continue toward the

upper end of the GHL with continued monitoring. This approach is applied to management areas, major beds within management areas and statistical reporting areas, depending upon the level of concern. This approach is used to help guard against localized depletion.

2.3 Fishery

Scallop vessels in the Alaska fishery are 58–124 feet length overall, with maximum 1,200 horsepower. Standard New Bedford style scallop dredges are used in the fishery. On average, a 15-foot dredge weighs a minimum of 2,600 pounds and a 6-foot dredge weighs about 900 pounds. The frame design provides a rigid, fixed dredge opening. Attached to and directly behind the frame is a steel ring bag consisting of 4-inch (inside diameter) rings connected with steel links; 4 inch or larger rings are required by state law. A sweep chain footrope is attached to the bottom of the mesh bag. The top of the bag consists of 6-inch stretched mesh polypropylene netting which helps hold the bag open while the dredge is towed along the ocean floor. A club stick attached to the end of the bag helps maintain the shape of the bag and provides for an attachment point to dump the dredge contents on deck. Steel dredge shoes that are welded onto the lower corners of the frame bear most of the dredge's weight and act as runners, permitting the dredge to move easily along the substrate. Each dredge is attached to the boat by a single steel wire cable operated from a deck winch.

Scallop fishing operations involve the following steps: (a) dredge deployment; (b) dredge towed for 50 to 60 minutes on the bottom at an average speed of 4.7 knots; (c) dredge retrieved; (d) dredge contents emptied on deck; (e) retained scallops sorted from the catch and bycatch discarded overboard; (f) baskets of retained scallops moved from the deck to the shucking area; (g) gear prepared for the next set; (h) gear deployed; and (i) shuck, wash, grade, package and freeze scallop meats. The scallop meat is the single adductor muscle that is removed from the scallop by crew members using specialized hand-held scallop knives. Scallop meats represent approximately 8-12% of the round weight depending on area and season (Barnhart and Rosenkranz, 2003). Scallop meats are graded by size and sold primarily to domestic seafood markets, with a smaller amount going to foreign markets (Kruse et al, 2005).

2.4 Observer Program

The primary purposes of the onboard scallop observer program are to collect biological and fishery data and to monitor bycatch. ADF&G requires observers on all trips of all vessels fishing scallops outside Cook Inlet in both state and federal waters. Observers are briefed and debriefed by ADF&G staff in each management area where fishing occurs prior to and after deployment.

Dredge hauls are sampled to collect data on retained scallop catch, crab and halibut bycatch, scallop discards, and catch composition. Detailed logbooks completed by vessel operators are checked by observers and submitted to ADF&G along with other observer data forms. Observers send summary reports to ADF&G fishery managers thrice weekly or more frequently during the season by radio or email. Data are entered, stored, and maintained by ADF&G staff in Kodiak. Observer data are used for inseason management and in setting seasonal GHLs. Scallop observer data are released to the public in reports prepared by ADF&G (e.g., Rosenkranz and Burt, 2009).

Onboard observer coverage is funded by industry through direct payments to independent contracting agents. Scallop observers are trained at the University of Alaska North Pacific Fisheries Observer Training Center in Anchorage. Observer training and deployment manuals (e.g., ADF&G, 2009) are prepared by ADF&G staff.

Observer cost for vessels limited to a single 6-ft dredge in federal waters was addressed in Amendment 10, section 6.8 of the Scallop FMP. The Council determined that given existing observer requirements

and their associated costs, the single 6-ft dredge restriction created a disproportionate economic hardship when fishing in federal waters (NPFMC, 2004). Amendment 10 allows two vessels to fish with two 10-ft dredges to capture a larger share of the total catch, thus allowing them to offset observer costs and perhaps enhance their economic viability.

2.5 Crab Bycatch Limits

Bycatch of crabs in the scallop fishery is controlled through the use of Crab Bycatch Limits (CBLs) that are based on condition of individual crab stocks. CBLs were first instituted by the state in July 1993. Methods used to determine CBLs in 1993 and 1994 were approved by the BOF and the NPFMC and, with few exceptions, remain unchanged. Annual CBLs are established pre-season by ADF&G for areas with current crab resource abundance information (surveys). For areas without crab abundance estimates, CBLs may be set as a fixed number of crabs that is not adjusted seasonally.

In the Kodiak, Alaska Peninsula, and Dutch Harbor Registration Areas, the CBLs are set at 0.5% or 1.0% of the total crab stock abundance estimate based on the most recent survey data. Statewide CBLs by region are shown in Table 2-4. Information specific to individual regions is indicated in the sections below. In registration areas or districts where red king crab or Tanner crab abundance is sufficient to support a commercial crab fishery, the cap is set at 1.0% of the most recent red king crab or Tanner crab abundance estimate. In registration areas or districts where the red king crab or Tanner crab abundance is insufficient to support a commercial fishery, the CBL is set at 0.5% of the most recent red king crab or Tanner crab abundance estimate. Bycatch caps are expressed in numbers of crabs and include all sizes of crabs caught in the scallop fishery.

In the Kamishak District of the Cook Inlet Registration Area, the Tanner crab bycatch limit is set at 0.5% of the total crab stock abundance from the most recent dredge survey and the red king crab limit is fixed at 60 crabs. In 2001, ADF&G set Tanner crab bycatch caps in the Prince William Sound Registration Area at 0.5% of the Tanner crab population estimate from the 2000 scallop survey. This resulted in bycatch limits of 2,700 and 8,700 for the east and west harvest areas. These levels have remained in place for all subsequent years.

CBLs in the Bering Sea (registration Area Q) have evolved from fixed numbers in 1993 to a three tier approach used in the current fishery. In 1993, Bering Sea CBLs were set by ADF&G to allow the fleet adequate opportunity to explore and harvest scallop stocks while protecting the crab resource. CBLs were established at 260,000 *Chionoecetes* spp. and 17,000 red king crabs. In 1995, ADF&G recommended that CBLs be established at 0.003176 percent of the best available estimate of *C. opilio* (snow crab) and 0.13542 percent of the best available estimate of Tanner crab abundance in Registration Area Q. That equated to about 300,000 snow and 260,000 Tanner crabs based on 1994 crab abundance estimates in Registration area Q. In Amendment 1 of the federal scallop FMP, the NPFMC approved the CBLs established by ADF&G. The NPFMC also recommended that king crab bycatch limits be set within a range of 500 to 3,000 annually. Beginning with the 1996/97 fishing season ADF&G took a conservative approach and set the red king crab limit in Registration Area Q at 500 red king crabs annually.

From the 1996/97 through 1998/99 fishing seasons the CBL for *Chionoecetes* spp. in the Bering Sea was established annually by applying the percentages established for snow and Tanner crab limits in Amendment 1 of the FMP. In 1998, consistent with the Tanner crab rebuilding plan in the Bering Sea, crab bycatch limits were modified.

The current three tier approach was established utilizing the bycatch limits established in Amendment 1 of the FMP, 300,000 snow crabs and 260,000 Tanner crabs. The three tiers include (1) Tanner crab spawning biomass above minimum stock size threshold (MSST); bycatch limit is set at 260,000 crabs, (2)

Tanner crab spawning biomass below MSST; bycatch limit is set at 130,000 crabs, and (3) Tanner crab spawning biomass is below MSST and the commercial fishing season is closed; Tanner crab limit is set at 65,000 crabs. A similar three tier approach was taken with the snow crab bycatch caps. The three tiers include (1) snow crab spawning biomass above the MSST; bycatch limit is set at 300,000 crabs, (2) snow crab spawning biomass below MSST; bycatch limit is set at 150,000 crabs, and (3) snow crab spawning biomass below MSST and the commercial fishing season is closed; the snow crab limit is set at 75,000 crabs.

Table 2-4 Statewide crab bycatch limits in percentage of crab abundance estimates (where available) or number of crabs.

Area/District	Red King Crab	<i>C. bairdi</i>	<i>C. opilio</i>
Yakutat District 16	NE ^a	NE	NA ^b
Yakutat Area D	NE	NE	NA
Prince William Sound	NE	0.5%	NA
Cook Inlet Kamishak District	60 crab	0.5%	NA
Kodiak Northeast District	0.5% or 1.0%	0.5% or 1.0%	NA
Kodiak Shelikof District	0.5% or 1.0%	0.5% or 1.0%	NA
Kodiak Semidi District	NE	NE	NA
Alaska Peninsula	0.5% or 1.0%	0.5% or 1.0%	NA
Bering Sea	500 crab ^c	3 tier approach	3 tier approach
Dutch Harbor	0.5% or 1.0%	0.5% or 1.0%	NA
Adak ^d	50	10,000 crab	NA

^a Not established.

^b Not applicable.

^c Fixed CBL.

^d Bycatch limit established to provide scallop fleet opportunity for exploratory fishing while protecting crab resources.

Bycatch of snow crabs, Tanner crabs, and Bristol Bay red king crabs by scallop fisheries are shown in Table 2-5 and Figure 2-6. Bycatch of snow, king, and Tanner crabs during the Bering Sea scallop fishery tends to be much lower than for other Bering Sea fisheries. Observer data on carapace width for samples crabs by registration area are available in Figure 2-7 through Figure 2-12 for 2010/11 fisheries.

Scallop fishery closures due to attainment of CBLs have decreased over the years, in part due to decreased crab abundance (Barnhart and Rosenkranz, 2003) as well as a voluntary industry cooperative, which provides the fleet additional flexibility to move off of high bycatch areas. ADF&G closely monitors bycatch rates during scallop seasons and has used a rate of one crab per pound of scallop meats as a benchmark since 1993. Bycatch may affect harvest and CPUE in the Bering Sea scallop fishery as vessel operators move or cease fishing when bycatch rates meet or exceed this benchmark.

Table 2-5 Bycatch of *Chionoecetes* crabs by Area/District in the 2010/11 Alaska weathervane scallop fishery.

Area/District	Est number crab	Est weight (lbs) ^a
Yakutat Area D	14,707	113
Yakutat District 16	92	3
Prince William Sound	28	1
Cook Inlet	366	146
Kodiak Northeast District	20,808	3,556
Kodiak Shelikof District	19,126	4,634
Dutch Harbor	901	300
Bering Sea <i>C. bairdi</i>	60,537	20,091
Bering Sea <i>C. opilio</i> and hybrids	18,823	9,975
Statewide total	135,022	38,672

^aWeight estimation for areas outside Cook Inlet uses estimated number crab, carapace width distributions from scallop observer sampling (Figures 2-7–2-12), and statistical CW-weight relationship parameters from NMFS Bering Sea crab research. Cook Inlet estimate is based on sampling weight of crab by ADF&G.

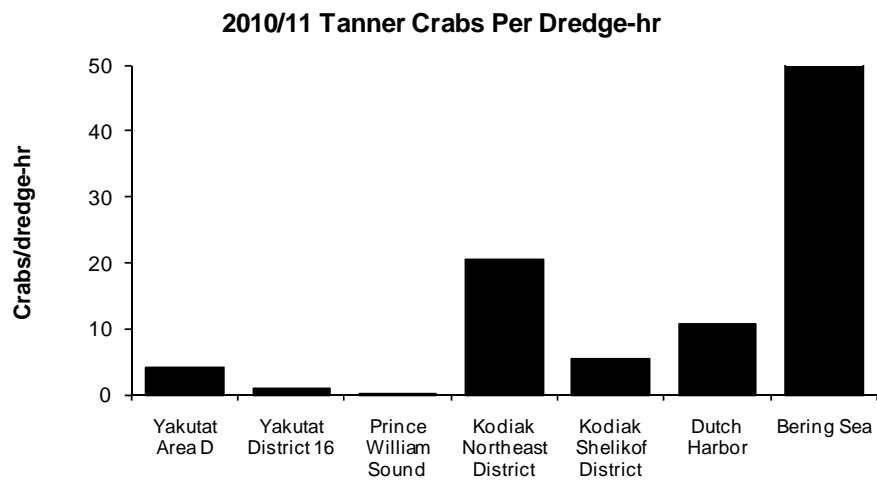
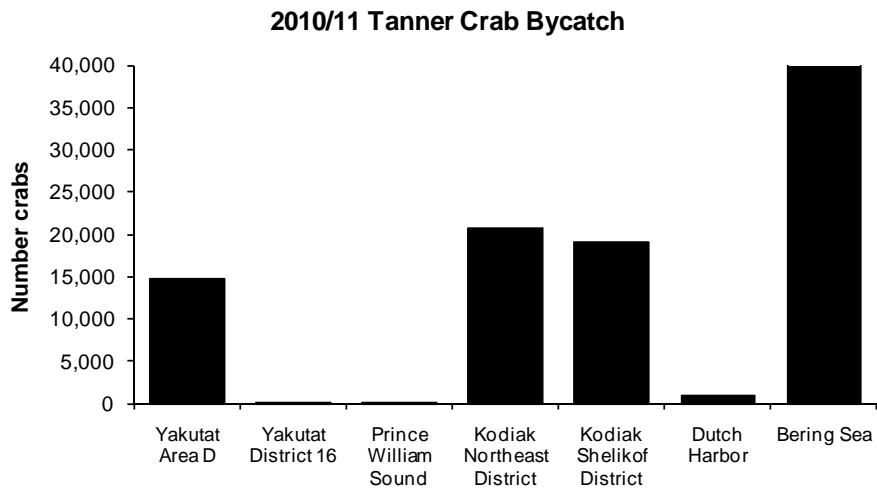


Figure 2-6 Estimated Tanner crab bycatch (top) and bycatch rate (bottom) during the 2010/11 scallop fishing season.

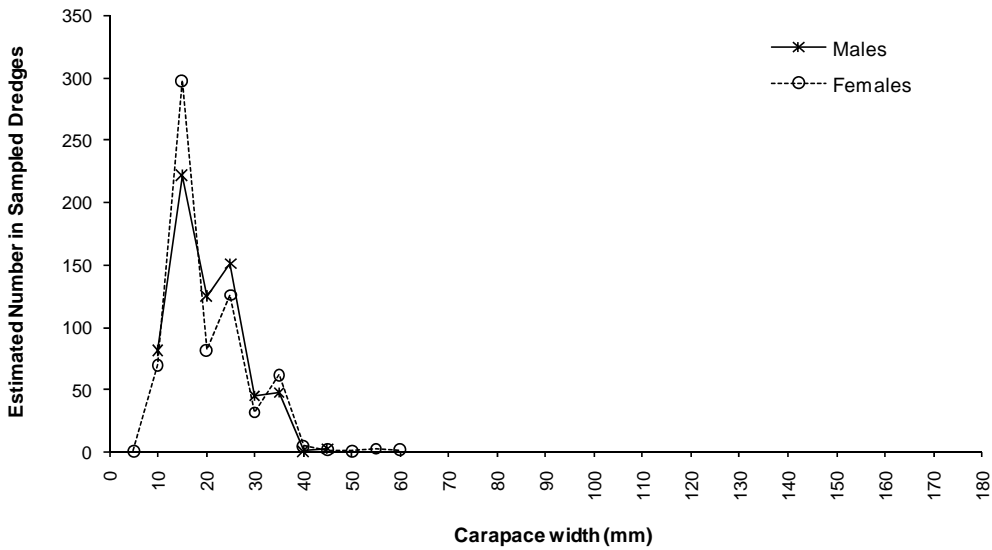


Figure 2-7 Tanner crab carapace width distribution from catch sampling during the 2010/11 Yakutat Area D scallop fishery. Sample sizes were 677 males and 684 females. Nine Tanner crabs <50 mm CW were sampled during the 2010/11 District 16 scallop fishery and no plot was constructed. Similarly, two Tanner crabs <25 mm CW were sampled during the 2010/11 Area E scallop fishery and no plot was constructed.

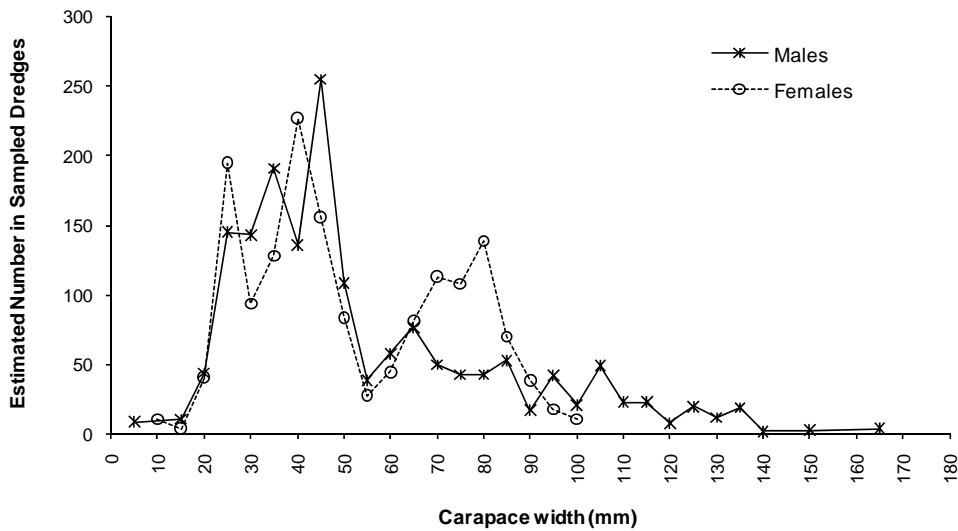


Figure 2-8 Tanner crab carapace width distribution from catch sampling during the 2010/11 Kodiak Northeast District scallop fishery. Sample sizes were 1,649 males and 1,592 females.

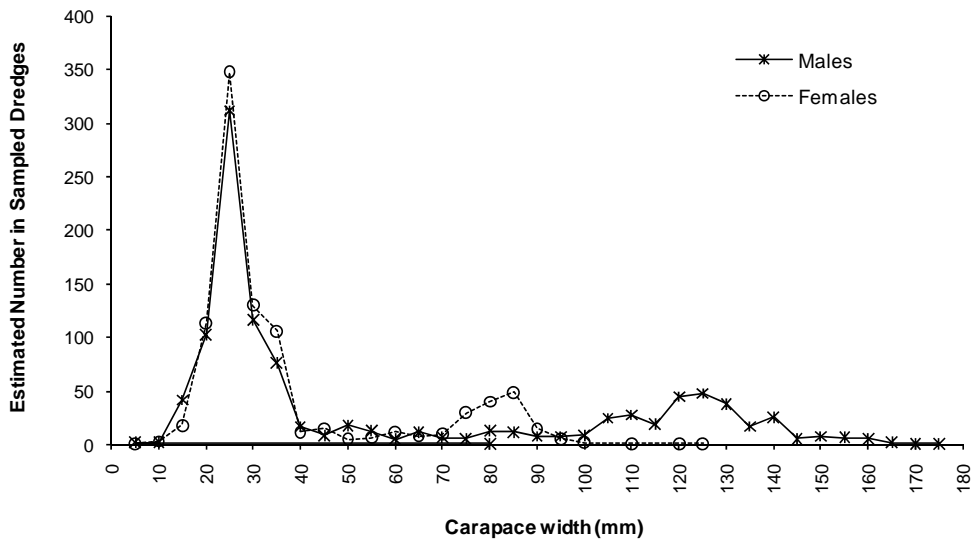


Figure 2-9 Tanner crab carapace width distribution from catch sampling during the 2010/11 Kodiak Shelikof District scallop fishery. Sample sizes were 1,068 males and 934 females.

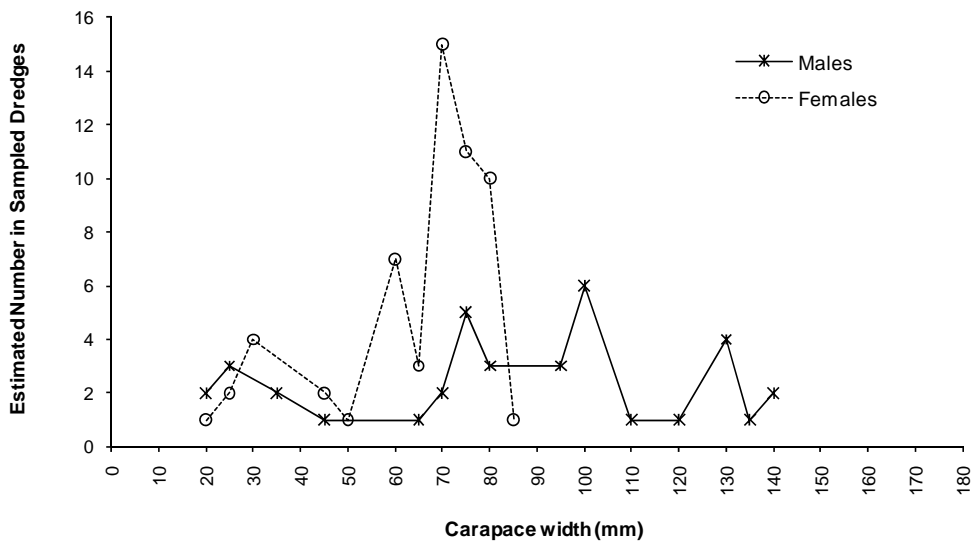


Figure 2-10 Tanner crab carapace width distribution from catch sampling during the 2010/11 Dutch Harbor scallop fishery. Sample sizes were 37 males and 57 females.

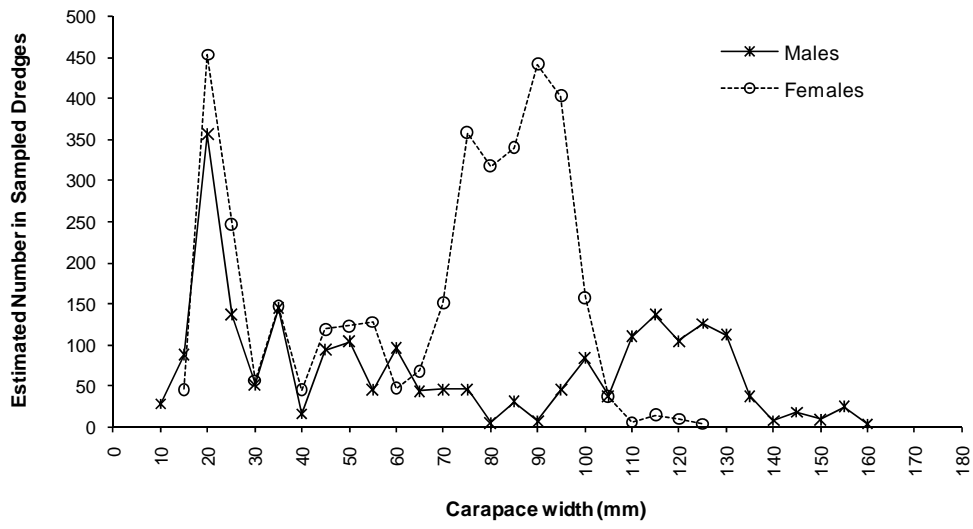


Figure 2-11 Tanner crab carapace width distribution from catch sampling during the 2010/11 Bering Sea scallop fishery. Sample sizes were 2,199 males and 3,722 females.

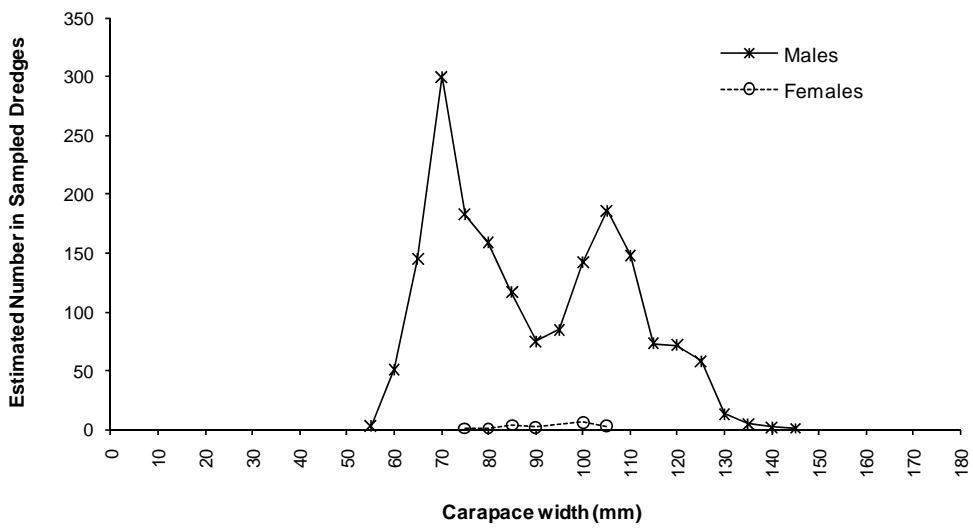


Figure 2-12 Combined snow crab and hybrid snow crab x Tanner crab carapace width distribution from bycatch sampling during the 2010/11 Bering Sea scallop fishery. Sample sizes were 1,818 males and 17 females.

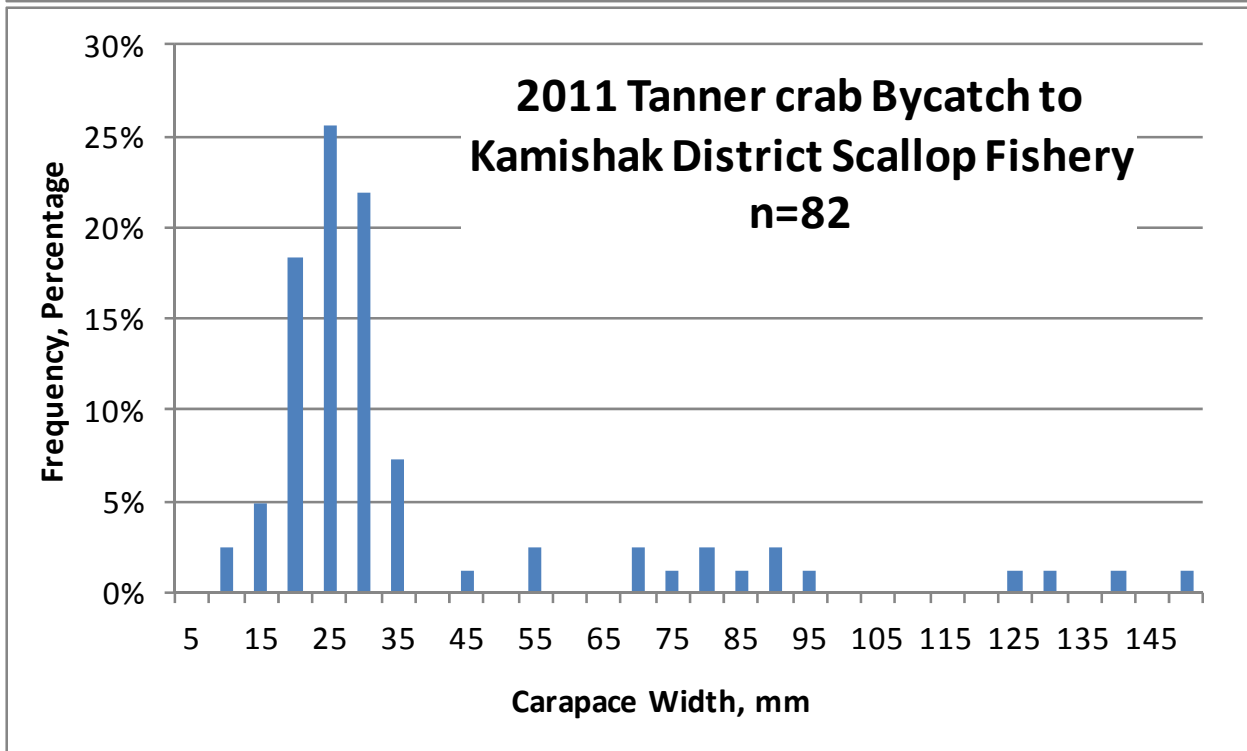
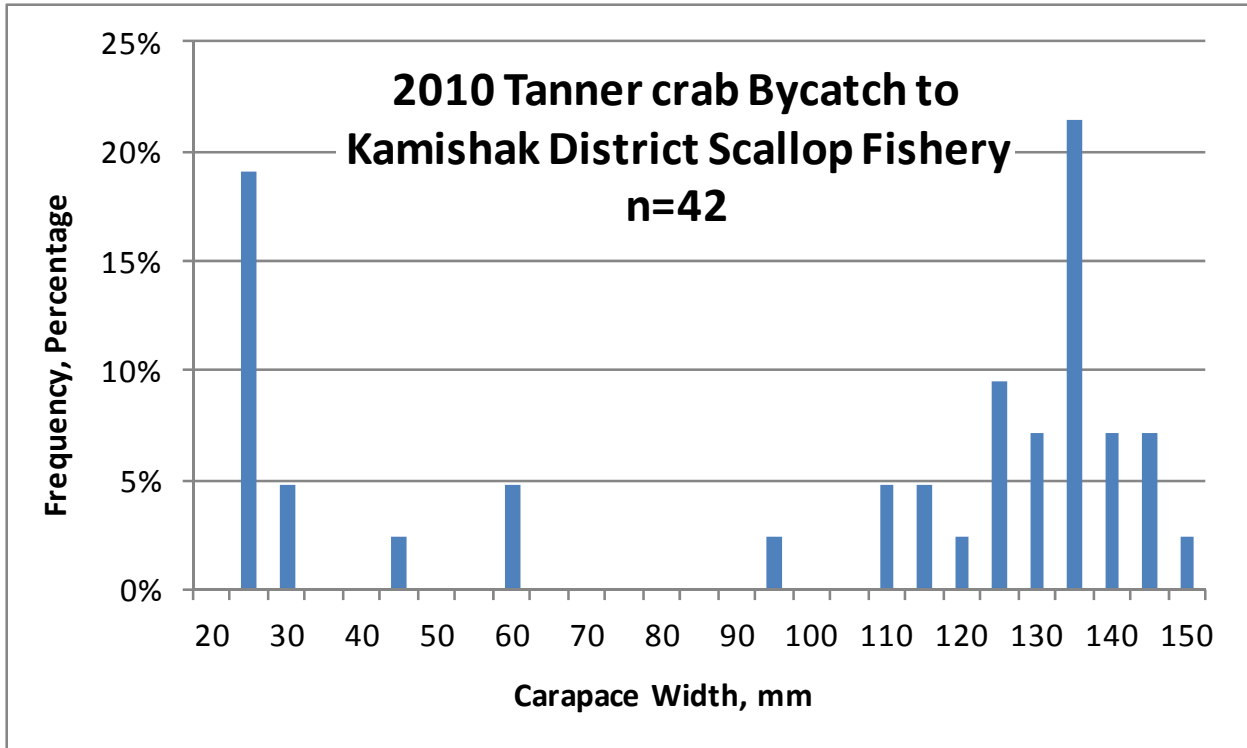


Figure 2-13 Tanner crab bycatch carapace width and frequency in Kamishak District fishery in 2010 (upper) and 2011 (lower)

Scallop License Limitation Program

Commercial weathervane scallop fishing in federal waters off Alaska is limited by a Federal license limitation program (LLP), while participation in state waters (0-3 nautical miles) is limited by a vessel-based limited entry program. The LLP limits participation in the statewide scallop fishery in Federal waters to nine vessels.

