

MEMORANDUM

TO: Council, SSC, and AP Members

FROM: Clarence G. Pautzke  
Executive Director



ESTIMATED TIME  
2 HOURS

DATE: April 13, 1998

SUBJECT: Scallop Overfishing Definitions

**ACTION REQUIRED**

Initial review of an amendment to revise definitions of overfishing, MSY, and OY for the Alaska Scallop FMP.

**BACKGROUND**

National Standard 1 states that conservation and management measures shall prevent overfishing while achieving, on a continuing basis, the optimum yield from each fishery for the United States fishing industry. NMFS published proposed National Standard guidelines in the Federal Register on August 4 to assist the Councils with amending FMPs.

An EA/RIR was drafted to examine alternative definitions of overfishing, maximum sustainable yield (MSY), and optimum yield (OY) for the Alaska scallop fishery, in accordance with the proposed rule. Two alternatives were considered:

Alternative 1: Status Quo. The current MSY, OY, and overfishing definitions would not be revised.

Alternative 2: Redefine overfishing, OY, and MSY, and update the FMP with additional information on bycatch data collection. The definitions proposed under Alternative 2 for weathervane scallops are more conservative than currently in the FMP. The current OY is 0 - 1.8 million pounds, and the overfishing definition is simply landings exceeding OY. The proposed amendment would reduce OY to a maximum of 1.24 million pounds, establish MSY at 1.24 million pounds, and establish overfishing based on fishing mortality rates for weathervane scallops. OY, MSY, and overfishing would not be established for pink, spiny, or rock scallops as these are undeveloped fisheries that are managed through ADF&G via special permit.

The EA/RIR is included in the briefing books as Item D-3(a).

## Executive Summary

This Environmental Assessment/Regulatory Impact Review (EA/RIR) addresses alternatives for meeting the NMFS proposed guidelines drafted in response to the Magnuson-Stevens Act provisions for National Standard 1. National Standard 1 states that conservation and management measures shall prevent overfishing while achieving, on a continuing basis, the optimum yield from each fishery for the United States fishing industry. The Act did not change the standard, but did change the definition of optimum yield and overfishing.

The Magnuson-Stevens act also requires the Secretary of Commerce to establish advisory guidelines (which shall not have the force and effect of law), based on the national standards, to assist in the development of fishery management plans. Proposed guidelines were published in the Federal Register on August 4. This document examines alternative definitions of overfishing, maximum sustainable yield (MSY), and optimum yield (OY), in accordance with the proposed rule.

Two alternatives were considered:

Alternative 1: Status Quo. No revisions to the current MSY, OY, and overfishing definitions would be made.

Alternative 2: Redefine overfishing, OY, and MSY, and update the FMP with additional information on bycatch data collection.

Alternative 2 would improve management of the scallop fisheries by instituting the following conservation measures:

1. Requirement that OY take into account protection of marine ecosystems, that OY be no greater than MSY, and the OY for an overfished fishery allow rebuilding to the MSY level.
2. Revised definitions for MSY based on prevailing ecological and environmental conditions; and
3. Revised definitions of overfishing that include both fishing mortality and biomass thresholds.

The following definitions are offered for consideration under Alternative 2. They were estimated for weathervane scallop stocks based on life history data and observed catch history.

MSY Control Rule ( $F_{msy}$ ) =  $M = 0.13$ ; hence  $F_{msy} = 0.13$ .

MSY = the average catch 1990-1997 (excluding 1995) =  $F_{msy} B_{msy} = 1.24$  million pounds.

Overfishing Control Rule ( $F_{overfishing}$ ) =  $F_{msy} = 0.13$ .

MSY Stock Size ( $B_{msy}$ ) =  $B_{1990-1997} = \frac{1}{2} B_0 = MSY/M = 9.54$  million pounds (meats).

Minimum Stock Size Threshold =  $\frac{1}{2} B_{msy} = 4.77$  million pounds in terms of meats.

OY = 0-1.24 million pounds; the upper end is MSY.

### Language from the Magnuson-Stevens Act 1996.

Optimum Yield: The term 'optimum', with respect to the yield from a fishery, means the amount of fish which –

- (a) will provide the greatest overall benefit to the Nation, particularly with respect to food production and recreational opportunities, and taking into account the protection of marine ecosystems;
- (b) is prescribed as such on the basis of maximum sustainable yield from the fishery, as reduced by any relevant economic, social, or ecological factor; and
- (c) in the case of an overfished fishery, provides for rebuilding to a level consistent with producing the maximum sustainable yield in such fishery.

Overfishing: The terms "overfishing" and "overfished" mean a rate or level of fishing mortality that jeopardizes the capacity of a fishery to produce the maximum sustainable yield on a continuing basis.

These definitions are more conservative than currently in the FMP. The current OY is 0 - 1.8 million pounds, and the overfishing definition is simply landings exceeding OY. The proposed amendment would reduce OY to a maximum of 1.24 million pounds, establish MSY at 1.24 million pounds, and establish overfishing based on fishing mortality rates for weathervane scallops. OY, MSY, and overfishing would not be established for pink, spiny, or rock scallops as these are undeveloped fisheries that are managed through ADF&G via special permit.

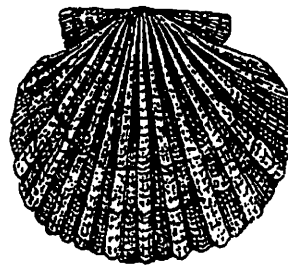
None of the alternatives is expected to result in a "significant regulatory action" as defined in E.O. 12866.

None of the alternatives are likely to significantly affect the quality of the human environment, and the preparation of an environmental impact statement for the proposed action is not required by Section 102(2)(C) of the National Environmental Policy Act or its implementing regulations.

DRAFT  
for  
COUNCIL REVIEW

ENVIRONMENTAL ASSESSMENT/REGULATORY IMPACT REVIEW  
for  
**AMENDMENT 6**  
to the Fishery Management Plan for the  
Scallop Fishery off Alaska  
to

- 1. Revise Definitions of Overfishing, MSY, and OY**
- 2. Add Additional Information on Bycatch Data Collection to FMP**



Prepared by staff of the  
North Pacific Fishery Management Council  
Alaska Department of Fish and Game

*April 1998*

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## Executive Summary

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The Magnuson-Stevens act also requires the Secretary of Commerce to establish advisory guidelines (which shall not have the force and effect of law), based on the national standards, to assist in the development of fishery management plans. Proposed guidelines were published in the Federal Register on August 4. This document examines alternative definitions of overfishing, maximum sustainable yield (MSY), and optimum yield (OY), in accordance with the proposed rule.

Two alternatives were considered:

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## 1.0 INTRODUCTION

The scallop fishery in the EEZ and in Alaskan State waters has been managed by the State since a fishery began in 1968. Regulations are implemented by ADF&G at 5 ACC 38.076. These regulations establish GHs for different scallop registration areas, fishing seasons, open and closed fishing areas, observer coverage requirements, gear restrictions, and measures to limit the processing efficiency of undersized scallops that include a ban on the use of mechanical shucking machines and a limitation on crew size. A Federal FMP for the scallop fishery was recommended by the Council in April 1995 and approved by NMFS July 26, 1995. The only management measure implemented by the FMP was a total closure of the EEZ off Alaska to scallop fishing to prevent overfishing by unregulated harvesting. Amendment 1 allowed fishing to resume under federal management measures in July 1996.

Actions taken to amend the FMPs or implement other regulations governing the fisheries must meet the requirements of Federal laws and regulations. In addition to the Magnuson-Stevens Act, the most important of these are the National Environmental Policy Act (NEPA), the Endangered Species Act (ESA), the Marine Mammal Protection Act (MMPA), Executive Order (E.O.) 12866, and the Regulatory Flexibility Act (RFA).

NEPA, E.O. 12866 and the RFA require a description of the purpose and need for the proposed action as well as a description of alternative actions which may address the problem. This information is included in Section 1 of this document. Section 2 contains information on the biological and environmental impacts of the alternatives as required by NEPA. Impacts on endangered species and marine mammals are also addressed in this section. Section 3 contains a Regulatory Impact Review (RIR) which addresses the requirements of both E.O. 12866 and the RFA that economic impacts of the alternatives be considered.

This Environmental Assessment/Regulatory Impact Review (EA/RIR) addresses alternatives for meeting the NMFS proposed guidelines drafted to in response to the revised Magnuson-Stevens Act provisions for National Standard 1.

### 1.1 Stocks Covered by the Plan

The FMP covers all fisheries for weathervane scallops (*Patinopecten caurinus*), pink scallops (*Chlamys rubida*), spiny scallops (*Chlamys hastata*), rock scallops (*Crassadoma gigantea*), and all other scallop species in the EEZ waters off Alaska. Only weathervane scallops are harvested commercially at this time.

### 1.2 Purpose of and Need for the Action

The Magnuson-Stevens Act was amended in 1996. Section 301(a) of the Magnuson-Stevens Act contains 10 national standards for fishery conservation and management, with which all FMPs and amendments prepared by the Councils and the Secretary must comply. Section 303(b) requires that the Secretary establish advisory guidelines, based on the national standards, to assist in the development of FMPs. One major provision of the Act necessitates significant revisions to the guidelines for national standard 1 (optimum yield), which were published as a proposed rule in the Federal Register on August 4, 1997. The proposed guidelines are intended as an aid to decision making, with responsible conservation and management of valued national resources as the goal.

The new and revised national standards apply to all FMPs and implementing regulations, existing and future. However, as Congress recognized by allowing the Councils 2 years from enactment (i.e., until October 11, 1998) to submit FMP amendments to comply with the related new requirements in section 303(a), it will take considerable time and effort to bring all FMPs into compliance with the Magnuson-Stevens Act. Once issued in final, NMFS will use these guidelines to review all new FMPs and amendments to determine whether they comply



with the new and revised national standards. The Councils are required to submit necessary amendments to comply with the standards by October 11, 1998.

National standard 1 guidelines were last revised in July 1989; that revision focused on establishing a conservation standard, with the requirement that specific, objective, and measurable definitions of overfishing be established for each fishery managed under the Magnuson-Stevens Act (then called the Magnuson Act). By 1993, more than 100 such definitions had been approved by NMFS. At that time, NMFS convened a panel of scientists from inside and outside the agency to review the approved definitions, investigate their strengths and shortcomings, and standardize, as much as possible, the criteria and basis for future evaluations of overfishing definitions. The goal of the review was to develop a scientific consensus as to the appropriateness of the definitions and the criteria used in their evaluation. The resulting analysis and report (Rosenberg et al. 1994) provided a set of scientific principles for defining overfishing. However, these principles were not incorporated into the national standard guidelines. The Sustainable Fisheries Act (SFA), which amended the Magnuson-Stevens Act, introduced or revised definitions for a number of terms and introduced several new requirements for contents of FMPs. As a consequence of the 1994 report and the statutory amendments, revisions to the national standard 1 guidelines are proposed as described below.

#### Overview of Issues

Revisions to the guidelines for national standard 1 center on the Magnuson-Stevens Act's definitions of "overfishing," "overfished," and "optimum yield (OY)," the requirement for the establishment of objective and measurable criteria for determining the status of a stock or stock complex; and the requirement for remedial action in the event that overfishing is occurring or that a stock or stock complex is overfished.

The Magnuson-Stevens Act, in section 3(29), defines both "overfishing" and "overfished" as a rate or level of fishing mortality that jeopardizes a fishery's capacity to produce maximum sustainable yield (MSY) on a continuing basis. Neither term was defined statutorily, prior to passage of the SFA. The existing national standard guidelines define overfishing somewhat differently, by qualifying "capacity" with the phrase "long-term," and do not include a definition of "overfished." The Magnuson-Stevens Act, in section 3(28), defines OY as the amount of fish that: (1) Will provide the greatest overall benefit to the Nation, particularly with respect to food production and recreational opportunities, and taking into account the protection of marine ecosystems; (2) is prescribed on the basis of the MSY from the fishery, as reduced by any relevant economic, social, or ecological factors; and (3) in the case of an overfished fishery, provides for rebuilding to a level consistent with producing the MSY in such fishery. The main changes relative to the pre-SFA definition include the requirements that OY take into account protection of marine ecosystems, that OY be no greater than MSY, and that OY for an overfished fishery allow rebuilding to the MSY level. The Magnuson-Stevens Act, in section 303(a)(10), requires each FMP to specify objective and measurable criteria for identifying when the fishery to which the FMP applies is overfished (also referred to as "criteria for overfishing"), with an analysis of how the criteria were determined and the relationship of the criteria to the reproductive potential of stocks of fish in that fishery. The Magnuson-Stevens Act also requires, in section 304(e), the Secretary to report annually to Congress and the Councils on the status of fisheries within each Council's geographical area of authority and identify those fisheries that are overfished or are approaching a condition of being overfished. For each fishery managed under an FMP or international agreement, the status is to be determined using the criteria for overfishing specified in that FMP or agreement. A fishery is to be classified as approaching a condition of being overfished if, based on trends in fishing effort, fishery resource size, and other appropriate factors, the Secretary estimates that it will become overfished within 2 years.

If the Secretary determines at any time that a fishery is overfished or approaching an overfished condition or that existing remedial action taken for the purpose of ending any previously identified overfishing has not resulted in adequate progress, the Secretary must notify the Council and request that remedial action be taken. Section

304(e)(3) of the Magnuson-Stevens Act requires that the Council then, within 1 year of notification, prepare an FMP, FMP amendment, or proposed regulations for the purposes of ending (or preventing) overfishing and rebuilding (or sustaining) affected stocks of fish.

### Overview of Approach

In developing the proposed revised guidelines, policy guidance was taken from the Magnuson-Stevens Act and other applicable law. Because the guidelines deal with technical subject matter, guidance was also taken from the scientific literature. In particular, the report by Rosenberg et al. (1994) was used to the extent that it is consistent with the Magnuson-Stevens Act and other applicable law.

### Sustainability

Sustainable fisheries is a key theme within the Magnuson-Stevens Act. The idea of sustainability is inherent in MSY, a quantity that is central to the Magnuson-Stevens Act's definitions of both overfishing and OY. Closely related to the idea of sustainability is the phrase "on a continuing basis," which is used both in the Magnuson-Stevens Act's definition of overfishing and in national standard 1. The appropriate interpretation of sustainability or the phrase "on a continuing basis" is the one generally accepted in the fishery science literature, which relates to an average stock level and/or average potential yield from a stock over a long period of time.

It is important to distinguish between the theoretical concept of MSY as an unconditional maximum independent of management practice, and actual estimates of MSY, which are necessarily conditional on some type of (perhaps hypothetical) management practice. Specifically, the proposed guidelines, in Sec. 600.310(c), describe the role of "control rules" in estimating MSY, where an MSY control rule is any harvest strategy that, if implemented, would be expected to result in a long-term average catch close to MSY. A Council could choose an MSY control rule in which fishing mortality is held constant over time at an appropriate rate, one in which escapement is held constant over time at an appropriate level, or some other control rule, so long as that control rule is consistent with the Magnuson-Stevens Act.

