

MEMORANDUM

TO: Council and AP Members

FROM: Chris Oliver  
Executive Director

*DO*  
*for*

ESTIMATED TIME  
8 HOURS  
ALL C-3 ITEMS

DATE: January 26, 2012

SUBJECT: BSAI crab issues

**ACTION REQUIRED**

(c) Update on Tanner crab rebuilding plan; action as necessary

**BACKGROUND**

On October 1, 2010, NMFS notified the Council that the eastern Bering Sea Tanner crab (*Chionoecetes bairdi*) stock is overfished. To comply with section 304(e)(7) of the MSA, the Council has two years from this notification to prepare and implement a Tanner crab rebuilding plan. The eastern Bering Sea Tanner crab stock was declared overfished because the survey estimate of total mature male biomass was below the minimum stock size threshold.

Overfishing is not occurring. The State of Alaska did not open the directed Tanner crab fishery for the 2010/2011 season, and the fishery will remain closed until abundance increases. While retained catch was 0 mt, total catch from all sources was estimated to be 870 mt. The overfishing level for the 2010/2011 season was 1,610 mt. Tanner crabs are incidentally taken in the groundfish, snow crab, red king crab, and scallop fisheries.

The Tanner crab rebuilding plan is a challenge because, at the time the stock was declared overfished, the stock assessment model was in the very early stages of development. Without a stock assessment model, it is not possible to estimate the required pieces of a rebuilding plan: the minimum time to rebuild, the target time to rebuild, and an estimate of the harvest rate to achieve rebuilding in the target time period. This is complicated by the need to estimate incidental harvests in the snow crab fishery in conjunction with directed and incidental catch of Tanner crab in the directed Tanner crab fishery as alternative time frames will likely be tied to these estimated harvest rates. Thus a stock assessment model is critical to development of an appropriate rebuilding plan which accurately estimates the necessary harvest rates to estimate rebuilding time frames.

Under agenda Item C-3(b), the SSC will receive a report on the progress made in developing the Tanner crab assessment model. A number of substantive issues were raised with the model parameters and assumptions that will need to be resolved before accurate rebuilding projections can be made. At this meeting, the SSC will provide guidance to the assessment authors and the Crab Plan Team for moving forward to resolve these issues in the next couple of months. The goal is for the SSC to approve the stock assessment model in June 2012. With this approved model, the rebuilding projects can be run and the impacts of alternative rebuilding times can be analyzed.

Staff will provide the Council with an update on the model development, issues related to identifying biological reference points, and draft rebuilding projections at this meeting. The preliminary alternatives

represent different rebuilding periods and ways to rebuild the stock in as short a time period as possible, taking into account the status and biology of the stock, the needs of fishing communities, and the interaction of Tanner crab within the marine ecosystem. An action plan based on draft rebuilding projections was approved by the Council in October 2011. A revised version of this action plan including the Council's approved problem statement is attached as **Item C-3(c)**. If the model is approved in June, the Council could conduct initial review in October and final action in December, 2012. Note that, in the absence of a rebuilding plan, the fishery will remain closed unless abundance increases sufficiently to meet the established threshold for opening the fishery.

**Action Plan – Bering Sea Tanner Crab Rebuilding Plan**  
Rev. January 2011

**Proposed action**

Amend the BSAI King and Tanner Crab FMP to establish a rebuilding plan for the overfished Bering Sea Tanner crab stock.

**Purpose and need**

**The Council developed the following problem statement for this analysis:**

*The Bering Sea Tanner crab stock is overfished. To comply with provisions of the Magnuson-Stevens Fishery Conservation and Management Act (MSA) a rebuilding plan must be implemented prior to the 2012/13 fishing season.*

*The Council is encouraged with the progress made on the Tanner crab stock assessment model and recognizes the importance of the model in developing an effective rebuilding plan. A fully developed model is integral in estimating the maximum/minimum time to rebuild and in selecting a target year for rebuilding. This action focuses on the directed Tanner crab and snow crab fisheries as the main sources of fishing related mortality of Tanner crab. The Council notes that Tanner crab bycatch in the groundfish fisheries have decreased in recent years due to changes in groundfish fishery management.*

*This action is necessary to comply with requirements of the MSA to rebuild the Tanner crab stock. Currently, the state is preventing overfishing. ADF&G has closed the directed Tanner crab fishery in 2010/11 and will likely do the same in 2011/12 based on the application of the state's harvest strategy. In the TAC setting process, the state also has the flexibility to constrain the snow crab fishery to prevent overfishing of Tanner crab.*

**Analysis**

EA

**Range of alternatives**

- Alternative 1: Status Quo – No action
- Alternative 2: Rebuild the stock in the minimum timeframe possible ( $T_{MIN}$ )
- Alternative 3-?: Rebuild the stock in X years ( $T_{TARGET}$ ) where  $T_{TARGET} > T_{MIN}$ . [Note the target (X) years will be determined during the course of the analysis using the projection model].
- Alternative X: Rebuild the stock in the maximum time frame allowable ( $T_{MAX}$ ) noting that  $T_{MAX}$  should not exceed 10 years unless the stock is not projected to rebuild within 10 years under  $F = 0$ .

Note that Alternatives 3-X may involve a combination of catch constraints on the directed Tanner crab and directed snow crab fisheries.

Options (apply to all alternatives): Area closures in the directed snow crab fishery to reduce Tanner crab bycatch

**Applicable laws**

MSA, NEPA

### Staff resources

NPFMC	Diana Stram	Project and document coordination, work with AFSC and ADF&G staff to finalize impact analysis and EA sections (additional NPFMC staff TBD)
ADFG	Karla Bush	Consultation re: BOF and ADF&G management
AFSC	Lou Rugolo, Jack Turnock	Tanner crab projection model, analysis of alternatives on rebuilding Tanner crab stock, catch constraints on Tanner and snow crab fishery
NMFS AKR	Gretchen Harrington Jason Gasper	NEPA compliance TBD
NOAA GC	Clayton Jernigan	legal guidance

