

SCOMM

102:9

## **SPONSOR STATEMENT**

### **HB 141**

#### **A VESSEL PERMIT MORATORIUM FOR THE ALASKA WEATHERVANE SCALLOP FISHERY**

I have introduced HB 141 to implement a moratorium within the state waters off Alaska similar to the moratorium being implemented by the North Pacific Fisheries Management Council affecting the federal waters off Alaska. Without a moratorium implemented in state waters, it is probable that there would be an increase in effort on our state water scallop stocks, as well as on the associated marine habitat, and create an unmanageable fishery.

World wide scallops have proven to be susceptible to overfishing and boom/bust cycles. Scallops are long lived shellfish. The large scallop meats which bring premium prices come from scallops eight years or older.

The Alaska scallop fishery started in 1968. Nineteen east coast scallop vessels came to Alaska and took 1.7 million pounds of scallop meats. The fishery continued at a harvest level of 1.3 million pounds of meats annually until 1973. Catches dropped off sharply after 1973 and fishing ceased in 1978 when scallop beds were depleted. This boom and bust cycle was repeated in the 1980's and appeared to be repeating for a third time in the 1990's until the state developed a fishery management plan for scallops in 1993. All scallop fishing was stopped in February 1995 in order to prevent an east coast scalloper, Mr. Big, from fishing in unregulated federal waters. The fishery reopened in late 1996 under a federal management plan.

At present weathervane scallops are managed jointly by the federal government and the State of Alaska. There is a federal fishery management plan to delegate management authority of scallops to the state "in process" which has not been finalized. The management plan includes mandatory 100% observer coverage, caps on the amount of crab bycatch which can be taken and area specific quotas. Under new language in the Magnuson-Stevens Fisheries Conservation and Management Act, the State of Alaska could exercise management authority out to 200 miles under delegated authority.

It is also in the State of Alaska's best interest that both the State and federal water scallop fisheries have a similar management plans and be managed by the State of Alaska. My goal is delegation of management authority by the U.S. Department of Commerce to the State of Alaska with a more restricted moratorium base. It should be noted that the North Pacific Fishery Management Council's Environmental Assessment and Regulatory Impact Review found that far fewer vessels than established by the federal moratorium could efficiently harvest the Alaska scallop quotas.

Within this legislation, I have separated out the weathervane scallop fishery conducted in Area H, Cook Inlet. The Area H scallop fishery is unique in that it is managed as an entirely separate fishery, has different gear specifications, and has more recently been developed.

HB 141 is needed to ensure careful conservation of the scallop stocks, as well as the marine habitat in which the scallops live, and to ensure that the bycatch of other marine animals, such as crabs, are properly controlled and managed. It is imperative to implement a moratorium on new entrants into the weathervane scallop fishery now.

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|-------------------|------------------|------|---------|------------|---|
| Post-It® Fax Note | 7871             | Date | 1-31-97 | # of pages | 6 |
| To                | Cheryl Dougherty |      |         |            |   |
| From              | Mark Kandianis   |      |         |            |   |
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rk Kandianis  
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January 30, 1997

Mr. Dale Anderson  
Commercial Fisheries Entry Commission  
State of Alaska

VIA FAX: 907-784-6170

Dear Dale:

My name is Mark Kandianis. I'm a commercial scallop fisherman from Kodiak. I have fished scallops commercially in Alaska since 1980 as mate and captain aboard the F/V Pursuit and later owner and captain aboard the F/V Provider.

In 1993, the North Pacific Fishery Management Council did an analysis which stated that the Alaskan scallop fishery could support nine vessels at break-even with a GHL of approximately 1.0 - 1.3 million lbs. of shucked scallops. This overstates the abundance of Alaska's scallop resource as GHL's are actually all set at 0 to the upper range of harvest. Since 1993, several management areas have had GHL's reduced or were closed early due to low CPUE, with signs that other areas may also be in decline. Additionally, many of the areas for which a GHL is established do not support any commercial weathervane scallop beds while other areas are closed due to crab bycatch long before the GHL is reached. Many commercially viable scallop beds are not available to harvest due to their location within closed areas such as sea lion rookeries and crab savings areas.

I have witnessed localized stock depletions often in the past. The Bering Sea started with no set quota in 1993 - later a GHL was set at 0-600,000 lbs. I fully expect to see reductions in this area in the near future. In Kodiak, the long term mainstay of our fishery, the GHL was set at 400,000 lbs. In the recent past, this production came almost exclusively from the Shelikof District as beds on the east side of Kodiak are depleted. Last year, the CPUE in Shelikof dropped quickly, and as I recall, the harvest was 210,000 lbs. when it was closed. The Prince William Sound quota was set at 50,000 lbs in 1994 and was reduced this year to 22,000 lbs. even after a lengthy closure.

I believe that many of the western area stocks are comprised of sporadic year classes with little or no sign of recruitment. In light of this, I believe in the near future that the statewide GHL's will be diminishing. I believe the Alaskan scallop resource to be classified as being spasmodic which shows irregular pulses of high abundance followed by periods of scarcity or collapse. Most scallop stocks fit this type. Environmental conditions

underlie spasmodic pulses in at least two well documented and dramatic cases. Another factor to consider is crab bycatch which can and has limited catch in most districts in the westward region.

However, conservative management measures can allow this fishery to stabilize. The weathervane is a longlived animal so good year classes can be spread out to accomodate a small fleet over time until the next successful recruitment event occurs.

As small a number as it might seem, it has been my experience over time that this resource has never supported more than four to five full time vessels on a year round basis and in some years fewer than that.

I own one vessel in the fishery and have many times in the past been asked if I would be interested in expanding to other vessels in the fishery. I have declined knowing from nearly two decades of experience the limits of the resource and the abundance fluctuations.

In 1992 with the arrival of two unusually large, high capacity vessels and with very little in the way of management, it became evident that the resource was about to be overexploited with no consideration for the future health of the fishery.

As word of large landings reached the east coast, gold fever seemed to prevail as owners sent vessels through the Panama Canal two at a time. In 1992, a Federal moratorium was sought when it became evident that the State of Alaska had no mechanism to limit the number of permits by vessel. (We also found that the Federal groundfish moratorium would not cover scallops as they were not covered under the federal groundfish management plan. Though the resource is located primarily in the EEZ, the scallop fishery had been managed by the State for over twenty years.)

As the newly arrived fleet steadily increased, their assertions were that though the fishery had been prosecuted for twenty years, neither the State nor the long-term fishers really knew the extent of the resource. Also, the North Pacific Fishery Management Council had only limited interest in this fishery as they had bigger fish to fry. State management concerns grew, along with many restrictive measures - which we supported.

At this time, with the inclusion of the newly arrived east coast vessels there were approximately 9-10 full time vessels participating. The historic participants found themselves operating at break even or less. In January 1995, one of the new high capacity vessels (Mr. Big) turned in its Alaskan scallop permit and fished exclusively in federal waters in order to avoid Alaska's regulations. Without an FMP, operators in the EEZ without any Alaskan permits could fish without adhering to any regulations. This resulted in the fishery being shut down completely by the NPFMC for over eighteen months. Only a limited fishery in state waters occurred during that time.

The result to the long time fishers were lost homes, broken families and near insolvency for the resident fleet. But all but one of the recently arrived east coast vessels returned to fish back east during the federal closure as they had permits to do so. On their way, this fleet stopped to fish off Washington and Oregon. They depleted those beds with gear that is illegal in both Alaska and on the east coast. The resident Alaskan fleet does not have the licenses to fish in the east coast's limited entry scallop fishery. Neither did our single purpose vessels qualify for any of the other Alaskan fisheries.

These events happened, I honestly feel, due to the lengthy three and a half years the NPFMC took to develop a management plan and federal moratorium for the Alaskan scallop fishery. This allowed the fleet, along with greed from the then newly arrived east coast fleet, to double in size and increase capacity way beyond the boundaries the resource can support in the long run.

It is sad that regulators do not react to curtail overcapitalization in fisheries until it is too late. It is then left to managers and what fishers remain to pick up the pieces to try to make a viable fishery. In this case, the cost and harm done to the resident fleet was, without question, immense.

In closing, I must again state that, in my estimation, this fishery can only support a handful of dedicated full time vessels. Anything more than this will result in attrition due to insolvency. The long term fishers here can not move to other fisheries as they have no other fisheries to move to.

I can not speak to issues concerning the Cook Inlet scallop fishery as this is not an area that we fish.

Thanks for your attention to these issues. Please call for any additional information.

Sincerely,

*Mark P. Kandianis*

MARK P. KANDIANIS  
FV Provider

**Draft for Public Review**

**ENVIRONMENTAL ASSESSMENT/  
REGULATORY IMPACT REVIEW/  
INITIAL REGULATORY FLEXIBILITY ANALYSIS  
of**

**Amendment 1**

**to the  
FISHERY MANAGEMENT PLAN  
for the  
SCALLOP FISHERY  
off Alaska**

**NOTE:** *The Council is scheduled to take final action on this amendment at it's June 1995 meeting. However, reviewers should note that there are a number of policy decisions regarding State and Federal management that need to be resolved before management measures considered by this amendment could be implemented. Also note that several management measures proposed under the alternative to the status quo contain more than one option. The suite of management measures and options identified under Alternative 2 in this document are subject to change when the Council takes final action.*

**Prepared by staff of the  
National Marine Fisheries Service  
North Pacific Fishery Management Council  
Alaska Department of Fish & Game**

**May 26, 1995**

harvested may indicate an increase in fishing mortality of larger individuals, or high recruitment (Ricker 1975). It has been well-established that scallop populations worldwide are vulnerable to overharvest, and stock recovery may be slow (Aachan-1991; Bannister 1986; Bourne 1986; McLoughlin et al. 1991; Orensanz 1986). For these reasons, significant increases in scallop harvests in Alaska beyond historic levels should be avoided, as they may jeopardize stock health and sustained yield.

The longevity of weathervane scallops in Alaska implies that they experience low natural mortality rates (Hoenig 1983), and this requires that conservative commercial harvests of weathervane scallops may be necessary to maintain healthy stocks and sustainable fisheries. The rate of natural mortality is one of the biological reference points commonly used in management of other fisheries to establish appropriate exploitation rates (Clark 1991). Unfortunately, other benchmarks that would bear on the choice of appropriate exploitation rates for weathervane scallops are not presently available; there is inadequate information on other biological production parameters, and uncertainty in scallop population dynamics for Alaskan scallop fisheries.

An unrestricted harvest in the EEZ would allow recruitment overfishing. It is widely accepted that fishery harvest levels should be prescribed in ways to prevent "recruitment overfishing", which is the condition that occurs when stocks are reduced to levels too low to produce adequate numbers of young scallops -- the future recruits to the fishery (Gulland 1983). Recruitment is a prerequisite for maintenance of viable populations, and is needed for sustainable harvests that support long-term economic benefits from the fishery. By closing the EEZ to harvest, recruitment overfishing of scallops would be prevented, and a future fishery would be assured.

#### *Overcapitalized Fleet*

The existence of an overcapitalized fleet increases the potential of overfishing the resource in an unrestricted fishery. At its January 1993 meeting, the Council determined that unrestricted access to this fishery may be harmful to the resource and result in a net loss to the Nation. A control date of January 20, 1993 was set to place the industry on notice that a moratorium for this fishery may be implemented. This control date was again reaffirmed at the Council's June 1993 meeting. As anticipated, effort in this fishery apparently increased in 1993; 32 permits, representing 21 vessels were issued to fish scallops in 1993. Eleven of these vessels had made landings as of July 31, 1993, and a total of 15 vessels had made landings by the end of the year.