Although the Magnuson-Stevens Act's definition of overfishing is expressed in terms of a stock's capacity to produce MSY on a continuing basis, nothing in the Magnuson-Stevens Act implies that such production, in the form of harvest, must actually occur. That is, a stock does not actually need to produce MSY on a continuing basis in order to have the capacity to do so.

### Use of the Terms "Overfishing" and "Overfished"

The relationship between the terms "overfishing" and "overfished" can be confusing. As used in the Magnuson-Stevens Act, the verb "to overfish" means to fish at a rate or level that jeopardizes the capacity of a stock or stock complex to produce MSY on a continuing basis. "Overfishing," then, occurs whenever a stock or stock complex is subjected to any such rate or level of fishing mortality. Interpreting the term "overfished" is more complicated. In the Magnuson-Stevens Act, this term is used in two senses: First, to describe any stock or stock complex that is subjected to overfishing; and second, to describe any stock or stock complex for which a change in management practices is required in order to achieve an appropriate level and rate of rebuilding. (See, for example, section 303(a)(1)(A) and section 304(e)(1)) To avoid confusion, the proposed guidelines use "overfished" in the second sense only. Both terms would be defined in Sec. 600.310(d).

### Status Determination Criteria

The Magnuson-Stevens Act, in section 303(a)(10), requires that each FMP specify objective and measurable criteria (status determination criteria) for identifying when stocks or stock complexes covered by the FMP are

overfished. To fulfill the intent of the Magnuson-Stevens Act, such status determination criteria are comprised of two components: A maximum fishing mortality threshold and a minimum stock size threshold (see Sec. 600.310(d)(2)). The maximum fishing mortality threshold should be set at the fishing mortality rate or level defined by the chosen MSY control rule. The minimum stock size threshold should be set at one-half the MSY level, or the minimum stock size at which rebuilding to the MSY level would be expected to occur within 10 years if the stock or stock complex were exploited at the maximum fishing mortality threshold, whichever is greater. When data are insufficient to estimate any of these quantities, use of reasonable proxies would be required.

It is important to note that, even if no minimum stock size threshold were set, the maximum fishing mortality threshold would define a minimum limit on the rate of rebuilding for a stock that falls below its MSY level. The reason for requiring a minimum stock size threshold in addition to a maximum fishing mortality threshold is to define the point at which this minimum rebuilding rate is no longer prudent. For example, in the case of a slow-growing stock, a rebuilding rate that satisfies the statutory deadline of 10 years would be considered prudent management. However, for a fast-growing stock, it might be possible to fall to an extremely low level of abundance and still rebuild to the MSY level within 10 years, which would not be considered prudent management. Thus, the definition of the minimum stock size threshold includes a constraint, equal to one-half the MSY level, to ensure that the 10-year allowance is not abused in the case of fast-growing stocks.

Choosing an MSY control rule is thus key to satisfying national standard 1, because it defines the maximum fishing mortality threshold and plays a role in defining the minimum stock size threshold. Any MSY control rule defines a relationship between fishing mortality rate and stock size. This relationship is the maximum fishing mortality threshold, which may be a single number or a mathematical function. In addition, any MSY control rule defines a rate of rebuilding for stocks that are below the level that would produce MSY. The smallest stock size at which rebuilding to the level that would produce MSY is achieved within 10 years defines the minimum stock size threshold for that rule, unless such a stock size is less than one-half the MSY level. The MSY control rule also defines an upper bound on any OY control rule that might be specified.

The proposed status determination criteria in Sec. 600.310(d)(2) would play a fundamental role in developing the Secretary's annual report to Congress and the Councils, as required by section 304(e) of the Magnuson-Stevens Act. Under the proposed guidelines, the Secretary's annual report would list all stocks or stock complexes for which the maximum fishing mortality rate has been exceeded or for which the minimum stock size has not been achieved. Thus, the Secretary's decision as to whether a stock or stock complex is listed in the annual report of overfished stocks would be based on either the current rate of fishing mortality or the current condition of the stock, regardless of whether that condition is associated with either previous or current overfishing.

### Preventing Overfishing

The Magnuson-Stevens Act is clear in its requirement to prevent overfishing. Except under very limited conditions, discussed below, this requirement must be satisfied. The Magnuson-Stevens Act's requirement to take remedial action in the event that a stock becomes overfished is not a substitute for the requirement to prevent overfishing in the first place.

Previous versions of the national standard guidelines have described limited conditions under which some amount of overfishing is permissible. Some of these conditions are retained in Sec. 600.310(d)(6) in the proposed revision, but they are tightened considerably. Although the Magnuson-Stevens Act requires that OY and overfishing criteria be specified for each fishery, it does not require a one-to-one relationship between the fisheries for which OYs are specified and the fisheries for which overfishing criteria are specified. For example, in a mixed-stock fishery, overfishing criteria may be specified for the individual stocks, even if OY is specified

for the fishery as a whole (see Sec. 600.310(c)(2)(iii)). Thus, it is conceivable that OY could be achieved for the fishery as a whole, even while overfishing of an individual stock is occurring.

### Ending Overfishing and Rebuilding Overfished Stocks

In the event that overfishing occurs or is projected to occur within 2 years, or in the event that a stock or stock complex is overfished or is projected to become overfished within 2 years, the Magnuson-Stevens Act, in section 304(e), gives detailed requirements for Council action that must be undertaken in response. As described in Sec. 600.310(e) of the proposed guidelines, if overfishing is occurring, Council action must be designed to reduce fishing mortality to a rate or level no greater than the maximum fishing mortality threshold. If a stock or stock complex is overfished, fishing at a rate or level equal to the maximum fishing mortality threshold will not meet the required rate and level of rebuilding. In such cases, Council action must go beyond that required for situations involving only overfishing.

Although the Magnuson-Stevens Act implicitly sets the rebuilding target equal to the MSY stock size, this constitutes a minimum standard only. In general, management practices should be designed to achieve an average stock size equal to the stock size associated with OY (or the average OY, in cases where OY is determined annually), and rebuilding plans should be consistent with this goal. Because OY cannot exceed MSY on average, the stock size that would produce OY will generally be greater than the stock size that would produce MSY. Remedial action should do more than merely assure that the stock reaches the target level; rather, the goal should be to restore the stock's capacity to remain at that level on a continuing basis, consistent with the stock's natural variability. For example, a stock should not be considered rebuilt just because its current size matches the target level, which could result from a single good year class, if the stock's condition would not likely be sustained by succeeding year classes. In order to conclude that a stock has fully recovered, it may be necessary to rebuild the age structure, in addition to achieving a particular biomass target. This generally requires keeping fishing mortality at an appropriately low level for several years (approximately one generation of the species).

Remedial action should be designed to make consistent and reasonably rapid progress towards recovery. "Consistent progress" means that no grace period exists beyond the statutory timeframe of 1 year for taking remedial action, and that such action should include explicit milestones expressed in terms of measurable improvement of the stock with respect to its status determination criteria. The Magnuson-Stevens Act, in section 304(e)(4), requires that the time period for rebuilding be as short as possible, but always less than 10 years, except in cases where the biology of the stock of fish, other environmental conditions, or management measures under an international agreement in which the United States participates dictate otherwise.

### Optimum Yield

One of the most significant changes made by the SFA is a requirement that OY not exceed MSY. Further, for overfished fisheries, OY must be based upon a rebuilding schedule that increases stock levels to those that would produce MSY. These changes are expressions of a precautionary approach, which should contain three features (see Sec. 600.310(f)(5)). First, target reference points, such as OY, should be set safely below limit reference points, such as the catch level associated with the maximum fishing mortality threshold. Second, a stock that is below its MSY level should be harvested at a lower rate or level of fishing mortality than if it were above its MSY level. Third, the criteria used to set target catch levels should be explicitly risk averse, so that greater uncertainty regarding a stock's status or productive capacity corresponds to greater caution in setting target catch levels. Because specification of a precautionary approach can be a complicated exercise, NMFS plans to supplement these guidelines in the near future with technical guidance for use in implementing such an approach. This additional guidance may be provided in a form similar to that developed to implement the 1994 amendments to the MMPA.

The Magnuson-Stevens Act is clear in its requirement that specification of OY take into account protection of marine ecosystems. This is reflected in the new provisions concerning the identification and description of essential fish habitat (EFH). Proposed guidelines for designation of EFH were published in the Federal Register on April 23, 1997, at 62 FR 19723. Due to the complex nature of marine ecosystem structure and function, qualitative methods may be used to satisfy this requirement wherever data or scientific understanding are insufficient to permit use of quantitative methods.

NMFS recognizes the growing importance of non-consumptive uses of marine fishery resources. Such activities include ecotourism, fish watching, recreational diving, and marine education. These proposed guidelines are intended to accommodate such uses in specifying OY.

### 1.3 NMFS Guidance on National Standard 1

Below is the Proposed Rule guidelines on National Standard 1 (Section 600.310), published in the Federal Register on August 4, 1997.

(a) Standard 1. Conservation and management measures shall prevent overfishing while achieving, on a continuing basis, the OY from each fishery for the U.S. fishing industry.

(b) General. The determination of OY is a decisional mechanism for resolving the Magnuson-Stevens Act's multiple purposes and policies, implementing an FMP's objectives, and balancing the various interests that comprise the national welfare. OY is based on MSY, or on MSY as it may be reduced under paragraph (f)(3) of this section. The most important limitation on the specification of OY is that the choice of OY, and the conservation and management measures proposed to achieve it, must prevent overfishing.

(c) MSY. Each FMP should include an estimate of MSY.

#### (1) Definitions.

(i) "MSY" is the largest long-term average catch or yield that can be taken from a stock or stock complex under prevailing ecological and environmental conditions.

(ii) "MSY control rule" means a harvest strategy which, if implemented, would be expected to result in a long-term average catch approximating MSY.

(iii) "MSY stock size" means the long-term average size of the stock or stock complex, measured in terms of spawning biomass or other appropriate units, that would be achieved under an MSY control rule in which the fishing mortality rate is constant.

#### (2) Options in specifying MSY.

(i) Because MSY is a theoretical concept, its estimation in practice is conditional on the choice of an MSY control rule. In choosing an MSY control rule, Councils should be guided by the characteristics of the fishery, the FMP's objectives, and the best scientific information available. The simplest MSY control rule is to remove a constant catch in each year that the estimated stock size exceeds an appropriate lower bound, where this catch is chosen so as to maximize the resulting long-term average yield. Other examples include the following: Remove a constant fraction of the biomass in each year, where this fraction is chosen so as to maximize the resulting long-term average yield; allow a constant level of escapement in each year, where this level is chosen so as to maximize the resulting long-term average yield; vary the fishing mortality rate as a continuous function of stock size, where the parameters

of this function are constant and chosen so as to maximize the resulting long-term average yield. In any MSY control rule, a given stock size is associated with a given level of fishing mortality and a given level of potential harvest, where the long-term average of these potential harvests provides an estimate of MSY.

(ii) Any MSY values used in determining OY will necessarily be estimates, and these will typically be associated with some level of uncertainty. Such estimates must be based on the best scientific information available (see Sec. 600.315) and must incorporate appropriate consideration of risk (see Sec. 600.335). Beyond these requirements, however, Councils have a reasonable degree of latitude in determining which estimates to use and how these estimates are to be expressed. For example, a point estimate of MSY may be expressed by itself or together with a confidence interval around that estimate.

(iii) In the case of a mixed-stock fishery, MSY should be specified on a stock-by-stock basis. However, where MSY cannot be specified for each stock, then MSY may be specified on the basis of one or more species as an indicator for the mixed stock as a whole or for the fishery as a whole.

(iv) Because MSY is a long-term average, it need not be estimated annually, but it must be based on the best scientific information available, and should be re-estimated as required by changes in environmental or ecological conditions or new scientific information.

(3) Alternatives to specifying MSY. When data are insufficient to estimate MSY directly, Councils should adopt other measures of productive capacity that can serve as reasonable proxies for MSY, to the extent possible. Examples include various reference points defined in terms of relative spawning per recruit. For instance, the fishing mortality rate that reduces the long-term average level of spawning per recruit to 30-40 percent of the long-term average that would be expected in the absence of fishing may be a reasonable proxy for the MSY fishing mortality rate. The long-term average stock size obtained by fishing year after year at this rate under average recruitment may be a reasonable proxy for the MSY stock size, and the long-term average catch so obtained may be a reasonable proxy for MSY. The natural mortality rate may also be a reasonable proxy for the MSY fishing mortality rate. If a reliable estimate of pristine stock size (i.e., the long-term average stock size that would be expected in the absence of fishing) is available, a stock size somewhere in the range of 25-75 percent of this value may be a reasonable proxy for the MSY stock size, and the product of this stock size and the natural mortality rate may be a reasonable proxy for MSY.

#### (d) Overfishing--

##### (1) Definitions.

(i) "To overfish" means to fish at a rate or level that jeopardizes the capacity of a stock or stock complex to produce MSY on a continuing basis.

(ii) "Overfishing" occurs whenever a stock or stock complex is subjected to a rate or level of fishing mortality that jeopardizes the capacity of a stock or stock complex to produce MSY on a continuing basis.

(iii) In the Magnuson-Stevens Act, the term "overfished" is used in two senses: First, to describe any stock or stock complex that is subjected to a rate or level of fishing mortality meeting the criterion in paragraph (d)(1)(i) of this section, and second, to describe any stock or stock complex whose size is sufficiently small that a change in management practices is required in order to achieve an appropriate level and rate of rebuilding. To avoid confusion, this section uses "overfished" in the second sense only.

(2) Specification of status determination criteria. Each FMP must specify, to the extent possible, objective and measurable status determination criteria for each stock or stock complex covered by that FMP and provide an analysis of how the status determination criteria were chosen and how they relate to reproductive potential. Status determination criteria must be expressed in a way that enables the Council and the Secretary to monitor the stock or stock complex and determine annually whether overfishing is occurring and whether the stock or stock complex is overfished. In all cases, status determination criteria must specify both of the following:

(i) A maximum fishing mortality threshold or reasonable proxy thereof. The fishing mortality threshold may be expressed either as a single number or as a function of spawning biomass or other measure of productive capacity. The fishing mortality threshold must not exceed the fishing mortality rate or level associated with the relevant MSY control rule. Exceeding the fishing mortality threshold for a period of 1 year or more constitutes overfishing.

(ii) A minimum stock size threshold or reasonable proxy thereof. The stock size threshold should be expressed in terms of spawning biomass or other measure of productive capacity. To the extent possible, the stock size threshold should equal whichever of the following is greater: One-half the MSY stock size, or the minimum stock size at which rebuilding to the MSY level would be expected to occur within 10 years if the stock or stock complex were exploited at the maximum fishing mortality threshold specified under paragraph (d)(2)(I) of this section. Should the actual size of the stock or stock complex in a given year fall below this threshold, the stock or stock complex is considered overfished.