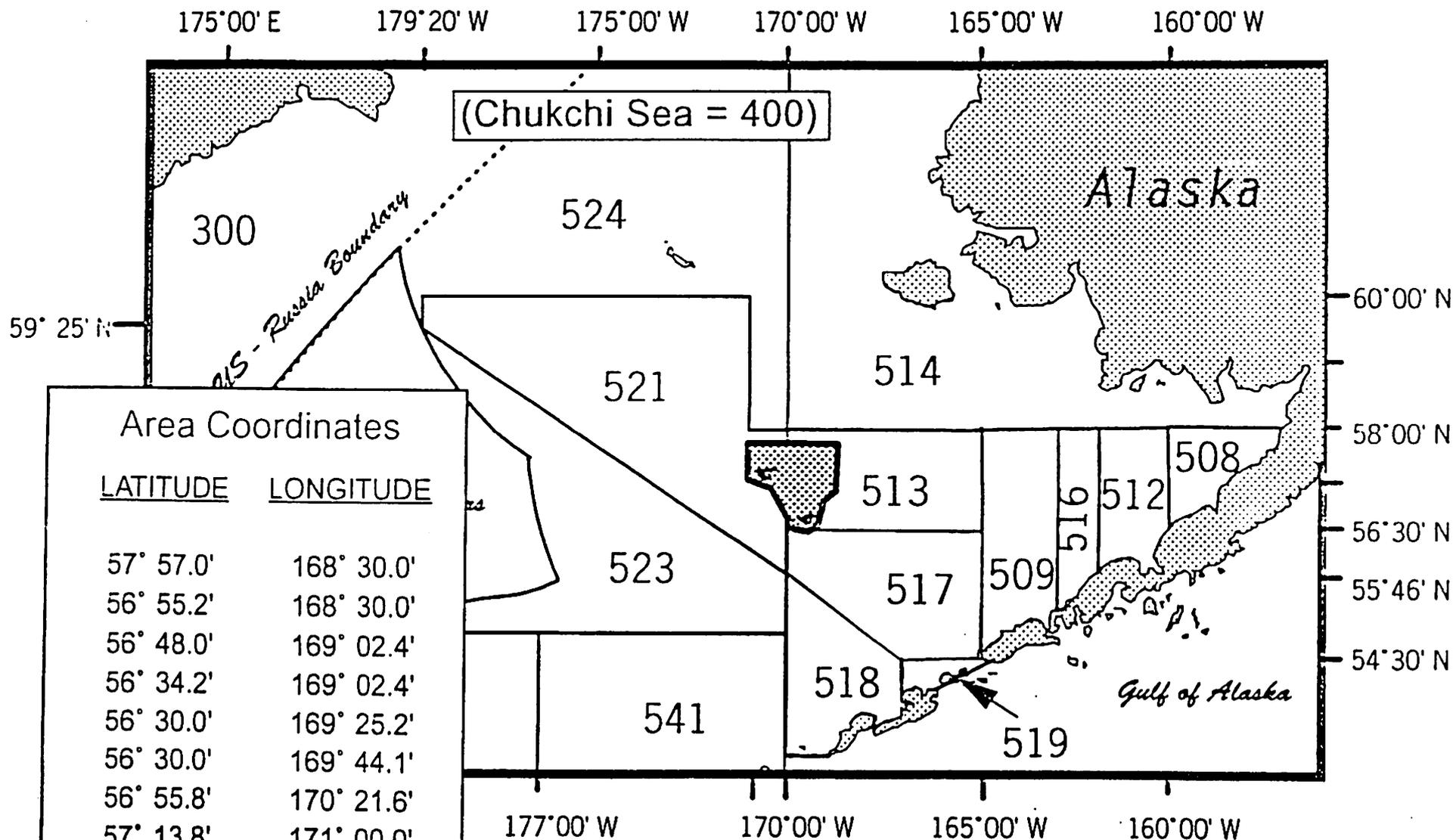
### Timeline to implementation

October 2011	Council adopts purpose statement and draft alternatives
January 2012	Crab modeling workshop on Tanner crab model, projections, <del>review proposed area closures</del>
February 2012	<b>Review of model by SSC, recommendations to analysts on rebuilding analysis considerations Council reviews preliminary review draft and draft projection analysis</b>
<del>March 2012</del>	<del>Board of Fisheries review and comments on analysis and alternatives</del>
<del>April 2012</del>	<del>Initial Review</del>
June 2012	<b>Council reviews preliminary review draft and draft projection analysis</b>
October 2012	<b>Initial review by Council, Council could select PPA</b> Board of Fisheries action/update (as needed)
December 2012	<b>Final action by Council</b>

# PRIBILOF ISLANDS AREA FOR YOUR INFORMATION

From: Artu Thomson

## HABITAT CONSERVATION ZONE



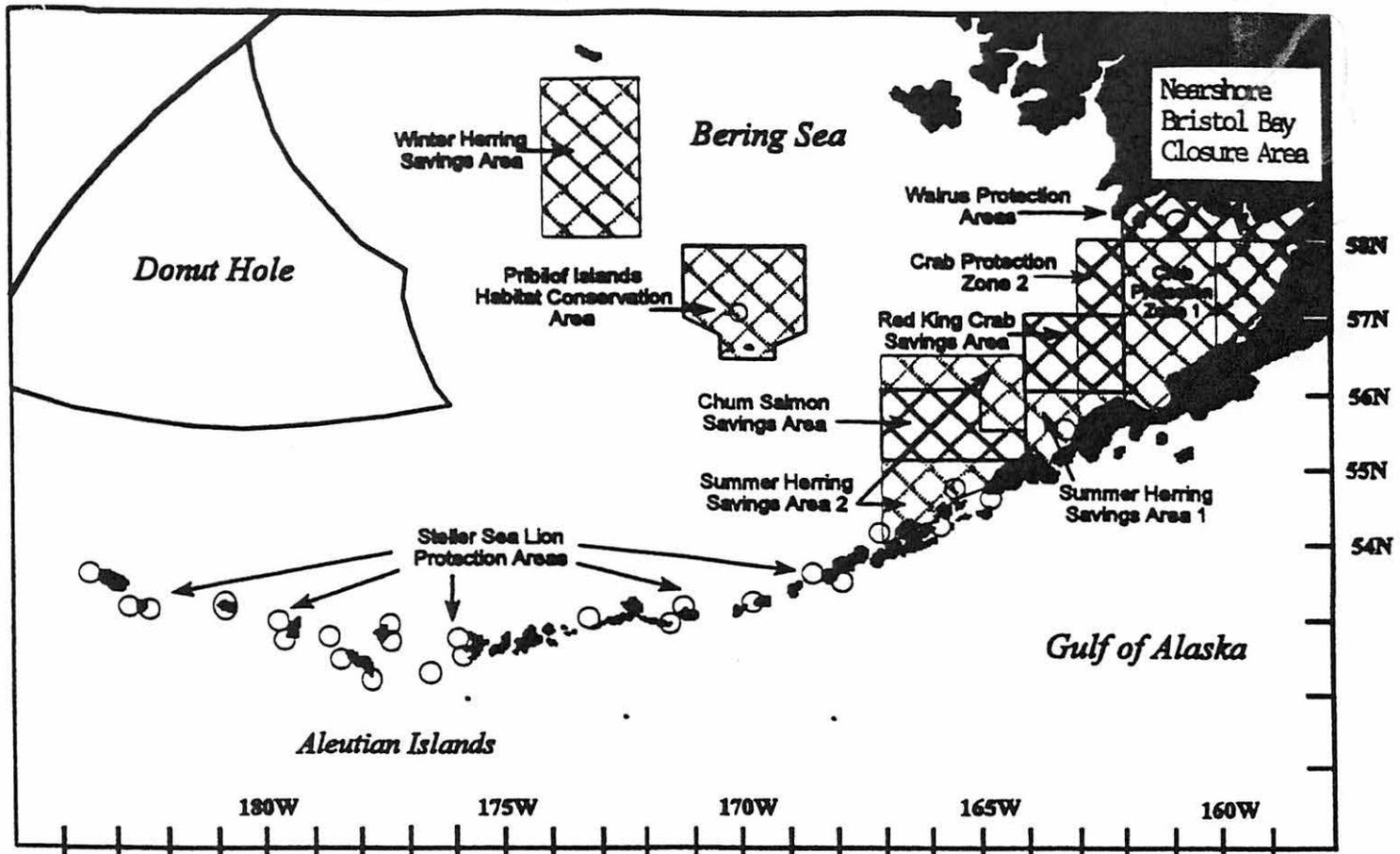
### Area Coordinates

LATITUDE    LONGITUDE

57° 57.0'	168° 30.0'
56° 55.2'	168° 30.0'
56° 48.0'	169° 02.4'
56° 34.2'	169° 02.4'
56° 30.0'	169° 25.2'
56° 30.0'	169° 44.1'
56° 55.8'	170° 21.6'
57° 13.8'	171° 00.0'
57° 57.0'	171° 00.0'
57° 57.0'	168° 30.0'

NMFS Permanent Rule:  
 Pribilof Islands Area closed to all trawling  
 year round. Effective Jan. 20, 1995.

# Bering Sea Species Protection Areas



## Nearshore Bristol Bay Closure Area

**Description of Area:** Would prohibit all trawling at all times in the EEZ within the area east of 162° W longitude with the exception of an area bounded by 159° to 160° W and 58° to 58°43' N that would remain open April 1 - June 15.

**Chum Salmon Savings Area:** closed to all trawling August 1-31 with provisional extension to October 5.

**Bristol Bay Red King Crab Area:** closed year-round to non-pelagic trawling.

**Pribilof Islands Habitat Conservation Area:** closed year-round to all trawling.

**Crab Protection Zones:** Zone 1 closed to trawling year-round.  
Zone 2 closed to trawling March 15 - June 15.

**Walrus Protection Areas:** closed to all fishing April 1 - September 30.

**Steller Sea Lion Protection Areas:** closed to all trawling year-round with some extended seasonally on January 20.

**Herring Savings Areas:** closed to all trawling when trigger reached.  
Summer Area 1 closed June 15 - July 1  
Summer Area 2 closed July 1 - August 15.  
Winter Area closed September 1 - March 1.