Even without additional vessels entering the fishery, the 1993 fishery was overcapitalized. In 1992, seven vessels harvested 1.8 million lb (816 mt), for an average of 257,143 lb (116.6 mt) harvested per vessel. The 1993 quota was set at 890,000 lb (403.7 mt) for areas with specified guideline harvest levels, or about one-half of the 1992 landings. Efficient harvesting of this quota could be done by only three to four vessels. Preliminary estimates of 1993 landings from areas without guideline harvest levels total 524,000 lb (237.7 mt), that potentially could have been taken by an additional two vessels. Yet, 11 vessels participated in the 1993 fishery by July 31. Hence, the 1993 fishery was overcapitalized, meaning that too much capital was invested relative to the fleet size necessary to efficiently conduct the fishery. In 1994 the fishery continued the trend; 16 vessels harvested 1,235,269 lb (560.3 mt) of scallops.

Conservation impacts of the scallop fishery in Alaska depend upon the particular suite of management measures adopted. Where no management exists there is every indication that the fishery would be subject to local and eventual general overfishing were the condition to persist. One vessel fishing in the EEZ without the effort restrictions on gear, and crew required by State law was apparently able to take over 100 percent of the State's GHL (54,000 lb) (24.5 mt). When the overcapitalization of the fishery is considered, it is clear the current scallop fleet could take several years' worth of the State's GHL in many areas in several months.

Because of the serious effects unrestricted fishing in this overcapitalized fishery would have on this resource, this proposed action concentrates on strict conservation in the fishery. Ideally, management strives to achieve a balance of factors, such as cost-effectiveness, enforceability, resource conservation, and positive economic

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## 1.6 Management Measures Considered under Alternative 2

### 1.6.1 Permit Requirements

Fishing Permits will be required for moratorium qualified vessels to harvest scallops in the EEZ. Permits are necessary to implement a moratorium and to track replacement of moratorium qualified vessels. A Federal permit for scallops would also be a requirement to process or transport scallops in the EEZ. A vessel without Federal fishing permits could still fish in State waters. However, vessels may also be required to be registered with the State of Alaska and comply with all state regulations when fishing in State waters.

### 1.6.2 Limited Access

A system for limiting access, which is an optional measure under section 303(b) of the Magnuson Act, is a type of allocation of fishing privileges that may be used to promote economic efficiency or conservation. For example, *"limited access may be used to combat overfishing, overcrowding, or overcapitalization in a fishery to achieve OY"* (50 CFR 602.15 (c)). The Magnuson Act (Section 3(21)) further defines "...The 'optimum' with respect to the yield from a fishery, means the amount of fish -- (A) which will provide the greatest overall benefit to the Nation, with particular reference to food production and recreational opportunities; and (B) which is prescribed as such on the basis of the maximum sustainable yield from such fishery, as modified by any relevant economic, social, or ecological factor."

A moratorium is proposed as an essential element to keep the fishery from being further overcapitalized. The intent of the proposed vessel moratorium is to stabilize the size and capitalization of the scallop fleet during the time that the Council is considering limited entry alternatives for this fishery. As such the vessel moratorium does not resolve the underlying problems of existing overcapitalization and excess effort in the fishery, but may prevent these problems from worsening while comprehensive solutions are being developed. The qualifying criteria and other elements previously adopted by the Council, and the analysis of these options are detailed in Chapter 3.

Permit limitation or participant limitation with individual fishing quotas (IFQ's) are two other forms of limited access that may be considered for management of the scallop fishery. Although not fully analyzed here, the Council has expressed interest in using IFQ's as a management measure for the scallop fishery. A study of the Atlantic sea scallop fishery found that significant benefits would accrue to the industry and the Nation if an IFQ program were implemented for the sea scallop fishery (Sutinen et al. 1992). However, given the extended time frame necessary to develop and analyze IFQ's for the Alaska scallop fishery, a moratorium would serve to stabilize capitalization of the fleet while limited entry alternatives for the fleet are being considered. Under an individual fishing quota (IFQ) system, the total allowable catch is divided into units (shares) that are then allocated to individuals. Individual shares allow fishermen to adjust their strategies to efficiently harvest the resource. IFQs were recently implemented for the halibut and sablefish fisheries in the North Pacific. As such, monitoring systems and other infrastructure will be already instituted should an IFQ system for scallops be proposed. An IFQ program for scallops would require additional analysis for plan amendment.

One potential drawback to all limited access measures is that they would apply only to Federal waters. Hence, under an IFQ system, quotas would not apply to state waters where 40% of the historic harvest has occurred. Similarly, under a moratorium or license limitation system, state waters would still be under open access, potentially creating problems with monitoring and enforcement.

At its September 1993 meeting, the Council tentatively identified its preferred moratorium options, but requested that additional analysis be done to assist with determining appropriate qualifying criteria. The options that the Council identified were 1) Vessels must have participated in either 1991 or 1992, or participated for a minimum of four years within the qualifying period (January 1, 1980 to January 20, 1993), or 2) Vessels must have participated in either 1990, 1991, 1992 or 1993 through July 30, or participated for

a minimum of four years within the qualifying period (January 1, 1980 to January 20, 1993). Additional information was provided in the draft FMP dated November 30, 1993.

★ In April 1994, the Council recommended the following qualifying criteria as its preferred option. To qualify under the moratorium, vessels must have participated (made at least one landing) in 1991 or 1992 or 1993, or must have participated for at least four years between January 1, 1980 and January 20, 1993. The 1980 date was adopted because it (1) matched with the proposed groundfish moratorium, (2) data prior to 1980 were not available, and more importantly, (3) 1980 marked the first year of the second phase of the scallop fishery, and was thus considered to be a reasonable base year for historical participation. Note that less than 3 vessels participated in 1974, 1976, 1977, and 1979, and no vessels participated in 1978. The January 20, 1993 date was adopted as a cutoff date for historic participation, because vessels making landings in 1993 would be included as recent participants; participation after January 20, 1993 would not accrue towards historic participation. The Council did not include those vessels that participated in 1990, but did not have historic participation or more recent participation in the fishery, as moratorium qualified. It was determined that these vessels had neither recent nor historic dependence on the fishery. Vessels that were in the "pipeline" to fish for Alaskan scallops (i.e., under construction, being refitted, relocated, etc.) but had not made a required landing, would not qualify under the moratorium. The Council had been discussing a scallop moratorium throughout 1993, and by including the 1993 participants as moratorium qualified would address the problem of those vessels in the "pipeline".

Permits would be issued to the owner of each vessel at the time of qualifying. If two owners qualify for a single vessel, the most recent owner qualifies, such that each vessel generates only one permit. Vessels that made landings from Cook Inlet only would receive permits for that area only, and no crossovers between Cook Inlet and other areas will be allowed unless a vessel qualifies for both areas.

In addition to qualifying criteria, the other moratorium elements are: duration, crossovers, reconstruction, replacement, exemptions for small vessels, and appeals. The Council's preferred options for these moratorium elements are listed Table 1.6. A 3 year limitation on the duration of the moratorium should provide sufficient time to develop, approve, and implement a permanent limited access program for the affected fisheries, or to decide to abandon limited access in favor of open access management measures. Crossovers of vessels between fisheries (scallop to or from groundfish, crab, salmon, or halibut) would not be allowed, except for those vessels qualified under both the scallop and groundfish moratoria. Additional crossovers would amplify any economic and biological impacts associated with the increased capacity of the fleet. Reconstruction and replacement of vessels was limit to prevent further increase the capacity of the fleet. Regarding exemptions, the preferred option was to allow exemptions for small vessels, but to limit the gear used by these vessels to gear other than dredges or trawls. Such an exemption would allow small vessels to develop alternative methods of harvesting weathervanes and other scallop species, such as by diving or longlining.

# North Pacific Fishery Management Council

Richard B. Lauber, Chairman  
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#3-95

## NEWSLETTER

6/28/95

### Dutch Harbor/Unalaska Rolls Out Red Carpet

From the first plane carrying meeting attendees to the last one to leave, participants in the NPFMC's June meeting in Dutch Harbor were greeted with enthusiasm and treated like royalty during their week-long stay. Several after-meeting social activities were provided by Dutch Harbor and Unalaska businesses and associations throughout the week, including a BBQ and recreational evening. Other opportunities for after-meeting sightseeing, plant tours, and fishing were abundant through the careful planning of the NPFMC Organizing Committee, composed of Mayor Frank Kelty, Doug Bagnell and Jane Schroeder (Grand Aleutian), Stephanie Madsen (Aleutian Logistics-ASPA), Shirley Marquardt (Freight Mgmt Services), Annemarie McElroy (Convention & Visitors Bureau), Herb Callahan (Arctic Alaska/Tyson Seafoods), and Emil Berikoff (Unalaska Fishermen's Assn). It seemed that every citizen of Unalaska and Dutch Harbor was in some way involved in ensuring a pleasant visit and worry-free meeting. Meeting participants and attendees alike commented on the extraordinary hospitality provided. An impromptu activity room provided by Grand Aleutian employees, equipped with a TV, VCR, loads of movies and games, was a life-saver when weather prevented many participants from leaving on Sunday.

*The hospitality of Dutch Harbor/Unalaska is much appreciated!*

Though a variety of issues were addressed during the meeting, the centerpiece of this meeting was final action on a license limitation program for the groundfish and crab fisheries off Alaska (details inside). The Council also took final action to recommend to the Secretary of Commerce that the inshore-offshore processing allocations established under Amendment 18/23 be extended for an additional three years. This action includes an extension of the pollock CDQ program.

The Council, Advisory Panel, and Scientific and Statistical Committee will meet next the week of September 25 at the Radisson Hotel/Quality Inn at the Sea-Tac Airport. Specific starting times and a draft agenda should be available by mid-August. [PLEASE NOTE: The original meeting date was delayed by one week because of meeting space availability.]

Major issues scheduled for the September meeting will include:

- Discussion of full utilization and waste reduction initiatives.
- Various amendments to the halibut/sablefish IFQ program.

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- The domestic Observer Program and the North Pacific Fisheries Research Plan (fee collection program).
- Long-term crab management and rebuilding programs.
- Next steps in Comprehensive Rationalization, including development of a BSAI pollock ITQ proposal.
- A review of Magnuson Act Reauthorization, and
- Initial specifications of groundfish TACs and PSC allowances for the 1996 fisheries.

### Council Bids Farewell to Two Members

The June 1995 meeting marked the end of six years of service on the Council for Mr. Ron Hegge of Anchorage. His direct presence on the Council will be missed, but given his keen interest in fisheries management issues, we don't expect to see him disappear into the sunset. We all look forward to his continued participation in the Council process.

Another member of the Council, Rear Admiral Roger Rufe Jr., will be moving on to warmer climates in the southern U.S. Admiral Rufe served for three years as the Coast Guard representative on the Council. He is replaced by Rear Admiral Ray Riutta, to whom the Council extends a warm welcome.

### Incidental Taking of Marine Mammals

NMFS has published a proposed rule to implement new marine mammal takings requirements in commercial fishing operations. This proposed rule, published on June 16, 1995, responds to changes made to the Marine Mammal Protection Act as amended in 1994. There still are three categories of fisheries in terms of marine mammal takings, each having different registration and reporting requirements. Category I is for fisheries with frequent incidental mortality and serious injury of marine mammals. No Alaska fisheries are in this category. Category II is for occasional incidental mortality and serious injury of marine mammals. Alaska fisheries in this category include most drift gillnet and setnet salmon fisheries, Southeast salmon purse seiners, BSAI groundfish trawlers, pair trawlers, and southern BSAI and Western Gulf of Alaska sablefish longliners in federal waters. Category III has fisheries with remote likelihood or no known incidental mortality or serious injury of marine mammals. They include most other commercial fisheries off Alaska.

Comments on the proposed regulations must be submitted to Chief, Marine Mammal Division, Office of Protected Resources, NMFS, 1315 East-West Highway, Silver Spring, MD 20910, by July 31, 1995. Comments on the listing of fisheries by category are due by September 14. Contact for the Alaska Region of NMFS is Dr. Steve Zimmerman at (907) 586-7235. We have limited copies of the federal register notice available upon request.