(3) Relationship of status determination criteria to other national standards--

(i) National standard 2. Status determination criteria must be based on the best scientific information available (see Sec. 600.315). When data are insufficient to estimate MSY, Councils should base status determination criteria on reasonable proxies thereof to the extent possible (also see paragraph (c)(3) of this section). In cases where scientific data are severely limited, effort should also be directed to identifying and gathering the needed data.

(ii) National standard 3. The requirement to manage interrelated stocks of fish as a unit or in close coordination notwithstanding (see Sec. 600.320), status determination criteria should generally be specified in terms of the level of stock aggregation for which the best scientific information is available (also see paragraph (c)(2)(iii) of this section).

(iii) National standard 6. Councils must build into the status determination criteria appropriate consideration of risk, taking into account uncertainties in estimating harvest, stock conditions, life history parameters, or the effects of environmental factors (see Sec. 600.335).

(4) Relationship of status determination criteria to environmental change. Some short-term environmental changes can alter the current size of a stock or stock complex without affecting the long-term productive capacity of the stock or stock complex. Other environmental changes affect both the current size of the stock or stock complex and the long-term productive capacity of the stock or stock complex.

(i) If environmental changes cause a stock or stock complex to fall below the minimum stock size threshold without affecting the long-term productive capacity of the stock or stock complex, fishing mortality must be constrained sufficiently to allow rebuilding within an acceptable timeframe (also see paragraph (e)(4)(ii) of this section). Status determination criteria need not be respecified.

(ii) If environmental changes affect the long-term productive capacity of the stock or stock complex, one or more components of the status determination criteria must be respecified. Once status determination

criteria have been respecified, fishing mortality may or may not have to be reduced, depending on the status of the stock or stock complex with respect to the new criteria.

(iii) If manmade environmental changes are partially responsible for a stock or stock complex being in an overfished condition, in addition to controlling effort, Councils should recommend restoration of habitat and other ameliorative programs, to the extent possible.

(5) Secretarial approval of status determination criteria. Secretarial approval or disapproval of proposed status determination criteria will be based on consideration of whether the proposal:

(i) Has sufficient scientific merit.

(ii) Contains the elements described in paragraph (d)(2) of this section.

(iii) Provides a basis for objective measurement of the status of the stock or stock complex against the criteria.

(iv) Is operationally feasible.

(6) Exceptions. There are certain limited exceptions to the requirement to prevent overfishing. Harvesting one species of a mixed- stock complex at its optimum level may result in the overfishing of another stock component in the complex. A Council may decide to permit this type of overfishing only if all of the following conditions are satisfied:

(i) It is demonstrated by analysis (paragraph (f)(6) of this section) that such action will result in long-term net benefits to the Nation.

(ii) It is demonstrated by analysis that a similar level of long- term net benefits cannot be achieved by modifying fleet behavior, gear selection/configuration, or other technical characteristic in a manner such that no overfishing would occur.

(iii) The resulting rate or level of fishing mortality will not cause any species or ecologically significant unit thereof to require protection under the ESA, or any stock or stock complex to fall below its minimum stock size threshold.

(e) Ending overfishing and rebuilding overfished stocks.

(1) Definition. A threshold, either maximum fishing mortality or minimum stock size, is being "approached" whenever it is projected that the threshold will be breached within 2 years, based on trends in fishing effort, fishery resource size, and other appropriate factors.

(2) Notification. The Secretary will immediately notify a Council and request that remedial action be taken whenever the Secretary determines that:

(i) Overfishing is occurring;

(ii) A stock or stock complex is overfished;

(iii) The rate or level of fishing mortality for a stock or stock complex is approaching the maximum fishing mortality threshold;



(iv) A stock or stock complex is approaching its minimum stock size threshold; or

(v) Existing remedial action taken for the purpose of ending previously identified overfishing or rebuilding a previously identified overfished stock or stock complex has not resulted in adequate progress.

(3) Council action. Within 1 year of such time as the Secretary may identify that overfishing is occurring, that a stock or stock complex is overfished, or that a threshold is being approached, or such time as a Council may be notified of the same under paragraph (e)(2) of this section, the Council must take remedial action by preparing an FMP, FMP amendment, or proposed regulations. This remedial action must be designed to accomplish all of the following purposes that apply:

(i) If overfishing is occurring, the purpose of the action is to end overfishing.

(ii) If the stock or stock complex is overfished, the purpose of the action is to rebuild the stock or stock complex to the MSY level within an appropriate timeframe.

(iii) If the rate or level of fishing mortality is approaching the maximum fishing mortality threshold (from below), the purpose of the action is to prevent this threshold from being reached.

(iv) If the stock or stock complex is approaching the minimum stock size threshold (from above), the purpose of the action is to prevent this threshold from being reached.

(4) Constraints on Council action.

(i) In cases where overfishing is occurring, Council action must be sufficient to end overfishing.

(ii) In cases where a stock or stock complex is overfished, Council action must specify a time period for rebuilding the stock or stock complex that is as short as possible, taking into account the status and biology of the stock or stock complex, the needs of fishing communities, recommendations by international organizations in which the United States participates, and the interaction of the overfished stock or stock complex within the marine ecosystem. However, in no case may the timeframe for rebuilding exceed 10 years, except where the biology of the stock or stock complex, other environmental conditions, or management measures under an international agreement in which the United States participates dictate otherwise.

(iii) For fisheries managed under an international agreement, Council action must reflect traditional participation in the fishery, relative to other nations, by fishermen of the United States.

(5) Interim measures. The Secretary, on his/her own initiative or in response to a Council request, may implement interim measures to reduce overfishing under section 305(c) of the Magnuson-Stevens Act, until such measures can be replaced by an FMP, FMP amendment, or regulations taking remedial action.

(i) These measures may remain in effect for no more than 180 days, but may be extended for an additional 180 days if the public has had an opportunity to comment on the measures and, in the case of Council-recommended measures, the Council is actively preparing an FMP, FMP amendment, or proposed regulations to address overfishing on a permanent basis. Such measures, if otherwise in compliance with the provisions of the Magnuson-Stevens Act, may be implemented even though they are not sufficient by themselves to stop overfishing of a fishery.

(ii) If interim measures are made effective without prior notice and opportunity for comment, they should be reserved for exceptional situations, because they affect fishermen without providing the usual procedural safeguards. A Council recommendation for interim measures without notice-and-comment rulemaking will be considered favorably if the short-term benefits of the measures in reducing overfishing outweigh the value of advance notice, public comment, and deliberative consideration of the impacts on participants in the fishery.

(f) OY--(1) Definitions.

(i) The term "optimum," with respect to the yield from a fishery, means the amount of fish that will provide the greatest overall benefit to the Nation, particularly with respect to food production and recreational opportunities and taking into account the protection of marine ecosystems; that is prescribed on the basis of the MSY from the fishery, as reduced by any relevant economic, social, or ecological factor; and, in the case of an overfished fishery, that provides for rebuilding to a level consistent with producing the MSY in such fishery.

(ii) In national standard 1, use of the phrase "achieving, on a continuing basis, the OY from each fishery" means producing, from each fishery, a long-term series of catches such that the average catch is equal to the average OY and such that status determination criteria are met.

(2) Values in determination. In determining the greatest benefit to the Nation, these values that should be weighed are food production, recreational opportunities, and protection afforded to marine ecosystems. They should receive serious attention when considering the economic, social, or ecological factors used in reducing MSY to obtain OY.

(i) The benefits of food production are derived from providing seafood to consumers, maintaining an economically viable fishery, and utilizing the capacity of U.S. fishery resources to meet nutritional needs.

(ii) The benefits of recreational opportunities reflect the importance of the quality of the recreational fishing experience and of the contribution of recreational fishing to the national, regional, and local economies and food supplies. Such benefits also include the quality of non-consumptive fishery experiences such as ecotourism, fish watching, recreational diving, and other non-consumptive activities important to the national, regional, and local economies.

(iii) The benefits of protection afforded to marine ecosystems are those resulting from maintaining viable populations (including those of unexploited species), maintaining evolutionary and ecological processes (e.g., disturbance regimes, hydrological processes, nutrient cycles), maintaining the evolutionary potential of species and ecosystems, and accommodating human use.

(3) Factors relevant to OY. Because fisheries have finite capacities, any attempt to maximize the measures of benefit described in paragraph (f)(2) of this section will inevitably encounter practical constraints. One of these is MSY. Moreover, various factors can constrain the optimum level of catch to a value less than MSY. The Magnuson-Stevens Act's definition of OY identifies three categories of such factors: Social, economic, and ecological. Not every factor will be relevant in every fishery. For some fisheries, insufficient information may be available with respect to some factors to provide a basis for corresponding reductions in MSY.

(i) Social factors. Examples are enjoyment gained from recreational fishing, avoidance of gear conflicts and resulting disputes, preservation of a way of life for fishermen and their families, and dependence of

local communities on a fishery. Other factors that may be considered include the cultural place of subsistence fishing, obligations under Indian treaties, and worldwide nutritional needs.

(ii) Economic factors. Examples are prudent consideration of the risk of overharvesting when a stock's size or productive capacity is uncertain, satisfaction of consumer and recreational needs, and encouragement of domestic and export markets for U.S.-harvested fish. Other factors that may be considered include the value of fisheries, the level of capitalization, the decrease in cost per unit of catch afforded by an increase in stock size, and the attendant increase in catch per unit of effort, alternate employment opportunities, and economies of coastal areas.

(iii) Ecological factors. Examples are stock size and age composition, the vulnerability of incidental or unregulated stocks in a mixed-stock fishery, predator-prey or competitive interactions, and dependence of marine mammals and birds or endangered species on a stock of fish. Also important are ecological or environmental conditions that stress marine organisms, such as natural and manmade changes in wetlands or nursery grounds, and effects of pollutants on habitat and stocks.

#### (4) Specification.

(i) The amount of fish that constitutes the OY should be expressed in terms of numbers or weight of fish. However, OY may be expressed as a formula that converts periodic stock assessments into target harvest levels; in terms of an annual harvest of fish or shellfish having a minimum weight, length, or other measurement; or as an amount of fish taken only in certain areas, in certain seasons, with particular gear, or by a specified amount of fishing effort.

(ii) Either a range or a single value may be specified for OY. Specification of a numerical, fixed-value OY does not preclude use of annual target harvest levels that vary with stock size. Such target harvest levels may be prescribed on the basis of an OY control rule similar to the MSY control rule described in paragraph (c)(1)(ii) of this section, but designed to achieve OY on average, rather than MSY. The annual harvest level obtained under an OY control rule should always be less than or equal to the harvest level that would be obtained under the MSY control rule.

(iii) All fishing mortality must be counted against OY, including that resulting from bycatch, research fishing, and any other fishing activities.

(iv) The OY specification should be translatable into an annual numerical estimate for the purposes of establishing any TALFF and analyzing impacts of the management regime. There should be a mechanism in the FMP for periodic reassessment of the OY specification, so that it is responsive to changing circumstances in the fishery.

(v) The determination of OY requires a specification of MSY, which may not always be possible or meaningful. However, even where sufficient scientific data as to the biological characteristics of the stock do not exist, or where the period of exploitation or investigation has not been long enough for adequate understanding of stock dynamics, or where frequent large-scale fluctuations in stock size diminish the meaningfulness of the MSY concept, the OY must still be based on the best scientific information available. When data are insufficient to estimate MSY directly, Councils should adopt other measures of productive capacity that can serve as reasonable proxies for MSY to the extent possible (also see paragraph (c)(3) of this section).

(vi) In a mixed-stock fishery, specification of a fishery-wide OY may be accompanied by management measures establishing separate annual target harvest levels for the individual stocks. In such cases, the sum of the individual target levels should not exceed OY.

(5) OY and the precautionary approach. In general, Councils should adopt a precautionary approach to specification of OY. A precautionary approach is characterized by three features:

(i) Target reference points, such as OY, should be set safely below limit reference points, such as the catch level associated with the fishing mortality rate or level defined by the status determination criteria. Because it is a target reference point, OY does not constitute an absolute ceiling, but rather a desired result. An FMP must contain conservation and management measures to achieve OY, and provisions for information collection that are designed to determine the degree to which OY is achieved on a continuing basis--that is, to result in a long-term average catch equal to the long-term average OY, while meeting the status determination criteria. These measures should allow for practical and effective implementation and enforcement of the management regime, so that the harvest is allowed to reach OY, but not to exceed OY by a substantial amount. The Secretary has an obligation to implement and enforce the FMP so that OY is achieved. If management measures prove unenforceable--or too restrictive, or not rigorous enough to realize OY--they should be modified; an alternative is to reexamine the adequacy of the OY specification. Exceeding OY does not necessarily constitute overfishing. However, even if no overfishing resulted from exceeding OY, continual harvest at a level above OY would violate national standard 1, because OY was not achieved on a continuing basis.

(ii) A stock or stock complex that is below the size that would produce MSY should be harvested at a lower rate or level of fishing mortality than if the stock or stock complex were above the size that would produce MSY.

(iii) Criteria used to set target catch levels should be explicitly risk averse, so that greater uncertainty regarding the status or productive capacity of a stock or stock complex corresponds to greater caution in setting target catch levels. Part of the OY may be held as a reserve to allow for factors such as uncertainties in estimates of stock size and DAH. If an OY reserve is established, an adequate mechanism should be included in the FMP to permit timely release of the reserve to domestic or foreign fishermen, if necessary.

(6) Analysis. An FMP must contain an assessment of how its OY specification was determined (section 303(a)(3) of the Magnuson-Stevens Act). It should relate the explanation of overfishing in paragraph (d) of this section to conditions in the particular fishery and explain how its choice of OY and conservation and management measures will prevent overfishing in that fishery. A Council must identify those economic, social, and ecological factors relevant to management of a particular fishery, then evaluate them to determine the amount, if any, by which MSY exceeds OY. The choice of a particular OY must be carefully defined and documented to show that the OY selected will produce the greatest benefit to the Nation. If overfishing is permitted under paragraph (d)(6) of this section, the assessment must contain a justification in terms of overall benefits, including a comparison of benefits under alternative management measures, and an analysis of the risk of any species or ecologically significant unit thereof reaching a threatened or endangered status, as well as the risk of any stock or stock complex falling below its minimum stock size threshold.

(7) OY and foreign fishing. Section 201(d) of the Magnuson-Stevens Act provides that fishing by foreign nations is limited to that portion of the OY that will not be harvested by vessels of the United States.

(i) DAH. Councils must consider the capacity of, and the extent to which, U.S. vessels will harvest the OY on an annual basis. Estimating the amount that U.S. fishing vessels will actually harvest is required to determine the surplus.

(ii) DAP. Each FMP must assess the capacity of U.S. processors. It must also assess the amount of DAP, which is the sum of two estimates: The estimated amount of U.S. harvest that domestic processors will process, which may be based on historical performance or on surveys of the expressed intention of manufacturers to process, supported by evidence of contracts, plant expansion, or other relevant information; and the estimated amount of fish that will be harvested by domestic vessels, but not processed (e.g., marketed as fresh whole fish, used for private consumption, or used for bait).

