

M E M O R A N D U M

TO: Council, Board, SSC and AP Members

FROM: J. Jim H. Branson *CHB*
Executive Director

DATE: March 21, 1983

SUBJECT: Bering Sea/Aleutian Islands King Crab Fishery Management Plan

ACTION REQUIRED

Review of BS/AI king crab fisheries including status of the stocks, regulatory proposals and status of the FMP. Discussion of 1983 king crab management with the Board.

BACKGROUND

On October 20, 1981, the North Pacific Fishery Management Council and the Alaska Board of Fisheries adopted the Joint Statement of Principles for managing the domestic king crab fisheries in the Bering Sea and Aleutian Islands [item D-3(a)]. This agreement requires that both bodies meet jointly at least once every year to review the management of the fishery, discuss any regulatory proposals, and determine if there is a need to amend the management framework. In preparation for this meeting the Council and Board held a joint public hearing on March 8, in Seattle, Washington to receive public testimony on the regulatory proposals. A list of the BS/AI king crab proposals, a copy of the proposal package, and the hearing summary are provided as items D-3(b), (c) and (d), respectively.

The Bering Sea/Aleutian Islands King Crab FMP, the Regulatory Impact Review, and implementing regulations were submitted for Secretarial review on June 1, 1982. The Secretarial review period has been extended pending receipt of minor editorial and technical changes to the FMP, the Final Environmental Impact Statement, and revised set of implementing regulations. These documents are nearing completion, and it is anticipated that the Secretary will act on the king crab FMP in the near future.

Problems have been identified in the FMP with the procedure for determining ABC and OY values as described in both the Board's and Council's king crab plans. These problems were discussed in a staff memo to the King Crab Plan Maintenance Team (PMT) sent to you in the last Council/Board mailing. The problems are caused by significant declines in the number of fertilized female king crab and the overall depressed condition of the crab stocks. While the Board and Council's ABC/OY procedure still provides important guidance when the crab stocks are healthy, it fails to provide the necessary guidance when the stock condition is poor. Attached as item D-3(e), is a PMT report, which summarizes the problems with the procedure and recommends technical changes to solve them. I have also enclosed a copy of the Board's Management framework for your information [item D-3(f)].

MAR83/L

Revised 9/8/81

JOINT STATEMENT OF PRINCIPLES
BETWEEN
NORTH PACIFIC FISHERY MANAGEMENT COUNCIL (NPFMC)
ANCHORAGE, ALASKA
and
ALASKA BOARD OF FISHERIES (BOF)
JUNEAU, ALASKA
ON
MANAGEMENT OF DOMESTIC KING CRAB FISHERIES
IN THE BERING SEA AND ALEUTIANS

Recognizing that NPFMC has a legal responsibility for reviewing and recommending to the Secretary of Commerce measures for the conservation and management of the fisheries of the Arctic Ocean, Bering Sea, and Pacific Ocean seaward of Alaska, with particular emphasis on the consistency of those measures with the National Standards of the Magnuson Fishery Conservation and Management Act (Magnuson Act); and

Recognizing that State and Federal governmental agencies are limited in fiscal resources, and that the optimal use of these monies for North Pacific fisheries management, research, and enforcement occurs through a clear definition of agency roles and division of responsibilities, thus avoiding unnecessary duplication; and

Recognizing that the State of Alaska has for more than two decades exercised effective control over domestic king crab fisheries both within and without its territorial waters. The State system centers around BOF for policy and regulations. BOF's regulatory system provides for extensive public input; is sufficiently structured to insure annual revisions; is flexible enough to accommodate resource and resource utilization "emergencies;" and is understood and familiar to the users of North Pacific fisheries resources. Further, there exists a substantial investment by the State in facilities, communications and information systems, vessels and other equipment, coupled with a cadre of experienced personnel capable of carrying out extensive management, research, and enforcement programs to monitor the conduct of the fisheries and the status of the resources.

Therefore, NPFMC and BOF enter into this Joint Statement of Principles, defining the roles of both organizations, in order to achieve the most effective and efficient management of domestic king crab fisheries in the Bering Sea and Aleutians.

I. Applicable Fisheries

This Joint Statement of Principles applies only to the domestic fishery for king crab (all members of genera Paralithodes and Lithodes) in the Bering Sea, Bristol Bay, Adak, and Dutch Harbor areas, also known as State of Alaska king crab statistical areas Q, T, R, and O. This fishery is hereinafter referred to as "the fishery."

II. Duration of Agreement

Recognizing that NPFMC is currently preparing a Fishery Management Plan (FMP) for the fishery, this agreement shall remain in effect until that FMP is implemented by the Secretary of Commerce. At that time the agreement shall be reviewed by both NPFMC and the BOF and revised as necessary and as they may agree so that it will conform with the then existing situation.

III. NPFMC and BOF shall undertake the following activities:

1. NPFMC and BOF shall adopt the framework developed and approved by both organizations in April and May, 1981 to govern management of the fishery, prescribing objectives, standards, and measures found to be necessary for the fishery's effective management. These objectives, standards, and measures are consistent with the national standards of the Magnuson Act and with the laws of the State of Alaska; and do not discriminate between residents and non-residents of the State of Alaska.
2. The framework shall be implemented through regulations adopted by BOF in accordance with the laws of the State of Alaska, which shall be consistent with the objectives, standards, and measures prescribed in the framework. Before taking final action on any regulation governing the fishery, BOF shall make readily available in written form to all persons interested in the fishery for a period of at least thirty (30) days, the reports and data received by BOF upon which the proposed regulation is based; shall afford all such persons the opportunity to submit written and oral comments to BOF on the proposed regulation during that period; and shall, upon the request of NPFMC, meet with NPFMC or its representatives to discuss the proposed regulation. Before any BOF regulation governing the fishery goes into effect, BOF shall issue a written statement explaining the basis for the regulation. The preceding provisions of this paragraph shall not apply to emergency regulations.
3. NPFMC and BOF shall meet jointly at least once every calendar year to consider management of the fishery and discuss the need for amendment of the framework or any regulations governing the fishery. NPFMC and BOF or their designated representatives shall also meet jointly to consider management of the fishery at the request of either NPFMC or BOF. All persons and agencies interested in the fishery shall have the opportunity to submit written and oral comments and reports on management of the fishery to NPFMC and BOF at these meetings. In preparation for the mandatory annual joint meeting provided for in the first sentence of this paragraph, representatives of NPFMC and BOF shall hold a public hearing in the State of Washington at which all persons and agencies interested in the fishery shall be afforded the same opportunity to comment on management of the fishery that they would have at the meeting itself.
4. The Alaska Department of Fish and Game (ADF&G) shall have primary responsibility for developing the information upon which regulations governing the fishery are to be based, and for implementing these regulations through monitoring of the fishery and development of

in-season management measures. NPFMC and BOF shall encourage ADF&G, in carrying out this responsibility, to consult actively with the National Marine Fisheries Service and the fishery management agencies of other states, in order to prevent duplication of research and management effort and to make optimum use of the resources available for management of the fishery.

5. NPFMC and BOF shall resolve conflicts on the framework and implementing regulations through all appropriate means.

Approved:

For the North Pacific Fishery
Management Council

For the Alaska Board of Fisheries


Clement V. Tillion, Chairman


Nick Szabo, Chairman

10 - 20 - 81
Date

10/20/81
Date

BERING SEA/ALEUTIAN ISLANDS KING CRAB PROPOSALS SUMMARY

	<u>Author</u>
<u>Registration</u>	
(30) Expand the Adak Area to the 800f contour and west to the US-USSR Convention Line	ADF&G
<u>Seasons</u>	
(25 & 31) Open the Dutch Harbor Area and Adak Area earlier, Sept 15 - Feb 15 vs. Nov 1 - Feb 15	public
(26) Open the Dutch Harbor Area later, Nov 10 - Feb 15 vs. Nov 1 - Feb 15	public
(32) Open the Adak Area later, Nov 10 vs. Nov 1	public
(34) Open the Bristol Bay Area later, Oct 1 vs. Sept 10	public
(37) Open and Close the N. Dist., Bering Sea Area later, Sept 15 - Apr 15 vs. Aug 1 - Sept 3	public
(38) Open the Pribilof Dist. and N. Dist., Bering Sea Area later Pribilofs, Oct 1 vs. Sept 10 N. Dist., Sept 22 vs. Sept 3	public
(39) Close Norton Sound to summer king crab fishing	public
(40) Change Brown king crab seasons for Pribilofs and N. Dist. Pribilofs, from set by EO to Sept 10 - Apr 15 N. Dist., from no season to Aug 1 - Sept 3	ADF&G
(41) Establish a season and size limit for Brown king crab in the N. Dist.	
<u>Size Limits</u>	
(27, 33, 35 & 42) Establish a Brown king crab size limit for the Dutch Harbor, Adak, Bristol Bay and Pribilof Dist.	public
(189) Reduce the Brown king crab size limit statewide	public
<u>Harvest Levels</u>	
(16) Establish a revised harvest strategy for the BS/AI area	ADF&G, PMT
<u>Gear</u>	
(28) Establish a 100 king crab pot limit in the Dutch Harbor Area	public
(29) Allow 72 hours to remove gear from the water in the Dutch Harbor Area following a season closure	public
(43) Move the N. Dist. pot storage area closer to the St. Matthew fishery	ADF&G
(45) Allow longlining for Brown king crab in the Dutch Harbor, Adak, Bristol Bay and Bering Sea areas	public

		<u>Author</u>
<u>Gear (cont.)</u>		
* (58 & 59)	Establish a 100 pot limit for the S. Penn. king and Tanner crab fisheries	public
* (60)	Provide king and Tanner crab pot storage areas in designated inshore waters within the Dutch Harbor Area	public
* (62)	Establish a second king and Tanner pot storage area in Bristol Bay (the old Federal pot storage area)	public

Miscellaneous

(36)	Require tank inspections in the N. Dist. of the Bering Sea 116 hours after the opening	public
(44)	Change closed waters around St. Lawrence, King and Little Diomedes Island from 3 to 15 miles	public
* (57)	In the Kodiak king and Tanner crab fisheries, prohibit the use of catcher/processor vessels	public
* (196)	Require an enforcement agent on every catcher/processor	public
* (61)	Prohibit all king and Tanner crab vessels over 50' from fishing Unalaska Bay, Dutch Harbor Area	public
* (63)	Provide extra fishing time to fishermen who assist other fishermen in duties within the BS/AI or Westward Areas	public
(187)	Allow the longlining of the king crab pots when fishing for Brown king crab - statewide	public
(188)	Require or permit for all processing vessels - statewide	BOF
* (194)	Eliminate "major damage" as a reason for allowing post-season recovery of gear and sale of crab. (This provision is not in the plan.)	ADF&G
* (195)	Allow longlining king and Tanner crab pots in waters of 125 f or more, in all areas where there are no pot limits	public

*Proposals for both king and Tanner crab fisheries

BOF = Board of Fisheries

ALASKA PENINSULA
DUNGENESS CRAB

15

5 AAC 32.410(b). FISHING SEASONS. (New Subsection) (Regulation page 44). Change the season.

The proposed regulation reads as follows:

5 AAC 32.410. FISHING SEASONS.

- (b) Dungeness crab may be taken in the South Peninsula district from September 1 through April 30 [MAY 1 THROUGH FEBRUARY 1].

Justification: To avoid the gear conflict during the salmon season.

Proposed by: King Cove Advisory Committee (59, 60)

WESTWARD
KING CRAB

* 16

5 AAC 34.080. HARVEST STRATEGY. (New section) Set exploitation rates that will determine the harvest levels for king crab in the Westward fisheries and amend or repeal current regulations governing harvest levels.

The proposed regulation reads as follows:

5 AAC 34.080. HARVEST STRATEGY. Unless otherwise specified in this chapter, the harvest levels for king crab in statistical areas K, M, O, R, T and Q must be set according to the general guidelines set out in the following table:

Comparison of exploitation rates of legal crab given relative population size, prerecruitment, and postrecruitment abundance levels:

Population Size	Prerecruit 1/ Abundance	Approximate exploitation rates of legal crab at given levels of postrecruits 1/		
		Low*	Moderate**	High***
Depressed	Declining	Less than 20	Less than 25	Less than 25
	Stable	30	30	35
	Increasing	30	30	35
Average	Declining	40	40	40
	Stable	40	45	45
	Increasing	40	50	50
Peak	Declining	40	45	50
	Stable	50	55	60
	Increasing	60	60	60

* Low = less than 1/3 of total population (lbs.).

** Moderate = 1/3 - 2/3 of total population.

*** High = over 2/3 of total population.

1/ Prerecruits - those crab which will not reach legal size for one to two years or one to two molts.

Recruits - those crab which have attained legal size for the first time.

Postrecruits - those crab which have been legal size for one or more years.

5 AAC 34.460. KODIAK KING CRAB MANAGEMENT PLAN.

(c) Repealed / /83.

5 AAC 34.615. HARVEST STRATEGY. Repealed / /83.

5 AAC 34.715. GUIDELINE HARVEST LEVEL. Repealed / /83.

5 AAC 34.815. HARVEST STRATEGY. Repealed / /83.

5 AAC 34.915. HARVEST STRATEGY. (a) Repealed / /83.

(b) Repealed / /83.

(c) (1) repealed / /83;
(2) repealed / /83.

Justification: In 1982 the Board of Fisheries expressed its intention to develop harvest strategies for Westward Region statistical areas. This table represents the best exploitation rates for all areas given available information on stock conditions recognizing a desire for a multi-age class fishery and increased protection for stocks at depressed levels.

Proposed by: Staff

KODIAK
KING CRAB

(18)

5 AAC 34.030(b). LANDING AND INSPECTION REQUIREMENTS. (Regulation page 48) Allow baited gear on the grounds 48 hours before a tank inspection.

The proposed regulation reads as follows:

5 AAC 34.030. LANDING AND INSPECTION REQUIREMENTS.

(b) Starting 116 hours after the opening of statistical areas T, M, O and the Pribilof district of Statistical area Q; starting 72 hours after the opening of statistical area H; and within 48 hours before taking or processing crab in statistical areas K, R, and Q, registered king crab vessels must have...

Justification: This method of starting the season is used successfully in areas R and Q to give all vessels an equitable start. Forty-eight hours is sufficient for Kodiak vessels to set their gear and return for a tank inspection.

Proposed by: Frank Abena and 76 other fishermen (238-246)

(19)

5 AAC 34.410(1). FISHING SEASONS. (Regulation page 62) Change the season.

The proposed regulation reads as follows:

5 AAC 34.410. FISHING SEASONS.

(1) from 12:00 noon September 25 [15] through January 15.

Justification: A ten day later opening for king crab would greatly improve the recovery/quality of the king crab.

Proposed by: Michale King (209).

ALASKA PENINSULA
KING CRAB

Justification: Extending the seaward boundary of area M will include all king crab habitat within the statistical area and be uniform with the adjacent Dutch Harbor area.

Proposed by: Staff

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17
See page 26
(23)

5 AAC 34.020(b). REGISTRATION. (Regulation page 47). Change the Alaska Peninsula area to a super-exclusive area.

The proposed regulation reads as follows:

5 AAC 34.020. REGISTRATION.

(b) The registration areas R and Q are non-exclusive registration areas. A vessel and gear may be registered for either or both of the non-exclusive registration areas together with one exclusive registration area during any registration year, except that a vessel or gear registered for areas H and M may not be used to take king crab in any other registration area.

Justification: None provided.

Proposed by: Sand Point Advisory Committee (49)

(24)

5 AAC 34.510(1). FISHING SEASONS. (Regulation page 65) Change the season.

The proposed regulation reads as follows:

5 AAC 34.510. FISHING SEASONS. Male king crab may be taken or possessed only as follows:

(1) from a time concurrent with other westward areas [12:00 NOON, SEPTEMBER 10] until closed by emergency order, king crab 6-1/2 inches (165 mm) or greater in width of shell may be taken or possessed.

Justification: None provided.

Proposed by: Sand Point A.C. (52)

DUTCH HARBOR
KING CRAB

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(25)

5 AAC 34.610(1). FISHING SEASONS. (Regulation page 66) Change the season.

The proposed regulation reads as follows:

5 AAC 34.610. FISHING SEASONS. King crab may be taken or possessed only as follows: (1) from 12:00 noon September 15 [NOVEMBER 1] through February 15, king crab 6½ inches (165 mm) or larger in width of shell may be taken or possessed.

Justification: This will spread out the fleet and reduce fishing pressure and also enable processors to gear up for one king crab season.

Proposed by: Bill Osborne (128)

DUTCH HARBOR
KING CRAB

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(26)

5 AAC 34.610(1). FISHING SEASONS. (Regulation page 66) Change the season.

The proposed regulation reads as follows:

5 AAC 34.610. FISHING SEASONS. King crab may be taken or possessed only as follows:

(1) from [12:00] noon November 10 [1] through February 15, unless closed earlier by emergency order, king crab 6½ inches (165 mm) or greater in width of shell may be taken or possessed;

Justification: The proposed opening would be 40 days after the opening dates in Statistical Area T (Bristol Bay) and the Pribilof district of Statistical Area Q (Bering Sea). A continuity in season openings is recommended to coordinate deliveries, maintain a continuous supply of raw material, sustain constant employment, and avoid major shutdown and startup costs (for example, travel expenses and gear storage costs) for both processor and harvester. This proposed opening is optimum. Later coordinated openings may compromise vessel safety and reduce fishing opportunities for smaller vessels. To disperse effort, the opening date should coincide with the opening in Statistical Area R (Adak). It is believed that the availability of crab is better later in the year. Due to the anticipated low abundance of crab and the need for high quality crab sections in the marketplace, this opening may minimize the risk of light crab.

Proposed by: Alaska Marketing Association, North Pacific Fishing Vessel Owners' Association, Pan-Alaska Fisheries, Sea Alaska Products, Seawest Industries, Trident Seafoods, and Universal Seafoods (85, 86)

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(27)

5 AAC 34.620. SIZE LIMITS. (Regulation page 66). Set a size limit for brown king crab.

The proposed regulation reads as follows:

5 AAC 34.620. SIZE LIMITS.

(a) Male red king crab 6½ inches (165 mm) or greater in width of shell and brown king crab _____ inches () or greater in width of shell may be taken or possessed.

(b) Male red king crab 7½ inches (191mm) or greater in width of shell and brown king crab _____ inches () or greater in width of shell may be taken or possessed as provided in 5 AAC 34.610(2).

Editor's Note: Adoption of this proposal will require appropriate changes to 5 AAC 34.610.

Justification: Many fishermen and processors believe that the size of brown king crab at the age of sexual maturity is smaller than red king crab. The National Marine Fisheries Service (NMFS) is currently investigating the size-age relationships for brown king crab. NMFS studies are not yet completed, but should be done by the time of the March meeting of the Board. As soon as the NMFS studies are available, they will be submitted to the Board. At that time, the makers of this proposal will submit a specific proposal for how much the minimum size should be decreased if the scientific data support such a reduction.

DUTCH HARBOR
KING CRAB

Proposed by: Alaska Marketing Association, North Pacific Fishing Vessel Owners' Association, Pan-Alaska Fisheries, Sea Alaska Products, Seawest Industries, Trident Seafoods, and Universal Seafoods (97, 98)

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(28)

5 AAC 34.625(g). LAWFUL GEAR. (New Subsection). (Regulation page 67)
Set a pot limit.

The proposed regulation reads as follows:

5 AAC 34.625. LAWFUL GEAR.

(g) During a king crab season, an aggregate of no more than 100 king crab pots may be fished from any registered king crab vessel.

Justification: This allows for smaller vessels to compete more economically with large vessels in the area. Quotas are smaller and larger vessels can fish more gear in more areas.

Proposed by: Ken Swimm (123)

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(29)

5 AAC 34.625 (d). LAWFUL GEAR. (New Subsection) (Regulation page 67).
Change the pot storage restrictions.

The proposed regulation reads as follows:

5 AAC 34.625. LAWFUL GEAR.

(d) king crab pots may not be stored in the water starting 72 hours after the closure of area 0 Dutch Harbor tanner crab season until November 1.

Justification: Provide pot storage.

Proposed by: Emil Berikoff (133)

ADAK
KING CRAB

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(30)

5 AAC 34.700. DESCRIPTION OF STATISTICAL AREA. (Regulation page 67)
Change the boundary.

The proposed regulation reads as follows:

5 AAC 34.700. DESCRIPTION OF STATISTICAL AREA. Statistical area R has as its eastern boundary 172° W. long., its western boundary a line from 51°20' N. lat., 168°20' E. long. to 54°36' N. lat., 171°45' E. long. (the U.S.-Russian Convention Line of 1867) [172° E. LONG.], and as its seaward boundaries the 800 fathom (1463 m) [500 FATHOM] depth contour.

Justification: During the 1982-83 Adak king crab fishery, vessels fished beyond the 170° E. long. boundary defined in the Shellfish Regulations. As the brown king crab fisheries expand, vessels are covering more grounds. To assist in the management of these fisheries, regulations are necessary to cover the entire scope of the fishery.

Proposed by: Staff

ADAK
KING CRAB

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31

5 AAC 34.710(a). FISHING SEASONS. (Regulation page 68). Change the season.

The proposed regulation reads as follows:

5 AAC 34.710. FISHING SEASONS. (a) Male red and brown king crab may be taken or possessed from 12:00 noon September 15 [NOVEMBER 1] through February 15.

Justification: This will spread out the fleet and reduce gear pressure and also enable processors to gear up for one king crab season.

Proposed by: Bill Osborne (126)

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32

5 AAC 34.710. FISHING SEASONS. (Regulation page 68) Change the seasons.

The proposed regulation reads as follows:

5 AAC 34.710. FISHING SEASONS. (a) Male red [AND] king crab may be taken or possessed from [12:00] noon November 10 [1] through February 15.

(c) Male brown king crab may be taken or possessed only from [12:00] noon November 10 [1] until closed by emergency order.

Justification: The proposed opening would be 40 days after the opening dates in Statistical Area T (Bristol Bay) and the Pribilof district of Statistical Area Q (Bering Sea). A continuity in season openings is recommended to coordinate deliveries, maintain a continuous supply of raw material, sustain constant employment, and avoid major shutdown and start up costs (for example, travel expenses and gear storage costs) for both processor and harvester. To disperse effort, the opening date should coincide with the opening in Statistical Area O (Dutch Harbor). Due to the anticipated low abundance of crab and the need for high quality crab sections in the marketplace, this opening should minimize the risk of light crab. It is believed the availability of crab is better later in the year. This opening should ensure that weather conditions would not unfairly restrict the smaller vessels.

Proposed by: Alaska Marketing Association,
North Pacific Fishing Vessel Owners' Association,
Pan-Alaska Fisheries,
Sea Alaska Products,
Seawest Industries,
Trident Seafoods, and
Universal Seafoods (87, 88)

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33

5 AAC 34.720. SIZE LIMITS. (Regulation page 68) Set a size limit for brown king crab.

The proposed regulation reads as follows:

5 AAC 34.720. SIZE LIMITS. (a) Male red king crab 6-1/2 inches (165 mm) or greater in width of shell may be taken or possessed.

(b) Male brown king crab inches (mm) or greater in width of shell may be taken or possessed.

ADAK
KING CRAB

Justification: Many fishermen and processors believe that the size of brown king crab at the age of sexual maturity is smaller than red king crab. The National Marine Fisheries Service (NMFS) is currently investigating the size-age relationships for brown king crab. NMFS studies are not yet completed, but should be done by the time of the March meeting of the Board. As soon as the NMFS studies are available, they will be submitted to the Board. At that time, the makers of this proposal will submit a specific proposal for how much the minimum size should be decreased if the scientific data support such a reduction.

Proposed by: Alaska Marketing Association,
North Pacific Fishing Vessel Owners' Association,
Pan-Alaska Fisheries,
Sea Alaska Products,
Seawest Industries,
Trident Seafoods, and
Universal Seafoods (95, 96)

BRISTOL BAY
KING CRAB

* (34)

5 AAC 34.180(b). FISHING SEASONS. (Regulation page 68) Change the season.

The proposed regulation reads as follows:

5 AAC 34.810. FISHING SEASONS.

(b) Red, blue and brown king crab $6\frac{1}{2}$ inches (165 mm) or greater in width of shell may be taken or possessed from [12:00] noon October 1 [SEPTEMBER 10] through April 15 unless closed earlier by emergency order, except that red, blue and brown king crab seven inches (178 mm) or greater in width of shell may be taken or possessed during periods opened and closed by emergency order.

Justification: Due to the low abundance of crab and the need for high quality crab section in the white tablecloth restaurant trade, a later season may help minimize the risk of light crab. A three-week delay should result in better meat recovery. To maintain a continuity with other season openings, it was felt that the opening data in the Bristol Bay fishery should coincide with the opening we proposed for the Pribilof district of Statistical Area Q (Bering Sea). This opening date was felt to be a reasonable compromise to ensure that weather conditions would not unfairly restrict fishing opportunities for smaller vessels. The proposed opening is 47 days after the opening we proposed for the Northern district of Statistical Area Q (Bering Sea) and 40 days before the openings we proposed for Statistical Area O (Dutch Harbor) and R (Adak). A continuity in season openings is recommended to coordinate deliveries, maintain a continuous supply of raw material, sustain constant employment, and avoid major shutdown and start up costs (for example, travel expenses and gear storage costs) for both processor and harvester.

Proposed by: Alaska Marketing Association, North Pacific Fishing Vessel Owners' Association, Pan-Alaska Fisheries, Sea Alaska Products, Seawest Industries, Trident Seafoods, and Universal Seafoods (83, 84)

BRISTOL BAY
KING CRAB

* (35)

5 AAC 34.820. SIZE LIMITS. (Regulation page 69) Set a size limit for brown king crab.

The proposed regulation reads as follows:

5 AAC 34.820. SIZE LIMITS.

(a) Male red[,] and blue [AND BROWN] king crab 6½ inches (165 mm) or greater in width of shell and brown king crab inches (mm) or greater in width of shell may be taken or possessed.

(b) Male red[,] and blue [AND BROWN] king crab seven inches (178 mm) or greater in width of shell and brown king crab inches (mm) or greater in width of shell may be taken or possessed as provided in 5 AAC 34.810(b).

Editor's Note: The adoption of this proposal will require appropriate changes to 5 AAC 34.810.

Justification: Many fishermen and processors believe that the size of brown king crab at the age of sexual maturity is smaller than red king crab. The National Marine Fisheries Service (NMFS) is currently investigating the size-age relationships for brown king crab. NMFS studies are not yet completed, but should be done by the time of the March meeting of the Board. As soon as the NMFS studies are available, they will be submitted to the Board. At that time, the makers of this proposal will submit a specific proposal for how much the minimum size should be decreased if the scientific data support such a reduction.

Proposed by: Alaska Marketing Association, North Pacific Fishing Vessel Owners' Association, Pan-Alaska Fisheries, Sea Alaska Products, Seawest Industries, Trident Seafoods, and Universal Seafoods (91, 92)

BERING SEA
KING CRAB

* (36)

5 AAC 34.030(b). LANDING AND INSPECTION REQUIREMENTS. (Regulation page 48). Change the tank inspection requirements for the St. Matthew king crab fishery.

The proposed regulation reads as follows:

5 AAC 34.030. LANDING AND INSPECTION REQUIREMENTS.

(b) Starting 116 hours after the opening of statistical areas T, M and [,] O₂ and the Pribilof district and General section of statistical area H; and within 48 hours before taking or processing crab in statistical area [S] and the Norton Sound section of statistical area Q, registered king crab vessels must have their holds, live tanks, and freezers inspected by a local representative of the department at inspection points specified in 5 AAC 34. No king crab may be on board at the time of inspection. Successful completion of the inspection validates the registration for the area.

Justification: In the past year, the St. Matthew king crab fishery has become one of the major king crab fisheries in the Bering Sea. With the exception of this fishery, all the major Bering Sea fisheries have their tank inspections 116 hours after the opening of the season. The 116-hour requirement enables the smaller vessels to be somewhat

BERING SEA
KING CRAB

competitive with the larger ones at the start of the season. Since crab cannot be delivered until after the tank inspection, there would seem to be no advantage gained by illegally fishing prior to the opening of the season. The 116-hour requirement is not being proposed for the Norton sound section because it would increase operating costs for those vessels desiring to fish Norton Sound prior to entering the St. Matthew fishery.

Proposed by: North Pacific Fishing Vessel Owners' Association (102, 103)

* (37)

5 AAC 34.910(d). FISHING SEASONS. (Regulation page 70). Change the red and blue king crab season for the Northern district.

The proposed regulation reads as follows:

5 AAC 34.910. FISHING SEASONS.

(d) in the Northern district, male red king crab 4 3/4 inches (121 mm) or greater in width of shell and blue king crab 5 1/2 inches (140mm) or greater in width of shell may be taken or possessed from 12:00 noon September 15 through April 15 [AUGUST 1 THROUGH 12:00 NOON SEPTEMBER 3] (summer season). Additionally, in the Norton Sound section male red and blue king crab may be taken or possessed only from January 1 through April 30 (winter season).

Justification: This will spread out the fleet and reduce gear pressure and also enable processors to gear up for one king crab season.

Proposed by: Bill Osborne (127)

* (38)

5 AAC 34.910(b),(c),(d). FISHING SEASONS. (Regulation page 70). Change the season for the Pribilof and Northern districts.

The proposed regulation reads as follows:

5 AAC 34.910. FISHING SEASONS.

(b) In the Pribilof district male red king crab 6 1/2 inches (165 mm) or greater in width of shell may be taken or possessed only from [12:00] noon October 1 [September 10] through April 15. Male red king crab 7 1/2 inches (190 mm) or greater in width of shell may be taken or possessed only during seasons established by emergency order.

(c) In the Pribilof district male blue king crab 6 1/2 inches (165 mm) or greater in width of shell may be taken or possessed only from [12:00] noon October 1 [September 10] through May 31.

(d) In the Northern district male red king crab 4 3/4 inches (121 mm) or greater in width of shell and blue king crab 5 1/2 inches (140 mm) or greater in width of shell may be taken or possessed from [12:00] noon September 22 [3] (summer season). Additionally, in the Norton Sound section male red and blue king crab may be taken or possessed only from January 2 through April 30 (winter season).

Justification (Pribilof season): Due to the low abundance of crab and the need for high quality crab sections in the white tablecloth restaurant trade, a later season may help minimize the risk of light

BERING SEA
KING CRAB

crab. A three-week delay should result in better meat recovery. To maintain a continuity with other season openings, it was felt that the opening data in the Pribilof district should coincide with the opening we proposed for Statistical Area T (Bristol Bay). This opening date was felt to be a reasonable compromise to ensure that weather conditions would not unfairly restrict fishing opportunities for smaller vessels. The proposed opening date is 47 days from the opening date we have proposed for the Northern district of Statistical Area Q (Bering Sea) and 40 days before the openings we have proposed for the Statistical Area O (Dutch Harbor) and R (Adak) fisheries. A continuity in season openings is recommended to coordinate deliveries, maintain a continuous supply of raw material, sustain constant employment, and avoid major shutdown and start up costs (for example, travel expenses and gear storage costs) for both processor and harvester.

Justification (Northern district season): This proposal is being recommended (along with proposals for Statistical Areas T (Bristol Bay), O (Dutch Harbor), R (Adak), and the Pribilof district of Statistical Area Q (Bering Sea) to coordinate deliveries, maintain a continuous supply of raw material, sustain constant employment, and avoid major shutdown and start up costs (for example, travel expenses and gear storage costs) for both processor and harvester. Recovery appears to be higher later in the year. This proposed opening is optimum. Later coordinated openings may compromise vessel safety and reduce fishing opportunities for smaller vessels. Coordinated openings for the St. Matthew and Norton Sound fisheries will reduce fishing pressure on the Norton Sound stocks. Note: This proposal assumes that the proposal for tank inspections 116 hours after the opening of the St. Matthew fishery is adopted. If not, then the makers of this proposal want an August 20 season opening.

Proposed by: Alaska Marketing Association, North Pacific Fishing Vessel Owners' Association, Pan-Alaska Fisheries, Sea Alaska Products, Seawest Industries, Trident Seafoods, and Universal Seafoods (79 - 82).

* (39)

5 AAC 34.910(d). FISHING SEASONS. (Regulation page 70) Close the Norton Sound section summer season.

The proposed regulation reads as follows:

5 AAC 39.910. FISHING SEASONS.

(d) In the General Section of the Northern district male red king crab 4 3/4 inches (121 mm) or greater in width of shell and blue king crab 5 1/2 inches (140 mm) or greater in width of shell may be taken or possessed from 12:00 noon August 1 through 12:00 noon September 3 (summer season). [Additionally] In the Norton Sound section male red and blue crab may be taken or possessed only from January 1 through April 30 (winter season).

Justification: In regards to the Norton Sound king crab stocks, we have unanimously taken a conservative approach to the exploitation of this resource. Over the protest of our local people these stocks have been jeopardized by the summer commercial harvest so we propose closing the summer season for an indefinite time for the following reasons:

BERING SEA
KING CRAB

1. The population has again declined to the lowest level since the beginning of the commercial fishery (1.6 million pounds of legal male crab estimated).
2. Age structure of the population has changed from mostly old crab to young (recruit crab). These younger crab won't suffer as high a natural mortality as the older crab. You won't lose all of these crab if they aren't harvested this year.
3. The subsistence catch has been very poor since the summer commercial crab harvest began.
4. Enforcement of regulations will be difficult because of low stocks elsewhere and a lack of crab on the marketplace.
5. There is a certain level of mature male crab needed for breeding and maintaining the ecological niche. No one knows what that level is. With a decline of 8 million to 1.6 million we are definitely heading for that minimum level. Maybe since no one knows what that level is we should stop now before barren females start showing up.

Proposed by: Matthew Iya (207, 208)

*

(40)

5 AAC 34.910(e)(f). FISHING SEASONS. (Regulation page 70). Set brown king crab seasons for the Northern and Pribilof districts.

The proposed regulation reads as follows:

5 AAC 34.910. FISHING SEASONS.

(e) In the Pribilof district, male brown king crab $6\frac{1}{2}$ inches (165 mm) or greater in width of shell may be taken or possessed from 12:00 noon September 10 through April 15 [ONLY DURING SEASON ESTABLISHED BY EMERGENCY ORDER].

(f) In the Northern district, male brown king crab inches (mm) or greater in width of shell may be taken or possessed from 12:00 August 1 through 12:00 noon September 3.

Justification: Establish seasons for the developing brown king crab fishery. Results of an as yet uncompleted research project being conducted by the University of Washington that will recommend a size limit will be presented at the Board meeting.

Proposed by: Staff

*

(41)

5 AAC 34.910(f) and 920(c). FISHING SEASONS and SIZE LIMITS. (New Subsections). (Regulation pages 70 and 71). Set a season and size limit for brown king crab for the Northern district.

The proposed regulation reads as follows:

5 AAC 34.910. FISHING SEASONS.

(f) in the Northern district, male brown king crab $5\frac{1}{2}$ inches (140 mm) or greater carapace in width of shell may be taken or possessed from 12:00 noon May 1 through 12:00 noon September 30.

BERING SEA
KING CRAB

5 AAC 34.920. SIZE LIMITS.

(c) male brown king crab $5\frac{1}{2}$ inches (140 mm) or greater in width of shell may be taken or possessed in the Northern district.