### Scallop Management

In June, the Council adopted Amendment 1 to the scallop fishery management plan which will allow a federally regulated scallop fishery to occur outside 3 miles in the Exclusive Economic Zone. The management program is based on the State of Alaska's management regime with additional measures previously adopted by the Council. Management measures include permit requirements, limited access, regulatory and reporting areas, districts and sections, scallop catch limits, inseason adjustments, reporting requirements, observer requirements, fishing seasons, closed waters, gear restrictions, efficiency limits, and prohibited species bycatch limits. A vessel moratorium, based on previously adopted criteria, was approved as a limited access measure for three years. If approved, the vessel moratorium would qualify vessels which participated (made at least one landing) in 1991, 1992 or 1993, or which participated for at least four years between January 1, 1980 and January 20, 1993. Areas to be closed to scallop fishing include those federal areas of the EEZ currently closed to bottom trawling to protect crabs and crab habitat. The Council also urged NMFS to require 100% observer coverage on all scallop vessels. NMFS and ADF&G will work together to develop a real-time monitoring system to monitor scallop

vessel locations relative to State water boundaries. If approved by the Secretary, a scallop fishery may be prosecuted under federal regulations by mid-1996, or earlier if opened by emergency rule. However, if the Magnuson Act is amended this year to allow extension of state jurisdiction into federal waters under certain conditions, the Council may revise the scallop FMP to defer management to the state. Staff contact is David Witherell.

### Crab Bycatch

**T**he Council reviewed an analysis of area closures to trawling that would protect red king crabs in Bristol Bay. The Council released the document for public review contingent upon completion of an economic analysis by late July and approval by the scientific and statistical committee. Please contact the NPFMC office if you wish to receive a copy of the analysis. Final action on this plan amendment is scheduled for September. If approved, an area closure would be implemented in early 1996, likely along the same lines as the 1995 closed area. NOAA General Counsel will examine the possibility of implementing this by emergency rule in January 1996. In September, the Council will also be receiving a report from the Crab Rebuilding Committee chaired by Dr. Fluharty, and perhaps initiating other, long-range crab management programs.

The Council also directed staff to analyze a proposal to combine the Zone 1 and Zone 2 Tanner crab PSC cap for the Pacific cod trawl and other fisheries. It was felt that the Bristol Bay closure may have increased bycatch rates of Tanner crab, causing an early closure of Zone 1. In turn, vessels fished in Zone 2 which may have increased halibut bycatch to the extent that the trawl fishery was unable to harvest its apportionment of the cod TAC. A draft analysis of this plan amendment proposal will be ready in December. Staff contact is David Witherell.

### Halibut Discard Mortality Rates

**A**t the December 1994 meeting, the Council recommended to NMFS the halibut discard mortality rates to be used for managing the Bering Sea/Aleutian Island and Gulf of Alaska 1995 groundfish fisheries. The Council recommended an assumed rate of 12.5 percent for the Pacific cod hook and line fishery for the first half of 1995 with a review of observed rates at the June 1995 Council meeting. The International Pacific Halibut Commission staff reevaluated the halibut discard mortality rate for BSAI Pacific cod hook and line fishery using in-season observer data, and reported the fishery is exhibiting a rate of 11.5 percent. The Council recommended that NMFS apply this new rate for the remainder of the 1995 BSAI Pacific cod hook and line season, and to adjust the discard mortalities for this fishery for the first half of 1995. Staff contact is Jane DiCosimo.

### Electronic Reporting

**T**he Council approved a regulatory amendment to implement hardware requirements for electronic reporting. The amendment requires all processor vessels that process groundfish to have satellite communication equipment and the necessary hardware and software for electronic transmission of observer data and requires all shoreside processors that process groundfish to have the necessary computer hardware and software to send data electronically via a modem. It will become effective January 1, 1996. The objective is to facilitate electronic reporting of fisheries data. Use of this equipment by observers should reduce both the time and expense of collecting fishery information by providing real-time data and reducing the workload of the Observer Program. Currently, most industry reports are submitted by FAX, and all logbooks are kept on paper.

The Council appointed a committee composed of industry representatives and agency staff to work out the remaining software and hardware requirements of the program. That committee will meet in early February 1997 at the Alaska Fisheries Science Center in Seattle. Contact Nick Hindman at the NMFS Regional Office (907-586-7228) for more information.

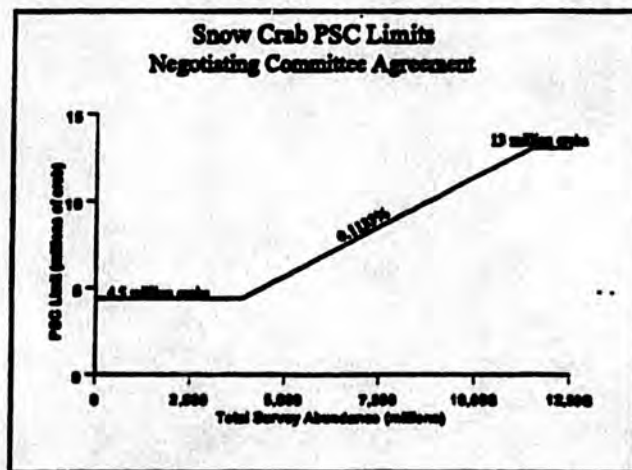
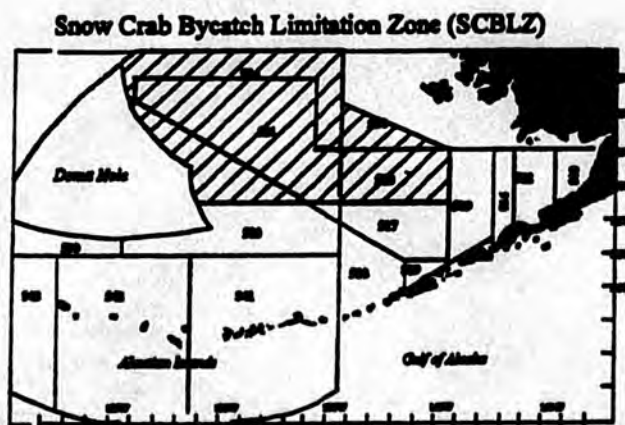
### Scallop Management

In June 1995, the Council approved an amendment package that established management measures to replace an interim closure of Federal waters off Alaska to scallop fishing. Amendment 1 allowed scallop fishing to resume in most registration areas on August 1, 1996, and about 750,000 pounds have been landed to date by nine vessels. Amendment 2 proposes a 3-year vessel moratorium on additional vessels entering the scallop fishery. To qualify, vessels had to have made at least one landing in any year from 1991 through 1993, or during any four years from 1980 through 1990. A notice of availability for the moratorium (Amendment 2) was recently published in the Federal Register; comment deadline is February 3, 1997.

Under the Magnuson-Stevens Act, the State of Alaska may now regulate vessels not registered with the State if they are operating in the EEZ. As such, one option the Council may consider is to delegate management authority of the scallop fishery to the State. At its December meeting, the Council recommended analysis of a proposal by NMFS to examine impacts of this option. The Council also initiated analysis of a proposal for a license limitation system for the scallop fishery. The Council is tentatively scheduled to review progress on the analyses in September. Staff contact is Dave Witherell.

### Snow Crab Bycatch Limits

The Council approved the agreement negotiated by affected industry groups regarding PSC limits for *C. opilio* snow crab taken in BSAI trawl fisheries. Under proposed Amendment 40, PSC limits for snow crab will be based on total abundance of *opilio* crab as indicated by the NMFS standard trawl survey. For 1998 and thereafter, the snow crab PSC cap will be set at 0.1133% of the Bering Sea snow crab abundance index, with a minimum PSC of 4.5 million snow crab and a maximum of 13 million snow crab. Snow crab taken within the "Snow Crab Bycatch Limitation Zone" (SCBLZ) would accrue towards the PSC limits established for individual trawl fisheries. Upon attainment of a snow crab PSC limit apportioned to a particular trawl target fishery, that fishery would be prohibited from fishing within the SCBLZ.



For 1997 only, all snow crab bycatch in areas 513, 514, 521, 523, and 524 will accrue to the PSC limit, and the PSC limit will be increased by 10%. Based on 1996 survey abundance (5,425 million crabs), the 1997 snow crab

historical fishing practices in, and dependence on, the fishery; (3) the economics of the fishery; (4) the capability of fishing vessels used in the fishery to engage in other fisheries; (5) the cultural and social framework relevant to the fishery; and (6) any other relevant considerations (16 U.S.C. 1853).

#### Scallop Management Background

Management of scallops in the EEZ of Alaska was conducted by the Alaska State Department of Fish and Game (ADF&G) from 1968 until the implementation of the Federal FMP and an interim closure of the EEZ to fishing for scallops in 1996. In 1992, ADF&G developed an Interim Fishery Management Plan (IFMP) for scallops, as fishing effort was rapidly increasing and maximum sustainable yield may have been exceeded. The IFMP specified three major management measures: (1) Setting area-specific guideline harvest levels and gear restrictions to prevent localized overharvesting; (2) creating an observer program to monitor the fishery and obtain biological information; and (3) limiting effort via gear restrictions, seasons, minimum size limits, and other measures. Consistent with scallop management actions taken on the east coast, the State of Alaska (State) promulgated regulations that limit crew size to a total of 12, and mandated that weather-vane scallops only be shucked manually to control effort. In 1993, the Commissioner of ADF&G declared scallops a High Impact Emerging Fishery (5 AAC 39.210) because of mounting resource concerns. A fishery may be regulated as a high impact emerging commercial fishery if the Commissioner determines that any of the following conditions apply to a species or species group in an area or region: (1) Harvesting effort has recently increased beyond a low sporadic level; (2) interest has been expressed in harvesting the resource by more than a single user group; (3) the level of harvest might be approaching a level that might not be sustainable on a local or regional level; and (4) comprehensive regulations to address issues of conservation, allocation, and conduct of an orderly fishery have not been developed.

In 1993, the Council also began to address the issue of overexploitation and overcapitalization in the scallop fishery. At the January 1993 meeting, the Council determined that the scallop fishery may require Federal management to protect the fishery from overexploitation and further overcapitalization. The Council set a control date of January 20, 1993, to

notify the industry that a moratorium for this fishery may be implemented. This control date, which was published in the Council's newsletter, meant that fishermen and/or vessels not participating in the fishery by that date may not be guaranteed future access to the fishery.

The Council was presented with information indicating that the stocks of weather-vane scallops were fully exploited and any increase in effort would be detrimental to the stocks and the Nation. Information indicated that dramatic changes in age composition had occurred after the fishing-up period (1980-89), with commensurate declines in harvest. In recent years, many fishermen abandoned historical fishing areas and searched for new areas to maintain catch levels. Increased numbers of small scallops were reported. Additionally, scallops are highly susceptible to overfishing and boom/bust cycles worldwide.

The need to limit access was the primary motivation for the Council to prepare the FMP in lieu of State management of the scallop fishery. As anticipated, effort in the scallop fishery increased in 1993 when 32 scallop permits, representing 21 vessels, were issued by the State. Fifteen of these vessels had made landings by the end of 1993. Even without additional vessels entering the fishery, the Council believed that the 1993 fishery was overcapitalized, meaning that too much capital was invested relative to the fleet size necessary to conduct the fishery. In 1992, seven vessels harvested 1.8 million lb (816 mt), for an average of 257,143 lb (116.6 mt) harvested per vessel. The 1993 quota was set at 890,000 lb (403.7 mt) for areas with specified guideline harvest levels, or about one-half of the 1992 landings. This quota could have been harvested by three or four vessels. In 1993, landings from areas without guideline harvest levels totaled 524,000 lb (237.7 mt), which could have been taken by an additional two vessels. Yet, 15 vessels participated in the 1993 fishery. In 1994, the growth trend in the fishery continued with 16 vessels harvesting 1,235,389 lb (560.3 mt) of scallops.

At its January 1993 meeting, the Council directed staff to proceed with an analysis to evaluate potential Federal management of Alaskan scallops. A vessel moratorium was proposed as an essential element of a Federal management regime to stabilize the size and capitalization of the scallop fleet during the time that the Council considers limited entry alternatives for this fishery.