The Federal Scallop License Limitation Program became effective in 2001. The NPFMC created the scallop LLP under Amendment 4 to the FMP to limit the number of participants and reduce fishing capacity. The LLP license is required on board any vessel deployed in the weathervane scallop fishery in federal waters off Alaska. NMFS granted 7 vessel owners licenses to fish statewide outside Cook Inlet. Originally, NMFS granted two vessel owners licenses to fish statewide utilizing a single 6-foot dredge. In August, 2005, NMFS implemented Amendment 10 to the FMP, which modified the gear restriction to allow these two licenses to be used on vessels with up to two 10-foot dredges statewide. All 9 licenses allow vessel owners to fish inside Cook Inlet with a single 6-foot dredge. Vessel length is limited to that of the qualifying period. All vessels fishing inside the Cook Inlet Registration Area are limited by state regulation to a single dredge not more than 6 feet in width. Unless otherwise restricted by the LLP, vessels fishing in the remainder of the state may simultaneously operate a maximum of 2 dredges that are 15 feet or less in width.

In 1997, the Alaska legislature approved legislation (AS 16.43.906) establishing a scallop vessel moratorium in state waters. In 2001, the legislature authorized a 3-year extension of the moratorium set to expire July 1, 2004. During the 2002 legislative session, passage of CSHB206 resulted in significant changes to the state's limited entry statutes. The changes authorized use of a vessel-based limited entry program in the weathervane scallop and hair crab fisheries. However, the program has a sunset provision. Under AS 16.43.450-520, the current vessel permit system was set to expire on December 30, 2008 unless statutory authority was extended. Introduced in the 25th Alaska Legislature in January 2007, House Bill 16 would have extended the existing vessel permit system until December 30, 2013. House Bill 16 became locked in committee. It was offered up under Senate Bill 254, where it passed through the legislative process and was signed into law on June 5, 2008. Therefore, the vessel permit system for scallops and hair crab will sunset on December 30, 2013. Eight vessel owners received permits to fish for weathervane scallops in state waters.

Two vessels with multiple LLP permits as well as state vessel-based limited entry permits have harvested most of the scallop catch outside Cook Inlet over the past several seasons. Three vessels 80 feet or less LOA typically participate in the Cook Inlet Registration Area fishery. Occasionally, one or more of these vessels participate in the scallop fishery outside of Cook Inlet. More information on the scallop LLP can be found on the NMFS Alaska Region web page at: <http://www.fakr.noaa.gov/ram/smp.htm>.

2.6 Voluntary Scallop Cooperative

In May 2000, six of the nine LLP owners formed the North Pacific Scallop Cooperative under authority of the Fishermen's Cooperative Marketing Act, 48 Stat. 1213 (1934), 15 U.S.C. Sec. 521. The cooperative is self-regulated and is neither endorsed nor managed by ADF&G or NMFS. The cooperative regulates individual vessel allocations within the GHR and crab bycatch caps under the terms of their cooperative contract. Non-coop vessels are not bound by any contract provisions. The cooperative does not receive an exclusive allocation of the scallop harvest. Some owners opted to remove their boats from the fishery and arranged for their shares to be caught by other members of the cooperative. Since formation of the cooperative, harvest rates have slowed and fishing effort occurs over a longer time period each season.

Vessel owners within the cooperative have taken an active role in reducing crab bycatch. Vessel operators provide confidential in-season fishing information to an independent consulting company contracted by the cooperative. This firm reviews crab bycatch data, fishing locations, and scallop harvest, which allows for real time identification of high crab bycatch areas. When these areas are identified, the fleet is provided with the information and directed to avoid the area. More information on the voluntary scallop cooperative can be found in the EA/RIR/IRFA for Amendment 10 to the Scallop FMP available on the Council website at: www.fakr.noaa.gov/npfmc/analyses/analyses.htm.

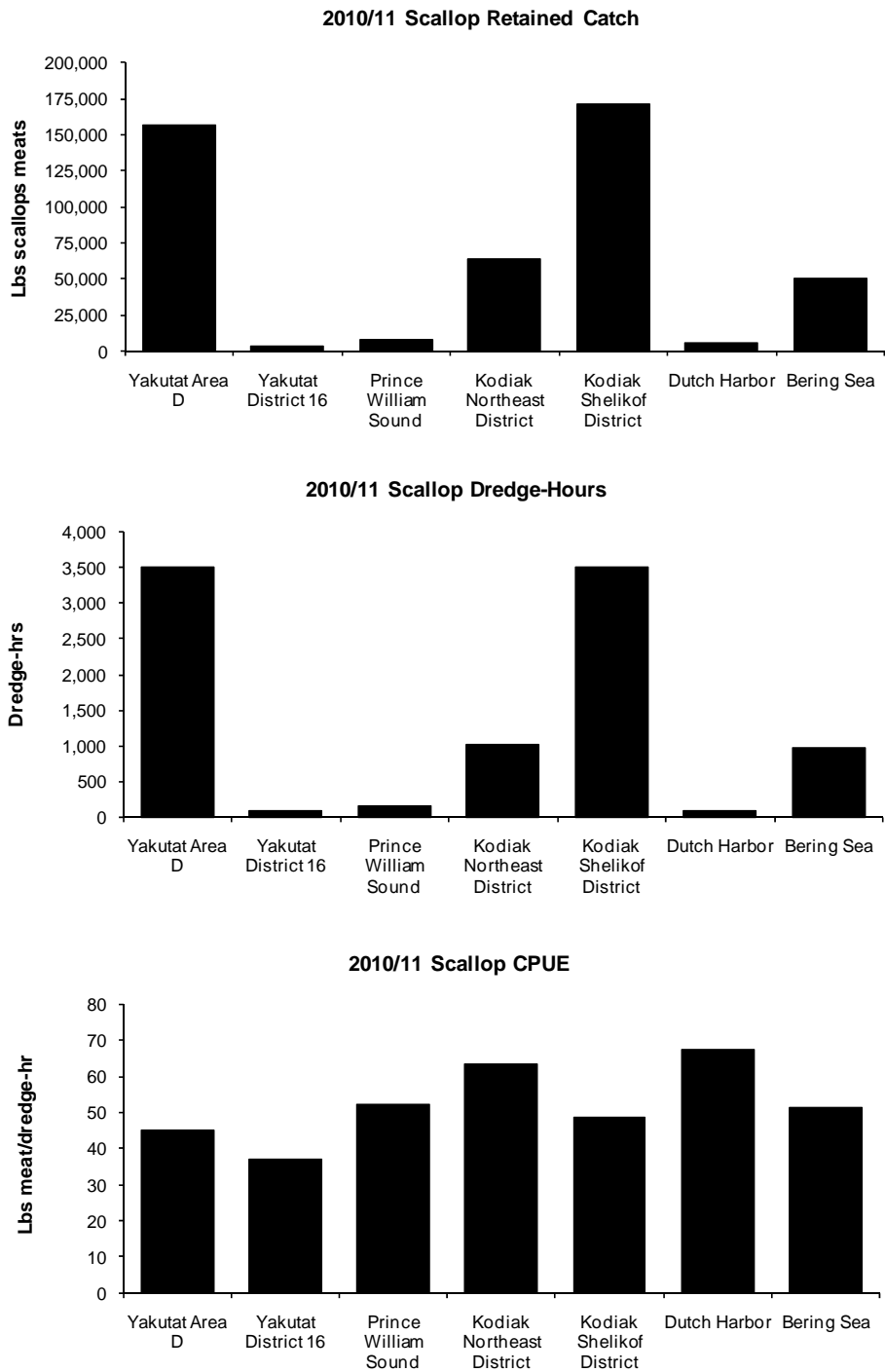


Figure 2-14 Scallop catch (top), dredge-hrs (center), and CPUE (bottom) during the 2010/11 statewide weathervane scallop fishery

3 Stock Status

The following sections provide summaries of recent scallop fishery performance for each registration area. Dredge survey summary data are provided for Prince William Sound and the Cook Inlet Registration Area. In other areas, dredge surveys are not performed. Fishery CPUE and data from the scallop observer program are the primary information sources. ADF&G camera sled image data have been collected in several management areas, but these data have not yet been used for fishery management purposes.

3.1 Yakutat Registration Areas: Area D and District 16

When considering GHLs for the Yakutat scallop fishery, data included fishery, observer and survey information. The GHRs in regulation for scallop harvest are 0 – 35,000 pounds in District 16 [5 AAC 38.168(1)], and 0 – 250,000 pounds in Area D [5 AAC 38.168(2)]. These GHRs were established with implementation of the scallop management plan in the 1993 season and are based on the average historic catch from 1969 to 1992, minus years when no fishery and ‘fishing up effect’ occurs (NPFMC, 2005) Prior to 1980, the harvest was sporadic, averaging 112,000 pounds in the 1970s, 125,000 in the 1980s, and increasing to 377,000 in the 1990s. The peak harvest of 1.1 million pounds occurred in 1992.

Declining catch rates in Area D during the 2000/01 season led to a reduction of the GHL to 200,000 pounds for the Yakutat area beginning in the 2001/02 season (

Table 2-1, Figure 2-14). Catch rates (observer data) during the first several days of fishing in individual beds of Area D were compared between years. A decline in initial catch rates was observed for most beds, and this decline was used as a proxy as a decline in scallop abundance. The GHL was reduced from the upper end of the GHR down to 200,000 pounds as a precautionary measure. For 2001/02 – 2004/05 seasons, the harvest ranged from 87,000 – 161,000 averaging 119,000 pounds. Only in the 2005/06 season was the 200,000-lb GHL reached in Area D, necessitating early season closure by emergency order. Data from this 2005/06 season noted a significantly declining commercial catch rate, poor recruitment in recent seasons, and decreases in the proportion of scallops in excess of 132 mm shell height (Figure 3-1). For these reasons the GHL for Area D was reduced 25% to 150,000 pounds prior to the 2006/07 season. During the 2006/07 season, the GHL in Area D was reached and the area was closed by emergency order.

During this period, the District 16 GHL remained at the upper end of the 0 - 35,000 pound GHR. Harvest in this area ranged from 1,000 – 22,000, averaging 12,000 pounds for the 2001/02 – 2004/05 season period (Table 3-1). Harvest in the 2005/06 season did not reach the GHL of 35,000 pounds. Data from the 2005/06 season noted a significantly declining commercial catch rate, poor recruitment in recent seasons, and decreases in the proportion of scallops in excess of 132 mm shell height (Figure 3-2, Figure 3-3). For these reasons, and since the GHL in the area had not been reached since the late 1990's, the GHL for District 16 was reduced 40% to 21,000 pounds prior to the 2006/07 season. During the 2006/07 season, the GHL in District 16 was not reached.

No adjustments were made to the Area D and District 16 GHLs prior to the 2007/08 season. The observer data compiled from the 2006/07 season noted the following: a shift in effort to one of the beds in Area D; an overall increase in CPUE; anecdotal evidence from industry that scallop meat quality had improved overall; shell height histograms from Area D showed a more evenly distributed age structure in the harvest; and shell height histograms from District 16 showed a harvest made up of smaller scallops than Area D, and some small signs of recruitment. During the 2007/08 season the GHLs for Area D and District 16 were not reached. Again, prior to the 2008/09 season no adjustments were made to the Area D and District 16 GHLs. The observer data compiled from the 2007/08 season noted the following: a shift in effort to two separate beds in Area D; an overall slight decrease in CPUE; shell height histograms from Area D showed a harvest of slightly smaller scallops than the previous season; and the fourth consecutive year of increasing Tanner crab bycatch. During the 2008/09 season, GHLs were reached in both Area D and District 16 and both areas were closed by emergency order.

Adjustments to the GHLs for both Area D and District 16 were made prior to the 2009/10 season. The observer data compiled from the 2008/09 season noted the following: stable catch rates; no evidence of localized depletion within the beds; in Area D, the mode of the shell height histogram was at its largest size in the last eight seasons; in District 16, the mode of the shell height histogram was at its largest size since the 2002/03 season; possible evidence of a larger than average recruitment event in the District 16 shell height histogram; and a drop in Tanner bycatch. An increase of <10% was proposed for Area D to take advantage of large, high quality scallops harvested in the area, and no evidence of localized depletion or declining catch rates since the last GHL adjustment prior to the 2006/07 season. In District 16, an increase of 20% was proposed to take advantage of large, high quality scallops harvested in the area and also evidence of a larger than average recruitment event, and no evidence of localized depletion or declining catch rates since the last GHL adjustment prior to the 2006/07 season. The GHLs were set at 160,000 pounds for Area D, and 25,000 pounds for District 16. During the 2009/10 season, the GHL was reached in Area D and the area was closed by emergency order, but the GHL in District 16 was not reached. Observer data from the 2009/10 season indicated stable catch rates, no evidence of localized depletion in 5 out of 6 beds, a shift of effort within Area D, and a sharp increase in Tanner bycatch. Prior to the 2010/11 season, no adjustments were made to the Area D and District 16 GHLs and they remained 160,000 pounds for Area D and 25,000 pounds for District 16. During the 2010/11 season the GHLs for Area D and District 16 were not reached.

Prior to the 2010/11 season, GHUs were set at 160,000 lbs scallop meats for Area D and 25,000 lbs for District 16 (D16). Three Alaska Scallop Association (industry cooperative) vessels fished the area, harvesting 156,984 lbs of scallop meats from Area D with CPUE 45 lbs meats/dredge-hr and 3,062 lbs of scallop meats from District 16 with CPUE 37 lbs meats/dredge-hr (Table 3-1 and Figure 3-1).

Onboard observers recorded over 16,000 SH measurements of retained and discarded scallops in Area D and 480 in D16 during the 2010/11 season. Plots from resampling Area D data (Figure 3-2) show a broader range of scallop sizes in the 2010/11 catch than in earlier years, with most retained scallops in the 115–145 mm SH range. District 16 plots (Figure 3-4) show a high discard proportion during 2010/11 with few scallops >130 mm SH encountered in the fishery.

Observers sampled catch and bycatch from 449 of the 2,074 total scallop tows made during the 2010/11 Yakutat fishery. From these data, an estimated 606,527 lbs whole scallops were discarded and 2,085,600 lbs were retained, for an estimated discard rate of 22.5% of the total whole scallop catch. Average estimated Yakutat scallop discard for the 2000/01–2009/10 seasons was 454,300 lbs or 17.8% of total catch. Variation in discard proportion during recent seasons is apparent in SH plots from resampling (Figure 3-2).

Bycatch estimates calculated from 2010/11 Area D observer samples were 14,707 Tanner crabs (95% C.I. 10,183–20,670), 24 Dungeness crabs, and 135 halibut. Estimates for D16 were 92 Tanner crabs, 17 halibut, and no Dungeness crabs. Estimated Yakutat Tanner crab bycatch for 2010/11 (Figure 11) was the highest recorded in recent seasons at about 14,800 crabs. Average carapace width (CW) of Tanner crabs sampled by observers was 20 mm, with the largest individual encountered measuring 61 mm CW.

Table 3-1 Yakutat Area D scallop fishery summary statistics.

Season	Number vessels	GHL (lbs meat)	Catch (lbs meat)	Dredge hours ^a	CPUE (lbs meat per dredge hr)	Scallop Discards (lbs whole) ^a
1993/94	7	250,000	139,057	1,999	70	
1994/95	10	250,000	246,862	4,130	60	
1995/96	8	250,000	237,417	4,730	50	
1996/97	4	250,000	238,736	4,438	54	295,933
1997/98	4	250,000	243,810	3,956	62	299,843
1998/99	8	250,000	242,929	4,154	58	271,506
1999/00	3	250,000	249,681	3,840	65	533,172
2000/01	3	250,000	195,699	4,241	46	588,981
2001/02	2	200,000	103,800	2,406	43	272,300
2002/03	2	200,000	122,718	2,439	50	358,200
2003/04	2	200,000	160,918	3,360	48	392,993
2004/05	2	200,000	86,950	2,132	41	219,107
2005/06	2	200,000	199,351	5,089	39	395,686
2006/07	2	150,000	150,041	2,817	53	380,250
2007/08	2	150,000	125,960	2,601	48	520,017
2008/09	3	150,000	150,289	3,286	46	416,807
2009/10	2	160,000	158,225	3,919	40	622,055
2010/11	3	160,000	156,984	3,495	45	578,494
2011/12 ^b		160,000	156,412			

^a Whole lbs estimated from observer samples; meat recovery from whole scallops varies from 7–12%; estimates of discard mortality are not currently available.

^b PRELIMINARY 2011/2012 catch data subject to change.

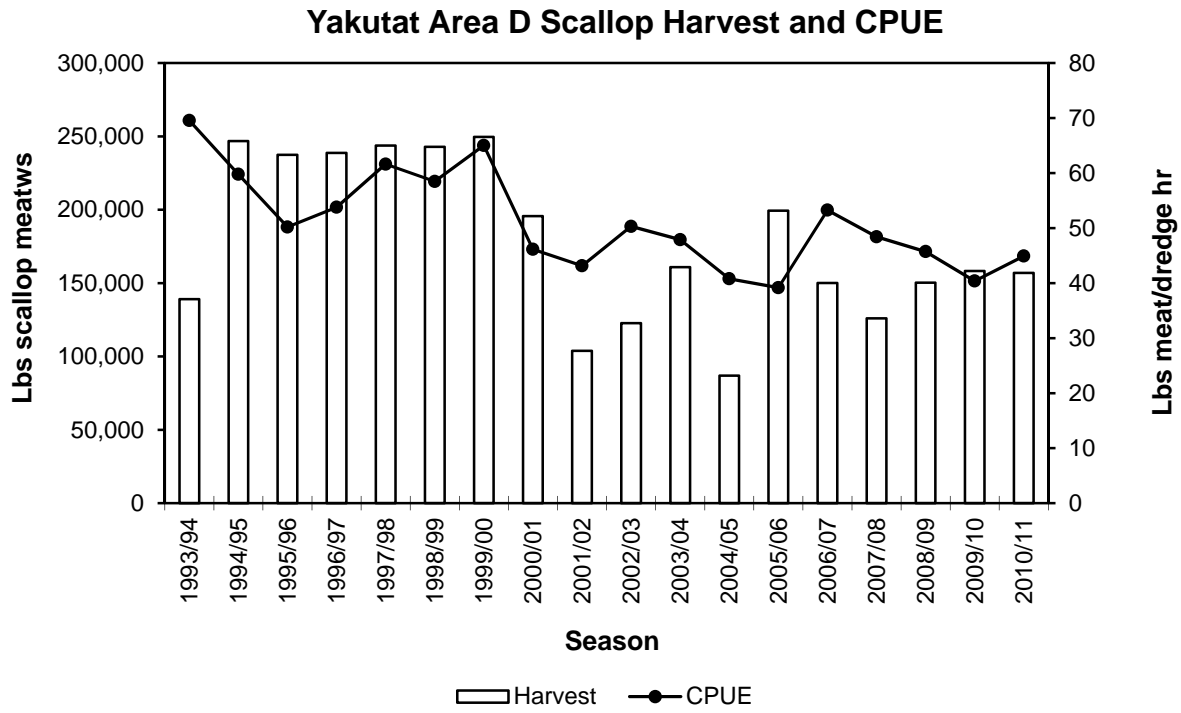


Figure 3-1 Yakutat Area D Scallop Harvest and CPUE, 1993/94-2010/11 seasons.

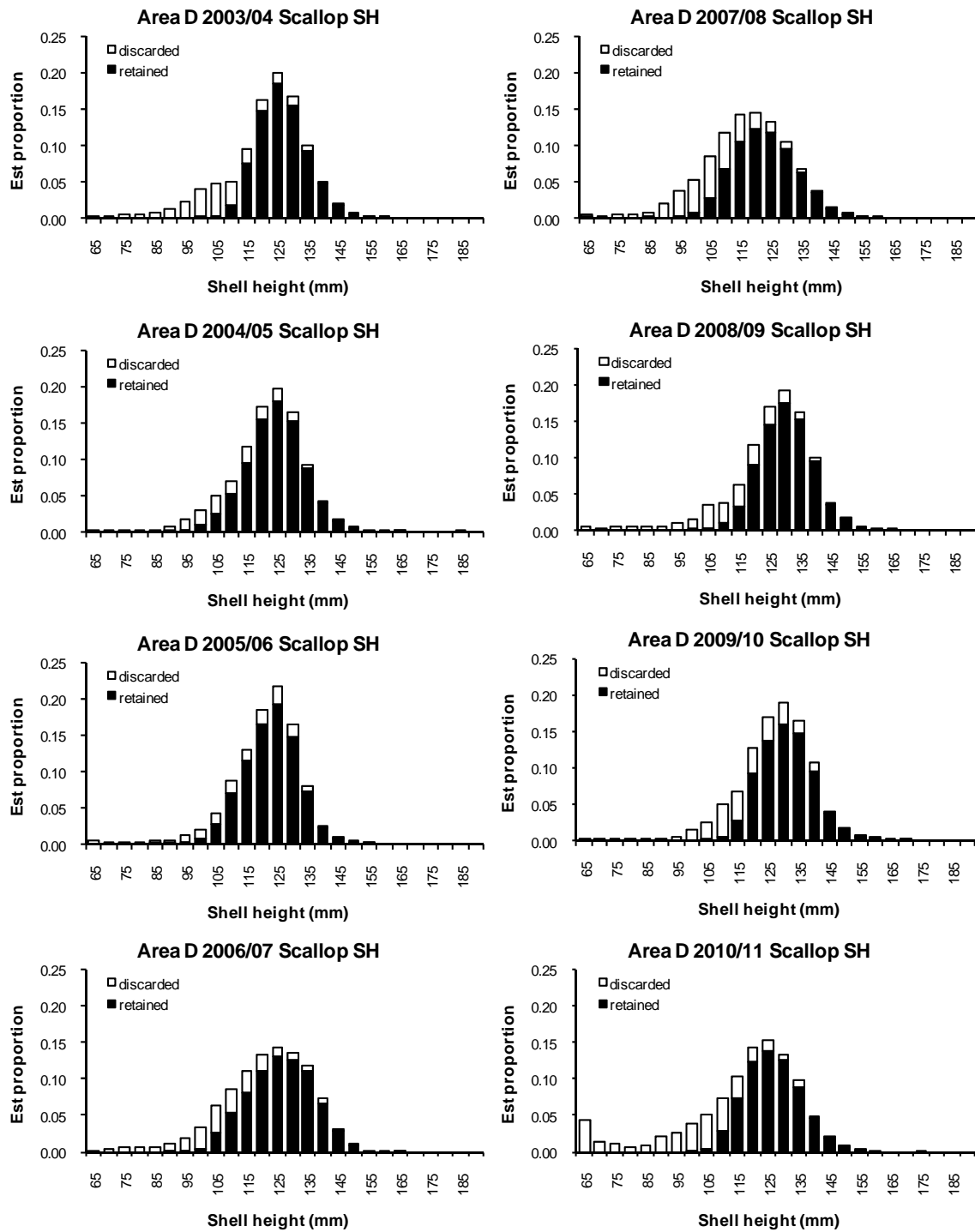


Figure 3-2 Estimated scallop shell height distributions from the 2000/01—2010/11 Yakutat Area D fishing seasons.

Table 3-2 Yakutat District 16 scallop fishery summary statistics.

Season	Number vessels	GHL (lbs meat)	Catch (lbs meat)	Dredge hours ^a	CPUE (lbs meat per dredge hr)	Scallop Discards (lbs whole) ^a
1993/94	1	35,000	NA			
1994/95	7	35,000	33,302	408	54	
1995/96	6	35,000	34,060	1,095	30	
1996/97	2	35,000	22,020	917	37	159,899
1997/98	4	35,000	34,153	561	39	32,764
1998/99	2	35,000	34,624	702	49	25,292
1999/00	2	35,000	30,904	674	51	57,718
2000/01	3	35,000	20,398	476	65	51,221
2001/02	2	35,000	3,685	417	49	48,879
2002/03	2	35,000	1,072	100	37	12,662
2003/04	2	35,000	24,430	18	60	1,079
2004/05	2	35,000	13,650	419	58	19,908
2005/06	2	35,000	13,445	407	34	35,791
2006/07	2	21,000	180	309	44	24,898
2007/08	1	21,000	20,986	6	30	2,020
2008/09	2	21,000	11,637	423	50	75,471
2009/10	2	25,000	3,062	437	27	104,634
2010/11	1	25,000	1,778	83	37	28,033
2011/12 ^b		25,000	22,226			

^a Whole lbs estimated from observer samples; meat recovery from whole scallops varies from 7–12%; estimates of discard mortality are not currently available.

^b PRELIMINARY 2011/2012 catch data subject to change..

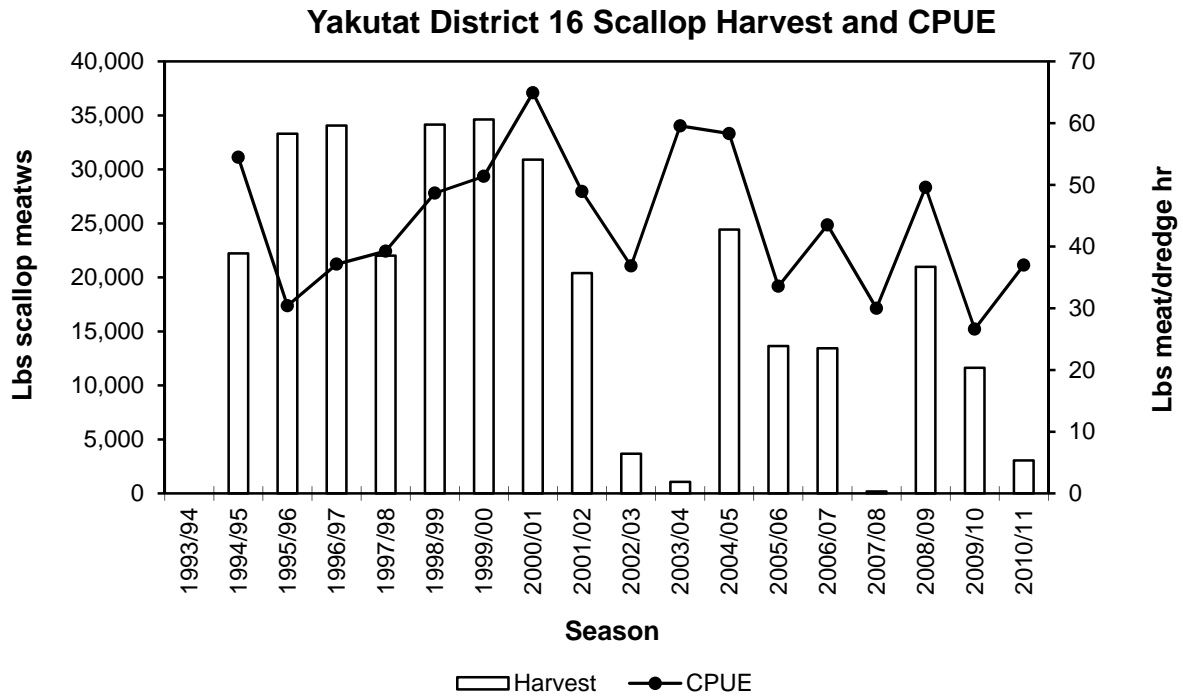


Figure 3-3 Yakutat District 16 Scallop Harvest and CPUE, 1993/94—2010/11 seasons.