Justification: The regulation would establish a fishing season to utilize brown king crab in an area where no commercial fishery has existed. The Northern district red and blue king crab size limit is lower than the size limit in the Pribilofs because of slower growth. The Northern district was fished for brown crab in 1982, and we only averaged two legal $6\frac{1}{2}$ inch crabs per pot. If the size limit would have been $5\frac{1}{2}$ inches, we could have caught 20 to 30 per pot. I believe the growth is slower on brown king crab, therefore, the size limited is biologically justified.

Proposed by: Trans-Pacific International Industries (135, 136)

* (42)

5 AAC 34.920(a)(e). SIZE LIMITS. (Regulation page 71). Set a size limit for brown king crab in the Pribilof district.

The proposed regulation reads as follows:

5 AAC 34.920. SIZE LIMITS.

(a) Male red and blue [and brown] king crab $6\frac{1}{2}$ inches (165 mm) and greater in width of shell may be taken or possessed in the Pribilof district.

(c) Male brown king crab inches (mm) or greater in width of shell may be taken or possessed in the Pribilof district.

Justification: Many fishermen and processors believe that the size of brown king crab at the age of sexual maturity is smaller than red king crab. The National Marine Fisheries Service (NMFS) is currently investigating the size-age relationships for brown king crab. NMFS studies are not yet completed, but should be done by the time of the March meeting of the Board. As soon as the NMFS studies are available, they will be submitted to the Board. At that time, the makers of this proposal will submit a specific proposal for how much the minimum size should be decreased if the scientific data support such a reduction.

Proposed by: Alaska Marketing Association, North Pacific Fishing Vessel Owners' Association, Pan-Alaska Fisheries, Sea Alaska Products, Seawest Industries, Trident Seafoods, and Universal Seafoods (93, 94)

* (43)

5 AAC 34.925(g). LAWFUL GEAR. (Regulation page 71) Change the pot storage area.

The proposed regulation reads as follows:

5 AAC 34.925. LAWFUL GEAR.

(g) During the closed season for any species of king crab, king crab pots may be stored in the Northern district only in waters north of 59° N. lat., south of $59^{\circ}30'$ N. lat., west of $169^{\circ}30'$ W. long., and east of 171° W. long., [NORTH OF 61° N. LAT., SOUTH OF $61^{\circ}30'$ N. LAT WEST OF 169° W. LONG., AND EAST OF $169^{\circ}30'$ W. LONG.] or by removal from the water.

BERING SEA
KING CRAB

Justification: This will allow vessels to have a pot storage area established closer to the present fishery.

Proposed by: Staff

* (44)

5 AAC 34.935(b). CLOSED WATERS. (Regulation page 71). Change the closed waters near St. Lawrence, King and Little Diomed Islands.

The proposed regulation reads as follows:

Option 1:

5 AAC 39.935. CLOSED WATERS.

(b) King crab may not be taken in the General Section between the latitudes of 61° 49' N. latitude and 66° N. latitude.

Option 2:

5 AAC 39.935. CLOSED WATERS.

(b) King crab may not be taken in waters within 15 [THREE] miles of mean lower low waters around St. Lawrence, King and Little Diomed Islands.

Justification: Over the protest of local people these stocks have been jeopardized by the summer commercial harvest so we propose closing the summer season for an indefinite time for the following reasons:

1. The population has declined to the lowest level since the beginning of the commercial fishing.
2. The subsistence catch has been very poor and/or the catch per unit effort has been very low since the summer commercial crab harvest began.
3. Enforcement of regulations will be difficult because of low stocks elsewhere and a lack of crab in the marketplace.
4. Most commercial fishermen prefer to fish the St. Matthew area and if they start overfishing the breeding grounds near these islands, the whole area will be effected.

Proposed by Matthew Iya (203 - 206)

WESTWARD
KING CRAB

* (45)

5 AAC 34.050. GEAR FOR KING CRAB. (Regulation page 51). Allow the longlining of brown king crab in statistical areas T, R, O, and Q.

The proposed regulation reads as follows:

5 AAC 34.050. GEAR FOR KING CRAB.

(h) When fishing for brown king crab only, vessels may longline pots; however, no more than 15 pots may be longlined in a string. A buoy is not required for each pot, but each end of the string

KING CRAB

must be marked by a cluster of four buoys as well as a pole and a flag. One buoy in the cluster must be marked in accordance with 5 AAC 34.050(b).

Justification: The brown king crab fishery is still in the developmental stage. Fishermen would like to experiment with different methods of harvesting this specie of crab. Under the regulations currently in effect, longlining pots is not possible because each pot is required to have at least one buoy attached.

Proposed by: North Pacific Fishing Vessel Owners' Association (101)

KODIAK
TANNER CRAB

* (46)

5 AAC 35.020(b). REGISTRATION. (Regulation page 74) Make Kodiak a super exclusive registration area.

The proposed regulation reads as follows:

5 AAC 35.020. REGISTRATION.

(b) The registration areas in statistical areas "A" and "J" except for the Kodiak District of Area "J" are nonexclusive registration areas. A vessel or gear may be registered for any or all of the nonexclusive areas during any registration year.

Justification: To establish local control and responsibility for management of the Kodiak District tanner crab stocks and to be consistent with present king crab regulations.

Proposed by: Frank Abena and 86 other fishermen (229-237)

* (47)

5 AAC 35.510(1). FISHING SEASONS. (Regulation page 86) Change the season.

The proposed regulation reads as follows:

5 AAC 35.510. FISHING SEASONS. Male tanner crab may be taken only as follows:

(1) in the Kodiak district, from 12:00 noon January [FEBRUARY] 10 through 12:00 noon April 30, except in that portion of the Kodiak district from the longitude of Kilokak Rocks (156°20'13" W. long.) to the longitude of Cape Kumlik (156°27' W. long.) tanner crab may be taken only from 12:00 noon January [FEBRUARY] 10 through May 15;

Justification: Either have to store pots on the grounds (with unavoidable loss) or have to dry storage at considerable cost, (fuel, storage fees, hauling) crab are almost always in prime condition-better for Kodiak's economy (no long period of no work).

Proposed by: Ray Spagnola (3)

KODIAK

TANNER CRAB

* (48)

5 AAC 35.510(1). FISHING SEASONS. (Regulation page 86). Change the season.

The proposed regulation reads as follows:

5 AAC 35.510. FISHING SEASONS. Male tanner crab may be taken only as follows:

(1) in the Kodiak district from 9:00 A.M. [12:00 NOON] February 10 through 12:00 noon April 30, except in that portion of the Kodiak district from the longitude of Kilokak Rocks (156° 20' 13" W. long.) to the longitude of Cape Kumlik (156° 27' W. long.). Tanner crab may be taken only from 9:00 A.M. [12:00 NOON] February 10 through May 15.

Justification: With the current 12:00 noon opening, darkness conflicts with the moving of gear onto the fishing grounds. A 9:00 A.M. opening would provide more daylight for boats without lights to get gear moved. Additionally, with the large amount of gear stored in 25 fathoms or less, daylight is needed to help your your gear.

Proposed by: Norman Miller (125)

ALASKA PENINSULA
TANNER CRAB

* (49)

5 AAC 35.005(a). STATISTICAL AREAS ESTABLISHED., and 5 AAC 35.600. DESCRIPTION OF STATISTICAL AREA. (Regulation pages 73 and 85) Create a superexclusive registration area for tanner crab in the Alaska Peninsula.

The proposed regulation reads as follows:

5 AAC 35.005. STATISTICAL AREAS ESTABLISHED.

M - Alaska Peninsula Area, comprised of the waters specified in 5 AAC 35.600.

5 AAC 35.600. DESCRIPTION OF STATISTICAL AREA. Statistical area M includes all Pacific Ocean waters west of the longitude of Cape Kumlik (157°27' W. long.) and east of the longitude of Scotch Cap Light (164°44' W. long.).

Justification: None provided.

Editor's Note: Adoption of this proposal will require amendments to other Westward (Area J) tanner crab regulations.

Proposed by: Sand Point A.C. (48, 51)
King Cove A.C. (59)

ALASKA PENINSULA
TANNER CRAB

* (50)

5 AAC 35.555. INSPECTION REQUIREMENTS. (Regulation page 88). Allow a 5 day bait up period.

The proposed regulation reads as follows:

5 AAC 35.555. INSPECTION REQUIREMENTS. Vessels registered for statistical areas J must have their holds, live tanks and freezers inspected by a local representative of the department at inspection points designated in 5 AAC 35.540 within the following periods and areas: starting 116 hours after the opening of the South Peninsula district and starting 24 hours before the opening of the remaining districts in area J. No tanner crab may be on board at the time of inspection. The requirements of this section do not apply to any registered tanner crab vessel which does not have any salt water circulation system in its fish hold or crab tanks.

Justification: Give boats time to take their gear out.

Proposed by: King Cove Advisory Committee (59, 60)

* (51)

5 AAC 35.610. FISHING SEASONS. (New Section). Set the season for the proposed area "M".

The proposed regulation reads as follows:

5 AAC 35.610. FISHING SEASONS. Male tanner crab may be taken from a time concurrent with openings in the districts of Area J until 12:00 noon, May 15 unless closed earlier by emergency order.

Justification: None provided.

Proposed by: Sand Point Advisory Committee (50)

ALEUTIANS
TANNER CRAB

* (52)

5 AAC 35.510(5). FISHING SEASONS. (Regulation page 87) Change the season.

The proposed regulation reads as follows:

5 AAC 35.510. FISHING SEASONS. Male tanner crab may be taken only as follows:

(5) in the Western Aleutian district, from [12:00] noon November 10 [1] through [12:00] noon June 15;

Justification: This opening would coincide with the opening we proposed for the king crab fishery in Statistical Area R (Adak). Simultaneous openings in the Adak king crab and tanner crab fisheries would be consistent with previous actions by the Board. Simultaneous king crab and tanner crab fisheries reduce handling mortalities on tanner crab.

ALEUTIANS
TANNER CRAB

Simultaneous king crab and tanner crab fisheries reduce operating costs for harvesters.

Proposed by: Alaska Marketing Association,
North Pacific Fishing Vessel Owners' Association,
Pan-Alaska Fisheries,
Sea Alaska Products,
Seawest Industries,
Trident Seafoods, and
Universal Seafoods (89, 90)

* (53)
5 AAC 35.525(g). LAWFUL GEAR. (New Subsection) (Regulation page 88)
Set a pot limit.

The proposed regulation reads as follows:

5 AAC 35.525. LAWFUL GEAR.

(g) in the Eastern Aleutian area no more than 100 Tanner crab pots may be fished from any registered Tanner crab fishing vessel during the open Tanner crab season.

Justification: This allows for smaller vessels to compete more economically with larger vessels in the area. Quotas are smaller and larger vessels can fish more gear in more areas.

Proposed by: Ken Swimm (122)

BERING SEA
TANNER CRAB

* (54)
5 AAC 35.520(b). SIZE LIMITS. (New Subsection) (Regulation page 87)
Change the size limit for C. bairdi in the Northern subdistrict.

The proposed regulation reads as follows:

5 AAC 35.520. SIZE LIMITS.

(b) male tanner crab of the species Chionoecetes bairdi or greater in width of shell may be taken or possessed in the Northern subdistrict of the Bering Sea district.

Justification: Most C. bairdi encountered in the area were no larger than five inches.

Proposed by: Trans-Pacific International Industries (134)

WESTWARD
TANNER CRAB

* (17)
The tanner crab fishery, particularly in the Bering Sea, harvests two species of tanner crab: bairdi and opilio. The department has documented increased landings of undersized bairdi crab that are being reported as opilio crab. The fishermen claim that they cannot accurately identify the two species and claim that all the smaller crab are opilio. The two species do interbreed, producing hybrids that have a mix of the characteristics of both species. The department will discuss this problem with the Board and the public is invited to make recommended solutions to the problem.

KODIAK
KING and TANNER CRAB

* (55)

5 AAC 34.425(e) and 35.525(b). LAWFUL GEAR. (Regulation pages 63 & 87)
Change the pot limits.

The proposed regulation reads as follows:

5 AAC 34.425. LAWFUL GEAR.

(e) During any king crab season an aggregate of no more than 100
[150] king and tanner crab pots may be fished from any registered king
crab vessel.

5 AAC 35.525. LAWFUL GEAR.

(b) In the Kodiak district no more than 100 [250] tanner crab pots
may be fished from any registered tanner crab fishing vessel during the
open tanner crab season.

Justification: The depressed state of the king crab stock in the Kodiak
area warrants strict control of harvest levels. Excessive numbers of
pots on the grounds makes this control difficult, increases pot loss and
causes a hazard to navigation. The 150 pot limit has proved to be
unenforceable making compliance unnecessary for some vessels. A 100 pot
limit is more easily enforced and would help curb the already excessive
effort.

Proposed by: Michael King (210)
Frank Abena and 83 other fishermen (247-264)

* (56)

5 AAC 34.425(f) and 35.525(g). LAWFUL GEAR. (New subsections) (Reg-
ulation pages 63 & 88) Prohibit inwater storage of king and tanner crab
pots.

The proposed regulation reads as follows:

5 AAC 34.425 and 35.525. LAWFUL GEAR.

(f)(g) During the closed season for king and tanner crab in the
Kodiak area, king and tanner crab pots must be removed from the water
or stored, with all bait containers removed in 30 fathoms of water or
less.

Justification: With the increase in gear it becomes increasingly harder
to find storage in 25 fathoms or less, this extra 5 fathoms would enable
storage up to 25 fathoms without fear of being sighted by Department of
Public Safety if tide conditions or pot drift were not accounted for in
storing gear.

Proposed by: Michael King (211, 212)

KODIAK
KING and TANNER CRAB

* (57)

5 AAC 34.425(f) and 35.525(g) LAWFUL GEAR. (New subsection) (Regulation page 63 & 88) Prohibit catcher/processors.

The proposed regulation reads as follows:

5 AAC 34.425 and 35.525. LAWFUL GEAR.

(f) (g) Vessels engaged in fishing king and tanner crab in the Kodiak area shall not be engaged in processing king or tanner crab during the legal Kodiak area king or tanner crab season.

Justification: Size limit compliance is difficult to monitor for catcher/processors. Present processing and catching capacities in the Kodiak area are already more than adequate.

Proposed by: Frank Abena and 86 other fishermen (219-228)

ALASKA PENINSULA
KING AND TANNER CRAB

* (58)

5 AAC 34.525(g) and 5 AAC 35.625. LAWFUL GEAR. (New Sections) (Regulation pages 65 and 87). Set king and tanner crab pot limits.

The proposed regulation reads as follows:

5 AAC 34.525(g) and 5 AAC 35.625. LAWFUL GEAR. During the open king and tanner crab season, no more than 100 king or tanner crab pots may be used to take king or tanner crab by any registered king or tanner crab fishing vessel.

Justification: To keep the area from being over fished since the quota is being reduced every year.

Proposed by: King Cove Advisory Committee (59, 60)

SOUTH PENINSULA
KING AND TANNER CRAB

* (59)

5 AAC 34.525(g) and 5 AAC 35.525(g). LAWFUL GEAR. (New Subsections) (Regulation pages 67 and 88). Set king and tanner crab pot limits for area M and the South Peninsula district.

The proposed regulation reads as follows:

5 AAC 34.525 and 35.525. LAWFUL GEAR. During any king or tanner crab season an aggregate of not more than 100 king and tanner crab pots may be fished from any registered king or tanner crab vessel.

Justification: Due to rapidly declining king and tanner crab stocks, a pot limit would limit the number of boats participating in the fisheries.

Proposed by: R.E. Newman (10, 11)

DUTCH HARBOR
KING AND TANNER CRAB

* (60)

5 AAC 34.625 and 5 AAC 35.535. LAWFUL GEAR. (Regulation pages 67 and 87). Establish pot storage areas.

The proposed regulation reads as follows:

5 AAC 34.625 and 5 AAC 35.525. LAWFUL GEAR.

(d) King crab pots may [NOT] be stored in the water, with all doors secured fully open and with all bait containers removed, only as follows; [DURING THE CLOSED KING CRAB SEASON]

(1) in waters of Unalaska Bay inside of a line from Eider Point (53° 57' 40" N. lat., 166° 35' 30" W. long.) to a point south of Constaine Bay at 53° 57' 30" N. lat., 166° 27' W. long. from the closure of the Akutan district until noon, February 20.

(2) in any waters that are 25 fathoms or less in depth from the closure of the Dutch Harbor season until noon, February 20, except that king crab pots may not be stored in waters of

(A) Hot Springs Bay inside of a line from the tip of Ridge Point to 54° 12' 40" N. lat., 165° 52' W. long.; and

(B) Kalekta Bay inside of a line from the tip of Erskine Point to the tip of Cape Kalekta.

Justification: At its March, 1982 meeting, the Board eliminated in-water pot storage in Statistical Area 0 largely over its concern about conflicts with other fisheries. However, in response to petitions for emergency regulations, the Board took notice that there were times when in-water storage would not interfere with other fisheries and issued emergency regulations establishing water storage areas. This proposal asks that the times and areas of water storage established by the Board on an emergency basis be adopted through "normal" regulatory procedures. Reduced king crab and tanner crab harvests in the Bering Sea and Aleutian Islands areas are threatening the economic health of the crab fleet. Allowing in-water storage will reduce operating expenses and eliminate the substantial fees incurred each time a pot goes into or is taken out of land storage. Water storage would only be for relatively short periods of time. In-water storage will not result in any biological harm to any fish stocks.

Proposed by: Alaska Marketing Association, North Pacific Fishing Vessel Owners' Association, Pan-Alaska Fisheries, Sea Alaska Products, Seawest Industries, Trident Seafoods, and Universal Seafoods (108, 109)

* (61)

5 AAC 34.xxx and 35.xxx. VESSEL SIZE LIMIT. (New Section). Set a vessel size limit for the Dutch Harbor king and tanner crab fisheries.

The proposed regulation reads as follows:

5 AAC 34.xxx, 35.xxx. VESSEL SIZE LIMIT.

Unalaska Bay waters inside a line from Cape Cheerful at 54° N Lat., 166° 40' 20" W. Long., to Priest Rock at 54° 00' N Lat., 166° 22' 30" W. Long. are closed to registered king and tanner crab vessels over 50 feet in registered length.

DUTCH HARBOR
KING AND TANNER CRAB

Justification: Protect the local king and tanner crab stock in Unalaska Bay from over harvesting.

Proposed by: R. Clark and J. Patron (6, 8)

BRISTOL BAY
KING AND TANNER CRAB

* (62)

5 AAC 34.825(c) and 5 AAC 35.525(c)(3). LAWFUL GEAR. (Regulation pages 69 and 87). Establish a new pot storage area in Bristol Bay.

The proposed regulation reads as follows:

5 AAC 34.825 and 5 AAC 35.525. LAWFUL GEAR.

(c) In addition to the pot storage provisions of 5 AAC 34.050(c) and 5 AAC 35.050(c), king and tanner crab pots may be stored during the closed season:

(1) in waters enclosed by a line from 55° 53' N. lat., 164° 20' W. long., to 56° 20' N. lat., 163° W. long. to 56° 20' N. lat., 162° 10' W. long. to 56° 03' N. lat., 162° 10' W. long. to 55° 18' N. lat., 164° 20' W. long. to the starting point; and

(2) in waters north of 57° N. lat., south of 58° N. lat., west of 164° W. long., and east of 166° W. long.

Justification: With the decline in harvest in the Bristol Bay king crab fishery and the emergence of the St. Matthew and Pribilof fisheries as major king crab fisheries, vessels need a storage area which is closer to these Area Q (Bering Sea) grounds than the present state storage area in Bristol Bay. In-water pot storage would only be for a relatively short period of time; from the end of the Bering Sea tanner crab fisheries to the beginning of the St. Matthew king crab fishery; and from the end of the St. Matthew fishery to the start of the Pribilof king crab fishery. It would be extremely costly, in both time and operating expenses, for fishermen intending to operate in the Statistical Area Q king crab fisheries to have to bring in their gear to the present Bristol Bay pot storage area for a short period. Due to the decline in king crab harvests in the Bering Sea, many fishermen are operating under severe financial hardships. Creation of a water storage area which is closer to the major grounds than the present area would give some economic relief to the fleet. The area being proposed is still the federal pot storage area. It was used by fishermen during 1982 and helped relieve congestion in the current pot storage area established in state regulations. The proposed area is also familiar to foreign and domestic fishing vessels as an area where crab pots are stored. The area being proposed would be in addition to the present state storage area in Bristol Bay.

Proposed by: Alaska Marketing Association, North Pacific Fishing Vessel Owners' Association, Pan-Alaska Fisheries, Sea Alaska Products, Seawest Industries, Trident Seafoods, and Universal Seafoods. (104 - 107)

WESTWARD
KING, TANNER AND HAIR CRAB

* (C3)

5 AAC 34.xxx, 35.xxx and 38.xxx. EXTRA FISHING TIME. (New Section). Allow a vessel to have extra fishing time when it aids a vessel in distress during the area T, R, O and Q king crab, tanner crab and hair crab fisheries.

The proposed regulation reads as follows:

5 AAC 34.xxx. EXTRA FISHING TIME. A vessel which goes to the aid of a vessel in distress is able to make up for the fishing time lost while rendering assistance.

Justification: In the Bering Sea and Aleutian Islands areas, there is virtually no Coast Guard search and rescue capability. Consequently, a fisherman must rely on another fisherman should his vessel become disabled. If a fisherman hesitates to render assistance because of losing fishing time, then the safety of a crew and vessel could be in jeopardy. This proposal would reward the fisherman who gives help and should eliminate any reasons for indecision.

Proposed by: North Pacific Fishery Vessel Owners' Association (99, 100)

MISCELLANEOUS SHELLFISH
WESTWARD (AREA J)

(C4)

5 ACC 38.420. (1)(2)(4)(5) FISHING SEASONS FOR SCALLOPS. (Regulation page 99). Open new areas and close old areas to scallop fishing.

The proposed regulation reads as follows:

5 AAC 38.420. FISHING SEASONS FOR SCALLOPS. Scallops may be taken:

(1) Repealed. [FROM JUNE THROUGH MARCH 31 IN THE PACIFIC OCEAN WATERS NORTH OF 57°37'07" N. LAT., AND EAST OF 152°09'01" W. LONG. (CAPE CHINIAK LIGHT) AND THE WATERS OF SHELKOF STRAIT NORTH OF 57°17'20" N. LAT. (THE LATITUDE OF CAPE IKOLIK);

(2) Repealed. [FROM JULY 15 THROUGH MARCH 31 IN THE PACIFIC OCEAN WATERS SOUTH OF THE LATITUDE OF CAPE CHINIAK LIGHT AND WATERS EAST OF THE LONGITUDE OF CAPE BARNABAS, EXCLUDING THOSE WATERS NORTHWEST OF A LINE FROM CAPE BARNABAS TO NARROW CAPE];

(4) from April 1 through August 31 in the Pacific Ocean waters of the Alaska Peninsula area between the longitude of Scotch Cap and the longitude of Cape Pankof, and inshore of a line extending from Cape Pankof to Bay Point on Unga Island to West Head on Unga Island to Dent Point on the west side of Stepeovak Bay to Bluff Point on Kupraanof Peninsula.

(5) from April 1 through August 31 in waters south of the latitude of Cape Ikolik (57°17'20" N. lat.), west of the longitude of Cape Barnabas (152°52'20" N. long.) east of the longitude of Kilokuk Rocks (126°19' W. long.) and in Old Harbor narrows west of 153°16' W. long.

Justification: To: (1) by alternately opening new scallop areas for closing old ones there will be better productive scallop harvests overall; (2) to open other large scallop areas in waters which larger vessels can work in (weather, heavier seas, etc.); (3) to maintain an ongoing productive scallop fishery from year to year.

Proposed by: Scott Hulse (190)

TANNER CRAB
COOK INLET

* (95)

5 AAC 35.410 (1)(2) FISHING SEASONS. (Regulation page 84). Change the opening date of the Tanner crab season in Cook Inlet.

The proposed regulation reads as follows:

5 AAC 35.410. FISHING SEASONS. Male Tanner crab may be taken:

(1) in the Southern district from 12:00 noon November 1 [DECEMBER 1] through April 30;

(2) in the Central, Kamishak Bay, Barren Islands, Outer and Eastern districts from 12:00 noon November 1 [DECEMBER 1] through May 31.

Justification: Condition of the crab seem to be in a marketable condition. The weather will allow more fishing time for the fleet due to the average size of the vessels fishing Tanner crab. This could save loss of property and life because the vessels would not have to fish during freezing weather.

Proposed by: Seldovia Advisory Committee (200)

* (96)

5 AAC 35.410(2). FISHING SEASONS. (Regulation page 84) Change the season.

The proposed regulation reads as follows:

5 AAC 35.410. FISHING SEASONS. Male tanner crab may be taken:

(2) in the Central, Kamishak Bay, Barren Island, Outer and Eastern districts from noon December 1 through June 15 [MAY 31.]

Justification: The last three years have shown harvestable quantities of crab available after calendar closure. This area has extremely bad weather 80% of the existing season, therefore, the quota has not been reached.

Proposed by: Bob Tremain (115)

* (97)

5 AAC 35.410. FISHING SEASONS. (Regulation page 84) Change the seasons.

The proposed regulation reads as follows:

5 AAC 35.410. FISHING SEASONS.

Male tanner crab may be taken:

(1) in the Southern district from 12:00 noon November 1 until half the guideline harvest level has been taken and from 12:00 noon March 1 until the remainder of the guideline harvest level has been taken or through April 30. [DECEMBER 1 THROUGH APRIL 30];

(2) in the Central, Kamishak Bay, Barren Islands, Outer and Eastern districts from 12:00 noon November 1 [December 1] through May 31.

COOK INLET
TANNER CRAB

Justification: Biologically the crab are ready to be harvested November 1. To take advantage of generally better weather. To spread the catch effort out over different crab stocks. To reduce price disputes between processors and fishermen.

Proposed by: John DeSylva (66-68)

* (98)

5 ACC 35.415. GUIDELINE HARVEST LEVELS. (Regulation page 84). Remove guideline harvest levels.

The proposed regulation reads as follows:

5 AAC 35.415. GUIDELINE HARVEST LEVELS. Guideline harvest levels for Tanner crab are as follows:

(1) [SOUTHERN DISTRICT: 3,000,000 POUNDS (1,361 MT)]
repealed;

(2) [KAMISHAK BAY AND BARREN ISLANDS: 4,500,000 (2,041 MT)]
repealed;

(3) [TOTAL OF ALL OTHER COOK INLET DISTRICT: 3,500,000 (1,588 MT)]
repealed;

Justification: The guideline harvest levels as they are currently published do not reflect the most recent estimates of fluctuating crab abundance. The most accurate assessment of stock abundance, and potential harvest is available upon completion of the annual population abundance index survey. Substituting preseason forecasts for the guideline harvest levels will provide a more useful basis for planning by fishermen and processors. Preseason index surveys will be used to determine potential harvest for the upcoming season. These forecast will be made available to the fishermen and processors through news release and public contact.

Proposed by: Staff

* (99)

5 AAC 35.425. (b) LAWFUL GEAR. (Regulation page 84). Provide for a Tanner crab pot limit.

The proposed regulation reads as follows:

5 AAC 35.425. LAWFUL GEAR.

(b) During any Tanner crab season no more than 150 Tanner crab pots may be fished in the Kamishak Bay and Barren Island districts. No more than 75 Tanner crab pots may be fished in the Southern district.

Justification: This is the number of pots tht the majority of the Seldovia/Homer fleet now fish. The existing fleet is now capable of harvesting the allowable harvest and due to the declining stocks in Kachemak Bay the reduced pot limit would assist in protecting these stocks.

Proposed by: Seldovia Advisory Committee (197)(201)

KING CRAB
PRINCE WILLIAM SOUND

fishermen, but causes unnecessary mortality due to stockpiling. Gear, with lids untied or doors open and in an unbaited condition, may be stored by existing regulation in 25 fathoms or less. This proposal is related to the proposal on 5 AAC 34.205 and should be acted on together.

Proposed by: Staff

111

5 AAC 34.215. GUIDELINE HARVEST LEVELS. (Regulation page 59). Repeal the existing guideline harvest level for the king crab fishery in Prince William Sound.

The proposed regulation reads as follows:

5 AAC 34.215. GUIDELINE HARVEST LEVELS. Repeal. [THE GUIDELINE HARVEST LEVEL IS 500,000 POUNDS (227 MT).]

Justification: The guideline harvest levels as they are currently published do not reflect the most recent estimates of fluctuating crab abundance. The most accurate assessment of stock abundance, and potential harvest is available upon completion of the annual population abundance index survey. Substituting preseason forecasts for the guideline harvest levels will provide a more useful basis for planning by fishermen and processors. Pre season index surveys will be used to determine potential harvest for the upcoming seasons. These forecasts will be made available to the fishermen and processors through news release and public contact.

Proposed by: Staff

TANNER CRAB
PRINCE WILLIAM SOUND

* 112

5 AAC 35.315. GUIDELINE HARVEST RANGE. Repeal the guideline harvest range for the Tanner crab fishery in Prince William Sound.

The proposed regulation reads as follows:

5 AAC 35.315. GUIDELINE HARVEST RANGE. Repeal. [THE GUIDELINE HARVEST RANGE FOR TANNER CRAB IS 1,300,000 TO 5,300,000 POUNDS (590 TO 2,403 MT).]

Justification: The guideline harvest levels as they are currently published do not reflect the most recent estimates of fluctuating crab abundance. The most accurate assessment of stock abundance, and potential harvest is available upon completion of the annual population abundance index survey. Substituting preseason forecasts for the guideline harvest levels will provide a more useful basis for planning by fishermen and processors. Pre season index surveys will be used to determine potential harvest for the upcoming seasons. These forecasts will be made available to the fishermen and processors through news release and public contact.

Proposed by: Staff

MISCELLANEOUS SHELLFISH
PRINCE WILLIAM SOUND

113

5 AAC 38.230. FISHING SEASON FOR SEA SNAILS. (Regulation page 98). Repeal the fishing season for sea snails in Prince William Sound.

The proposed regulation reads as follows:

SOUTHEAST
TANNER CRAB

* 164

5AAC 35.020. (b). REGISTRATION. (Regulation page 74)
Establish portions or all of Southeast Alaska as an exclusive
registration area for Tanner crab.

The proposed regulation reads as follows:

5AAC 35.020. REGISTRATION.

Option 1

(b) The registration areas in statistical areas A, except for Districts 1 - 15, and J are nonexclusive registration areas. A vessel or gear may be registered for any or all of the nonexclusive registration areas during any registration year.

Option 2

(b) The registration area [AREAS] in statistical area [AREAS A AND] J is a [ARE] nonexclusive registration area [AREAS]. A vessel or gear may be registered for any on all of the nonexclusive registration areas during any registration year.

Justifications:

Option 1

- 1) Less fishing pressure, stopping unpredictable amounts of gear from showing up in the fishery.
- 2) Better management of stocks by ADF&G.
- 3) SE Alaska had a disastrous season in 1982-83 due to the tremendous influx of gear.

Proposed by: Sitka Advisory Committee (169)

Option 2

The well documented burden of effort and resultant economic crash for our local S.E. fleet leaves area registration as the only viable solution. Under the present regulation, out of the 4 statewide Tanner fishing registration areas, 2 of them (Cook Inlet and Prince William Sound) are exclusive and the other half (Westward and Southeast) are nonexclusive. This is a move to lessen the influx of vessels from other areas. Vessels stop and fish Southeast on the way Westward and then when Southeast closes, they continue on to their normal fishing areas. This along with other proposals to change the opening date of the Tanner crab fishery to February 10, would remove most of this additional pressure from the Southeast Stocks.

Proposed by: Petersburg Advisory Committee (276)
Arl Mathisen (285)
Juneau Commercial Crab Fishermen (179)

SOUTHEASTERN-YAKUTAT
TANNER CRAB

*

165

5AAC 35.110. (a). FISHING SEASONS. (Regulation page 81)
Change the opening date for the Southeast Tanner crab fishing
season.

The proposed regulation reads as follows:

5AAC 35.110. FISHING SEASONS. (a) In those districts
described in 5AAC 33.200, male Tanner crab may be taken only
from 12:00 noon February 10 [DECEMBER 1] through May 1.

Justification: Better meat recovery and more spread out
fishing pressure in several districts. In some areas of
Southeast Alaska Tanner crab don't show up until February.
Present season duration not allowing a harvest of these
stocks. Opening the Tanner crab season at the same time as
the brown king crab season should reduce effort on Tanner
crab stocks, make management easier and be at a time when
meat recovery is high.

Proposed by: Sitka Advisory Committee (168)
Petersburg Advisory Committee (273)
Arl Mathissen (283)
Juneau Commercial Crab Fishermen (180)

*

166

5 AAC 35.110(a). FISHING SEASONS. (Regulation page 81) Change the
season.

The proposed regulation reads as follows:

5 AAC 35.110. FISHING SEASONS. (a) In those districts described
in 5 AAC 33.200, male tanner crab may be taken only from 12:00 noon
February [DECEMBER] 1 through May 15 [1].

Justification: The quality of tanner crab is better later in the year.

Proposed by: Sitka Sound Seafoods (4)

*

167

5AAC 35.115.(2) and (3) (New Subsection). GUIDELINE HARVEST
RANGES. (Regulation page 82) Establish a guideline harvest
range for Districts 1 - 4.

The proposed regulation reads as follows:

5AAC 35.115. GUIDELINE HARVEST RANGES. The guideline
harvest ranges for Tanner crab are as follows:

(2) in Districts 5-16 of those waters described in
5AAC 33.200 750,000 to 2,500,000 pounds (340 to 1134 m.t.)

(3) in Districts 1-4 of those waters described in
5AAC 33.200 _____ pounds.

Justification: With the very intense and rapidly expanding
Tanner crab fishery in northern Southeast, the guideline

SOUTHEASTERN YAKUTAT
TANNER CRAB

harvest range is filled and the season closed with all the fisheries in Districts 1 through 4 untapped. There are some Tanner crab stocks available in Districts 1 through 4.

Proposed by Larry Painter (295)

* (168)

5 AAC 35.125(f). LAWFUL GEAR. (Regulation page 82) Set tanner crab pot identification requirements.

The proposed regulation reads as follows:

5 AAC 35.125. LAWFUL GEAR.

(f) Pot or buoy identification requirements for tanner crab pots are as follows:

(1) in areas where a tanner crab pot limit is in effect each tanner crab pot must have an identification tag issued by the department. The tag must be placed on the main buoy or on the trailer buoy if more than one buoy is attached to the pot; the tags are issued prior to each fishing season and are uniquely numbered for each registration year;

(2) the tags will be issued at the time of registration for the vessel only; each application must apply at offices of the department designated to issue the tags;

(3) replacement of tags lost during the season is permitted if the vessel operator submit a sworn statement or affidavit describing how the tags were lost and listing the numbers of the lost tags;

(4) annual renewal of the tags must be accomplished by obtaining new tags prior to each fishing season.