UNITED STATES DEPARTMENT OF COMMERCE  
National Oceanic and Atmospheric Administration  
NATIONAL MARINE FISHERIES SERVICE  
1315 East-West Highway  
Silver Spring, MD 20910

THE DIRECTOR

MAY 11 2000

MEMORANDUM FOR: D. James Baker  
Under Secretary for Oceans and Atmosphere

FROM: Penelope D. Dalton *Penelope D Dalton*

SUBJECT: Determination of a Commercial Fishery Failure  
Due to a Fishery Resource Disaster in the Snow  
Crab Fishery in the Eastern Bering Sea off  
Alaska--INFORMATION MEMORANDUM

The Governor of the State of Alaska formally requested on March 10, 2000, that the Secretary of Commerce (Secretary) determine a commercial fishery failure resource disaster in the snow crab fishery under section 312(a) of the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act). Representatives from Pribilof Islands communities and other groups also have petitioned the Secretary to make a section 312 determination for the snow crab fishery and other Bering Sea crab species (red and blue king crab, Tanner crab, and hair crab).

Such a determination would authorize the Secretary to provide funds appropriated for the purpose to the State of Alaska to assess the economic and social effects of the commercial fishery failure, to support any activity that would restore the fishery or prevent a similar failure, and assist the fishing communities affected by the failure.

The National Marine Fisheries Service (NMFS) conducted a summer trawl survey of the Bering Sea, which indicated the biomass of snow crabs declined significantly from the levels in the 1998 survey. On September 24, 1999, NMFS declared the Bering Sea snow crab resource was overfished. The North Pacific Fishery Management Council is preparing a rebuilding plan for this resource. The 2000 fishery was conducted with a harvest level of 23.5 million pounds, an 85 percent decrease from the 1999 harvest level of 136 million pounds. The evidence available to NMFS suggests that natural conditions are the causes of this dramatic reduction in this crab population.

THE ASSISTANT ADMINISTRATOR  
FOR FISHERIES



I find that the apparent collapse of the Bering Sea snow crab resource in 2000 and, in all likelihood 2001 and beyond, has resulted in a commercial fishery failure due to a fishery resource disaster as provided under the Magnuson-Stevens Act.

Attachment

DETERMINATION OF A COMMERCIAL FISHERY FAILURE  
AFFECTING THE 2000 BERING SEA SNOW CRAB  
(CHIONOECETES OPILIO) FISHERY

A precipitous decline in the Bering Sea snow crab abundance has occurred in the eastern Bering Sea. The Governor of the State of Alaska, as well as the Pribilof Island communities of St. George and St. Paul, have petitioned the Secretary of Commerce (Secretary) to make the determination, pursuant to section 312(a) of the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act), that a commercial fishery failure has occurred in the Bering Sea snow crab fishery due to a fishery resource disaster. In addition, representatives from Pribilof communities also expressed concern that other Bering Sea crab stocks, such as red and blue king crab, Tanner crab, and hair crab are suffering a resource disaster.

Section 312(a) of the Magnuson-Stevens Act, 16 U.S.C. 1861a, authorizes the Secretary to exercise discretion in determining whether there is a commercial fishery failure due to a fishery resource disaster as a result of:

- a. natural causes;
- b. man-made causes beyond the control of fishery managers to mitigate through conservation and management measures; or
- c. undetermined causes.

Determination of a fishery resource disaster

The National Marine Fisheries Service (NMFS) 1999 summer trawl survey of the Bering Sea indicated the biomass of both male and female snow crabs declined significantly from levels observed during the 1998 survey. The 1999 estimate of male crabs 4 inches (industry-standard minimum size) and larger dropped 63% from the prior year and all other components of the stock also declined significantly. Currently, the stock is 60% of the minimum stock size threshold, which represents one half the long-term average mature biomass as defined in the Federal Fishery Management Plan for the Bering Sea and Aleutian Inlands King and Tanner Crab (FMP).

Collapse of the Bering Sea snow crab stocks, as evidenced by severe lack of recruitment into the population, precipitated a guideline harvest level reduction of over 85% in the snow crab fishery in the year 2000. The 2000 guideline harvest level is:

snow crab was established at 28.5 million pounds compared to the 1999 harvest level of 196 million pounds. Owing to the low biomass of mature crabs, NMFS classified the snow crab stock as "overfished" in 1999 and a rebuilding plan is being prepared by the North Pacific Fishery Management Council. The prospects for a 2001 fishery are uncertain.

Bristol Bay red king crab (Paralithodes camtschaticus) is not suffering a fishery resource disaster. The abundance index of legal male red king crabs was 11.0 million crabs, representing a 49% increase from last year and is near the 20-year average. During 1996-1999, the Bristol Bay red king crab fishery yielded 9.4, 8.9, 14.3, 11.2 million pounds worth \$33.5, \$28.9, \$37.3, and \$70 million in ex-vessel values, respectively. Thus, this stock is supporting a productive fishery.

King crab fisheries off St. Matthew and Pribilof Islands were closed in 1999 owing to low stock size and associated high degree of uncertainty. In 1999, the abundance of Pribilof Islands blue king crabs (P. platypus) continued an ongoing decline and fell below the threshold established for this fishery. On the other hand, estimates of red king crabs in the Pribilof Islands area increased significantly from 1998; however, most red king crabs were captured in a single tow, making the reliability of that estimate extremely low. Historically, red king crabs have not been abundant in the Pribilof Islands and landings taken incidentally during the blue king crab fishery. Survey estimates for St. Matthew Island blue king crabs indicated dramatic declines of both male and female crabs in all size categories in 1999. Owing to the low biomass of mature crabs, the St. Matthew blue king crab stock was classified as "overfished" in 1999 and a rebuilding plan is being prepared. The decline in abundance for these red and blue king crab stocks constitutes a fishery resource disaster.

The Tanner crab (Chionoecetes bairdi) fishery has been closed since 1997 due to depressed stock conditions. The estimated spawning biomass of this stock is low and the stock is considered "overfished" under the Magnuson-Stevens Act. A rebuilding plan is under public review. Over the past few decades, this stock appears to have experienced a 13-14 year recruitment cycle. The NMFS survey revealed high abundance of juvenile Tanner crabs in 1999, suggesting that an apparent strong recruitment event may soon promote stock rebuilding. Once the stock exceeds the fishery threshold for two consecutive years, fishing will be resumed, perhaps as soon as January 2002.

Hair crab<sup>1</sup> (Erimacrus isenbeckii) abundance index for large males declined from 1981-1992, increased from 1992 to 1995, and is now declining again. The abundance index of 2.3 million large males is 22% lower than last year. Hair crabs constitute a small fishery in the Bering Sea. In 1998, 0.3 million pounds were taken. As with many crab stocks, recruitment is periodic. Lack of recent recruitment has led to chronic stock declines in recent years, and harvests have been cut accordingly. During 1995-1999, commercial catches were 1.9, 0.8, 0.8, 0.3, 0.2 million pounds worth \$5.2, \$1.6, \$1.6, \$1.0, and \$0.9 million, respectively. This decline is a serious concern when added to other problems with Bering Sea crab stocks.

Therefore, I find that a fishery resource disaster occurred in the Bering Sea in 2000 that significantly reduced the abundance of snow crab; St. Matthew blue king crab; and Pribilof Islands blue king crab; resulting in a considerable reduction in the harvests. Low abundances of Tanner and hair crab have contributed to the overall reduction in available resources for the fishery.

#### Determination of the cause of the fishery resource disaster

Insufficient evidence exists to determine the cause of the snow crab, St. Matthew blue king crab, and Pribilof Islands blue king crab declines. However, the evidence highly suggests the causes are natural. The crab fisheries only harvest the large male crabs, however, the 1999 NMFS trawl survey showed dramatic declines in all segments of population of these crabs. Recruitment for crab species appears to be linked to environmental factors rather than biomass, so trends in recruitment are difficult to predict.