#### 1.4 Current Scallop FMP Definitions of Overfishing, OY, and MSY

The current definition of MSY, Optimum Yield, and Overfishing is contained in the FMP was implemented under Amendment 1. Prior to Amendment 1, the FMP specified a long-term OY for the scallop fishery in the EEZ as a numerical range of zero to 1.1 million pounds of shucked scallop meats. Under the interim FMP, OY was set at zero to prevent unregulated fishing by non-licensed vessels. Amendment 1 revised the OY range to 0-1.8 million pounds to reflect landings in State waters.

The FMP was originally based on the Magnuson-Stevens Act 602 guidelines for FMP's, whereby overfishing is a level or rate of fishing mortality that jeopardizes the long-term capacity of a stock or stock complex to provide maximum sustainable yield (MSY) on a continuing basis. Overfishing definitions for existing FMP have been based on stock abundance levels, fishing mortality rate, or both (Rosenberg et al. 1993). Optimum Yield (OY) is that which provides the greatest overall benefit to the nation with particular reference to food production and recreational fisheries. OY is based upon the maximum sustainable yield for a given fishery, modified by relevant economic, social or biological factors.

Biomass estimates for scallops are lacking, such that numerical estimation of MSY for weathervane and other scallop species not possible at this time. NOAA recognizes that there are cases where the specification of MSY may either be impossible or irrelevant. This may be due to lack of assessment data ... or because biological resiliency or high fecundity of some stocks or other fishery characteristic may allow OY to become a descriptive statement only, making calculation of MSY unnecessary (602 Guidelines Final Rule 1989). Pectinids in general exhibit extreme variations in year class strength (Orensanz et al. 1991), and effort and landings from the Alaskan scallop fishery have varied widely. In addition, the lack of biomass estimates suggest that numerical specification of these fishery reference points was premature when the FMP was implemented.

Instead of a specifying OY as a fishing rate or constant catch level, OY is specified as a numerical range for Alaskan scallops. **The OY range established under Amendment 1 was zero to 1,800,000 pounds of shucked scallop meats, and was derived from historical catches.** The low end of the range is the lowest catch on record (0 pounds, 1978). The high end of the OY range was defined as the highest catch recorded since the 'fishing up' period (1,800,000 pounds, 1992). The OY includes landings from state waters. Quotas, or guideline harvest ranges (GHRs), may be set for individual scallop species, so long as the total GHRs are less than or equal to the upper end of the OY range.

**In the current FMP, overfishing is defines as landings that exceed optimum yield.** Although overfishing could have been defined as a fishing mortality rate for weathervane scallops, based on existing life history data, the lack of stock assessment information (surveys, population age or size structure) limit the use of an overfishing rate. The FMP notes that as data collected from the fisheries and/or assessment surveys of the scallop resource are analyzed, overfishing for scallops may be defined on a fishing mortality rate basis. The FMP further notes that until better information becomes available, overfishing is defined as landings that exceed optimum yield.

## 1.5 Alternatives Considered

### 1.5.1 Alternative 1: Status Quo

The current FMP specifies OY to be a range from 0 - 1,800,000 pounds of shucked scallop meats, and was derived from historical catches. The low end of the range is the lowest catch on record (0 pounds, 1978). The high end of the OY range was defined as the highest catch recorded since the 'fishing up' period (1,800,000 pounds, 1992). The OY includes landings from state waters. Overfishing is defined as landings that exceed optimum yield. No estimates of MSY or biomass thresholds are provided.

### 1.5.2 Alternative 2 : Redefine overfishing, OY, and MSY.

The Magnuson-Stevens Act redefines OY to be less than or equal to MSY. Further, the Act provides for revised guidelines for national standard 1. These guidelines, as presented in the proposed rule, assist the Councils with amending the FMPs to comply with Magnuson Stevens Act provisions. Alternative 2 is proposed to amend the scallop FMP by redefining overfishing, OY, and MSY. This amendment also adds additional language to the FMP to comply with another Act requirement to monitor bycatch.

## 1.6 Analysis of overfishing, OY, and MSY

Many of the recommendations from the proposed rule can not be applied to the scallop fishery off Alaska because biomass has not been estimated for most local stocks. The rule notes that the MSY control rule can be based on removing a constant catch; remove a constant fraction of the biomass in each year, where this fraction is chosen so as to maximize the resulting long-term average yield; allow a constant level of escapement in each year, where this level is chosen so as to maximize the resulting long-term average yield; vary the fishing mortality rate as a continuous function of stock size, where the parameters of this function are constant and chosen so as to maximize the resulting long-term average yield. In any MSY control rule, a given stock size is associated with a given level of fishing mortality and a given level of potential harvest, where the long-term average of these potential harvests provides an estimate of MSY. Unfortunately, comprehensive surveys for weathervane scallops are lacking (as is age data from the fishery). In rare cases, biomass has been estimated using Leslie depletion estimates.

### Maximum Sustainable Yield (MSY)

The proposed rule defines MSY as the largest long-term average catch or yield that can be taken from a stock or stock complex under prevailing ecological and environmental conditions. The rule further notes that the long-term average stock size obtained by fishing year after year at this rate under average recruitment may be a reasonable proxy for the MSY stock size, and the long-term average catch so obtained may be a reasonable proxy for MSY

MSY could be estimated based on the average catch from 1990-1997, which reflects prevailing ecological conditions. The fishery was fully capitalized during this time period, and all areas of the state where scallops could be harvested were being exploited. Prior to that time period, vessels moved into and out of the scallop fishery, in part in response to economic opportunities available in other fisheries (Shirley and Kruse,

Landings and effort in the Alaska weathervane scallop fishery, 1980 - 1997.

Year	# of Vessels	Landings (pounds)	Price (\$/lb)
1980	8	633,000	4.32
1981	18	924,000	4.05
1982	13	914,000	3.77
1983	6	194,000	4.88
1984	10	390,000	4.47
1985	8	648,000	3.12
1986	9	683,000	3.66
1987	4	583,000	3.38
1988	4	341,000	3.49
1989	7	526,000	3.68
1990	9	1,489,000	3.37
1991	7	1,191,000	3.76
1992	7	1,811,000	3.88
1993	15	1,429,000	5.00
1994	16	1,235,000	6.00
1995	10	283,000	n/a
1996	9	732,424	6.38
1997	9	786,043	6.50

1995). Note however, that since 1993, the fishery has been somewhat limited by crab bycatch, closure areas, and season length. The average landings, 1990-1997 (1995 data not included as fishery was closed most of the year), was 1,240,000 pounds of shucked meats.

As there really is no stable period during the history of this fishery, MSY estimation by averaging catches is problematic, but their does not appear to be a better solution at this point. It seems appropriate to exclude 1995 due to the Mr. Big snafu (the entire fishery was closed in February 1995 when an unregistered vessel continued to catch scallops). However, there was some latent effect of this snafu in 1996. That year, there was a harvest of 55,000 pounds from state waters only in January, and the federal waters opening was delayed until August 1 after the FMP problems were fixed. The late start could have inhibited the fishery. Additionally, the sustainable level of catches from the Bering Sea is an important issue. Note that the fishery in the Bering Sea did not start until 1993. Thus, by averaging catches from 1990-1992, it is assumed that no catches were sustainable from the Bering Sea during those three years. This will lead to an underestimate of MSY. On the other hand, the Bering Sea catches in 1993 and 1994 exceeded 600,000 pounds and 500,000 pounds respectively. These high catches are probably not sustainable as a result of the fishing-up process. Including these catches will tend to overestimate MSY. So, on the one hand, the 1990-1997 period of averaging unfairly excludes Bering Sea catches that could have been taken in 1990-1992, and on the other hand, this period includes two years of fishing-up (1993-1994) that are likely unsustainable. Indeed, catches in 1996 and 1997 have fallen off (1997 catches were severely constrained by snow and Tanner crab bycatch rates).

Another option for defining MSY for scallops can be calculated based on a formula developed by Gulland (1971), who proposed that  $MSY = 0.5 M B_0$ , where  $M$  is instantaneous natural mortality and  $B_0$  is virgin biomass. This equation assumes that the population grows according to the logistic population model, which does not account for spatial or temporal variability in the environment, nor for age or size structure in the population. This equation also assumes that the proportion of the population that can be harvested be equivalent to the proportion that would succumb naturally ( $M$ ) in the absence of fishing.

Instantaneous natural mortality ( $M$ ) for weathervane scallops has been estimated by Kruse and Funk (1995), based on published papers (Kaiser 1986, Hennick 1973). A median  $M$  value of 0.13 was estimated using the methodology of Alverson and Carney (1975) based on growth parameters, Robson and Chapman (1961) based on catch curves, and Hoening (1983) and Beverton (1963) based on maximum age.

Using the formula of Gulland (1971) maximum sustainable yield for weathervane scallops can thus be estimated using the following formula:  $MSY = 0.5 (0.13) B_0$ . The product of these factors is  $0.065 B_0$ . In other words, maximum allowable annual yield is estimated to be 6.5% of the virgin population size.

### **MSY Control Rule ( $F_{msy}$ )**

The proposed rule defines the MSY control rule as a harvest strategy which, if implemented, would be expected to result in a long-term average catch approximating MSY. The MSY control rule establishes a maximum fishing mortality threshold, which may be expressed either as a single number or as a function of spawning biomass or other measure of productive capacity. The fishing mortality threshold should be set at the fishing mortality rate or level associated with the relevant MSY control rule. Exceeding the fishing mortality threshold for a period of 1 year or more constitutes overfishing.

In choosing an MSY control rule, Councils should be guided by the characteristics of the fishery, the FMP's objectives, and the best scientific information available. The simplest MSY control rule is to remove a constant catch in each year that the estimated stock size exceeds an appropriate lower bound, where this catch is chosen so as to maximize the resulting long-term average yield. Other examples include the following: Remove a constant fraction of the biomass in each year, where this fraction is chosen so as to maximize the resulting

long-term average yield; allow a constant level of escapement in each year, where this level is chosen so as to maximize the resulting long-term average yield; vary the fishing mortality rate as a continuous function of stock size, where the parameters of this function are constant and chosen so as to maximize the resulting long-term average yield. In any MSY control rule, a given stock size is associated with a given level of fishing mortality and a given level of potential harvest, where the long-term average of these potential harvests provides an estimate of MSY. The natural mortality rate may also be a reasonable proxy for the MSY fishing mortality rate.

The proposed rule notes alternatives to specifying MSY. When data are insufficient to estimate MSY directly, Councils should adopt other measures of productive capacity that can serve as reasonable proxies for MSY, to the extent possible. Examples include various reference points defined in terms of relative spawning per recruit, or simply the natural mortality rate. If a reliable estimate of pristine stock size (i.e., the long-term average stock size that would be expected in the absence of fishing) is available, a stock size somewhere in the range of 25-75 percent of this value may be a reasonable proxy for the MSY stock size, and the product of this stock size and the natural mortality rate may be a reasonable proxy for MSY.

Kruse and Funk (1995) estimated  $F_{35\%} = 0.15$  for weathervane scallops off Alaska. Their estimate was conservative in that it estimated handling mortality rates of 20-40% for non-retained small scallops. They also proposed that overfishing be defined based on  $F_{30\%} = 0.25$ .

An MSY control rule based on natural mortality might also be reasonable for weathervane scallops. Using the estimate of  $M = 0.13$  (Kruse and Funk 1995),  $F_{msy} = M$ , or  $F_{msy} = 0.13$ . This estimate is more conservative than the rate generated by  $F_{35\%}$ . No control rule for spiny, pink, or rock scallops is recommended at this time.

### **MSY Stock Size ( $B_{msy}$ )**

The proposed rule defines the MSY stock size as the long term average size of the stock or stock complex, measured in terms of spawning biomass or other appropriate units, associated with the production of MSY. It is the stock size that would be achieved under an appropriate MSY control rule. It is also the minimum standard for a rebuilding target when remedial management action is required.

As noted earlier MSY for weathervane scallops could be established at 1.24 million pounds of shucked adductor muscles. Therefore, MSY stock size can be estimated as  $MSY/M = 9.54$  million pounds of shucked meat biomass. In terms of whole animals (including shells and gurry)  $B_{msy}$  would be 95.4 million pounds, as expanded by a product recovery rate of 10%

$B_{msy}$  could be established based on the MSY biomass, as follows:  $MSY \text{ Stock Size } (B_{msy}) = B_{1990-1997} = \frac{1}{2} B_0 = MSY/M = 9.54$  million pounds (meats). This assumes that the stock was at  $B_{msy}$  and that catches were at MSY during 1990-1997, and that the logistic equation holds.

### **Minimum Stock Size Threshold**

The proposed rule states that the minimum stock size threshold, to the extent possible, should equal whichever is greater: one half the MSY stock size, or the minimum stock size at which rebuilding to the MSY level would be expected to occur within 10 years if the stock or stock complex were exploited at the maximum fishing mortality threshold. Should the actual size of the stock or stock complex in a given year fall below this threshold, the stock or stock complex is considered overfished. The minimum stock size threshold should be expressed in terms of spawning biomass or other measure of reproductive capacity. Based on the proposed rule, a minimum stock size threshold for weathervane scallops could be established based on  $\frac{1}{2} MSY \text{ stock size} = \frac{1}{2} B_{msy} = 4.77$  million pounds of shucked adductor muscles.



## Overfishing Control Rule ( $F_{\text{overfishing}}$ )

The Proposed Rule defines the terms "overfishing" and "overfished" mean a rate or level of fishing mortality that jeopardizes the capacity of a fishery to produce the maximum sustainable yield on a continuing basis.

Overfishing could be established for weathervane scallop stocks as a fishing rate in excess of the natural mortality rate. Hence,  $F_{\text{overfishing}} = M = 0.13$ .

## Optimum Yield (OY)

The definition of optimum yield proposed by Alternative 2, is simply the definition contained in the Magnuson-Stevens Act. The term 'optimum', with respect to the yield from a fishery, means the amount of fish which --

- (a) will provide the greatest overall benefit to the Nation, particularly with respect to food production and recreational opportunities, and taking into account the protection of marine ecosystems;
- (b) is prescribed as such on the basis of maximum sustainable yield from the fishery, as reduced by any relevant economic, social, or ecological factor; and
- (c) in the case of an overfished fishery, provides for rebuilding to a level consistent with producing the maximum sustainable yield in such fishery.

Optimum yield should be established on the basis of MSY. OY is upper bounded by  $MSY = F_{\text{msy}} B_{\text{msy}} = M B_{\text{msy}}$  (= 1,240,000 pounds). Hence, a numerical range for OY of 0-1,240,000 pounds can thus be established for Alaska weathervane scallops. Because MSY cannot be estimated for the other scallop species, OY cannot be quantified for rock scallops, pink scallops, or spiny scallops. The ADF&G manages fisheries for these species through special permits. Note however, that no commercial harvest of these species has been made since 1992.