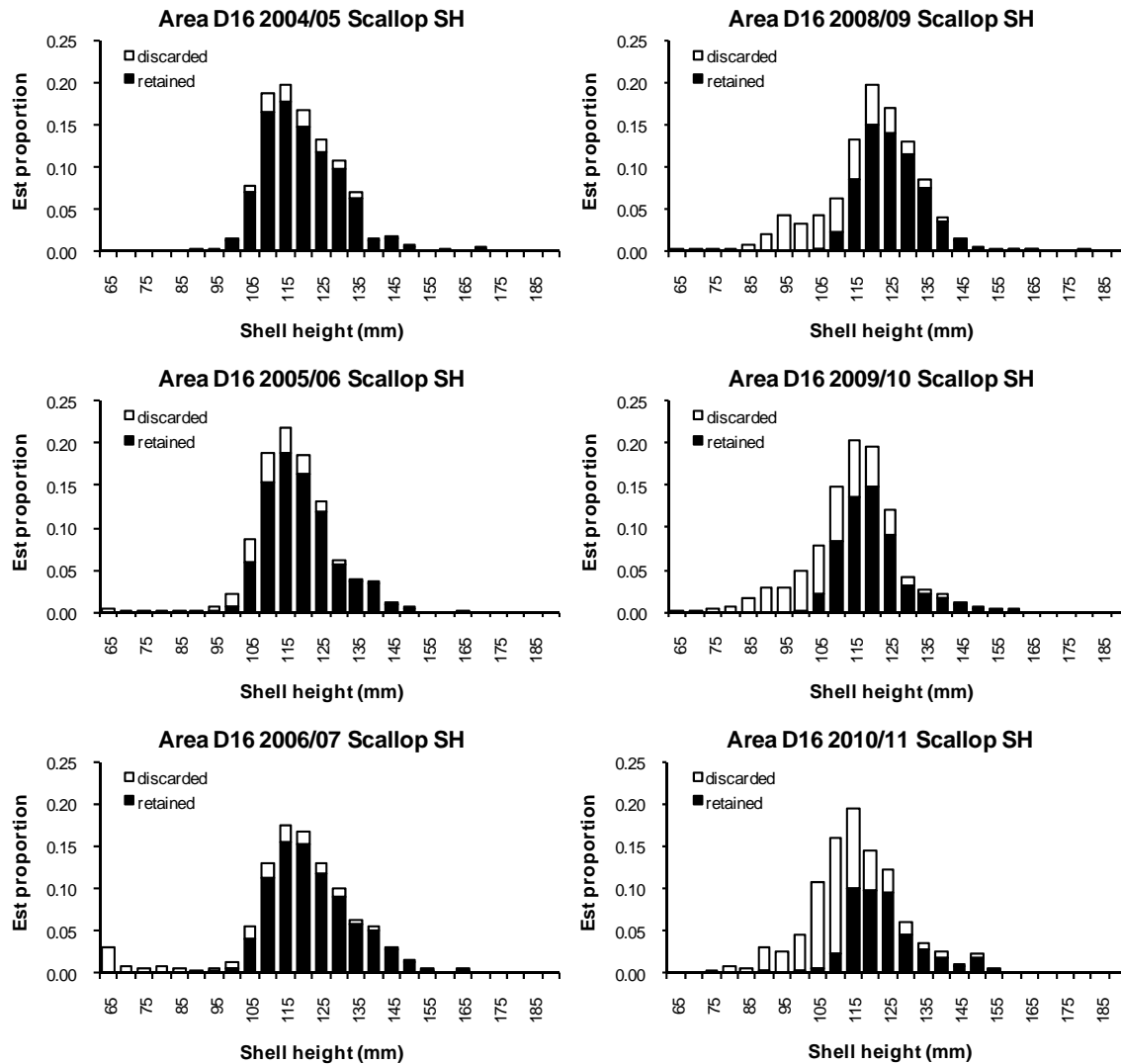


Figure 3-4 Estimated scallop shell height distributions from the 1999/00—2010/11 Yakutat District 16 fishing seasons. No 2003/04 plot was created due to small samples size.

3.2 Prince William Sound Registration Area

Scallop dredge surveys are conducted biennially in the Prince William Sound Registration Area (Area E) near Kayak Island (Figure 2-1 and Table 3-3). In 2010, the survey was set to a standardized area. Additional ancillary stations were added in the eastern boundary of the East bed corresponding to where the fishery occurred in 2009-10 season to the Cape Suckling boundary of the PWS Management Area. However high seas and a failure of a seal on the dredge winch caused an incomplete survey of the East bed and ancillary stations were not sampled. In May and July a total of 38 successful 1nm dredge tows were made during the 2010 Kayak Island survey (12 in the East bed and 26 in the West bed with three ancillary stations). May 8-10 the West bed was surveyed and a series of large storms with forecast winds in excess of 50 knots resulted in postponing surveying the East bed until July. Abundance and biomass estimates from all Kayak Island surveys are given in Table 3-3

Catch in the west bed was 1,520 weathervane scallops weighing 260 kg (572 lb). Catch abundance ranged from 0 to 266 scallops/nm resulting in a mean among all stations of 55 scallops/nm. Standardized catches by weight ranged from 0 to 93.0 kg/nm (205.1 lb/nm) with a mean catch among all stations used for the estimate of 9.1 kg/nm (20.0lb/nm). The West bed abundance estimate was 2 million scallops and was a 49% decrease from the 2008 abundance estimate and considerably less than the estimates of previous biennial surveys. Survey results further indicate a change in age structure of the stock from 21% age seven and under in 2006 to 55% age seven and under in 2010. While potential recruitment to the fishery is a positive note for future years, scallops age seven and under would likely be discarded in the commercial fishery due to small size. The above biological information, combined with a declining trend of catch per unit effort (CPUE) in the commercial fishery since 2003, causes the department to have concerns for the sustainability of the Kayak Island scallop fishery. Therefore waters the West bed closed for the 2010 and 2011 seasons.

In July high seas and mechanical winch problems were encountered resulting in only 12 stations sampled with none of the eastern ancillary stations were not sampled. Since the sampled stations East bed were located mainly on the outer edge of the bed abundance and biomass estimates were not presented for 2010. Total catch was 1,733 weathervane scallops weighing 425 kg (936936.4 lb). Standardized catch abundance ranged from 5.7 to 646.7 scallops/nm resulting in a mean among all stations of 142.7scallops/nm. Standardized catches by weight ranged from 0.1kg (0.3 lb/nm) to 192.3 kg/nm (424.0 lb/nm) with a mean catch among all stations fished of 34.9 kg/nm (76.9 lb/nm).. Age data from sampled stations indicate a tri-modal distribution with prominent classes occurring at three, 10 and 18 years (Figure RG B) **Error! Reference source not found.**). These age data track well with previous assessments and indicate potential recruitment to the fishery, reproductive age classes, and older age classes that are of a marketable size. Estimates of scallop abundance from previous surveys indicate a declining trend from 26,000 lb for the 2004/05 season to 15,000 lb for the 2008/09 season. In addition, logbook data from the observed commercial fishery indicate a declining trend of catch per unit effort (CPUE) since the 2005/06 season. The CPUE in this area declined 44% from the 2008/09 to the 2009/10 season. The department was concerned with the declining trend in CPUE in both the fishery and assessment surveys. However, the department determined that there is a harvestable surplus. Reducing the previous east side GHL of 15,000 lb by the 44% decline in fishery CPUE yields an allowable harvest of 8,400 pounds for the 2010-11 season. The next survey is scheduled for spring 2012.

Preliminary efforts using underwater video techniques to evaluate survey dredge efficiency in 2004 provided a mean gear efficiency coefficient of 0.83, which has been applied since 2006 (Table 3-3) The goal is to further assess dredge efficiency, thereby increasing accuracy of survey abundance and biomass estimates resulting in more appropriate harvest limits (by using a value less than one).

Weak Meats: During the 2009 Scallop Plan Team Meeting “weak meats” were discussed. Weak meats are characterized by adductor muscle coming off the shell when the viscera are pulled off the shell in the shucking process. These meats are off color, with a stringy consistency that makes them unacceptable for marketing by the industry. In the 2010 meeting representatives of the industry mention finding scallops with weak meats in Kayak Island fishery. To address this problem sampling for weak meats was incorporated in to our age-height-sexual maturity sampling protocols. Weak meats were found in 2.5% of scallops sampled in the West bed and 5.8% in the East bed.

Sled-dredge: The sled-dredge continues to undergo field tests with the goal of comparing catches to the 8’ dredge and eventually replacing the 8’ dredge with the sled dredge for all scallop surveys in Central Region.

Fishery overview: A guideline harvest level of 8,400 lbs of scallop meats was set for Area E east of Kayak Island prior to the 2010/11 season. Fishing was not opened in the section west of Kayak Island due to concerns about low scallop abundance levels. Additionally, start of fishing was delayed to August 16,

2010 from the normal opening date of July 1 by technical difficulties encountered during assessment survey work.

One vessel fished the open area 18 August through 22 August 2010, making 101 tows to harvest 8,442 lbs of scallop meats. CPUE was 52 lbs scallop meats/dredge-hr, up from 44 lbs meat/dredge-hr in 2009/10. CPUE remained well below the 1999/2000–2009/10 average of 83 lbs meat/dredge-hr.

The observer sampled 24 of 101 tows made during the 2010/11 season. Using these data, estimates were 130,075 lbs of whole scallops retained and 9,378 lbs whole scallops discarded, for a discard rate of 6.7%.

Plots of SH distributions from resampling observer measurements (Figure 3-6) show that the 2010/11 harvest was comprised primarily of scallops 125–155 mm SH, with very few small scallops caught and discarded.

Tanner crab bycatch was estimated at 28 crabs based on four animals found in 24 sampled tows. No dungeness crabs or halibut appeared in sampled dredges.

Plots of Prince William Sound SH distributions from the commercial fishery (Figure 3-6) show the range of shell heights caught in the fishery has been very consistent over the years.

Table 3-3 Summary of systematic estimates for weathervane scallop survey in Kayak Island 1996-2010, using a standardized area of 78.9 nm² East Bed and 48.6 nm² West Bed and Arc GIS distance for estimates. The dredge was 8 feet wide and weighed ~1600 pounds, ring size 4 inches inside diameter, and lined with 1.5 inch stretch 24 thread nylon mesh.

Year	Number of Survey stations sampled	Mean catch (kg/nm ²)	Estimated abundance	95% CI	CV (scal/m ²)	Scallop Average density (g/scal)	Average weight (g/scal)	Estimated biomass	
								q = 1.0 (kg meat)	q = 0.83 (kg meat)
East Bed									
1996	38	27.85	7,302,257 ±	4,894,454	0.33	0.028	228	132,491	
1998	28	20.45	5,288,222 ±	1,738,890	0.16	0.020	231	196,960	
2000	33	37.62	9,534,300 ±	2,500,602	0.13	0.036	237	322,247	
2002	20	10.17	2,294,732 ±	1,055,631	0.22	0.009	266	95,601	
2004	31	77.1	17,439,786 ±	12,041,316	0.34	0.062	264	614,143	
2006	32	44.44	9,719,899 ±	5,548,726	0.28	0.036	274	419,377	222,567
2008	37	36.46	7,113,909 ±	3,005,172	0.21	0.026	307	287,633	152,649
2010	12	34.87				0.032	245		
West Bed									
1998	21	33.86	6,377,024 ±	3,795,593	0.29	0.039	196	105,039	
2000	20	94.66	17,884,533 ±	10,403,252	0.28	0.108	195	302,050	
2002	17	39.56	5,740,805 ±	3,017,298	0.25	0.035	254	105,553	
2004	25	84.78	14,489,753 ±	7,359,932	0.25	0.087	216	235,067	
2006	20	60.98	10,104,198 ±	6,077,100	0.29	0.061	223	167,115	195,524
2008	10	19.72	3,930,982 ±	3,155,133	0.35	0.023	185	34,812	40,730
2010	26	9.07	2,023,600 ±	1,099,311	0.26	0.012	166	23,908	27,973

Table 3-4 Commercial harvest of weathervane scallops from Prince William Sound, 1992–2011

Year ^c	Fishery Area	GHL ^a (lb meat)	Number of Vessels	Harvest (lb meat)	Dredge Hours	CPUE
1992		64,000	4	208,836	NA	NA
1993		50,000	7	63,068	638	99
1994/95		Closed				
1995/96		50,000	3	108,000	NA	NA
1996/97		Closed				
1997/98		17,200	1 ^b	18,000	171	105
1998/99	East	6,000	2 ^b	19,650	179	110
	West	14,000				
1999/00	East	6,000	2 ^b	20,410	149	137
	West	14,000				
2000/01	East	9,000	3	8,998	221	137
	West	21,000		21,268		
2001/02	East	9,000	1 ^b	9,060	263	114
	West	21,000		21,030		
2002/03	East	6,000	2 ^b	1,680	122	128
	West	14,000		13,961		
2003/04	East	6,000	1 ^b	5,910	216	93
	West	14,000		14,070		
2004/05	East	26,000	2 ^b	25,350	614	80
	West	24,000		23,970		
2005/06	East	26,000	3	24,435	491	100
	West	24,000		24,781		
2006/07	East	20,000	2 ^b	20,010	334	111
	West	17,000		17,005		
2007/08	East	20,000	2 ^b	20,015	428	87
	West	17,000		17,090		
2008/09	East	15,000	1 ^b	15,030	331	64
	West	5,000		5,010		
2009/10	East	15,000	2 ^b	15,035	419	46
	West	5,000		4,980		
2010/11	East	8,400	1 ^b	8,445	161	52
	West	Closed		Closed		
2011/12	East	8,400	1 ^b	8,460	160	53
	West	Closed		Closed		

Table 3-5 Scallop fishery statistics for Area E [east](#) section.

Season	Retained catch (lbs scallop meat)	Effort (dredge hours)	CPUE (lbs meat per dredge hour)
1998/99	6,210	85	73
1999/00	6,065	74	82
2000/01	9,196	92	100
2001/02	18,630	140	134
2002/03	1,680	43	39
2003/04	5,910	123	48
2004/05	24,309	430	57
2005/06	25,785	214	120
2006/07	19,675	188	105
2007/08	20,010	203	99
2008/09	15,030	189	79
2009/10	14,859	339	44
2010/11	8,442	161	52

Table 3-6 Scallop fishery statistics for Area E [west](#) section.

Season	Retained catch (lbs scallop meat)	Effort (dredge hours)	CPUE (lbs meat per dredge hour)
1998/99	13,440	94	73
1999/00	13,525	76	82
2000/01	21,268	129	100
2001/02	11,460	124	134
2002/03	13,961	79	39
2003/04	14,070	93	48
2004/05	23,228	185	57
2005/06	23,837	268	120
2006/07	17,240	147	105
2007/08	16,980	225	99
2008/09	5,010	125	79
2009/10	4,491	87	44
2010/11	0	0	

Prince William Sound Scallop Harvest and CPUE

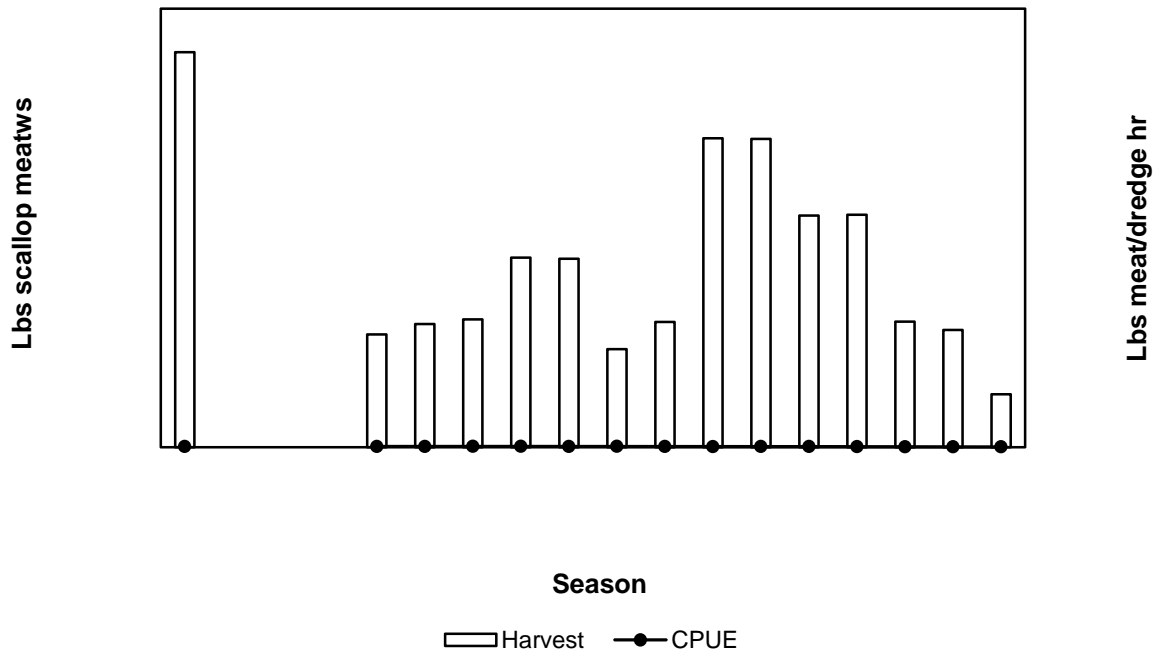


Figure 3-5 Prince William Sound Scallop Harvest and CPUE, 1993/94—2010/11 seasons.

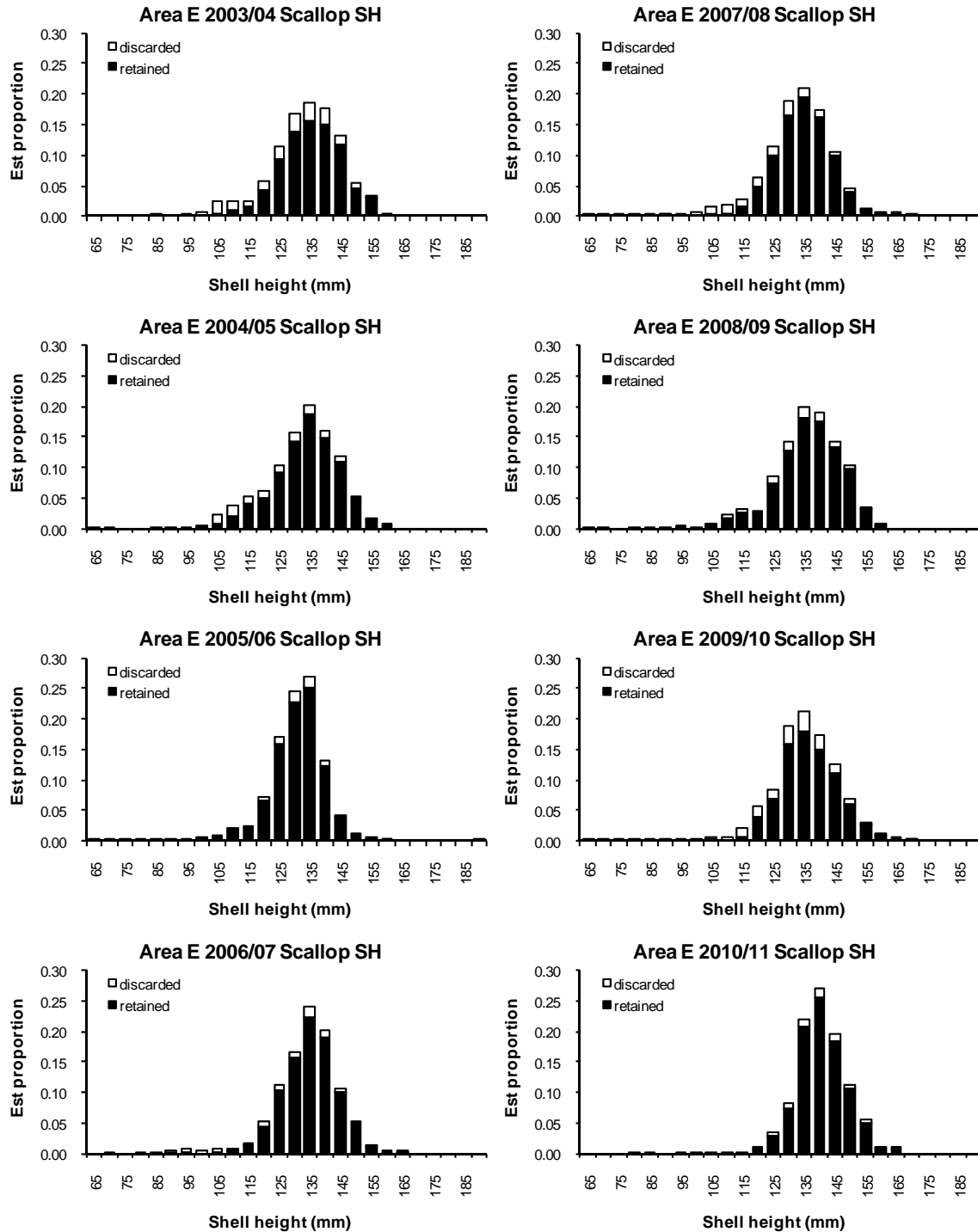


Figure 3-6 Estimated scallop shell height distributions from the 2001/02 – 2010/11 Prince William Sound fishing seasons.

**Kayak Island
East Bed**

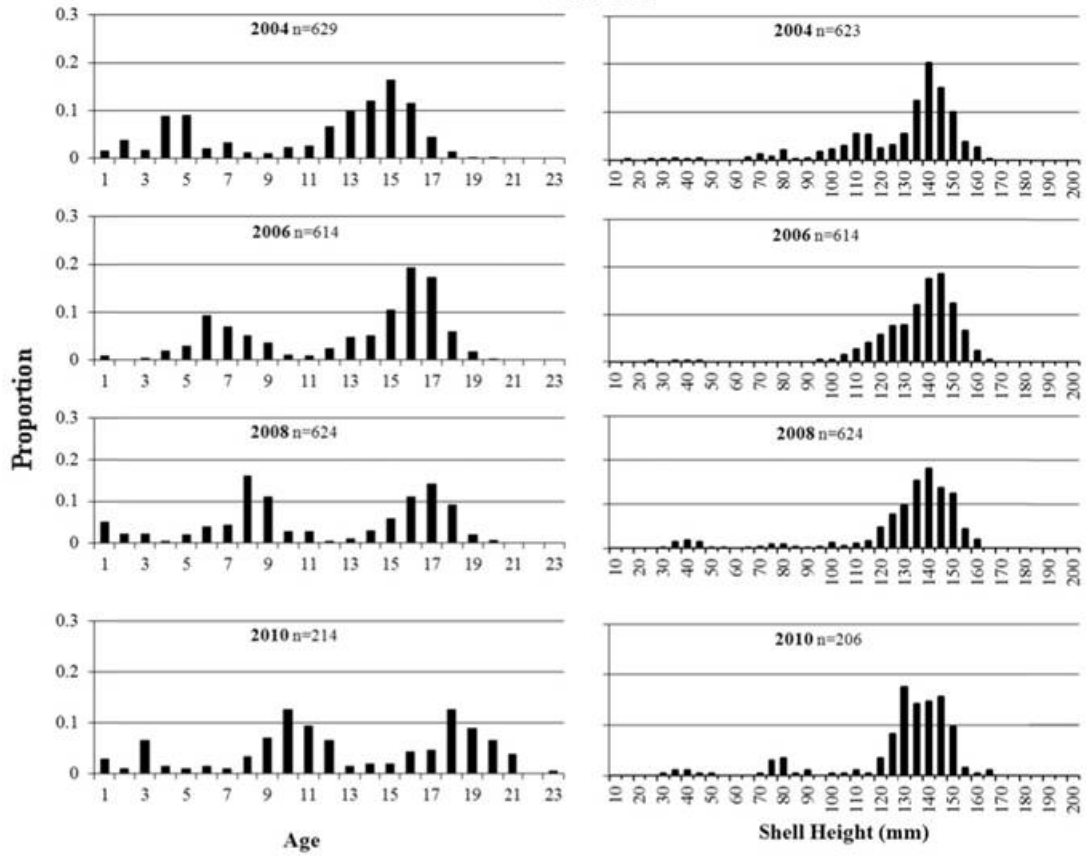


Figure 3-7 Comparison of ages and shell height distribution 2004-2010, East bed

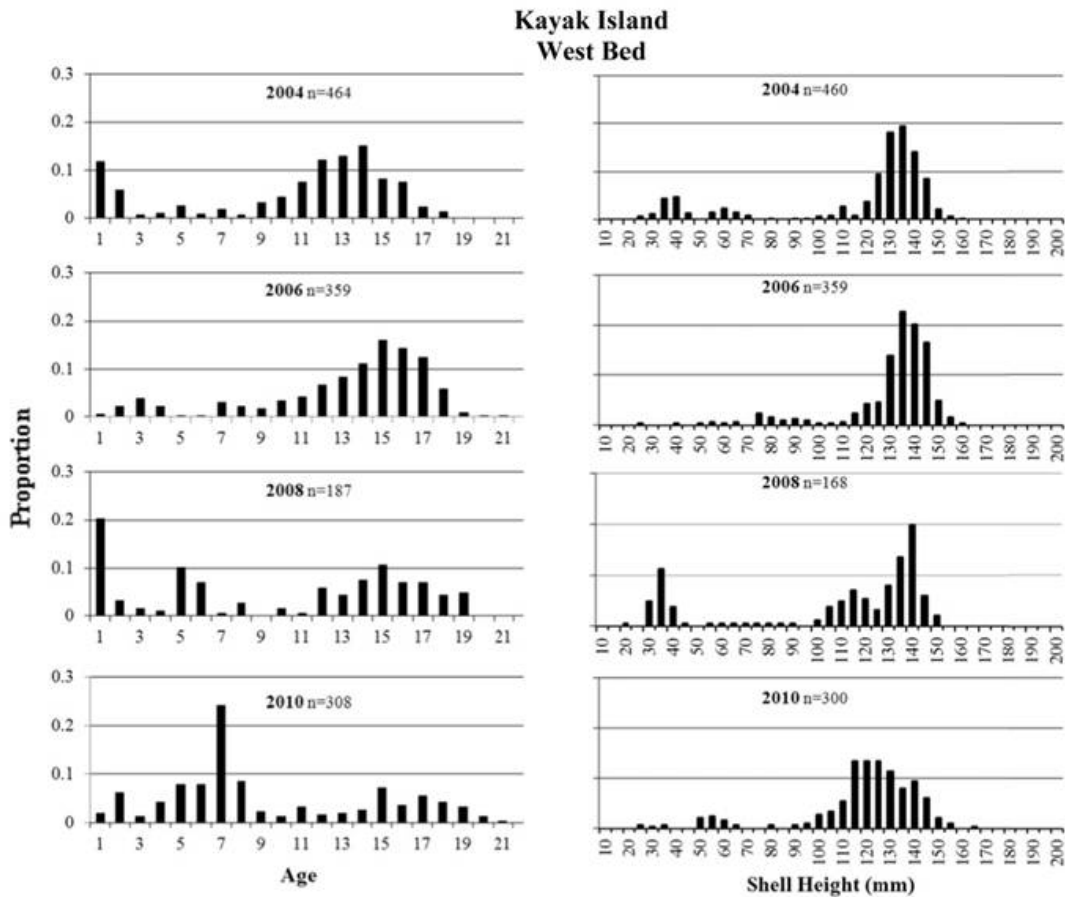


Figure 3-8 Comparison of ages and shell heights 2004-2010 West Bed

3.3 Cook Inlet Registration Area, Kamishak District

Scallop dredge surveys are conducted biennially in the Cook Inlet Registration Area (Area H) in Kamishak Bay.