At its June 1993 meeting, the Council and its advisory panels reviewed a draft EA/RIR/IRFA analysis of management alternatives for the scallop fishery. Also at that meeting, the Council reaffirmed the control date of January 20, 1993, and recommended several revisions to the draft analysis, which was subsequently released for public review on August 9, 1993. At the September 1993 Council meeting, public testimony was received on scallop management, particularly on the qualifying criteria for a moratorium. At that meeting, the Council tentatively identified its preferred alternative of a separate FMP for the scallop fishery, with shared management authority with the State. The preferred alternative also included a vessel moratorium option. However, the Council requested additional analysis to assist with determining appropriate qualifying criteria. Additional analysis was incorporated into the revised draft FMP, including a draft EA/RIR/IRFA, and was released for public review on November 30, 1993.

At its April 1994 meeting, the Council and its advisory bodies reviewed the draft FMP, took public testimony, and voted to adopt a separate FMP for the scallop fishery. Eighteen vessels would qualify under the criteria adopted by the Council in April 1994. The 1994 draft FMP, which deferred most management measures to the State, was based on the premise that all vessels fishing for scallops in the Federal waters off Alaska would also be registered with the State.

While regulations were being drafted to implement the FMP, a vessel that had nullified its registration with the State began fishing for scallops in the Federal waters of the Prince William Sound Registration Area, which the State had already closed after the guideline harvest level of 50,000 lb (22,686 kg) was taken on January 26, 1995. The State did not have authority to stop the vessel from fishing, because it was no longer registered with the State and was fishing in the EEZ. On February 17, 1995, the Council met by emergency teleconference and recommended that NMFS implement an emergency rule to close the EEZ off Alaska to scallop fishing to prevent further uncontrolled harvests in Federal waters. The emergency rule went into effect on February 23, 1995 and was published on March 1, 1995 (60 FR 11054).

At its April 1995 meeting, the Council took additional steps to prevent unregulated and uncontrolled harvests after the emergency rule expired. On April 19, 1995, the Council adopted an FMP, which continued the closure of the EEZ to fishing for scallops for a 1-year period. The FMP was approved by

| <i>Number of vessels fished during the eligibility periods<br/>for the federal scallop vessel moratorium</i> |                                            |
|--------------------------------------------------------------------------------------------------------------|--------------------------------------------|
| <b>Time Period</b>                                                                                           | <b>Number of Vessels<br/>with Landings</b> |
| 1991                                                                                                         | 7                                          |
| 1992                                                                                                         | 7                                          |
| 1993                                                                                                         | 15                                         |
| Fished in 4 years during<br>Jan. 1, 1980-Jan. 20, 1993                                                       | 7                                          |
| <b>Total Unique Vessels</b>                                                                                  | <b>18</b>                                  |

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October 4, 1996

## DEVELOPMENT OF THE FISHERY FOR WEATHERVANE SCALLOPS, *PATINOPECTEN CAURINUS* (GOULD, 1850), IN ALASKA

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**ABSTRACT** The Alaska scallop fishery harvests weathervane scallops, *Patinopecten caurinus* (Gould 1850), in the Gulf of Alaska and Bering Sea, although small quantities of *Chlamys* spp. were harvested in recent years. The fishery began in 1967 and evolved from a sporadic, low-intensity fishery to one characterized by a highly specialized fleet by 1993. An influx of larger, more efficient vessels from 1990 through 1993 increased harvests and altered the character of the fishery. Vessel length increased 85% from a mean ( $\pm 1$  standard error) of  $18.5 \pm 2.9$  m in 1983 to  $34.3 \pm 4.5$  m in 1991, and crew sizes doubled. The number of scallop landings increased significantly from  $65.9 \pm 8.3$  y<sup>-1</sup> during 1980 through 1989 to  $140.7 \pm 3.3$  y<sup>-1</sup> during 1990 through 1993, although the mean number of vessels did not change significantly between the two periods. Scallop harvests averaged  $667.1 \pm 54.8$  mt of shucked meats from 1990 through 1993, three times the average harvest of  $216.7 \pm 30.3$  mt from 1983 through 1989. The percentage of the fleet's total Alaskan fishing income derived from the scallop fishery increased from 57.7% in 1983 to 100% by 1990. The decreased diversification of scallop vessels into other fisheries represented a shift from a part-time fleet to a dedicated, full-time scallop fleet with greater harvesting efficiency. New management measures were adopted to address the changing nature of the fishery and included altered fishing seasons, observer coverage, area harvest limits, ceilings on catch of incidental species, restrictions on crew size and a moratorium on vessels fishing in the exclusive economic zone.

**KEY WORDS:** Scallops, fishery, *Patinopecten caurinus*, Alaska

### INTRODUCTION

The commercial fishery in Alaska for weathervane scallops, *Patinopecten caurinus* (Gould 1850), is a relatively small fishery occurring primarily in the Gulf of Alaska and the Bering Sea in the northeastern Pacific Ocean. Although other scallop species (*Chlamys pseudoslandica* and *C. rubida*) were harvested in 1991 and 1992 in small directed fisheries in the Aleutian Islands or caught incidentally in the fishery for weathervane scallops, their contributions to the total harvest were minimal.

Interest in the Alaskan fishery developed in the late 1960s at the time catch-per-unit-effort (CPUE) was declining in the U.S. and Canadian scallop fisheries on Georges Bank (Orensanz 1986). The decreasing supply of Georges Bank scallops to U.S. markets and increased prices encouraged development of new fisheries and expansion of existing fisheries worldwide to meet the demand for scallops (Caddy and Lord 1971).

The contribution of the Alaskan fishery to the total U.S. harvest of scallops is small, but has grown in recent years. Landings for Alaska and U.S. are commonly reported as shucked meat weight (e.g., U.S. Dept. Commerce 1993). The Alaskan percentage of the U.S. harvest increased from an average of 1.7% from 1980 through 1985, to 2% from 1986 through 1990, to 4% in 1991 through 1992 (U.S. Dept. Commerce 1982-1993). The larger percentage resulted from declining harvest in other U.S. fisheries and increased harvest in the Alaskan fishery. Worldwide scallop landings are commonly reported as live whole weight (e.g., Anonymous 1991). Shucked weight of weathervane scallops averages 11.5% of whole weight (Haynes and Powell 1968). Thus, in 1991 the Alaskan harvest of 536 mt shucked weight was approximately 4,661 mt (0.57%) of the world scallop harvest of 816,000 mt whole weight (Anonymous 1991).

Because the Alaskan scallop fishery was relatively minor until recently, it was passively managed and data collection was minimal. Without a time series of routine abundance and catch sampling data, historical description of stock dynamics is not possible. Standardized CPUE data are unavailable. In any case, CPUE data may not be indicative of relative abundance due to the spatial distribution of scallop beds and the pattern of vessel movement among beds to sustain high CPUE (Orensanz et al. 1991). On the other hand, good records on landings, vessels, and participants have been maintained since the inception of the fishery.

In this paper, we review the geographic distribution of weathervane scallops in Alaska and chronicle the development and management of the commercial fishery, with particular emphasis on the evolution of the scallop fleet from a part-time, diversified, small-vessel fleet to a full-time, large-vessel fleet fishing almost exclusively for scallops.

### MATERIALS AND METHODS

We analyzed databases of commercial vessel license applications, commercial fishing permit applications, and fish tickets which are maintained by the Alaska Department of Fish and Game (ADF&G) and Commercial Fisheries Entry Commission. Vessel license applications contain data on fishing vessels such as length, whereas fishing permit applications include information on permit holders such as residency, age, fishery and type of fishing gear.

Fish tickets are sales receipts which include information such as the date of landing, species, number and weight of fish caught, and area of harvest. In Alaska, scallop landings data are generally considered to be accurate, because there have been fewer than 20 vessels to monitor and overall compliance with fish ticket requirements is excellent. The scallop harvests reported herein include all

species, and represent weights of shucked meats without roe. Alaska state statutes protect the confidentiality of individual fishers' harvests and earnings. To maintain the confidentiality of this information, we omitted scallop harvest and earnings data when the number of persons or number of vessels participating in the fishery was less than four. For this reason, data were considered confidential in 1976, 1977 and 1979.

#### The Weathervane Scallop

The weathervane scallop, *P. caurinus*, is a large, long-lived species. The largest specimen recorded in Alaska was 250 mm shell height (SH), and had an adductor meat weight of 340 g (Hennick 1973). Bourne (1991) reported weathervane scallops over 20 years of age from the Strait of Georgia, British Columbia, and scallops up to age 28 have been found in Alaska (Hennick 1973).

Weathervane scallops are distributed along the western coast of North America from California northward to the Bering Sea and westward as far as the Aleutian Islands in depths to 300 m (Grau 1959, Bernard 1983). Commercial quantities of weathervane scallops in Alaska are located primarily in the relatively shallow waters of the submerged continental shelf (Kaiser 1986, Fig. 1). From 1973 through 1976, 68 to 100% of the calculated scallop biomass in Alaska was reported at depths of 0 to 100 m, and commercially harvestable quantities were identified at depths of 46 to 128 m (Ronholt et al. 1977). *P. caurinus* in the northeastern Gulf of Alaska comprised 31% to 37% of the benthic biomass, at depths of 100 m or less (Feder et al. 1981). Unfortunately, scallop assessment surveys were conducted in only a few years and their geographic coverage was limited.

Locations of commercially important beds of *Placopecten magellanicus* on the Atlantic coast were characterized in areas with oceanographic features, including persistent tidal gyres, which contribute to retention of pelagic larvae in the area during the larval period (Sinclair et al. 1985, Caddy 1989). The dominant oceanographic feature of the Gulf of Alaska is a permanent, counterclockwise gyre of the Alaska Current which generally parallels the continental slope at velocities of 30 to 100 cm s<sup>-1</sup>. The velocities are relatively slow, but as the current narrows into the Alaskan Stream from Kodiak Island westward, velocities increase to a maximum of 100 cm s<sup>-1</sup> (Hood 1986). Shoreward of the shelf break, the Alaska Coastal Current borders the Gulf of Alaska from the southeastern panhandle to beyond Kodiak Island and into the Bering Sea. The Alaska Coastal Current flows counterclockwise and is driven by wind and freshwater discharge (Royer 1983).

The largest commercial scallop harvests in Alaska were produced from the coastal margin of the Gulf of Alaska near Kodiak and Yakutat (Fig. 1). Smaller harvests occurred in Southeast Alaska, Prince William Sound, Cook Inlet, Dutch Harbor and the Bering Sea. Analyses have not been completed to determine if scallops in these areas are genetically distinct populations, although larvae could conceivably be transported by currents between some of the closer areas.

Weathervane scallops are found in aggregations which tend to form elongated beds, oriented along the direction of current flow as described for other scallop species (Orensanz 1986, Caddy 1989), on substrates of sand, mud, clay and gravel (Hennick 1973). Growth and size at maturity of weathervane scallops may vary spatially within beds in the same area or between beds in geographically different areas (Haynes and Hitz 1971, Orensanz

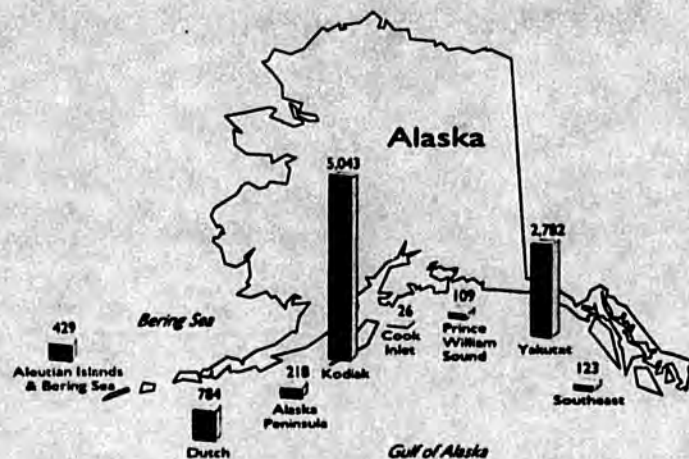


Figure 1. Distribution of total commercial scallop harvest in the Gulf of Alaska and Bering Sea from 1967 through 1993. Cumulative harvests in metric tons of shucked meats are indicated above the bar for each area; bar height is proportional to the area harvest.