A period of low recruitment is thought to be the reason for the decline in snow crab. These events are quite possibly triggered by corresponding events in the physical environment, such as the regime shift and warm Bering Sea conditions in 1997 and 1998. Furthermore, it was suggested that the reproductive capacity of these populations is related to the abundance or biomass of mature females, which are not affected to any great extent by the crab and groundfish fisheries. Temperature is likely to be important to snow crab population dynamics. Warmer temperatures hasten growth, but they likely have a negative effect on reproduction as faster growing males have fewer mating

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<sup>1</sup>Hair crab is not a Federally managed species under the Fishery Management Plan for Bering Sea/Aleutian Islands King and Tanner Crabs. The State of Alaska has management authority for hair crab.

opportunities prior to attaining harvestable size. On the other hand, crab larvae feed primarily on copepod nauplii, which we think are favored by warmer water in the Bering Sea. Crab megalopa settle out of the water column at very specific temperatures and depths. Therefore, survival may be favored by cooler, warmer or intermediate temperatures depending on what life stage one considers. In 1997 and 1998, water temperatures were at record high levels, triggering unusual plankton blooms and contributing to salmon run failures. Beyond temperature, we suspect advection of larvae by ocean currents to the nursery areas and cannibalism within the limited nursery areas from older crab cohorts are contributors to recruitment success or failures.

Recruitment to the St. Matthew and Pribilof Islands blue king crab stocks has been declining for several years, but the sharp decline in all sizes of crabs suggest large survey measurement errors, a large increase in natural mortality, or some combination of both. The causes of the decline in recruitment into these blue king crab stocks is unknown, however, its presumed to be environmental.

NMFS conducts annual assessments with a multi-species trawl survey, and the State of Alaska Department of Fish and Game administers onboard observer and dockside sampling programs. Little additional biological information is available to predict the population abundance. The full geographic distribution of these species is uncertain. Most basic biological productivity parameters have never been studied.

Gear selectivity, crab handling mortality, and other potential effects are virtually unknown. These uncertainties are urgently needed to be addressed so that crab stock productivity can be better understood. Better understanding will allow harvest strategies to be adjusted accordingly to promote stock rehabilitation and to diminish risks of future fishery collapses.

Therefore, I find that the cause of the fishery resource disasters are undetermined, but probably due to natural conditions.

#### Determination of a commercial fishery failure

The impacts of the snow crab decline and the early sea ice advance on communities are dramatic. St. Paul processes over 40 percent of the snow crab harvest, generating \$8 million in municipal taxes in 1999. This year, crab tax revenues are projected to be 66 to 90 percent below recent averages. St. George projects a revenue shortfall of \$900 thousand and the

inability to make bond payments for harbor completion.

Reduced revenues for both communities have already resulted in reduced plane service, reduced municipal and health care services, increased food costs, and the inability to continue capital projects. Fisheries closures for St. Matthew and Pribilof Islands blue king crab as well as Tanner crab may compound the fisheries failure experienced by these communities with the decline of the snow crab stock.

Therefore, I find that the apparent collapse of the Bering Sea snow crab in 2000 has resulted in a commercial fishery failure due to a fishery resource disaster as provided under section 312(a) of the Magnuson-Stevens Act. This determination is supported by the Governor of Alaska's declaration of a commercial fishery failure for the snow crab fishery.

*Penelope D. Dalton*  
Penelope D. Dalton  
Assistant Administrator  
for Fisheries

5/11/00  
Date

DRAFT

DRAFT

DRAFT  
MINUTES  
Scientific Statistical Committee  
April 10-12, 2000

The Scientific Statistical Committee met April 10-12, 2000 at the Hilton Hotel in Anchorage, Alaska. All members were present except Doug Larson:

Richard Marasco, Chair  
Steve Hare  
Terry Quinn  
Sue Hills

Jack Tagart, Vice Chair  
Dan Kimura  
Al Tyler  
Doug Eggers

Keith Criddle  
Seth Macinko  
Jeff Hartman

C-2. OBSERVER PROGRAM

Chris Oliver provided the SSC with a report on the March 20-21 Observer Committee meeting held in Seattle; Dan Ito and Shannon Fitzgerald reviewed the NMFS/AFSC Observer Program organizational structure, goals and current projects; and Bridgette Mansfield led the SSC through the initial review of an RIR for a proposed rule to amend regulations for observer coverage for vessels and shoreside processors.

Historically, the SSC has been a strong advocate for an effective and comprehensive observer program. For the SSC these terms imply that the observer program should representatively gather biological data from each of the fisheries engaged in harvest while simultaneously providing data for unbiased estimates of total catch. Secondly, to the extent practicable, the Observer Program should provide requisite data on compliance with the many regulatory requirements imposed on the fisheries. While the Council and SSC are in general agreement on the objectives of the Observer Program, explicit clarification and prioritization by the Council of observer requirements will facilitate improvements in all areas of the program.

C-2(a) Observer Committee Report

The Council's reconstitution of the Observer Committee follows concern over the ability of the Observer Program to meet the combined objectives of biological data gathering, catch and compliance monitoring. The Council seeks advice from the Observer Committee on means to improve the Observer Program. Concurrently, NMFS/AFSC is already engaged in a contracted independent review (MRAG) of Observer Program administrative procedures, sampling and estimation methodologies. Among specific recurring themes in the review of the Observer Program are the availability, training and retention of qualified observers, cost of observer coverage, observer logistics including deployment flexibility and work environment, elimination of perceived conflicts of interest and clarification of discrepancies between vessel records and NMFS estimates of total catch.

Dr. Ito reported that the first MRAG report on Observer procedures is expected in April. The SSC requests that the report be made available to its members soon after it is received by NMFS. MRAG's follow-up report on sampling methodologies and catch estimation is due in November 2001. Additionally, the NMFS has begun an aggressive outreach program to improve agency communications with industry, as well as active observers. To accomplish this outreach, NMFS has formed an Observer Cadre of government hired former observers who will be deployed throughout the region. The SSC believes this is a promising initiative on the part of NMFS.

The SSC is concerned that data quality and quantity may be adversely affected by observer availability. Consequently, we would like to see an evaluation of the current retention rates for observers, including an objective appraisal of the reasons observers leave the program. We believe such a review could help identify

discretionary adjustment of the prior year TAC's by the ratio of the present year ABC to the prior year ABC. Final specifications for the fishing year would be published by May 1. These would respond to public comments received on Council recommended specifications. NMFS intent is to manage the first quarter fishery based on the interim TAC's.

The SSC believes the proposal has merits and should be developed as a full amendment package. There is a potential that the interim TAC's by which the first quarter fisheries are managed would differ greatly from the final TAC's. To evaluate this potential the SSC suggests that the analysis review, in a retrospective manner, the relationship between the proposed and interim TAC's based on the non-discretionary adjustment.

The SSC also notes that the proposed non-discretionary procedure for determining interim TAC's depends on the ABC set at the December Council meeting, may not satisfy APA standards for public review and input.

The SSC recommends that an additional alternative be added to the analysis. In order to avoid interim rules and meet all administrative procedures, the Council's ABC and TAC setting process would have to occur earlier in the year based on the previous years' stock assessment data. The SSC believes that an alternative, which presents such a process, is required. The SSC notes, that an earlier ABC/TAC setting process would have several drawbacks, among them would be utilization of dated survey and biological information.

#### D-1(c) EXPERIMENTAL FISHING PERMIT (EFP) FOR HALIBUT EXCLUDERS

The SSC received a presentation from John Gauvin (Groundfish Forum) and Trevor McCabe (At-Sea Processors) regarding their application to NMFS for an experimental fishing permit to test halibut excluder device for use in BSAI and GOA cod trawl fisheries.

In general, the SSC is supportive of industry/science partnerships that attempt to lower halibut bycatch mortality rates. The SSC recommends that the Council support the application for an EFP.

#### D-2 CRAB MANAGEMENT

##### Blue King Crab (*P. Platypus*) and Snow Crab (*C. opilio*) Rebuilding Plans

Jie Zheng and Doug Pengilly presented the rebuilding plan for blue king crab and snow crab, respectively. Public testimony was given by Ray Hilborn (UW) and Arni Thompson (ACC). The 1999 NMFS Bering Sea survey indicates that the St. Matthew blue king crab stock and Bering Sea snow crab (*C. opilio*) stock have fallen below their respective minimum stock size thresholds (MSST). Pursuant to the Magnuson-Stevens Act Guidelines, a rebuilding plan for these stocks must be developed within one year from September 9, 2001. The mature biomass of both stocks is at near historic low levels. The Alaska Board of Fish has developed new harvest policies and other management measures in response to these declines. Under deferred management, the SSC believes that the issue before the Council is to determine whether the rebuilding plans meet Federal requirements.