The Cook Inlet scallop fishery is prosecuted in the Kamishak District by vessels that are limited to one 6-foot dredge. The third-party contract observer requirement is waived by the ADF&G fishery manager provided that participants accommodate an ADF&G observer when requested. Other areas of Cook Inlet were explored briefly but are not currently fished (Trowbridge and Bechtol 2003). Much of Cook Inlet is closed to scallop dredging (Figure 2-1).

A total of 61 successful 1nm dredge tows were conducted during the 2011 Kamishak Bay weathervane scallop survey (45 in the north bed and 16 and one ancillary in the south bed). Catch in the north bed was 1,898 weathervane scallops weighing 777 kg (1,713 lb). Standardized catch abundance ranged from 0 to 165 scallops/nm resulting in a mean among all stations of 42.1 scallops/nm. Standardized catches by weight ranged from 0 to 63 kg/nm (140lb/nm) with a mean catch among all stations fished of 17 kg/nm (38.1lb/nm). Catch in the south bed was 870 weathervane scallops weighing 223 kg (491 lb). Standardized catch abundance ranged from 0 to 210 scallops/nm resulting in a mean among all stations of

54.2 scallops/nm. Standardized catches by weight ranged from 0 to 65 kg/nm (143 lb/nm) with a mean catch among all stations fished of 13.9 kg/nm (30.6 lb/nm). Abundance and biomass estimates from all Kamishak Bay surveys are given in Table 3-7. Age distributions from 2003-2011 scallops collected during the Kamishak dredge survey are found on **Error! Reference source not found.** Figure 3-9 and Figure 3-10. The Central Region applies a 0.05 harvest rate to the estimate biomass derived from the survey. The justification for the use of 0.05 F rate is the following: Both survey and commercial fishery CPUE were low in recent years, however, a small surplus of scallops was still available for harvest. The department chose to use an exploitation rate that was either below or at the low end of estimates of natural mortality to provide for fishing yet allows recruitment to the adult portion of the bed to increase in biomass. Natural mortality estimates for weathervane scallops in Alaska have been reported to range from 0.04 to 0.25 (Kruse 1994, Kruse et al. 2005) with a median of 0.15 (Kruse 1994). Estimates of natural mortality from Kamishak Bay in Central Region were estimated at 0.19 (Bechtol et al. 2009). To accomplish the previously stated goals, the department chose an exploitation rate of 0.05 to apply to biomass data to set the guideline harvest limit (GHL), and to consistently apply this level of exploitation until such time as biomass levels increase and allow for greater harvest.

A gear efficiency rate of 0.83 was derived from comparative dredge and underwater video work conducted in 2004 at Kayak Island. Based on that work and continuing efforts by Central Region staff to assess the gear efficiency of the 8' dredge, department staff felt that applying 0.83, instead of a value of 1.0, was a conservative first step to address an identified weakness in the estimate while protecting recovering biomass. Continuing work indicates that the gear efficiency is likely lower than 0.83. Until such time as current efforts to estimate gear efficiency are completed, Central Region staff will continue to apply the 0.83 value to derive GHL's for scallops.

In 2007, Central Region and statewide scallop staff conducted a gear efficiency experiment in Kamishak Bay using the 8' dredge and the sled-dredge and should be able to report on those data at the 2013 SPT meeting. However, current and future plans are to continue gear efficiency field tests with both the 8' dredge and the sled dredge. Once enough data are gathered to provide quality statistical analysis, those data will be incorporated into biomass estimates and for setting GHL's. Until that time, Central Region staff is applying the 0.83 gear efficiency estimate from Kayak Island to the Kamishak data for setting GHL's.

Table 3-7 Summary of systematic estimates for weathervane scallop survey in Kamishak Bay 1996-2011, using a standardized area of 90.2 nm² North Bed and 68.0 nm² South Bed and Arc GIS distance for estimates. The dredge was 8 feet wide and weighed ~1600 pounds, ring size 4 inches inside diameter, and lined with 1.5 inch stretch 24 thread nylon mesh.

Survey Year	Number stations sampled	Mean catch kg/nm	Estimated abundance	95% CI	CV	Scallop density scal/m ²	Average weight (g/scal)	Estimated biomass w/ dredge efficiency =1.0 (kg meat)	Estimated biomass w/ dredge efficiency =0.83 (kg meat)
North Bed									
1996	26	60.0	15,674,085 ±	4,921,324	0.15	0.05	262	351,141	
1999	41	67.1	12,115,707 ±	3,032,424	0.12	0.04	380	300,950	
2001	37	62.9	9,980,638 ±	2,708,305	0.13	0.03	431	274,801	
2003	31	26.2	4,120,643 ±	948,209	0.11	0.01	435	110,137	
2005	38	22.7	3,535,142 ±	795,020	0.11	0.01	439	101,483	
2007	43	26.4	5,094,047 ±	978,442	0.10	0.02	354	139,580	
2009	43	20.5	3,701,402 ±	808,379	0.11	0.01	379	97,408	117,359
2011	45	17.2	2,885,639 ±	540,212	0.09	0.01		94,188	113,479
South Bed									
2003	28	59.7	9,434,220 ±	2,467,551	0.13	0.04	327	221,258	
2005	29	16.2	3,935,459 ±	1,069,549	0.13	0.02	212	60,881	
2007	31	23.5	5,988,540 ±	1,648,559	0.13	0.03	202	97,851	
2009	23	9.2	2,757,557 ±	1,179,705	0.21	0.01	172	18,146	21,863
2011	16	13.9	2,799,128 ±	1,642,687	0.28	0.01		62,428	75,214

**Kamishak Bay
South Bed**

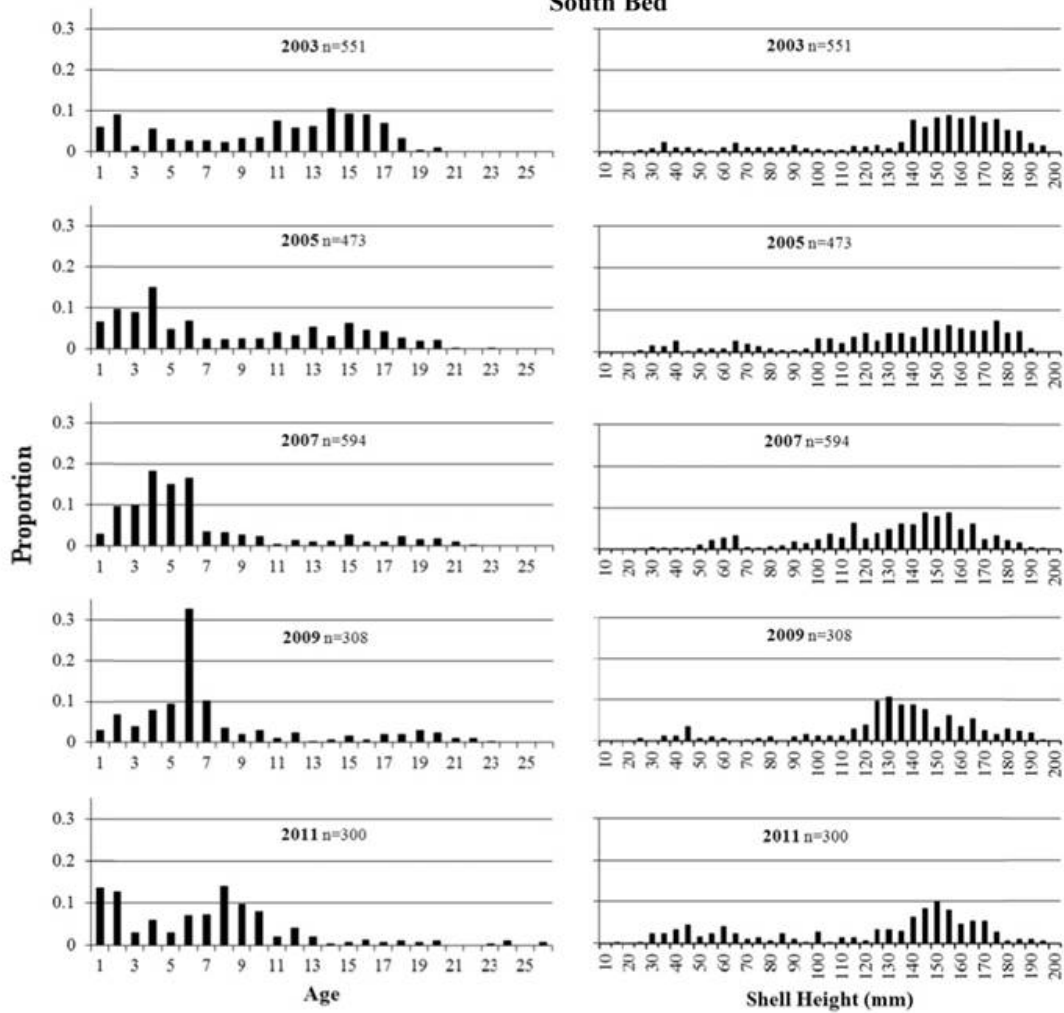


Figure 3-9 Comparison of ages and shell height distribution, south bed

**Kamishak Bay
North Bed**

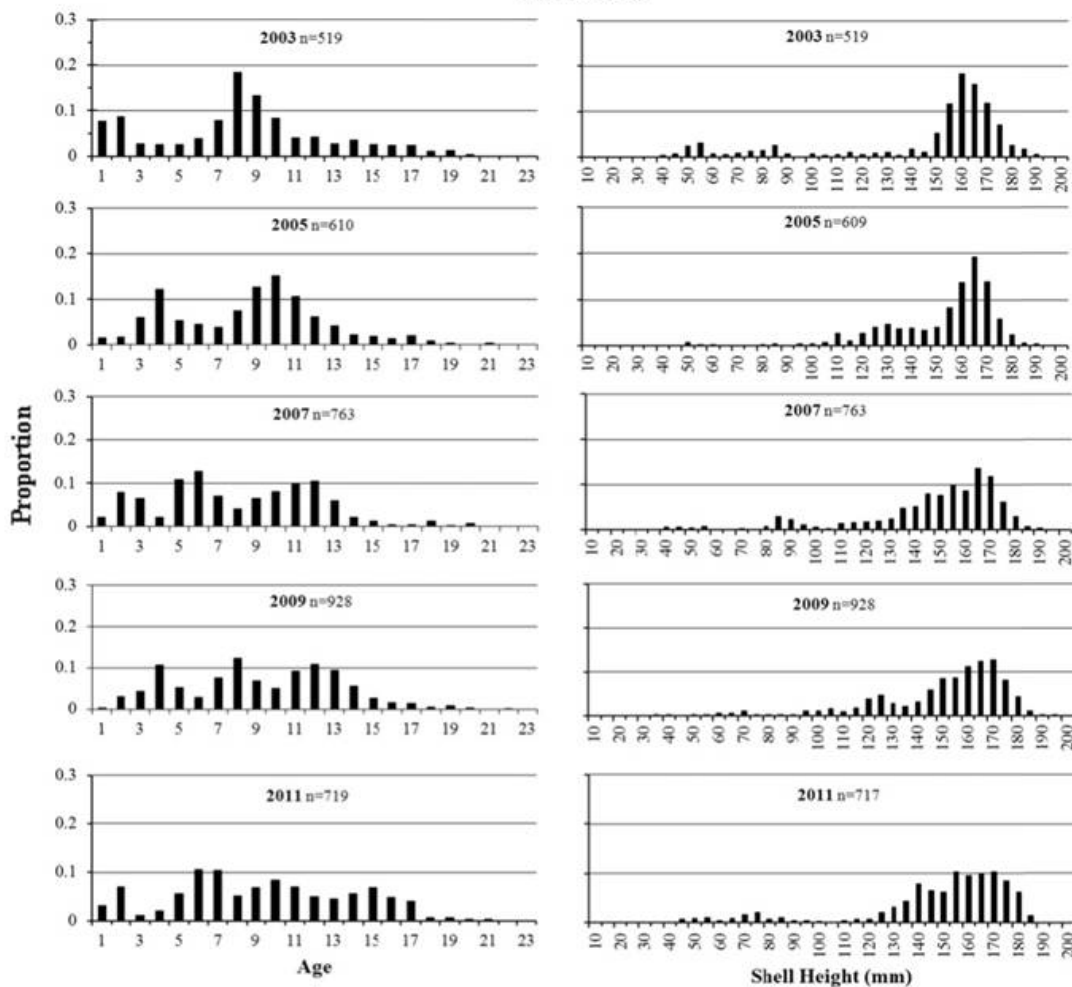


Figure 3-10 Comparison of ages and shell height distributions, north bed

Sled-dredge: Preliminary efforts have been made using underwater video techniques to evaluate survey dredge efficiency, thereby increasing accuracy of the survey estimates and resulting in more appropriate harvest limits. Because the scallop “beds” of significant aggregation appear to occur in discrete area, project results are further delineating essential habitat of weathervane scallops, a need specified in the Magnuson-Stevens Act. Central Region staff has also developed a sled-dredge (Figure 3-11). The sled is analogous to that used by the statewide scallop program in Kodiak, but instead of only allowing for video and counts to be made, this sled has a pinning system on the back to allow for an ~6’ wide dredge setup to be attached. The sled-dredge setup allows for video cameras to look forward and aft to obtain counts of scallops before the sled reaches them and looking aft at the foot of the dredge bag to examine the efficiency of the gear (i.e. how many scallops go in vs. under the dredge).

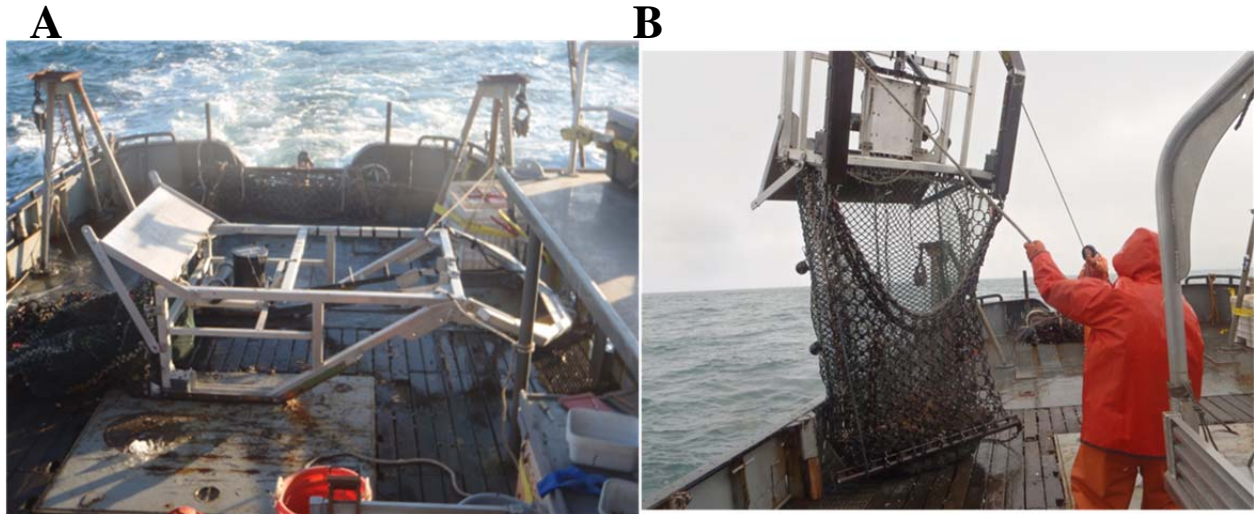


Figure 3-11 A) Photo of sled-dredge onboard deck of R/V Pandalus, with 8' dredge bag in foreground; B) ADF&G sled-dredge with bag stretched out on deck after trial tow (8' dredge can be seen in background).

Weak Meats: During the 2009 Scallop Planning Team Meeting “weak meats” were discussed. Weak meats are characterized by adductor muscle coming off the shell when the viscera are pulled off the shell in the shucking process. These meats are off color, with a stringy consistency that makes them unacceptable for marketing by the industry. Weathervane scallops with “weak meats” were observed while shucking the age and meat weight sample (~20 scallops/tow) from the 2009 Kamishak survey. Of scallops observed for “weak meats” 10.4% had weak meats in the north bed and 4.9% in the south bed. The sled-dredge had 14.7% weak meat scallops. The sled dredge was only trialed in the north bed during the 2009 survey. During the 2011 survey only the 8' dredge was used with the north bed having 12.9% weak meats and the south bed having 3.3% weak meats.

Fishery overview:

The guideline harvest regulation specified by state regulation for the Kamishak District is 10,000 to 20,000 pounds of shucked meats, with a season August 15–October 31. The most recent harvest occurred in the 2010 of scallop meats (Harvest peaked in 1996 with 5 vessels harvesting 28,228 pounds of shucked meats with catch rates of 53 lb/hr (Table 3-8). The most recent harvest was 9,460 pounds of shucked meats with catch rates of 26 pounds/hour. Participation and CPUE in this small fishery vary widely (Table 3-8, Figure 3-6)

Table 3-8 Cook Inlet, Kamishak District scallop fishery summary statistics

Year	Number vessels	GHL (lb meat)	Catch (lb)^a shucked meats	Dredge^b Hours	CPUE^c lb/hour
1993	3		20,115	528	38
1994	4		20,431	458	45
1995				Closed	
1996	5	28,000	28,228	534	53
1997	3	20,000	20,336	394	52
1998 ^d	1	20,000		Confidential	
1999	3	20,000	20,315	325	63
2000	3	20,000	20,516	275	75
2001 ^d	2	20,000		GHL Achieved	
2002 ^e	3	20,000	8,591	311	28
2003 ^{d, f}	2	20,000		Confidential	
2004 ^d	3	20,000	6,117	364	17
2005 ^d	2	7,000		GHL Achieved	
2006 ^g	1	7,000	50	10	5
2007		12,000		No Effort	
2008		12,000		No Effort	
2009		14,000		No Effort	
2010 ^g	1	14,000	9,460	365	26
2011 ^g	1	12,500	9,975	324	31

Note: If not specified, harvest was from North bed, north of 59° 16.00'N. lat.

^aCatch includes harvested scallops and estimated deadloss.

^bDredge-hour equals one dredge fished for 60 minutes.

^cCPUE (catch per unit effort) equals pounds of scallop meats caught per dredge-hour.

^dConfidential data.

^eHarvest in 2002 and 2004 from both North and South beds.

^fHarvest in 2003 from South bed only.

^gConfidential data released by vessel operators.

3.4 Kodiak Registration Area, Northeast District

Guideline Harvest Levels (GHL) must be in compliance with harvest ranges established by the Alaska Board of Fisheries, 5 AAC 38.430 Guideline Harvest Range for the Taking of Scallops. Harvest levels for the weathervane scallop fishery in the Northeast District are set by reviewing fishery-dependent data collected from the onboard observer program. Data available consist of effort (dredge hours), size frequency of retained and discarded scallops (discarded scallops are smaller size than retained scallops and indicate recruitment trends), harvest location and depth. ADF&G tracks catch per unit effort (CPUE) by vessel throughout the season.

The management program employs an overall guideline harvest level for the district, with individual scallop bed harvest caps within the district, coupled with inseason tracking of CPUE against predetermined CPUE benchmarks. The management program annually reviews recent fishery performance against historical trends in the fishery. Prior to 1999, weathervane scallop harvests in the Northeast District were not constrained by a GHL (Table 3-9, Figure 3-12). The 1999/00 season was the first in which a GHL was established. The 1999/00 season GHL was based on 75% of the average harvest from the 1997/98 and 1998/99 seasons, and further reduced by 5,000 pounds as a precautionary approach; the initial GHL range was 0-75,000 pounds.

Along with implementing a GHL during the 1999/00 season, ADF&G also established individual harvest caps for scallop beds within the district. This management measure was aimed to distribute effort across the three known scallop beds. For the 2000/01 season the GHL was increased to 80,000 lbs based on improving fishery performance during the 1999/00 season. The 80,000 pound GHL remained in effect from the 2000/01 through the 2005/06 seasons. During this time period, CPUE ranged from 46 to 73 pounds meat/dredge hr (Table 3-9, Figure 3-12) and observer program shell height data demonstrated catches contained a wide range of scallop sizes (Figure 3-13) suggesting sustained recruitment through that time period.

Beginning in the 2003/04 season ADF&G tracked inseason fishery performance, by individual scallop bed, against a preseason established benchmark. The benchmark was established as the lowest recent annual cumulative CPUE. The benchmark was used to assess inseason fishery performance after the scallop participants had harvested one-half the GHL. The performance thresholds are used to assess if the upper end of the GHL range should be taken or if harvests should be limited below the upper end of the GHL range.

Prior to the start of the 2006/07 season, the harvest cap for Statistical Area 525630 was reduced by 5,000 pounds due to a decline in CPUE during the previous season. To provide an opportunity for exploratory fishing in the northern portion of the district, the GHL was increased by 15,000 pounds. The GHL for the 2006/07 season was 90,000 pounds, and remained at this level through the 2008/09 season. The exploratory addition of 15,000 pounds could only be harvested north of Cape Izhut (58.1° N latitude). This area lies east of Afognak Island and north of areas fished since inception of the observer program in 1993. Scallops were last harvested in this area during the 1980s. Due to fuel costs and other considerations, the exploratory area saw little effort, with less than 100 pounds of scallop meats harvested from 2006/07 through the 2008/09 season. Prior to the 2009/10 season the exploratory harvest level of 15,000 pounds was removed from the Northeast District GHL reducing the overall GHL to 75,000 pounds.

Two vessels harvested about 75,000 pounds of scallop meats from the Northeast District during the 2008/09 season. Summary statistics from recent fishery data are presented in Table 3-9. Northeast District catches and CPUE have remained stable since the 2000/01 fishing season (Table 3-9, Figure 3-12). One vessel harvested about 73,000 pounds of scallop meats from the Northeast District in 2009/10

season. Large portions of the Northeast District that contain scallops are closed to scallop dredging (Figure 2-2). These closures were recommended by ADF&G and adopted by the Alaska Board of Fisheries over 30 years ago due to concerns about red king crab bycatch and gear conflicts.

Prior to the 2001/11 scallop season, Kodiak Northeast District (KNE) GHs were specified as follows:

Portion of Northeast District	Harvest cap (lbs meat)
Statistical Area 525702	20,000
Statistical Area 525630	20,000
Remainder of Northeast District	25,000
Total	65,000

Three vessels fished KNE during the 2010/11 season, harvesting 64,465 lbs scallop meats from 618 tows for overall CPUE 64 lbs meat/dredge-hr (Table 3-9, Figure 3-12). Average CPUE from the previous ten KNE scallop seasons was 62 lbs meat/dredge-hr. Additional information on the Kodiak Northeast fishery management is included in Appendix 1.

Observers measured SH of about 5,300 retained and discarded scallops during the 2010/11 KNE season. Plots from resampling these data (Figure x) show a wide size range of scallops retained during the 2010/11 season with about 80% of scallops <115 mm SH discarded. Results from visual aging of KNE retained scallop shells show the strong 2001 year class still prevalent in the 2010/11 harvest.

Observers sampled 144 (23%) of the KNE scallop tows made during the 2010/11 season. From these data, an estimated 85,890 lbs of whole scallops were discarded and 646,674 lbs were retained for a discard rate of 11.7%. Estimated Tanner crab bycatch in the district for 2010/11 (Table 2-5) was 20,808 crabs from a cap of 169,925.

Table 3-9 Kodiak Northeast District scallop fishery summary statistics.

Season	Number vessels	GHL (lbs meat)	Catch (lbs meat)	Dredge hours ^a	CPUE (lbs meat per dredge hr)	Scallop Discards (lbs whole) ^a
1993/94	10	NA	155,187	6,940	22	
1994/95	7	NA	35,207	1,773	20	
1995/96		closed				
1996/97	3	NA	11,430	581	20	8,355
1997/98	3	NA	95,858	2,604	37	41,615
1998/99	4	NA	120,010	2,749	44	190,480
1999/00	3	75,000	77,119	1,384	56	113,349
2000/01	4	80,000	79,965	1,101	73	113,422
2001/02	3	80,000	80,470	1,142	70	108,835
2002/03	2	80,000	80,000	1,350	59	166,547
2003/04	2	80,000	79,965	1,248	64	113,536
2004/05	2	80,000	80,105	1,227	65	262,976
2005/06	3	80,000	79,990	1,759	45	209,906
2006/07	2	90,000	75,150	1,168	64	135,343
2007/08	2	90,000	75,105	1,170	64	203,059
2008/09	3	90,000	74,863	1,363	55	110,869
2009/10	1	75,000	73,320	1,210	61	121,021
2010/11	3	65,000	64,465	1,015	64	85,890
2011/12 ^b		65,000	61,107			

^a Whole lbs estimated from observer samples; meat recovery from whole scallops varies from 7–12%; estimates of discard mortality are not currently available.

^b PRELIMINARY 2011/2012 catch data subject to change.

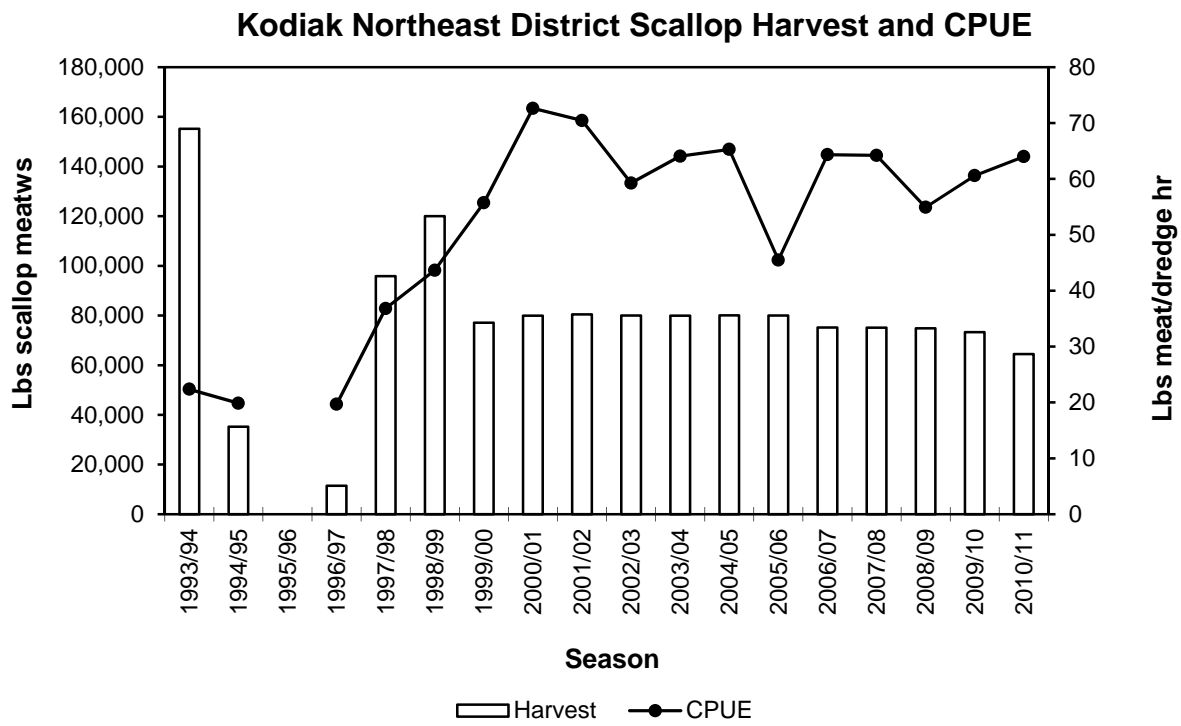


Figure 3-12 Kodiak Northeast District Harvest and CPUE, 1993/94—2010/11 seasons.