1986, MacDonald and Bourne 1987, Caddy 1989). Based on von Bertalanffy growth estimates, weathervane scallops sampled in 1975 from Marmot Flats off the northeast side of Kodiak Island grew faster (131 mm SH at age 4) and achieved larger asymptotic sizes ( $L_{\infty}$  = 190 mm SH) than those sampled in 1980 from Cape St. Elias to Cape Fairweather in the eastern Gulf of Alaska (91 mm SH at age 4;  $L_{\infty}$  = 144 mm SH) (Kaiser 1986). Growth and mortality rates may be density dependent (Orensanz 1986) or may vary with spatial differences in temperature or feeding conditions (MacDonald and Thompson 1985).

Annual survival of long-lived species, such as the weathervane scallop, tends to be high. Kruse (1994) estimated the instantaneous natural mortality ( $M$ ) of *P. caurinus* between 0.04 and 0.25, corresponding to annual mortality rates of 4 to 22%. A median estimate of  $M$  = 0.16, corresponding to 15% annual mortality, was obtained using Hoenig's (1983) method based on a Hennick's (1973) maximum scallop age of 28 (Kruse 1994).

The level of fishing mortality for weathervane scallops in Alaska is unknown. For other species of commercially important scallops, direct and indirect mortalities have been identified in association with fishing activities. Direct mortality includes damage or crushing within scallop dredges, and handling and exposure of undersized scallops that are later returned to the sea (Naidu 1988, Medcof and Bourne 1964). Indirect mortality results when scallops in the path of a dredge are not caught but are lethally damaged or exposed to increased predation as predators are attracted to dredge tracks (Caddy 1968, Elner and Jamieson 1979, Caddy 1973). Indirect fishing mortality of Iceland scallops, *Chlamys islandica*, was estimated to range up to 17% or 31%, depending on the type of dredge used (Naidu 1988).

The vulnerability of scallops to fishing mortality may be increased by commensal or parasitic organisms. Scallops in the Cape Yakutat/Cape Yakutat region of Alaska were reported to be infested by the burrowing, spionid polychaetes *Pygospio elegans* and *Polydora ciliata* in the mid- and late-1970s (Feder et al. 1981). The polychaetes weakened the valves and increased the susceptibility of scallops to breakage in trawls or dredges.

#### The Fishery

The commercial scallop fishery progressed through several developmental phases along the Alaskan coast. In the initial phase

from 1967 through 1977, previously unexploited scallop beds were explored and harvested. Scallop landings were greatest in the years 1968 and 1969 (Fig. 2). Harvest effort decreased from 1970 to 1978, and a smaller, more stable fishery followed from 1979 through 1989. Beginning in 1990, the fishery for weathervane scallops in Alaska expanded with an influx of new, more efficient vessels. New state and federal management regimes were implemented in 1993 and 1994 to address concerns in the growing fishery.

The first commercial landings of weathervane scallops in the Alaskan fishery were made in 1967 in the western Gulf of Alaska near Kodiak Island. The fishery consisted of two vessels which delivered scallops alive and in the shell to processors on shore for an ex-vessel price of \$0.15 kg<sup>-1</sup> (Kaiser 1986). The fishery expanded rapidly in 1968 and 1969 when 19 vessels entered the fishery in the Kodiak area and the eastern Gulf of Alaska near Yakutat. A record harvest for the Alaskan fishery of 839.2 mt was produced in 1969. The costly process of shucking scallops by shore-based processors was soon abandoned, and scallopers began delivering shucked meats to processors for freezing and packaging (Kaiser 1986). The weighted average ex-vessel price for shucked meats in 1969 was \$1.89 kg<sup>-1</sup>. Unsuccessful attempts were made to extract scallop mantles and gonads for sale as frozen food (ADF&G 1968). To this date, a market for "roe-on" scallops has not developed, and shucked meats continue to be the only product of the Alaskan scallop industry.

During the years 1970 through 1978, the scallop fishery entered a phase of declining effort and harvest. Harvest levels of 1968 and 1969 were not sustained. More restrictive management measures, such as closed areas to limit bycatch, may have contributed to a reduction in the fishery. A catch sampling program conducted during 1968–1972 showed that the largest scallops were fished from previously unexploited populations. Hennick (1973) estimated catch age composition by enumerating annuli on the left valves of scallops. In the early years of the fishery the majority of scallops sampled from commercial harvests were at least 7 years old, but by the early 1970s, the percentage of scallops 2 to 6 years old had increased (Hennick 1973, Fig. 3). Scallopers continued to explore for new beds in attempts to boost their harvests in response to the decreasing abundance of large scallops.

The number of vessels in the fishery dropped from 19 in 1969 to 7 in 1970, but because the most efficient scallop vessels remained in the fishery (Kaiser 1986), the relatively high harvests continued from 1970 through 1973 and mean ( $\pm 1$  standard error

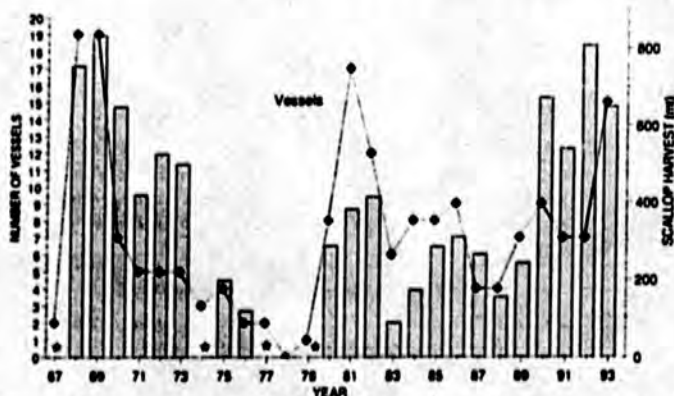


Figure 2. Annual scallop harvest (metric tons of shucked meats) and number of vessels fished in the Alaskan scallop fishery. Confidential harvests are indicated by an asterisk (\*).

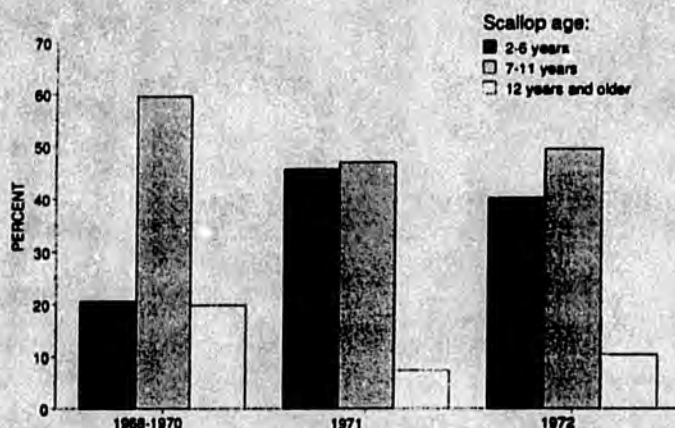


Figure 3. Age composition of scallops sampled from 1968 through 1972 commercial harvests from the Kodiak and Yakutat areas combined (Hennick 1973).

landings were  $522.9 \pm 94.9$  mt y<sup>-1</sup>. By 1977, the number of vessels had dwindled to two. The fishery was opened in 1978, but no vessels participated and commercial harvest of scallops ceased.

The scallop fishery emerged again in 1979 with one vessel fishing off Kodiak Island. Marked increases in ex-vessel prices from an average of \$3.49 kg<sup>-1</sup> in 1976 and 1977 to \$6.11 kg<sup>-1</sup> in 1979 to \$9.23 kg<sup>-1</sup> in 1981 stimulated more interest in the fishery, and the number of vessels increased to 17 by 1981. Kaiser (1986) attributed much of the growth in the Alaskan fishery to an influx of vessels from the east coast of the U.S. A five-fold increase in the number of vessels in the Atlantic sea scallop fishery from 1975 through 1979 and a 22% decrease in the sea scallop harvest from 1978 through 1981 (NEFMC 1982) caused scallopers to move to the west coast in search of more productive scallop fisheries. This search led to an intense fishery for weathervane scallops off the Oregon coast in 1981 in which 532 mt (shucked weight) was harvested by 118 vessels (Starr and McCrae 1983). Subsequent landings in Oregon have been small (Bourne 1991).

Vessels began harvesting scallops from new areas of Alaska in the 1980s. Whereas previous fisheries occurred entirely in the Kodiak and Yakutat regions of the Gulf of Alaska, an increasing percentage of the harvest in the 1980s was from less traditional areas. Scallops were harvested from Southeast Alaska along the Alexander Archipelago south of Yakutat, for the first time in 1980. The first scallop harvest from the Alaska Peninsula in the western Gulf of Alaska south of Kodiak was recorded in 1982. Harvests were reported from the Dutch Harbor area of the Aleutian Islands beginning in 1982, and the first harvest from Cook Inlet was produced in 1983. Expansion of the scallop fishery continued into the Bering Sea in 1986. From 1983 through 1989, effort in the Alaskan fishery varied from 4 to 9 vessels. The harvest level fluctuated during that period, and averaged  $216.7 \pm 30.3$  mt y<sup>-1</sup>.

Expansion of the fishery continued as scallopers explored and exploited new scallop grounds further west along the Aleutian Islands chain to Adak in 1991. In 1992, scallops were harvested from Prince William Sound in the north central Gulf of Alaska for the first time.

The period from 1990 through 1993 represented the most recent growth phase in the fishery. The average harvest more than tripled from an average of  $216.7 \pm 30.3$  mt y<sup>-1</sup> during 1983 through 1989 to  $667.1 \pm 54.8$  mt y<sup>-1</sup> from 1990 through 1993. The 1992 harvest of 806.9 mt, with an ex-vessel value of \$6.9

million, was the second largest recorded in the Alaskan scallop fishery. Although scallop harvests were much larger, effort was similar to that of recent years. Nine vessels fished in 1990 and 7 vessels in 1991 and 1992.

The number of vessels in the scallop fishery doubled to 15 in 1993. As in the early years of the fishery, many of the new vessels entering the fishery from 1990 through 1993 were east coast scallopers. A proposed moratorium in the Atlantic sea scallop fishery (NEFMC 1993) caused some vessels, which would be excluded from the east coast fishery by the moratorium, to move into west coast scallop fisheries.

In 1993, the North Pacific Fishery Management Council (NPFMC) considered a vessel moratorium for the Alaska fishery within the exclusive economic zone (3–200 miles) and gave notice to scallopers that new participants in the fishery after January 20, 1993 may not qualify to fish during a moratorium (NPFMC 1993). Effort escalated in anticipation of a moratorium in the Alaska scallop fishery as vessel owners established their eligibility by harvesting scallops in Alaska prior to January 20, 1993. State management agencies also considered a moratorium on new entrants within territorial (0–3 miles) waters (Kruse et al. 1992).

#### Vessel Length

Vessel size in the Alaskan scallop fishery increased substantially from the onset of the fishery in 1967. During the developmental period of the Alaskan fishery, scallop vessels consisted of a variety of converted crab, halibut and shrimp vessels, as well as scallop vessels from the east coast of the U.S. The east coast vessels averaged 24 to 28 m keel length and were capable of fishing two scallop dredges 3 to 5 m wide. These were the most efficient harvesters in the fleet (Kaiser 1986). Other vessels were fishing modified beam and otter trawls and an assortment of scallop dredges of various sizes.