Justification: During the 1982 tanner crab season in Southeast, Fish and Wildlife Protection received numerous complaints of overlimit of gear. To successfully prosecute an overlimit of gear violation, Fish and Wildlife Protection must first count an overlimit of gear which is actually being fished. Attempts to count gear by Fish and Wildlife Protection was unsuccessful due to weather conditions and gear constantly being moved. If there was a tag requirement Fish and Wildlife Protection could immediately take action involving an untagged pot.

Proposed by: Department of Public Safety

(169)

5AAC 35.125. (f) (New Subsection). LAWFUL GEAR. (Regulation page 82). Require that only one legal limit of Tanner crab fishing gear may be on a vessel or in the water at any time.

The proposed regulation reads as follows:

5AAC 35.125. LAWFUL GEAR.

(f) No registered Tanner crab vessel may have more than the legal limit of gear on the vessel, in the water in fishing condition, or in the water in stored condition at any time.

SOUTHEASTERN-YAKUTAT
TANNER CRAB

Justification To facilitate enforcement of king crab, Tanner crab and dungeness crab season openings, closures, and pot limits.

Proposed by Petersburg Advisory Committee (277)
Sig Mathisen (288)

X (170)

5AAC 35.125. (f) (New Subsection). LAWFUL GEAR. (Regulation page 82). Require escape rings for Tanner crab pots.

The proposed regulation reads as follows:

5AAC 35.125. LAWFUL GEAR.

(f) Two escape rings 4 3/4 inches (122 mm) in minimum inside diameter, so located on the verticle plane to permit the escape of undersize crabs, shall be provided for each Tanner crab pot.

Justification: The presence of escape rings in Tanner crab pots will reduce handling mortalities of undersize male and female crabs.

Proposed by: Staff (I-5)

X (171)

5AAC 34.200. (New Section). LIMITATIONS WHILE FISHING FOR KING CRAB and 5AAC 35.200 (New Section). LIMITATIONS WHILE FISHING FOR TANNER CRAB. (Regulation page 58 and 82). Prohibit king and Tanner crab vessels from fishing or storing pots in the water for one week prior to the opening of the king or Tanner crab fishing seasons.

The proposed regulation reads as follows:

5AAC 34.200. LIMITATIONS WHILE FISHING FOR KING CRAB. Validly registered king crab fishing vessels may not fish any pot gear or store any pot gear in the water one week prior to the opening of the king crab season.

5AAC 35.200. LIMITATIONS WHILE FISHING FOR TANNER CRAB. Validly registered Tanner crab fishing vessels may not fish any pot gear or store any pot gear in the water one week prior to the opening of the Tanner crab season.

Justification: Enforcement cannot control early fishing in the red king crab and Tanner crab fisheries. This might be an alternative to trying to have pot definitions.

Proposed by: Sitka Advisory Committee (173)

X (172)

5AAC 35.125. (e). LAWFUL GEAR. (Regulation page 82). Allow the use of square Tanner crab pots in portions of the Yakutat area.

The proposed regulation reads as follows:

SOUTHEASTERN-YAKUTAT
TANNER CRAB

5AAC 35.125. LAWFUL GEAR.

(e) In Yakutat Bay and contiguous waters north an east of a line extending from Point Manby to Ocean Cape [THOSE DISTRICTS IN 5AAC 30.200], Tanner crab may not be taken with pots which have tunnel eye openings located on the verticle plane of the pot. This subsection is effective January 1, 1983.

Justification: Square pots will take halibut, but so will conical and pyramid pots. It is the operators responsibility to release halibut. Many experienced "crabbers" say that halibut survival is greater in square pots. Halibut Commission figures show halibut stocks rebuilding in the Gulf of Alaska and since we feel that square pots are not a resource problem to the halibut fishery, the ban should only include Yakutat Bay if the area people want it.

Proposed by: Aril Mathisen (284)
Petersburg Advisory Committee (174)

173

5AAC 35.150.(New Section). CLOSED WATERS. (Regulation page 82). Close the waters of Gastineau Channel to commercial Tanner crab fishing.

The proposed regulation reads as follows:

5AAC 35.150. CLOSED WATERS. All waters of Gastineau Channel north of a line from Marmion Island light to Point Salisbury are closed to the taking of Tanner crab.

Justification: Gastineau Channel is one of the only areas where people living in Juneau can obtain Tanner crab for subsistence utilization. There are plenty of other areas where commercial fishermen can harvest crab within a few miles of Juneau where a subsistence fisherman, with a small skiff cannot reach safely.

Proposed by: Carl Hagerup (265)

SOUTHEASTERN-YAKUTAT
DUNGENESS, KING AND TANNER CRAB

174

5 AAC 32.150, 34.150 and 35.150. CLOSED WATERS. (New Subsections) (Regulation pages 41, 58, and 82). Close areas around Ketchikan to commercial crab fishing.

The proposed regulation reads as follows:

5 AAC 32.150, 34.150 and 35.150. CLOSED WATERS.

Dungeness, king and tanner crab may not be taken in the waters of Yes Bay, Traitors Cove, Naha, Bostwick Inlet, Helm Bay, Port Stewart, Spacious Bay and Shoal Cove.

Justification: Areas are getting fished out for local residents.

Proposed by: Al Kotlanov and 23 others (16, 17)

STATEWIDE
KING CRAB

* 187

5 AAC 34.050(h). GEAR FOR KING CRAB. (New subsection) (Regulation page 52) Allow the longlining of brown king crab pots.

The proposed regulation reads as follows:

5 AAC 34.050. GEAR FOR KING CRAB.

(h) Pots used for the taking of brown king crab may be longlined.

Justification: Longlining is the only way to fish brown king crab in the tide.

Proposed by: Terry Buholm (55)

* 188

5 AAC 34.055. PERMITS FOR PROCESSING VESSELS. (Regulation page 52) Require a permit for processing vessels in all areas of the state.

The proposed regulation reads as follows:

5 AAC 34.055. PERMITS FOR PROCESSING VESSELS. The owner or operator of a vessel used in the processing of king crab (IN STATISTICAL AREAS K, M, O, R, T AND Q] shall obtain a permit from the department before starting processing operations. The permit must contain the following requirements:

- (1) reporting of vessel location to the department;
- (2) reporting of harvesting or processing operations to the department;
- (3) reporting of unloading and transport operations to the department;
- (4) permission for local representatives of the department to inspect, at any time, the vessel's holds, live tanks, freezers, processing areas, and processed and unprocessed king crab; and
- (5) reporting of any other information required by the department for the conservation and development of king crab resources.

Justification: The current regulation was adopted by the Board primarily as a method to enhance enforcement of crab species, sex, and size limit regulations, but was restricted to the Westward areas due to legal notice constraints. The Board requested a proposal be presented at its Spring 1983 meeting that would allow the permit procedure to be required statewide.

Proposed by: Board of Fisheries

* 189

5 AAC 34.060(b). SIZE LIMIT FOR KING CRAB. (New subsection) (Regulation page 53) Reduce the size limit for brown king crab.

Editor's Note: The proposer did not provide a recommended size limit.

Justification: Brown crab don't grow like red crab.

Proposed by: Terry Buholm (55)

STATEWIDE
TANNER CRAB

192

5 AAC 34.xxx. FISHING SEASONS. (New Section). Set a concurrent opening for all tanner crab fisheries.

The proposed regulation reads as follows:

5 AAC 34.xxx. FISHING SEASONS. Have each area in the state open at a uniform time, for the tanner crab seasons.

Justification: To keep the CRAB from BEING OVER HARVESTED.

Proposed by: King Cove Advisory Committee (59, 60)

* 193

5 AAC 35.055. PERMITS FOR PROCESSING VESSELS. (Regulation page 78)
Require a permit for processing vessels in all waters of the state.

The proposed regulation reads as follows:

5 AAC 35.055. PERMITS FOR PROCESSING VESSELS. The owner or operator of a vessel used in the processing of tanner crab [IN STATISTICAL AREA J] shall obtain a permit from the department before starting processing operations. The permit must contain the following requirements:

- (1) reporting of vessel location to the department;
- (2) reporting of harvesting or processing operations to the department;
- (3) reporting of unloading and transport operations to the department;
- (4) permission for local representatives of the department to inspect at any time the vessel's holds, live tanks, freezers, processing areas, and processed and unprocessed tanner crab; and
- (5) reporting of any other information required by the department for the conservation and development of tanner crab resources.

Justification: The current regulation was adopted by the Board primarily as a method to enhance enforcement of crab species, sex, and size limit regulations, but was restricted to the Westward areas due to legal notice constraints. The Board requested a proposal be presented at its Spring 1983 meeting that would allow the permit procedure to be required statewide.

Proposed by: Board of Fisheries

STATEWIDE
KING AND TANNER CRAB

194

5 AAC 34.050(d) and 5 AAC 35.050(d). GEAR FOR KING and TANNER CRAB. (Regulation pages 52 and 77) Eliminate "major damage" as a reason for allowing the retention of king and tanner crab after a season closure.

The proposed regulation reads as follows:

5 AAC 34.050 and 35.040. GEAR FOR KING and TANNER CRAB.

STATEWIDE
TANNER CRAB

(d) The owner or operator of a king or tanner crab vessel that has sunk [OR IS NOT ABLE TO TAKE KING CRAB BECAUSE OF MAJOR DAMAGE DOCUMENTED IN WRITING BY A MARINE SURVEYOR] may apply to the commissioner for a permit to sell legal size male king or tanner crab obtained when his pots are removed by himself or his authorized agent though the king or tanner crab season is closed in the area. The application must be made within 14 days of the sinking of [OR DAMAGE TO] the vessel. The fish ticket must show the delivery made by the lost vessel.

Justification: During the 1982-83 king crab fisheries, four vessels made application for late deliveries under this provision for Bristol Bay, one vessel for a district closure, four after the season in the Dutch Harbor area, six vessels for the Pribilof district and one vessel for the St. Matthew area. Damage ranged from broken propeller shafts to the loss of navigation equipment, blown mains to cracked hulls. Each individual felt they had a major breakdown. Individuals would request application and in some cases, when granted, would take up to two weeks before they left to fish, being two to three weeks after the season closure.

We expect similar situations to occur in the 82/83 tanner crab fisheries.

Proposed by: Staff

* 195

5 AAC 34.050 and 35.050. LAWFUL GEAR. (New Subsection) (Regulation pages 52 and 77). Allow the longlining of pots in areas without pot limits.

The proposed regulation reads as follows:

5 AAC 34.050 and 35.050. LAWFUL GEAR.

(h) king and tanner crab may be taken by pots attached to a long line in depths greater than 125 fathoms in those areas not affected by pot limits. At least one buoy bearing a single number of the vessel fishing the long line gear must be attached to one end of the gear. The numbers must be painted on the top one-third of the buoy in numerals at least four inches in height, one-half inch in width and in a color contrasting to that of the buoy. The buoy markings must be visible on the buoy above the water surface when the buoy is attached to the long line.

Justification: None provided.

Proposed by: George Fulton (131, 132)
Russell Moore (129)

* 196

The proposer requests that a fish and wildlife agent be aboard each catcher processor that processes in the state during the tanner and king crab season.

Justification: To keep the processors from processing UNDERSIZED crab.

Proposed by: King Cove Advisory Committee (59, 60)

SUMMARY: COUNCIL/BOARD OF FISHERIES JOINT PUBLIC HEARING
ON THE PROPOSED KING CRAB REGULATIONS FOR THE 1983-84 FISHERY

Seattle, Washington
March 8, 1983

In accordance with the provisions of the Joint Statement of Principles between the North Pacific Fishery Management Council and the Alaska Board of Fisheries for management of domestic king crab fisheries in the Bering Sea and Aleutians, the Council and Board conducted their second joint public hearing outside Alaska on Tuesday, March 8, 1983 in Seattle. The hearing was chaired by Harry Sundberg, with Board member Pete Isleib, and Council members Clem Tillion, Harold Lokken, Rudy Petersen, Jeffrey Stephan, and Gene DiDonato in attendance. Support staff present were Mil Zahn, Eulalie Sullivan and Kris Wright, ABOF, Jim Branson and Steve Davis, NPFMC, Jack Lechner Marty Eaton and Fred Gaffney, ADF&G, Phil Chitwood and Jerry Reeves, NMFS.

The hearing convened at 9:00 a.m. with a staff report presented by Marty Eaton. Approximately thirty-three members of the public attended the hearing and synopses of individual testimony are given below.

Richard Goldsmith, North Pacific Fishing Vessel Owner's Association, Seattle, presented his association's support and opposition to a variety of proposals currently before the Board and Council [See item D-3() for a detailed summary of the NPFVOA position.]

His testimony focused primarily on proposals concerning season dates, pot storage, pot limits, and a smaller Brown king crab size limit. His association supports a later season opening date for the Bering Sea, Bristol Bay, Dutch Harbor and Adak king crab fisheries by approximately 10-14 days (Nos. 26, 32, 34, 38). The purpose behind these series of opening dates is for the crab fleet to fish their way south, by first fishing the Northern district of the Bering Sea on August 15, to be followed 47 days later with openings of the Pribilof district and Bristol Bay on October 1, to be followed by openings in the Dutch Harbor and Adak areas on November 10. The rationale supporting these later seasons is to harvest crab of better quality and allow crab vessels which have been tendering in the salmon fishery an opportunity to move north in time for the St. Matthew king crab fishery. The continuity of seasons in this manner would help lower the processor's growing shutdown and startup costs by reducing the amount of time between seasons when they would otherwise be idle. Mr. Goldsmith also expressed his association's support for the following proposals: revision of Bering Sea tank inspections regulations so they are consistent with other major crab fisheries (No. 36); that changes to the Adak king crab season dates be made as well to the Adak Tanner crab season (No. 52); reduce the Brown king crab size limit (Nos. 27, 33, 35, 42, 189); all Brown king crab seasons should be set by field order due to the lack of information on this fishery (Nos. 40, 41); the ADF&G proposal to move the current Northern district pot storage area to between the Pribilof Islands and St. Matthew (No. 43); the authorization to longline crab pots when fishing for Brown king crab (Nos. 45, 187); a reduction in the C. bairdi size limit, north of 58°N. latitude (No. 54); the required presence of an enforcement agent on

each catcher/processor (No. 196); and that extra fishing time be provided to a vessel if its involved in aiding another vessel in distress (No. 63).

The NPFVOA opposed the following proposals: the use of longlining crab gear when fishing for red or blue king crab and Tanner crab (No. 195); the prohibition of catcher/processors from the Kodiak fishery (No. 57); the prohibition of all vessels greater than 50' from fishing in the Dutch Harbor area (No. 61); the proposed area closures for Norton Sound and the Northern district king crab fisheries (Nos. 39, 44); all pot limit proposals (Nos. 28, 53, 55, 58, 59); and all super-exclusive and exclusive registration area proposals (Nos. 23, 46, 49, 164). In addition to commenting on specified proposals, Mr. Goldsmith did bring to the Board's attention, an inconsistency between the Adak king and Tanner crab tank inspection requirements. Since both of these fisheries open simultaneously, it is necessary that the time required for inspections be the same for both fisheries. He also recommended the printing of identification sketches to aid fishermen in identifying the different species of Tanner crab and the establishment of a toll-free hotline so fishermen can obtain the latest information concerning regulations.

Robert Alverson, Alaska Marketing Association, Seattle, testified in favor of the proposed delay in the season opening for the Bering Sea, Bristol Bay, Dutch Harbor and Adak areas (Nos. 26, 32, 34, 38). As was mentioned by Mr. Goldsmith, the purpose behind these series of opening dates was due to the low abundance of crab and the need for high quality sections for the white tablecloth market. To meet the demand for a high quality product, the later seasons would help minimize the risk of light crab. The proposed dates were selected as a reasonable compromise between harvesters and processors to ensure that weather conditions do not unfairly restrict the fishing operations of smaller vessels. He also voiced his support of reducing the Brown king crab size limit (No. 189).

Mr. Alverson opposed the following proposals: establishing Kodiak and South Peninsula areas as "super-exclusive" (Nos. 46, 49) for lack of economic incentive; prohibiting the use of catcher/processors in the Kodiak area (No. 57); prohibiting the use of vessels greater than 50' in the Dutch Harbor area (No. 61); and the closure of Norton Sound to summer king crab fishing (No. 39).

Dennis Petersen - vessel owner/fisherman, Seattle, supported the comments made by Mr. Goldsmith on the proposal package. He voiced his support for re-locating the Bering Sea pot storage area making it more accessible to fishermen (No. 43); and the importance of an issuance of a Notice to Mariners to all foreign trawl fleets, informing them of pot storage areas and the likelihood of gear conflict when fishing in these locations. In addition, Mr. Petersen proposed that ADF&G develop a day-by-day monitoring system to improve the manager's capability of monitoring catch rates and prevent area closures prior to quotas being reached.

Bill Osborne - vessel owner/fisherman, Seattle, testified in favor of a September 15 opening, in the Dutch Harbor, Adak and the Northern district of the Bering Sea (Nos. 25, 31, 37). The primary reason for the earlier openings was to spread the fleet over a large area and as a result, seasons may last longer. He added that there should be some consistency in the criteria used by ADF&G when they close fisheries and that this problem should be addressed.

Buzz Johnson - vessel owner, Seattle, commented on pot storage. He felt that pot storage areas should be larger than what is currently available and that all foreign fishermen should be prohibited from trawling in designated pot storage areas. Mr. Johnson stated his support for in-water pot storage provisions in the Dutch Harbor area (No. 60), the reduction of the Brown king crab size limit (No. 27, 33, 35, 42, 189), the elimination of "major damage" as a reason for post-season recovery of gear and crab (No. 194), and the requirement for an enforcement agent to be on board all catcher/processor vessels. He was opposed to the method of longlining pots in the crab fisheries, stating that it would be unenforceable (Nos. 45, 187, 195), and to the proposal providing extra fishing time to fishermen who assist other vessels in distress (No. 63). He felt that owners with multiple vessels would abuse this regulation if approved.

Terry Buholm, fisherman, Seattle, supported proposals for lowering the Brown king crab size limit, the authorization to longline for Brown king crab and the establishment of a 24-hour, toll-free hotline to provide fishermen with better communications to ADF&G (Nos. 187, 189, 199).

PROPOSAL NUMBERSUMMARY OF PROPOSAL/NPFVOA POSITION

- 16 Set a harvest strategy for all the king crab areas from Kodiak west--NPFVOA WILL QUESTION how the Alaska Department of Fish and Game (ADF&G) arrived at the exploitation rates it is proposing.
- 17 Problem with distinguishing C. opilio from C. bairdi tanner crab--NPFVOA WILL SUGGEST that identification sketches be sent out with interim-use permits.
- 23 Make the Alaska Peninsula a super-exclusive registration area for king crab (that is, a vessel may fish only there and nowhere else)--NPFVOA WILL OPPOSE.
- 26 Change the opening of the Dutch Harbor king crab season from November 1 to November 10 (tank inspections to be given on November 15)--NPFVOA WILL SUPPORT (co-maker of proposal).
- *27 Reduce size limit for brown king crab in the Dutch Harbor area--NPFVOA WILL SUPPORT (co-maker of proposal).
- 28 Set a limit of 100 king crab pots for Dutch Harbor--NPFVOA WILL OPPOSE.
- 32 Change the opening of the Adak king crab season from November 1 to November 10 (tank inspections to be given no earlier than noon, November 8)--NPFVOA WILL SUPPORT (co-maker of proposal).
- *33 Reduce the size limit for brown king crab in Adak--NPFVOA WILL SUPPORT (co-maker of proposal).
- 34 Change the opening of the Bristol Bay king crab season from September 10 to October 1 (tank inspections to be given on October 6)--NPFVOA WILL SUPPORT (co-maker of proposal).
- *35 Reduce size limit for brown king crab in Bristol Bay--NPFVOA WILL SUPPORT (co-maker of proposal).
- 36 Change tank inspection requirement for the St. Matthew king crab fishery from 48 hours before to 116 hours after the season opens--NPFVOA WILL SUPPORT (maker of proposal).
- 38 Change the opening of the Pribilof king crab fishery from September 10 to October 1 (tank inspections to be given on October 6) and the opening of the Northern district king crab fishery from August 1 to August 15 (tank inspections for St. Matthew would be given on August 20 if Proposal 36 is adopted; tank inspections for Norton Sound to be given no earlier than August 13); Change last day of Northern district season from September 3 to September 22--NPFVOA WILL SUPPORT (co-maker of proposal).

*
NPFVOA is waiting for completion of study by National Marine Fisheries Service before it takes a stance on what the minimum size for brown king crab should be.

PROPOSAL NUMBERSUMMARY OF PROPOSAL/NPFVOA POSITION

- 39 Close the summer king crab fishery in Norton Sound--NPFVOA WILL OPPOSE.
- 40 Set seasons for brown king crab in the Northern and Pribilof districts--NPFVOA WILL QUESTION establishment of fixed seasons. NPFVOA WANTS SEASONS ESTABLISHED BY EMERGENCY ORDER. (More data is needed on these developing fisheries. Use of emergency orders to open and close fisheries will give managers greater flexibility by enabling them to regulate fishing in harmony with resource condition as indicated by data from on-going fishery.)
- 41 Set a season and reduce size limit for brown king crab in the Northern district--NPFVOA WILL SUPPORT reduction in minimum size limit (although may not support minimum size in this proposal; depends on the results of the uncompleted National Marine Fisheries Service study). NPFVOA WANTS ESTABLISHMENT OF BROWN KING CFAB SEASONS BY EMERGENCY ORDER. (See NPFVOA position on Proposal 40.)
- *42 Reduce size limit for brown king crab in the Pribilof district--NPFVOA WILL SUPPORT (co-maker of proposal).
- 43 Move Northern district pot storage area down to area north of 59° North latitude, south of 59° 30' North latitude, west of 169° 30' West longitude, and east of 171° West longitude--NPFVOA IS INVESTIGATING whether this area is large enough for pot storage and is meeting with U.S. trawl fishermen to see if storage in this area is acceptable to them. Based on its findings, NPFVOA may drop Proposal 62 and support this proposal or offer a modification to this proposal.
- 44 Close the waters in the General section of the Northern district between 61° 49' North latitude and 66° North latitude to king crab fishing (Option 1) or Extend the area closed to king crab fishing around St. Lawrence, King and Little Diomed Islands from 3 to 15 miles offshore (Option 2)--NPFVOA WILL OPPOSE.
- 45 Allow longlining of pots for brown king crab (no more than 15 pots to a string) in the Bering Sea, Dutch Harbor, Bristol Bay and Adak registration areas--NPFVOA WILL SUPPORT (maker of proposal).
- 46 Make Kodiak a super-exclusive area for tanner crab--NPFVOA WILL OPPOSE.
- 49 Make the Alaska Peninsula a super-exclusive area for tanner crab--NPFVOA WILL OPPOSE.
- 50 Change the tank inspection requirement: for the South Peninsula district tanner crab fishery from no earlier than 24 hours before to 116 hours after the season opens--NPFVOA WILL SUPPORT. NPFVOA will suggest this proposal be extended throughout Area J.
- 52 Change the opening of the tanner crab season in the Western Aleutian district from November 1 to November 10 (tank inspections to be given no earlier than November 9)--NPFVOA WILL SUPPORT (co-maker of proposal).

PROPOSAL NUMBERSUMMARY OF PROPOSAL/NPFVOA POSITION

- 53 Set a limit of 100 tanner crab pots for the Eastern Aleutian district--NPFVOA WILL OPPOSE.
- 54 Reduce the size limit for C. bairdi in the Northern subdistrict of the Bering Sea district--NPFVOA WILL SUPPORT.
- 55 Reduce the limit from 150 to 100 king crab pots and from 250 to 100 tanner crab pots in Kodiak--NPFVOA WILL OPPOSE.
- 57 Prohibit catcher/processor vessels from operating in the Kodiak king crab and tanner crab fisheries (a vessel may either catch or process; it can't do both activities)--NPFVOA WILL OPPOSE.
- 58 Set a limit of 100 pots for the Alaska Peninsula king and tanner crab fisheries--NPFVOA WILL OPPOSE.
- 59 Set a limit of 100 pots for the Alaska Peninsula king crab and the South Peninsula district tanner crab fisheries--NPFVOA WILL OPPOSE.
- 60 Establish pot storage areas in Dutch Harbor--NPFVOA WILL SUPPORT (maker of proposal). (NPFVOA will modify proposal so storage areas can be available from the close of the Pribilof and Bristol Bay king crab fisheries until the opening of the Dutch Harbor king crab fishery.)
- 61 Prohibit vessels over 50' in length from fishing in the Dutch Harbor king crab and tanner crab fisheries--NPFVOA WILL OPPOSE.
- 62 Establish a new pot storage area in Bristol Bay (turn the federal storage area into another state storage area)--NPFVOA (maker of proposal) MAY DROP PROPOSAL IN FAVOR OF AN AREA CLOSER TO THE ST. MATTHEW AND PRIBILOF FISHERIES. (See NPFVOA position on Proposal 43.)
- 63 Allow a vessel in the Dutch Harbor, Bristol Bay, Bering Sea and Adak crab fisheries (king, tanner and hair) extra fishing time when it aids a vessel in distress--NPFVOA WILL SUPPORT (maker of proposal).
- 164 Establish all or portions of Southeast Alaska as an exclusive registration area for tanner crab--NPFVOA WILL OPPOSE.
- 187 Allow the longlining of brown king crab pots statewide--NPFVOA WILL SUPPORT IF THERE IS A LIMIT OF 15 POTS TO A STRING. (See NPFVOA position on Proposal 45.)
- *189 Reduce the size limit for brown king crab statewide--NPFVOA WILL SUPPORT. (See NPFVOA position on Proposals 27, 33, 35, 41, and 42.)
- 194 Eliminate "major damage" as a reason for allowing retention of king crab or tanner crab after a season closure--NPFVOA WILL OPPOSE. NPFVOA will suggest that "major damage" be defined as "damage which requires a vessel to be towed to port for repairs."

PROPOSAL NUMBERSUMMARY OF PROPOSAL/NPFVOA POSITION

- 195 Allow the longlining of king crab and tanner crab pots in areas without pot limits--NPFVOA WILL SUPPORT FOR BROWN KING CRAB ONLY (with limit of 15 pots to a string). (See NPFVOA position on Proposals 45 and 187.)
- 196 Place a fish and wildlife agent aboard a catcher/processor that processes during tanner and king crab fisheries--NPFVOA WILL SUPPORT.
- 199 ADF&G should establish a 24-hour, toll-free telephone number to provide information to fishermen--NPFVOA WILL SUPPORT.

M E M O R A N D U M

TO: Council, Board, SSC and AP Members

FROM: King Crab Plan Maintenance Team
(Ray Baglin, Steve Davis, Fred Gaffney and Jerry Reeves)

DATE: March 16, 1983

SUBJECT: Board/Council procedure for determining king crab ABC/OY values in the Bering Sea/Aleutian Islands area.

As was discussed in the Davis memo to the King Crab PMT sent to you in the March 7 Council mailing and the March 11 mailing to the Board, problems exist with the procedure for determining ABC and OY values as described in both the Board's and Council's king crab plans (FMP). There are two problems with this procedure: the first occurs when the number of fertilized females in Bristol Bay drops below the accepted minimum level required to maximize recruitment, thereby preventing the use of the size limit/exploitation rate table (prepared by Dr. J. Reeves) in establishing an ABC and OY; and the second problem occurs when stock and pre-recruitment levels in other areas (i.e. Dutch Harbor, Adak and Bering Sea) are so depressed that a fixed .4 exploitation rate may be dangerously high. There may also be instances where stock conditions encourage an exploitation rate above .4 in these areas.

Since the possibility of a female fecundity problem in Bristol Bay was not considered when we developed the FMP, we did not include a procedure to deal with this situation. When this situation occurs, as it did in 1982, the Board and Council may want to close the fishery or they may want to continue but utilize a more conservative procedure. The PMT recommends that the Board and Council adopt an additional procedure to be used when female fecundity problems arise. The PMT recommends adoption of the following language, to be added to the Bristol Bay ABC section of the FMP:

If the female spawning stock drops below the level which maximizes recruitment, either because of reduced clutch size, barrenness, or lowered abundance of mature females, the ABC will be based on the exploitation rates in Table 2 for depressed populations, applied to that part of the male stock above the minimum biological size.

The PMT also recommends the adoption of a fifth step to the OY procedure:

5. If in the case an OY cannot be determined due to the female spawning stock dropping below the level which maximizes recruitment, either because of reduced clutch size, barrenness, or lowered abundance of mature females, the OY will equal the ABC as based on the exploitation rates in Table 2 for depressed populations.

This alternative procedure for determining ABC and OY would only be used if a female fecundity problem continues or occurs again in Bristol Bay. The procedure would provide the necessary guidance to the Council and Board and provide an opportunity for a limited fishery in these instances. Adoption of the PMT recommendation would eliminate the problems with the Bristol Bay ABC/OY procedure.

The second problem with the ABC/OY procedure is in regulatory areas where spawner-recruitment relationships cannot be determined. In these areas (i.e. Dutch Harbor, Adak and Bering Sea), the Board's plan states that the ABC will be set at the catch corresponding to an exploitation rate of .4 and that OY will equal ABC. There is no flexibility in this procedure, and it implies that regardless of the biological condition of the stock, a fishery at the .4 exploitation rate will always occur. The Board's plan does state that a fishery may have to be restricted to maintain full female fertilization, but no guidance is provided. This problem is to be expected since the Board's king crab framework is an early version of the Council's Bering Sea/Aleutian Islands King Crab FMP currently undergoing Secretarial review. The Council's FMP differs from the early version by providing a framework for establishing exploitation rates in the Dutch Harbor, Adak and Bering Sea areas. An exploitation rate range of .2 to .6 is provided based on population size and pre-recruitment levels. However, it too has a weakness in that a fishery will always occur at no lower than a .2 exploitation rate. Since stock conditions may warrant a lower exploitation rate or an area closure, the PMT recommends that the framework table (Attachment 1) be revised to include this possibility. A solution is to add the words "less than" to the top row in Table 2 with the variables, Depressed population size, Declining pre-recruitment abundance, and Low, Moderate, and High post-recruit levels. Because there has been some question about definitions for these variables, Alaska Department of Fish and Game - Kodiak, the authors of this portion of the framework, have defined them and will present them at this meeting if needed. If the Council and Board adopt the complete framework table it will eliminate the problems with the Dutch Harbor, Adak and Bering Sea ABC/OY procedure.

On a final note, the PMT would recommend that the Board update their entire ABC/OY section of their plan by adopting the latest text as it appears in the Bering Sea/Aleutian Islands King Crab FMP (Attachment 2). Since the Board adopted the early version of the framework in 1981, this section has been expanded greatly by the plan development team. The improved text does not change the procedure described in the Board's framework, but it does go into greater detail and provides examples on how the procedure operates.

Table 2. Comparison of exploitation rates of legal crab given relative population size and recruitment and post-recruitment abundance levels.

Population Size	Pre-Recruitment Abundance	Recruitment Level		
		Approximate exploitation rates of legal crab at given levels of post-recruits		
		Low ^{1/}	Moderate ^{2/}	High ^{3/}
Depressed	Declining	Less than .20 ^{4/}	Less than .25 ^{4/}	Less than .25 ^{4/}
	Stable	.30	.30	.35
	Increasing	.30	.30	.35
Average	Declining	.40	.40	.40
	Stable	.40	.45	.45
	Increasing	.40	.50	.50
Peak	Declining	.40	.45	.50
	Stable	.50	.55	.60
	Increasing	.60	.60	.60

^{1/} Low = less than 1/3 of total population (lbs.)

^{2/} Moderate = 1/3 - 2/3 of total population

^{3/} High = over 2/3 of total population

^{4/} Exploitation rate will be based on review of in-season considerations described in Section 4.9.

3.1 Determination of Optimum Yield

Two numerical values are addressed in this section. One is the Acceptable Biological Catch (ABC) of king crab, which is based on the biological status of the stocks. The other is king crab Optimum Yield (OY), which represents a modification of the ABC for social, economic, or ecological factors. The OY is attained through the use of two specific regulations: (1) establishment of a minimum size limit for crabs which can be taken for commercial harvest; and (2) establishment of guideline harvest levels which are a function of an exploitation rate applied to the biomass above the minimum size.

ABC

The ABC is to be determined using primarily estimates of stock abundance, distribution of crabs by sex and size, and recruitment into the fishery.

KC1/B11

These estimates are revised annually from population surveys, commercial catch statistics, and research. In addition, secondary considerations, though less frequently updated due to lack of information, are used in the determination of ABC. These are:

1. natural mortality rates by sex and size class;
2. fishing mortality rates from previous years by size class;
3. growth rates by sex and size class;
4. critical size necessary for reproductive needs;
5. reproductive success given a specific population size, sex ratio, and distribution of spawning stocks; and
6. environmental and ecological effects.

The ABC shall be so calculated as to maintain recruitment to the fishable stock at the highest possible level. Maintenance of this level of recruitment for king crab shall be achieved by determining and perpetuating an optimum required spawning stock of fertilized females. When the stock is below the determined optimum, the fishery shall be restricted to maintain full female fertilization. When the stock is above this optimum, higher exploitation or lower size limits on males may be permitted.

The amount of information available to determine the ABC varies from area to area of the BS/AI. As a result, the procedure for determining ABC shall be different based on the amount of information available on that particular stock.

Maximum sustainable yield (MSY) is the average of annual ABC's over a reasonable number of years and is the maximum average annual catch which can be taken from a stock under environmental conditions prevailing during these years. Determination of MSY for the BS/AI area is described in detail in Section 7.3.6.

ABC for areas for which spawner-recruitment relationships can be determined

The procedure for determining ABC for king crab in fishing areas on which resource data is sufficient for determination of spawner-recruitment relationships is as follows:

1. Establish the minimum female spawning stock required to maximize recruitment. This is done by an analysis of the spawner-recruitment relationship for a given area (example: Bristol Bay), based on abundance estimates from resource assessment surveys (Reeves, 1981). The spawner-recruitment relationship is the relationship between the number of spawning individuals in a stock and the number of recruits (i.e. the supply of fish that becomes available to the fishery) the stock will produce each year. The spawner-recruitment relationship can take many forms, but from a management standpoint, two basic types can be distinguished: (1) relationships in which recruitment drops off at high levels of spawner abundance; and (2) those in which recruitment becomes independent of spawner stock density above a certain level. The spawner-recruitment relationship data from Bristol Bay suggests that we are dealing with the first form, although at this early stage of knowledge other forms cannot be discounted. The description of spawner-recruitment relationships is a product of an ongoing analysis which builds on the use of additional data as each resource assessment survey is completed.

The waters currently encompassed in the State of Alaska's Bristol Bay management area (see Section 4.8 below) have thus far yielded the best king crab data base and have experienced high stock levels. A study by Reeves and Marasco (1980) which analyzed the spawner-recruitment relationship for that area, indicates that at high stock levels there are more males than are needed to achieve full reproductive potential. Reeves (1981) has indicated that 20-40 million fertilized females is a reasonable estimate of the number necessary to maximize recruitment. Therefore, at the high population levels prevailing in 1980 when 60 million mature females were present in this stock, a large portion of male stock was unnecessary for reproduction and was available to ABC. The ABC is estimated using spawner-recruitment information combined with current survey estimates of abundance. A detailed example is produced by Reeves (1981).