The SSC believes these rebuilding plans meet the technical requirement of NMFS guidelines. Under the assumptions concerning recruitment, rebuilding is projected to occur within 10 years. Therefore, the SSC believes that these rebuilding plans are ready for Public review.

Analysis of the potential economic consequences of alternative rebuilding strategies is not well developed in the draft EA/RIR. In addition to providing an estimate of the expected net present value of rebuilding under the alternative strategies, the draft EA/RIR could benefit from a discussion of the distribution of economic impacts across fishery communities.

The SSC also notes that PSC caps for C. Opilio are very low (~0.113%). While these caps have not been binding in recent years, there would be a significant cost to groundfish fisheries if the cap were to become binding. The risk of fishery closure could be increased if the current strategy setting the bycatch cap were revised to be proportional to stock size even at low biomass levels.

Rebuilding simulations indicate that under the new Board of Fish precautionary harvest strategy, rebuilding will occur 6 years earlier for blue king crab than under the status quo harvest strategy at a long-term average cost of  $0.469 \times 10^6$  pounds of annual foregone harvest. For snow crab, however, simulations indicate that rebuilding will occur only a year earlier despite the new precautionary harvest strategy, at a long-term average cost of  $16.4 \times 10^6$  pounds of foregone annual harvest.

The SSC wished to convey the great uncertainty in our knowledge of crab biology on which the rebuilding simulations are based. Furthermore, the current biomass of snow crab is now at near historic low levels. Sampling variability of surveys is large, and crab availability to surveys appear highly variable. Large declines in abundance appear triggered by surges in mortality that remain unexplained. Recruitment appears to be linked to environmental factors rather than biomass, so trends in recruitment are difficult to predict. Rebuilding simulations simply assume that future recruitment will be similar to what we have observed in the past: highly variable. Rebuilding times can vary over an order of magnitude depending on the particular set of assumptions adopted. It should be emphasized therefore, that these rebuilding scenarios are highly uncertain and are not robust to mis-specification of recruitment variability. The exact functional form and parameters of the recruitment relationship are unknown. Density-dependent effects at low population levels may actually occur, but we do not have information to establish that conclusion. Therefore, precautionary management should factor in uncertainties such as these, which led to the Board of Fish actions.

An exhaustive statistical study of C. bairdi showed that most of the change in recruitment could be explained by physical oceanographic factors (Rosenkrantz 1999). In particular year-class strength is related to wind-driven currents, and bottom temperatures of the Bering Sea "cold pool". An effect of stock size on year-class strength could not be found. That is, even if the spawning stock size was reduced by the fishery, the effort was not severe enough to leave behind statistical evidence of a relationship between reduced stock size and year-class strength. C. opilio crabs are closely related to C. bairdi and are also likely to be strongly influenced by oceanographic processes. Research to look for these relationships has not yet begun.

The SSC recommends that the Crab Plan Team reconsider its definitions for "overfishing" and "overfished" to be more in line with the biology and ecology of crab species. During the development of overfishing definitions required for the Sustainable Fisheries Act, the SSC commented that fixed values for MSY and MSS1 were incompatible with species with highly variable recruitment. This recommendation was not followed, and as a result, St. Matthew blue king crab and C. opilio are now classified by NMFS as being "overfished". In reality, fishing has probably had little influence on recent declines of these populations. Rather, a massive natural mortality event between 1998 and 1999 was the most likely explanation given to the SSC for the decline in St. Matthews blue king crab. A period of low recruitment is thought to be the reason for the decline in C. opilio. These events are quite possibly triggered by corresponding events in the physical environment, such as the regime shift and warm Bering Sea conditions in 1997 and 1998. Furthermore, it was suggested that the reproductive capacity of these populations is related to the abundance or biomass of mature females, which are not affected to any great extent by the crab and groundfish fisheries. Only if the fertilization of females was compromised by the low abundance of mature males would the fishery be involved as a contributing factor. Unfortunately, the current state of knowledge precludes precise determination of reproductive capacity of these crab populations. The SSC envisions that the pathway to rational exploitation strategies based on reproductive capacity involves the collection of necessary life history information combined with length-based modeling of assessment data. The SSC notes that this development is underway and expects that the issue of biologically realistic rebuilding strategies can be revisited in 2002.

The SSC further encourages greater consistency among the various crab rebuilding plans in terms of the reference points in the rebuilding plan and the adjustments in exploitation rate. For example, the C. opilio plan has different adjustments at biomass reference levels  $MSST/2$ ,  $MSST$ , and the surrogate level for  $B_{MSY}$  than does the St. Matthew blue king crab plan.

In addition, further modeling efforts are warranted. This effort should examine the differences in the rebuilding rate of blue king crab and snow crab and determine whether some of these differences are artifacts of the modeling approaches being used.

Finally, the SSC noted in several previous minutes several problems with the current NMFS overfishing guidelines. Consequently, the SSC has prepared a draft letter to NMFS from NPFMC explaining the problems with the current NMFS guidelines and requesting greater flexibility in the development of overfishing definitions and status determination criteria. The letter also calls for NMFS to convene a workshop comprised of SSC and assessment scientists from around the country to craft a better set of procedures that have scientific credibility. If NMFS does not change its current guidelines, the SSC believes that (1) the perception will be created that NPFMC and Board of Fish management practices led to the decline of certain NPFMC populations because NMFS determined they were "overfished", even though fishing had no demonstrable effect, (2) the deserved reputation of the NPFMC for its conservative management practices will be damaged, and (3) much time and energy of NPFMC members, staff, advisory bodies, and agency personnel will be squandered on meaningless overfishing compliance activities, which would be better spent on improved science and management.

X.(a) Report on PFMC West Coast Groundfish Harvest Rate Policy Workshop

Terry Quinn served on a panel that examined biological reference points used in the harvest management of West Coast groundfish managed by PFMC. The workshop has convened by the PFMC SSC and the panel consisted of representatives of the PFMC SSC and outside experts. Several new papers presented at the workshop suggested the productivity of West Coast groundfish may be lower than in other places at the current time and that recommended fishing mortality levels may be lower than the current defaults.

The reason for having the NPFMC SSC members was in part to promote closer communication between the two SSC's and to share information. It is interesting that there are major similarities in harvest policy between the two Councils. For example, both Councils have biomass-based policies in which fishing mortality decreases at lower population levels. There are also some interesting differences in policy and implementation between the two Councils. Continuing with previous example, the NPFMC reduces fishing mortality linearly as a function of biomass, while PFMC reduces catch linearly.

At the NPFMC Council develops revisions to its current overfishing definitions, it would be beneficial to hold a joint meeting between the two SSC's to brainstorm alternatives and compare approaches. There is a commonality of philosophy and approach between the two Councils, so it would be beneficial to have greater information exchange.

X.(b) Economic Guidelines

The SSC will review and provide comments to the Council staff on the draft National Standard Guidelines on Economic Analysis by April 18, 2000.



**UNITED STATES DEPARTMENT OF COMMERCE  
National Oceanic and Atmospheric Administration**

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September 5, 2002

Memorandum For : F/AKR - Dr. James W. Balsiger  
Through for F/AKC - Dr. Douglas DeMaster  
Through F/AKC1 - Dr. Gary D. Stauffer  
From : F/AKC11 - Dr. Robert S. Otto  
Subject : Status of Eastern Bering Sea Crabs Relative to FCMA  
Overfishing Definitions in 2002.

According to the 1999 Fishery Management Plan for Bering Sea/Aleutians Islands King and Tanner Crabs (FMP), a stock is considered "overfished" if the stock size falls below the minimum stock size threshold (MSST). The MSST is 50 % of the mean total (male and female) spawning biomass (SB) for the period upon which the maximum sustainable yield (MSY) was based (50 % B msy). The sustainable yield (SY) in a given year is the MSY rule applied to the current SB (F = M = 0.2 for king crabs and F = M = 0.30 for Tanner and snow crabs). Overfishing also occurs if the SY is exceeded for a period exceeding one year. An MSST is defined in the plan for each of the six stocks in the Bering Sea that are surveyed annually by the NMFS. Pertinent statistics and Guideline Harvest Levels (GHLs) resulting from joint NMFS and ADF&G assessment of stock conditions and management planning documents that incorporate the 2002 EBS trawl survey are shown in the attached table. I also have attached graphs showing the history of each surveyed stock's SB relative to the overfishing definitions for your use.