Kaiser (1986) summarized vessel lengths in the scallop fishery from ADF&G data for 1967 through 1981. Vessels that fished in the Kodiak area were reported separately from vessels in Yakutat, although some vessels fished in both areas. Vessels that fished near Yakutat varied in length from 12 to 16 m to 24 to 28 m from 1967 through 1977. The largest number of vessels each year is 24 to 28 m in length. Similarly, most scallop vessels that fished in the Kodiak area were 24 to 28 m, although the size range for Kodiak vessels was greater than the range for Yakutat vessels in the early years of the fishery. Kodiak vessels varied from a 6 to 10 m length class to 48 to 52 m in length.

Vessel lengths after 1977 are shown in Figure 4 for all fishing areas combined. The largest component of the fleet in most years was the 18 to 31 m vessel class (Fig. 4A). Registered vessel length averaged  $25.1 \pm 0.8$  m from 1980 through 1982 (Fig. 4B). An influx of vessels smaller than 18 m was evident beginning in 1982 and was associated with initiation of a scallop fishery in the Cook Inlet area where vessels tended to be smaller than vessels fishing in other areas. The mean vessel length reached a minimum of  $18.5 \pm 2.9$  m in 1983 as a result of the increase in small vessels.

By 1988 all scallop vessels in the Alaskan fleet were larger than 18 m. Mean vessel length increased as the number of vessels over 31 m began to rise. Vessel size was largest during the years 1990 through 1992, when the percentage of vessels over 31 m varied from 30 to 57% of the fleet (Fig. 5). Mean length in 1991,  $34.3 \pm 4.5$  m, was 85% larger than the mean length of  $18.5 \pm 2.9$  m in 1983. The mean vessel length dropped to  $26.8 \pm 1.7$  m as more vessels under 31 m in length entered the fishery.

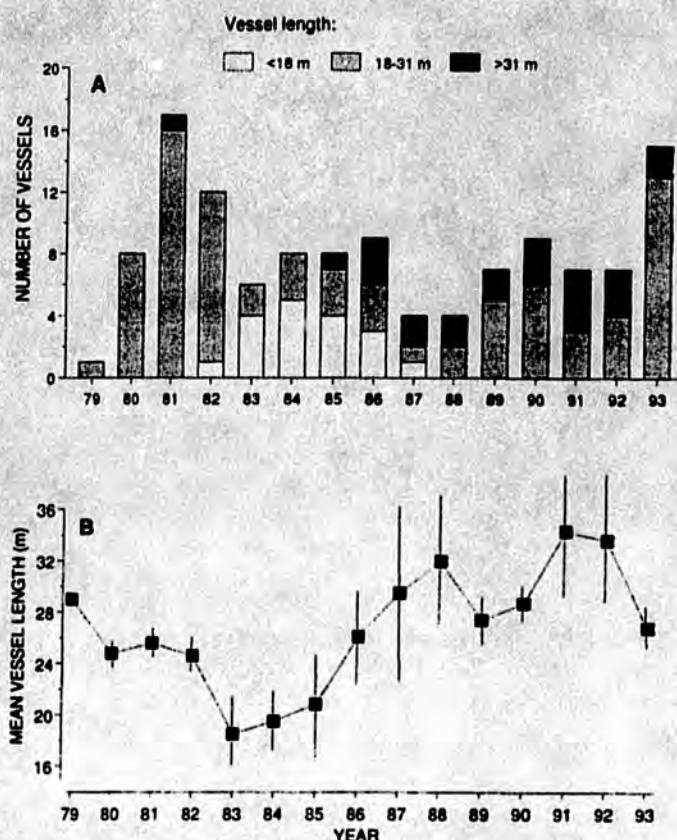


Figure 4. (A) Annual number of vessels in the Alaska scallop fishery from 1979 through 1993, by vessel length class. (B) Annual mean vessel lengths  $\pm 1$  standard error.

#### Fishing Capacity

One of the more important changes in the scallop fishery was the change in fishing capacity of the fleet. Fishing capacity was measured as the mean number of scallop landings (deliveries) per year and the mean size of landings.

In a previous study, we reported an escalation in the number of landings in the Alaskan scallop fishery in recent years (Kruse and Shirley 1994). A Student's *t*-test (SAS 1989) revealed that the mean number of landings of  $140.7 \pm 3.3$  in 1990 through 1993 was significantly larger ( $p \leq 0.01$ ) than the mean of  $65.9 \pm 8.3$  landings in 1980 through 1989. The number of landings increased although the mean number of vessels fished per year from 1990 through 1993,  $7.7 \pm 0.7$ , was not significantly different from the number of vessels fished in the earlier period,  $8.3 \pm 1.2$ . The mean landing size (in mt) was not significantly different between the two time periods.

#### Diversification of Fishing Income

The proportion of Alaska fishing income derived from the scallop fishery was used as an indicator of the economic dependence of vessels on the scallop fishery and the extent of effort exerted in the fishery by these vessels. All ex-vessel earnings (gross receipts paid to fishers) from Alaskan fisheries were compiled annually for vessels that made scallop landings each year. Scallop earnings were calculated as a percentage of the scallop fleet's total earnings to estimate the degree of diversification from 1975 through 1992. The fleet was considered to be more diversified in years when the percentage of fishing income derived from scallops was low and

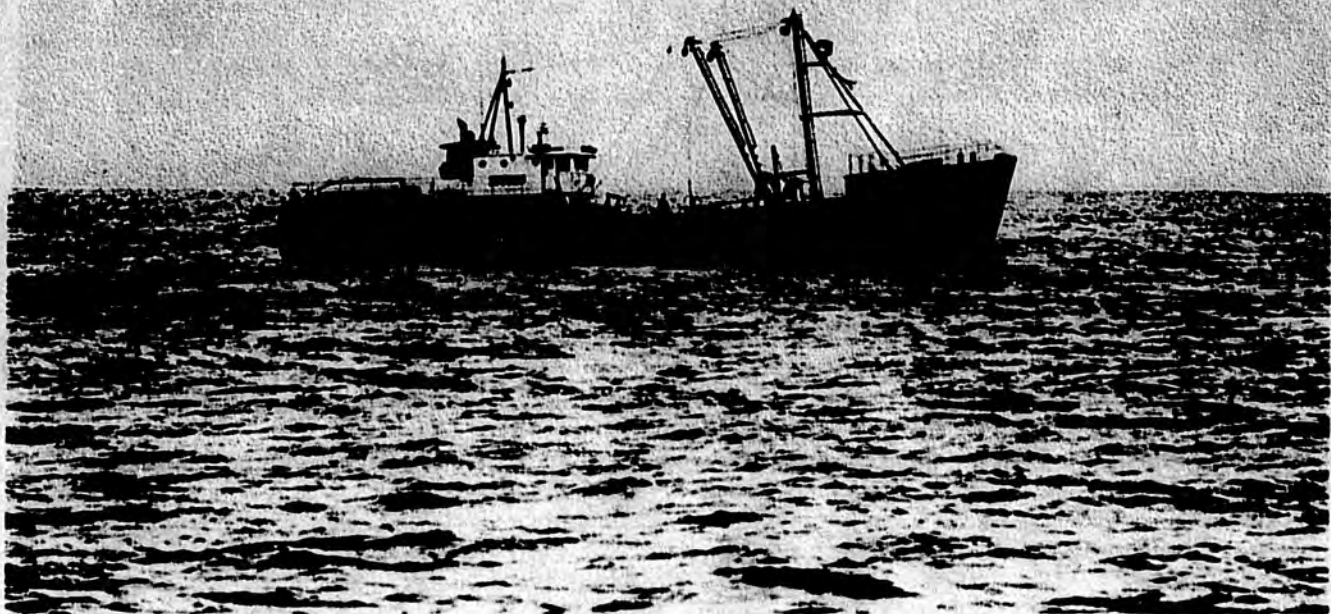


Figure 5. The commercial scallop vessel F/V PROVIDER which is an example of the type of vessel which has been used in the Alaskan scallop fishery since 1990. (Photo by Augustine Delahay)

less diversified in years when scallops contributed larger percentages to the fishing income.

The percentage of fishing income derived from the scallop fishery varied over time from a low of 57.7% in 1983 to 100% in 1979, 1990 and 1991 (Fig. 6). In 1975 through 1979, effort and harvests were reduced, and almost all fishing income for the few vessels during that period was generated from the scallop fishery.

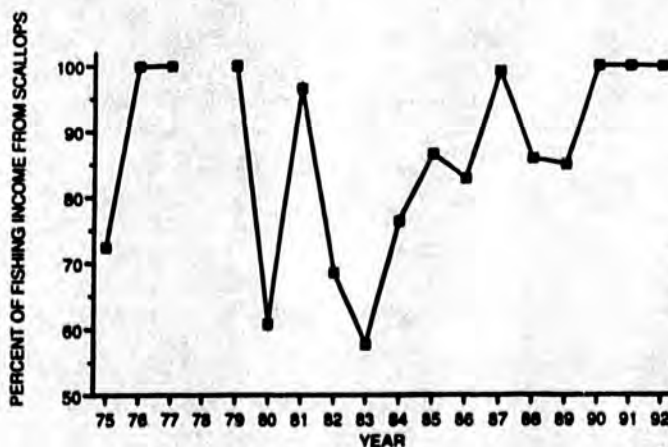


Figure 6. Percent of total ex-vessel fishing income derived from the scallop fishery for vessels participating in the fishery from 1975 through 1992. Total fishing income does not include any income generated from fisheries outside of Alaska.

Small percentages of non-scallop income were produced from king crab, halibut and salmon fisheries.

The contribution of scallops to total fishing income generally decreased after 1979 to the lowest level in 1983, suggesting an increased diversification of the fleet into fisheries other than scallops. Scallop vessels were also used in king crab, Tanner crab, shrimp, salmon, halibut and herring fisheries during that period.

Diversification of the scallop fleet began to change in 1983. The percentage of fishing income produced from the scallop fishery increased from 1983 to 1990. By 1990, scallops contributed 100% of the fishing income for the first time since 1979. All of the fishing income for the scallop vessels from 1990 through 1992 was produced from the scallop fishery. The change in fishing income represented a shift from a diversified fleet in the 1980s to a fleet concentrating almost entirely on scallops. The number of landings and the total harvest increased concurrently.

The contribution of the scallop fishery to total fishing income was not directly related to ex-vessel price of scallops or to the total scallop harvest. Ex-vessel prices remained relatively stable from 1982 through 1992, although when corrected for inflation, the price of scallops decreased over time (Kruse and Shirley 1994).

#### Harvesting Efficiency

The harvesting efficiency of the scallop fleet improved during the 1980s and 1990s. As vessels became larger and more specialized, crew sizes expanded and mechanical shuckers came into use. The average crew size for scallop vessels during 1980 through

1984 was estimated to be 5 persons per-vessel in the Yakutat area, 6 per-vessel in Prince William Sound, 6.3 per-vessel in Cook Inlet, the Alaska Peninsula, Aleutian Islands and Bristol Bay, and 8 per-vessel in Kodiak (Alaska Department of Labor, unpublished). By 1993, all vessels except the smallest in the fleet carried 12-person crews (NPFMC 1993). The Alaska Board of Fisheries limited the crew size on scallop vessels to 12 persons in 1993.

The use of mechanical shucking devices in Alaskan scallop fisheries was first reported in the 1991 fishery (Griffin and Ward 1992). Automatic shucking machines were employed to make harvest of smaller scallops more economical (Kruse and Shirley, in press). Although shucking machines were used primarily on vessels exploiting *Chlamys* spp., their use in processing weathervane scallops was banned in Alaska in 1993.

### DISCUSSION

Alaska's commercial fishery for scallops evolved from a sporadic, low-intensity fishery to a fishery characterized by a highly specialized fleet capable of harvesting with greater efficiency. This growth and specialization within the fishery created conservation concerns for the scallop resource. Recent anecdotal reports indicated that the proportion of smaller scallops harvested in the commercial fishery may be increasing (NPFMC 1993). Additional concern has arisen over the increased threat to species caught incidentally in non-selective scallop dredges. Particularly vulnerable are benthic migratory species, such as crab, which move into shallower depths during their molting and mating periods (Haynes and Powell 1968, Hennick 1973, Stone et al. 1992). Protection of non-targeted species is especially critical in some areas of Alaska where depressed populations of commercially valuable king and Tanner crabs are rebuilding.