2. ABC is set equal to the maximum catch (i.e., a given minimum size limit/exploitation rate combination applied to survey estimates of abundance) which maintains the minimum required number of spawners.

Potential ABC's are calculated from a series of survey abundance estimates using various size limits and exploitation rates. Those catches which will not reduce the number of spawners below the minimum required for maximum recruitment are then identified. These catches are defined as the values above the line drawn through Table 1, which provides an example based on 1980 survey and fishery information. The position of the line is established from reproductive considerations and corresponds to the spawning stock level which maximizes recruitment, as calculated from a spawner-recruit relationship (see Reeves, 1981 for details of the procedures). The highest of the catches above the line is selected as the ABC.

Table 1 -- Estimated yields (millions of pounds) for red king crab in Bristol Bay for 1981, by minimum size limit and exploitation rate (from Reeves, 1981).

Size Limit	Exploitation Rate						
	.3	.4	.5	.6	.7	.8	.9
7.00"	24	32	41	49	57	65	73
6.75"	31	41	52	62	72	83	93
6.50"	37	50	62	75	87	100	112
6.25"	43	57	71	85	100	114	128
6.00"	48	63	79	95	111	127	143
5.75"	52	70	87	104	122	139	157
5.50"	55	73	91	109	128	146	164
5.25"	57	76	95	114	133	152	171

If the female spawning stock drops below the level which maximizes recruitment, either because of reduced clutch size, barrenness, or lowered abundance of mature females, the ABC will be based on the exploitation rates in Table 2 (page 16) for depressed populations, applied to that part of the male stock above the minimum biological size.

Table 2. Comparison of exploitation rates of legal crab given relative population size and recruitment and post-recruitment abundance levels.

Population Size	Pre-Recruitment Abundance	Recruitment Level Approximate exploitation rates of legal crab at given levels of post-recruits		
		Low ^{1/}	Moderate ^{2/}	High ^{3/}
Depressed	Declining	Less than .20 ^{4/}	Less than .25 ^{4/}	Less than .25 ^{4/}
	Stable	.30	.30	.35
	Increasing	.30	.30	.35
Average	Declining	.40	.40	.40
	Stable	.40	.45	.45
	Increasing	.40	.50	.50
Peak	Declining	.40	.45	.50
	Stable	.50	.55	.60
	Increasing	.60	.60	.60

^{1/} Low = less than 1/3 of total population (lbs.)

^{2/} Moderate = 1/3 - 2/3 of total population

^{3/} High = over 2/3 of total population

^{4/} Exploitation rate will be based on review of in-season considerations described in Section 4.9.

ABC for areas for which spawner-recruitment relationships cannot be determined.

In some parts of the BS/AI data are insufficient to determine a spawner-recruitment relationship. Until such data become available for a fishing area, the ABC will be set at the maximum catch of male crab which does not result in a decline of female fertilization. The ABC for an area is determined by applying an exploitation rate based on population size and recruitment levels (Table 2), to male crab above a minimum biological size. The size limit is determined for each area by using the size when 50% of the male population is sexually mature and adding three years, thus ensuring each male the opportunity to reproduce at least once before becoming vulnerable to the fishery. (For further explanation of the reproductive characteristics of king crab, refer to the life history description in Section 7.3.1.)

Fisheries where size limits and exploitation rates set on this basis are in effect have not shown any decline in female fertilization. Therefore, until additional information indicates otherwise, for stocks that are at a low level or whose spawner-recruitment relationship is unknown, the ABC will be calculated on this basis.

OY

Optimum yield (expressed in pounds) for the BS/AI king crab fishery is pre-season estimate of the harvest based on biological and economic conditions. The specification of OY for an area will be based on the procedure used in determining ABC. In areas where ABC is determined using spawner-recruit relationships (eg. Bristol Bay), the OY will be specified within a range and, if necessary, for separate districts within the area. The OY in those areas can be modified annually without a plan amendment as long as the OY remains within the range specified in this plan and described in the next paragraph. In areas where biological information is limited and spawner-recruit relationships cannot be determined, the OY will equal the ABC. It is recognized that the actual harvest may differ from earlier estimates of OY because of information gained during the season, or from assessment surveys just prior to the season. (See Section 4.9, In-Season Adjustment of Time and Area).

In Bristol Bay, the OY will equal the ABC unless modified by social, economic, or ecological factors which require it to be less than ABC in order to achieve the management objectives of this plan (refer to Section 3.0 on page 8). The OY may not be larger than ABC and the reduction from ABC is limited to that amount of crab that would be equal to the amount which could be taken at a carapace width equal to 7.0 inches and an exploitation rate equal to 30 percent. The actual specification of OY shall be derived annually through the use of minimum size limits and exploitation rates.

The OY for the Bristol Bay area shall be determined annually using the following procedure:

1. The ABC recommendation will be reviewed and adopted.
2. A minimum size limit will be adopted. Criteria which will be considered in establishing the size limit include:
 - industrial (processing) requirements such as the desirability of a uniform crab size to facilitate processing.
 - minimum size requirements for domestic and foreign markets;
 - marketing requirements such as large claws for speciality markets or advertising commitments;
 - fishing gear requirements, such as design changes in gear if size limits are changed; and
 - fishing efficiency requirements; for example changes in size limits may substantially increase sorting problems.
3. An exploitation rate will be adopted. Criteria which will be considered in establishing the exploitation rate include:
 - an evaluation of the economic viability of the fishery;
 - an evaluation of processing availability and marketing requirements;
 - an evaluation of king crab population composition and levels;
 - an evaluation of opportunities for diversification by the harvesting and processing sectors; and
 - an evaluation of labor forces and industry dependence on the king crab fishery.

4. The purpose of this process will be to permit the harvest of individual king crab stocks by adhering to the primary objective specified in Section 3.0 while striving to achieve the secondary objectives.
5. If in the case an OY cannot be determined due to the female spawning stock dropping below the level which maximizes recruitment, either because of reduced clutch size, barrenness, or lowered abundance of mature females, the OY will equal the ABC as based on the exploitation rates in Table 2 for depressed populations.

ALASKA BOARD OF FISHERIES

BERING SEA/ALEUTIAN ISLAND
KING CRAB
FISHERY MANAGEMENT FRAMEWORK

April 1, 1981

TABLE OF CONTENTS

	<u>Page</u>
1.0 AREAS AND FISHERIES	2
2.0 MANAGEMENT OBJECTIVES	2
3.0 MANAGEMENT MEASURES	4
3.1 Determination of Optimum Yield	5
3.2 Fishing Seasons	7
3.3 Catch Restrictions Based on Sex	8
3.4 Exclusive Registration Areas	9
3.5 Gear Placement	9
3.6 Gear Storage	10
3.7 Vessel Tank Inspection	10
3.8 Limited Entry	11
3.9 In-season Adjustment of Time and Area	11
4.0 ENFORCEMENT AND REPORTING REQUIREMENTS	12
5.0 APPENDICES	
5.1 State of Alaska Management Structure	
5.2 State Landing Laws	
5.3 National Standards	
5.4 Biological and Environmental Characteristics of the Resource	
5.5 Description of the Fishery	
5.6 Literature Cited	

1.0 AREAS AND FISHERIES

This management framework presently applies only to the king crab (family Lithodidae) fisheries in the Bering Sea and Aleutian Islands (Figure 1). These fisheries are described in the Alaska Shellfish Regulations as the Bering Sea, Bristol Bay, Adak, and Dutch Harbor "statistical areas" (Areas Q, T, R, and O, see Figure 1).

These areas describe geographically segregated stocks capable of being managed as independent units. Within each statistical area manageable portions of the stocks are further divided into fishing districts and sections. For a complete description of the statistical areas, fishing districts, and sections, refer to the commercial section of the Alaska Shellfish Regulations.

2.0 MANAGEMENT OBJECTIVES

The management regime for the king crab fisheries is intended to achieve the following objectives. These objectives are not mutually exclusive and management measures may be designed to accomplish several objectives.

1. Achieve Reproductive Requirements for Individual King Crab Stocks.

The cornerstone of king crab fishery management is optimization of the reproductive potential of individual king crab stocks. At low population levels or in situations when there is insufficient knowledge of spawner-recruitment relationships to define spawning requirements, it is prudent to strive to ensure that a sufficient number of males remains on the grounds to maximize reproductive potential. At high abundance levels full egg clutch development in all female crab is unnecessary. Additional harvest of male crab or allowing a harvest of female crab is under these circumstances consistent with the goal of achieving the reproductive requirement of individual stocks.

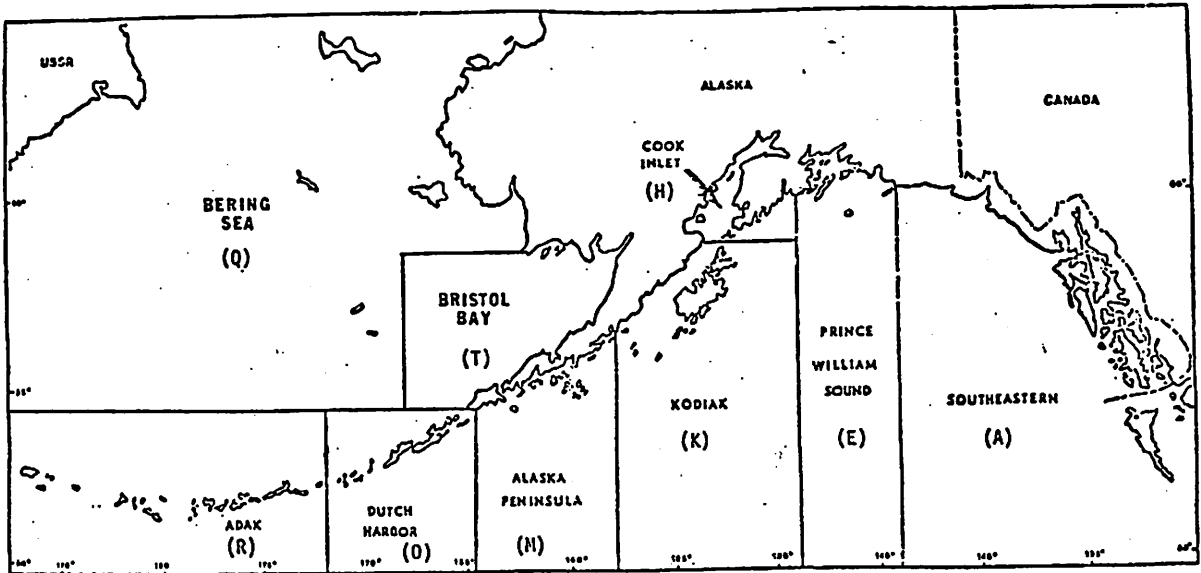


Figure 1. Alaska King Crab Statistical Areas

2. Provide for Subsistence uses of King Crab.

If king crab are an important food source in some areas, management measures should provide for traditional and customary uses. These uses will be given a priority if it is necessary to restrict the taking of king crab to assure the maintenance of the sustained yield of the stock.

3. Optimize the Net Value of the Fishery

The optimal harvestable surplus for the Bering Sea/Aleutian Island king crab fishery is not necessarily the maximum physical yield. Social, economic or ecological factors may change the yield. In particular, annual harvests that are relatively stable between years (i.e., where extreme fluctuations in annual harvests do not occur) are a goal because adverse socioeconomic consequences are associated with "boom and bust" crab fisheries. Management strategies should attempt to moderate peaks and troughs (which are a function of year class strength) with due regard for cost/benefit considerations.

Unless consideration is necessary for conservation or social objectives, mangement measures should not impose additional burdens on industry; cost effective harvesting and processing techniques should not be restricted; and production/marketing standards should be accommodated.

As an example, management strategies should avoid unnecessary vessel use. As another example, since crab recovery rates (the ratio of recoverable meat to total body weight) increase dramatically during the period of rapid growth following molting, a delayed season opening can act to increase both the volume and value of the catch and final product, benefiting both fishermen and processors. However, delayed season openings could also increase harvesting costs due to adverse weather conditions.

4. Minimize Adverse Socioeconomic Impacts by Protecting Community and Industrial Investments

Because the Bering Sea/Aleutian Island king crab fishery is an existing, historic fishery with established Alaska and non-Alaska industrial systems (harvesting and processing) and community infrastructures depending on the fishery, mechanisms may be necessary to protect investments that have been made.

These considerations are not solely economic but also social in nature. Changes made in the management of the fishery need to be evaluated in light of these previously made investments.

Examples of management measures that have been used to accomplish this objective are exclusive registration, "fair starts," and the setting of seasons in relation to other fisheries.

5. Minimize Adverse Interactions Among Fisheries

Modern management practices dictate that the management of a particular fishery consider the interaction with other fisheries. For example, interference of pot gear with trawl fisheries.

6. Optimize the Cost Effectiveness of Management and Enforcement

Fishery management should seek to bring management and enforcement costs to within reasonable limits relative to the value of the fishery.

3.0 MANAGEMENT MEASURES

A variety of management measures can be used to achieve the objectives defined for this fishery. While some of them can be used to realize either one or several objectives, it is essential that only those mechanisms deemed necessary be adopted.

3.1 Determination of Optimum Yield

Two numerical values are addressed in this section. One is the Acceptable Biological Catch (ABC), which is based on the biological status of the stocks. The other is the Optimum Yield (OY), which represents a modification of the ABC for social, economic, or ecological factors.

ABC

The ABC, in so far as possible, should be based on the following estimates:

1. stock abundance and distribution by sex and size class;
2. natural mortality rates by sex and size class;
3. fishing mortality rates from previous years by size class;
4. growth rates by sex and size class;
5. recruitment into the fishery;
6. critical size necessary for reproductive needs;
7. reproductive success given a specific population size, sex ratio, and distribution of spawning stocks; and
8. environmental and ecological effects.

The ABC should maintain recruitment to the fishable stock at the highest possible level. Maintenance of this level of recruitment for king crab is achieved by perpetuating a minimum required spawning stock of fertilized females. When the stock is below the determined minimum, the fishery should be restricted to maintain full female fertilization. When the stock is above this minimum, higher exploitation or lower size limits on males may be permitted.

The amount of information available to determine the ABC varies according to statistical areas. In particular, the Adak, Bering Sea and Dutch Harbor areas have less information than Bristol Bay. As a result the procedure for ABC in Bristol Bay is different than the other areas and will be addressed separately.

Bristol Bay

The procedure for determining ABC for king crab in Bristol Bay is as follows:

1. Establish the minimum required female spawning stock.

This is done by an analysis of the stock-recruitment relationship, based on abundance estimates from resource assessment surveys. This is an ongoing analysis which builds on the use of additional data as each survey is completed.

The Bristol Bay area presently has the best data base and is experiencing high stock levels. A study by Reeves and Marasco (1980) which simulated the spawner-recruitment relationship, the copulation coefficient and the size of the Bristol Bay fishery indicates that because of high stock levels there is currently an excess reproductive potential. Further, Reeves (1981) has indicated that 40 million copulated females is a reasonable estimate of the minimum number necessary to sustain the population based on current spawner-recruit information. Therefore, at the high population levels now apparent in Bristol Bay, a greater portion of males is surplus to reproduction and is available as ABC for the fishery. The ABC is estimated using this information combined with current survey estimates of abundance. A detailed example is provided by Reeves (1981).

2. ABC is set equal to the maximum catch (i.e., a given minimum size limit/exploitation rate combination applied to survey estimates of abundance) which still maintains the minimum required spawning stock.

Expected catches are calculated from survey abundance estimates by minimum size limit and exploitation rate. Acceptable catches are those which do not lower the expected spawning population of females below a minimum required. Such a reduction in spawning population operates through a presumed reduction in percent copulation. The highest of these catches is selected as the ABC.

Adak, Bering Sea and Dutch Harbor

In these areas data are insufficient for determining the minimum required spawning stock, therefore, ABC will be set as the catch corresponding to an exploitation rate of .4.

OY

The Optimum Yield for the Bering Sea/Aleutian Island king crab fishery is the pre-season indication of the allowable harvest. The realized harvest may differ from the earlier specification of OY due to information gained during the season (see Section 3.9, In-season Adjustment of Time and Area).

The OY will equal the ABC unless there is social, economic or ecological rationale for harvesting more or less than the ABC in order to achieve management objectives. Agency reports, public comments, analyses of impacts on markets, the processing and harvesting sectors and the community infrastructures, etc. will serve as the basis of modifying ABC into OY.

3.2 Fishing Seasons

Fishing seasons have historically been used in the king crab fishery to protect crab during the mating, molting, and growing periods of their life cycle. Because harvest levels are usually taken in two months or less there is opportunity to look beyond biological considerations in setting the date of the season opening.

In addition to the above concerns, several additional factors will be weighed in determining an appropriate season. One factor to be considered is the recovery rate (the ratio of recoverable meat to total body weight). Because the recovery rate increases dramatically during the period of rapid growth following molting, a delayed opening will generally act to increase both the volume and value of the catch and final product.

A second factor to be weighed is weather conditions. These generally worsen as the year progresses; consequently a late season opening is likely to

translate into more difficult fishing conditions. This will particularly disadvantage operators of smaller vessels.

A third factor is the timing of the king crab fishery relative to other fisheries, particularly the salmon fisheries. If the season opening for king crab occurs before the salmon fisheries are over, this will create difficulties for vessels and processors that normally participate in both fisheries. Conversely, a lengthy period of time between the two fisheries will force vessels and processors to lie idle and may create additional start up costs.

A fourth factor is the timing of the season openings for individual areas relative to one another. Most of the major king crab fisheries now open simultaneously. This distributes fishing effort at the start of the season, helps prevent gear saturation problems, and allows greater participation by local fleets.

The season opening should reflect a balance of attitudes within the industry with respect to the several factors described above.

3.3 Catch Restrictions Based on Sex

Common to nearly all crab fisheries is the restriction of taking only male crab. This restriction is assumed to contribute to maximum reproductive potential. The data base to support or reject an extensive harvest of female king crab is poor. Reeves and Marasco (1980) and Reeves (1981) indicate that there are probably surplus female crab which can be taken from the high stock levels now present in the Bristol Bay. However, the accumulative effects of female harvest and the subsequent environmental impacts are not demonstrable at this time and may never be without actually harvesting the female population.

The potential harvest of female crab has not been an issue. Management philosophies endorse a limited fishery for females in years of high abundance; however, industry has shown little interest. Females are considerably smaller than males of the same age and the proportion of recoverable meat is much less than that of males.

At the request of industry, the feasibility of providing a limited harvest of female crab will be determined.

3.4 Exclusive Registration Areas

The designation of registration areas as exclusive or non-exclusive has been debated for years. Exclusive registration areas encompass well developed historical fisheries. Non-exclusive registration areas are generally areas where king crab fisheries are relatively underutilized, unstable or marginal. The socioeconomic impact upon local communities within an area has been a major consideration as to whether a registration area warrants exclusive or non-exclusive status.

In determining the need for designating a registration area as exclusive or non-exclusive, consideration will be given to:

1. the desire by the public to protect industrial and community investments;
2. the ability to properly manage the fishery;
3. providing fleets a reasonable opportunity to participate in the fishery;
4. promoting the most efficient utilization of vessels and gear; and
5. availability of similar management measures which would limit overall fishing effort.

3.5 Gear Placement

Determination of the need for regulations affecting gear placement or staging, (i.e., allowing fishing gear to be placed on the grounds prior to fishing and/or remain on the grounds after the season closure) will result from examining:

1. the biological impacts on target and non-target species;
2. enforcement problems and costs borne by the public versus by the industry; and

3. possible gear conflicts.

3.6 Gear Storage

Between fishing seasons, king crab gear can be stored on land or at sea. The expense of storage on land is of course greater than at sea, however, loss of gear is significantly reduced with on land storage. Under current State regulations, gear must be removed from the fishing grounds after the fishing season is over and stored on land in shallow waters (less than 25 fathoms), or in specific high seas areas when there is insufficient shallow water storage. These designated storage areas have historically been areas of low crab abundance. Gear must be stored in a non-fishing condition; bait and bait containers removed and doors locked open.

Regulations which describe the means by which king crab fishing gear may be stored during the closed fishing season will continue to be developed. These regulations may range from random (at sea) storage to limited designated (at sea) storage areas, or complete removal of gear from the sea and will be based on analyses of the following information:

1. the biological impacts of storing gear at sea;
2. the enforcement costs of determining whether fishing gear stored at sea is in a non-fishing condition;
3. the costs borne by the fleet to store gear;
4. availability of on land or at sea storage areas; and
5. possible gear conflicts.

3.7 Vessel Tank Inspection

Vessel tank (e.g., live hold) inspections are required under current State regulations to meet the legal requirements for the State's "landing laws" (see Appendix 5.2). In order to pass inspection, the vessel must have no crab aboard. Generally, the tank inspection is performed by Department personnel during a 2-5 day period preceding the season opening depending on the statistical area.

In determining the need for vessel tank inspection regulations, consideration will be given to:

1. enforcement requirements;
2. documentation of commercial harvest location;
3. the fleet's ability to move freely from the fishing grounds to processing locations;
4. the time necessary to transport gear from the storage areas to the fishing grounds;
5. the increase fuel useage required by the fleet to effect this regulation; and
6. the desire by the fleet to insure a fair and equitable season start among the various participants.

3.8 Limited Entry

At present, a limited entry program for vessels fishing the king crab fishery in the Bering Sea/Aleutian Islands area will not be implemented.

3.9 In-season Adjustment of Time and Area

Optimum yields are based upon projections of the status of the stocks, economic and other conditions several months in advance of the actual conduct of the fishery and may be found to be in error in light of unanticipated adverse or favorable stock conditions which are revealed in-season. Under such circumstances it is appropriate to take immediate action by issuing emergency orders adjusting time and/or area restrictions. Therefore, this framework provides that seasons and area shall be subject to in-season adjustment based upon one or more of the following factors:

1. distribution of fishing effort by time and area;
2. catch per unit of effort and rate of harvest;
3. relative abundance of age classes of king crab within the area in comparison with preseason prediction;

4. the proportion of immature or soft shell king crab being handled; and
5. any other factors relevant to the conservation and management of king crab.

4.0 ENFORCEMENT AND REPORTING REQUIREMENTS

Enforcement procedures are necessary for:

1. surveillance of fishing vessels to assure compliance with the registration and permitting regulations as well as area and season openings and closures;
2. surveillance of landing to assure compliance with size, sex, and species regulations;
3. surveillance of fishing gear to assure compliance with gear restrictions and gear storage areas; and
4. compliance with reporting requirements.

Reporting requirements.

(a) The operator of any fishing vessel participating in this fishery whose port of landing is in the United States is responsible for the submission of an accurately completed State of Alaska fish ticket for each sale or delivery of any king crab covered by the management regime.

(b) At the election of the vessel operator, the fish ticket shall be either: (1) submitted by the vessel operator directly to the ADF&G within one week after such king crab are sold or delivered; or (2) prepared, at the request of the operator, by the purchaser (i.e., any person who received king crab for a commercial purpose from a fishing vessel subject to this management regime) and submitted by the purchaser to the ADF&G within one week after such king crab are received by the purchaser.

(c) In addition to the requirements of paragraphs (a) and (b) of this section, each operator (or purchaser, if the fish ticket is submitted in accordance with paragraph (b)(2)) shall also accurately state on each such fish ticket: (1) vessel name; (2) date of delivery; (3) type of gear used; (4) total number of pot lifts; (5) statistical reporting areas of catch; and (6) for each species, the number of pounds landed and the deadloss.

(d) The operator of any fishing vessel operating in this fishery whose port of landing is outside the State of Alaska shall submit a completed State of Alaska fish ticket, or an equivalent document containing all of the information required on an Alaska fish ticket and in section (c), to the ADF&G within one week after the date of each sale or delivery of any king crab.

REPORT TO ALASKA BOARD OF FISHERIES
AND
NORTH PACIFIC FISHERIES MANAGEMENT COUNCIL
ON
BERING SEA AND ALEUTIAN KING CRAB
AND
WESTWARD REGION TANNER CRAB

BY

MARTIN F. EATON

MARCH 1983

ANCHORAGE, ALASKA

KING CRAB

Introduction

The proposed western Alaska king crab management plan includes the State of Alaska king crab registration areas - Area "O" (Dutch Harbor), Area "T" (Bristol Bay), Area "Q" (Bering Sea) and Area "R" (Adak) (Figure 1).

•

This report will present the results of the 1982-83 king crab commercial fisheries and projected harvest for the 1983-84 fisheries beginning with the Norton Sound fishery.

BERING SEA AREA "Q"

Norton Sound Section - 1982-83 Season

The season opened on August 1 and closed on September 3 (and a preseason harvest was forecast to be .5 to 1.1 million pounds). A fleet of 11 vessels harvested 63,949 crab weighing 228,921 pounds. The average weight per crab was 3.6 pounds and catch per pot was six crab. The 1982 harvest was 1.1 million pounds less than the harvest in 1981 and 300,000 pounds less than the low end of the guideline.

Stock Status

The 1983 Norton Sound red king crab stock is increasing with a population of legal male crab estimated to be between 1.6 and 2.6 million pounds. A harvest of .2 to .3 could be expected using a 10 percent exploitation rate.

Northern District 1982-83 Season

The season opened on August 1 and closed by emergency order on August 16, after 96 vessels harvested 8,944,789 pounds of blue king crab. The preseason harvest forecast was three to seven million pounds. The final harvest exceeded the high end of the guideline by almost two million pounds.

The 1982-83 harvest exceeded the 1981-82 harvest by 4.2 million pounds. Average weight increased in 1983 from 4.4 to 4.6 pounds per crab, but catch per pot decreased from 18 in 1982 to 12 in 1983.

Stock Status

National Marine Fisheries Service (NMFS) biologists have calculated that eight to thirteen million pounds will be available for harvest in the 1983 fishery. However, this number will depend on its relation to the results of the 1983 trawl survey.

Pribilof District

The district opened to fishing on September 10 and closed on September 25, after 122 vessels harvested 4,405,353 pounds of blue king crab. The preseason harvest guideline was five to eight million pounds. The final catch was 600,000 pounds lower than the low end of the forecast. The average weight per crab was 7.5 pounds in 1982, a decrease of .1 of a pound from 1981 and the CPUE was five crab per pot in 1982 compared to seven in 1981.

Stock Status

The legal population is declining and a two to four million pound harvest is expected for the 1983-84 season.

BRISTOL BAY AREA "T"

The red king crab fishery opened at noon on September 10 and closed on October 10 to protect female reproductivity. The final catch was 3,001,210 pounds of crab landed by 90 vessels. The average weight per crab was 5.6 pounds, a decrease from 1981 when the average weight was 6.3 pounds. CPUE also declined in 1982 to four crab per pot.

Stock Status

The number of legal crab appears to be increasing in the area and a four to nine million pound guideline is projected.

DUTCH HARBOR AREA "O"

Red King Crab

The season opened on November 1 and closed on January 15, after 93 vessels landed 431,179 pounds - the lowest harvest ever recorded.

Stock Status

No abundance estimate surveys have been done in the area since 1980 because of budget limitations. The red king crab populations appear to be severely depressed. Information collected this season suggests that the area also has serious female fecundity problems and chances of large area closures for the 1983-84 season are possible.

Brown King Crab

The season opened on November 1 and closed on February 15 after 49 vessels delivered 1,184,971 pounds. With the decline in red king crab stocks, greater effort is expected to occur in 1983-84. The brown king crab averaged 5.2 pounds each, and the average catch per pot was eight crab.

Stock Status

Very little is known about brown king crab in the area. The only information available has been obtained by vessel interviews, which indicate to date fishing has occurred in the Western District. The possibility of crab being available in other areas is highly probable, which should increase the 1983-84 harvest.

ADAK AREA "R"

Red King Crab

The fishery opened on November 1 and closed on January 15, after 72 vessels caught 1,701,818 pounds of crab.

Stock Status

The stock appears fairly stable and a .5 to 3 million pound harvest is forecast for 1983-84 season.

Brown King Crab

The season opened on November 1 and is still in progress. As of March 20, the harvest is 5.4 million pounds. A closure announcement was made on March 22 for April 15. The harvest is expected to reach 6.5 million pounds.

Stock Status

Very little is known about abundance but not all area have been fished. If the area fished in 1983 continue to produce, a two to five million pound harvest could be expected for 1983-84.

TANNER CRAB

Introduction

The fisheries management plan for Tanner crab off Alaska was adopted in December of 1978. It covers all existing State Tanner crab fisheries in the Westward Region, which area separated into six management areas. The general boundaries of this area are depicted in Figure 2. This report will cover the 1983 fisheries and status of stocks by district.

Kodiak District

The season opened on February 10 with a preseason forecast of 17.4 to 29.0 million pounds. A fleet of approximately 350 vessels fished. The entire district was closed in one emergency order, as effort was evenly distributed

and harvest was according to section projections. The final catch is still being tabulated, but a preliminary final catch is near 18.5 million pounds. This is just above the low end of the forecast by one million pounds.

Stock Status

A survey will be done in July to determine population estimates for 1984. Information gathered during the fishery indicates that the harvest should be equal or greater than 1983 because of the large abundance of prerecruit crab.

Chignik-South Peninsula District

The season opened on February 10 and closed on March 10, after approximately 70 vessels delivered 3.6 million pounds. The harvest was at the upper end of the preseason guideline of 2.25 to 3.75 million pounds.

The South Peninsula District opened on February 10 also, and 70 vessels landed 2.7 million pounds or 300,000 pounds less than the forecasted guideline of 3.0 to 4.5 million pounds.

Stock Status

Both districts will be surveyed in July of 1983. An abundance estimate will be available by December. Information collected from the fleet indicated similar harvest can be expected in 1984.

Eastern and Western Aleutians

The fisheries are currently in progress and the harvest for the Eastern Aleutians is 349,000 pounds and in the Western Aleutians the catch is 385,000 pounds through March 20. The final harvest in the Eastern Aleutians should reach 800,000 pounds and 400,000 pounds in the Western Aleutians.

Bering Sea

The season opened on February 15 and is currently in progress. The Chionoecetes bairdi catch is at one million pounds through March 20 with the final catch to be near 10 million pounds. The Chionoecetes opilio harvest through March 20 is two million pounds with an expected harvest of over 20 million pounds.

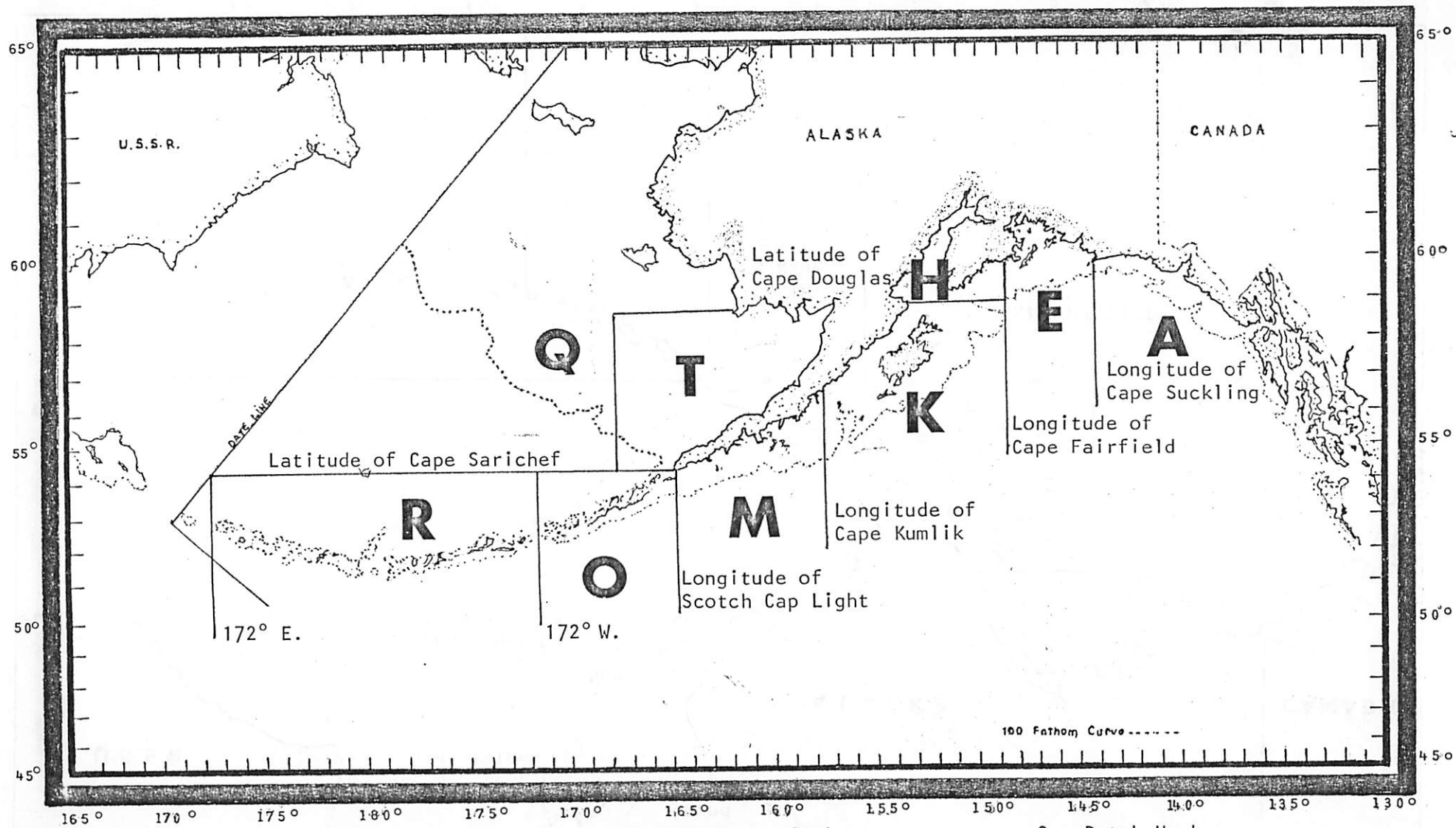


Figure 1. King crab statistical areas:

- | | |
|--------------------------|------------------|
| A - Southeastern Alaska | O - Dutch Harbor |
| E - Prince William Sound | R - Adak |
| H - Cook Inlet | Q - Bering Sea |
| K - Kodiak | T - Bristol Bay |
| M - Alaska Peninsula | |

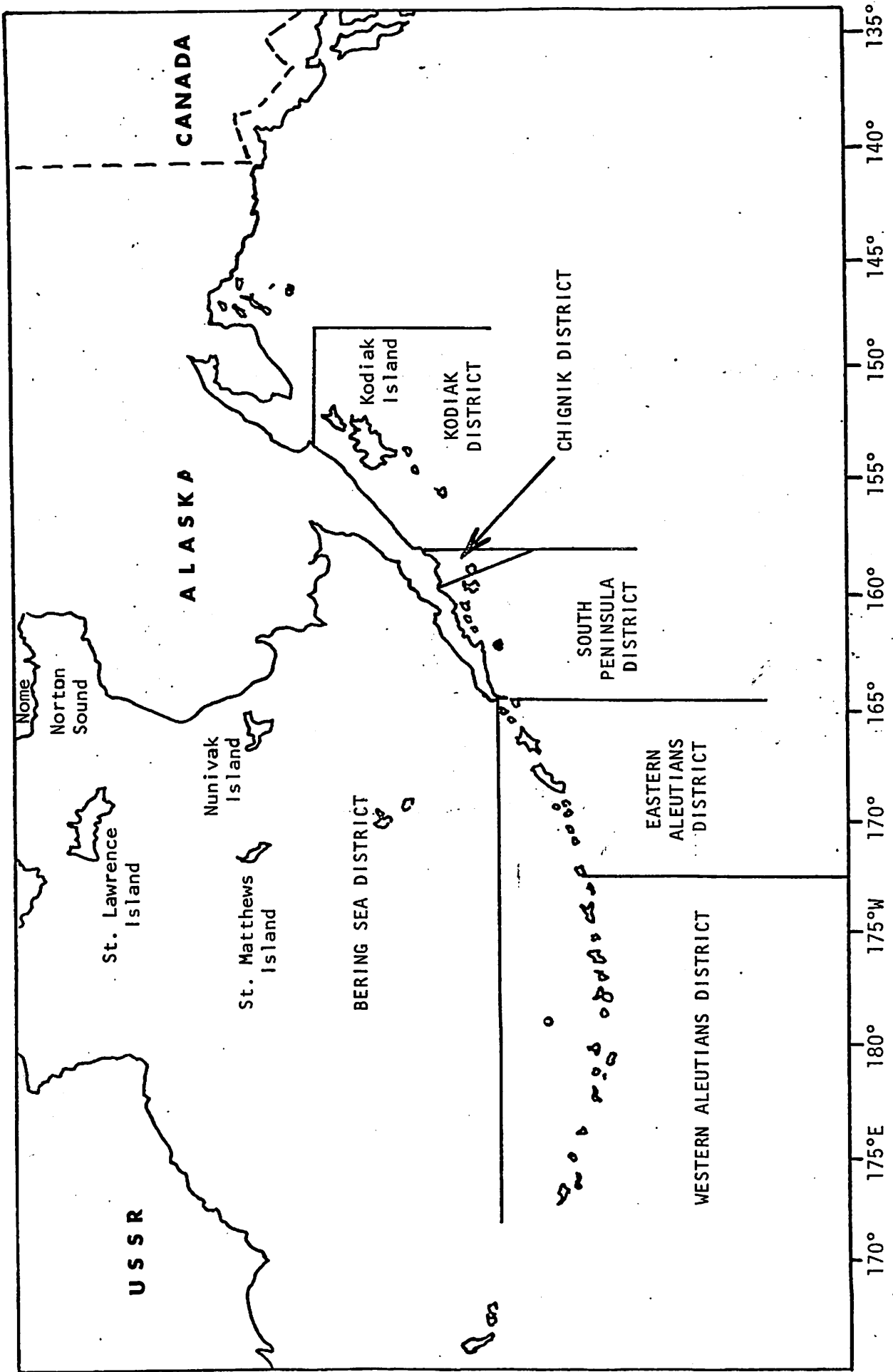


Figure 2. Westward Region Tanner crab district.