There is sufficient conservatism built into establishing an annual OY cap of 1.24 million pounds for the following reasons:

1. the years of averaging include years when no fishing occurred in the Bering Sea, but obviously some sustainable harvest was possible,
2. the period of averaging includes other areas and years when the harvest was constrained by fishery controls, such as recently by bycatch PSCs, and therefore the resulting catch underestimates the productivity of scallop stocks,
3. substantial areas are closed to scallop dredging due to concerns about bycatch, yet these areas have substantial productivity -- these areas can almost be thought of as marine refuges and potential yields from these areas are not factored into MSY estimates,
4. there are years during the history of the fishery when effort was low due to market (not abundance) conditions,
5.  $F_{30\%}$  is probably a better estimator of  $F_{\text{overfishing}}$  than is  $F=M$ , yet  $M < F_{30\%}$  so the overfishing rule is conservative, and
6. when good recruitment comes along, the stocks are likely greater than  $B_{\text{msy}}$ , thus we will fish at  $F < F_{\text{overfishing}}$  to achieve  $OY=MSY$  (recall  $MSY = F_{\text{msy}} B_{\text{msy}}$ , so if  $B > B_{\text{msy}}$ , then  $F < F_{\text{msy}}$ ).

It should be noted that, if you add up all the upper ends of the GHL ranges for each area at present, you get 1.6 million pounds compared to the potential upper bound of OY of 1.24 million pounds. If the proposed amendment is adopted and implemented, then the state will need to cut off fishing when the 1.24 million pound level is hit. In practice this may mean that the managers will need to tally the catches along the way, and if the Bering Sea fishery comes last, for instance, then the GHL for the Bering Sea will have to be set accordingly to come in under the OY cap. Alternatively, all the area-specific GHLs could be adjusted so their upper ends add up to 1.24 million pounds. Essentially, the summed GHLs will have to be reduced by 360,000 pounds. This may not be

too difficult nor unjustified. Preliminary fishery information suggests that the upper ends on the GHLS for Kodiak (400,000 pounds), Dutch Harbor (170,000 pounds), and Bering Sea (600,000 pounds) may be too optimistic. Hence, if the GHL for Kodiak was reduced by 100,000, Dutch Harbor by 60,000, and Bering Sea by 200,000 pounds, the sum of all GHLS would equal the OY cap.

In the future, better quantitative estimates of appropriate scallop yields by area may be generated based on observer data analysis. Additional information on biomass and long term potential yield of pink, spiny and rock scallops may also be available in the future. At such time, MSY and OY would be re-estimated and the FMP amended.

## 1.7 Information on Bycatch

The Magnuson-Stevens Act amendments emphasized the importance of bycatch effects on achieving sustainable fisheries. National Standard 9 mandates that conservation and management measures shall, to the extent practicable: (1) minimize bycatch; and (2) to the extent bycatch cannot be avoided, minimize the mortality of such bycatch.

### 1.7.1 NMFS Guidance on National Standard 9

The following are excerpts from the proposed rule on national standard guidelines.

The term "bycatch" means fish that are harvested in a fishery (i.e., removed permanently from the population as a result of fishing), but that are not sold or kept for personal use. Bycatch includes economic discards, regulatory discards, and fishing mortality due to an encounter with fishing gear that does not result in capture of fish (i.e., unobserved fishing mortality). Bycatch does not include any fish that legally are retained in a fishery and kept for personal, tribal, or cultural use, or that enter commerce through sale, barter, or trade.

The priority for reducing bycatch under this standard is to minimize or avoid catching bycatch species where possible. Fish that are bycatch and cannot be avoided should, to the extent practicable, be returned to the sea alive. To evaluate conservation and management measures relative to this and other national standards, as well as to evaluate total fishing mortality, Councils should:

(1) Promote development of a database on bycatch and bycatch mortality in the fishery to the extent practicable. A review and, where necessary, improvement of data collection methods, data sources, and applications of data should be initiated for each fishery to determine the amount, type, disposition, and other characteristics of bycatch and bycatch mortality in each fishery for purposes of this standard and of section 303(a)(11) and (12) of the Magnuson-Stevens Act. Bycatch should be categorized to focus on management responses necessary to minimize bycatch and bycatch mortality to the extent practicable. When appropriate, management measures, such as at-sea monitoring programs, should be developed to meet these information needs.

(2) For each management measure, assess the effects on the amount and type of bycatch and bycatch mortality in the fishery. Most conservation and management measures can affect the amounts of bycatch or bycatch mortality in a fishery, as well as the extent to which further reductions in bycatch are practicable. In analyzing measures, including the status quo, Councils should assess the impacts of minimizing bycatch and bycatch mortality, as well as consistency of the selected measure with other national standards and applicable laws. The benefits of minimizing bycatch to the extent practicable should be identified and an assessment of the impact of the selected measure on bycatch and bycatch mortality provided. Due to limitations on the information available, fishery managers may not be able to generate precise estimates of bycatch and bycatch mortality or other effects for each alternative. In the absence of quantitative estimates of the impacts of each alternative, Councils may use qualitative estimates.

(3) Select measures that, to the extent practicable, will minimize bycatch and bycatch mortality. A determination of whether a conservation and management measure minimizes bycatch or bycatch mortality to the extent practicable, consistent with other national standards, should consider the following factors:

- (i) Population effects for the bycatch species.
- (ii) Ecological effects due to changes in the bycatch of that species (effects on other species in the ecosystem).
- (iii) Changes in the bycatch of other species of fish and the resulting population and ecosystem effects.
- (iv) Effects on marine mammals and birds.
- (v) Changes in fishing, processing, disposal, and marketing costs.
- (vi) Changes in fishing practices and behavior of fishermen.
- (vii) Changes in research, administration, and enforcement costs and management effectiveness.
- (viii) Changes in the economic, social, or cultural value of fishing activities and nonconsumptive uses of fishery resources.
- (ix) Changes in the distribution of benefits and costs.
- (x) Social effects.

(4) Implement and monitor selected management measures. Effects of implemented measures should be evaluated routinely. Monitoring systems should be established prior to fishing under the selected management measures. Where applicable, implementation plans should be developed and coordinated with industry and other concerned organizations to identify opportunities for cooperative data collection, coordination of data management for cost efficiency and avoidance of duplicative effort.

### **1.7.2 Bycatch Monitoring in the Alaska Scallop Fishery**

An influx of scallop boats from the East Coast of the United States into the weathervane scallop fishery during the early 1990's and corresponding concerns about crab bycatch in the scallop fishery prompted Alaska Department of Fish and Game Commissioner Rosier to declare the scallop fishery a high impact emerging fishery on May 21, 1993. The resulting management plan included an observer program to monitor crab bycatch as well as collect biological and fishery based information on weathervane scallops. The plan contained provisions for king and Tanner crab bycatch caps for most areas. The weathervane scallop onboard observer program has been in place since July 1, 1993.

Data collection has evolved and expanded since 1993 to focus more on scallop biology and stock assessment in an effort to answer critical management questions. Efforts are underway to use observer collected data to estimate abundance of scallops using a fishery based stock assessment model. The analysis of biological reference points based on historical scallop data has been recently updated using observer collected data. Ongoing work with scallop age analysis from shells collected by onboard observers is expected to increase the departments understanding of population dynamics and fishery effects. Other data is collected to define the biological season, define the time period of highest quality and quantity of product, gain insights into scallop

recruitment and maturity, estimate the number and weight of discarded scallops, map scallop beds, determine extent of bottom area dredged, calculate catch per unit effort, etc.

Daily crab bycatch counts from sampled tows are used in season to estimate crab bycatch. Management areas are closed by emergency order if established crab bycatch limits are reached. Crab bycatch is examined in detail to determine mortality, size frequency, shell-age, and injuries.

#### At-Sea Catch Sampling

Scallop observers are given detailed instructions to collect a variety of biological data on a daily basis. The daily goal is to sample a single dredge from one tow for species haul composition and a single dredge from six different tows for crab and halibut bycatch and discarded scallop catch as well as sampling two tows for scallop meat (adductor muscle) recovery data.

Haul composition sampling is used to document all species of bycatch by weight. Dredge contents, including noncommercial species, are sorted into baskets by species and weighed. Observer haul composition samples are summarized and reported by management area and district. An example is table one, which contains a list of the twenty most frequently caught species by weight from the Alaska Peninsula Area. Data from each management area and district is then summarized into one table, as in table 2.

From each of the six tows sampled daily for crab and halibut bycatch, one dredge per tow is examined. Observers identify, count, and record the number of crab and halibut encountered as well as examining both the retained and discarded scallop catch. In addition to enumerating crab, carapace measurements, shell age, sex, injuries and mortality are recorded. All Pacific halibut encountered are measured for length and examined for injuries and overall body condition. The discarded scallop catch is collected from the deck and weighed. A subsample is examined to determine the weight and number of broken and intact scallops, and shell heights. From the retained scallop catch; shell height, sex, and gonad development is collected. Shells are collected from both the retained and discarded scallop catch for shell aging. Tables 3 - 9 and Figures 1 - 3 are examples of a few tables based on observer collected data from the 6 bycatch and scallop discard tows sampled daily.

## **2.0 NEPA REQUIREMENTS: ENVIRONMENTAL IMPACTS OF THE ALTERNATIVES**

An environmental assessment (EA) is required by the National Environmental Policy Act of 1969 (NEPA) to determine whether the action considered will result in significant impact on the human environment. If the action is determined not to be significant based on an analysis of relevant considerations, the EA and resulting finding of no significant impact (FONSI) would be the final environmental documents required by NEPA. An environmental impact statement (EIS) must be prepared for major Federal actions significantly affecting the human environment.

An EA must include a brief discussion of the need for the proposal, the alternatives considered, the environmental impacts of the proposed action and the alternatives, and a list of document preparers. The purpose and alternatives were discussed in Sections 1.1 and 1.2, and the list of preparers is in Section 6. This section contains the discussion of the environmental impacts of the alternatives including impacts on threatened and endangered species and marine mammals.

### **2.1 Environmental Impacts of the Alternatives**

The environmental impacts generally associated with fishery management actions are effects resulting from (1) harvest of fish stocks which may result in changes in food availability to predators and scavengers, changes in the population structure of target fish stocks, and changes in the marine ecosystem community structure; (2) changes in the physical and biological structure of the marine environment as a result of fishing practices, e.g., effects of gear use and fish processing discards; and (3) entanglement/entrapment of non-target organisms in active or inactive fishing gear.

A summary of the effects of the annual groundfish harvests on the biological environment and associated impacts on marine mammals, seabirds, and other threatened or endangered species are discussed in the final environmental assessment for the annual groundfish total allowable catch specifications.

### **2.2 Impacts on Endangered or Threatened Species**

**Background.** The ESA provides for the conservation of endangered and threatened species of fish, wildlife, and plants. The program is administered jointly by the Department of Commerce (NMFS) for most marine species, and the U.S. Fish and Wildlife Service (FWS) for terrestrial and freshwater species.

The ESA procedure for identifying or listing imperiled species involves a two-tiered process, classifying species as either threatened or endangered, based on the biological health of a species. Threatened species are those likely to become endangered in the foreseeable future [16 U.S.C. ' 1532(20)]. Endangered species are those in danger of becoming extinct throughout all or a significant portion of their range [16 U.S.C. ' 1532(20)]. The Secretary, acting through NMFS, is authorized to list marine mammal and fish species. The Secretary of Interior, acting through the FWS, is authorized to list all other organisms.

In addition to listing species under the ESA, the critical habitat of a newly listed species must be designated concurrent with its listing to the "maximum extent prudent and determinable" [16 U.S.C. ' 1533(b)(1)(A)]. The ESA defines critical habitat as those specific areas that are essential to the conservation of a listed species and that may be in need of special consideration. The primary benefit of critical habitat designation is that it informs Federal agencies that listed species are dependent upon these areas for their continued existence, and that consultation with NMFS on any Federal action that may affect these areas is required. Some species, primarily the cetaceans, listed in 1969 under the Endangered Species Conservation Act and carried forward as endangered under the ESA, have not received critical habitat designations.

**Listed Species.** The following species are currently listed as endangered or threatened under the ESA and occur in the GOA and/or BSAI:

### Endangered

Northern Right Whale	<i>Balaena glacialis</i>
Bowhead Whale <sup>1</sup>	<i>Balaena mysticetus</i>
Sei Whale	<i>Balaenoptera borealis</i>
Blue Whale	<i>Balaenoptera musculus</i>
Fin Whale	<i>Balaenoptera physalus</i>
Humpback Whale	<i>Megaptera novaeangliae</i>
Sperm Whale	<i>Physeter macrocephalus</i>
Snake River Sockeye Salmon	<i>Oncorhynchus nerka</i>
Short-tailed Albatross	<i>Diomedea albatrus</i>
Steller Sea Lion <sup>1</sup>	<i>Eumetopias jubatus</i>

### Threatened

Snake River Fall Chinook Salmon	<i>Oncorhynchus tshawytscha</i>
Snake River Spring/Summer Chinook Salmon	<i>Oncorhynchus tshawytscha</i>
Steller Sea Lion <sup>2</sup>	<i>Eumetopias jubatus</i>
Spectacled Eider	<i>Somateria fishcheri</i>

**Section 7 Consultations.** Because both groundfish fisheries are federally regulated activities, any negative affects of the fisheries on listed species or critical habitat and any takings<sup>3</sup> that may occur are subject to ESA section 7 consultation. NMFS initiates the consultation and the resulting biological opinions are issued to NMFS. The Council may be invited to participate in the compilation, review, and analysis of data used in the consultations. The determination of whether the action "is likely to jeopardize the continued existence of" endangered or threatened species or to result in the destruction or modification of critical habitat, however, is the responsibility of the appropriate agency (NMFS or FWS). If the action is determined to result in jeopardy, the opinion includes reasonable and prudent measures that are necessary to alter the action so that jeopardy is avoided. If an incidental take of a listed species is expected to occur under normal promulgation of the action, an incidental take statement is appended to the biological opinion.

Section 7 consultations have been done for all the above listed species, some individually and some as groups. Below are summaries of the consultations.

**Endangered Cetaceans.** NMFS concluded a formal section 7 consultation on the effects of the BSAI and GOA groundfish fisheries on endangered cetaceans within the BSAI and GOA on December 14, 1979, and April 19, 1991, respectively. These opinions concluded that the fisheries are unlikely to jeopardize the continued existence or recovery of endangered whales. Consideration of the bowhead whale as one of the listed species present within the area of the Bering Sea fishery was not recognized in the 1979 opinion, however, its range and status are not known to have changed. No new information exists that would cause NMFS to alter the conclusion of the 1979 or 1991 opinions. NMFS has no plan to reopen Section 7 consultations on the listed cetaceans for this action.

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<sup>1</sup>listed as endangered in waters west of Cape Suckling.