The rapid growth, specialization and over-capitalization of the scallop fishery may have jeopardized the economic viability of the fishery. Larger vessels and crews and mandatory observer coverage have increased operating costs for scallop vessels. Shorter fishing seasons and harvest limits have constrained the earning potential in the scallop fishery.

With increased competition, over-capitalization and decreased ex-vessel value, the tendency for some fisheries in Alaska has been for vessels to become more diversified by participating in more fisheries in order to maintain the level of income necessary to support their operations (Shirley 1993). More restrictive measures (e.g., harvest limits, seasons, crab bycatch caps) recently adopted by state and federal management agencies may also cause some scallop vessels to diversify their fishing activities.

Management changes have been made to address some of these problems in the fishery and to provide more scientific data to analyze the impact of the fishery on Alaskan scallop populations. For many years, the small scallop fishery prompted few conservation or management concerns, and was managed using gear restrictions, fishing seasons and closed areas (Kruse and Shirley, in press). The Alaska scallop fishery recently shifted from a passive management mode to more active management and monitoring of the fishery in response to expanded effort and increased harvest levels in the 1990s.

A management plan adopted in 1994 established a more comprehensive management regime for the scallop fishery (Kruse 1994). Scallop gear in Alaska was restricted to two New England-style dredges (Bourne 1964) per vessel, with a maximum dredge

width of 4.57 m and a minimum ring size of 10.16 cm. Dredges used in Cook Inlet cannot exceed 1.83 m in width. Alaskan waters were divided into 9 registration areas, and vessels are now required to register with ADF&G before harvesting scallops in an area. Annual harvest limits were established for each registration area. All scallop vessels are required to have, and pay for, observers on board to monitor incidental catch of crab and collect biological data on scallops. Restrictions on scallop crew size and prohibition of automatic shucking machines on vessels fishing for weathervane scallops were implemented to control harvesting efficiency. Fishing seasons were amended in the new plan to protect molting and mating crabs from incidental harvest by scallop dredges. The regulatory season extends from July 1 in most areas (August 15 in Cook Inlet) through February 15. In the Yakutat and Prince William Sound areas, the season opens on January 10. The fishing season ends when the harvest limit has been met, when the incidental catch limit has been met, or on the regulatory closing date, whichever comes first.

The NPFMC adopted a federal management plan for scallops in 1994 which included a moratorium on vessels fishing in the exclusive economic zone (NPFMC 1993). Vessels fishing scallops outside of territorial waters were previously managed by ADF&G in the absence of a federal management plan. Management changes provided by the new ADF&G and NPFMC management plans should help to curtail rapid expansion of the scallop fishery.

Because the weathervane scallop is a long-lived, slow-growing species with low natural mortality, it may be vulnerable to overfishing (Adams 1980). Historically, an overall depletion of scallop populations may have been avoided because of the widespread distribution of scallops in the Gulf of Alaska and the Bering Sea and the small fleet's motivation to move to new areas to maintain catch rates or to other fisheries. However, some local populations may have been overfished. As a fishery begins on virgin stocks it is normal for age composition to shift toward younger ages. However, the magnitude of the age shift during the early years of the fishery, coupled to subsequent fishery performance, suggests to us that high harvests during the early years of the fishery off Kodiak and Yakutat may not have been sustainable over the long term. Unfortunately, fishery-independent data are unavailable to verify whether overfishing occurred.

Oceanographic features similar to those described by Sinclair et al. (1985) and Caddy (1989) for self-sustaining scallop populations also may have contributed to the apparent resiliency of weathervane scallop populations in Alaska. Nonetheless, recent expansion of fishing capacity by the fleet concerned fishery managers who sought to conserve and sustain natural populations, and thereby avoid stock collapses that have often occurred in many other scallop fisheries after periods of intense fishing (Orensanz 1986, Bourne 1991, Gwyther et al. 1991, Orensanz et al. 1991, Piquimil et al. 1991). As biological data are collected from the new observer program, our knowledge of the sustainability of exploited weathervane scallop populations in Alaska should improve markedly with the estimation of recruitment, growth and mortality parameters.

### ACKNOWLEDGMENTS

We thank Don Huntsman for producing the income diversification data, Thomas C. Shirley and anonymous reviewers for their helpful comments on the manuscript.

## LITERATURE CITED

- Adams, P. B. 1980. Life history patterns in marine fishes and their consequences for fisheries management. *Fish. Bull.* 78:1-12.
- ADF&G. 1968. 1967 Kodiak management area annual report. Alaska Dept. Fish & Game, Division of Commercial Fisheries. Kodiak, Alaska.
- Anonymous. 1991. Food and Agriculture Organization of the United Nations (FAO) Yearbook of Fishery Statistics. Vol. 72. Rome.
- Bernard, F. R. 1983. Catalogue of the living Bivalvia of the eastern Pacific Ocean: Bering Strait to Cape Horn. *Can. Spec. Publ. Fish. Aquat. Sci.* 61.
- Bourne, N. 1964. Scallops and the offshore fishery of the Maritimes. *Fish. Res. Bd. Canada. Bull.* No. 145.
- Bourne, N. 1991. West Coast of North America. pp. 925-942. In S. E. Shumway (ed.). *Scallops: Biology, Ecology and Aquaculture*. Developments in Aquaculture and Fisheries Science, 21. Elsevier, Amsterdam.
- Caddy, J. F. 1968. Underwater observations on scallop (*Placopecten magellanicus*) behaviour and drag efficiency. *J. Fish. Res. Bd. Can.* 25:2123-2141.
- Caddy, J. F. 1973. Underwater observations on tracks of dredges and trawls and some effects of dredging on a scallop ground. *J. Fish. Res. Bd. Can.* 30:173-180.
- Caddy, J. F. 1989. A perspective on the population dynamics and assessment of scallop fisheries, with special reference to the sea scallop *Placopecten magellanicus* Gmelin. pp. 559-589. In J. F. Caddy (ed.). *Marine Invertebrate Fisheries: Their Assessment and Management*. John Wiley and Sons, New York.
- Caddy, J. F. & E. I. Lord. 1971. High price of scallop landings conceals decline in offshore stocks. *Fisheries of Canada* 23(5):3-7.
- Elnor, R. W. & G. S. Jamieson. 1979. Predation on sea scallops, *Placopecten magellanicus*, by the rock crab, *Cancer irroratus*, and the American lobster, *Homarus americanus*. *J. Fish. Res. Bd. Can.* 36: 537-543.
- Feder, H. M., S. C. Jewett, S. G. McGee & G. E. M. Matheke. 1981. Distribution, abundance, community structure, and trophic relationships of the benthos of the northeastern Gulf of Alaska from Yakutat Bay to Cross Sound. Research Unit 5. Final report to Outer Continental Shelf Environmental Assessment Program. pp. 305-391. Institute of Marine Science, University of Alaska Fairbanks. Fairbanks, Alaska.
- Grau, G. 1959. Pectinidae of the eastern Pacific. *Univ. Calif. Publ. Allan Hancock Found. Pac. Exp.* 23.
- Griffin, K. L. & M. L. Ward. 1992. Annual management report for the shellfish fisheries of the Eastern Aleutians area, 1991. pp. 109-126. In *Annual Management Report for the Shellfish Fisheries of the Westward Region, 1991*. Alaska Dept. Fish & Game, Division of Commercial Fisheries, Regional Information Report 4K92-9. Kodiak, Alaska.
- Gwyther, D., D. A. Cropp, L. M. Joll & M. C. L. Dredge. 1991. pp. 835-851. In S. E. Shumway (ed.). *Scallops: Biology, Ecology and Aquaculture*. Developments in Aquaculture and Fisheries Science, 21. Elsevier, Amsterdam.
- Haynes, E. B. & C. R. Hitz. 1971. Age and growth of the giant Pacific sea scallop, *Patinopecten caurinus*, from the Strait of Georgia and outer Washington coast. *J. Fish. Res. Bd. Can.* 28:1335-1341.
- Haynes, E. B. & G. C. Powell. 1968. A preliminary report on the Alaska sea scallop-fishery exploration, biology, and commercial processing. Alaska Dept. Fish & Game, Division of Commercial Fisheries, Informational Leaflet 125. Juneau, Alaska.
- Hennick, D. P. 1973. Sea scallop *Patinopecten caurinus*, investigations in Alaska. Alaska Dept. Fish & Game, Division of Commercial Fisheries, Completion Report 5-23-R. Juneau, Alaska.
- Hoenig, J. M. 1983. Empirical use of longevity data to estimate mortality rates. *Fish. Bull.* 82:898-903.
- Hood, D. W. 1986. Physical setting and scientific history. pp. 5-27. In D. W. Hood and S. T. Zimmerman (eds.). *The Gulf of Alaska Physical Environment and Biological Resources*. U.S. Department of Commerce. Washington, D.C.
- Kaiser, R. J. 1986. Characteristics of the Pacific weathervane scallop (*Pecten [Patinopecten] caurinus*, Gould 1850) fishery in Alaska, 1967-1981. Alaska Dept. Fish & Game, Division of Commercial Fisheries (Unpublished Report, Catalog RUR-5J86-01). Juneau, Alaska.
- Kruse, G. H. 1994. Fishery management plan for commercial scallop fisheries in Alaska. Draft Special Publication 5, Alaska Dept. Fish & Game, Commercial Fisheries Management and Development Division. Juneau, Alaska.
- Kruse, G. H., P. R. Larson & M. C. Murphy. 1992. Proposed interim management measures for commercial scallop fisheries in Alaska. Alaska Dept. Fish & Game, Division of Commercial Fisheries, Regional Information Report 5J92-08. Juneau, Alaska.
- Kruse, G. H. & S. M. Shirley. 1994. The Alaskan scallop fishery and its management. pp. 107-177. In N. F. Bourne, B. L. Bunting and L. D. Townsend (eds.). *Proceedings of the Ninth International Pectinid Workshop*. Nanaimo, B.C., Canada, April 22-27, 1993. Volume 2. *Can. Tech. Rpt. Fish. Aquat. Sci.* 1994.
- MacDonald, B. A. & N. F. Bourne. 1987. Growth, reproductive output, and energy partitioning in weathervane scallops, *Patinopecten caurinus*, from British Columbia. *Can. J. Fish. Aquat. Sci.* 44:152-160.
- MacDonald, B. A. & R. J. Thompson. 1985. Influence of temperature and food availability on the ecological energetics of the giant scallop *Placopecten magellanicus*. I. Growth rates of shell and somatic tissue. *Mar. Ecol. Prog. Ser.* 25:279-294.
- Medcof, J. & N. Bourne. 1964. Causes of mortality of the sea scallop *Placopecten magellanicus*. *Proc. Nat. Shellfish Assoc.* 53:33-50.
- Naidu, K. S. 1988. Estimating mortality rates in the Iceland scallop, *Chlamys islandica* (O. F. Muller). *J. Shellfish Res.* 7:61-71.
- NEFMC. 1982. Fishery management plan-final environmental impact statement, regulatory impact review for Atlantic sea scallop (*Placopecten magellanicus*). New England Fishery Management Council. Saugus, Massachusetts.
- NEFMC. 1993. Draft amendment #4 to the Atlantic sea scallop fishery management plan. New England Fishery Management Council. Saugus, Massachusetts.
- NPFMC. 1993. Draft fishery management plan for the scallop fishery of the Gulf of Alaska, Bering Sea and Aleutian Islands. North Pacific Fishery Management Council, Anchorage, Alaska. November, 1993.
- Orensanz, J. M. 1986. Size, environment, and density: the regulation of a scallop stock and its management implications. pp. 195-227. In G. S. Jamieson and N. Bourne (eds.). *North Pacific Workshop on Stock Assessment and Management of Invertebrates*. *Can. Spec. Publ. Fish. Aquat. Sci.* 92.
- Orensanz, J. M., A. M. Parma & O. O. Iribarne. 1991. Population dynamics and management of natural stocks. pp. 625-713. In S. E. Shumway (ed.). *Scallops: Biology, Ecology and Aquaculture*. Developments in Aquaculture and Fisheries Science, 21. Elsevier, Amsterdam.
- Piquimil, R. N., L. S. Figueroa & O. C. Contreras. 1991. Chile. pp. 1001-1015. In S. E. Shumway (ed.). *Scallops: Biology, Ecology and Aquaculture*. Developments in Aquaculture and Fisheries Science, 21. Elsevier, Amsterdam.
- Ronholt, L. L., H. H. Shippen & E. S. Brown. 1977. Demersal fish and shellfish resources of the Gulf of Alaska from Cape Spencer to Unimak Pass, 1948-1976; a historical review. U.S. Department of Commerce, NOAA/OCSEAP, Final Report 2:1-955.