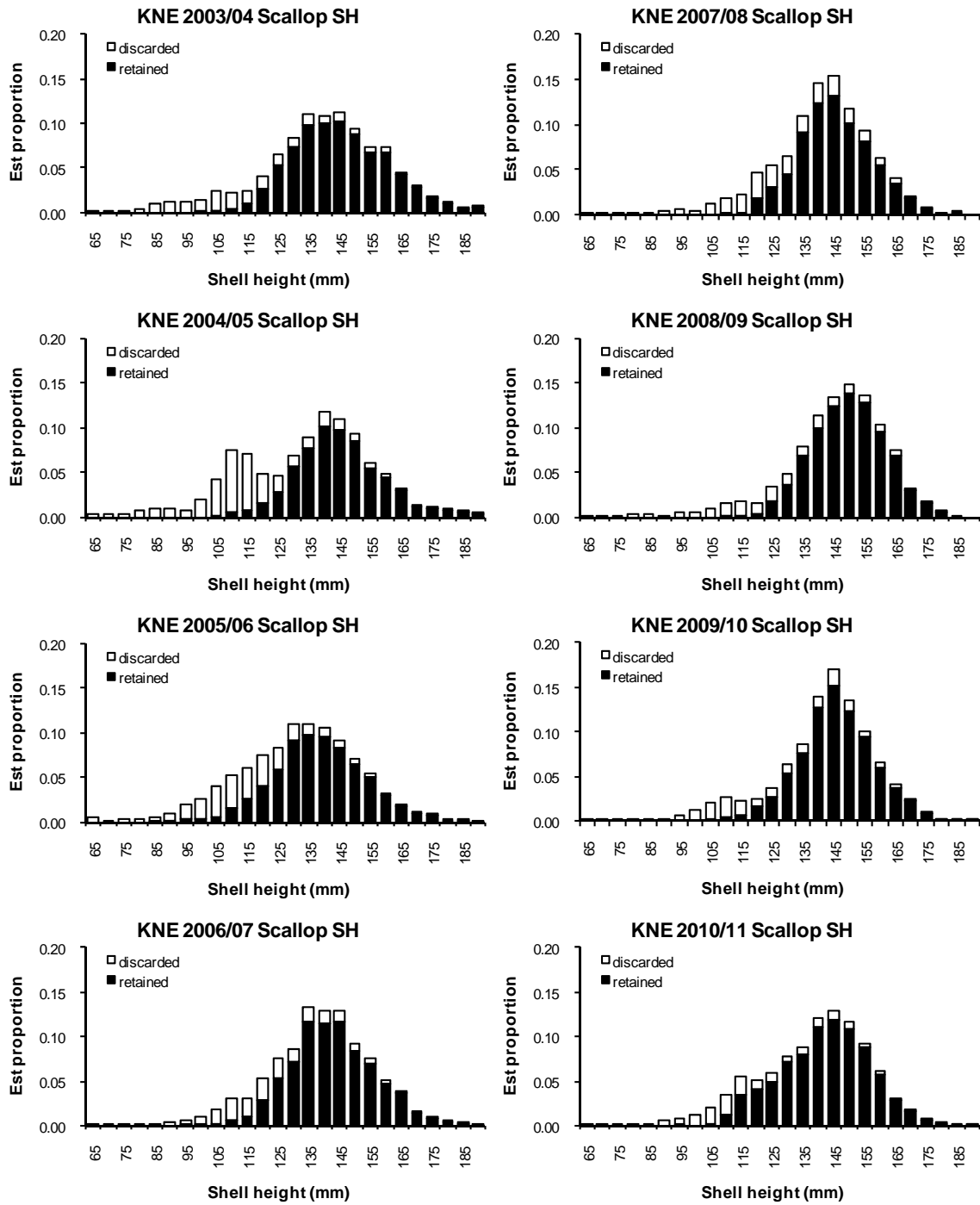


Figure 3-13 Estimated scallop shell height distributions from the 2001/2002—2010/11 Kodiak Northeast District fishing seasons.

3.5 Kodiak Registration Area, Shelikof District

Similar the Northeast District, managers use fishery dependent data and information obtained through the observer program to establish Shelikof District GHLs and manage harvests inseason.

A GHL of 180,000 pounds of shucked scallop meat was established in the Shelikof District prior to the 1999/2000 season. The initial GHL was calculated by applying a tier 6 calculation to the historic (1990-1997) proportion of weathervane scallops harvested in the Shelikof District relative to the total upper limit of the Kodiak Registration Area Guideline Harvest Range (GHR). Between 1990 and 1997 the total Kodiak Area weathervane scallop GHR was 300,000 pounds and 72% of all weathervane scallops in the Kodiak Area were harvested in the Shelikof District resulting in an average Shelikof District harvest of 216,000 pounds. Applying a tier 6 calculation (216,000 lbs x .75) resulted in a precautionary GHL of 162,000 pounds which was revised up to 180,000 pounds to match the amount of scallops harvested during the 1998/99 season.

The GHL was reduced to 160,000 pounds for the 2005/06 and 2006/07 seasons due to concerns about the concentration of effort in the northern part of the main Shelikof bed. This action led to a split GHL with 130,000 pounds allocated to the northern portion (north of 58° 30' N Lat.) of the district and 30,000 pounds allocated to the southern portion. Prior to the 2007/08 season, the GHL was set at 130,000 pounds for the northern portion of the district and increased to 40,000 pounds for the southern portion based on an increase in CPUE from 38 pounds meat/dredge hr during the 2004/05 season to 66 pounds meat/dredge hr during the 2006/07 season.

Two vessels using 15 foot dredges and a smaller vessel that deployed a single 10 foot dredge participated in the 2007/08 fishery and harvested about 170,000 pounds. Summary statistics from recent fishery data are presented in Table 3-10, Figure 3-12, and Figure 3-13.

Shelikof District CPUE decreased to 58 pounds meat/dredge hr for the 2007/08 season (Table 3-10, Figure 3-12) ADF&G attributes this decline in part, to participation of a smaller vessel deploying a smaller dredge. ADF&G does not account for dredge width in CPUE calculations. Overall Shelikof District CPUE has been greater than 50 pounds meat/dredge-hr in each season since 2003/04. Significant numbers of scallops less than 120 mm shell height were discarded during the 2007/08 season (Figure 3-13).

During the 2008/09 season the Shelikof District was closed prior to the GHL being achieved when the Tanner crab bycatch cap was exceeded. Tanner crab bycatch limits for the Shelikof District were set pre-season at 16,900 crabs. Only 12,700 pounds of scallop meats were harvested district-wide before the fishery was closed in July 2009. In 2009/10 season the GHL was achieved and Tanner crab bycatch was lower.

Kodiak Shelikof District GHL was set at 170,000 lbs scallop meats for the 2010/11 season, with harvest limited to a maximum of 130,000 lbs from the KSH North section (north of 58.5° N.).

Four vessels participated in the fishery, harvesting 171,065 lbs scallop meats from 2,218 hauls with overall CPUE 49 lbs meat/dredge-hr (Table 3-10 and Figure 3-15). CPUE for 2010/11 was the same as for 2009/10 but remained below the 2000/01–2009/10 average of 58 lbs meat/dredge-hr.

Onboard observers sampled 509 (23%) of the KSH tows made during the 2010/11 season and measured SH of over 19,000 retained and discarded scallops. Plots from resampling these data to account for estimated discard proportion (Figure 16) show that a wide range of scallop sizes was present in the 2010/11 catch, with about 80% of scallops <120 mm SH discarded. Overall, an estimated 1,814,562 lbs of whole scallops were retained and 423,118 lbs discarded in the 2010/11 KSH fishery for a discard proportion of about 19%.

Results from visual aging of retained scallop shells from recent KSH seasons (Figure 3-16) show a strong 5-year-old age class in the 2010/11 data, with 9-year-old scallops that had been dominant during the past 3 seasons fading as a proportion of the catch. Average SH of visually aged 5-year-old and 9-year-old scallops was 128 mm and 152 mm.

Estimated Tanner crab bycatch in the 2010/11 KSH scallop fishery (Figure 2-6) was 19,126 crabs from a cap of 26,400 crabs. An estimated 805 Dungeness crabs and 450 halibut were also taken incidentally during the season.

Table 3-10 Kodiak Shelikof District scallop fishery summary statistics.

Season	Number vessels	GHL (lbs meat)	Catch (lbs meat)	Dredge hours ^a	CPUE (lbs meat per dredge hr)	Scallop Discards (lbs whole) ^a
1993/94	5	NA	105017	2491	42	
1994/95	11	NA	314,051	8,662	36	
1995/96		closed				
1996/97	3	NA	219,305	3,491	63	197,174
1997/98	4	NA	258,346	5,492	47	93,221
1998/99	8	NA	179,870	4,081	44	216,354
1999/00	6	180,000	187,963	4,304	44	289,867
2000/01	5	180,000	180,087	2,907	62	128,614
2001/02	4	180,000	177,112	3,398	52	239,459
2002/03	3	180,000	180580	3,799	48	496,577
2003/04	2	180,000	180011	3,258	55	402,800
2004/05	2	180,000	174,622	3,467	50	435,844
2005/06	2	160,000	159,941	2,280	70	233,911
2006/07	3	160,000	162,537	2,183	74	234,979
2007/08	3	170,000	169,968	2,937	58	377,063
2008/09	2	170,000	13,761	263	52	32,301
2009/10	3	170,000	169,877	3,447	49	349,952
2010/11	4	170,000	171,065	3,507	49	423,118
2011/12 ^b		170,000	136,791			

^a Whole lbs estimated from observer samples; meat recovery from whole scallops varies from 7–12%; estimates of discard mortality are not currently available.

^b PRELIMINARY 2011/2012 catch data subject to change.

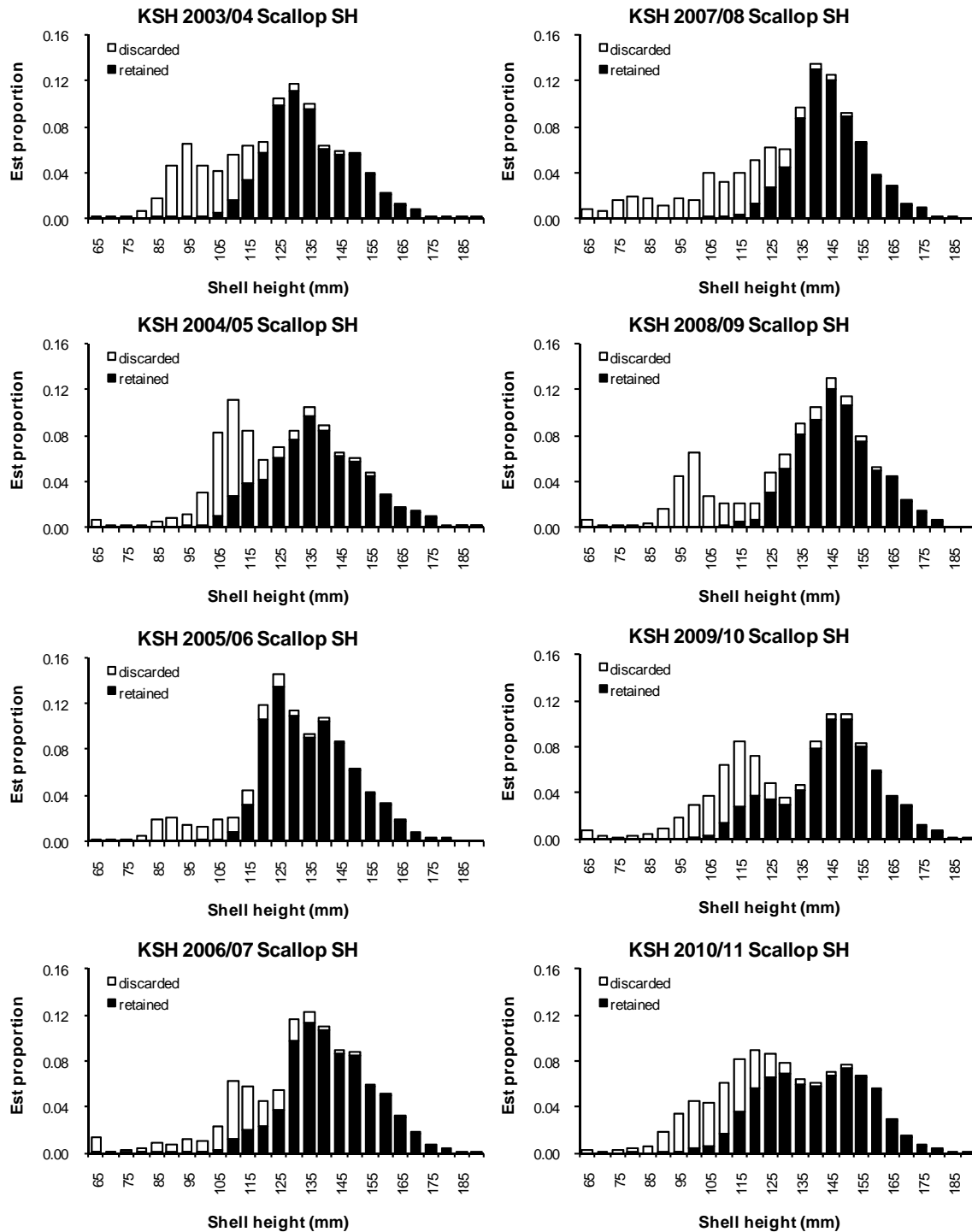


Figure 3-14 Estimated scallop shell height distributions from the 2001/00-2010/11 Kodiak Shelikof District fishing seasons.

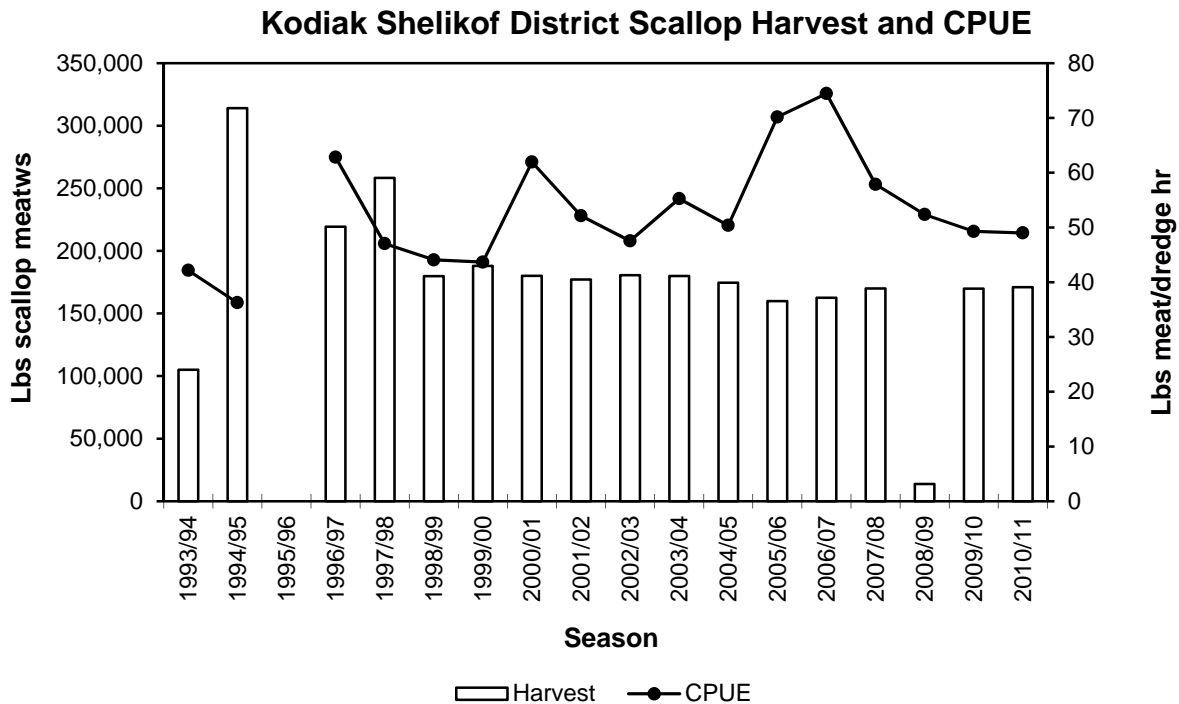


Figure 3-15 Kodiak Shelikof District Harvest and CPUE, 1993/94—2010/11 seasons.

3.6 Kodiak Registration Area, Southwest District

In March 2009, the Alaska Board of Fisheries opened, on an experimental basis, previously closed waters for scallops in the Southwest District south of a line from the westernmost tip of Cape Ikolik to the southernmost tip of Cape Kilokak, and west of 155° W Long., north of 56° 07' N Lat., and east of 156° 20.22' W Long. The Southwest District was closed to scallop fishing in 1969 due to king and Tanner crab bycatch concerns.

Participation in this area is allowed only by ADF&G commissioner's permit as specified in 5 AAC 38.420 Fishing Seasons for Scallops in Registration Area J. During the board meeting, managers recommended a 25,000 pound GHF for the Southwest District to encourage participants to distribute effort to help delineate scallop beds. ADF&G plans to conduct video surveys in this area to further assess the resource.

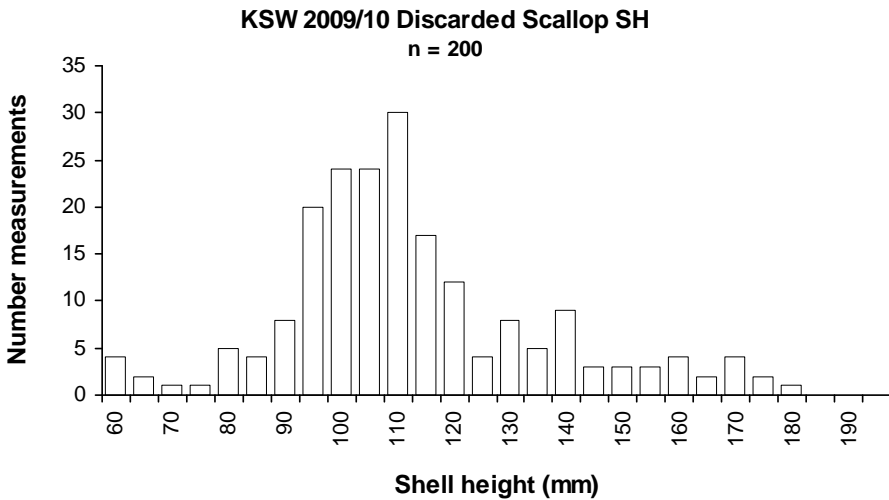
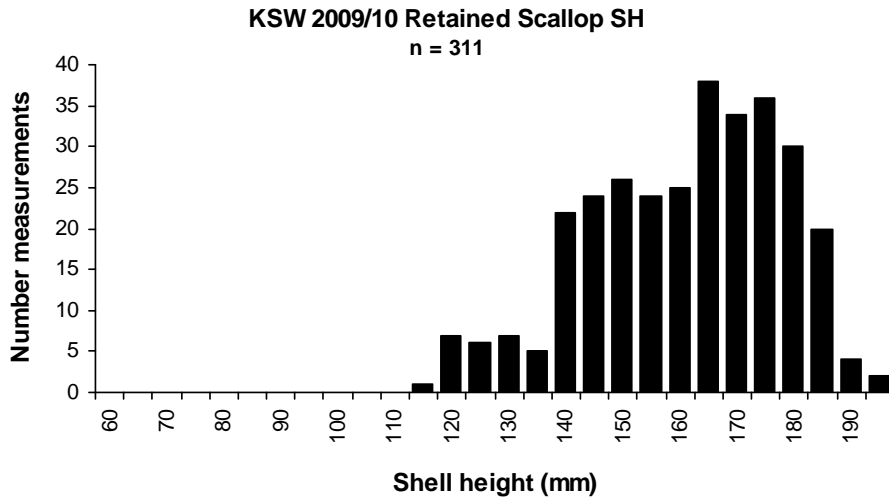


Figure 3-16 Estimated shell height distributions of scallops retained (upper plot) and discarded (lower plot) during the 2009/10 exploratory Kodiak Southwest District scallop fishery.

3.7 Kodiak Registration Area, Semidi District

Traditional scallop fishing areas of the Semidi District are located in state waters that were closed to scallop dredging by the Alaska Board of Fisheries in 2000 (Figure 2-2). Offshore waters of the district remain open to fishing, but no effort has occurred since the 1999/00 season (Table 3-11).

Table 3-11 Kodiak Semidi District scallop fishery summary statistics.

Season	Number vessels	GHL (lbs meat)	Dredge hours ^a	Catch ^a (lbs meat)	CPUE (lbs meat per dredge hr)
1993/94	6 ^b	NA	1,819	55,487	32
1994/95	2	NA	272	confidential	
1995/96		closed			
1996/97	3	NA	1,017	37,810	37
1997/98	1	NA	349	6,315	18
1998/99	2	NA	106	1,720	16
1999/00	1	NA	45	930	21

^a Confidential data released by vessel operators.

^b Two additional vessel fished but data are not available.

^c Estimated from bycatch samples.

3.8 Alaska Peninsula Registration Area

Similar the Northeast District, managers use fishery dependent data and information obtained through the observer program to establish Alaska Peninsula GHLs and manage harvests inseason. Scallop fishing in the Alaska Peninsula Registration Area (Area M) was traditionally concentrated in a small region near the Shumagin Islands between 160° and 161° W longitude. Area M was closed during the 2001/02 and 2002/03 seasons due to localized depletion (Table 3-12, Figure 3-14).

For the 2003/04 and 2004/05 seasons, the area between 160° and 161° W longitude remained closed to promote stock rebuilding, while the remainder of the area was opened with a 10,000 pound GHL. For the 2005/06 season, the area between 160° and 161° W. longitude was opened with a 10,000 pound GHL, the remainder of the area was opened with a 10,000 pound GHL, and no effort occurred. Prior to the 2006/07 season, the GHL was increased to 25,000 pounds for the area to increase incentive for participation, and two cooperative vessels fished traditional areas and adjacent waters on an experimental basis. Catches were very poor, indicating 5-yrs of no fishing did not rebuild the scallop stock.

In response, the GHL for the 2007/08 and 2008/09 seasons was lowered to 10,000 pounds and waters between 160°-161° W longitude were closed to scallop fishing. Total harvest from the 2007/08 season was 2,460 pounds, CPUE was low, and crab bycatch was relatively high. No vessels participated in the 2008/09 fishery.

The Alaska Peninsula scallop fishery was not opened during the 2009/10 or 2010/11 seasons. Limited effort, poor fishery performance, and high crab bycatch were observed when fishing occurred during the 2008/09 season. Below is a brief summary of the fishery over the past 10 years.

The Area M scallop fishery was closed during the 2000/01 season due to concerns about localized depletion. Waters between 160°–161° W longitude that provided the bulk of the catch during the 1990s remained closed until 2005/06 to allow the stock to rebuild.

No effort occurred during the 2003/04–2005/06 seasons. Prior to the 2006/07 season, the GHL was set at 25,000 lbs with a maximum of 15,000 lbs to come from waters between 160°–161° W longitude. Two cop vessels participated in the 2006/07 fishery and harvested approximately 155 lbs meat from 73 hauls for a CPUE of 2 lbs meat/dredge hr.

A GHL of 10,000 lbs of scallop meats with all waters between 160°–161° W longitude closed was set prior to the 2007/08 season, and no fishing effort occurred.

The 2008/09 GHL was also set at 10,000 lbs with all waters between 160°–161° W longitude closed. One vessel fished the area September 5–12, 2008 and harvested 2,460 lbs of scallop meats from statistical area 575531 near Lighthouse Rocks; twenty-three tows in other parts of the area produced zero lbs scallop meats .

Tanner crab bycatch for the 2008/09 Alaska Peninsula scallop fishery was estimated at 18,302 crabs (95% C.I. 12,155–23,804).

Table 3-12 Alaska Peninsula Area scallop fishery summary statistics.

Season	Number vessels	GH L (lbs meat)	Catch (lbs meat)	Dredge hours ^a	CPUE (lbs meat per dredge hr)	Scallop Discards (lbs whole)
1993/94	8	NA	112152	1847	61	
1994/95	7	NA	65,282	1,664	39	
1995/96		closed				
1996/97	2	200,000	12,560	327	38	7,384
1997/98	4	200,000	51,616	1,752	29	38,219
1998/99	4	200,000	63,290	1,612	39	43,129
1999/00	5	200,000	75,535	2,025	37	59,077
2000/01	3	33,000	7,660	320	24	4,538
2001/02		closed				
2002/03		closed				
2003/04		closed				
2004/05		closed				
2005/06	0	20,000		0		
2006/07	2	25,000	155	64	2	794
2007/08	0	10,000				
2008/09		10,000	2,460	151	16	4,101
2009/10		closed				
2010/11		closed				
2011/12 ^b		closed				

^a Whole lbs estimated from observer samples; meat recovery from whole scallops varies from 7–12%; estimates of discard mortality are not currently available.

^b PRELIMINARY 2011/2012 catch data subject to change.

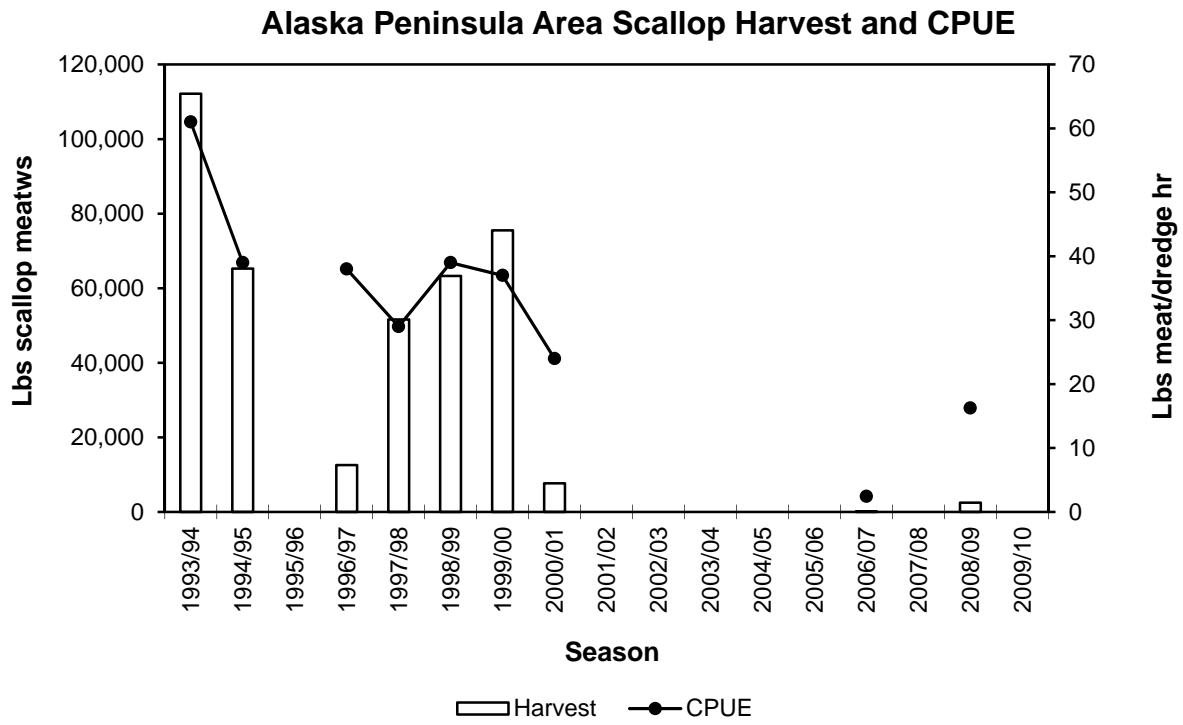


Figure 3-17 Alaska Peninsula harvest and CPUE, 1993/94—2009/10 seasons.