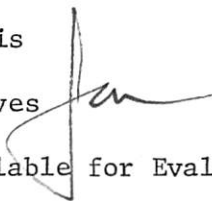


UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE

Northwest and Alaska Fisheries Center
Resource Ecology and Fisheries Management
2725 Montlake Boulevard East
Seattle, WA 98112

March 23, 1983

F/NWC2:JR

TO: Steve Davis
FROM: Jerry Reeves 
SUBJECT: Data Available for Evaluation of Minimum Size Limit for Brown King Crab

The information we have been able to assemble thus far, attached as four packets, is as follows:

1. Somerton report, "Size at maturity of the golden king crab (Lithodes aequispina) in the Northern Bering Sea".
2. Growth per molt and carapace width - length conversion formula for Southeast Alaska brown king crab (letter and material from Koeneman to Reeves, Feb. 2, 1983).
3. Size at maturity and other biological information for Southeast Alaska brown king crab (Memo from Clausen to Reeves, Feb. 18, 1983).
4. Summary of maximum size information on brown king crab from the NMFS observer program and other sources.

Somerton's report provides us with an estimate of size at maturity for brown king crabs in the northern Bering Sea (north of 58 degrees N). However, the other important element, an estimate of growth, is lacking, and any size limit to be established at this time can only be based on comparative or somewhat circumstantial evidence, as follows:

1. Somerton reports an average carapace length at maturity of 92 mm for male brown king crabs. This compares to 103 mm for red king crabs in Bristol Bay.
2. Growth per molt information from Southeast Alaska indicates 16 mm for males in the legal size range. This is similar to figures that have been estimated for red king crab in Bristol Bay.
3. Adding 34 mm to 103 mm, the average size of maturity for Bristol Bay red king crabs, we arrive at their legal size limit of 137 mm carapace length.



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National Oceanic and Atmospheric Administration

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tradition of service to the Nation

THE UNIVERSITY OF CHICAGO
DEPARTMENT OF CHEMISTRY
5708 SOUTH CAMPUS DRIVE
CHICAGO, ILLINOIS 60637

January 10, 1961

Dear Sirs:
Enclosed are two copies of a report
on the synthesis of polyethylene
oxide.

The synthesis of polyethylene oxide
has been carried out by the
oxidation of ethylene in the presence
of silver catalyst.

The reaction conditions were
as follows: ethylene pressure, 100
psi; oxygen pressure, 100 psi;
temperature, 200°C.

The product was purified by
distillation and its molecular weight
determined by osmometry.

The results of the experiment
are given in the attached report.

The polyethylene oxide obtained
is a white, waxy solid which
melts at 60°C. It is soluble
in water and many organic
solvents. The molecular weight
of the polymer is in the range
of 10,000 to 20,000.

The reaction is exothermic and
the rate of polymerization
increases with increasing
temperature.

The yield of polyethylene oxide
is about 10% under the conditions
used. The reaction is sensitive
to the concentration of the
catalyst.

Very truly yours,
[Signature]



4. Assuming similar growth for brown king crab, we add 92 + 34 to arrive at 126 mm as a size limit for brown crab in the northern Bering Sea. Using Koeneman's conversion formula, we get 156 mm, or 6.1 inches carapace width.

This estimate applies only to the northern Bering Sea. However, the available information on maximum size of brown crab indicates that southern and northern Bering Sea crab are similar, and that Bering Sea crabs are smaller than crabs in the Aleutians and Gulf of Alaska. The only information available on size at maturity of brown crab in these latter areas comes from Southeast Alaska and is in an early stage of development. Thus as far as data needs go, it is obvious that we need information on size at maturity for Aleutian and Western Gulf stocks as well as growth data for these and the Bering Sea stocks. Maturity information can be collected relatively easily. Growth information will have to come from tagging studies which require more of both money and time.

cc: Gaffney
Baglin
Eaton
Marasco
Bevan
Clausen
Kimker
Koeneman
Somerton

Assuming similar growth for brown pine crop, we get 33 + 34 to arrive at 136 for a state limit for brown crop in the northern region. Using Koenig's conversion formula, we get 136 for 0.61 inches average width.

This estimate applies only to the northern part of the state. However, the available information on maximum size of brown pine indicates that southern and northern regions are not similar, and that the only information available on size of brown pine in these latter areas comes from Southern States and is in an early stage of development. There is no information on size of brown pine in the northern part of the state as well as growth data for these areas. Therefore, information can be collected relatively easily. Growth information will have to come from regions which require more of both money and time.

- California
- Florida
- Georgia
- Illinois
- Indiana
- Michigan
- Minnesota
- Wisconsin

Size at Maturity of the Golden King Crab
(Lithodes aequispina) in the Northern Bering Sea

David A. Somerton

Department of Fisheries and Wildlife
Oregon State University
Corvallis, OR 97331

Alaskan king crab fisheries traditionally have been supported by red king crab (Paralithodes camtschatica) and, to a lesser degree, by blue king crab (P. platypus). However, the recent precipitous decline in the Bering Sea population of red king crab has stimulated interest in directed fisheries for a deeper water species, the golden king crab (Lithodes ~~ae~~quispina). Due to their relatively minor contribution to the total king crab catch, golden king crab have not been studied extensively. Consequently, there exists little biological information useful for managing these new fisheries.

One important regulatory measure is a minimum size limit. For red king crab, minimum size limits are set at the average size of a male two to three years after reaching sexual maturity. Determination of this size thus requires estimates of the size at sexual maturity and the growth rate in the first few years after maturity.

In this paper I examine the size at maturity for both male and female golden king crab in the northern Bering Sea. For males this size was determined from chela allometry; for females this size was determined from the presence of eggs or egg remnants on the pleopod setae.

Materials and Methods

Sample collection

Samples of golden king crab were collected between 12 July and 3 August, 1982, aboard the Japanese stern trawler, Ryujin Maru No. 8. Sampling was conducted between 120-820 m along a section of the continental slope of the eastern Bering Sea bounded by 58° 19'N and 60° 55'N. A total of 110 locations were sampled, 42 of which at least one golden king crab was captured.

On all specimens, carapace length was measured to the nearest 1 mm and shell condition, a relative index of the time since the last molt, was scored on a four point scale. The height of the right chela (see Wallace et al. 1949 for a description of this measurement) was measured on all males, excluding those which appeared to be in the process of regenerating a lost right chela.

Females were examined for the presence of eggs or egg remnants (empty egg cases and egg funiculi) on the pleopod setae. Unlike blue and red king crab females, golden king crab females often have egg remnants that are sparse and hard to detect. To insure that adult and juvenile females were correctly separated, the following procedure was used. For females lacking eggs or conspicuous egg remnants, the carapace was removed and the ovaries were examined. If the ovaries were white and undeveloped, the female was classified as juvenile. If the ovaries were pink or orange and appeared at least partially developed, the three largest pleopods were removed and examined under a microscope. If microscope examination failed to reveal egg remnants, the female was classified as juvenile. Less than 10% of all females required microscopic examination to determine maturity.

The total sample of golden king crab consisted of 342 females and 292 males. However, some crabs were mutilated in the trawls, therefore only 336 females, ranging in size from 31 to 145 mm, and 212 males, ranging in size from 34-163 mm, were suitable for analysis.

Analysis

For males, the size at maturity was determined from Chela allometry using a technique described in Somerton and MacIntosh (in press). This technique assumes that the growth of the carapace changes with respect to the growth of the carapace at maturity. For king crabs, when chela height is plotted against carapace length on log-log axes, the data assume a pattern consisting of two straight lines intersecting at a point. This intersection point is assumed to be the average size at sexual maturity. To estimate the carapace length at the intersection point, a model, consisting of a pair of straight lines constrained to meet at a point, is iteratively fit to logarithms of chela height and carapace length measurements until the residual sum of squares about the model is minimized. The intersection point producing the minimum sum of squares is then chosen as the size at maturity (Fig. 1).

The variance of the estimated male size at maturity was estimated using a Monte Carlo technique discussed in Somerton and MacIntosh (in press). If the golden king crab population was sampled a number of times, independent estimates of size at maturity could be obtained by fitting the two line model to the morphometric data from each sample. The best estimate of the size at maturity would be the mean of these independent estimates and the variance of this mean would be the variance among the independent estimates. The Monte Carlo procedure approximates this multiple sample method of estimating variance by utilizing synthetic data sets. A synthetic data set is generated by assigning a new chela measurement for each carapace measurement in the original sample. This measurement consists of two parts, a determinate part based on the estimated parameters of the

best fitting two line model, and a random part, based on the estimated variance about the two line model. Utilizing this technique, ten synthetic data sets were generated. The two line model was fit to each data set, and the variance of the estimated size at maturity was computed as the variance among the 10 independent estimates.

For females, the size at maturity was estimated in two stages. First, based on the presence of eggs or egg remnants on the pleopod setae, females were classified as either adult or juvenile. Second, a logistic equation was fit, using methods described in Somerton (1980), to the percent mature, within 3 mm size intervals, as a function of size. The fitted logistic equation was then evaluated to determine the size at which 50% of the females were mature (Fig. 2). The variance of the size at 50% maturity was estimated using methods discussed in Somerton (1980).

Results and Discussion

For males, the estimated size at maturity was 92.0 mm with a standard deviation of 1.7 mm. This estimate is much more precise than similar estimates for blue king crab (Somerton and MacIntosh, in press) for two reasons. First, the golden king crab sample contained a broad size range of specimens. Since precision in the estimates of the slopes of the two line model increases as the size range of data increases (Draper and Smith 1981), the precision in the estimate of the intersection point also increases. Second, golden king crab have a greater change in chela relative growth at maturity than do blue king crab. Since precision in the estimate of the intersection point of the two line model increases

as the included angle between the lines decreases, a large change in relative growth allows more precise estimates of size at maturity.

The second point is particularly important when examining the general utility of chela allometry as a tool for estimating the size at maturity of male king crabs. It is now clear that blue king crab (Somerton and MacIntosh, in press) and red king crab (Somerton 1980) do not have a pronounced change in relative growth at maturity, whereas golden king crab (this study) and deep-sea king crab (L. couesi; Somerton 1981) do have a pronounced change. Thus the degree of change in relative growth appears to differ between genera of king crab. Consequently, given equal size ranges of data, estimates of male size at maturity are inherently more precise for Lithodes than they are for Paralithodes.

For females, the estimated size at maturity was 97.1 mm with a standard deviation of 0.4 mm. The precision of this estimate is similar to that obtained for female blue king crabs (Somerton and MacIntosh, in press).

Since 95% confidence intervals of males (88.7-95.3 mm) and females (96.3-97.9 mm) do not overlap, male golden king crab mature at a significantly smaller size than female golden king crab.

Within the Bristol Bay and Pribilof management districts of the eastern Bering Sea, golden king crab currently have the same minimum size limit as red and blue king crab. This size limit is appropriate only to the extent that the growth rate and size at maturity of golden king crab equal those of red and blue king crab. Since the growth rate of golden king crab cannot be determined until tagging studies have been conducted, the

adequacy of the current size limit must be assessed based on the similarity in the size at maturity of the three species.

Size at maturity estimates for both males and females are shown in Table 1 for golden king crab, for Pribilof Island blue king crab and for Bristol Bay red king crab. Notice that the female estimates of all three species are nearly identical, but the male estimate for golden king crab is substantially less than those for blue and red king crabs. This apparent difference in the male size at maturity between species should be viewed with skepticism due to the inherent imprecision of the red and blue king crab size at maturity estimates. The 95% confidence interval about the blue king crab estimate is so broad that it includes the point estimate for golden king crab. Consequently, these two species are not significantly different. Although the variance of the male red king crab estimate is not known, it is undoubtedly large. Thus the available evidence suggests that the size of maturity does not differ greatly, if at all, between golden king crab, Pribilof Island blue king crab, and Bristol Bay red king crab. For this reason, identical size limits for all three species appears to be justified until a difference in growth rate has been demonstrated.

Since king crab size at maturity is known to vary between areas (Somerton and MacIntosh, in press), the estimates of golden king crab size at maturity presented in this report, which were based on samples collected at the northern extreme of this species range, should not be used, without further validation, to set minimum size limits in areas outside of the Bering Sea. One type of validation would be similarity in the size distribution of male golden king crab between the Bering Sea and the area being investigated. The size distribution of the male crab used in this study is shown in Figure 3 to facilitate such a comparison.

Literature Cited

- Draper, N.R., and H. Smith. 1981. Applied regression analysis. John Wiley and Sons, New York.
- Somerton, D.A. 1980. A computer technique for estimating the size of sexual maturity in crabs. Can. J. Fish. Aquat. Sci. 37:1488-1494.
- Somerton, D.A. 1981. Contribution to the life history of the deep-sea king crab, Lithodes couesi, in the Gulf of Alaska. Fish. Bull. 79:259-270.
- Somerton, D.A., and R.A. MacIntosh. In press. The size at sexual maturity of blue king crab, Paralithodes platypus, in Alaska. Fish. Bull.
- Wallace, M., C.J. Pertuit, A.R. Hvatum. 1949. Contributions to the life history of the king crab, Paralithodes camtschatica. U.S. Fish. Wild. Leaflet. 340:50 p.

Table 1.--Comparison of average size of maturity for Bering Sea king crabs.

Species/Area	Carapace length (mm)	
	Male	Female
Brown, northern Bering Sea ^{1/}	92	97
Red, Bristol Bay ^{2/}	103	96
Blue, Pribilofs ^{3/}	108	96

^{1/} This study.

^{2/} Somerton, 1980.

^{3/} Somerton and MacIntosh, in press.

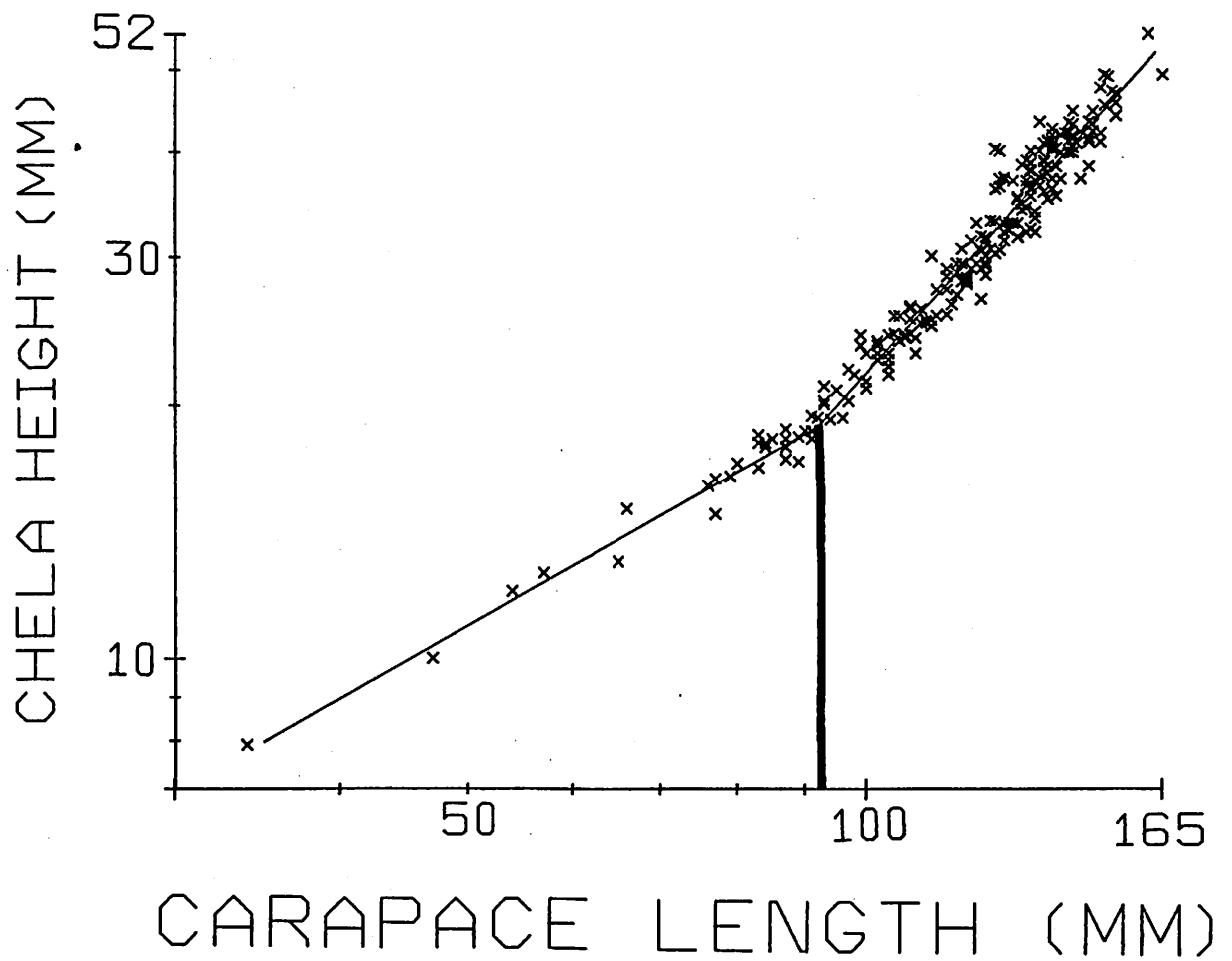


Figure 1

Male chela heights and carapace lengths, plotted on log-log axes, are shown, with the best fitting two line model. The dark vertical line indicates the carapace length (92 mm) of the intersection point.

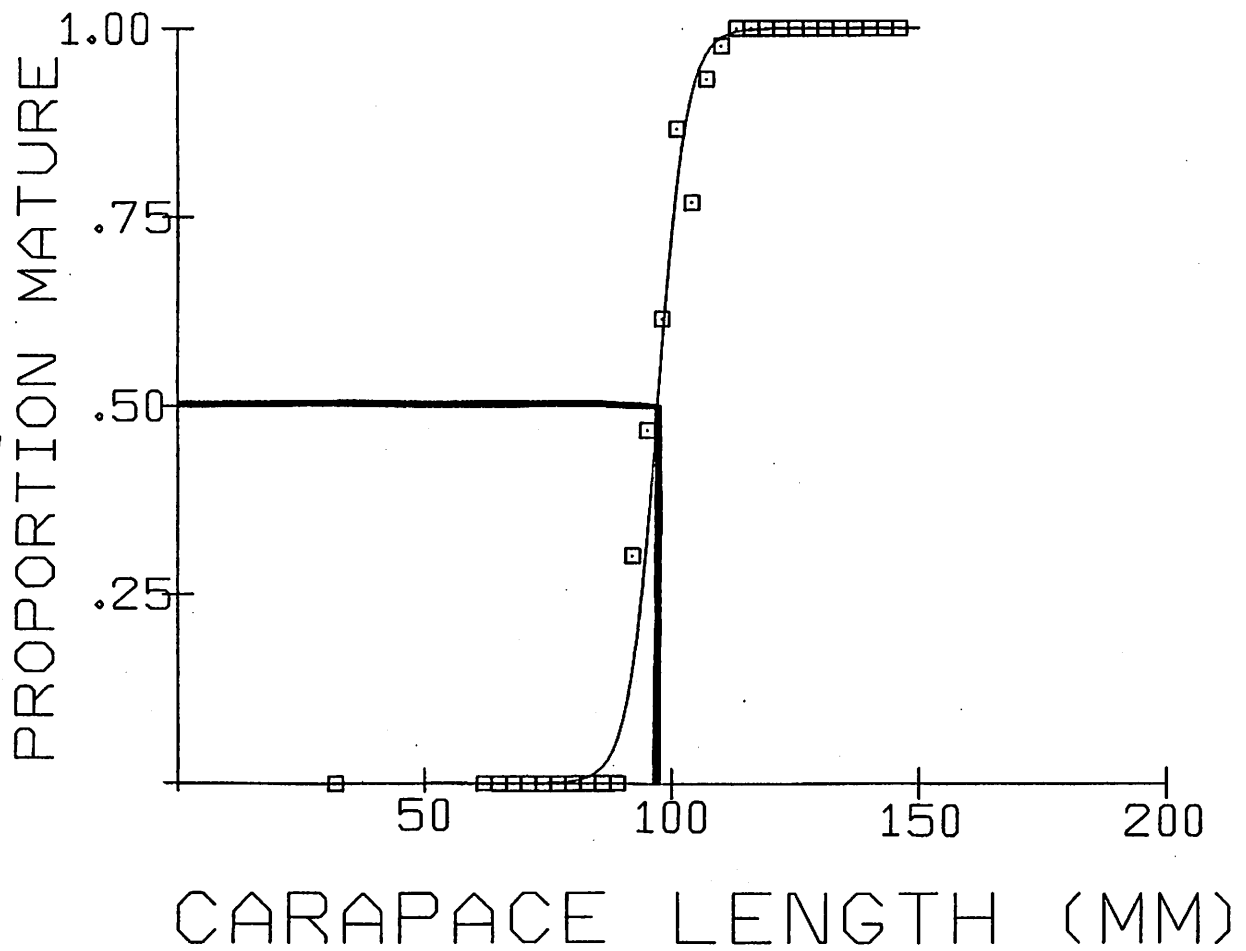


Figure 2

Proportion of females that were mature by 3 mm size intervals and the fitted logistic equation. The dark lines indicate the size (97.1 mm) at which 50% of the females were mature.

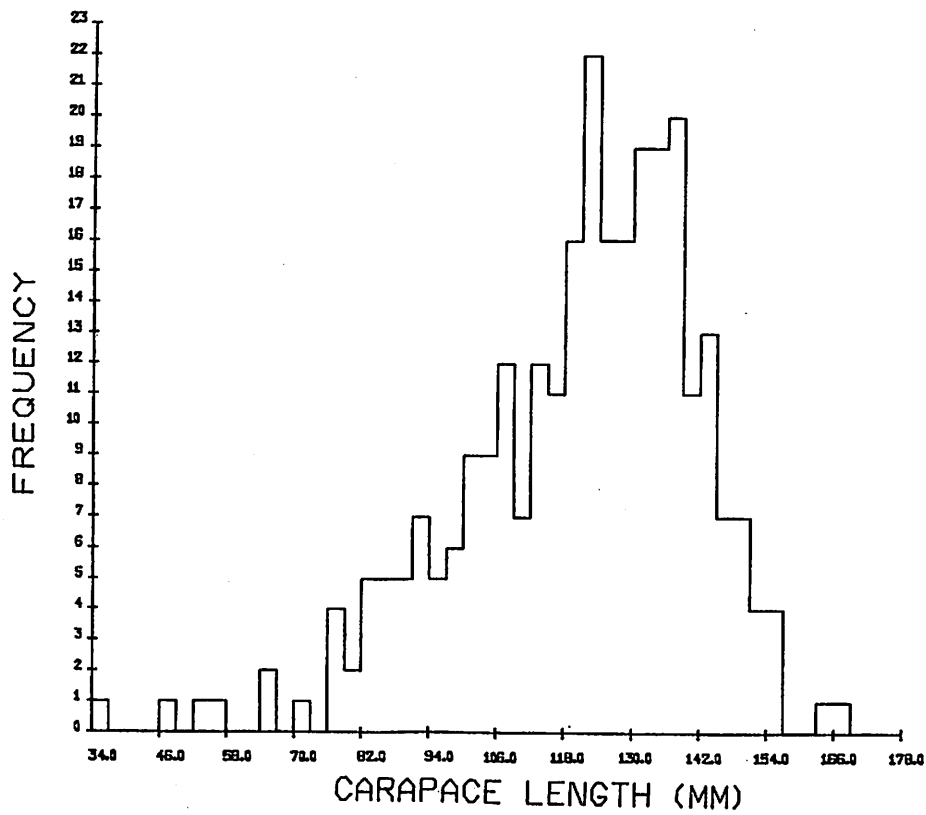


Figure 3

Size distribution of male golden king crab from the northern Bering Sea.

STATE OF ALASKA

DEPARTMENT OF FISH AND GAME

Bill Sheffield, Governor

P.O. Box 667
Petersburg, Alaska 99833

February 2, 1983

Dr. Jerry Reeves
U.S. Department of Commerce
N.O.A.A., National Marine Fisheries Service
Northwest and Alaska Fisheries Center
Resource Ecology & Fisheries Management
2725 Montlake Boulevard East
Seattle, Washington 98112

Dear Jerry,

Here are the data I have readily available. Perhaps in the near future (prior to Board) an analysis of the size frequency (length-shell condition) data from the dockside samples can be accomplished. The tag utilized in the studies was the plastic isthmus spaghetti tag which was knotted after application. Tag numbers were stamped onto the plastic material. Tagging occurred on the grounds on-board fishing vessels.

Fecundity data was based on preserved eggs taken from live females on February 16, 1971. Females selected all had "full clutches" and eggs were eyed.

That's it for now. Let me know if questions arise.

Cheers,



Timothy Koeneman
Shellfish Biologist
Commercial Fisheries
(907) 772-3801

MAX EDWIN KING CRAB GROWTH BY TAGGING RESULTS.
 RECOVERIES INDICATING MOLTS.

TAG NO	MM BEGIN	MM END	MM DIFF.	NO. MONTHS	FEDERAL NO MOLTS
10111	152	170	18	22	1
11002	134	151	17	15	
10658	150	158	8	15	
11258	158.5	175	16.5	15	
01163	157	174	17	10	
01177	150	167	17	10	
11377	143	160	17	16	
11308	147	166	19	17	
01181	149	167	18	11	
01089	149	168	19	12	
01031	149	160	11	13	
01032	149	165	16	13	
01024	162	177	15	13	
01038	158	177	19	13	
01153	145	163	18	12	
01113	148	163	15	12	
01260	157	171	14	12	
01023	149	168	19	13+	
01059	145	165	20	13+	
01162	159	175	16	12+	
01092	152	170	18	13	
01182	140	157	17	13	
01166	132	150	18	13	
01081	148	167	19	14	
01187	148	165	17	14	
11001	133	152	19	26	
11327	170	184	14	21	
01028	145	159	14	17	
11259	148	164	16	22	
11219	170	187	17	28	
10957	162	183	19	27	
01093	148	165	17	21	1
11000	126	165	39	33	2
01232	158	165	7	22	1
01134	146	160	14	22	1
11262	133	167	34	28	2
01141	151	168	17	22	1
01253	153	172	19	22	1
01128	140	158	18	22	1
11322	142	176	34	29	2
01121	142	152	10	24	1
01142	158	177	19	27	1
01021	155	164	9	28	1
01214	147	165	18	28	1
01229	152	169	17	33	1
01107	140	173	33	34	2
09256	152	183	31	45	2
01160	149	175	26	45	2
01239	147	196.6	49.6	56	3

57 = 16.3 mm/...

SUMMARY OF MUC BROWN KING CRAB TAG RETURNS
1970 THROUGH 1972 APPLICATION DATES.

1. NUMBER TAGGED - 848
2. NUMBER RECOVERED - 138 (16.2%)

3. a. NO DATA WAS RECORDED FOR 1 TAG,
b. NO SIZE DATA WAS RECORDED FOR 6 TAGS WHICH WERE AT LARGE FOR 7, 9, 16, 21, 26, AND 32 MONTHS.
c. NO SIZE DATA WAS RECORDED FOR 4 TAGS WHICH WERE AT LARGE FOR 10, 11, 17, AND 21 MONTHS, BUT NOTES INDICATED THAT EACH CRAB HAD MOLTED AT LEAST ONCE.
d. NO MOLTING OCCURRED FOR 52 RECOVERIES WHICH OCCURRED PRIOR TO HAVING AN OPPORTUNITY TO MOLT, LISTED BY MONTH AT LARGE AND NUMBER OF OCCURRENCES:

<u>MONTH</u>	<u>OCCURRENCE</u>
0	18
1	25
4	2
5	1
6	1
8	4
9	1

- e. NO MOLTING OCCURRED FOR 26 RECOVERIES WHICH WERE AT LARGE FROM 13 TO 23 MONTHS. LISTED BY MONTH AND OCCURRENCE:

<u>MONTH</u>	<u>OCCURRENCE</u>
13	1
14	1
15	6
16	11
17	2
20	2
22	2
23	1

- f. OF THE 49 RECOVERIES INDICATING THE OCCURRENCE OF MOLT(S) 42 MOLTED ONCE, 6 MOLTED TWICE, AND 1 MOLTED THREE TIMES.
1) AVERAGE INCREASE OF SINGLE MOLTS IS 16.25MM IN LENGTH
2) AVERAGE INCREASE/MOLT OF DOUBLE MOLTS IS 16.42MM,
3) AVERAGE INCREASE/MOLT OF TRIPLE MOLT WAS 16.53MM.

INCREASES RANGED FROM 8 TO 20MM (FOR SINGLE MOLTS) AND TIME AT LARGE RANGED FROM 10 TO 56 MONTHS. A LIST OF RECOVERED MOLTS FOLLOWS:

STATE
of ALASKA

MEMORANDUM

TO: Guy Powell
Commercial Fish Research
Kodiak

DATE : June 5, 1978

FROM: Tim Koeneman
Commercial Fish
Petersburg

SUBJECT: Brown King Crab Life History
Info

Your letter stirred my inquisitive nature, so I have done some digging into the files. Exhibit (1) expresses Buchanan's thoughts on molt timing as he stated in his 2/18/72 report (which I believe was presented to the Board). Exhibit (2) is a summary of the data available from dockside sampling. With the exception of 72/73, there does not appear to be a distinct molting period (softshell in the catch) for males. However, the data since 1974/75 reflects different samplers and less sampling effort. Additionally, local processors have found that recovery percentages are lower for browns than reds, so fishermen may have been sorting a bit more with respect to shell condition. It is difficult to imagine that browns do not have a distinct cycle similar to reds, tanners, Dungeness, etc, and I would tend to agree with your thoughts.

I do have a conversion equation for male brown crab length and width (regression formula). In millimeters, it is:

$$Y = 44.3336 + 0.8875 X$$

N = 345

RANGE = 144 TO 210 mm LENGTH

Where X = carapace length, and Y = carapace width

Exhibit 3 is a linear regression (least squares) of brown female carapace length and number of eggs. This data was recomputed from old information that Buchanan had stored in the files. Tate and I helped with the counts.

I do have some info on growth per molt of male browns but it will take a concerted effort to put it together.

The latest on the submarine should have been forwarded to you from Bill High. But, if the mail is slow, here is what he sent me last. It is possible we can do some scuba diving off the NOAA vessel but will let you know what gear they would furnish (tanks and air).

Guess that's it, I'll keep in touch.

SHELL CONDITION

Red crab - In June and July 1971 almost 40 percent of the red crab sampled were in the soft-shell or newly-molted condition. Last March some soft crab appeared in the commercial catch. This year's catch had less than one percent soft-shell crab because of the early closure on January 31. The breakdown of red crab condition from this season's catch for soft, exuviant, and anexuviant was 0.5, 75.7, and 23.8 percent respectively.

Brown crab - This was the first year that shell condition could be separated in brown crabs. The shell of the brown crab appears to harden faster than the red crab after the actual molt, so color and weight have to be judged with shell hardness. The exuviant and anexuviant crabs were best separated using the amount of wear marks on the chela. Over 26 percent of the brown crabs had anexuviant shells and 66 percent had exuviant shells. Our samples indicate that a year-around, low-level molting condition is possible in brown crabs. Below are listed the months that soft-shell crabs were sampled in the fishery.

<u>MONTH</u>	<u>PERCENT SOFT-SHELL</u>
June	11.7
October	9.5
November	7.6
December	5.0
January	9.1
February	6.5

FROM BUCKANANS REPORT 2/10/72



U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration

NATIONAL MARINE FISHERIES SERVICE
Auke Bay Fisheries Laboratory
P. O. Box 155, Auke Bay, Alaska 99821

Date : February 18, 1983

FEB 28 1983

Reply to Attn. of:

To : Jerry Reeves, REFM, Seattle

From : David Clausen, Auke Bay Lab *Dmc*

Subject: Size of maturity of golden (brown) king crab and other aspects of its biology.