<sup>2</sup>listed as threatened in waters east of Cape Suckling.

<sup>3</sup> the term "take" under the ESA means "harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or attempt to engage in any such conduct" (16 U.S.C. ' 1538(a)(1)(B)).

Of note, however, are observations of Northern Right Whales during Bering Sea stock assessment cruises in the summer of 1997 (NMFS per. com). Prior to these sightings, and one observation of a group of two whales in 1996, confirmed sightings had not occurred.

**Steller sea lion.** The Steller sea lion range extends from California and associated waters to Alaska, including the Gulf of Alaska and Aleutian Islands, and into the Bering Sea and North Pacific and into Russian waters and territory. In 1997, based on biological information collected since the species was listed as threatened in 1990 (60 FR 51968), NMFS reclassified Steller sea lions as two distinct population segments under the ESA (62 FR 24345). The Steller sea lion population segment west of 144°E longitude (a line near Cape Suckling, Alaska) is listed as endangered; the remainder of the U.S. Steller sea lion population maintains the threatened listing.

NMFS designated critical habitat in 1993 (58 FR 45278) for the Steller sea lion based on the Recovery Team's determination of habitat sites essential to reproduction, rest, refuge, and feeding. Listed critical habitats in Alaska include all rookeries, major haul-outs, and specific aquatic foraging habitats of the BSAI and GOA. The designation does not place any additional restrictions on human activities within designated areas. No changes in critical habitat designation were made as result of the 1997 re-listing.

Beginning in 1990 when Steller sea lions were first listed under the ESA, NMFS determined that both groundfish fisheries may adversely affect Steller sea lions, and therefore conducted Section 7 consultation on the overall fisheries (NMFS 1991), and subsequent changes in the fisheries (NMFS 1992). The most recent biological opinion on the BSAI and GOA fisheries effects on Steller sea lions was issued by NMFS January 26, 1996. It concluded that these fisheries and harvest levels are unlikely to jeopardize the continued existence and recovery of the Steller sea lion or adversely modify critical habitat. NMFS has no plan to reopen Section 7 consultations on Steller sea lions for this action.

**Pacific Salmon.** No species of Pacific salmon originating from freshwater habitat in Alaska are listed under the ESA. These listed species originate in freshwater habitat in the headwaters of the Columbia (Snake) River. During ocean migration to the Pacific marine waters a small (undetermined) portion of the stock go into the Gulf of Alaska as far east as the AI. In that habitat they are mixed with hundreds to thousands of other stocks originating from the Columbia River, British Columbia, Alaska, and Asia. The listed fish are not visually distinguishable from the other, unlisted, stocks. Mortal take of them in the chinook salmon bycatch portion of the fisheries is assumed based on sketchy abundance, timing, and migration pattern information.

NMFS designated critical habitat in 1992 (57 FR 57051) for the for the Snake River sockeye, Snake River spring/summer chinook, and Snake River fall chinook salmon. The designations did not include any marine waters, therefore, does not include any of the habitat where the groundfish fisheries are promulgated.

NMFS has issued two biological opinions and no-jeopardy determinations for listed Pacific salmon in the Alaska groundfish fisheries (NMFS 1994, NMFS 1995). Conservation measures were recommended to reduce salmon bycatch and improve the level of information about the salmon bycatch. The no jeopardy determination was based on the assumption that if total salmon bycatch is controlled, the impacts to listed salmon are also controlled. The incidental take statement appended to the second biological opinion allowed for take of one Snake River fall chinook and zero take of either Snake River spring/summer chinook or Snake River sockeye, per year. As explained above, it is not technically possible to know if any have been taken. Compliance with the biological opinion is stated in terms of limiting salmon bycatch per year to under 55,000 and 40,000 for chinook salmon, and 200 and 100 sockeye salmon in the BSAI and GOA fisheries, respectively.

**Short-tailed albatross.** The entire world population in 1995 was estimated as 800 birds; 350 adults breed on two small islands near Japan. The population is growing but is still critically endangered because of its small size and restricted breeding range. Past observations indicate that older short-tailed albatrosses are present in Alaska

primarily during the summer and fall months along the shelf break from the Alaska Peninsula to the Gulf of Alaska, although 1- and 2-year old juveniles may be present at other times of the year (FWS 1993). Consequently, these albatrosses generally would be exposed to fishery interactions most often during the summer and fall--during the latter part of the second and the whole of the third fishing quarters.

Short-tailed albatrosses reported caught in the longline fishery include two in 1995, one in October 1996, and none so far in 1997. Both 1995 birds were caught in the vicinity of Unimak Pass and were taken outside the observers statistical samples.

Formal consultation on the effects of the groundfish fisheries on the short-tailed albatross under the jurisdiction of the FWS concluded that BSAI and GOA groundfish fisheries would adversely affect the short-tailed albatross and would result in the incidental take of up to two birds per year, but would not jeopardize the continued existence of that species (FWS 1989). Subsequent consultations for changes to the fishery that might affect the short-tailed albatross also concluded no jeopardy (FWS 1995, FWS 1997). The US Fish and Wildlife Service does not intend to renew consultation for the 1998 groundfish fisheries.

**Spectacled Eider.** These sea ducks feed on benthic mollusks and crustaceans taken in shallow marine waters or on pelagic crustaceans. The marine range for spectacled eider is not known, although Dau and Kitchinski (1977) review evidence that they winter near the pack ice in the northern Bering Sea. Spectacled eider are rarely seen in U.S. waters except in August through September when they molt in northeast Norton Sound and in migration near St. Lawrence Island. The lack of observations in U.S. waters suggests that, if not confined to sea ice polyneas, they likely winter near the Russian coast (FWS 1993). Although the species is noted as occurring in the GOA and BSAI management areas no evidence that they interact with these groundfish fisheries exists.

**Conditions for Reinitiation of Consultation.** For all ESA listed species, consultation must be reinitiated if: the amount or extent of taking specified in the Incidental Take Statement is exceeded, new information reveals effects of the action that may affect listed species in a way not previously considered, the action is subsequently modified in a manner that causes an effect to listed species that was not considered in the biological opinion, or a new species is listed or critical habitat is designated that may be affected by the action.

**Impacts of the Alternatives on Endangered or Threatened Species.** None of the alternatives under consideration would affect the prosecution of the scallop fisheries of the GOA or BSAI in a way not previously considered in the above consultations. None of the alternatives would affect the prey or habitat of listed species, or takes of listed species. Therefore, none of the alternatives are expected to have a significant impact on endangered, threatened, or candidate species.

### 2.3 Impacts on Marine Mammals

Marine mammals not listed under the ESA that may be present in the BSAI include cetaceans, [minke whale (*Balaenoptera acutorostrata*), killer whale (*Orcinus orca*), Dall's porpoise (*Phocoenoides dalli*), harbor porpoise (*Phocoena phocoena*), Pacific white-sided dolphin (*Lagenorhynchus obliquidens*), and the beaked whales (e.g., *Berardius bairdii* and *Mesoplodon spp.*)] as well as pinnipeds [northern fur seals (*Callorhinus ursinus*), and Pacific harbor seals (*Phoca vitulina*)] and the sea otter (*Enhydra lutris*).

None of the alternatives would affect the abundance of available prey or habitat for marine mammals, or takes of marine mammals. Therefore, none of the alternatives are expected to have a significant impact on marine mammals.



**2.4 Coastal Zone Management Act**

Implementation of each of the alternatives would be conducted in a manner consistent, to the maximum extent practicable, with the Alaska Coastal Management Program within the meaning of Section 30(c)(1) of the Coastal Zone Management Act of 1972 and its implementing regulations.

**2.5 Conclusions or Finding of No Significant Impact**

None of the alternatives are likely to significantly affect the quality of the human environment, and the preparation of an environmental impact statement for the proposed action is not required by Section 102(2)(C) of the National Environmental Policy Act or its implementing regulations.

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Assistant Administrator for Fisheries, NOAA

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Date

### **3.0 REGULATORY IMPACT REVIEW: ECONOMIC AND SOCIOECONOMIC IMPACTS OF THE ALTERNATIVES**

This section provides information about the economic and socioeconomic impacts of the alternatives including identification of the individuals or groups that may be affected by the action, the nature of these impacts, quantification of the economic impacts if possible, and discussion of the trade offs between qualitative and quantitative benefits and costs.

The requirements for all regulatory actions specified in E.O. 12866 are summarized in the following statement from the order:

In deciding whether and how to regulate, agencies should assess all costs and benefits of available regulatory alternatives, including the alternative of not regulating. Costs and benefits shall be understood to include both quantifiable measures (to the fullest extent that these can be usefully estimated) and qualitative measures of costs and benefits that are difficult to quantify, but nevertheless essential to consider. Further, in choosing among alternative regulatory approaches, agencies should select those approaches that maximize net benefits (including potential economic, environment, public health and safety, and other advantages; distributive impacts; and equity), unless a statute requires another regulatory approach.

This section also addresses the requirements of both E.O. 12866 and the Regulatory Flexibility Act (RFA) to provide adequate information to determine whether an action is "significant" under E.O. 12866 or will result in "significant" impacts on small entities under the RFA.

E. O. 12866 requires that the Office of Management and Budget review proposed regulatory programs that are considered to be "significant". A "significant regulatory action" is one that is likely to:

- (1) Have an annual effect on the economy of \$100 million or more or adversely affect in a material way the economy, a sector of the economy, productivity, competition, jobs, the environment, public health or safety, or State, local, or tribal governments or communities;
- (2) Create a serious inconsistency or otherwise interfere with an action taken or planned by another agency;
- (3) Materially alter the budgetary impact of entitlements, grants, user fees, or loan programs or the rights and obligations of recipients thereof; or
- (4) Raise novel legal or policy issues arising out of legal mandates, the President's priorities, or the principles set forth in this Executive Order.

A regulatory program is "economically significant" if it is likely to result in the effects described above. The RIR is designed to provide information to determine whether the proposed regulation is likely to be "economically significant."

#### **3.1 Economic Impact on Small Entities**

The objective of the RFA is to require consideration of the capacity of those affected by regulations to bear the direct and indirect costs of regulation. If an action will have a negative significant impact on a substantial number of small entities, an Initial Regulatory Flexibility Analysis (RFA) must be prepared to identify the need for the

action, alternatives, potential costs and benefits of the action, the distribution of these impacts, and a determination of net benefits.

The small Business Administration has defined all fish-harvesting or hatchery businesses that are independently owned and operated, not dominant in their field of operation, with annual receipts not in excess of \$3,000,000 as small businesses. In addition, seafood processors with 500 employees or fewer, wholesale industry members with 100 employees or fewer, not-for-profit enterprises, and government jurisdictions with a population of 50,000 or less are considered small entities. NMFS has determined that a "substantial number" of small entities would generally be 20 percent of the total universe of small entities affected by the regulation. A regulation would have a negative "significant impact" on these small entities if it reduced annual gross revenues by more than 5 percent, increased total costs of production by more than 5 percent, or resulted in compliance costs for small entities that are at least 10 percent higher than compliance costs as a percent of sales for large entities.

Although all vessels participating in the Alaska scallop fishery would be considered small entities, none of the alternatives is expected to result in a "significant regulatory action" as defined in E.O. 12866. Recent harvests of Alaska scallops have averaged about 750,000 pounds, which is well below the OY maximum proposed under Alternative 2. Landings are not expected to be significantly constrained by the proposed OY definition, and hence, no negative significant impacts are expected.

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7.0 Scallop Species Summary

**Scallops**

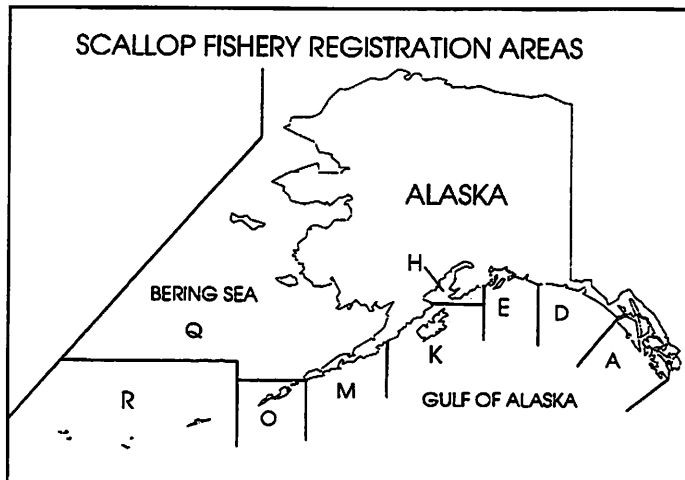
**Biology:** Weathervane scallops (*Patinopectin caurinus*), are distributed from Point Reyes, California, to the Pribilof Islands, Alaska. The highest known densities in Alaska have been found to occur in the Bering Sea, off Kodiak Island, and along the eastern gulf coast from Cape Spencer to Cape St. Elias. Weathervane scallops are found from intertidal waters to depths of 300 m, but abundance tends to be greatest between depths of 40-130 m on beds of mud, clay, sand, and gravel. Sexes are separate and mature male and female scallops are distinguishable based on gonad color. Although spawning time varies with latitude and depth, weathervane scallops in Alaska spawn in May to July depending on location. Eggs and spermatozoa are released into the water, where the eggs become fertilized. After a few days, eggs hatch, and larvae rise into the water column and drift with ocean currents. Larvae are pelagic and drift for about one month until metamorphosis to the juvenile stage when they settle to the bottom. Weathervane scallops begin to mature by age 3 at about 7.6 cm (3 inches) in shell height (SH), and virtually all scallops are mature by age 4. Growth, maximum size, and size at maturity vary significantly within and between beds and geographic areas. Weathervane scallops are long-lived; individuals may live 28 years old or more. Scallops are likely prey to various fish and invertebrates during the early part of their life cycle. Flounders are known to prey on juvenile weathervane scallops, and seastars may also be important predators.

Several other species of scallop found in the EEZ off Alaska have commercial potential. These scallops grow to smaller sizes than weathervanes, and thus have not been extensively exploited in Alaska. Pink scallops, *Chlamys rubida*, range from California to the Pribilof Islands. Pink scallops are found in deep waters (to 200 m) in areas with soft bottom, whereas spiny scallop occur in shallower (to 150 m) areas characterized by hard bottom and strong currents. Pink scallops mature at age 2, and spawn in the winter (January-March). Maximum age for this species is 6 years. Spiny scallops, *Chlamys hastata*, are found in coastal regions from California to the Gulf of Alaska. Spiny scallops grow to slightly larger sizes (75 mm) than pink scallops (60 mm). Spiny scallops also mature at age 2 (35 mm) and spawn in the autumn (August-October). Rock scallops, *Crassadoma gigantea*, range from Mexico to Unalaska Island. Rock scallops are found in relatively shallower water (0-80 m) with strong currents. Apparently, distribution of these animals is discontinuous, and the abundance in most areas is low. These scallops attach themselves to rocks, attain a large size (to 250 mm), and exhibit fast growth rates. Rock scallops are thought to spawn during two distinct periods, one in the autumn (October -January), and one in the spring-summer (March-August).