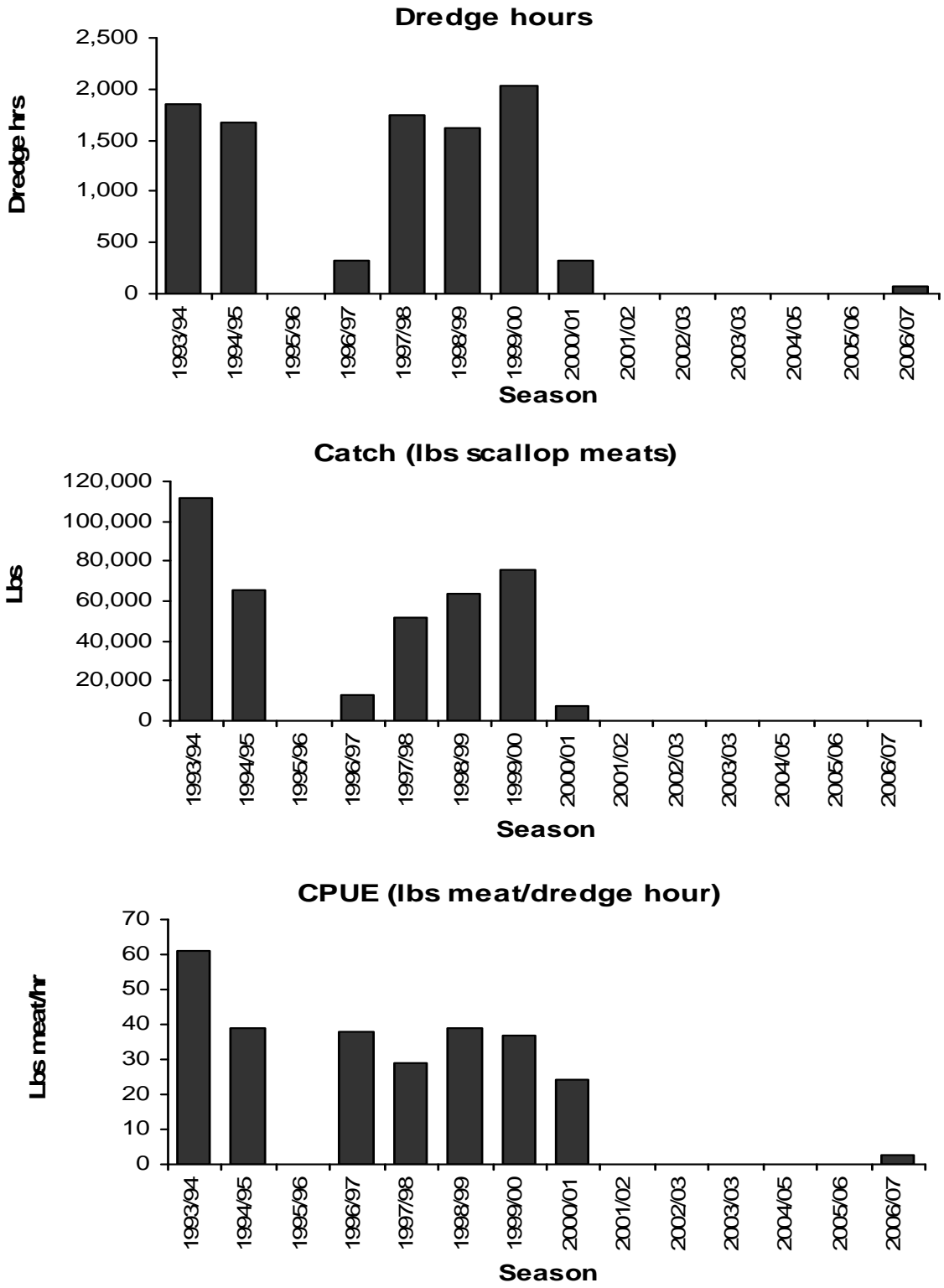


Figure 3-18 Barplots of Alaska Peninsula scallop fishery statistics.

3.9 Bering Sea Registration Area

Weathervane scallop fisheries in the Bering Sea Registration Area (BSRA) were unconstrained by a GHL prior to the 1996/97 season (Table 3-13, Figure 3-15). Once established, early GHL ranges were set optimistically, with upper bounds of 400,000 to 600,000 pounds of shucked scallop meats. Catch rates were relatively high during the mid to late-1990s, but annual harvests never exceeded half the upper bound of the GHL range. Scallop catches in the mid to late 1990s were often restricted by Tanner crab bycatch limits.

The upper bound of the BSRA weathervane scallop GHL was adjusted downward to 200,000 pounds beginning with the 2000/01 season and that level was retained for the following season when CPUE dropped by approximately 25% and total harvest was 70% of the upper limit of the GHL range. In response to diminishing fishery performance during the 2000/01 and 2001/02 seasons, managers set a GHL range of zero to 105,000 pounds of shucked scallop meats for the 2002/03 and 2003/04 seasons. The 2002/03 season performed reasonably well, but catch rates and overall catch continued to decrease in 2003/04.

Experimental video survey tows conducted in 2003 showed scallops distributed over a wide, poorly defined area at low densities. BSRA scallop density was low enough to raise concerns for reproductive potential of the stock. The absence of smaller size scallops during the video survey is partially confounded by shell height data from the commercial fishery indicating periodic recruitment events (Figure 3-18).

In addition to the incorporation of video survey data into the stocks assessment process, the 2003/04 season was the first in which managers established a CPUE hard threshold below which the fishery would be closed. Inseason fishery performance data was evaluated against the hard threshold mid-way to the GHL. The threshold was somewhat arbitrarily set at the CPUE level of the 2002/03 season, or 44 pounds of shucked scallop meats per dredge hour. The CPUE hard threshold was not met during both the 2003/04 and 2004/05 seasons thereby triggering fishery closures before the GHL upper bound was achieved.

Fishery performance has improved since the mid-2000s – Season average CPUE levels are well above the hard threshold, the upper bound of the GHL range is regularly met, and scallop shell-height data shows moderate recruitment (Figure 3-20). The current 50,000 pound GHL upper bound appears to be sustainable under prevailing conditions.

Given the paucity of stock status data available for weathervane scallop populations, managers place a heavy reliance on the imperfect metric of fishery dependent CPUE data. CPUE data may be skewed by fleet behavior and weather effects, and in the BSRA may be influenced, in part, by crab bycatch rates. Incidental catches of *Chionoecetes* crabs in the Bering Sea scallop fishery have remained below established limits in recent years, but concerns about *Chionoecetes* bycatch rates may alter fleet behavior in the fishery.

Large portions of the eastern Bering Sea shelf and the Pribilof Islands Habitat Conservation Area are closed to scallop fishing to protect red and blue king crab habitat and to provide for habitat conservation (Figure 2-2).

A GHL of 50,000 lbs of was established for the Bering Sea management area prior to the 2010/11 season. Two vessels completed a total of 597 tows, harvesting 50,063 lbs scallop meats with CPUE 52 lbs meat/dredge-hr. Average Area Q CPUE over the previous 10 seasons was 45 lbs meat/dredge-hr.

Onboard observers measured SH of about 4,500 retained and discarded scallops during the 2010/11 Bering Sea fishery. Plots from resampling these data (**Figure 3-20**) show some small scallops around 115

mm SH that were discarded, with the most retained scallops 130–170 mm SH. Average SH of retained scallops was 154 mm.

Observers sampled 115, or 19% of the tows made during the season. From these samples, 494,725 lbs of whole scallops were retained and 73,178 lbs or 12.9% of the total round weight catch were discarded. Estimated bycatch during the season was 60,537 Tanner crabs from a cap of 130,000 crabs, and 18,823 snow crabs from a cap of 300,000 crabs (Table 2-5). Additionally, 26 red king crabs were incidentally caught during the season.

Table 3-13 Bering Sea Area scallop fishery summary statistics.

Season	Number vessels	GHL (lbs meat)	Catch (lbs meat)	Dredge hours ^a	CPUE (lbs meat per dredge hr)	Scallop Discards (lbs whole) ^a
1993/94	9	NA	284,414	5,764	49	
1994/95	8	NA	505,439	11,113	45	
1995/96		closed				
1996/97	1	600,000	150,295	2,313	65	16,188
1997/98	2	600,000	97,002	2,246	43	38,262
1998/99	4	400,000	96,795	2,319	42	127,607
1999/00	2	400,000	164,929	3,294	50	68,406
2000/01	3	200,000	205,520	3,355	61	97,994
2001/02	3	200,000	140,871	3,072	46	76,261
2002/03	2	105,000	92,240	2,038	45	55,197
2003/04	2	105,000	42,590	1,020	42	34,327
2004/05	1	105,000	10,050	275	37	5,639
2005/06	1	50,000	23,220	602	39	17,433
2006/07	1	50,000	48,246	1,138	42	54,503
2007/08	2	50,000	49,995	1,084	46	49,356
2008/09	1	50,000	49,995	962	52	58,417
2009/10	1	50,000	48,855	1,270	38	57,984
2010/11	2	50,000	50,099	972	52	73,178
2011/12 ^b		50,000	50,275			

^a Whole lbs estimated from observer samples; meat recovery from whole scallops varies from 7–12%; estimates of discard mortality are not currently available.

^b PRELIMINARY 2011/2012 catch data subject to change.

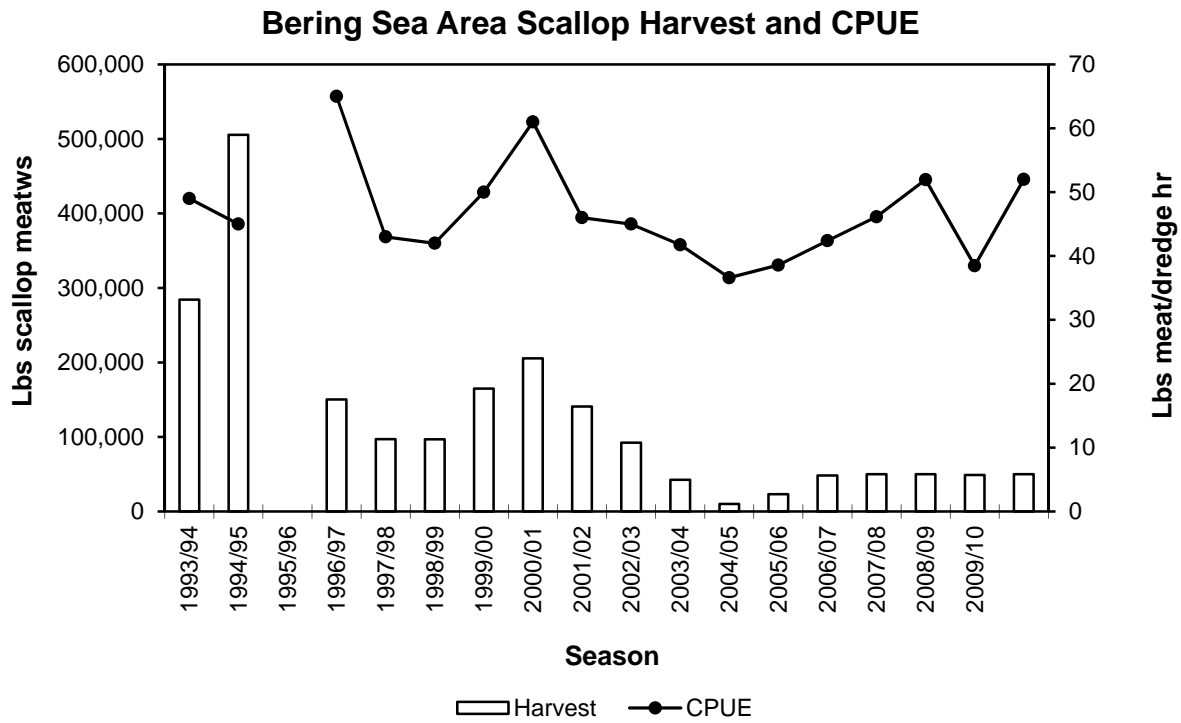


Figure 3-19 Bering Sea Scallop Harvest and CPUE, 1993/94—2010/11 seasons.

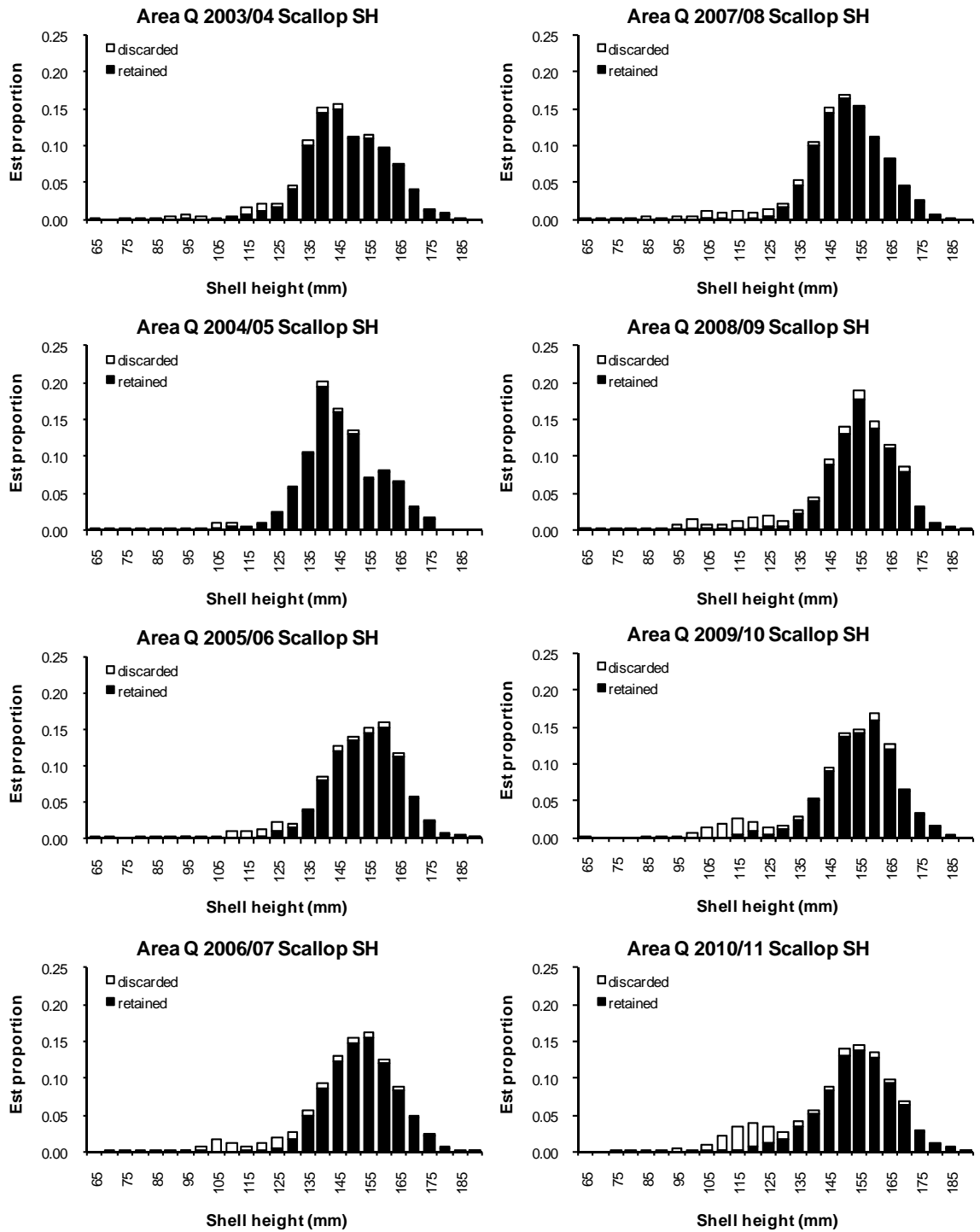


Figure 3-20 Estimated scallop shell height distributions from the 2001/02—2010/11 Bering Sea fishing seasons.

3.9 Dutch Harbor Registration Area

The first landings of weathervane scallops from the Dutch Harbor Registration Area (DHRA) occurred in 1982, however GHM ranges were not established until 1993. The initial DHRA GHM range was zero to 170,000 pounds of shucked scallop meats and was lowered to a range of zero to 110,000 pounds of shucked scallop meats for the 1998/99 and 1999/00 seasons Table 3-14. The DHRA scallop fishery failed to meet preseason performance expectations when GHM ranges included levels above 100,000 pounds: under those scenarios catch rates were often less than half that observed on other, more productive scallop beds and annual harvests consistently fell short of even half of the upper bound of the GHM range.

ADF&G closed the DHRA to commercial fishing for weathervane scallops for the 2000/01 and 2001/02 fishing seasons and reopened the area in 2002/03 with a GHM range of zero to 10,000 pounds of shucked meats. In setting this GHM range, managers established that the fishery would be closed inseason if preseason expectations of catch rate, effort distribution, and overall harvest were not met. The 10,000 pound upper bound was crafted to provide sufficient economic incentive for industry to cautiously pursue the fishery and generate information needed to assess stock status. In addition, the 10,000 pound upper bound is indicative of a change in fishery managers' perception of DHRA scallop abundance relative to the previous decade. Fishery performance during the 2002/03 season was not markedly improved from those of the 1990s resulting in closure of the DHRA for the next five fishing seasons to allow for stock rebuilding.

The DHRA was reopened to commercial fishing for weathervane scallops during the 2008/09 season with a GHM range of zero to 10,000 pounds of shucked scallop meats. Justification for the GHM was the same as that applied in setting the 2002/03 GHM. Fishery performance was greatly improved during the 2008/09 season (see Figure 3-21): the upper limit of the GHM range was met, catch per unit of effort was among the highest on record, catches showed reasonable spatial and temporal distribution, and size-frequency data indicated potential for future scallop recruitment.

Based on positive results of the 2008/09 season ADF&G set a 2009/10 GHM range of zero to 10,000 pounds of shucked scallop meats for the DHRA. Fishery information suggests that scallop beds in the DHRA are small and isolated, so the 2009/10 GHM was set with the limitation that no more than 5,000 pounds of shucked scallop meats could be taken from either waters of the Bering Sea or Pacific Ocean waters. This restriction was intended to spatially distribute fishing effort and reduce the chance of overharvesting a single bed. Fishery performance for the Bering Sea portion of the 2009/10 DHRA fishery was among the best on record; catches were sporadic in Pacific Ocean waters.

Prior to the 2010/11 season, a GHM of 10,000 lbs scallop meats was established for Area O with 5,000 lbs each assigned to the Bering Sea and Pacific Ocean sections. One vessel fished the area from 30 September to 3 October 2010, harvesting 5,040 lbs from the bed outside Inanudak Bay on the Bering Sea side with CPUE 95 lbs meat/dredge-hr and 602 lbs from the Pacific side with CPUE 20 lbs meat/dredge-hr. Overall CPUE for 2010/11 was 68 lbs meat/dredge-hr.

The onboard observer measured 290 retained and discarded scallop shells from the 2010/11 Inanudak Bay tows. The plot from resampling these data (Figure 3-22) shows that retained scallops were primarily 140–155 mm SH. Results from visual aging of 18 Inanudak Bay shells collected by the observer showed rapid growth and suggested that 5- and 6-year-old scallops were important in the retained catch.

Observers sampled 13 of 53 tows made during the 2010/11 Area O fishery. Estimates from these data were 43,835 lbs whole scallops retained and 3,237 lbs discarded (7.5% discard rate), plus bycatch of 901 Tanner crabs from a cap of 10,000 crabs as well as 50 halibut incidentally caught.

Table 3-14 Dutch Harbor Area scallop fishery summary statistics.

Season	Number vessels	GHL (lbs meat)	Catch (lbs meat)	Dredge hours ^a	CPUE (lbs meat per dredge hr)	Scallop Discards (lbs whole) ^a
1993/94	2	170,000		838	46	
1994/95	3	170,000	1,931	81	24	
1995/96	1	170,000	26,950	1,047	26	
1996/97		170,000				
1997/98	1	170,000	5,790	171	34	18,561
1998/99	4	110,000	46,432	1,025	45	29,348
1999/00	1	110,000	6,465	273	24	4,284
2000/01		closed				
2001/02		closed				
2002/03	1	10,000	6,000	184	33	4,346
2003/04		closed				
2004/05		closed				
2005/06		closed				
2006/07		closed				
2007/08		closed				
2008/09	1	10,000	10,040	225	45	32,584
2009/10	1	10,000	8,445	104	81	2,082
2010/11	1	10,000	5,642	83	68	3,237
2011/12 ^b		10,000	5,570			

^a Whole lbs estimated from observer samples; meat recovery from whole scallops varies from 7–12%; estimates of discard mortality are not currently available.

^b PRELIMINARY 2011/2012 catch data subject to change.

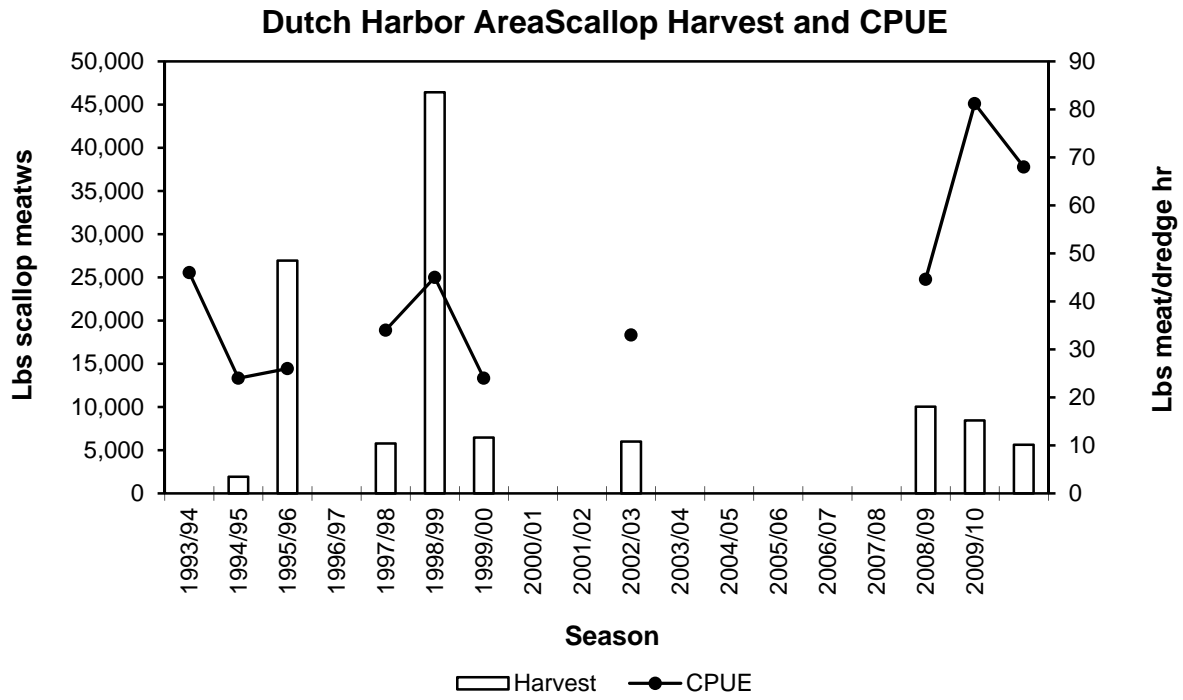


Figure 3-21 Dutch Harbor Area Scallop Harvest and CPUE, 1994/95—2010/11 seasons.

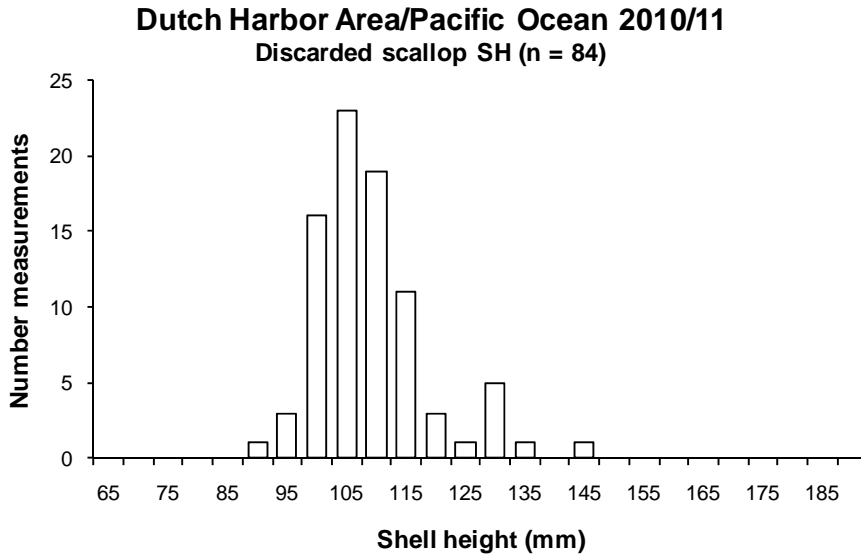
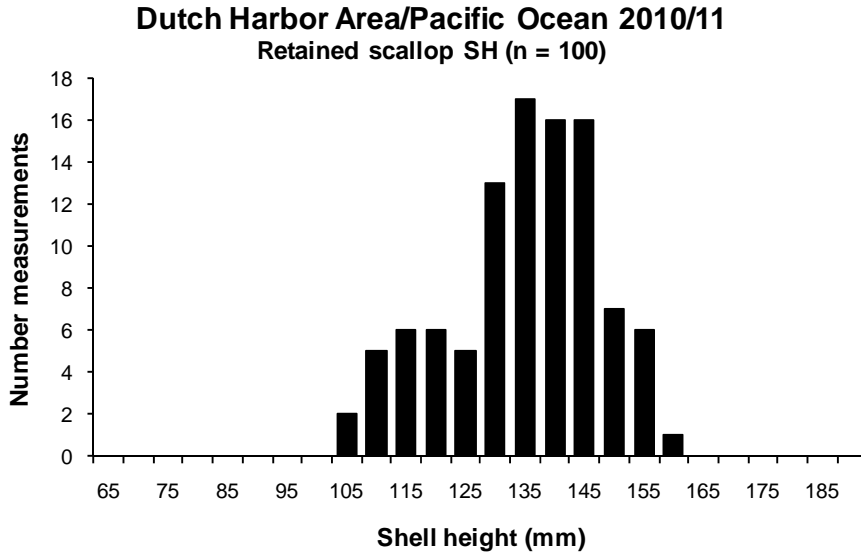


Figure 3-22 Estimated shell height distributions of scallops retained (upper plot) and discarded (lower plot) during the 2010/11 Dutch Harbor scallop fishery.

3.10 Adak Registration Area

Scallops were first harvested from the Adak Registration Area (ARA) in 1979 with subsequent fishing periods in 1992 and 1995; all harvest information from the ARA is confidential due to limited participation in the fishery. Bathymetry of the Aleutian Islands, with a narrow continental shelf edge, provides limited scallop habitat; however, a major scallop bed was known to occur on Petrel Bank, an area of important red king crab habitat. To protect red king crab habitat on Petrel Bank, and reduce red king crab bycatch mortality, waters between 51° 30' N. latitude and 54° 30' N. latitude, and between 179°

W. longitude and 179° E. longitude were closed to commercial scallop fishing in 1991.

Scant information is available for scallop populations in the ARA; both weathervane and pink scallops are known to occur in the area, but distribution and abundance are unknown. No scallop assessment surveys have been conducted in the ARA and future stock status information will likely be limited. Previous ADF&G management action set a GHM range of zero to 75,000 pounds of shucked scallop meats for the ARA, but that GHM range was poorly justified. Under the current management approach ADF&G does not set a GHM for the ARA scallop fishery and is unlikely to allow future commercial scallop fishing there due to ongoing concerns for red king crab bycatch mortality and limited information on the scallop resource.

4 Ecosystem Considerations

The Ecosystem Considerations section was added to the SAFE in 2006, and the SPT hopes to continue improving the section. A wealth of information on climate effects on ecosystems and ecosystem trends contained in the GOA Groundfish Plan Team Ecosystems Considerations document is equally relevant to the scallop fishery and may be accessed at: <http://www.fakr.noaa.gov/npfmc/SAFE/SAFE.htm>.

Commercial concentrations of weathervane scallops occur along the Alaska coast in elongated beds oriented in the same direction as prevailing currents. Image data from ADF&G CamSled tows show that benthic habitats where scallop fishing occurs in the Bering Sea, eastern GOA, and Shelikof Strait, consist predominately of fine sediments (silt, mud, and sand), with heavy sediment clouds regularly suspended by tidal currents. Areas of harder bottom and larger sediments are found inshore from where scallop fishing occurs. ADF&G is beginning to use CamSled data to document and map habitat in the vicinity of scallop fishing areas.

Essential Fish Habitat (EFH) descriptions for scallops may be revised in conjunction with the EFH 5-year review. More information on the current EFH designations may be found at: <http://www.fakr.noaa.gov/habitat/efh.htm>. The Council is scheduled to take action to initiate EFH amendment analyses to the April 2010 meeting.

4.1 Ecosystem Component

In conjunction with the proposed amendment to the Scallop FMP to comply with ACL requirements, a new category is to be created within the FMP for the ‘Ecosystem Component’(EC). The non-target scallop stocks (pink, rock and spiny scallops) are to be moved into this EC under the FMP. Stocks contained under this category of the FMP are intended to be stocks which are not the subject of a directed fishery. For these stocks ACLs are not required to be annually specified.

While these stocks are currently not targeted commercially, moving them to the ecosystem component would be intended to discourage uncontrolled fishing on these species without applicable management measures in place should they become economically viable in the future. There is currently a low-level personal use/subsistence fisheries for some of these species.

The EC species may be identified at the species or stock level, and may be grouped into complexes. Determination of conformity to the above criteria may require more in-depth analysis, with contributions by ADF&G and NMFS, than is provided in this document. In addition, a periodic assessment of these non-target stocks would be beneficial. The EC species may be included in an FMP or FMP amendment for any of the following reasons:

“...for data collection purposes; for ecosystem considerations related to specification of OY for

the associated fishery; as considerations in the development of conservation and management measures for the associated fishery; and/or to address other ecosystem issues. While EC species are not considered to be “in the fishery,” a Council should consider measures for the fishery to minimize bycatch and bycatch mortality of EC species consistent with National Standard 9, and to protect their associated role in the ecosystem. EC species do not require specification of reference points but should be monitored on a regular basis, to the extent practicable, to determine changes in their status or their vulnerability to the fishery. If necessary, they should be reclassified as in the fishery.”