For the past year and a half, I have been collecting data on the biology of the golden (brown) king crab, Lithodes aequispina, in the Lynn Canal - Icy Strait areas of southeastern Alaska. These data include information on (1) size of sexual maturity of male and female crabs (2) fecundity of females (3) stage and size of the eggs carried by females (4) parasitism (5) measurements for both sexes of carapace length, carapace width, and carapace width including spines, for computation of regressions. In response to your memo, I discuss my results below. I emphasize that my data has not been completely worked up, and that in some cases I need to collect additional samples. Thus, these results are very preliminary.

a) Size of sexual maturity of males:

I have found that direct observation of the male vas deferens, under a compound microscope, appears to show whether a crab has reached anatomical sexual maturity. I haven't been able to locate any reference in the literature to a technique like this for king crabs, although it is quite straightforward. The methods are as follows: The carapace of a live crab is removed, exposing the internal structures within. A small section of the vas deferens is cut out, placed on a glass slide, and smeared. The slide is then examined under a compound microscope at magnifications between 100 and 500 power. The structures inside the vas deferens are identified from the descriptions and drawings of Marukawa (1933). Crabs are presumed to be sexually mature if their vas deferens contains spermatophore bands. These bands are stringy, coiled structures with clumps of oval capsules (spermatophores) containing spermatozoa. Crabs with vas deferens not containing spermatophore bands with spermatophores are presumed to be sexually immature; their vas deferens is a hollow tube with no discernable structures inside.

My preliminary results indicate that male golden king crabs reach sexual maturity somewhere in the size range of 80-95 mm carapace width (c.w.) not including spines. Crabs were examined at two separate times: early April 1982 (Figure 1) and early August 1982 (Figure 2). In each time period, only one crab was found to be sexually immature - i.e. the vas deferens did not contain spermatophore bands with

spermatophores. These two crabs measured 68 mm and 78 mm c.w. not including spines. The other 90 crabs examined, in both April and August, from 96 to 200 mm c.w. including spines, all appeared to be sexually mature; their vas deferens contained spermatophore bands with spermatophores. Obviously, before I can publish these results in some form, I need to sample many more crabs in the 60-100 mm size range.

b) Sexual maturity of females:

Size of sexual maturity of female crabs appears to be less than 100 mm c.w. not including spines, similar to males. I examined female crabs in both April and August 1982. Of these, all 114 crabs greater than 100 mm c.w. not including spines were either sexually mature (carrying eggs) or becoming sexually mature (orange eggs were developing in the ovary). Only three female crabs less than 100 mm were examined. Two crabs, 63 mm and 97 mm c.w. not including spines were immature; they were non-ovigerous, and their white ovary did not contain developing eggs. One crab 85 mm c.w. was also non-ovigerous, but the orange eggs developing in the ovary indicated it was becoming sexually mature. As with male crabs, I need more samples of small females in the 60-100 mm size range to really bracket the size of maturity.

c) Growth per molt:

I have no information on growth per molt.

d) Maximum size of/males and females:

The largest male crab I have examined was 193 mm carapace length and 223 mm carapace width, not including spines. The largest female was 178 mm carapace length and 180 mm carapace width not including spines.

e) Mating season:

I think mating in the golden king crab in southeastern Alaska is not concentrated in one season of the year as it is in red king crab. Rather, the reproductive cycle appears to be asynchronous, with individual females spawning at different times of the year than other individuals. I base this conclusion on my observations of the reproductive condition of females (whether they were ovigerous, non-ovigerous, or in the process of releasing larvae) combined with stage of eggs carried (eyed or not eyed). In both the spring and summer, the seasons when I have sampled crabs, females varied widely in their reproductive condition and in the stage of eggs carried. For the population as a whole, perhaps some degree of spawning goes on throughout the year.

f) Occurrence of soft-shelled crabs:

I have not observed any soft-shelled crabs at any time during my sampling.

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This research has been a side project for me in addition to my primary job involving groundfish. Most of the samples have been collected incidental to other research carried on here at the laboratory, although I was able to obtain some crabs directly from commercial fishermen. Because of my other duties at work, I haven't been able to devote as much time to the golden king crab project as I would like. I hope to collect more samples from commercial fishermen this summer, particularly small crabs. If I can get these additional samples, I should be able to work up the data and write a report this fall. Because of the recent increased fishery for golden king crab in the Bering Sea, it appears any information I can contribute would be both useful and timely.

cc: Doyme Kessler, Kodiak Lab

Figure 1

SIZE OF MATURITY OF MALE LITHODES AEQUISPINA,

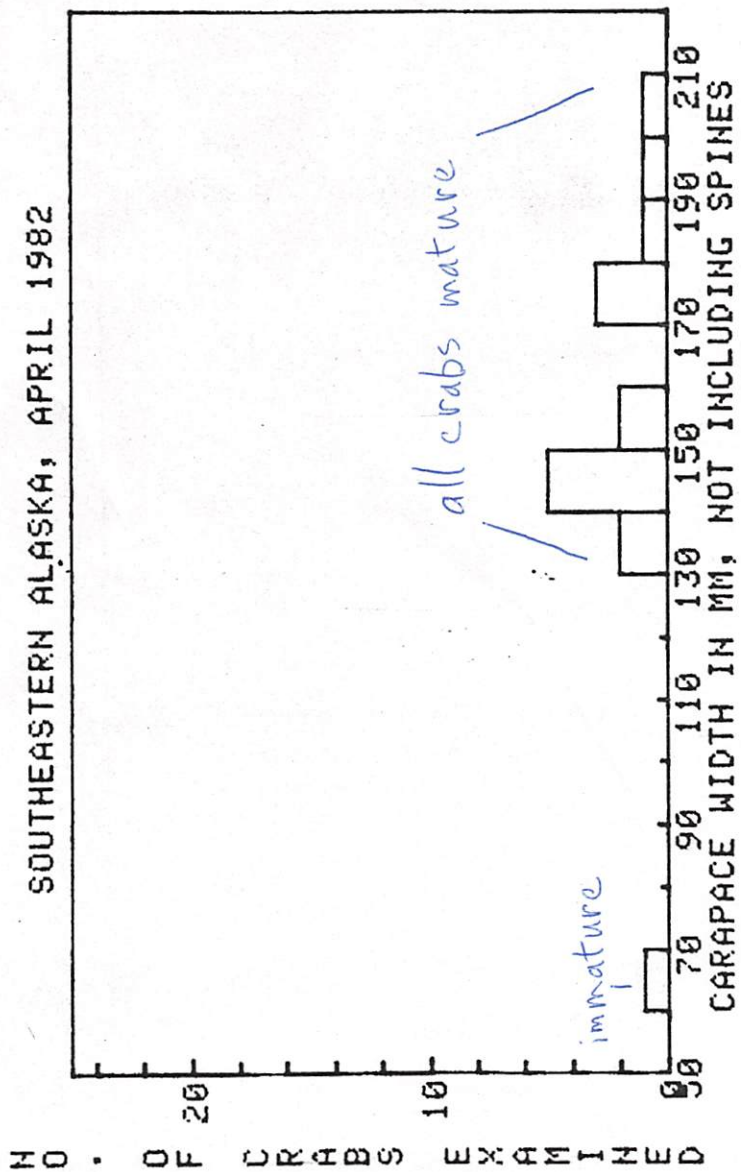


Figure 2

SIZE OF MATURITY OF MALE LITHODES AEQUISPINA,

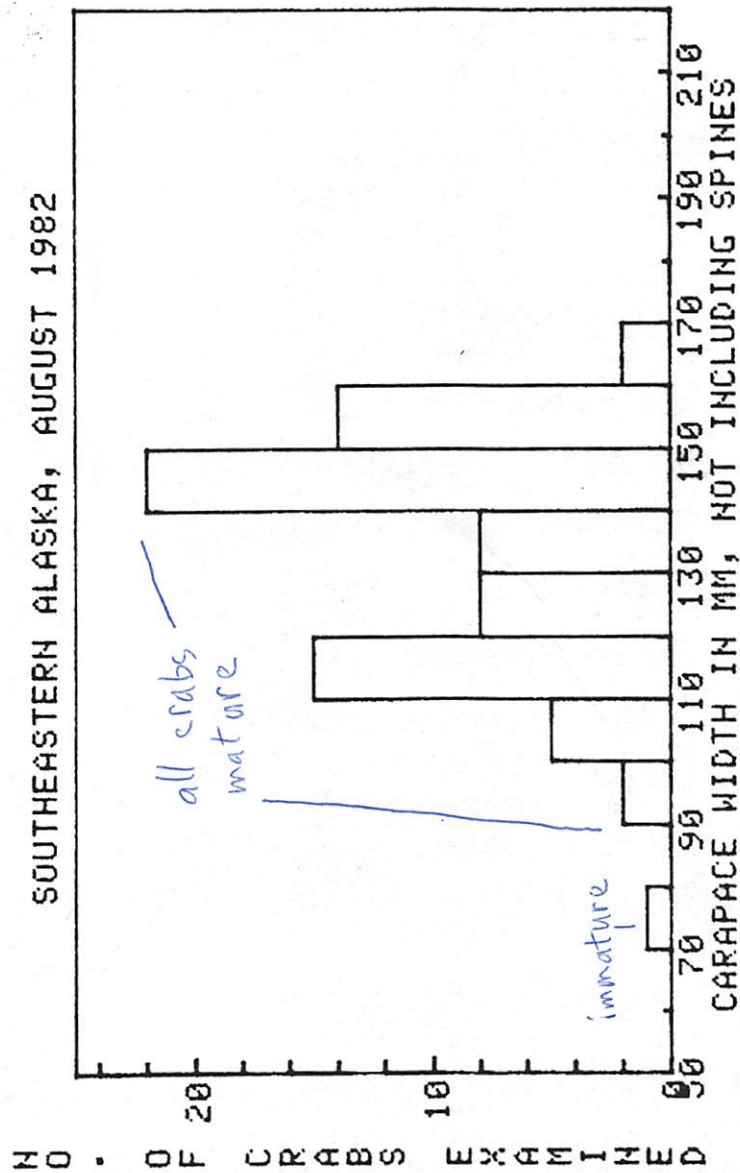


Table .--Maximum carapace length (mm) observations for brown king crab from various areas of Alaska.

Area	Males	Females	Source
Northern Bering Sea	187	173	NMFS Observer Program
	165	145	Somerton
Southern Bering Sea	178	172	NMFS Observer Program
Western Aleutians	204	195	NMFS Observer Program
Shumagin	206		NMFS Observer Program
Prince William Sound	212		ADF&G Catch Sampling
Yakutat		204	NMFS Observer Program
Southeast Alaska	210	157	ADF&G Tagging, Fecundity Studies
	193	178	NMFS Biological Studies

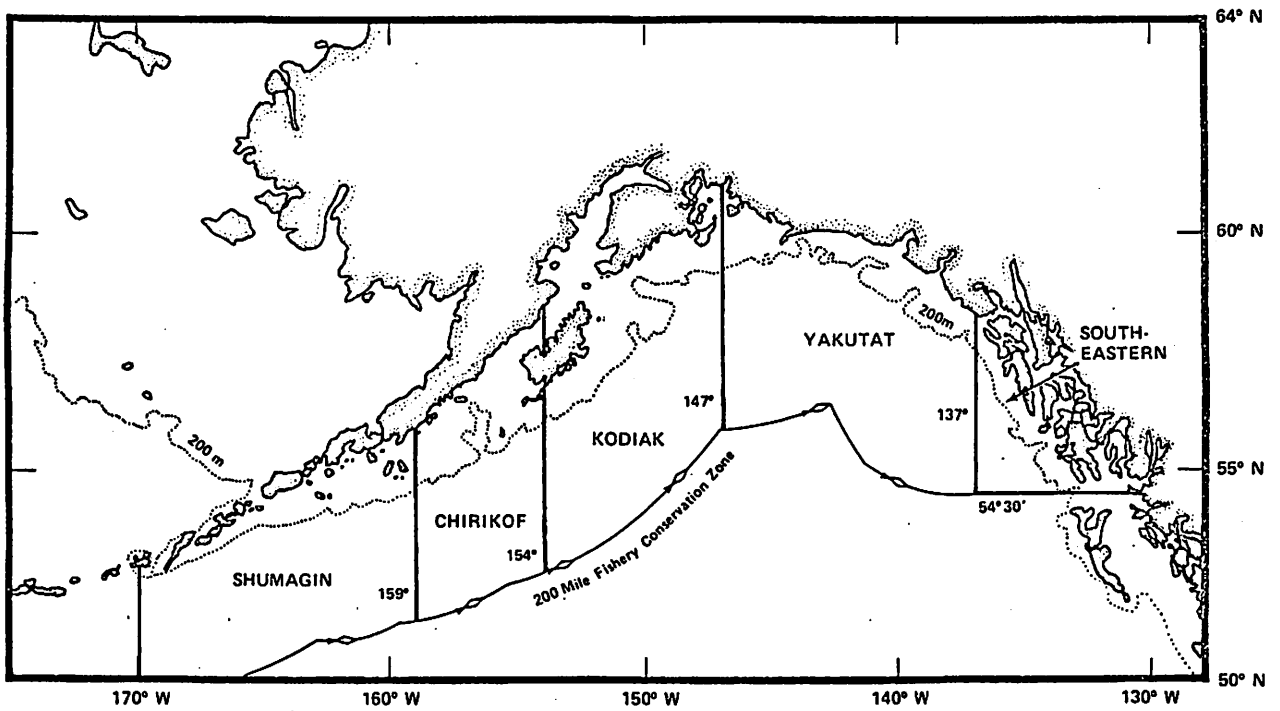
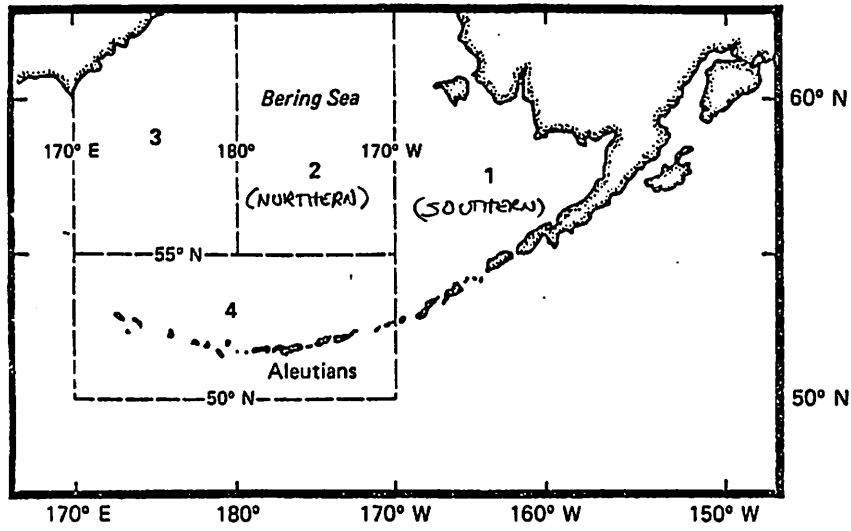


Figure 4 Statistical areas (U.S. and INPFC) for brown king crab observer data.

Table .--Summary of maximum carapace length data for brown king crab from the NMFS Observer Program.

Area	Males		Females	
	Average	95% Conf. Int.	Average	95% Conf. Int.
Northern Bering Sea	187	+ 10.7	173	+ 12.0
Southern Bering Sea	178	+ 10.8	172	+ 21.1
Western Aleutians	204	+ 10.4	195	+ 21.1
Shumagin	206	+ 15.0		
Yakutat			204	+ 16.0

Table .--Maximum carapace lengths of brown king crab sampled aboard foreign trawlers by the NMFS observer program.

Year	Area	Sex	Maximum length (mm)	Sample Size
1973	Northern Bering Sea	Male	162	174
		Female	136	131
	Southern Bering Sea	Male	155	125
		Female	119	142
1974	Northern Bering Sea	Male	189	191
		Female	167	218
	Southern Bering Sea	Male	166	44
		Female	156	47
1976	Northern Bering Sea	Male	168	45
		Female	138	28
	Western Aleutians	Female	140	16
1977	Northern Bering Sea	Male	173	269
		Female	178	367
	Southern Bering Sea	Male	166	36
		Female	178	37
	Western Aleutians	Male	188	50
		Female	158	21
	Yakutat	Female	220	18
1978	Northern Bering Sea	Male	163	473
		Female	163	451
	Southern Bering Sea	Male	153	35
		Female	148	31
	Western Aleutians	Male	176	13
	Shumagin	Male	193	15

Table .--Maximum carapace lengths of brown king crab sampled aboard foreign trawlers by the NMFS observer program (continued).

Year	Area	Sex	Maximum length (mm)	Sample size	
1979	Northern Bering Sea	Male	208	3,369	
		Female	173	3,236	
	Southern Bering Sea	Male	193	493	
		Female	193	394	
	Western Aleutians	Male	208	2,655	
		Female	203	1,596	
1980	Northern Bering Sea	Male	173	2,911	
		Female	163	3,053	
	Southern Bering Sea	Male	163	771	
		Female	143	689	
	Western Aleutians	Male	208	895	
		Female	203	752	
	Shumagin	Male	208	85	
	Yakutat	Female	188	17	
	1981	Northern Bering Sea	Male	178	6,808
			Female	163	6,224
Southern Bering Sea		Male	188	411	
		Female	158	259	
Western Aleutians		Male	193	1,206	
		Female	193	953	
1982	Northern Bering Sea	Male	198	4,711	
		Female	193	4,853	
	Southern Bering Sea	Male	183	977	
		Female	213	597	
	Western Aleutians	Male	203	1,400	
		Female	183	1,348	

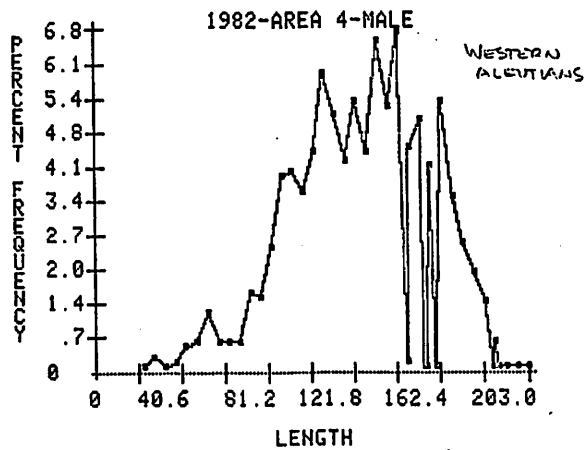
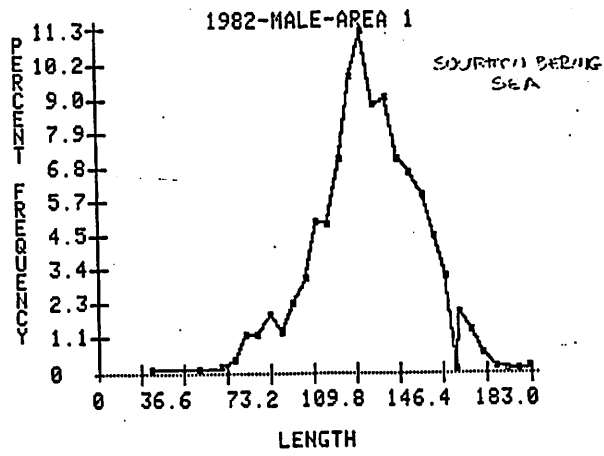
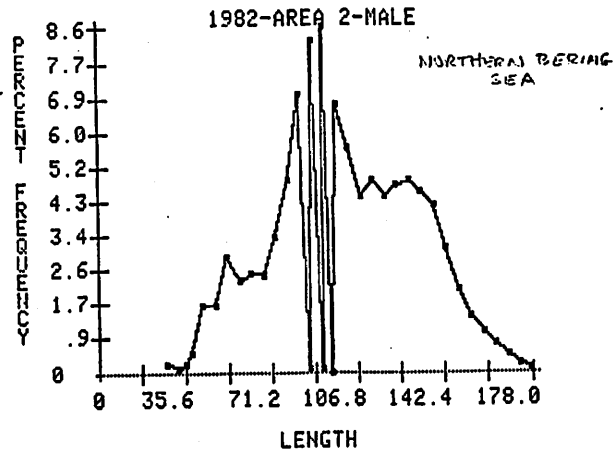


Figure — Length-frequency distributions for male brown king crabs sampled by the NMFS observer program in 1982.

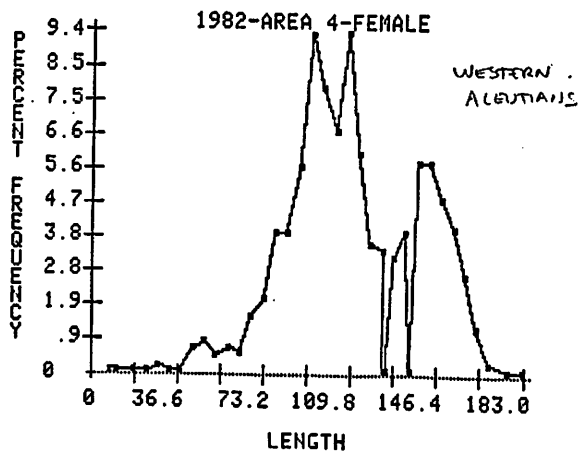
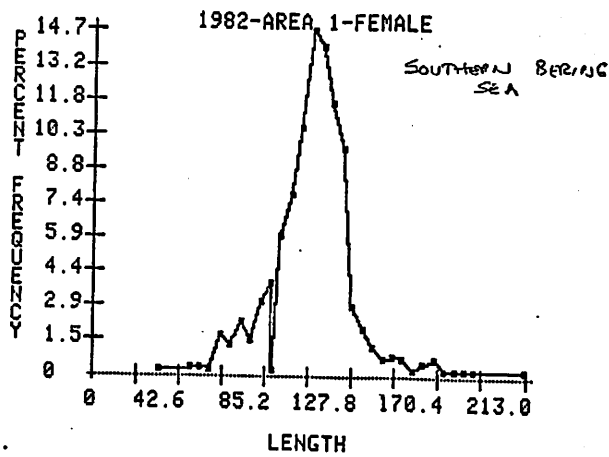
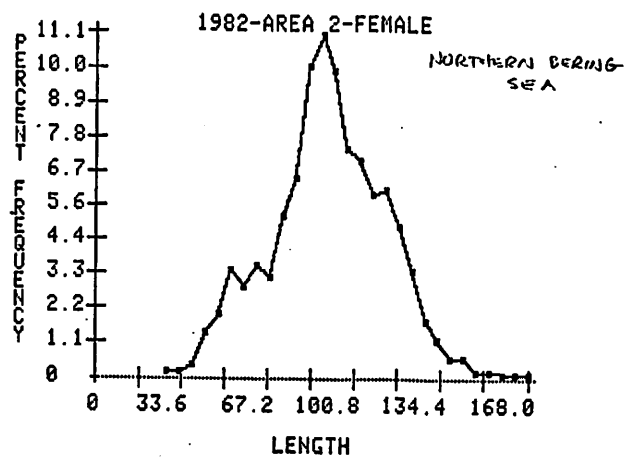


Figure — Length-frequency distributions for female brown king crab sampled by the NMFS observer program in 1982.

D-3
T-4

PROJECTED CATCHES FOR BRISTOL BAY RED KING CRAB

IN 1983

by

J. E. Reeves

Northwest and Alaska Fisheries Center
National Marine Fisheries Service
National Oceanic and Atmospheric Administration
2725 Montlake Boulevard East
Seattle, WA 98112

March 1983

Projected Catches for Bristol Bay Red King Crab in 1983

SUMMARY

1. Analysis of data through 1982 indicates that the minimum required level of spawning females is 48 million crabs. About 56 million mature females are expected to be on the spawning grounds in 1983 and about 53 million in 1984.

2. However, in 1982, 54 million mature females were present, but only 34% were fully fertilized, reducing the spawning population to 18 million.

3. Uncertainty regarding the health of the female stock in 1983, as well as the continuing problem of high sub-legal male mortality leads to uncertainty in the projected catches for 1983.

4. The 1983 catch will probably not exceed 24 million pounds, but could be substantially less than that, if female barrenness and high sub-legal mortalities remain as significant problems. Final determination of the catch range will be made after the 1983 NMFS survey.

INTRODUCTION

Preliminary estimates of acceptable biological catch presented in this report are based on the procedure specified in the NPFMC Fisheries Management Plan for king crab in the Bristol Bay management area. The procedure calls for establishing the minimum female spawning stock required for maximizing future recruitment, and then determining the catches that can be taken without reducing the minimum spawning stock level. In the following sections, the details of these two components are discussed as they pertain to the 1983 season. The resulting projected catches should be considered tentative. Final estimates will be available after analysis of the 1983 NMFS trawl survey.

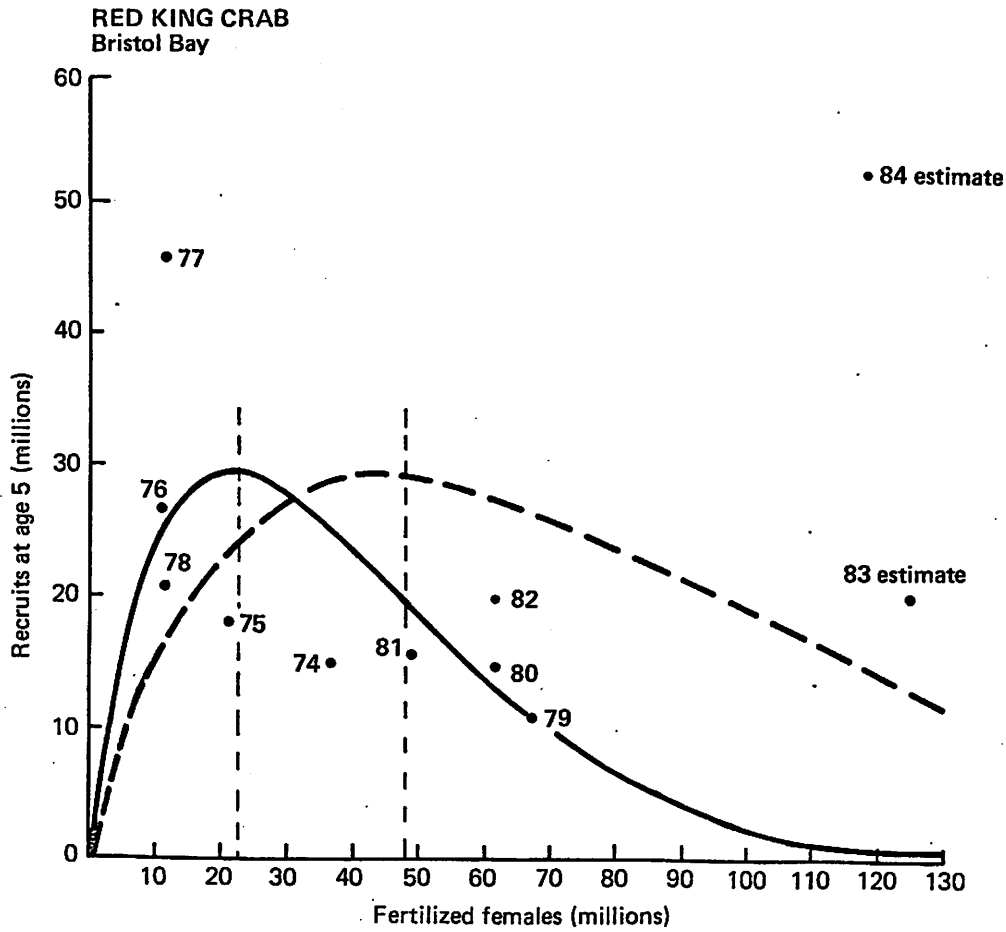


Figure 1.--Spawner-recruit relationship for Bristol Bay red king crab (solid line is based on survey data through 1982; the broken line represents the actual data through 1982, plus recruitment estimates for 1983 and 1984).

STATUS OF THE FEMALE SPAWNING STOCK

Spawner-recruit data for the Bristol Bay red king crab stock is shown in Figure 1. The solid line represents actual trawl survey population estimates through 1982. The broken line represents estimates of recruitment of five-year-old males to the stock for 1983 and 1984, added to the actual survey data. Details of estimation of recruitment for 1983 and 1984 are given in Appendix 1, along with parameter estimates for the two spawner-recruit curves. The two curves taken together provide a range of spawning stock values which are likely to provide high recruitment in the future. A range of 22 to 48 million fertilized females is indicated from the data. The upper end of this range, the 48-million level, has been picked as a conservative estimate of the minimum required female spawning stock.

In order to estimate the effect on the spawning stock of any particular size limit and exploitation rate operating on male crabs during the 1983 season, estimates of the abundance of mating females in 1984, and the percent fertilization, are required. The abundance of mature females on the mating grounds in 1984 is projected to be at 53 million crabs, according to methods described by Reeves (1981b) and Appendix 2. This value is used in conjunction with the values in Table 1 (top), showing estimates of percent fertilization, to give estimates of the 1984 spawning stock for various combinations of size limit and exploitation rate (bottom). The line drawn through these spawning stock values corresponds to the minimum required spawning stock of 48 million fertilized females established from the spawner-recruit analysis.

In 1982, the abundance of mature females was above the minimum level required, but high levels of barren females were discovered during research surveys and observation trips aboard commercial vessels during the fishing season. From this

information it is estimated that only 34% (as opposed to 96% expected from Table 1) of the mature female stock had full clutches, leading to the conclusion that in 1982 there was a much-reduced female spawning stock of 18 million (Table 2). The reason for this high level of barren females is still under investigation. Sex ratios and abundances of mature crabs were not greatly different between 1982 and 1981, when percent fertilization was 96%. There are indications that the high level of barren females may be associated with skipmolting among the larger and older females. Whatever the causes, the following analysis of catches for 1983 is based on the assumption that the rate of fertilization will be back to normal in 1983. If this is not the case, and high levels of barrenness are encountered during the 1983 survey, then a continued low catch can be expected in 1983.

DETERMINATION OF POSSIBLE CATCHES FOR 1983

Estimates of 1983 catches which are acceptable in terms of their effect on the reproduction of the stock are based on 1982 abundance estimates from the trawl survey and 1982 fishery removals. Estimated catches for 1983 are shown by size limit and exploitation rate in Table 3. Methods of calculating these values are given in Reeves (1981b). Two sets of catches are presented in Table 3, based on two possible natural mortality schedules for sub-legal crabs.

Prior to 1981, natural mortality rates estimated from tagging studies had been used successfully to project catches one year in advance. However, information from the 1981 survey indicated that natural mortality of sub-legal male crabs was substantially higher between 1980 and 1981 than in earlier years, leading to faulty projections. Thus, in 1982, catches were projected using two natural mortality schedules; one, depicting the rates in effect prior to 1981, and the other using estimates of generally higher sublegal

Table 1.--Estimated values of percent fertilization and 1984 female spawning stock for red king crab in Bristol Bay.

Size Limit (inches)	Exploitation Rate									
	.1	.2	.3	.4	.5	.6	.7	.8	.9	1.0
<u>Estimated Percent Fertilized Females-1980</u>										
7.00	100	100	100	100	100	100	98	97	95	96
6.75	100	100	100	98	97	96	92	90	87	86
6.50	100	100	100	96	96	96	86	82	79	76
6.25	99	96	93	89	85	81	78	74	72	67
6.00	93	89	86	82	77	73	70	66	64	59
5.75	87	84	81	77	72	68	65	62	60	55
5.50	84	80	77	73	68	64	61	57	55	50
5.25	78	75	72	68	63	59	56	53	51	46
<u>Estimated 1984 Spawning Stock (Millions of Fertilized Females)</u>										
7.00	53	53	53	53	53	53	52	51	50	51
6.75	53	53	53	52	51	51	49	48	46	46
6.50	53	53	53	51	51	51	46	43	42	40
6.25	52	51	49	47	45	43	41	39	38	36
6.00	49	47	46	43	41	39	37	35	34	31
5.75	46	45	43	41	38	36	34	33	32	29
5.50	45	42	41	39	36	34	32	30	29	27
5.25	41	40	38	36	34	31	30	28	27	24

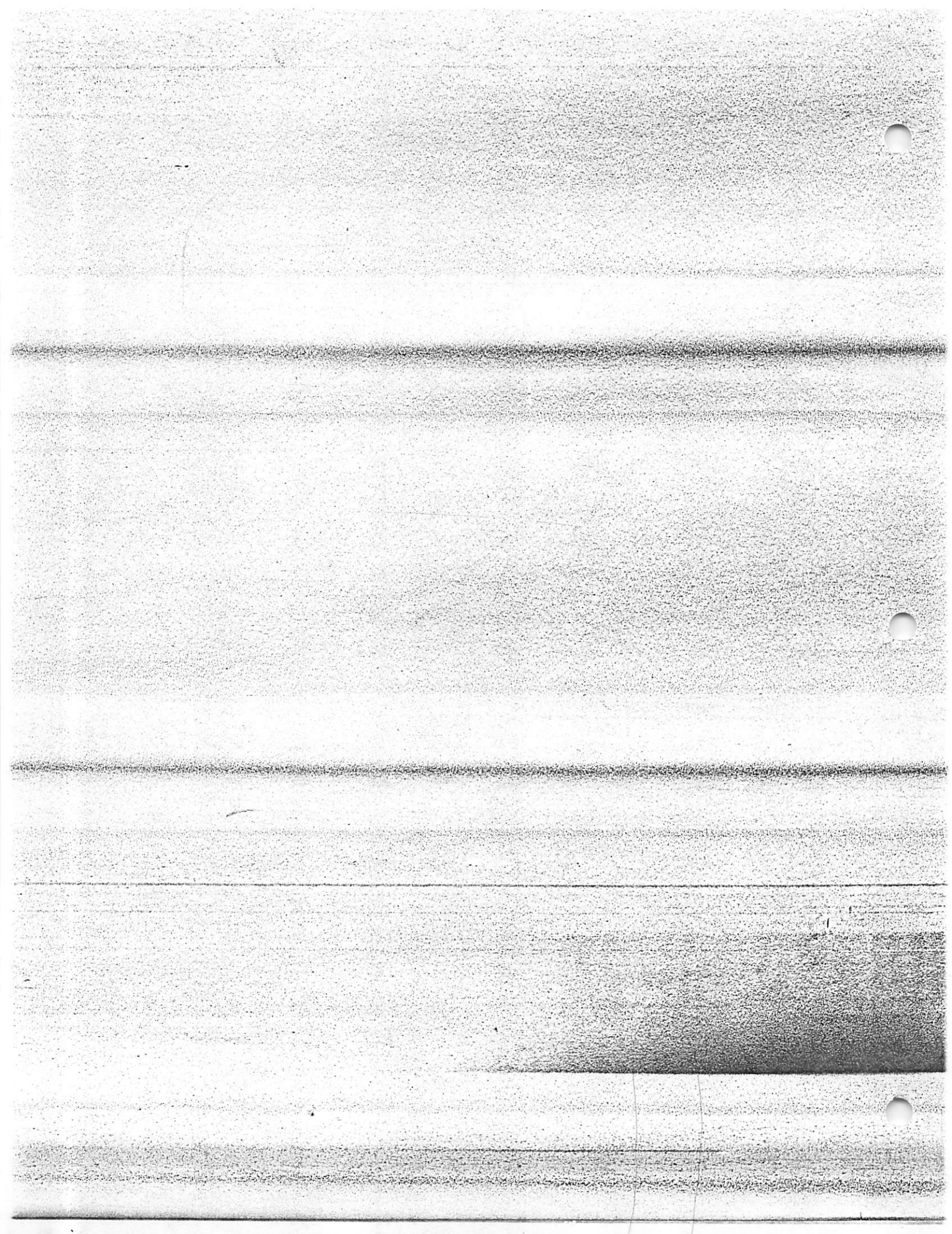


Table 2.--Calculation of abundance of fertilized females based on NMFS survey and fleet observer data for red king crab in Bristol Bay, 1982.