**Management:** The weathervane scallop resource consists of multiple, discrete, self sustaining populations that are managed as separate stock units. Scallop stocks in Alaska have been managed under a federal fishery management plan (FMP) since July 26, 1995, which established a 1 year interim closure of federal waters to scallop fishing to prevent uncontrolled fishing. Amendment 1, which allowed scallop fishing under a federal management regime, was approved July 10, 1996 and fishing resumed on August 1. Amendment 1 provided for fishery management through permits, registration areas and districts, seasons, closed waters, gear restrictions, efficiency limits, crab bycatch limits, scallop catch limits, inseason adjustments, and observer monitoring. Most of these regulations were developed by the State prior to 1995. Dredge size is limited to a

**A summary of management measures established under amendments to the federal scallop FMP.**

Amendment	Date	Action
1	July 1996	Allowed fishing after a 1 year closure of Federal waters.
2	July 1997	Established a federal scallop vessel moratorium.
3	Dec 1997	If approved, would defer all management (except limited access) to State.
4	1999?	Would establish a permanent limited access system.
5	1998	Essential Fish Habitat



maximum width of 15 feet, and only 2 dredges may be used at any one time. In the Kamishak District of Cook Inlet, only 1 dredge with a 6' maximum width is allowed. Dredges are required to have rings with a 4" minimum inside diameter. To reduce incentives to harvest small scallops, crew size on scallop vessels is limited to 12 persons and all scallops must be manually shucked. Dredging is prohibited in areas designated as crab habitat protection areas, similar to the groundfish FMPs. In June 1995, the Council adopted a 3-year vessel moratorium to restrict new entry into the scallop fishery while a more comprehensive plan was being developed. The moratorium approved as Amendment 2, effective August 1, 1997. To qualify under the proposed moratorium, a vessel must have made at least one landing in

1991, 1992, or 1993, or must have participated for at least 4 years between 1980 and 1993. The moratorium also limits reconstruction and replacement of vessels to a 20% maximum increase in original qualifying length overall.

**Weathervane scallop registration areas, seasons, GHL's (pounds, shucked), and crab bycatch limits established for the 1997 scallop fishery, by area.**

<u>Area</u>	<u>GH L</u> <u>(pounds)</u>	<u>Fishing</u> <u>Season</u>	<u>Crab Bycatch Limits</u>		
			<u>king</u> <u>crab</u>	<u>Tanner</u> <u>crab</u>	<u>Snow</u> <u>crab</u>
D - District 16	0 - 35,000	Jan 10 - Dec 31	n/a	n/a	n/a
D - Yakutat	0 - 250,000	Jan 10 - Dec 31	n/a	n/a	n/a
E - Eastern PWS	0 - 50,000	Jan 10 - Dec 31	n/a	500	n/a
Western PWS	combined	Jan 10 - Dec 31	n/a	130	n/a
H - Cook Inlet (Kamishak)	0 - 20,000	Aug 15 - Oct 31	60	24,992	n/a
Cook Inlet (Outer area)	combined	Jan 1 - Dec 31	98	2,170	n/a
K - Kodiak (Shelikof)	0 - 400,000	July 1 - Feb 15	35	51,000	n/a
Kodiak (Northeast)	combined	July 1 - Feb 15	50	91,600	n/a
M - AK Peninsula	0 - 200,000	July 1 - Feb 15	79	45,300	n/a
O - Dutch Harbor	0 - 170,000	July 1 - Feb 15	10	10,700	n/a
Q - Bering Sea	0 - 600,000	July 1 - Feb 15	500	238,000	172,000
R - Adak	0 - 75,000	July 1 - Feb 15	50	10,000	n/a

**Fishery:** In 1996, a total of 9 vessels participated in the scallop fishery statewide. Scallop vessels average 90-110 ft long. Scallops are harvested using dredges of standard design. Weathervane scallops are processed at sea by manual shucking, with only the meats (adductor muscles) retained. Scallops harvested in Cook Inlet are bagged and iced, whereas scallops harvested from other areas are generally block frozen at sea. The fishery has occurred almost exclusively in the EEZ in recent years, but some fishing in State waters occurs off Yakutat, Dutch Harbor, and Adak.

**Catch History:** Since 1967, when the first landings were made, fishing effort and total scallop harvest (weight of shucked meats) have varied annually. Total commercial harvest of weathervane scallops has fluctuated from a high of 157 landings totaling 1,850,187 pounds of shucked meats by 19 vessels in 1969 to no landings in 1978. Prices and demand for scallop have remained high since fishery inception. Prior to 1990, about two-thirds of the scallop harvest has been taken off Kodiak Island and about one-third has come from the Yakutat area; other areas had made minor contributions to overall landings. Harvests in 1990 and 1991 were the highest on record since the early 1970's. The 1992 scallop harvest was even higher at 1,810,788 pounds. The increased harvests in the 1990's occurred with new exploitation in the Bering Sea. The reduced 1995 catch was due to implementation of an interim closure in the EEZ from 2/23/96 to 8/1/96.

The 1996 and 1997 fishery can be summarized as follows:

<u>AREA</u>	<u>1996</u>	<u>1997</u>
Cook Inlet		
No. of vessels	4*	3
Landings (lbs)	28,228	20,336
Outside		
No. of vessels	4	6
Landings (lbs)	704,196	765,707

\*one additional vessel fished in state waters only.

**Landings and effort in the Alaska weathervane scallop fishery, 1980 - 1997.**

<u>Year</u>	<u># of</u> <u>Vessels</u>	<u>Landings</u> <u>(pounds)</u>	<u>Price</u> <u>(\$/lb)</u>
1980	8	633,000	4.32
1981	18	924,000	4.05
1982	13	914,000	3.77
1983	6	194,000	4.88
1984	10	390,000	4.47
1985	8	648,000	3.12
1986	9	683,000	3.66
1987	4	583,000	3.38
1988	4	341,000	3.49
1989	7	526,000	3.68
1990	9	1,489,000	3.37
1991	7	1,191,000	3.76
1992	7	1,811,000	3.88
1993	15	1,429,000	5.00
1994	16	1,235,000	6.00
1995	10	283,000	n/a
1996	9	732,424	6.38
1997	9	786,043	6.50



## 8.0 Tables and Figures

Table 1. Twenty most frequently caught species by weight as recorded by scallop observers during the 1996/97 Alaska Peninsula Area scallop season. Non target commercial species<sup>a</sup> accounted for 8.6% of the twenty most frequently caught species by weight.

Rank	Species	Scientific Name	% of Total Catch
1	weathervane scallops	<i>Patinopecten caurinus</i>	70.3%
2	starfish	Class Stelleroidea	11.4%
3	arrowtooth flounder	<i>Atheresthes stomias</i>	4.8%
4	basket starfish	<i>Gorgonocephalus caryi</i>	4.6%
5	weathervane shells	<i>P. caurinus</i>	2.9%
6	sea urchin	Family Strongyocentrotidae	1.6%
7	Pacific Cod	<i>Gadus macrocephalus</i>	0.7%
8	snails	Class Gastropoda	0.5%
9	Tanner crab	<i>Chionoecetes bairdi</i>	0.5%
10	kelp, rocks, etc.		0.5%
11	flathead sole	<i>Hippoglossoides elassodon</i>	0.3%
12	walleye pollock	<i>Theragra chalcogramma</i>	0.2%
13	hermit crab	Family Paguridae	0.2%
14	Greenland turbot	<i>Reinhardtius hippoglossoides</i>	0.2%
15	bay scallops	Chlamys spp	0.2%
16	brown box crab	<i>Lopholithodes foraminatus</i>	0.1%
17	snail eggs	Class Gastropoda	0.1%
18	man-made debris		0.1%
19	worms unident	Class Polychaeta	0.1%
20	shrimp	Family Pandalidae	0.1%

<sup>a</sup>Commercial species caught in declining order of poundage: arrowtooth flounder, sea urchin, Pacific cod, *Chionoecetes bairdi*, flathead sole, walleye pollock, Greenland turbot, bay scallops, and shrimp.

Table 2. Summary of the most frequently caught species, by percent weight in sampled dredges, as recorded by scallop observers during the 1996/97 scallop fishery.

Species Category	Management Area / District					
	Yakutat	Kodiak			Alaska Peninsula	Bering Sea
		Northeast	helikof	Semidi		
weathervane scallops	84.7	54.1	76.8	51.8	70.3	87.5
<b>PROHIBITED SPECIES BYCATCH</b>						
Tanner crab	<.1	0.9	0.1	0.9	0.5	0.8
snow crab, opilio	0	0	0	0	0	3.7
king crab	0	0	0	<.1	0	0
Dungeness crab	<.1	0	<.1	0.8	0	0
Pacific halibut	0.2	0.5	0.2	<.1	0	<.1
<b>OTHER COMMERCIAL SPECIES</b>						
skates	1.9	4.9	3.1	2.5	0	1.0
arrowtooth flounder	0.3	0.3	0.4	0.3	4.8	0.8
rock sole	<.1	0.2	<.1	0.5	0.1	0.2
Dover sole	0.2	0.1	<.1	0.1	0	0.1
yellowfin sole	0	0	<.1	0.7	0	<.1
rex sole	0.1	0.6	0	0	0.1	0
flathead sole	0.2	0.5	0.5	1.2	0.3	0.3
butter sole	<.1	0.4	0	0.8	0	<.1
Pacific cod	0.1	1.2	<.1	0.9	0.7	0.4
starry flounder	<.1	0	0	1.6	0	0
walleye pollock	<.1	0	<.1	<.1	0.2	0.4
bay scallops	<.1	0	<.1	<.1	0.2	0
sea urchins	0	0	<.1	<.1	1.6	<.1
octopus	0	0	0.1	0	<.1	<.1
Alaska plaice	0	0	0.6	0.1	0	0
sea cucumber	<.1	0.1	<.1	<.1	0	0.2
<b>MISCELLANEOUS</b>						
starfish	4.5	32.4	2.7	15.7	11.4	0.1
basket star	<.1	<.1	<.1	3.8	4.6	0
weathervane shells	3.7	1.8	5.5	8.0	2.9	2.1
kelp, rocks, etc.	1.2	1.4	6.5	9.0	0.5	0.8
man-made debris	<.1	0.1	0.2	0.2	0.1	0.6
Misc. invertebrates	1.7	0.3	0.8	0.1	1.4	0.8
Mis. fish	0.3	0	0.1	0.2	0.3	<.1

Table 3. Estimated bycatch , in numbers of individuals, and confidence intervals for *C. opilio*, *C. bairdi*, Dungeness, and king crab, and halibut from the 1996/97 statewide scallop fishery.

Management Area	n <sup>b</sup>	Bycatch Estimates by Species <sup>a</sup>									
		<i>C. opilio</i>		<i>C. bairdi</i>		Dungeness		king crab		halibut	
		Bycatch	95% CI	Bycatch	95% CI	Bycatch	95% CI	Bycatch <sup>c</sup>	95% CI	Bycatch	95% CI
Yakutat	82	0	NA	6,872	4,641-9,588	38	7-77	0	NA	150	91-151
District 16	26	0	NA	669	274-1,123	9	NA	0	NA	68	30-68
<b>Kodiak</b>											
Northeast District	28	0	NA	27,722	10,298-48,407	0	NA	0	NA	202	79-384
Shelikof District	104	0	NA	11,285	9,408-13,257	1,008	584-1,508	0	NA	440	318-569
Semidi District	38	0	NA	8,902	3,798-15,750	4,554	2,504-7,068	9	NA	79	5-176
Alaska Peninsula	13	0	NA	19,045	12,604-26,362	10	NA	0	NA	25	NA
Bering Sea	63	106,935	98,033-116,196	16,642	14,227-19,373	0	NA	0	NA	124	49-229

<sup>a</sup>Estimates were calculated as bycatch per hour per boat per day x total hours dredged x number of dredges fished.

<sup>b</sup>Number of vessel days.

<sup>c</sup>Actual count, not an estimate.

Table 4. Condition of halibut as recorded by scallop observers during the 1996/97 fishing season.

MANAGEMENT AREA	CONDITION <sup>a</sup> Of HALIBUT (Number of Halibut)						Total
	Excellent	Good	Fair	Poor	Dead	Previously dead	
District 16	4	0	1	1	0	1	7
Yakutat	13	5	2	1	1	0	22
Kodiak, Northeast District	4	2	4	6	2	0	18
Kodiak, Shelikof District	20	10	8	11	4	2	55
Kodiak, Semidi District	1	4	1	3	0	0	9
Alaska Peninsula	1	0	0	1	1	0	3
Bering Sea	2	4	4	1	2	0	13
<b>Total all Areas</b>	<b>45</b>	<b>25</b>	<b>20</b>	<b>24</b>	<b>10</b>	<b>3</b>	<b>127</b>

<sup>a</sup>Condition Codes

Excellent: Vigorous body movement before and after release; could close operculum tightly; minor external injuries, if any.

Good: Feeble body movements; could close operculum tightly; minor external injuries, if any.

Fair: No body movement; could close operculum tightly; minor external injuries, if any.

Poor: No body movement; could move operculum but not tightly; severe injuries (eg. bleeding).

Dead: No body or opercular movement; probably killed in sampled haul.

Previously dead: Obviously not killed in the current haul (incidentally caught).

Table 5. Tanner crab bycatch mortality as recorded by scallop observers during the 1996/97 fishing season.

MANAGEMENT AREA	NUMBER OF TANNER CRAB OBSERVED		
	Dead	Alive	Percent Dead
District 16	34	38	47.2
Yakutat	537	373	58.9
Kodiak, Northeast District	262	1,361	16.1
Kodiak, Shelikof District	587	1,013	36.6
Kodiak, Semidi District	271	464	36.9
Alaska Peninsula	735	1,541	32.3
Bering Sea <i>C. opilio</i>	1,675	8,674	16.2
Bering Sea <i>C. bairdi</i>	210	1,454	12.6
<b>Total all Areas</b>	<b>4,311</b>	<b>14,918</b>	<b>28.9</b>

Table 6. Number and weight of discarded scallops as recorded by scallop observers during the 1996/97 fishing season.

MANAGEMENT AREA	Number of Sampled Scallops		Weight of Sampled Scallop	
	Intact	Broken	Intact	Broken
Yakutat	35,697	19,595	8,376	7,212
District 16	19,239	2,684	4,031	735
Yakutat Total	54,936	22,279	12,407	7,947
Kodiak, Northeast District	908	982	228	493
Kodiak, Shelikof District	34,398	29,337	7,722	9,314
Kodiak, Semidi District	254	974	126	531
Kodiak Total	35,560	31,293	8,076	10,338
Alaska Peninsula	1,858	2,546	281	711
Bering Sea	1,397	2,174	588	1,097
Total	93,751	58,292	21,352	20,093

Table 7. Estimated number and weight of intact and broken scallops in the discarded scallop catch during the 1996/97 scallop fishery.