Limited data exists currently to assess the spatial extent or biomass of these non-target scallop stocks. No commercial harvests have been documented for scallop species other than weathervane scallops in waters off Alaska since at least 1992 (C. Russ, ADF&G, Homer, pers. Comm.). Major fishery development is not anticipated for non-weathervane scallops but market potential does exist for both “pink and rock” scallops. The spatial distribution of non-weathervane scallop species is not well defined, although these species currently compose a relatively minor component of catches in both NMFS and ADF&G surveys. In conjunction with the EA for amendment 12, data on capture of non-target scallop species was derived from ADF&G and NMFS trawl surveys for the years 1998–2008 (M. Stichert, ADF&G, Kodiak; M. Spahn, ADF&G, Homer; and R. Foy, NMFS, Kodiak, all pers. comm.). Trawl surveys are conducted in Region 1 only by NMFS and in Regions 2 and 4 by both ADF&G and NMFS. Among all ADF&G surveys, all non-target scallops were recorded as *Chlamys* sp. Although data extrapolated to area-swept estimates were not available for the ADF&G surveys, and these trawl surveys are not designed to assess non-target scallop species, surveys catches of non-target scallops were relatively minor (**Table 4-1**). Data on non-target species was summarized according to whole weight (lbs). In Region 1, catches of non-target scallops by the NMFS survey in odd-numbered years from 1999 to 2007 averaged 1 lb annually. For Region 2, ADF&G catches among either annual trawl surveys averaged 22 lbs (whole weight; CV = 84%) annually, ranging from <1 to 53 lbs, whereas NMFS surveys caught an average of 4 lbs annually. For Region 4, annual catch of *Chlamys* among ADF&G trawl surveys ranged from 3 to 109 lbs, averaging 35 lbs (CV = 97%), whereas NMFS survey catches averaged 70 lbs (CV = 50%) annually.

Table 4-1 Annual biomass (whole lbs) of non-target scallops captured in ADF&G and NMFS surveys within ADF&G management region during 1998-2008.

Year	Region 1		Region 2		Region 3		Region 4		
	NMFS Trawl	Region Total	ADF&G Dredge	ADF&G Trawl	NMFS Trawl	Region Total	ADF&G Trawl	NMFS Trawl	Region Total
Non-target scallop species									
	Survey Catch (whole lbs)								
1998			NA	46		46	75		75
1999	1	1		6	10	15	68	36	105
2000				33		33	109		109
2001	0	0		53	2	55	23	32	55
2002				15		15	19		19
2003	2	2		12	2	13	33	96	129
2004				38		38	11		11
2005	3	3		10	3	14	3	111	114
2006				18		18	20		20
2007	0	0		7	2	9	15	77	92
2008				<1		<1	8		8
Total	5	5		238	18	257	384	352	736
Mean	1.0	1.0		21.7	3.7	23.3	34.9	70.3	66.9
CV (%)	55.1	55.1		24.9	43.0	22.2	29.3	22.4	20.8

^a Meat weight based on a median meat recovery of 10% statewide.

^b Discard mortality assumes a 20% mortality on scallops that were captured, but not retained.

Additional information will be included in the SAFE report on these non-target stocks as it becomes available. Any recorded catch of these species will be recorded in order to best evaluate retention of these species in conjunction with their vulnerability and potential for directed targeting. Should a target fishery becomes desirable for any of these species, either as a whole complex or by individual stock grouping, an FMP amendment would need to be initiated by the Council to move the stock ‘into the fishery’ under the FMP and ACLs annually specified.

4.2 Ecosystem Effects on the Stock

Little is known about how changes in marine ecosystems affect the Alaska scallop stock. The fishery began in the 1960s, but data from the period before inception of the observer program in 1993 are scarce. Hence, there is no basis for comparison of stock dynamics in response to, for example, the 1977 regime shift. The bivalve mollusk design appears to be extremely robust, as scallops with morphology similar to weathervane scallops have inhabited oceans around the world for millions of years.

4.3 Fishery Effects on Ecosystem

The Alaska weathervane scallop fishery occurs in continental shelf waters at depths 40–150 m in three main areas: the eastern Gulf of Alaska between Prince William Sound and Cape Spencer; around Kodiak Island; and in the eastern Bering Sea (Figure 2-2). Because the fishery footprint is confined to these areas and because many areas of similar habitat are closed to scallop dredging, we expect the effects of the scallop fishery on the GOA and Bering Sea ecosystems to be minor.

Predators: Little is known about scallop predators. Plankton feeders probably eat a large amount of floating larvae. Small weathervane scallops have been found in the stomachs of flounders and crabs may also be scallop predators. Starfish, shell boring worms and sponges may also prey upon scallops. Twentyarm sea stars are a known predator of juvenile weathervane scallops.

Bycatch: Scallop fishery bycatch is closely monitored by the onboard observer program (see Section 2.4). Bycatch in the scallop fishery includes prohibited species such as red king crab, Tanner crab, snow crab, and Pacific Halibut, other commercially important species of fish and invertebrates, miscellaneous non-commercial species, and natural and man-made debris. Crab bycatch in the scallop fishery is highest in the Bering Sea, although this accounts for a small proportion of total Bering Sea crab bycatch.

Although a variety of marine vertebrates, invertebrates, and debris are caught incidentally in scallop dredges, weathervane scallops predominate catches. Gorgonian (hard) corals are infrequently encountered by scallop observers; since 1996, corals have been observed in only 11 of the 15,836 tows sampled for catch composition and bycatch. Summaries of haul composition sampling by area are presented in observer reports prepared by ADF&G (e.g., Rosenkranz and Burt, 2009).

For example, during the 2000/01–2007/08 seasons, the most frequently caught species or items in the statewide scallop fishery by weight were weathervane scallops and scallop shells (84%), twentyarm sea stars *Pycnopodia helianthoides* (4%), natural debris (kelp, wood, etc., 3%), and several species of skates (2%). A comparison of the statewide incidental catch and the incidental catch for each scallop fishery area/district for the 2010/11 and 2009/2010 seasons are listed in Table 4-2 and Table 4-3. Further information on the actual weights associated with the haul composition data in 2010/11 is shown in Table 4-4. Additional details on the full haul composition data are included as appendix 2.

Table 4-2 Summary of results from scallop observer haul composition sampling (% by weight) during the 2010/11 season

Species category	Yakutat			PWS William Sound	Kodiak			
	Statewide	Area D	District 16		Northeast District	Shelikof District	Dutch Harbor	Bering Sea
Weathervane scallops	76.6	80.7	80.9	86.1	73.1	74.0	77.9	75.2
^a Flatfish	2.4	4.1	1.2	0.8	2.6	3.1	2.9	3.8
^b Sea stars	4.7	6.9	2.1		6.2	4.0	11.2	0.1
^c Skates	3.1	2.8	5.8	1.1	2.1	4.0	0.1	2.3
Chionoecetes crabs	0.4	0.1	<0.1	<0.1	0.4	0.2	0.3	3.7
Pacific halibut	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1

^a Miscellaneous flatfish including arrowtooth flounder *Atheresthes stomias*, Alaska plaice *Pleuronectes quadrituberculatus*, flathead sole *Hippoglossoides elassodon*, English sole *Parophrys vetulus*, rex sole *Glyptocephalus zachirus*, Dover sole *Microstomus pacificus*, and yellowfin sole *Limanda aspera*; Pacific halibut *Hippoglossus stenolepis* are accounted separately.

^b Includes sunflower sea stars *Pycnopodia helianthoide*, brittle stars *Ophiura* sp., basket stars *Gorgonocephalus* sp., and sun sea stars *Solaster* sp.

^c Includes Alaska skate *Bathyrāja parmifera*, big skate *Raja binoculata*, longnose skate *Raja rhina*, Bering skate *Bathyrāja interrupta*, and unspecified skate species.

Table 4-3 Weights associated with haul composition data from 201/11 as shown in Table 4-2 and percentage of catch.

Categories for SAFE	WEIGHTS IN KG combined from haul comp tows	% of Catch
Weathervane in whole scallop wt (includes harvested scallops, crushed discards, & small live discards)	2314.28	85.0%
Flatfish	61.27	2.2%
Sea Stars	103.41	3.8%
Skates (includes egg cases)	51.05	1.9%
<i>Chionoecetes</i> crab	2.53	0.1%
Pacific halibut	4.8	0.2%
Other	186.42	6.8%

Table 4-4 Summary of results from scallop observer haul composition sampling (% by weight) during the 2009/10 season.

Species category	Statewide	Yakutat		Kodiak					
		Area D	District 16	Prince William Sound	Northeast District	Shelikof District	Southwest District	Dutch Harbor	Bering Sea
Weathervane scallops	79.1	79.3	83.6	89.5	67.5	80.8	80.7	74.3	85.2
^a Flatfish	5.0	3.0	3.4	1.3	1.6	2.1	5.1	1.0	1.1
^b Sea stars	3.1	4.6	7.6	3.4	8.0	2.7	3.9	2.1	0.2
^c Skates	2.4	2.3	2.1	1.3	1.3	4.0	2.4	<0.1	1.9
<i>Chionoecetes</i> crabs	0.4	<0.1	<0.1	<0.1	0.3	0.2	0.2	<0.1	4.4
Pacific halibut	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1

^a Miscellaneous flatfish including arrowtooth flounder *Atheresthes stomias*, Alaska plaice *Pleuronectes quadrituberculatus*, flathead sole *Hippoglossoides elassodon*, English sole *Parophrys vetulus*, rex sole *Glyptocephalus zachirus*, Dover sole *Microstomus pacificus*, and yellowfin sole *Limanda aspera*; Pacific halibut *Hippoglossus stenolepis* are accounted separately.

^b Includes sunflower sea stars *Pycnopodia helianthoide*, brittle stars *Ophiura* sp., basket stars *Gorgonocephalus* sp., and sun sea stars *Solaster* sp.

^c Includes Alaska skate *Bathyraja parmifera*, big skate *Raja binoculata*, longnose skate *Raja rhina*, Bering skate *Bathyraja interrupta*, and unspecified skate species.

4.4 Trawl Survey Information on Scallop Stocks

Trawl surveys for fisheries stock assessment are conducted annually in the Gulf of Alaska and the Bering Sea by NMFS and ADF&G. Although these surveys target crab and groundfish and the gear is not designed to efficiently capture scallops, weathervane scallops are caught in some areas and survey data provide information on the range of the species.

In the eastern GOA (Figure 4-1), weathervane scallops have been captured during trawl surveys offshore from traditional scallop fishing grounds and in closed waters adjacent to Prince William Sound. Around Kodiak Island (Figure 4-2), trawl surveys have captured scallops in closed waters south of the island and in many bays and inlets. Along the south side of the Alaska Peninsula, trawl survey data indicate that most scallop habitat lies in coastal waters that are closed to scallop fishing, while scallops have been captured during trawl surveys over a large swath of the eastern Bering Sea shelf Figure 4-3.

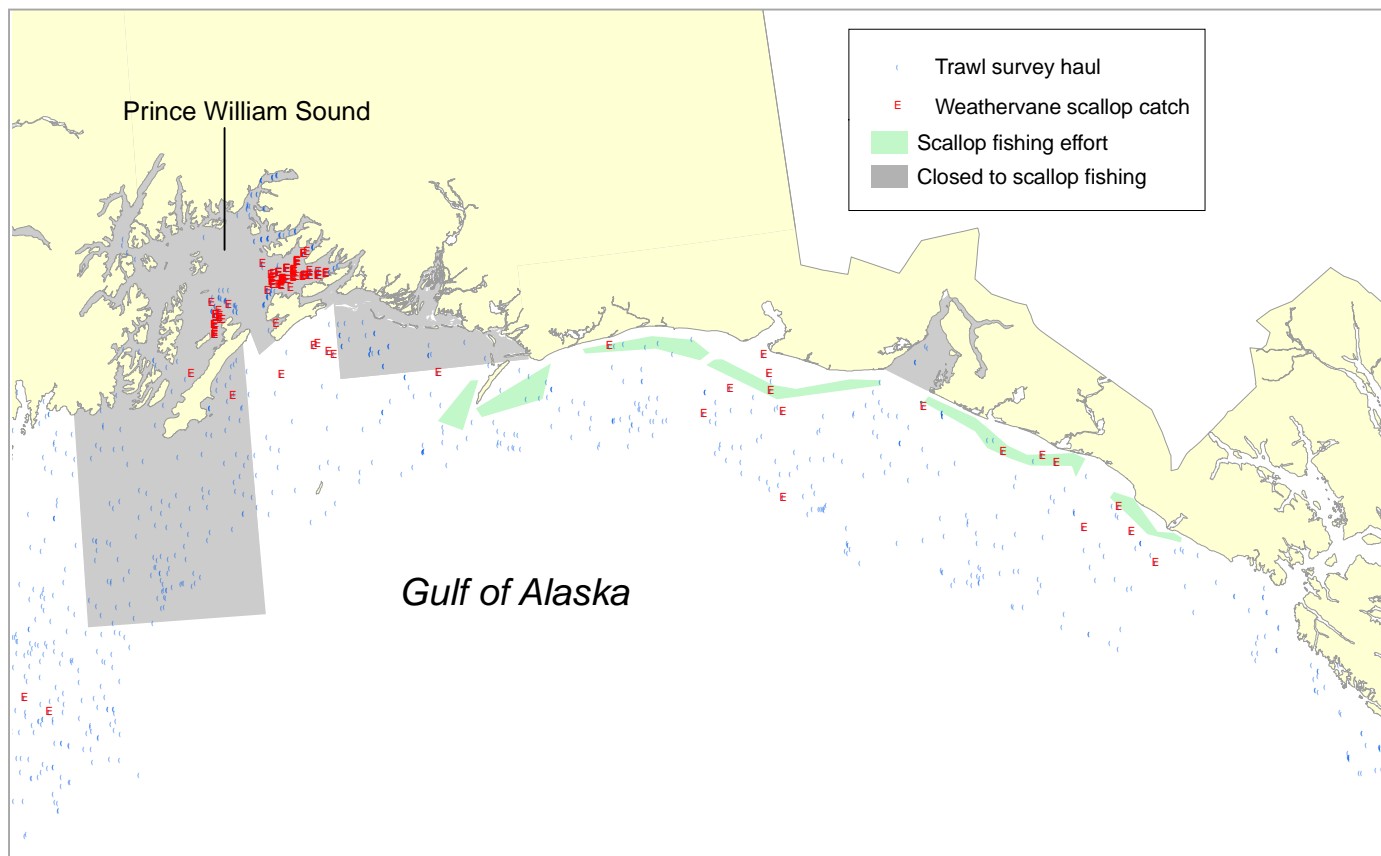


Figure 4-1 Map showing trawl survey haul locations (blue circles), survey locations with weathervane scallop catch (red crosses) in the eastern Gulf of Alaska, 2001-2010.

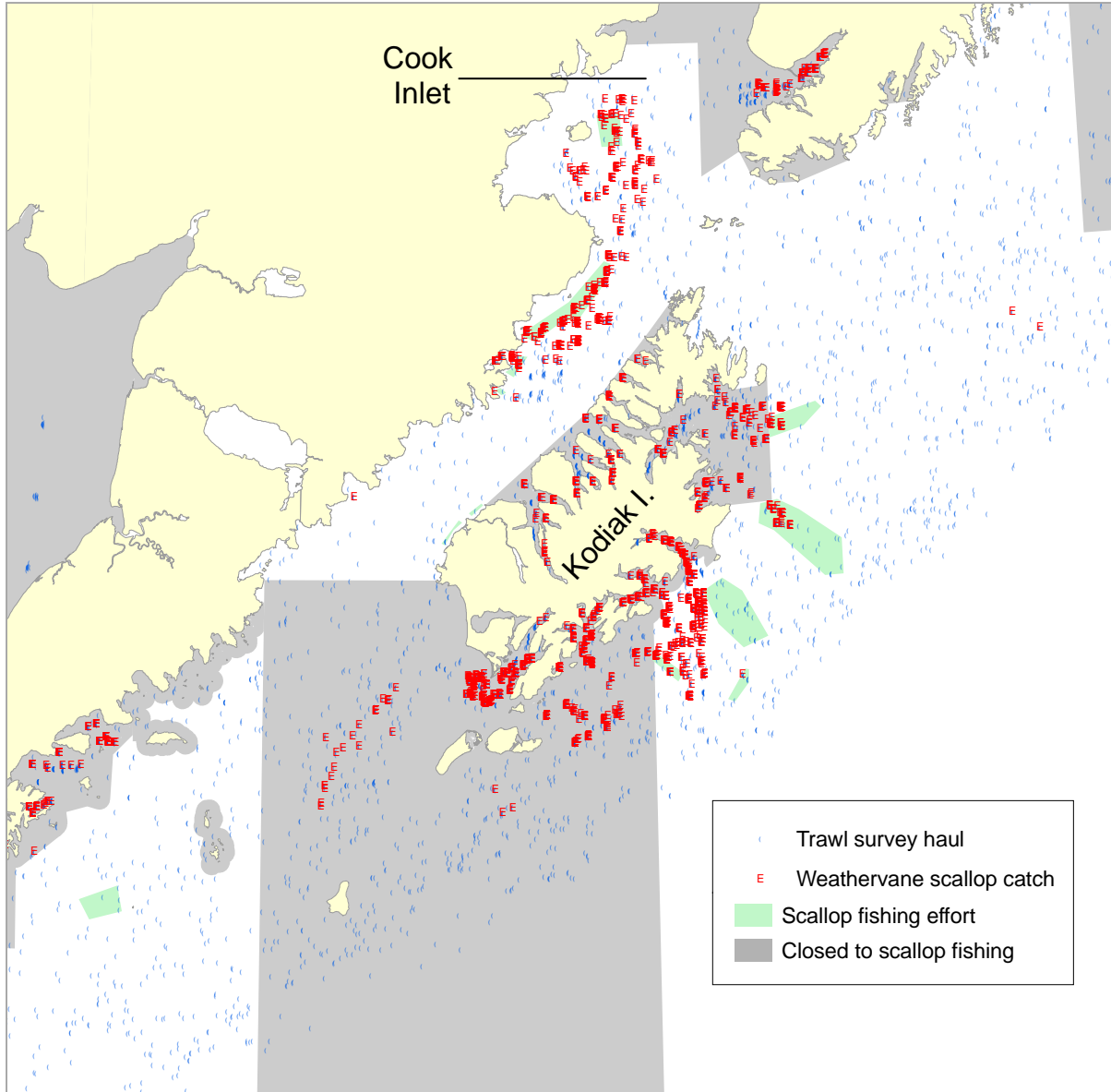


Figure 4-2 Map showing trawl survey haul locations (blue circles) and locations with weathervane scallop catch (red crosses) in the Lower Cook Inlet and Kodiak Island vicinity, 2001-2010.

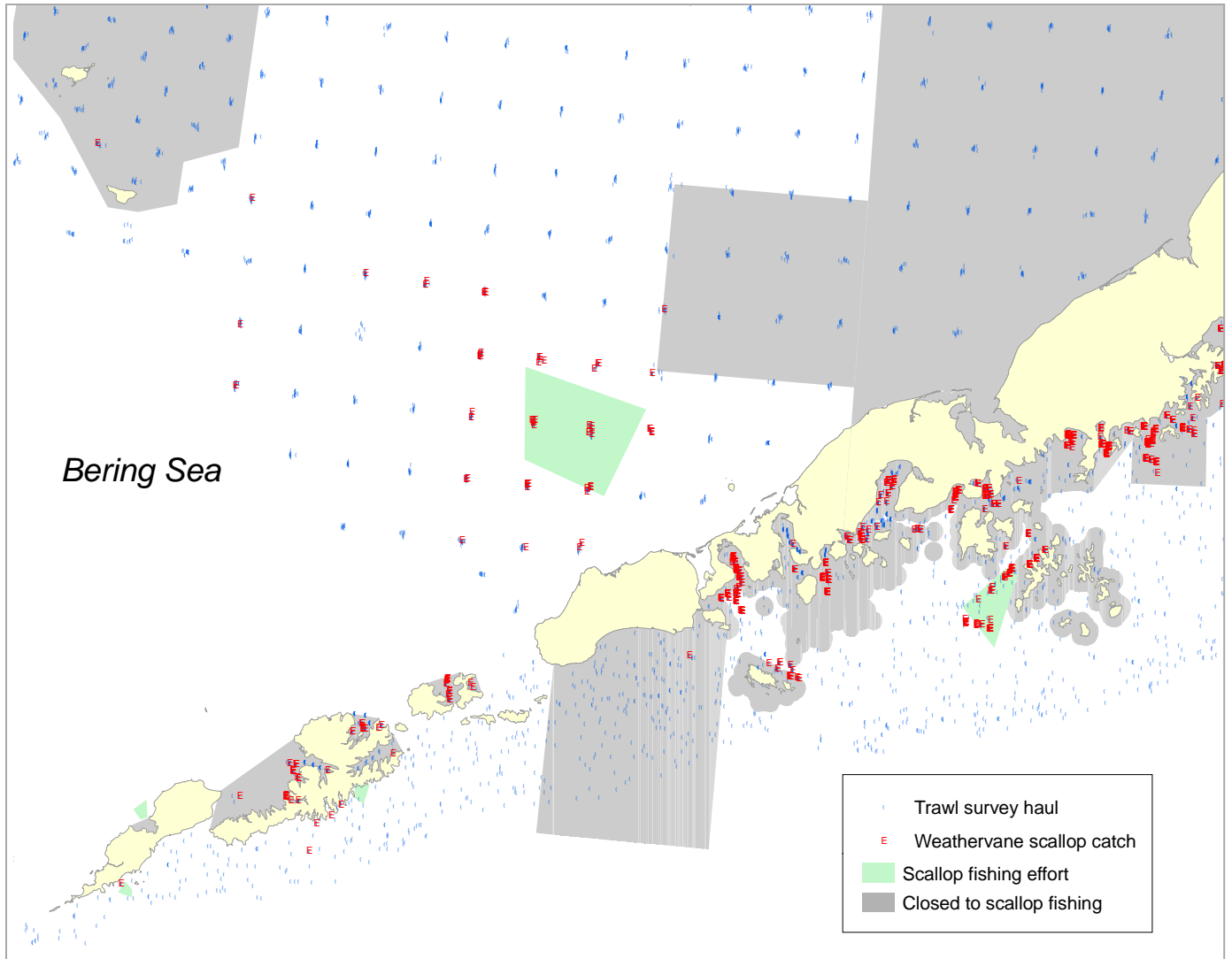


Figure 4-3 Map showing trawl survey haul locations (blue circles) and locations with weathervane scallop catch (red crosses) in western Alaska, 2001-2010.

5 Economic Overview of the Scallop Fishery.

An overview of Alaska weathervane scallop harvest and wholesale revenue is presented in Table 5-1. Some of this data is excerpted from Kruse et al. (2005) and updated with information from annual scallop harvest information contained in Chapter 3, Stock Status. Vessel participation in this fishery has declined in recent years due to the Federal LLP and formation of a voluntary marketing association. The Federal LLP limits the participation to 9 permit holders. Since 2000, no more than 8 vessels have participated, and in recent years no more than 4 vessels have participated.

Table 5-1 provides the statewide average price per pound of landed scallop meats, as well as an inflation adjusted price and total value adjusted using the GDP deflator to 2010 value. Total real gross first wholesale revenue is calculated by multiplying landed pounds of meats by the adjusted price. Adjusted price converts the landed prices by year to year 2010 values to allow for comparisons in current dollar values, after accounting for inflation.

The majority of the scallop meats that are landed have been processed (shucked) and frozen at sea and their value represents gross revenue at the first wholesale level. However, some shucked meats are delivered fresh for dock or roadside sales and are destined for either fresh intermediate markets (restaurants and raw seafood vendors) or as direct sales to final consumers. Prior to 1996, almost all scallop meats were placed in muslin bags and iced (not frozen) at sea. Thus, although landed price is often referred to as an ex-vessel price, since 1996 it is actually primarily a first wholesale price in that the landed product is a primary processed product. As a result, gross revenue is identified as first wholesale gross revenue here.

It is important to note is that there can be significant differences in prices for scallops that are frozen at sea compared to those that are sold fresh at the dock or on the roadside. The statewide scallop price used here is calculated by the Alaska Department of Revenue (ADOR), Division of Taxation, and is an average of all the reported State fish tax revenue collected from the scallop fishery through 2010. The 2011 price is a spot price provided by harvesters. Thus, the average price is likely less than the prices received for fresh product. Frozen product prices are reportedly averaging \$10 per pound in 2011 (Pers.Comm. Jim Stone, March 2012) and as much as \$12 per pound at dockside in fresh form (Pers. Comm. Brendan Harrington, FV Kilkenney, March 2012). However, fresh product deliveries are subject to local landings taxation that frozen at sea product is not charged. Thus, the statewide average price calculated by ADOR (ADOR, 2010) is used in Table 5-1 with the understanding that it may slightly undervalue the total harvest due to fresh product landings and the frozen product spot price is used for 2011 as the official statewide average price has not yet been published.

Adjusted price has fluctuated during the past; trending upwards from a \$7.22 in 1993/94 to \$8.43 in 1997/98, then falling to \$6.12 in 2003/04, rebounding to \$8.34 by 2006/07, and then falling to \$6.13 in 2007/08. The statewide average 2009/10 price reported by ADOR increased to \$6.48. These price fluctuations may be directly related to U.S. East coast scallop stock conditions and related market prices. The dependence of market prices in the Alaska scallop fishery on east coast markets, and imported scallop prices, is a topic for further research.

First wholesale revenue in this fishery has varied considerably over the period as both price and landings have varied. The peak value in the fishery, since 1993, occurred in 1994/95 season when about \$9.9 million was earned. Since that time, real total first wholesale revenue in the fishery has fluctuated with prices. Overall, the total value has trended downward as landings have fallen from more than 1.2 million pounds down to a low in 2008/09 of 342,434 pounds. The total real first wholesale revenue of a little less than \$2.2 million in the 2008/09 season was the lowest revenue total since 1993; however, the 2009/10 wholesale revenue total improved to \$3.2 million.

Table 5-1: Statewide Commercial Weathervane Scallop Real Wholesale Value, 1993/94—2010/11.

Year	Vessels	Catch (lbs. shucked meats) ^a	Nominal Average Price/lb.	Inflation Factor ^c	Real Average Price/lb	Real Wholesale Value
1993/94	15	984,583	\$5.15	1.40	\$7.22	\$7,105,416
1994/95	15	1,240,775	\$5.79	1.37	\$7.95	\$9,859,321
1995/96	10	410,743 ^b	\$6.05	1.34	\$8.13	\$3,340,767
1996/97	9	732,424	\$6.30	1.32	\$8.31	\$6,087,441
1997/98	9	818,913	\$6.50	1.30	\$8.43	\$6,900,520
1998/99	8	822,096	\$6.40	1.28	\$8.20	\$6,744,512
1999/00	10	837,971	\$6.25	1.26	\$7.90	\$6,616,364
2000/01	8	750,617	\$5.50	1.24	\$6.80	\$5,104,898
2001/02	6	572,838	\$5.25	1.21	\$6.35	\$3,636,581
2002/03	6	509,455	\$5.25	1.19	\$6.25	\$3,182,663
2003/04	4	492,000	\$5.25	1.16	\$6.12	\$3,008,879
2004/05	5	425,477	\$5.50	1.13	\$6.23	\$2,650,745
2005/06	5	525,357	\$7.58	1.10	\$8.31	\$4,365,095
2006/07	4	487,473	\$7.86	1.06	\$8.34	\$4,067,463
2007/08	4	458,313	\$5.94	1.03	\$6.13	\$2,807,383
2008/09	4	342,434	\$6.34	1.01	\$6.40	\$2,190,939
2009/10	3	486,059	\$6.48	1.00	\$6.48	\$3,162,622
2010/11 prelim.	3	459,759	\$10.00	1.00	\$10.00	\$4,597,590

^a Pounds of shucked scallop meats are reported on State fish tickets and landed pounds and are a primary processed product.

^b Includes illegal harvest in federal waters by the vessel Mr. Big that resulted in an emergency closure of the entire scallop fishery, as well as development of federal License Limitation and the Scallop FMP.

^c inflation adjustment uses the gdp price deflator through 2010. Once 2010/11 data on landings and average price are finalized the values can be updated to 2011 base values.