As shown in the table, four of six stocks are considered overfished at this time. The FMP requires that the Secretary of Commerce be informed when a stock is overfished and that "the Secretary will notify the Council to take action to rebuild the stock or stock complex". This occurred with respect to Tanner crab (*Chionoecetes bairdi*) in 1997 and a rebuilding plan was developed as soon as overfishing definitions were established in 1998. Severe declines in the St Matthew Island Blue king crab (*Paralithodes platypus*) stock and the EBS snow crab (*C. opilio*) stock resulted in the SB values that fall below MSST in 1999 and also required Secretarial notification resulting in establishment of rebuilding plans in 2000. Rebuilding plans for these three overfished stocks have been approved by the Secretary and are all currently in force. The SB of EBS snow crab increased in 2000 and exceeded MSST 2001. Unfortunately the snow crab stock has again declined below MSST in 2002 and continued measures must be taken under the rebuilding plan. The Pribilof Islands Blue King crab stock SB fell below MSST in 2002 and the Secretary must now notify the Council to take action relative to rebuilding this stock as well. Only the two Red king crab (*P. camtschaticus*) stocks are not considered overfished at this time. The Pribilof Islands red king crab fishery has been



closed from 1999 onward because of concerns as to the low precision of population estimates and the belief that bycatch mortality of blue king crab would be unacceptably high given the low abundance of the latter stock.

The SB of the Pribilof Islands blue king crab stock has been declining since reaching its most recent peak in 1995. In 2001, the Pribilof Islands blue king crab SB was just above MSST. In 2002, the point estimate of SB has fallen below MSST, although estimates of abundance for this stock are very imprecise and there is some possibility that the 2002 point estimate is low, the stock has been approaching MSST for some time (see diagram). The fishery has been closed from 1999 onwards and the stock is also protected by the Pribilof Islands no trawling zone. Additionally, the Pribilof red king crab fishery has been closed due to bycatch concerns (see above). In short, there appears to be few measures to protect this stock that have not been in force for some time.

Reasons for the decline in Pribilof blue king crab abundance are unclear. Blue king crab are cold-adapted relative to red king crab and have left what appear to be small isolated glacial remnant populations in specialized habitats in the Gulf of Alaska and warmer parts of the Bering Sea. Red king crab are the dominant species throughout the Gulf of Alaska and relatively warm portions of the Bering Sea. This may indicate a gradual replacement of blue king crab by red king crab during post-glacial time. Due to biennial spawning, larger eggs and smaller numbers of eggs per clutch, blue king crab may have considerably lower reproductive capacity than red king crab. As blue king crab have declined in the Pribilof Islands, red king crab have become more prevalent and this change in relative abundance has occurred during the warm water period of the past 20 or so years. Prior to this period red king crab were rarely taken in the Pribilof Islands area.

cc. Crab Plan Team  
Mr. Doug Woodby, ADF&G Juneau  
Dr. Gary Stauffer, RACE  
Mr. David Witherell

Attachment 1

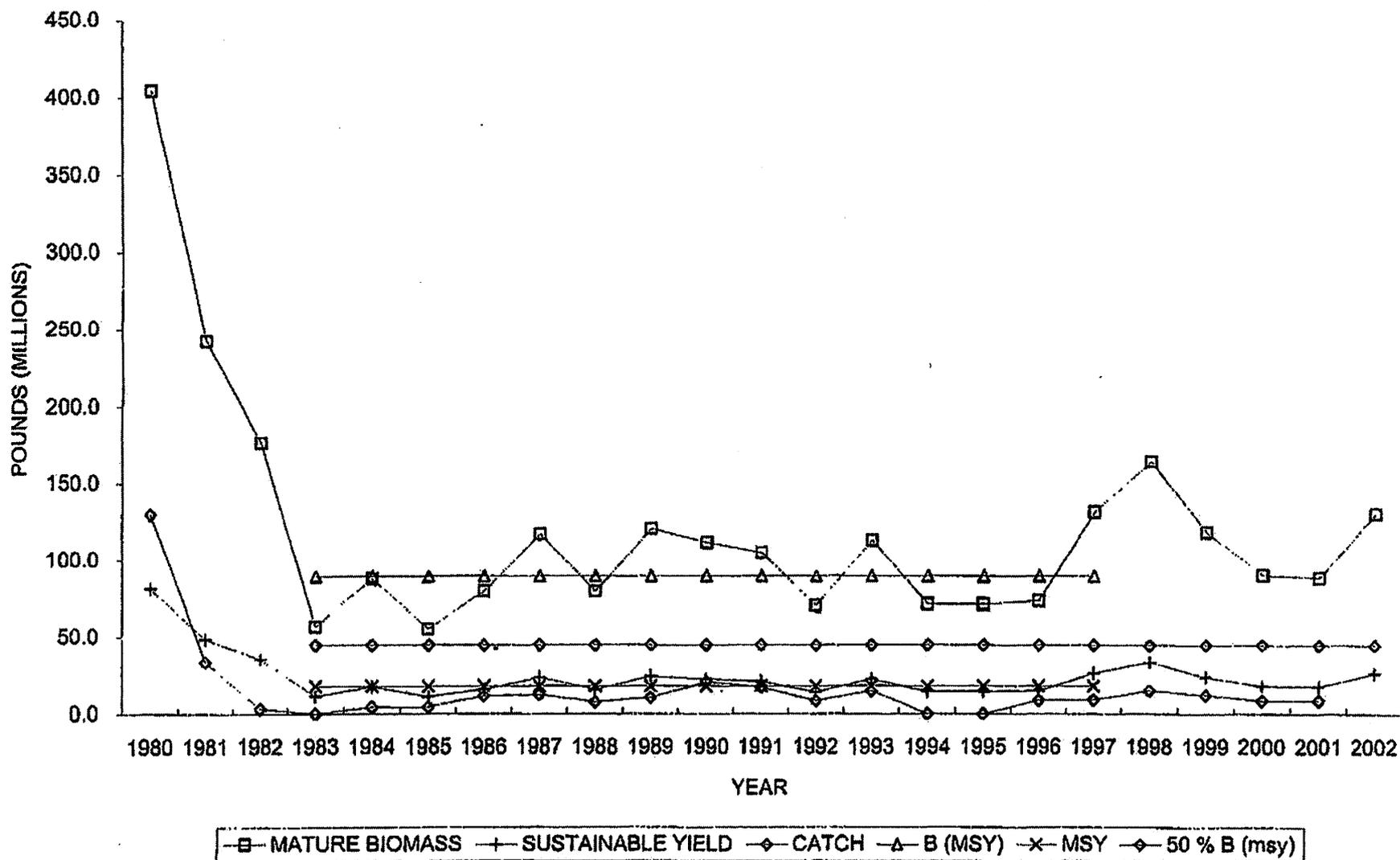
Status of eastern Bering Sea crab stocks relative to FMP overfishing definitions.