Management Area	Intact Number		Intact Weight		Broken Number		Broken Weight		Total Number Intact+broken	Total Weight Intact+broken
	Mean	95% CI	Mean	95% CI	Mean	95% CI	Mean	95% CI		
Yakutat	654,403	545,808-772,828	152,144	127,471-179,519	512,019	432,103-597,075	143,789	122,602-166,680	1,166,422	295,933
District 16	594,598	465,351-716,840	124,860	98,939-150,282	112,638	82,188-148,605	35,039	23,600-49,970	707,236	159,899
Yakutat Total	1,249,001		277,004		624,657		178,828		1,873,658	455,832
Kodiak										
Northeast District	9,404	5,921-13,683	2,307	1,339-3,412	12,672	7,728-19,940	6,048	3,767-9,091	22,076	8,355
Shelikof District	412,477	312,151-531,298	91,600	69,853-114,774	340,815	265,836-424,079	105,574	29,444-85,174	753,292	197,174
Semidi District	2,477	1,343-3,772	1,245	637-1,957	8,734	7,263-10,185	4,755	3,930-5,549	11,211	6,000
Kodiak Total	424,358		95,152		362,221		116,377		786,579	211,529
Alaska Peninsula	16,301	9,550-22,795	2,646	1,526-3,856	17,383	9,071-27,292	4,738	2,407-7,636	33,684	7,384
Bering Sea	12,939	11,101-15,009	5,381	4,537-6,390	21,473	18,822-24,331	10,737	9,402-12,077	34,412	16,118
TOTAL	1,702,599		380,183		1,025,734		310,680		2,728,333	690,863

<sup>a</sup>Weight in pounds of unshucked scallops

Table 8. Average weight of intact and broken scallops from observer sampled discarded scallop catch during the 1996/97 fishing season.

MANAGEMENT AREA	WEIGHT <sup>a</sup>		
	Intact Scallops	Broken Scallops	Average
Yakutat	0.24	0.29	0.27
District 16	0.21	0.28	0.25
Yakutat Average	0.22	0.28	
Kodiak, Northeast District	0.38	0.52	0.45
Kodiak, Shelikof District	0.25	0.34	0.30
Kodiak, Semidi District	0.46	0.54	0.50
Kodiak Average	0.37	0.46	
Alaska Peninsula	0.15	0.26	0.21
Bering Sea	0.44	0.51	0.47
Overall Average	0.31	0.39	

<sup>a</sup>Weight in pounds.



Table 9. Scallop meat recovery by management area during the 1996/97 fishing season.

MANAGEMENT AREA	Number of Samples	PERCENT RECOVERY		
		Mean	Median	95% Confidence Interval
Yakutat	52	0.09	0.09	0.088 to 0.093
District 16	17	0.09	0.09	0.084 to 0.098
Kodiak, Northeast District	11	0.10	0.11	0.097 to 0.108
Kodiak, Shelikof District	137	0.12	0.12	0.118 to 0.122
Kodiak, Semidi District	11	0.12	0.13	0.110 to 0.131
Alaska Peninsula	13	0.11	0.11	0.108 to 0.112
Bering Sea	37	0.10	0.10	0.099 to 0.103

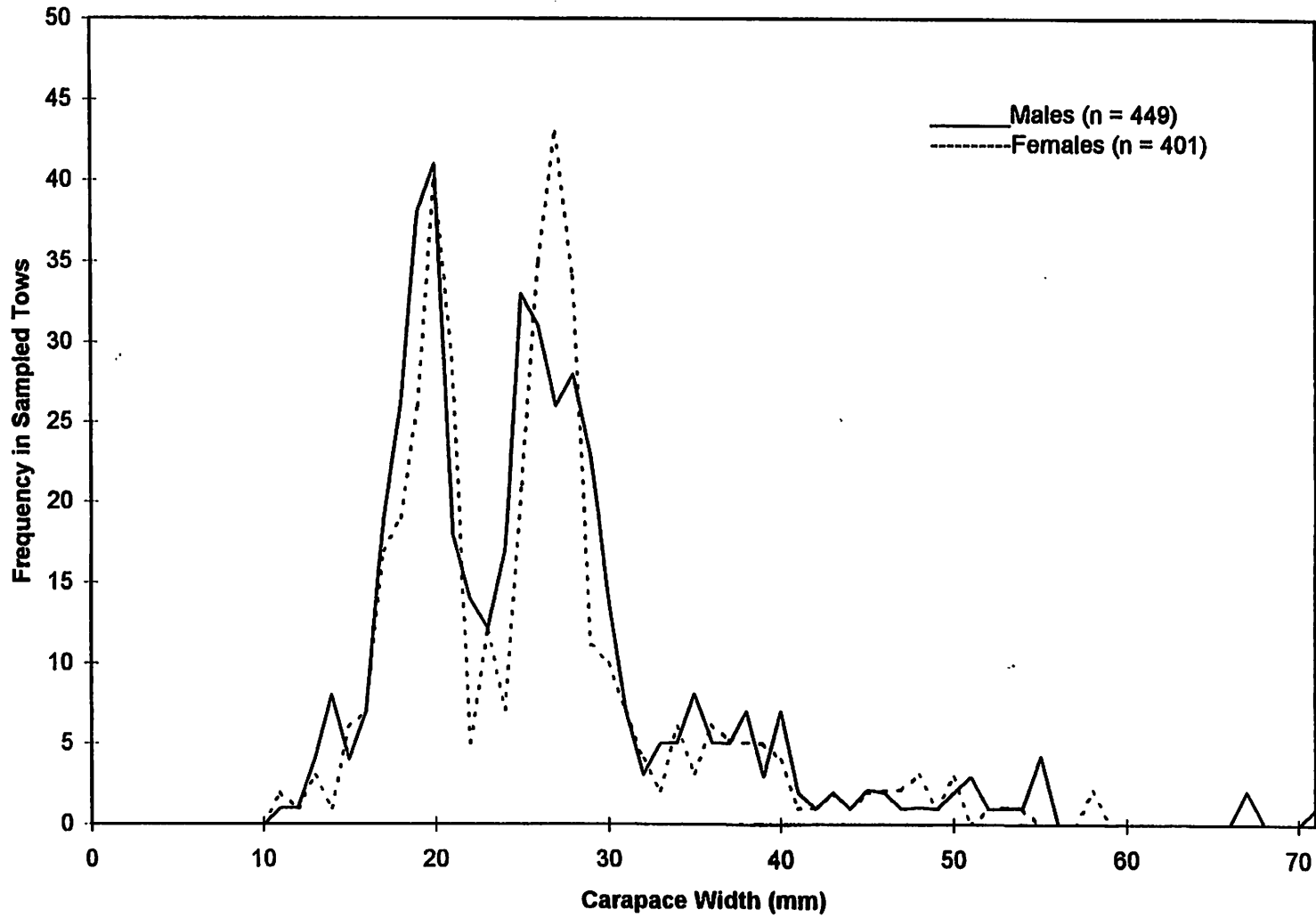


Figure 1. Tanner crab width frequency as determined from bycatch samples in the 1996/97 scallop fishery in Yakutat.

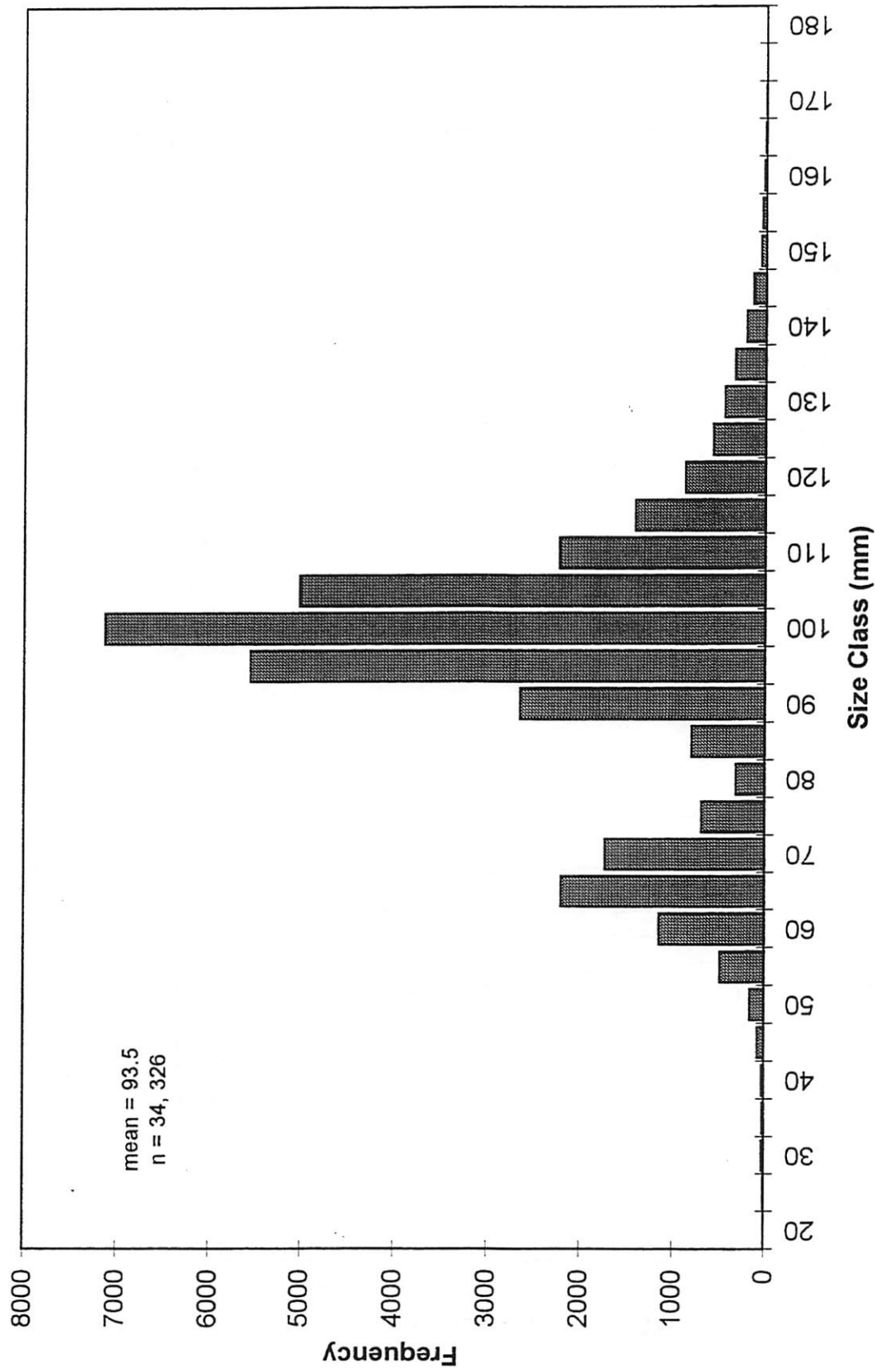


Figure 2. Size frequency of discarded scallops from observer samples in the 1996/97 scallop fishery in the Kodiak Area, District of the Kodiak Area.

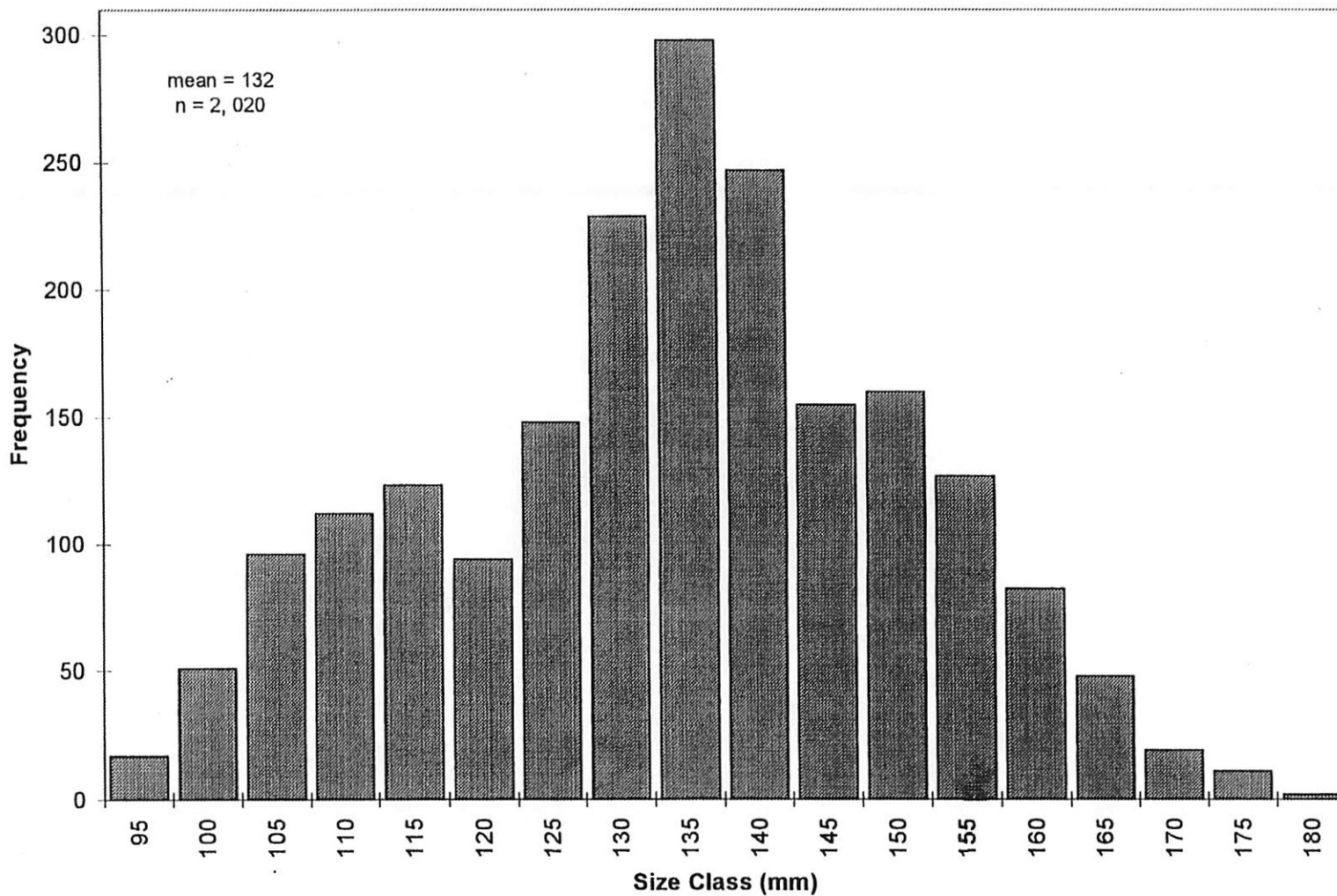


Figure 3. Size frequency of observer sampled retained scallop catch (males, females, and unknown) from the 1996/97 scallop fishery in District 16.