- Royer, T. C. 1983. Observations of the Alaska Coastal Current. pp. 9-30. In H. G. Gade, A. Edwards and H. Svendsen (eds.). *Coastal Oceanography*. Plenum Press, New York.
- SAS Institute Inc. 1989. SAS/STAT User's Guide, Version 6, Fourth Edition, Volume 2. Cary, North Carolina.
- Shirley, S. M. 1993. Characterization of the 1990 Dungeness crab fleet in southeast Alaska: vessel attributes, fishery participation and fishery performance. Alaska Commercial Fisheries Entry Commission Report 93-9C. Juneau, Alaska.
- Sinclair, M., R. K. Mohn, G. Robert & D. L. Roddick. 1985. Consideration for the effective management of Atlantic scallops. *Can. Tech. Rpt. Fish. Aquat. Sci.* 1382.
- Starr, R. M. & J. E. McCrae. 1983. Weathervane scallop (*Patinopecten caurinus*) investigations in Oregon, 1981-1983. Oregon Department of Fish and Wildlife, Information Reports 83-10. Newport, Oregon.
- Stone, R. P., C. E. O'Clair & T. C. Shirley. 1992. Seasonal migration and distribution of female red king crabs in a southeast Alaskan estuary. *J. Crust. Biol.* 12(4):546-560.
- U.S. Department of Commerce. 1982-1993. Fisheries Statistics of the United States. Current Fishery Statistics. Washington, D.C.

Effective January 1, 1996, all commercial pots were required to be partly covered by rigid mesh, which must have 7/8ths inch minimum diameter openings. This regulation was designed to reduce handling of small non-marketable shrimp thereby decreasing avoidable fishing mortality. Similar regulations are utilized in the Prince William Sound Management Area, Southeast Region, and State of Washington.

KAMISHAIK BAY  
SCALLOP FISHERY  
(AREA H)

Introduction

The commercial scallop fishery in the Cook Inlet Management Area (H) began in 1983. The target species for the fishery is the Pacific weathervane scallop (Patinopecten caurinus). In 1983 and 1984 the Alaska Board of Fisheries responded to a public proposal by directing the department to allow restricted exploratory fisheries for scallops. These initial fisheries were characterized by low effort due to severe permit restrictions when compared with traditional scallop fisheries both inside and outside Alaska. The most important restrictions were:

- 1) Legal gear limited to a 6 foot wide dredge with minimum ring size of 4 inches inside diameter.
- 2) Only 1 unit of gear allowed on board at any one time.
- 3) Mandatory log book completion.
- 4) Contact with the Homer office prior to and at the completion of each trip.
- 5) An agreement to carry department observers on board if requested.

Except for some brief exploratory fishing elsewhere in the Kamishak District in 1984 and in the Outer District in 1987, a single bed of scallops near Augustine Island in the Kamishak District has sustained almost the entire harvest since the fishery began in 1983 (Figure 1). Using the state research vessel Pandalus, the department conducted an assessment survey in August, 1984 to define the extent of this particular bed and to aid in establishing appropriate harvest levels.

Based on information from the 1984 survey as well as data from the initial fisheries, the 1985 Board of Fisheries adopted regulations for scallops in Cook Inlet. These regulations included a season in the Kamishak District from August 15 through October 31, a guideline harvest level of 10,000 to 20,000 lb (changed to 0 to 20,000 lb in 1994) of shucked meats, and the restrictions mentioned previously (except for the single unit of gear provision). Commercial fishery performance has been used inseason to adjust guideline harvest levels. Historic harvest and effort peaked fishery during 1994 when 4 vessels took 20,431 lb of shucked meats (Figure 12 and Appendix K).

By regulation the Southern District was not open to scallop fishing in order to protect crab stocks, while the Outer and Eastern Districts were opened year round to encourage exploratory fishing.

In 1987 review of inseason fishery performance data clearly demonstrated that the Kamishak District stock had taken an unexpected decline. Substantial undocumented information indicated that the Kamishak scallop bed had been fished illegally between the 1986 and 1987 seasons. Regardless of the reason for the sharp decline in abundance, the department closed the fishery.

No commercial effort occurred in Cook Inlet from 1988 through 1992. Although some local fishermen expressed interest in fishing during these years, the potential of a fishery closure after 1 trip did not warrant the investment in time and effort because the department told fishermen that their catch data would be used to justify continuance of the fishery. Fishermen speculated that the probability of good catches were low. Information required from the fishermen would have included logbooks, shell samples, interviews, and a potential for observers.

In 1993 the fishery was essentially redeveloped when a single fishermen took a chance and began fishing the Kamishak District scallops. After his initial trip it was apparent that the stock had recovered to near historic levels. Two other boats joined the fishery before the season was over. The resultant catch was 20,115 lb. Logbooks and shell samples indicated a small but healthy stock of weathervane scallops once again existed near Augustine Island.

#### 1995 Season Summary

In early 1995 a single vessel commercially fished scallops in a venture that was illegal by state law. This occurred in federal waters off Kayak Island (adjacent to the Prince William Sound Management Area) and resulted in the closure of all commercial scallop fisheries in federal waters. Virtually the entire stock of scallops in the Kamishak District resides in federal waters. Although state waters opened by regulation on August 15, 1995, no one fished as fishermen did not want to waste their time in an area where few scallops existed.

#### 1996 Management Outlook

It appears that the state and federal regulatory problems, that provided a loophole for illegal fishing, have been resolved. The Kamishak District fishery, in both state and federal waters, will likely open by regulation on August 15, 1996. It appears that management of the fishery will be by the state with consent from the federal government. The harvest guideline, however, will be set based on the results of a department dredge survey that will occur in July 1996. It seems likely that the data should justify a harvest guideline of 20,000 lb or more because of the size and age structure of the stock coupled with no fishing mortality in 1995.

The scallop fishery in the Outer and Eastern Districts will be managed by regulation, which includes a requirement for an observer. The department does not anticipate significant effort or catch from these districts because exploratory fishing by 2 large commercial scallopers in 1994 yielded a catch of 11 scallops.

Appendix K. Pacific weathervane scallop catches, Cook Inlet  
Management Area., 1983-95.

| Year              | District              | Number of<br>vessels | Catch in pounds of<br>shucked meats |
|-------------------|-----------------------|----------------------|-------------------------------------|
| 1983              | Kamishak              | 1                    | 2,346                               |
| 1984              | Kamishak              | 3                    | 6,305                               |
| 1985 <sup>a</sup> | Kamishak              | 1                    | 11,810                              |
| 1986              | Kamishak              | 3                    | 15,364                              |
| 1987              | Outer                 | 1                    | 1,128                               |
|                   | Kamishak <sup>b</sup> | 2                    | 360                                 |
|                   | '87 Total             | 2                    | 1,488                               |
| 1988              |                       | NO                   | EFFORT                              |
| 1989              |                       | NO                   | EFFORT                              |
| 1990              |                       | NO                   | EFFORT                              |
| 1991              |                       | NO,                  | EFFORT                              |
| 1992              |                       | NO                   | EFFORT                              |
| 1993              | Kamishak              | 3                    | 20,115                              |
| 1994              | Kamishak              | 4                    | 20,431                              |
| 1995 <sup>c</sup> | Kamishak              | 0                    | 0                                   |

a/ Season and harvest guideline set by regulation.

b/ Season closed by E.O. on August 21, 1987, one week after opening,  
due to low cpue.

c/ State waters open only.

|      |          |   |        |
|------|----------|---|--------|
| 1996 | Kamishak | 5 | 28,228 |
|------|----------|---|--------|

**ALASKAN SCALLOP FISHERY (BERING SEA AND GULF OF ALASKA)****AREA PRODUCTION FORECASTS 97-98**

1. **BERING SEA --** SEASON STARTS JULY '97. EXPECT DROP IN CPUE MID SEASON AND BYCATCH PROBLEMS. VIRGIN GROUNDS STARTED '92" (NO QUOTAS, NO OBSERVERS). '93" 100% OBSERVERS AND QUOTAS, HEAVY FISHING EFFORT AND HIGH BYCATCH RATES.
2. **SHUMAGINS --** CRAB BYCATCH HAS BEEN MAJOR PROBLEM, TWO VESSELS HAVE CLOSED AREA EARLY WITH HEAVY BYCATCH RATES LAST TWO SEASONS. LOW SCALLOP HARVEST.
3. **KODIAK (SHELIKOF) --** EXPECT DROP IN CPUE EARLY ON. HAS BEEN MAINSTAY OF KODIAK SINCE MID 80'S. HAS HAD HEAVY FISHING PRESURE SINCE 92, BYCATCH MED.
4. **KODIAK (EAST SIDE) --** FISHED HEAVLY SINCE EARLY 80'S, NOW DEPLETED. NEEDS RECRUITMENT.
5. **PRINCE WILLIAM SOUND --** KAYAK ISLAND - DOWN, VESSEL MR. BIG OVEREXPLOITED RESOURSE BY OVER 100% IN '95". QUOTA HAS BEEN CUT FROM 50K TO 17K
6. **YAKUTAT --** STABLE, NO BYCATCH PROBLEMS, FISHING SEASON CHANGED FROM JAN 10<sup>TH</sup> TO JULY 1<sup>ST</sup>. NEEDS TO BE WATCHED, MAY BE SOURCE OF LARVAL RECRUITMENT FOR WESTERN AREAS DUE TO THE CURRENT FLOW PATTERNS IN THE GULF OF ALASKA
7. **SOUTHEAST (AREA 16) --** CPUE DROPED FEB '97, EXPECT RESRICTIVE ACTION FOR '98"

**SCALLOP HARVEST SHOULD LEVEL OUT AT BETWEEN 600K TO 800K IN THE NEXT FEW YEARS**

**COST DATA FOR ALASKAN SCALLOP FLEET**

**AVERAGE BREAKEVEN COST FOR SCALLOP FLEET IS \$ 824,234.00, NPFMC  
RANGE 1.1 MIL- 7 MIL**

**NUMBER OF VESSELS THAT WILL BREAK EVEN AT PROJECTED PRICE LEVELS  
AND AVAILABLE HARVEST LEVELS**

| <u>PRICE /LB</u>      |             | <u>6.00/LB</u> | <u>5.50/LB</u> | <u>5.00/LB</u> | <u>4.50/LB</u> |
|-----------------------|-------------|----------------|----------------|----------------|----------------|
| IF QUOTA =            | 900,000 LBS | 6.5            | 6              | 5.4            | 4.9            |
| IF QUOTA=             | 800,000 LBS | 5.8            | 5.3            | 4.8            | 4.3            |
| "96 HARVEST"<br>aprox | 704,000 LBS | 5              | 4.6            | 4.2            | 3.8            |
| IF QUOTA=             | 600,000 LBS | 4.3            | 4              | 3.6            | 3.2            |
| IF QUOTA=             | 500,000 LBS | 3.7            | 3.3            | 3              | 2.7            |

**\* VESSELS WITH ABOVE THE AVERAGE BREAKEVEN COSTS WILL HAVE TROUBLE WITH  
THIS SCENARIO**