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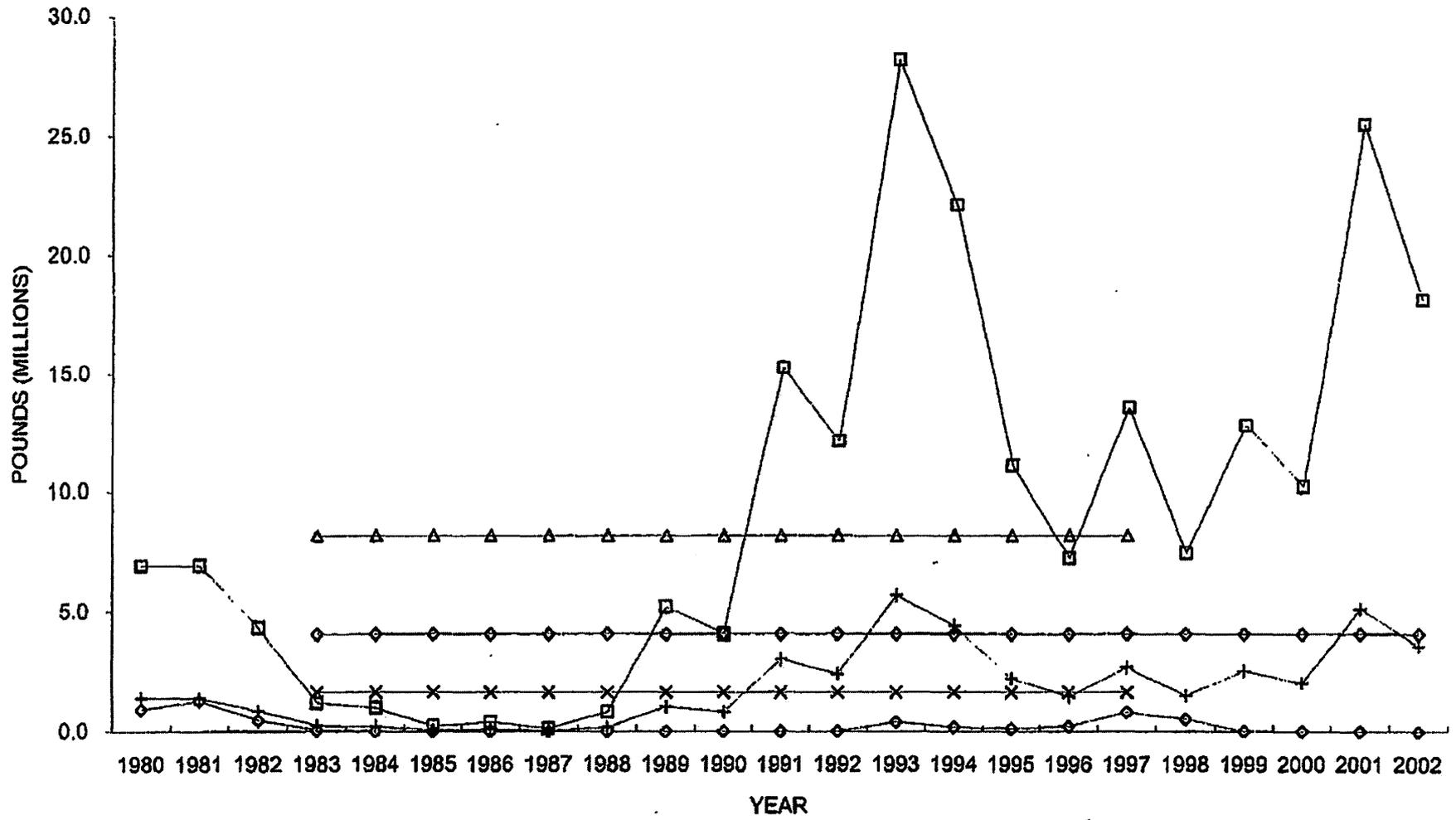
Stock	2001/2002 Season				2002/2003 Season		
	MSST	SB	SY	Catch	SB	SY	GHL
	<i>millions of pounds</i>						
Red King Crab:							
Bristol Bay	44.8	88.0	17.6	8.4	129.9	26.0	9.3
Pribilof Is.	3.3	25.5	5.1	0.0	18.1	3.6	0.0
Blue King Crab:							
Pribilof Is.	6.6	7.0	1.4	0.0	4.5	0.9	0.0
St Matthew Is.	11.0	9.0	1.8	0.0	4.7	0.9	0.0
EBS Tanner crab	94.8	67.7	20.3	0.0	69.4	20.3	0.0
EBS snow crab	460.8	571.0	171.1	32.6	313.3	93.7	25.6