Size Group (Carapace LG, MM)	Millions of females	PERCENT WITH FULL EGG CLUTCHES					FERTILIZED FEMALES (MILLIONS)		
		Fleet observers	n	Miller Freeman	n	Weighted average	Fleet observers	Miller Freeman	Weighted average
75-79	14.4	1	365			1	0.1	0.1	
80-84	9.0	9	121	6	307	7	0.8	0.5	0.6
85-89	10.0	14	230	22	132	17	1.4	2.2	0.2
90-94	11.4	21	219	44	135	30	2.4	5.0	3.4
95-99	9.5	25	138	67	63	38	2.4	6.4	3.6
100-104	5.6	12	119	59	25	20	0.7	3.3	1.1
105-109	4.6	27	97	57	24	33	1.2	2.6	1.5
110-114	6.2	27	90	17	12	26	1.7	1.1	1.6
115-119	6.7	39	90	56	9	41	2.6	3.8	2.8
120-124	4.9	38	93	64	14	41	1.9	3.1	2.0
125-129	2.8	32	55	33	3	32	0.9	0.9	0.9
130-134	1.5	26	38	50	2	27	0.4	0.7	0.4
135-139	.6	37	12			37	0.2		0.2
>140	.2	8	6			8	0.0		0.0
TOTAL >89	54.0		1,637			726	16.7	29.6	18.4

Table 3.--Estimated catches (millions of pounds) of red king crab males for 1983 in Bristol Bay, based on two different natural mortality schedules.

Size Limit (inches)	Exploitation Rate									
	.1	.2	.3	.4	.5	.6	.7	.8	.9	1.0
<u>"Normal" Sub-legal Mortality</u>										
7.00	2	4	6	8	10	12	13	15	17	19
6.75	3	6	9	12	15	18	21	24	27	29
6.50	4	8	12	16	20	24	28	33	37	41
6.25	5	11	16	22	27	32	38	43	49	54
6.00	7	14	20	27	34	40	47	54	61	67
5.75	9	17	25	34	42	51	59	68	76	85
5.50	9	19	28	38	47	57	66	75	85	94
5.25	10	21	31	42	52	62	73	83	93	104
<u>High Sub-legal Mortality</u>										
7.00	1	3	4	5	7	8	10	11	12	14
6.75	2	4	5	7	9	10	12	14	16	17
6.50	2	4	7	9	11	13	16	18	20	22
6.25	3	6	9	12	15	18	21	24	27	30
6.00	4	8	12	15	19	23	27	31	35	39
5.75	5	10	15	20	26	31	36	41	46	51
5.50	6	12	17	23	29	35	41	46	52	58
5.25	7	13	19	26	32	39	45	52	58	65

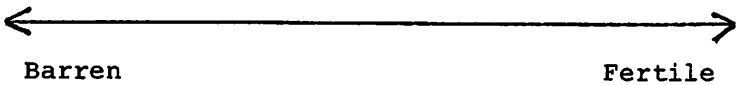
mortality obtained from the 1980 and 1981 surveys. In the spring of 1982, a range of 5-9million legal crabs was projected for the 1982 season. Later, the NMFS survey estimated the abundance to be 4.2 million legal, indicating the higher mortality schedule was also operating between 1981 and 1982. Thus, two schedules are again used for the 1983 projections.

The lines drawn through both the top and bottom parts of Table 3 represent the minimum required spawning stock level of 48 million fertilized females. Estimated catches above the line should not reduce the spawning stock below 48 million crabs, and are thus considered acceptable biologically. The lines representing the spawning stock are dashed to indicate that they are tentative. The final path that the line takes through the table will be determined by the actual estimates of female stock and percent fertilization from the 1983 survey.

Uncertainty regarding the health of the female population and the level of mortality on sublegal males in 1983 leads to uncertainty in the projection of the 1983 catch. The range of catches to be expected assuming a 6.5" size limit, depending on conditions determined by the 1983 survey, is illustrated in Table 4. This is a wide range, going from 2 to 24 million pounds. If sub-legal mortality is lower and the female stock is reproductively healthy, then the 1983 catch can be expected to tend toward the high end of the range. On the other hand, if high mortality is in effect and female barrenness is encountered, the low end of the range can be expected. Final adjustment of the predicted catch will be made after the 1983 trawl survey is completed.

Table 4.--Range of catches of red king crab (millions of pounds) to be expected in 1983 in Bristol Bay with a 6.5" minimum size limit, depending on sub-legal mortality and female population.

Sub-legal Male Mortality	Exploitation Rate					
	.1	.2	.3	.4	.5	.6
Normal	4	8	12	16	20	24
High	2	4	7	9	11	13



Mature female population

REFERENCES

- Reeves, J.E. 1981a. A proposed method for determining ABC and OY for the eastern Bering Sea king crab fishery (1981 update). NWAFC Ms, 16 p, plus appendix.
- Reeves, J.E. 1981b. Projected 1981 guideline harvest level for red king crabs in Bristol Bay. NWAFC Ms, 14 p, plus appendix.

1983 and 1984

Annual Mortality Estimates

	Ages		
	2-3	3-4	4-5
1983	.05	.77	1.05
1984			.07
1985		.09	
1986			.15
1987			.54
1988	.25		
1989	.30		
1990			.06
1991			
Average	.20	.43	.37
S.D.	.13	.48	.43

Age 14.7 million crabs

Age 35.1 million crabs

APPENDIX 1

Estimation of Age Five Recruits for 1983 and 1984

Back-calculation method

Millions of Male Crabs					Natural Mortality Estimates			
Year	Age				Years	Ages		
	2	3	4	5		2-3	3-4	4-5
69	2.0	8.0	9.7	15.9	69-70	.05	.77	1.05
70	0.2	2.1	3.7	3.4	74-75			.07
71	-	-	-	-	75-76		.09	
72	0.0	1.5	7.3	7.4	77-78			.15
73	4.8	11.7	14.0	19.2	78-79	.25		.54
74	4.7	19.9	19.7	14.7	79-80	.30		
75	5.2	36.5	25.0	18.3	80-81			.06
76	0.0	9.8	33.2	27.2	Average	.20	.43	.37
77	4.4	6.3	23.7	45.6	S.D.	.13	.48	.43
78	17.1	6.4	18.2	20.5				
79	12.3	13.3	13.9	10.6				
80	4.4	9.1	17.8	14.9				
81	4.0	19.3	16.8	16.7				
82	2.9	64.1	19.9	19.9				

Using the range $M = .2-.43$

$$N_{5,83} = N_{4,82}e^{-M} = 13.0, 16.3; \text{ average } 14.7 \text{ million crabs}$$

$$N_{5,84} = N_{3,82}e^{-2M} = 27.1, 43.0; \text{ average } 35.1 \text{ million crabs}$$

APPENDIX 1 (Continued)

Regression Method

$$N_{5,i+1} = 2.16 + 1.18 N_{4,i} ; n = 11, R^2 = 65\%$$

$$N_{5,83} = 25.6$$

$$N_{5,i+2} = 8.02 + .99 N_{3,i} ; n = 10, R^2 = 91\%$$

$$N_{5,84} = 71.6$$

Averaging the two methods

$$N_{5,83} = \frac{14.7 + 25.6}{2} = 20.2 \quad \text{1983 estimate of recruitment}$$

$$N_{5,84} = \frac{35.1 + 71.6}{2} = 53.4 \quad \text{1984 estimate of recruitment}$$

APPENDIX 1 (Continued)

Spawner-Recruit Parameters

<u>Fertilized Females</u>		<u>Resulting Five-Year-Old Recruits</u>	
<u>Year</u>	<u>Million Crabs</u>	<u>Year</u>	<u>Million Crabs</u>
68	37	74	15
69	21	75	18
70	11	76	27
71	11 (est.)	77	46
72	11	78	21
73	67	79	11
74	61	80	15
75	49	81	17
76	61	82	20
77	126	83	20 (est.)
78	117	84	53 (est.)
79	122	85	
80	68	86	
81	67		
82	18 (54 mature)	88	

$$R_{i+6} = aS_i e^{-bS_i} \quad \text{spawner-recruit model}$$

for the 1974-82 period, $a = 3.60$, $b = .046$, $S_m (=b^{-1}) = 21.7$

for the 1974-84 period, $a = 1.69$, $b = .021$, $S_m = 47.6$

APPENDIX 2

Estimation of Mature Females in 1983

The model,

$$XF_{i+2,j+2} = (XF_{i+1,j+2} + XF_{i+1,j+1})e^{-M}$$

$$XF_{i+1,j+2} = (XF_{i,j+2} + XF_{i,j+1})e^{-.75M}$$

$$XF_{i+1,j+1} = \frac{1}{a + \frac{b}{XF_{i,j}}}$$

defined as follows,

$XF_{i+2,j+2}$ = projected abundance of mature females on mating grounds in 1984 ($i = 1982$)

$XF_{i+1,j+2}$ = projected abundance of mature females on mating grounds in 1983

= 56.4 million crabs

$XF_{i,j+2}$ = estimated abundance of mature females in 1982 survey

= 53.8 million crabs

$XF_{i,j+1}$ = estimated abundance of pre-recruit (one year to maturity) immature females in 1982 survey

= 33.4 million crabs

$XF_{i+1,j+1}$ = projected abundance of pre-recruit (one year to maturity) immature females in 1983

= 38.3 million crabs

$XF_{i,j}$ = estimated abundance of pre-recruit (two years to maturity) immature females in 1982 survey

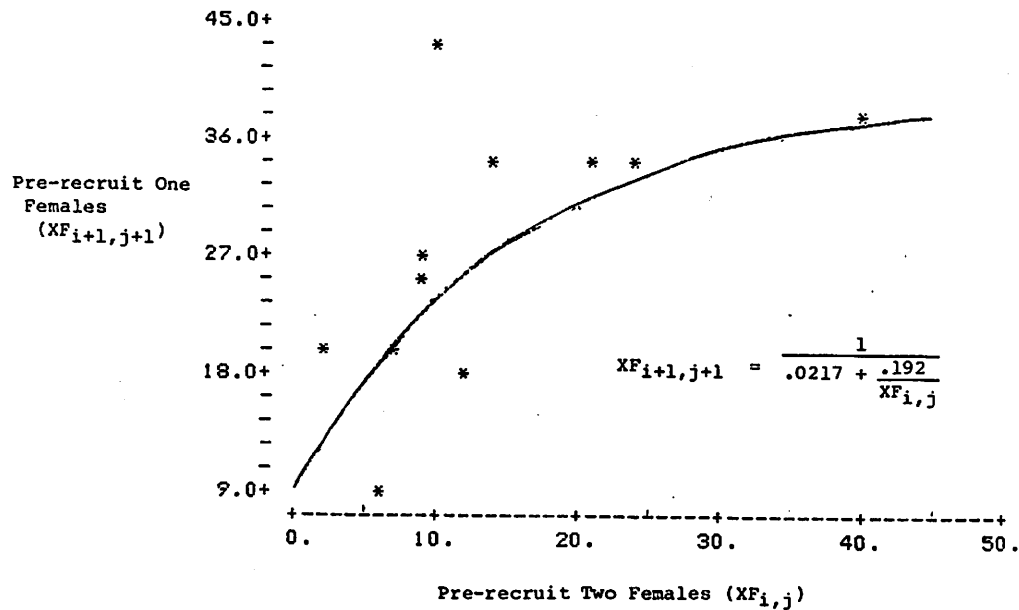
= 43.4 million crabs

M = instantaneous annual natural mortality

= .58

APPENDIX 2 (Continued)

- j = 1, immature females (55-74 mm)
 j = 2, immature females (75-89 mm)
 j = 3, mature females (>89 mm)
 a, b = parameters of the following regression



was used to estimate the 1984 abundance of mature females on the mating grounds at 53.0 million crabs.

RESULTS OF THE 1982 EASTERN BERING SEA
CRAB SURVEY WITH NOTES ON CURRENT
POPULATION TRENDS

Report To: North Pacific Fishery Management
Council and the Alaska Board of Fisheries

Anchorage, Alaska
March 29-30, 1983

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INTRODUCTION

The 1982 survey was conducted between May 27 and August 6 by the NOAA R/V Chapman and the chartered F/V Pat San Marie. The survey covered the habitats of all commercial crab stocks in the Bering Sea except for Norton Sound red king crab. Abundance estimates are given in Tables 1 - 3. Distribution charts are provided in Figures 1 - 5. Size frequency distributions for each stock are given in Figures 6 and 7 to provide an indication of future stock trends.

Methodology was similar to that of previous surveys in that stations were made at the centers of squares defined by a 20 x 20 nautical mile grid. A larger trawl was used in the 1982 survey than has been used in previous years. Population estimates have been adjusted for this fact. Bottom tending characteristics of the larger trawl appear to be similar to those of trawls used in previous years so the necessary adjustment was simply to allow for a greater area swept during each tow in 1982. Procedures for estimating abundance were identical to those of previous years.

STATUS OF STOCKS

Red King Crab. The abundance of legal crab is the lowest on record (Table 1). The contribution of Pribilof Islands red king crab is insignificant and the figures given reflect trends in Bristol Bay. The downward trend in legal crab abundance began in 1980, became severe in 1981, and continues to be severe in 1982. The distribution of crab in 1982 (Fig. 1) was similar to that of 1981. Size frequency information indicates improvement over the next several years although little improvement is expected for 1983. A catch of 10 - 20 million pounds was anticipated prior to the 1982 fishing season. The 1982 catch was 3.0 million pounds from Bristol Bay and 0.4 million pounds in the Pribilof Islands area. Catches in 1980 and 1981 were 130 million pounds and 33 million

pounds respectively. Low catches in 1982 resulted from poor fishing and from early closure of the fishery due to a prevalence of mature females that were not carrying eggs (the subject of a separate document).

Projected populations of legal-sized crab for the 1983 fishing season are based on 1982 survey data, 1982 fishery removals, average growth rates and two assumed natural mortality schedules. These projections are:

Assumed Mortality	Millions of Crab	Millions of Pounds	Average Weight
Average natural mortality	8.7	45.7	5.3
Total mortality exclusive of landings is twice average mortality	4.3	23.0	5.0

The two schedules of mortality reflect historical and recent (1981-1982) conditions. In each year from 1977 to 1979, use of average natural mortality schedules (by size group) resulted in projected populations that were within 10% of those estimated for the following year (e.g. the 1978 population was estimated to be 43.5 million crab based on 1977 survey and fishing data; while the 1978 survey estimate was 46.6 million crab). In 1980 and 1981, projections were about 50% of the following year's survey estimates (20.0 vs. 10.8 million crab for 1980 projected to 1981, 9.0 vs. 4.4 for 1981 projected to 1982).

Increased mortality may have resulted from environmental conditions, various diseases, predation or incidental mortality during the extremely intense fisheries of recent years. Data collected by Alaska Department of Fish and Game observers last fall, show that red king crab approximately one-half legal size are captured in the fishery and that crabs in the 1 to 2 year pre-recruit size group (Table 1) are captured at nearly the same rate as legal-sized crab. Effort in the 1982 fishery was 142,000 pot lifts as compared to 542,000 pot lifts in 1981. If recent high mortality of pre-recruit crab were entirely related to intense fishing, 1982 projections

of 1983 abundance should be within 10% of the 1983 survey estimate.

Pribilof Islands Blue King Crab. Abundance of legal crab in 1982 is about half of what it was from 1978 to 1981. The distribution of blue king crab (Fig. 2) is similar to that of previous years. Trends in abundance of pre-recruits and size frequency information (Fig. 6) indicate declining abundance in the future. Prior to the 1982 fishing season a catch in excess of 6 million pounds was anticipated. The actual 1982 catch was 4.4 million pounds or about 50% of the 1981 catch (9 million pounds). A sharp decline in catch occurred in spite of a 25% increase in vessel effort from 1981 to 1982. This population is expected to be at low abundance in 1983.

St. Matthew Island Blue King Crab. Abundance of legal crab in 1982 was more than twice that of 1981. The distribution of legal crab (Fig. 2) was similar to that of 1981 except that somewhat higher relative abundances were encountered to the south and west of the island. Size frequency information (Fig. 6) indicates declining recruitment although abundance is expected to be above average in 1983. The fishery occurred during August and a record catch of 8.7 million pounds was taken, as compared to 4.6 million pounds in 1981. This fishery attracted 96 vessels in 1982 as compared to 31 in 1981. Catch rates for 1981 and 1982 were 18 and 11 crab per pot respectively. In this case, declining catch rates are indicative of increased competition between vessels as opposed to declining abundance.

Tanner Crab (C. bairdi). Abundance of legal Chionoecetes bairdi in 1982 is down about 30% from 1981 (Table 2). There has been a downward trend in abundance since 1975. The distribution of legal crab in 1982 (Fig. 3) is similar to that of 1981; showing highest relative abundances in eastern Bristol Bay and in the vicinity of the Pribilof Islands. The abundance of pre-recruits as well as size frequency data (Fig. 7) indicate increasing recruitment that should be reflected in the 1983 fishery. The 1982 fishery produced 11 million pounds as compared to

30 million pounds in 1981. Vessels participating in the fishery declined from 165 in 1981 to 125 in 1982 while catch rates declined from 21 to 10 crab per pot. Both declines reflect diminished stock abundance, but conditions should improve in the next few years.

Tanner Crab (C. opilio). Abundance of large (>4.3 inches) crab is down by about one-third in the area south of 58°N latitude and up by about a half to the north (Table 2). Overall abundance remained about the same from 1981 to 1982. Consistent with above abundance trends, the distribution of large crab (Fig. 4) showed higher relative abundances north of 58° than were present in 1981. This shift in distribution is attributed to localized recruitment patterns. Tentatively, pre-recruit abundances as well as size frequency information (Fig. 7) indicate increasing recruitment. Recruitment patterns in this species are poorly known due to localized differences in growth rates.

Historically, the size at recruitment was about 110 mm (4.3 inches) while a legal size limit of 78 mm is now in force. From 1981 to 1982 the fraction of crab landed that was less than 4.3 inches in width increased from 33 to 51%. I anticipate that at least 50% of the crab landed in 1983 will also be smaller than 4.3 inches. Only about 3% of 1982 landings were less than 3.5 inches. If 3.5 inches is accepted as the size at recruitment, trends in abundance can be obtained by totalling estimates for pre-recruit and large crab in Table 2.

Korean Hair Crab. Abundance of large crab (no legal size established) declined by more than 50% from 1981 to 1982 (Table 3). The distribution of hair crab (Fig. 5) is similar to that of previous years and shows that the vast majority of the stock is located near the Pribilof Islands. This is a developing fishery and catches were inconsequential prior to 1981 when 2.4 million pounds were taken. Production in 1982 did not reach 50% of that in 1981. The decline in catch from 1981 to 1982 primarily reflects poor market conditions rather than changes in abundance.

Table 1. -- Population estimates for eastern Bering Sea king crabs from NMFS surveys (millions of crabs).

Bristol Bay and Pribilof Red King Crabs

Year	Pre-recruits <u>1/</u>	Legals <u>1/</u>
1969	19.5	9.8
1970 <u>2/</u>	8.4	5.3
1972	8.3	5.4
1973	25.9	10.9
1974	31.2	20.8
1975	29.6	21.2
1976	49.3	32.7
1977	63.9	37.6
1978	52.5	46.6
1979	38.8	45.5
1980	23.9	36.1
1981	18.9	10.8
1982	17.1	4.4

Table 1. -- (CONTINUED)

Pribilof Blue King Crabs

Year	Pre-recruits <u>1/</u>	Legals <u>1/</u>
1974	3.1	1.9
1975	8.0	7.5
1976	2.1	3.9
1977	2.2	9.4
1978	5.6	4.3
1979	1.5	4.6
1980	1.4	4.2
1981	1.4	4.1
1982	0.7	2.2

Saint Matthew Blue King Crabs

Year	Pre-recruits <u>3/</u>	Legals <u>3/</u>
1978	3.3	1.9
1979	3.0	2.1
1980	3.0	2.5
1981	2.2	3.1
1982	3.3	6.8

1/ The size groups 5.2" - 6.4" and \geq 6.5" have been used for pre-recruits and legals.

2/ Limited survey in 1971, not used for population estimates.

3/ The size groups 4.3" - 5.4" and \geq 5.5" have been used for pre-recruits and legals respectively.

Table 2. -- Population estimate for eastern Bering Sea tanner crabs from NMFS surveys (millions of crabs).

Bristol Bay and Pribilof C. bairdi

Year	Pre-recruits <u>1/</u>	Legals <u>1/</u>
1973	140.5	66.9
1974	255.0	130.5
1975	207.0	209.6
1976	136.6	109.5
1977	116.3	92.1
1978	81.2	45.6
1979	47.7	31.5
1980	65.0	31.0
1981	24.0	14.0
1982	46.9	10.1

Bristol Bay and Pribilof C. opilio

Year	Pre-recruits <u>2/1</u>	Large <u>2/</u>
1973	38.7	84.7
1974	169.2	246.7
1975	247.4	274.8
1976	190.4	181.6
1977	196.6	137.3
1978	171.6	78.4
1979	146.3	106.3
1980	99.1	53.6
1981	62.7	15.7
1982	63.8	10.8

Table 2. -- (CONTINUED)

Bristol Bay and Pribilof Hybrid Tanner Crab

Year	Pre-recruits <u>2/</u>	Large <u>2/</u>
1975	13.2	33.8
1976	4.0	16.5
1977	9.6	15.4
1978	2.0	5.6
1979	3.0	5.1
1980	0.8	1.7
1981	0.5	0.8
1982 <u>2/</u>	0.6	0.5

Northern District C. opilio

Year	Pre-recruits <u>2/</u>	Large <u>2/</u>
1978	8.2	10.5
1979	20.8	6.6
1980	30.4	4.2
1981	17.1	6.5
1982 <u>2/</u>	70.4	10.9

1/ A legal size limit of 5.5 inches carapace width was imposed in 1976, prior to this greater than 5.0 inches was used in the "Legal" column. In parallel, pre-recruit was 3.3 - 5.0 inches prior to 1976 and 4.3 to 5.5 since.

2/ Large is greater than 4.3 inches as this has been the size of interest to U.S. industry; pre-recruit is 3.7 to 4.3 inches. The current legal size is 3.1 inches (see text).

Table 3. -- Population estimates for eastern Bering Sea Korean hair crabs from NOAA/NMFS surveys (millions of crabs).

Pribilof District

Year	Pre-recruits ^{1/}	Large
1979	2.9	8.4
1980	3.6	10.4
1981	4.3	13.0
1982	0.8	5.3

Bristol Bay

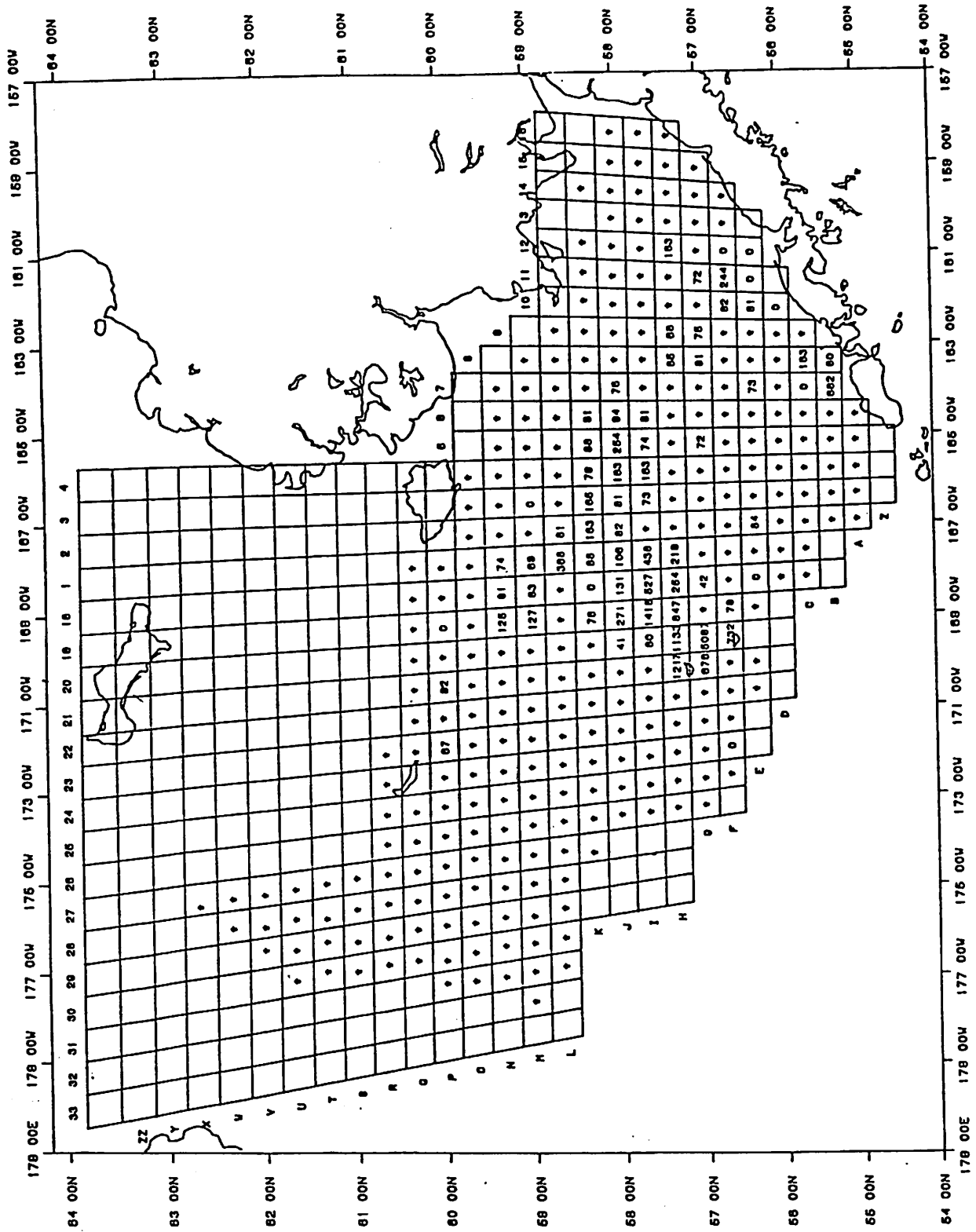
Year	Pre-recruits	Large
1979	1.2	6.3
1980	0.7	2.5
1981	0.4	2.7
1982	0.3	1.9

Northern District

Year	Pre-recruits	Large
1979	0.4	1.4
1980	0.8	0.8
1981	<0.1	0.2
1982	<0.1	0.5

^{1/} Large is greater than 3.5 inches in width which is approximately the size at entry into the U.S. fishery; pre-recruit is 3.0 to 3.4 inches.

Figure 5.--Distribution of large Korean hair crab from the 1982 NMFS crab survey (number per mile towed).



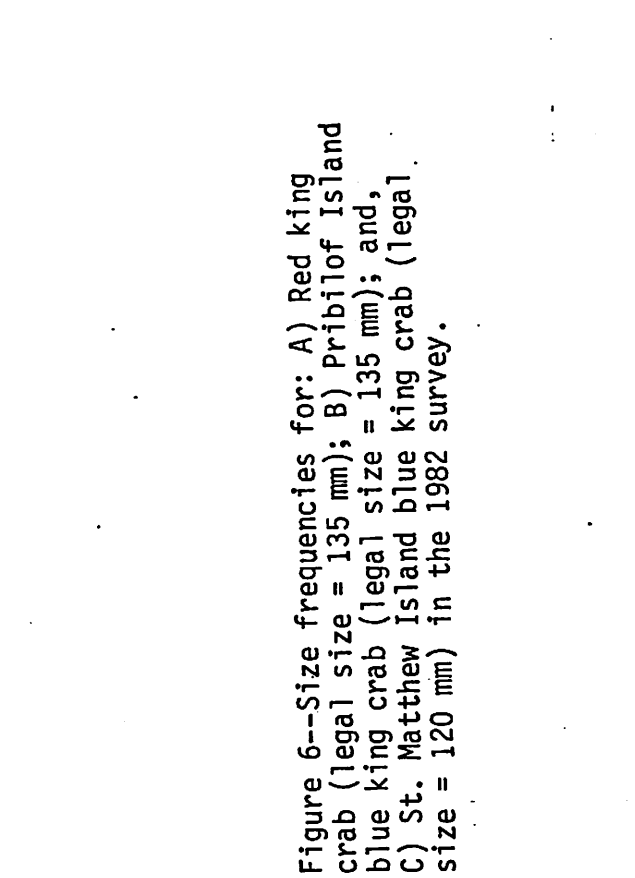
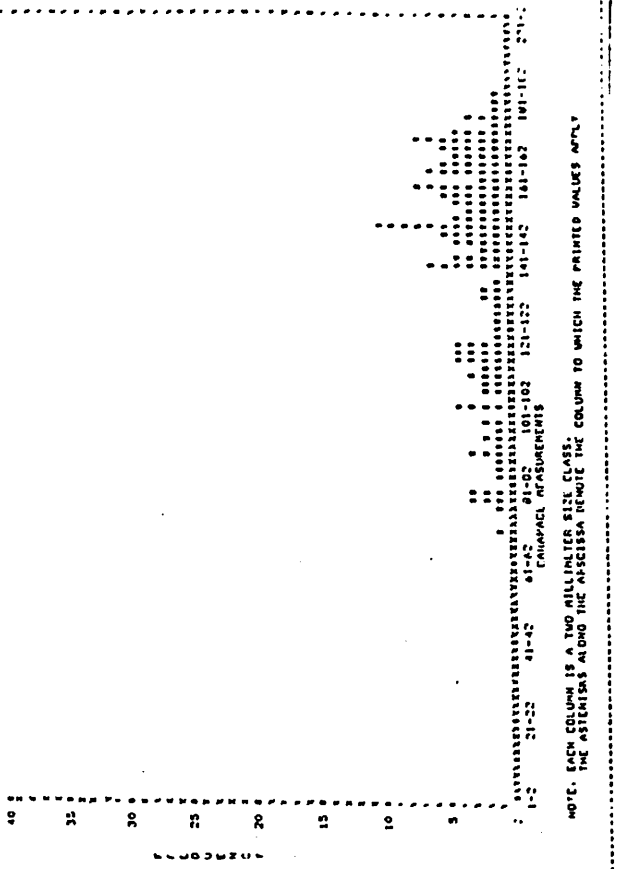
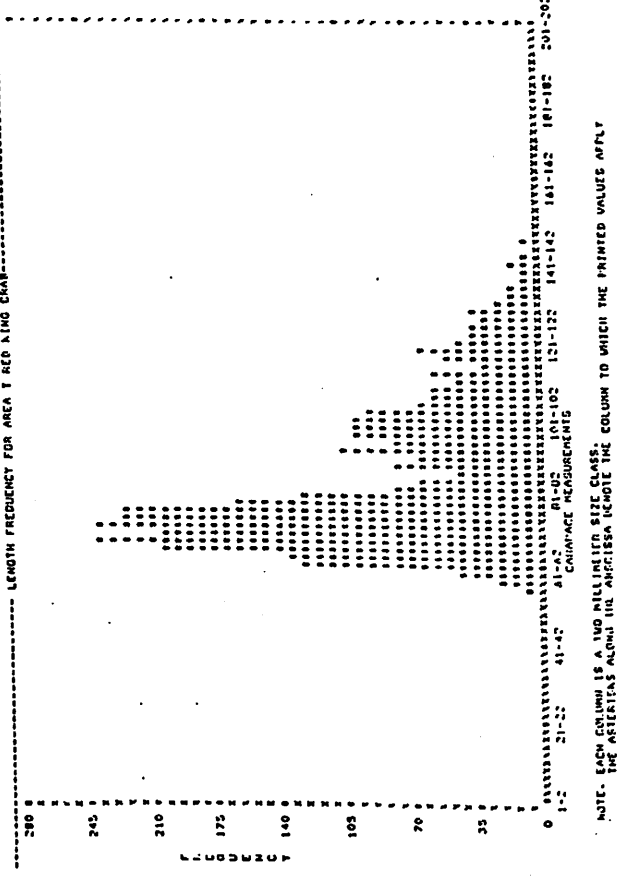
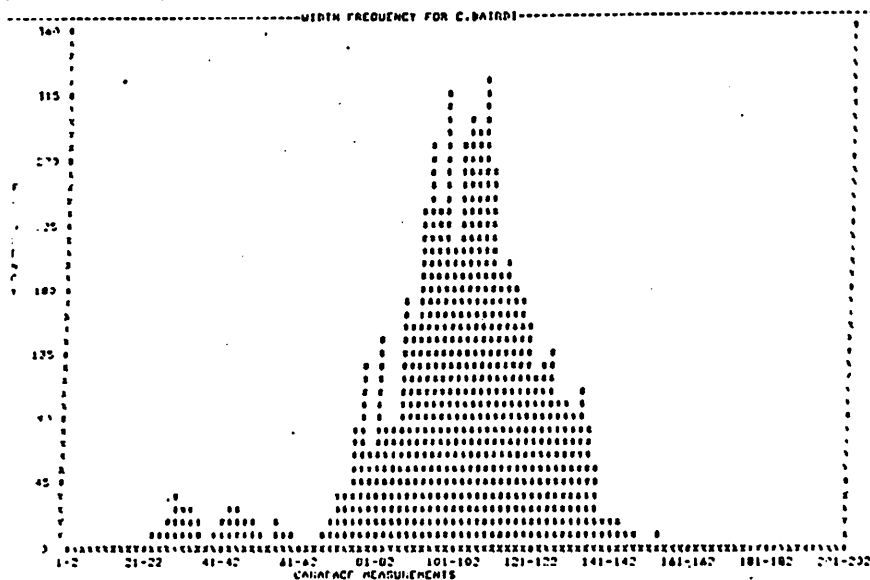
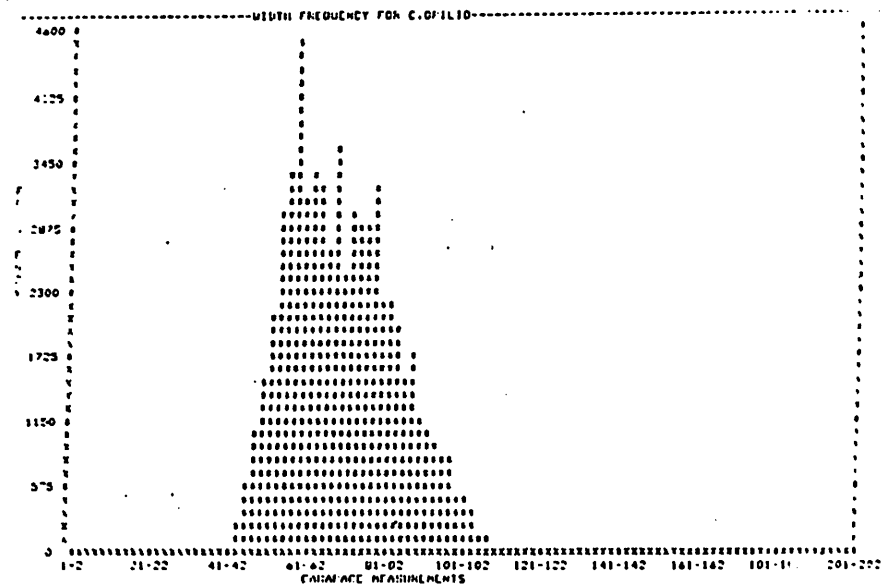


Figure 6--Size frequencies for: A) Red king crab (legal size = 135 mm); B) Pribilof Island blue king crab (legal size = 135 mm); and, C) St. Matthew Island blue king crab (legal size = 120 mm) in the 1982 survey.