Crew Usage and Wages:

Scallop vessels in the Alaska Weathervane Scallop fishery are allowed, by State of Alaska regulation, to carry 12 crew including the skipper. In the past, prior to formation of the scallop cooperative and when many more vessels participated, it was commonplace for vessels to carry the maximum allowed crew. This was largely due to the fact that, even under the license limitation program, there was still a "race for fish" mentality of attempting to capture as much of the unallocated GHL as possible in the shortest time possible. To do this, a vessel would use the full complement of crew allowed by regulation in order to speed up the processing time (shucking, freezing, and packaging) and allow continued deployment of the dredge, especially in instances of high CPUE. (Pers.Comm. Jim Stone and Brendan Harrington, March 2012)

The formation of the scallop cooperative, along with declining CPUE in several areas has had some impacts on crew positions. The scallop cooperative reports that they will vary the number of crew they carry depending on their expectations of fishing conditions. Essentially, if they feel that the pace of fishing will be a bit slow on any given trip they may carry anywhere between 8 and 12 crew and can even operate with few crew than that in some cases. The one non-cooperative vessel in the fleet, the

Kilkenney, is presently fishing the Kamishak Bay beds and areas near Kodiak Island. They are delivering fresh shucked meats to buyers in Homer and Kodiak and indicate that, since they are not freezing their product at sea they can fish with as few as 3 crew but usually take 4 or more. Thus, the current Alaska scallop fishery is likely using fewer crew due to the efficiency gains they have created through the cooperative and through the ability of the Kilkenny to sell fresh product.

Crew wages in the present fishery are undoubtedly less, in the aggregate, than they would have been as a share of total revenue in the past. What is not clear; however, is whether individual crew shares have increased for those who continue to work in the scallop fishery. Improved efficiency and reduced numbers of crew on a vessel create the opportunity to have increased crew shares; however, there is no economic data collection program in the scallop fishery. Thus, it is not possible to address changes in crew compensation with existing sources of data.

Port of Landing and Impacts on Communities

The two vessels that fish within the scallop cooperative may make landings of frozen product for transshipment to cold storage in several ports including, but not limited to, Dutch Harbor, Kodiak, Yakutat, Juneau, and Seattle. Given that these landings are often made by a single cooperative vessel in a port, these landings are confidential. Similarly, the one vessel that makes landings of fresh product in Homer and Kodiak does so to too few processors for the data on landings to be released due to confidentiality restrictions. Thus, it is not possible to establish release landings by port. Furthermore, there is no economic data collection program in place to collect vessel expenditure data while vessels, and crew, are in port. Unfortunately, the limits of confidentiality and limited expenditure data make it impossible to establish the potential importance of this fishery to fishery dependent communities.

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Appendix 1: Westward Region GHGs for 2010/11 season (provided by Mark Stichert)

The Alaska Scallop Fishery Management Plan, 5 AAC 38.076 (g), allows the Alaska Department of Fish and Game (ADF&G) to require a vessel to carry an onboard observer. In Westward Region scallop fisheries, vessels are required to carry an onboard observer. Observer data are the primary information used to monitor stock status, set guideline harvest levels, and monitor harvest and bycatch inseason.

The 2011/2012 weathervane scallop season will be managed similar to past seasons. However, available data indicate that some scallop beds may be in decline. Inseason fishery closures have been rare in recent years; however, inseason management actions may become more frequent until scallop recruitment improves. As a result, observer data will be reviewed frequently. During the season, staff will review fishery performance to assess if the entire GHG should be taken or if harvests should be limited below the GHG. In prior guideline harvest level memorandums, the term 'benchmark' or 'CPUE benchmark' has been used to reference the minimum CPUE that ADF&G would allow the fishery to decline prior to making an inseason closure. Staff changed the term from benchmark to minimum performance standard to better convey meaning. So, while past memorandums use benchmark, beginning in 2010/11 the term 'minimum performance standard' (MPS) was used.

MPS is based on fishery performance from vessels >80 ft that typically utilize 2-fifteen foot dredges. For management purposes, if vessels <80 ft utilizing less than 2-fifteen foot dredges participate in this fishery, their data will not be included with that of the larger vessels for the purposes of applying the CPUE MPS. In prior years, an MPS was only established for the Bristol Bay-Bering Sea District, Shelikof District, and statistical area 525702 in the Northeast District because these were the most productive areas in the Westward Region with the most consistent fishing history. Some additional benchmarks have been established in recent years in areas with more fishing pressure. Details on specific benchmarks are described in the individual sections. Traditionally, MPS has been reviewed after half the GHG has been harvested, allowing some time for the vessels to locate scallops and establish a track record.

Inseason management based exclusively on catch per unit of effort (CPUE) presents management challenges. Tow by tow data are recorded by vessel captains in the vessel logbook provided by ADF&G. Fishermen generally target areas of high scallop density in an attempt to maintain maximum CPUE. Due to this fishing behavior, CPUE may not decline. Conversely, the following factors may bias CPUE in a manner that suggest a declining population: (1) poor gear performance (2) vessel operator's fishing ability, (3) sea condition and state, (4) crab bycatch avoidance behavior, (5) market conditions, (6) time of year, (7) shucked meat weight recovery, and (8) strength of ocean currents. Because of these confounding effects on CPUE, for inseason management CPUE data are evaluated over the course of the season, rather than judging performance over a short time period.

In 2010/2011 only four vessels participated in the fishery and similar effort is expected for the 2011/2012 season. These low effort levels enable the department to closely monitor harvest levels through observer reports. Most of the permit holders have formed a voluntary cooperative. The cooperative regulates individual permit holder allocation (page 14, NPFMC 2009).

Historically management was based on district-wide catch data. Finer scale management, at the individual statistical area level or in some cases, group of statistical areas, has evolved as a method to distribute fishing effort and harvest, and monitor the health of individual scallop beds. While this management approach has been effective at distributing effort, it does limit the fleet's ability to move in response to low CPUE or high crab bycatch because, for example, areas with the highest GHGs may coincide with areas of high crab abundance.

**KODIAK REGISTRATION AREA
(Area K)**

Northeast District

2010/2011 Fishery

The 2010/2011 GHL for the Northeast District was 65,000 lb and apportioned as follows:

- 0 - 20,000 lb for statistical area 525702
- 0 - 20,000 lb for 525630
- 0 - 25,000 lb for the remainder of the Northeast District

The 2010/2011 season scallop harvest in the Northeast District of the Kodiak Area totaled 64,465 lb from three vessels (Table 1; page 4). The Northeast District CPUE (64), expressed in pounds of scallop meats per dredge-hour (lb meat/drg-hr), was an increase over the 2009/2010 season (57; Table 1). Catch rates were relatively strong in Chiniak Gully (bed #2; Table 3 page 7). However, CPUE in statistical area 525702 (47) was near the record low (Table 2; page 6). Crab bycatch (20,808 Tanner crab; see page 3 of attachment) was similar to the 2009/2010 season and well below the cap of 169,925 Tanner crab (Figure 9; page 12).

Shell height (SH) histograms from the Northeast District observer data (Figure 7; page 10) show that catches contain a wide range of scallop sizes. Staff noted that the mean size of the retained catch has increased since the 2005/2006 season and it does not appear that there has been recent significant recruitment. Comparing annual CPUE in the fishery to age class data (Figure 8; page 11), it appears recruitment of age 5 scallops into the 2006/2007 fishery corresponded to increased catch rates (district-wide; Table 1). Some scallop beds in the Northeast District have not experienced declining CPUE, and some have actually experienced higher catch rates.

Splitting the Northeast District into smaller areas has effectively distributed the effort in the district. Due to high fuel prices, very little exploratory fishing occurs, but division of the GHL does prevent vessels from harvesting the entire quota from a single scallop bed.

The MPS for statistical area 525702 is 52, and has been in place since 2003/2004. This is the lowest CPUE observed in this statistical area (2002/2003 season). For historical CPUE data please refer to past scallop season summaries (Sagalkin 2010).

Beginning with the 2010/2011 season, staff recognized that many of the beds in the Northeast District may have declining populations. An MPS was set for statistical area 525630 (45) based upon the lowest CPUE observed in this statistical area (2005/2006 season). An MPS was also established for scallop bed #2 (43), also based upon the lowest CPUE observed in that area (2005/2006 season). There are a few problems with establishing MPS for areas within the Northeast District. First, CPUE varies among scallop beds, and some beds traditionally perform better than others over time. Moreover, scallop beds cross statistical boundaries and it is difficult to obtain higher resolution data inseason. Similarly, some statistical areas contain more than one scallop bed.

2011/2012 Northeast District Management Recommendation

Areas	GHL (lbs of meat)	MPS (CPUE)	Basis Year^a
Statistical area 525630	20,000	45	2005/2006
Statistical area 525702	20,000	52	2002/2003
Remainder of NE District ^b	25,000	43	2005/2006
North of Cape Izhut	5,000	none	

aThe basis year is the season with the lowest previously observed CPUE
b The GHL is for the area south of the latitude of Cape Izhut; the MPS is only for scallop bed 2

- Harvest from statistical area 525630 will remain capped at 20,000 pounds. While CPUE from statistical area 525630 has been increasing for the last several seasons, it is not above the all time high (2004/2005 season; 92) and recent recruitment has been low.
- Harvest and CPUE from statistical area 525630 will be monitored inseason. If the inseason cumulative CPUE is less than or equal to the 2005/2006 season cumulative CPUE of 45 meat lb/drg-hr (MPS) at the point when approximately half the maximum allowable catch is reached, staff will consider closing the season prior to achieving the GHL.
- Harvest and CPUE from statistical area 525702 will be monitored inseason. If the inseason cumulative CPUE is less than or equal to the 2005/2006 season cumulative CPUE of 52 meat lb/drg-hr (MPS) at the point when approximately half the maximum allowable catch is reached, staff will consider closing the season prior to achieving the GHL.
- In 2010/2011 CPUE in bed #2 was the highest observed from that bed since 2004/2005. In the past when CPUE has increased, staff gather CPUE data, along with other stock status indicators, for at least two seasons prior to considering adjusting the GHL upwards. Therefore, the GHL for the remainder of the Northeast District will be capped at 25,000 pounds.
- Harvest and CPUE from scallop bed #2 will be monitored inseason. If the inseason cumulative CPUE is less than or equal to the 2005/2006 season cumulative CPUE of 43 meat lb/drg-hr (MPS) at the point when approximately half the maximum allowable catch is reached, staff will consider closing the season prior to achieving the GHL.
- An exploratory area north of the latitude of Cape Izhut was established in 2006/2007 season through the 2008/2009 season. Very little harvest occurred and the exploratory GHL was removed from the area starting in the 2009/2010 season. There continues to be interest from the fleet to explore this area so a 5,000 lb GHL will be set to determine stock status in this area. Daily reports will be required from vessels in this area. The total 2011/2012 GHL for the Northeast District will be 65,000 pounds.

Shelikof District

2010/2011 Fishery

The 2010/2011 GHL for the Shelikof District was 170,000 and apportioned as follows:

- 0 - 130,000 lb for north section (statistical areas 535831 and 535832)
- 0 - 40,000 lb for south section (primarily 535801 and 535802)

The 2010/2011 season scallop harvest in the Shelikof District of the Kodiak Area totaled 171,065 lb from four vessels (Table 5; page 16). The 2010/2011 Shelikof District closed early in 2008/2009 after only 12,660 lbs were harvested due to high crab bycatch. The Shelikof District CPUE in 2010/2011 was 49 (Table 5), which was the same as 2009/2010, and the lowest CPUE observed since 2002/2003 (excluding 2008/2009). Tanner crab bycatch (19,126 crab; page 13) was below the cap of 26,400 crab (Figure 18; page 24).

Shell height histograms from the Shelikof District observer data (Figure 16; page 22), show that catches contain a wide range of scallop sizes. Staff noted that the year class that first appeared in the 2005/2006 fishery has reduced substantially from prior seasons. While there is some recent recruitment it appears weak.

During the 2005/2006 GHF meeting, the primary Shelikof bed was divided for management purposes, at 58° 30' N lat. The same management strategy was used during the 2006/2007 through 2010/2011 seasons. The north Shelikof section is comprised of statistical areas 535831 and 535832 (Figure 10; page 14) while the south Shelikof section is comprised of statistical areas 535801 and 535802. In some years, statistical areas 545733 and 545701, near the Karluk River, contribute to the South Shelikof section catch.

The Shelikof District MPS was established for the 2003/2004 season based upon the lowest observed cumulative CPUE in the Shelikof District (2002/2003 season; 47 meat lb/drg-hr). It has only been applied to the main scallop bed in the district.

2011/2012 Shelikof District Management Recommendation

Area	GHF (lbs of meat)	MPS (CPUE)	Basis Yeara
Combined north/south	130,000	47	2002/2003
Shelikof Westb	5,000	none	

aThe basis year is the season with the lowest previously observed CPUE
b No MPS for this exploratory area

- The division of the Shelikof bed into North and South sections should be removed. CamSled video and observer data both suggest one continuous scallop bed.
- The main Shelikof District bed GHF should be reduced from 170,000 pounds to 130,000 pounds based on the following:
 - Overall CPUE has declined by approximately 34 percent (74 pounds/hour in 2006/2007 to 49 pounds/hour in 2009/2010 and 2010/2011).
 - Preliminary CamSled based biomass estimates for both sections (combined) declined by approximately 30 percent between 2007 and 2010.
 - The 2010 CamSled survey did not reveal any signs of future recruitment. Size frequency graphs from observer data show little recruitment below 100 mm and there is no predominate size mode for scallops above 125 mm as is typically seen.
- Harvest and CPUE from the main scallop bed will be closely monitored inseason. If the inseason cumulative CPUE is less than or equal to 47 meat lb/drg-hr (the MPS) after 60,000 pounds of shucked scallop meats are harvested, staff will consider closing the fishery.
- In previous years, all areas south of 58° 30' N lat were managed toward 40,000 pounds. Staff indicated that other beds in the Shelikof should be managed separately from the main bed. However, these areas appear limited based on previous fishing history (e.g., Figure 10; page 14 – statistical areas 545801, 545802, 545733, and 545701), and CPUE in statistical areas adjacent to the Karluk River were relatively low (statistical areas 545733 and 545701; Table 6). An exploratory GHF of 5,000 pounds will be set for areas west of 154° W long (Shelikof West). An MPS has not established for the Shelikof West, but fishery performance will be monitored inseason.

Southwest District

In March 2009, the Board of Fisheries (BOF) modified closed waters for scallops (5 AAC 38.425) by

opening waters of the Southwest District (5 AAC 34.405 (c)) south of a line from the westernmost tip of Cape Ikolik to the southernmost tip of Cape Kilokak, and west of 155° W long., north of 56° 07' N lat., and east of 156° 20.22' W long.

2010/2011 Fishery

No effort occurred in this district in 2010/2011

2011/2012 Southwest District Management Recommendation

- Staff recommends a status quo GHL for the 2011/2012 season (25,000 lb) for continued exploration of this area.

Semidi District

In March 2000, the BOF closed the state-waters portion of the Semidi District between Kilokak Rocks and Cape Kumlik (Figure 1; 5 AAC 38.425 (5)). Historically, the state-waters portion of this district accounted for the majority of the scallop production. There has been no fishing effort in the Semidi District since the 2000/2001 season. Due to lack of effort, this area will remain an exploratory fishing area and managed inseason based on fishery performance.

ALASKA PENINSULA REGISTRATION AREA (Area M)

Beginning in 2009/2010, the entire Alaska Peninsula Area was closed for a period of 5 years to allow stocks to recover. Staff recommend keeping the area closed for an additional 3 years.

BRISTOL BAY - BERING SEA REGISTRATION AREA (Area Q)

2010/2011 Fishery

The 2010/2011 Bristol Bay-Bering Sea Registration Area GHL was set at 50,000 pounds. Two vessels participated in the fishery and harvested 50,099 pounds (Table 9; page 30). The 2010/2011 CPUE was 52 pounds of shucked scallop meats per dredge hour, a 37 percent increase from the 2009/2010 season (Table 9). A larger CPUE may indicate an increase in abundance, however many factors such as vessel captain experience and dredge efficiency make CPUE an unreliable indicator of overall abundance. Approximately 60,537 Tanner crab and 18,823 snow crab were caught as bycatch during the fishery (Figure 24; page 34). Tanner crab bycatch during the 2010/2011 season was more than double the estimate for 2009/2010 while snow crab bycatch fell to roughly half that of the prior season. In addition to Tanner crab, 26 red king crab were caught incidentally. To avoid red king crab bycatch, fishing effort was shifted further west than in 2009/2010 season.

2011/2012 Bristol Bay – Bering Sea Registration Area Management Recommendation

- Staff recommendation for the 2011/2012 season is for the Bristol Bay-Bering Sea weathervane scallop GHL to remain static at 50,000 pounds. This level was established for the 2004/2005 season in response to a trend of decreasing catches and catch rates. Fishery performance began to trend upward after the 2004/2005 season and establishment of the 50,000 pound GHL; 2009/2010 was the first season where a reversal in that trend became evident.
- A 37 percent increase from 2009/2010 to 2010/2011 in CPUE is promising; however, there is no plan to increase the GHL at present due to the recent 27 percent decrease in CPUE between the 2008/2009 and 2009/2010 seasons (Figure 29). Given the variability in CPUE in recent years, staff are not recommending a GHL adjustment based solely on this season's increased CPUE.

- The stock appears to be mainly comprised of large size scallops with little recruitment evident in the size frequency histograms.
- For the 2011/2012 season the Bering Sea weathervane scallop fishery will be managed using an inseason MPS of 43 pounds of shucked scallop meats per dredge hour. This MPS is based on the average CPUE during the 2004/2005 to 2009/2010 seasons, a period chosen because the GHLL was static at 50,000 pounds and because it encapsulates a broad range of fishery CPUE values (37 to 52 pounds of shucked scallop meats per dredge hour).

**DUTCH HARBOR REGISTRATION AREA
(Area O)**

The Dutch Harbor Registration Area was closed from 2000/2001 through 2007/2008 except for a single opening in 2002/2003 (Table 10; page 36). The closures were triggered by low CPUE and were intended to allow an opportunity for the stock to rebuild. The registration area was reopened in 2008/2009 and the entire GHLL (10,000 pounds) was harvested with a CPUE of 44 pounds of shucked scallop meats per dredge hour.

The 2009/2010 Dutch Harbor Registration Area weathervane scallop GHLL was set at 10,000 pounds split so that 50 percent of the harvest would occur in waters of the Bering Sea and 50 percent would occur in waters of the Pacific Ocean. In 2009/2010, 6,080 pounds were harvested with a CPUE of 59.

For the 2010/2011 season, the GHLL remained at 10,000 pounds with the same GHLL split of 50 percent each for the Bering Sea and Pacific Ocean sides. The 2010/2011 catch rates were very high in the Bering Sea (95 pounds of shucked scallop meats per dredge hour) and 5,040 pounds were harvested. A limited amount of fishing effort south of Unalaska Island yielded 602 pounds and a CPUE of 20 pounds of shucked meats per dredge hour. Crab bycatch was low in the Dutch Harbor Registration Area with 901 Tanner and no king crab. In addition, 50 halibut were incidentally caught (see page 35 of attachment). Harvest occurred near Inanudak Bay and Kayak Cape (Figure 25; page 37). Little harvest occurred south of Umnak Island, an area traditionally known to produce weathervane scallops. Nearly all of the 2010/2011 Dutch Harbor Registration Area weathervane scallop harvest occurred in state waters.

2011/2012 Dutch Harbor Registration Area Management Recommendation

Area	GHLL (lbs of meat)	MPS (CPUE)	Basis Year
Pacific side	5,000	none	
Bering Sea side	5,000	none	
aThere is no MPS established for the Dutch Harbor area because of limited fishing history			

- Staff recommendation for the 2011/2012 season is for the Dutch Harbor weathervane scallop GHLL to remain static at 10,000 pounds. Staff also recommend splitting the GHLL evenly so that 50 percent is available in Pacific Ocean waters and 50 percent is available in waters of the Bering Sea.
- Although the 2010/2011 CPUE was high near Inanudak Bay, size frequency indicates the harvest was comprised of older-age scallops (Figure 26; page 38).

**ADAK REGISTRATION AREA
(Area R)**

No recent scallop fishing effort has occurred in the Adak Registration Area despite the fact that the area was open for commercial scallop fishing through the 2007/2008 season. The area was closed in the 2008/2009 season. Staff recommend keeping this registration area closed for the 2011/2012 season. Potential for a fishery in the area could be re-evaluated if warranted by industry interest.

Appendix 2: 2010/11 Observer haul composition sampling in pounds by species/category and area.

Area Totals (lbs) 72,614 1,630 4,240 30,865 80,668 1,626 15,532

Totals by pounds of what sampled. Sample sizes in Table 1

common_name	Statewide	YakD	D16	E	KNE	KSH	O	Q
weathervane scallop	158,772	58,620	1,319	3,650	22,571	59,660	1,267	11,686
empty bivalve shells	9,391	2,533	56	173	1,623	4,574	37	395
sunflower sea star	8,846	3,763	18	100	1,714	3,082	169	
unsorted shab	8,006	1,879	41	130	1,896	3,885	37	138
sea anemone unidentified	1,829	374	3	2	292	1,057	4	97
longnose skate	1,783	294	23	7	352	1,107		
arrowtooth flounder	1,497	290	5		298	806		98
big skate	1,464	1,095	11	5		353		
Alaska skate	1,059	193			14	650		202
flathead sole	963	45		13	69	637	3	196
hairy triton (or Oregon triton)	876	89			51	629	3	104
notched brittlestar	802	674	3	19	90	6	10	
Alaska plaice	763					763		
Aleutian skate	724	6	2		170	515		31
Bering skate	712	24		28	104	442		114
Tanner crab	635	45		1	133	133	5	318
sand sea star	620	509	13	61	28	5	4	
sponge unidentified	610				3	5		602
Halipteris sea whip	477	44		1	71	20	1	340
English sole	474	441	10	5		15	3	
Dover sole	455	122		12	120	201		
debris	454	12	1	1	15	269		156
Pacific cod	372	32			117	206		17
empty gastropod shells	342	115			35	87	1	104
big skate egg case	314	175	54	1	1	83		
Tanner crab unidentified	256							256
lingcod	220	207	6	7				
northern rock sole	207				23		4	180
rex sole	203	60	3	3	84	13		40
southern rock sole	203				161	5	37	
Pacific lyre crab	192	32			19	105	1	35
spiny dogfish shark	186	169				17		
bristle worm	186	78	1	4	7	93		3
giant octopus	163		42		40	81		
Alaskan hermit crab	155	66	1		29	59		
basket star	153	9			98	5		41
Aleutian hermit crab	148	8			4	78	1	57
longnose skate egg case	143	83		7	7	43		3
Bathyrāja sp. egg case	103	44	4		15	28	1	11
rock sole unidentified	99		2		32	3		62
walleye pollock	95	5			26	55		9
octopus unidentified	87	4	1		53	28	1	
skate egg case unidentified	86	85				1		
common mud star	82	8			5	56	1	12

Area Totals (lbs) 72,614 1,630 4,240 30,865 80,668 1,626 15,532

Totals by pounds of what sampled. Sample sizes in Table 1

common_name	Statewide	YakD	D16	E	KNE	KSH	O	Q
Chlamys scallop	77	14			37	22	4	
Solaster sp.	71				57	14		
lyre whelk	70	2		1	4	23	1	39
bigmouth sculpin	69				21	7		41
hairy hermit crab	68	2			7	39	2	18
hairy cockle	59	11			1	44	1	2
Aleutian moonsnail	51	36	2		7	5	1	
Cheilonereis cyclurus	50	3			4	43		
green sea urchin	48				5	23	12	8
spiny red sea star	47				47			
knobbyhand hermit crab	46	10			12	15	1	8
box crab	44	11			33			
Buccinum snail eggs	44	1			9	21	2	11
Clinocardium sp.	40	18				22		
milky venus	39	31				8		
hermit sponge	38	3			17	14	1	3
vermilion sea star	36	4		3	15	14		
hermit crab unidentified	35	10			2	19		4
yellowfin sole	34				19	4		11
shrimp unidentified	32	27			2	3		
lyre buccinum (or sinuous whelk)	32	7			4	16	1	4
Pandora sp.	32	7				25		
blackspined sea star	30				25		5	
jellyfish unidentified	28	2			1	7		18
graceful decorator crab	28	4			9	13		2
Neptunea snail eggs	28	2		2	2	18		4
Volutopsius sp. eggs	27			1		16	1	9
Fusitriton oregonensis eggs	26	1			1	18		6
Beringius kennicottii	26	6			3	17		
longfinger hermit crab	25	6			6	13		
moonsnail eggs unid.	24	6			5	13		
Dungeness crab	23					23		
shortfin eelpout	21	10		1		10		
great sculpin	20					20		
giant scale worm	20	1			2	13		4
northern horsemussel	20	2			13	5		
whitebarred prickleback	19	15	1			1		2
Greenland cockle	19				1	15		3
Alaskan scarlet sea star	18	3	3		4	6	2	
pale moonsnail	17	13			1	3		
pink shrimp (or northern shrimp)	16	8			7	1		
Beringius sp. eggs	15	7			5	2		1
rose sea star	15				7	8		
Sakhalin sole	13					13		
butter sole	13	3			3	7		
pygmy cancer crab	13	4			1	5		3

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Totals by pounds of what sampled. Sample sizes in Table 1

common_name	Statewide	YakD	D16	E	KNE	KSH	O	Q
sun sea star	13				3	9	1	
orange sea pen	12	4				8		
oblique smoothcockle	12					10		2
Parma sand dollar	12				12			
starry flounder	11	11						
sponge hermit crab	11				8	3		
fuzzy hermit crab	11	1				2		8
widehand hermit crab	11	5			6			
Pribilof neptune (or Pribilof whelk)	11	2			3	6		
morning sun sea star	11					11		
scallop sponge	11		1		10			
sea urchin unidentified	10				1	9		
sweet sea potato	10					10		
Pacific tomcod	9					9		
left-hand whelk	9				2	7		
yellow Irish lord	8				8			
sea whip unidentified	8				8			
striped sea leech	8					8		
Argis sp.	8	8						
Stylasterias forreri	8	5				3		
blood sea star	8				5	3		
splendid hermit crab	7	6				1		
Arctic moonsnail	7	4	1		1	1		
Beringius sp.	7				3	4		
Leptychaster pacificus	7				1	1		5
sturgeon poacher	6	3	1		1		1	
Pagurus sp.	6					6		
rusty moonsnail	6	2		1		3		
silky buccinum (or ladder whelk)	6					4		2
Macoma sp.	6					6		
Kamchatka flounder	5					4		1
polychaete worm unidentified	5	1			1	3		
mussel unidentified	5	3				2		
skate unidentified	4					4		
poacher unidentified	4	3				1		
roughspine sculpin	4	1	1		2			
eelpout unidentified	4	2				2		
wattled eelpout	4	4						
sea pen or sea whip unidentified	4				2	2		
Arctic argid	4	2			1	1		
broad yoldia	4					4		
black mussel	4	4						
giant sea star	4				4			
northern sun sea star	4					4		
Leptychaster sp.	4				3			1
sawback poacher	3	1	1			1		

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Totals by pounds of what sampled. Sample sizes in Table 1

common_name	Statewide	YakD	D16	E	KNE	KSH	O	Q
snailfish unidentified	3	3						
smelt unidentified	3	1			1	1		
snail unidentified	3	2				1		
Colus sp.	3					3		
bivalve unidentified	3	2				1		
sea cucumber unidentified	3					3		
slender sole	2					2		
spinyhead sculpin	2	1				1		
capelin	2					2		
ocean shrimp	2	2						
longhand hermit crab	2	1			1			
Colus hypolisus	2					2		
Neptune snail unidentified	2							2
mottled sea star	2					2		
evening sun sea star	2					2		
purple-orange sea star	2							2
crescent sea cucumber	2					2		
Raja sp.	1	1						
tadpole sculpin	1				1			
dwarf wrymouth	1					1		
prickleback unidentified	1	1						
snake prickleback	1	1						
Pandalus sp.	1	1						
sidestripe shrimp	1				1			
Crangon sp.	1	1						
twospine crangon	1				1			
common argid	1				1			
purple hermit crab	1			1				
whelk unidentified	1	1						
Buccinum snail unidentified	1	1						
Yoldia sp.	1	1						
butter clam	1					1		
Pacific razor	1				1			
broad cockle	1					1		
Mya sp.	1					1		
Leptasterias sp.	1				1			
Leptychaster anomalus	1							1
northern sea star	1				1			
orange-pink sea urchin	1					1		
sand dollar unidentified	1				1			
lampshell unidentified	1					1		
sea peach unidentified	1				1			