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BRISTOL BAY RED KING CRAB  
HISTORY RELATIVE TO OVERFISHING

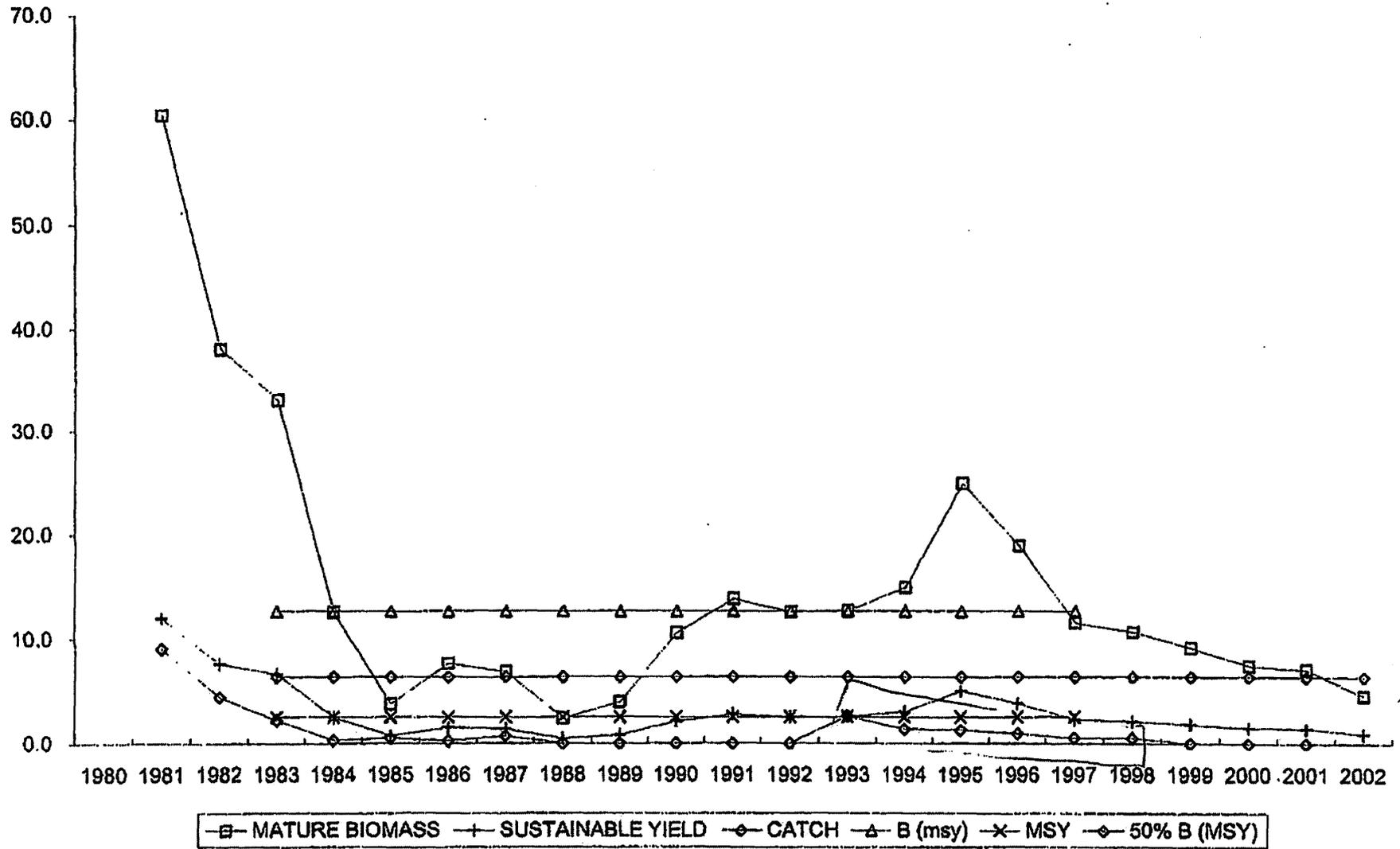


PRIBILOF ISLAND RED KING CRAB  
HISTORY RELATIVE TO OVERFISHING

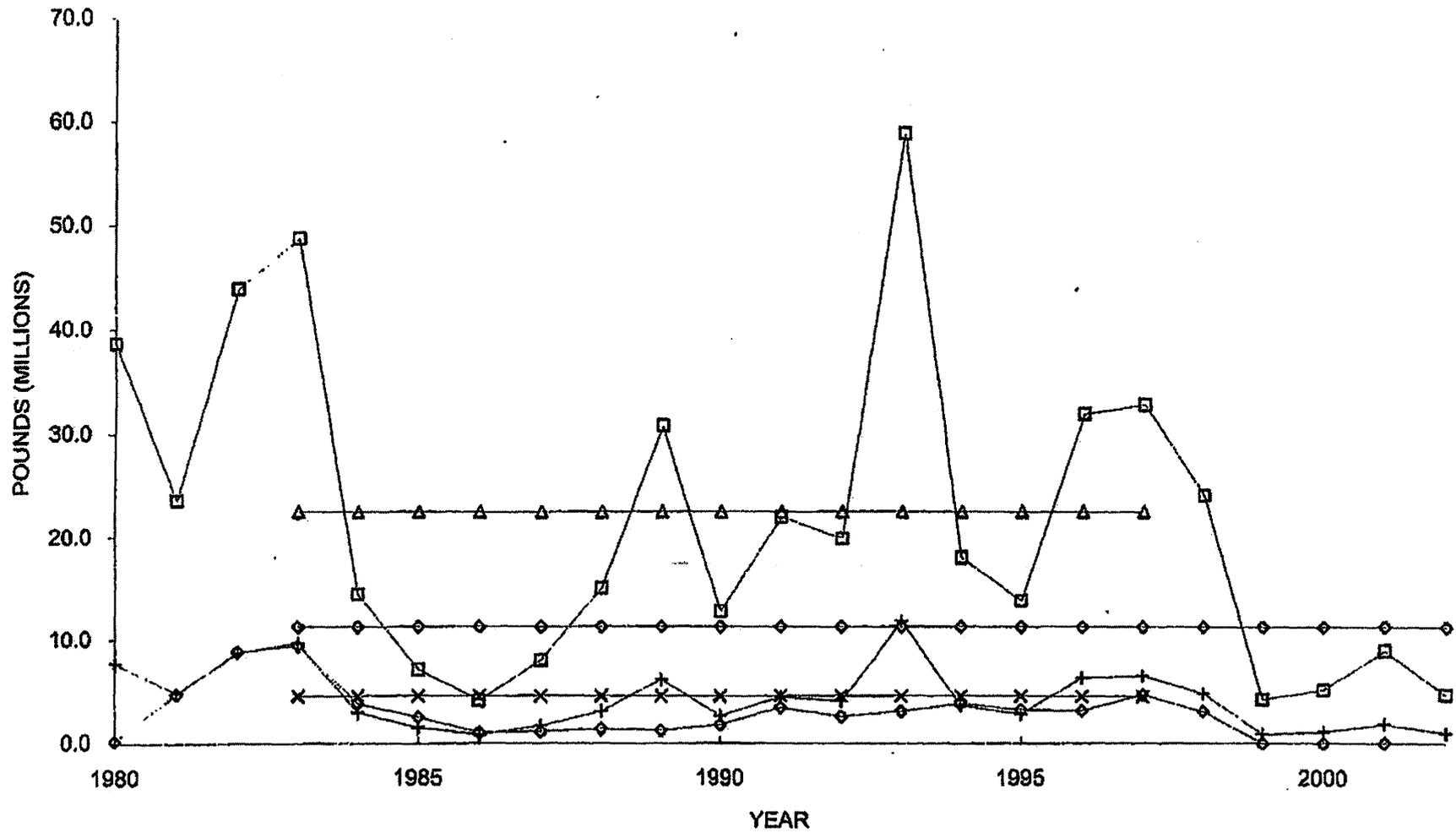


MATURE BIOMASS
  SUSTAINABLE YIELD
  CATCH
  B (MSY)
  MSY
  50% B (msy)

PRIBILOF ISLANDS BLUE KING CRAB  
HISTORY RELATIVE TO OVERFISHING

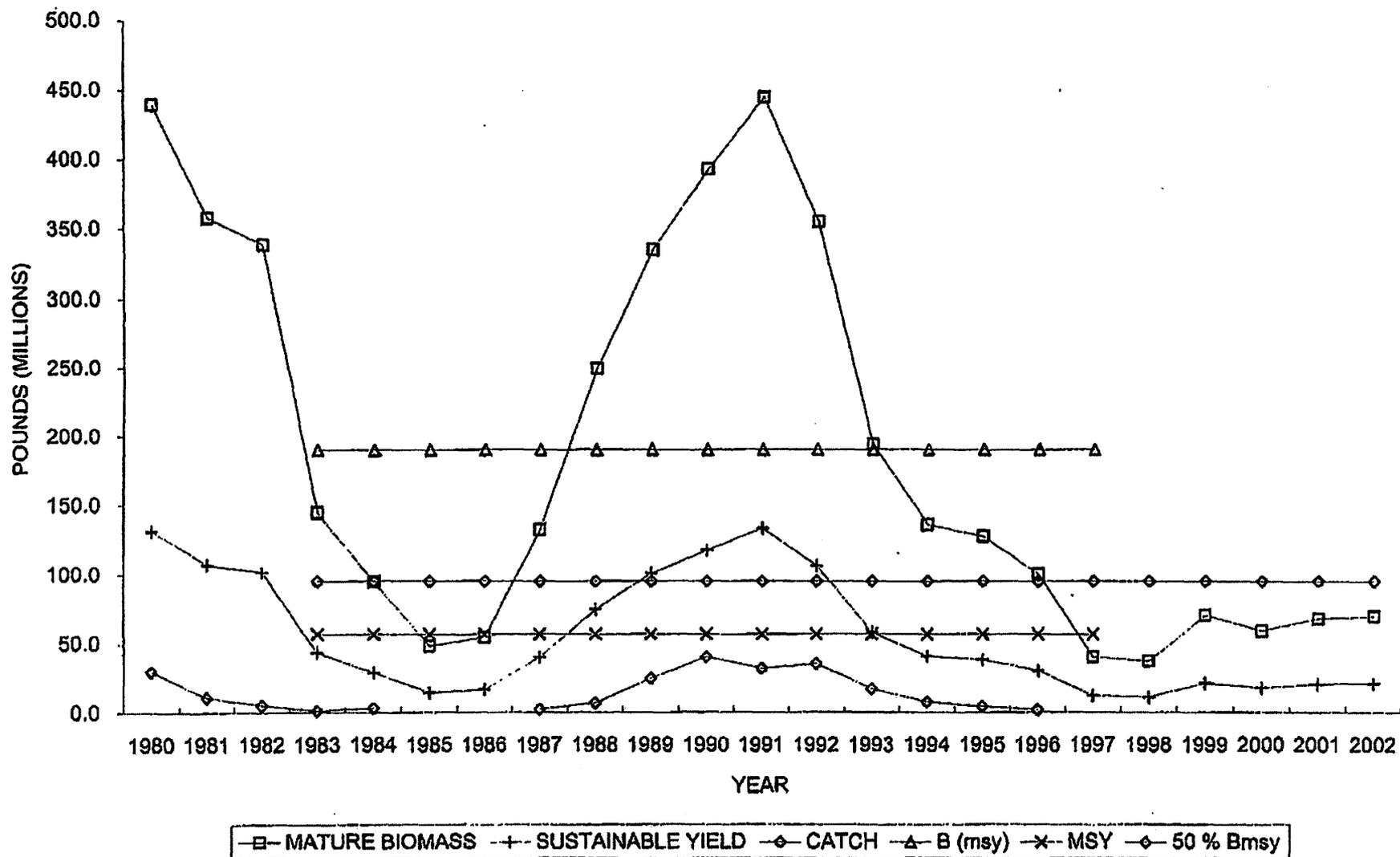


ST. MATTHEW IS. BLUE KING CRAB HISTORY  
VS. OVERFISHING DEFINITIONS



MATURE BIOMASS
 
 SUSTAINABLE YIELD
 
 CATCH
 
 B(MSY)
 
 MSY
 
 50% B(MSY)

WHOLE EBS TANNER CRAB  
HISTORY RELATIVE TO OVERFISHING



WHOLE EBS SNOW CRAB  
HISTORY RELATIVE TO OVERFISHING