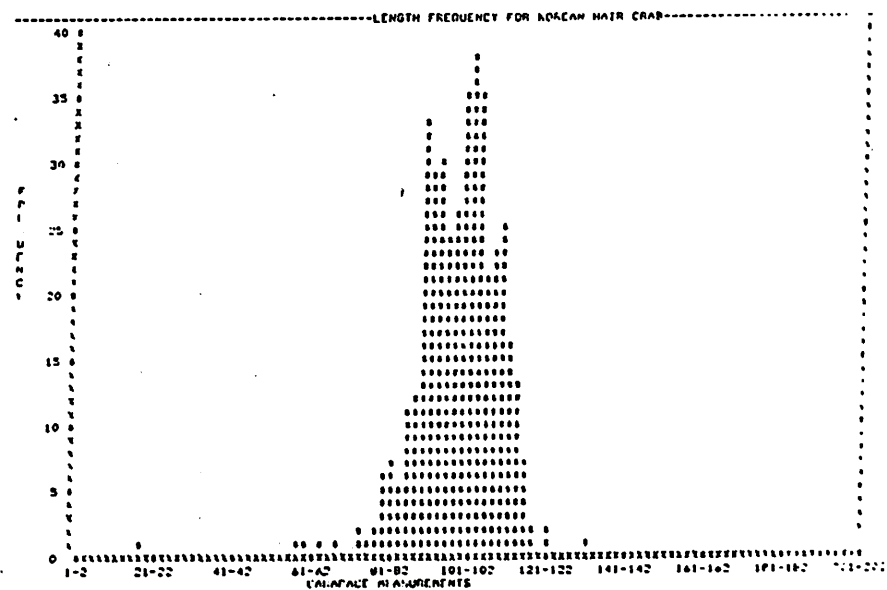


NOTE. EACH COLUMN IS A TWO MILLIMETER SIZE CLASS.
THE ASTERISKS ALONG THE ABSISSA DEMOTE THE COLUMN TO WHICH THE PRINTED VALUES APPLY



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Figure 7--Size frequencies for: A) *C. bairdi* (legal size = 140 mm); B) *C. opilio* (size at recruitment about 110 mm); and, C) Korean hair crab (size at recruitment about 90 mm) in the 1982 survey.



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THE ASTERISKS ALONG THE ABSISSA DEMOTE THE COLUMN TO WHICH THE PRINTED VALUES APPLY

D-3
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CURRENT STATUS OF REPRODUCTIVE
CONDITIONS IN BRISTOL BAY RED
KING CRAB

Report to: North Pacific Fishery Management
Council and the Alaska Board of Fisheries

Anchorage, Alaska
March 29-30, 1983

Robert S. Otto, Richard A. MacIntosh and W. Steven Meyers
National Marine Fisheries Service
Northwest and Alaska Fisheries Center
Resource Assessment and Conservation
Engineering Division
P.O. Box 1638
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SUMMARY

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Reproductive data on female red king crab, including the relative size of egg masses carried by females and the condition of eggs, are routinely collected during NMFS trawl surveys. The prevalence of mature females without eggs in Bristol Bay during the spring and fall of 1982 led to more detailed studies and to a special survey of Bristol Bay in February, 1983. Analysis of resultant data, as well as data collected by ADF&G observers during the 1982 fishery, leads to the following conclusions:

- 1) Reproductive conditions were normal in Bristol Bay during 1981.
- 2) A large number of mature females failed to molt and mate in 1982 and hence were barren.
- 3) Most females that were barren in 1982 had died by February, 1983.
- 4) Most surviving barren females will not mate in 1983.
- 5) The reproductive potential of the Bristol Bay red king crab population will be dependent on relatively small females in 1983.
- 6) There have been high mortalities of relatively large mature females from 1981 to 1982 and from 1982 to February, 1983.

INTRODUCTION

Under normal conditions, almost all mature female eastern Bering Sea red king crab are carrying full clutches of new eggs by mid-June. In the summer and fall of 1982, numerous mature females were observed that were carrying empty egg cases. Available data indicated that, in most cases, these empty egg cases were remnants of eggs produced in 1981 rather than 1982.

The calculated number of egg-bearing females present in the fall of 1982 was less than the optimum of 40 million established by the Council and Board. This observation, as well as low catch rates in the 1982 fishery, led to an emergency order closing the fishery on October 10. The exploitation rate in the 1982 fishery was about 12% as compared to 53% in 1981.

A special study of females was conducted during a cruise by the NOAA R/V Miller Freeman from February 10 to 28, 1983. This report presents reproductive data collected in 1981 (baseline) and 1982 and compares them to data collected during the February cruise.

METHODS

Reproductive data is normally collected as part of NMFS trawl surveys in the eastern Bering Sea. Standard data include the relative size of the egg mass (clutch) carried by individual females and the condition of the eggs or egg remnants. Clutch size is subjectively coded in the following categories: absent, trace to 1/8 full, 1/4 full, 1/2 full, 3/4 full and full. Condition of eggs is coded as: uneyed, eyed (with visible spots of pigment in developing eyes), dead or empty (egg cases). The combination of clutch size and egg condition provides a measure of maturity and the reproductive state of individual females. The color of eggs is also noted. New red king crab eggs are usually purple or brown, while older eggs frequently have an orange or pink coloration. These data are entered into a computer and may be summarized by size of females (usually grouped in 5 mm increments of carapace

length) and shell condition (new, i.e. shell of the year, or old).

Because anomalous reproductive conditions were encountered in 1982, we collected whole ovaries and histological samples in the fall of 1982 and during February, 1983. Ovary weight and ovarian egg size were later measured at the Kodiak Laboratory. Histological samples were forwarded to the NMFS Laboratory in Mukilteo, Washington for pathological examination. We had previously made such collections from blue king crab in the course of another investigation and hence had trained personnel and established standard procedures available.

The following sampling periods and observations are included in the results presented below:

<u>Collection</u>	<u>Time</u>	<u>Type</u>
1981 trawl survey	June	Standard reproductive data
" " "	August	" " "
1982 trawl survey	June	" " "
" " "	September	" " "
1982 ADF&G observer's observations	September/October	1) Relative clutch size and length measurements. 2) Live female crab (40) for laboratory dissection.
1983 trawl survey	February	1) Standard data 2) Whole ovaries 3) Tissue samples for pathological examination

RESULTS AND DISCUSSION

In some years, the NMFS trawl survey occurred toward the end of the spawning period and some non-ovigerous (without eggs) females were observed. When this has happened, samples taken later in the year have usually confirmed that almost all females were ovigerous. The lower and upper panels of Figure 1 show the results of spring and fall sampling in 1981 and illustrate the normal situation. The upper panel of Figure 1 is also typical of the frequencies of egg-bearing females observed from 1975 through 1981.

In 1982, we observed numerous females that were non-ovigerous (Fig. 2, lower)

and this condition persisted into the fall (Fig. 2, upper). The principal difference between June and September sampling was that some ovigerous females sampled during June were carrying eyed eggs (from 1981 spawning) while all ovigerous females sampled in the fall were bearing new eggs (1982 spawning).

Many females with empty egg cases were encountered during both sampling periods. During June, we assumed that these females would later spawn because they had old-shells and some of them were in the process of molting. This assumption was corroborated by visual examination of ovaries during the survey. At that time, ovaries were large and usually purple as would be typical of a female just prior to spawning. The September sample was, however, collected well after the molting period and it was evident that many females had failed to molt and spawn.

During both periods the frequency of ovigerous females was near normal for all size groups if only new-shelled females were considered. This is illustrated by comparing Figure 3 with the upper panel of Figure 1. Further, dissection of crab collected by ADF&G observers during October demonstrated that females with empty egg cases had large ovaries. Subsequent pathological examination indicated that eggs within these ovaries were deteriorating and probably in the process of being re-absorbed. From these facts we concluded that most of the non-ovigerous mature females encountered during the fall had failed to molt during the previous spring even though their ovaries were mature.

The frequencies of females bearing new (1982) eggs for various size groups demonstrates that there was considerable spawning activity between June and September-October 1982 (Figure 4). Females in the larger size groups accounted for most of this activity. Comparison of the June curves for new-shell females and all females, however, shows that some non-ovigerous females were encountered in the smaller size groups in June. The September trawl survey data and the September-October observer data were inconsistent with regard to the prevalence of non-ovigerous females among the smaller size groups. This inconsistency was not resolved until February.

The February sample demonstrated that almost all mature females, and all females that had molted in 1982 were ovigerous (Fig. 5). The entire difference between the upper and lower panels of Figure 5 was accounted for by 13 non-ovigerous females. A few females in the smaller size groups (<105 mm) had already spawned (1983) and were carrying uneyed eggs. The remainder of mature females were all carrying eyed eggs. Subsequent laboratory examination of eyed eggs showed that they contained fully developed embryos that were near hatching. This last observation demonstrated that eyed eggs observed in February were not the result of spawning since October and hence corroborates the histological observation that eggs were deteriorating in the fall.

Changes in the frequency of ovigerous females in various size groups were accompanied by drastic changes in the size-frequency of mature females in Bristol Bay (Fig. 6). Declines in abundance estimates for females above the size at 50% maturity from 1981 (67.3 million \pm 11% with 95% confidence) to 1982 (54.8 million \pm 19%) were not statistically significant. Size-frequency data, however, strongly suggest high mortalities of mature females in the larger size groups from June 1981 to June 1982. While population estimates are not yet available for the February 1983 survey, size frequency data suggest continued high mortality among the larger females. We conclude from these data that most of the barren females present during the fall of 1982 had died by February of 1983. Regardless of the cause of mortality, it is apparent that most of the eggs to be produced in 1983 will be produced by relatively small females.

We have not yet examined all of the ovaries collected in February, but the relative size of ovaries from females bearing empty eggs strongly suggests that most of them will not spawn in 1983 (Fig. 7). Only two of 11 ovaries from such females were of normal size for this time of year. The remaining nine females in this group may represent those that re-absorbed their 1982 eggs. By contrast, all females that were carrying eyed eggs (therefore spawned in 1982) appeared normal.

Many small females that lacked eggs or egg cases also appear to be ready to spawn. This latter group represents crab that will spawn for the first time in 1983.

Causes of high mortalities among mature females have not been identified. Pathological examination of 40 females collected by ADF&G observers showed signs of general stress and a low incidence of a microsporidian, protozoan infection. These results were, however, attributed to the fact that these crab were in a vessel hold for nearly 2 weeks without food prior to dissection. A microsporidian infection that results in a large accumulation of white curd-like material within the body cavities of blue king crab had previously been identified for us by Dr. Phyllis Johnson (NMFS, Oxford, MD). One female red king crab collected in February had similar material in the body cavity and was subsequently found to have a microsporidian infection. Shrimp in the Gulf of Mexico are sometimes infested with microsporidians in epidemic proportions (Dr. Al Sparks, NMFS, Mulkilteo; personal communication); and, it is possible that such infections are responsible for substantial mortalities of king crabs.

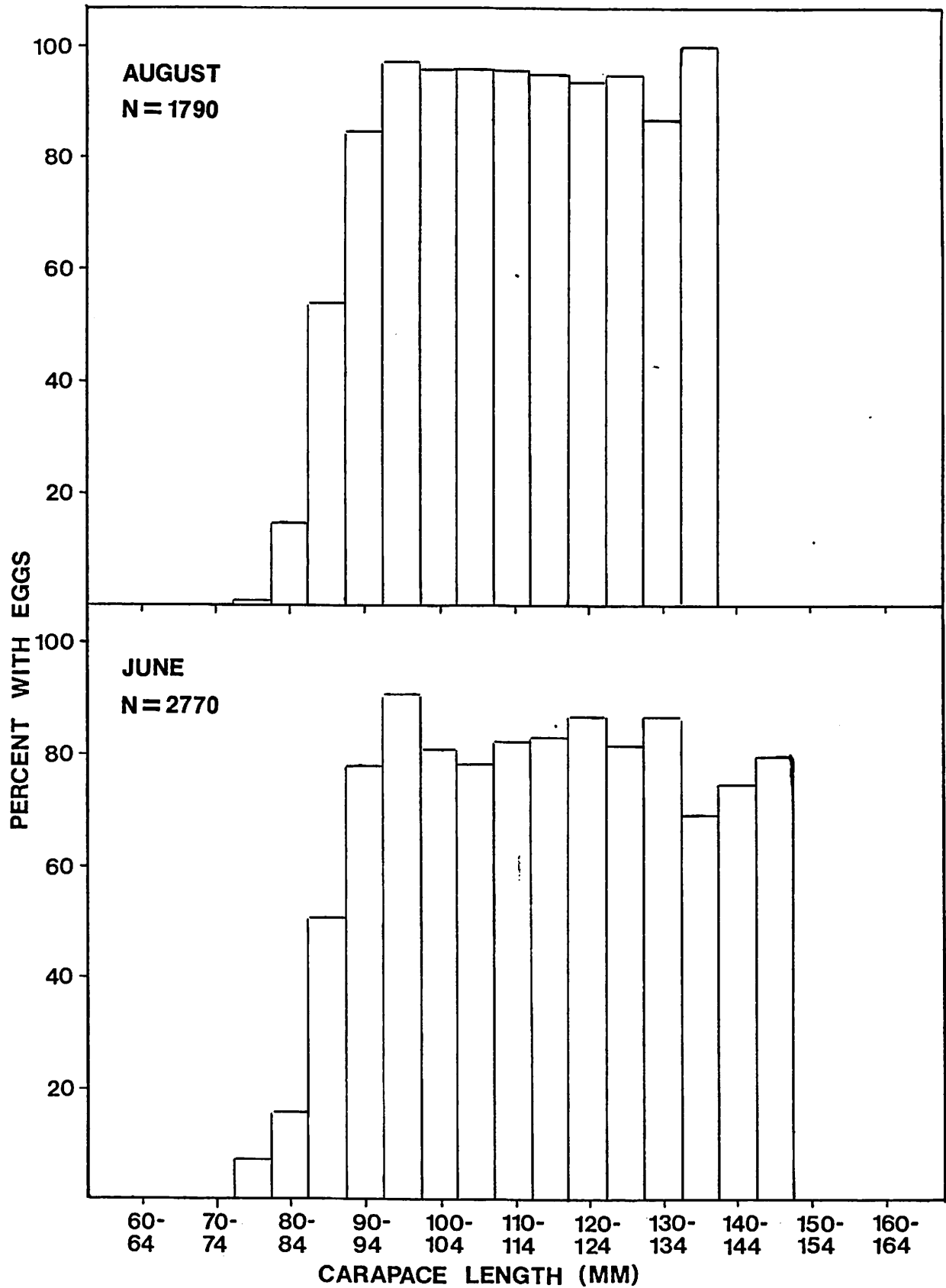


Figure 1.--Frequency of egg-bearing females by 5 mm size groups from the 1981 eastern Bering Sea, NMFS trawl survey in Bristol Bay.

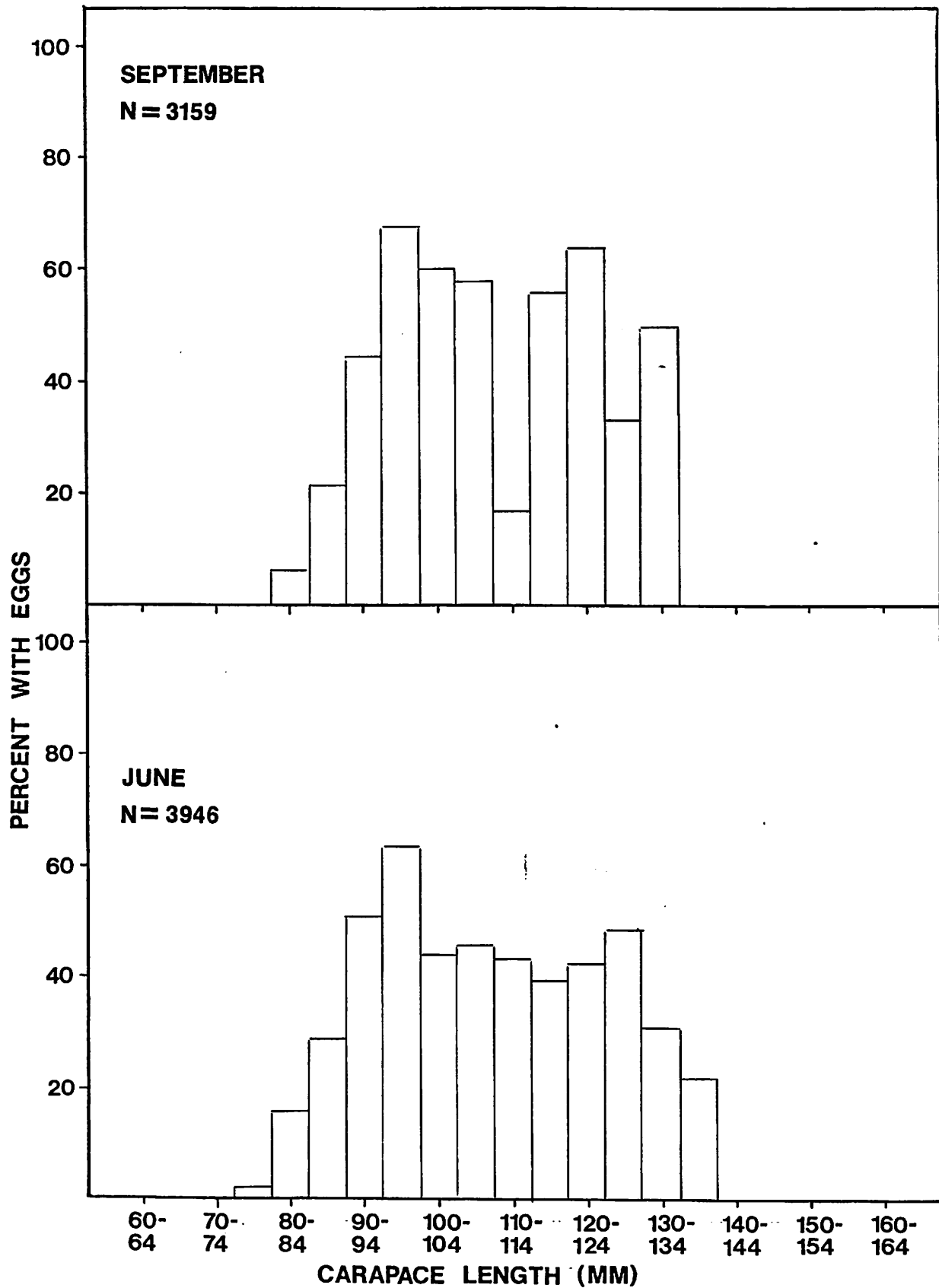


Figure 2.--Frequency of egg-bearing females by 5 mm size groups from two 1982 eastern Bering Sea, NMFS trawl surveys.

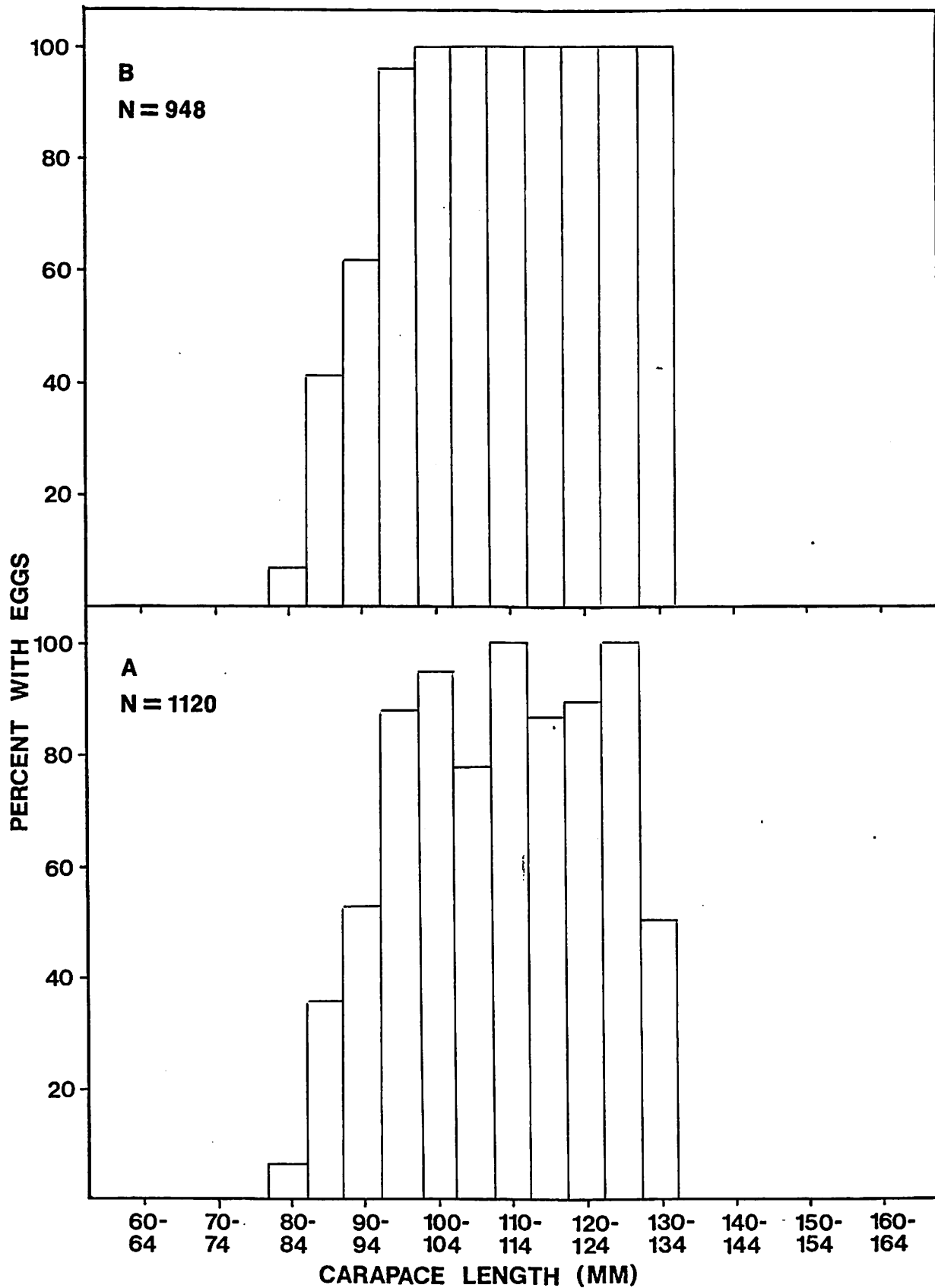


Figure 3.—Frequency of egg-bearing females by 5 mm size groups for all females (A) and females that molted in 1983 (B). Data from February, 1983 eastern Bering Sea NMFS trawl survey.

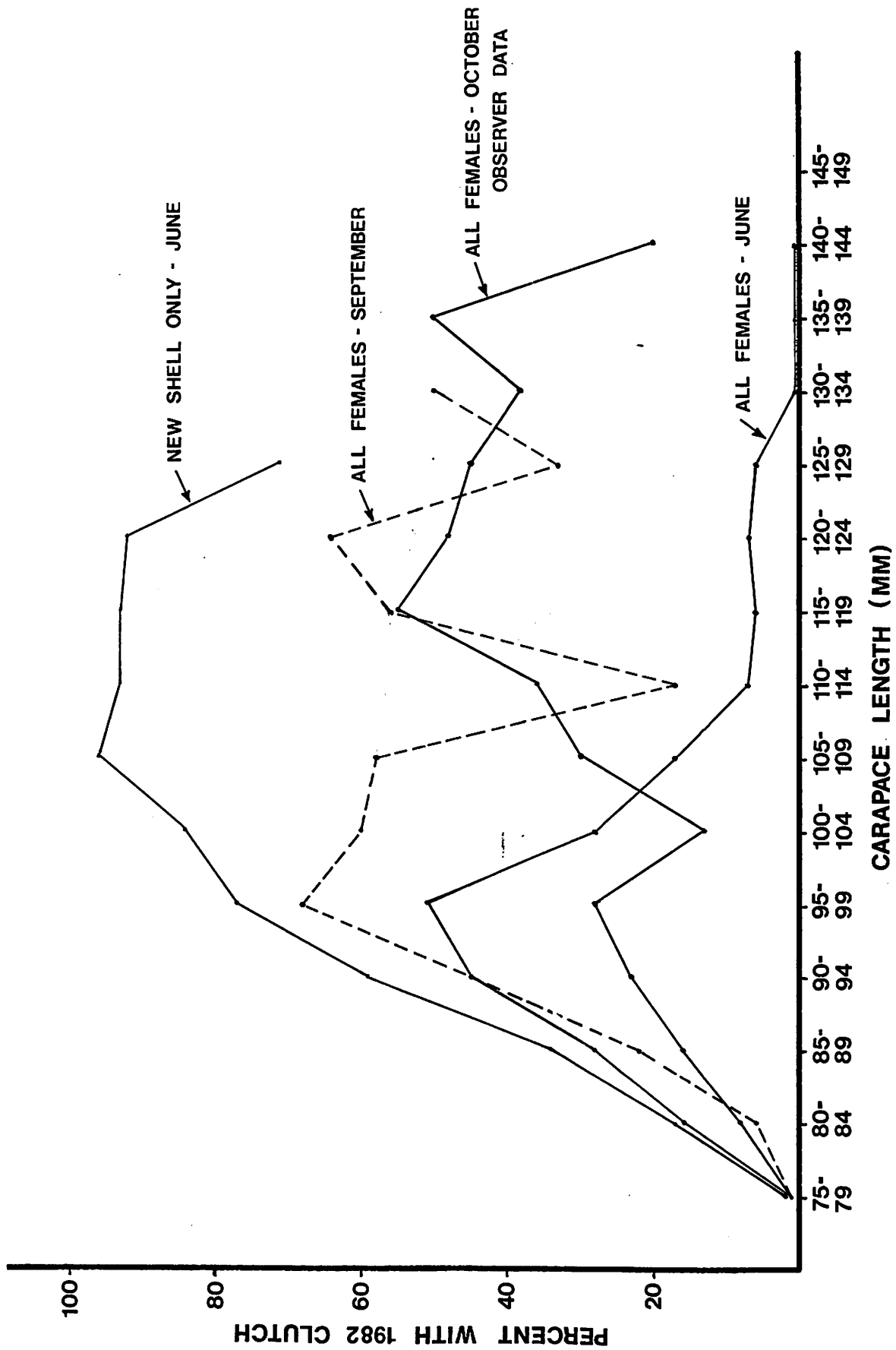


Figure 4.--Frequency of red king crab females bearing 1982 clutches by 5 mm size groups from NMFS trawl surveys and ADF&G observer data.

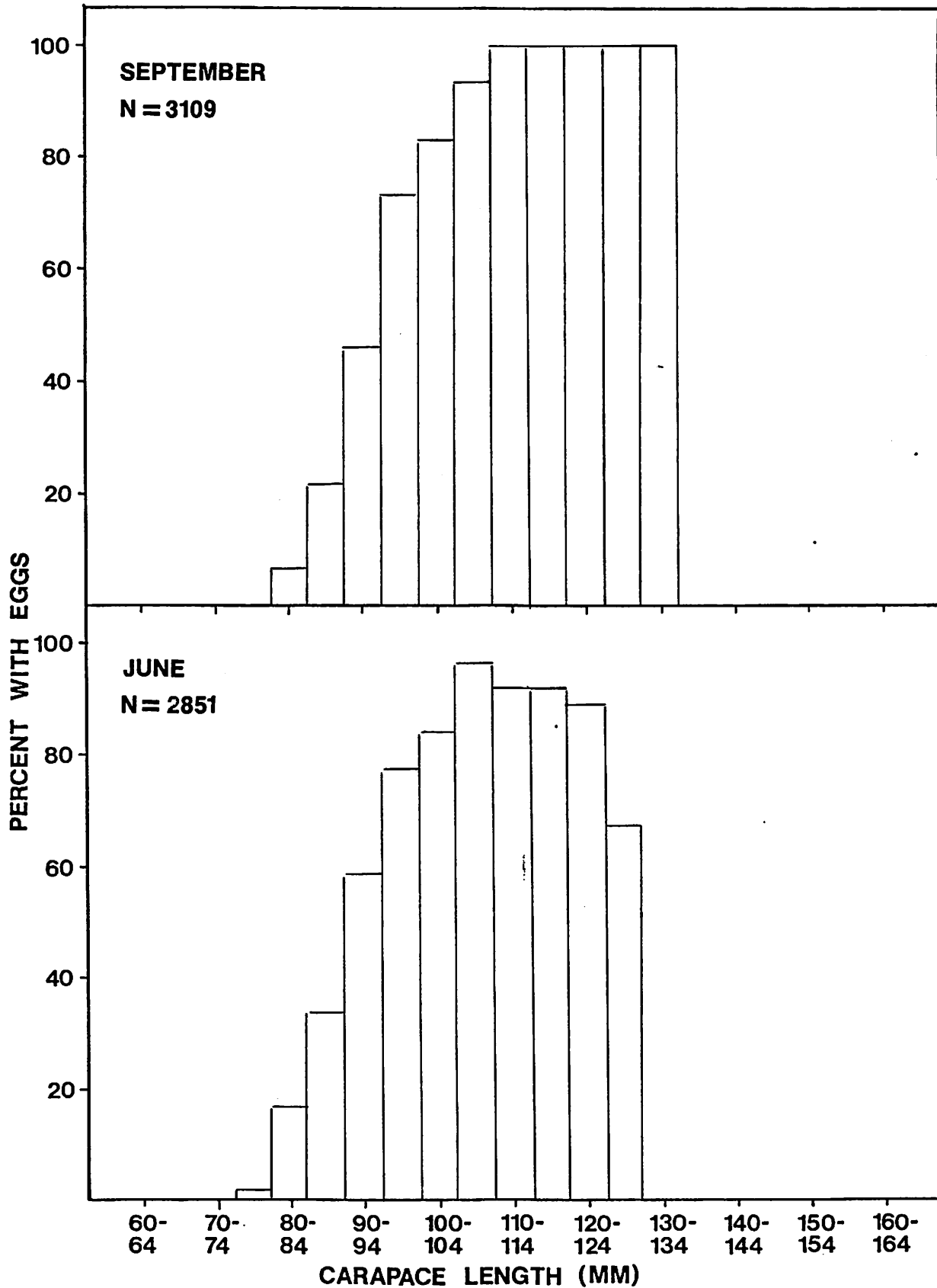


Figure 5.—Frequency of egg-bearing females by 5 mm size groups for females that molted in 1982. Data from two 1982 eastern Bering Sea NMFS trawl surveys.

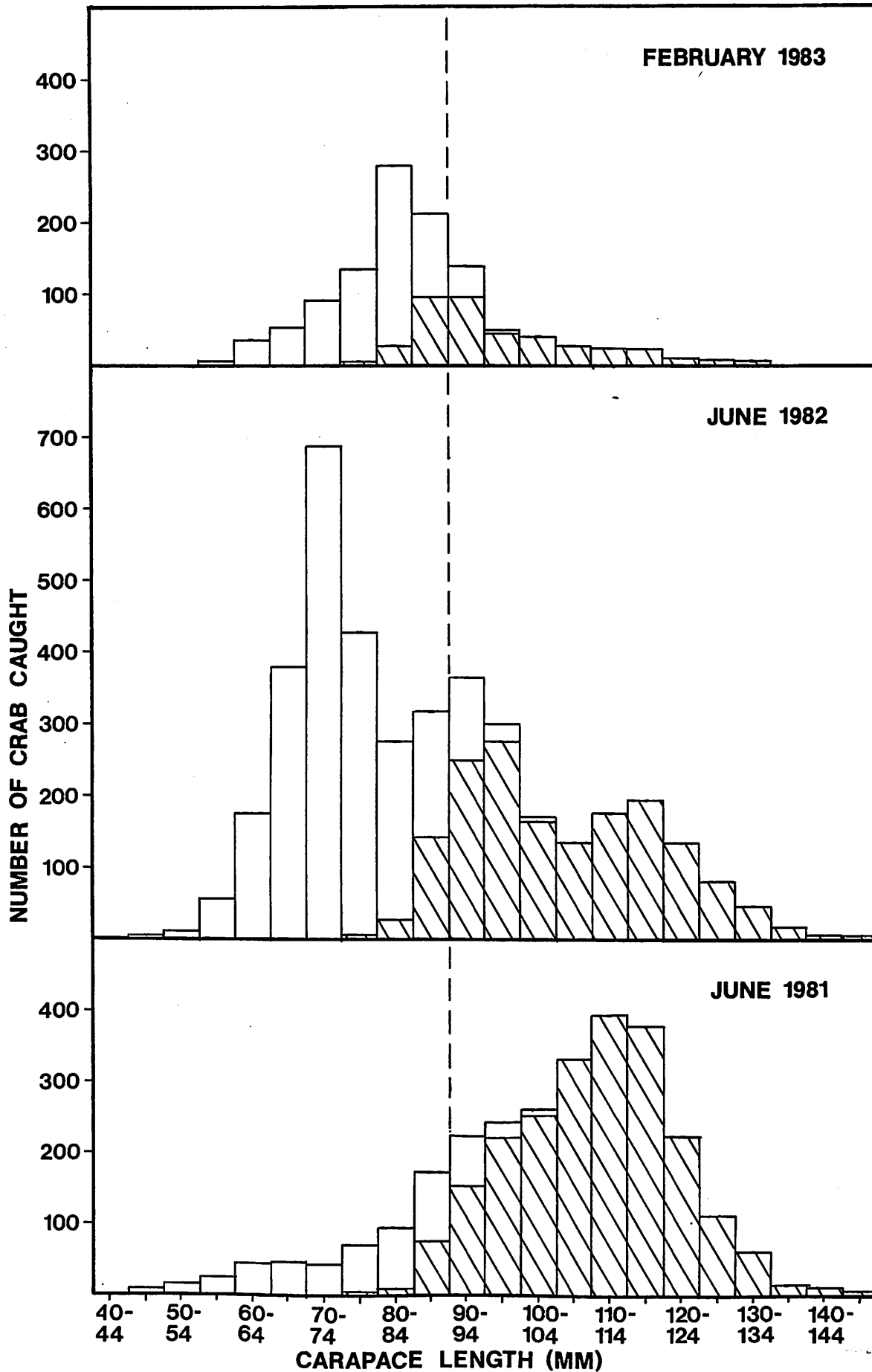


Figure 6.--Length frequency of female red king crab from NMFS trawl surveys in the eastern Bering Sea. Shaded area represents mature crab (with and without eggs).

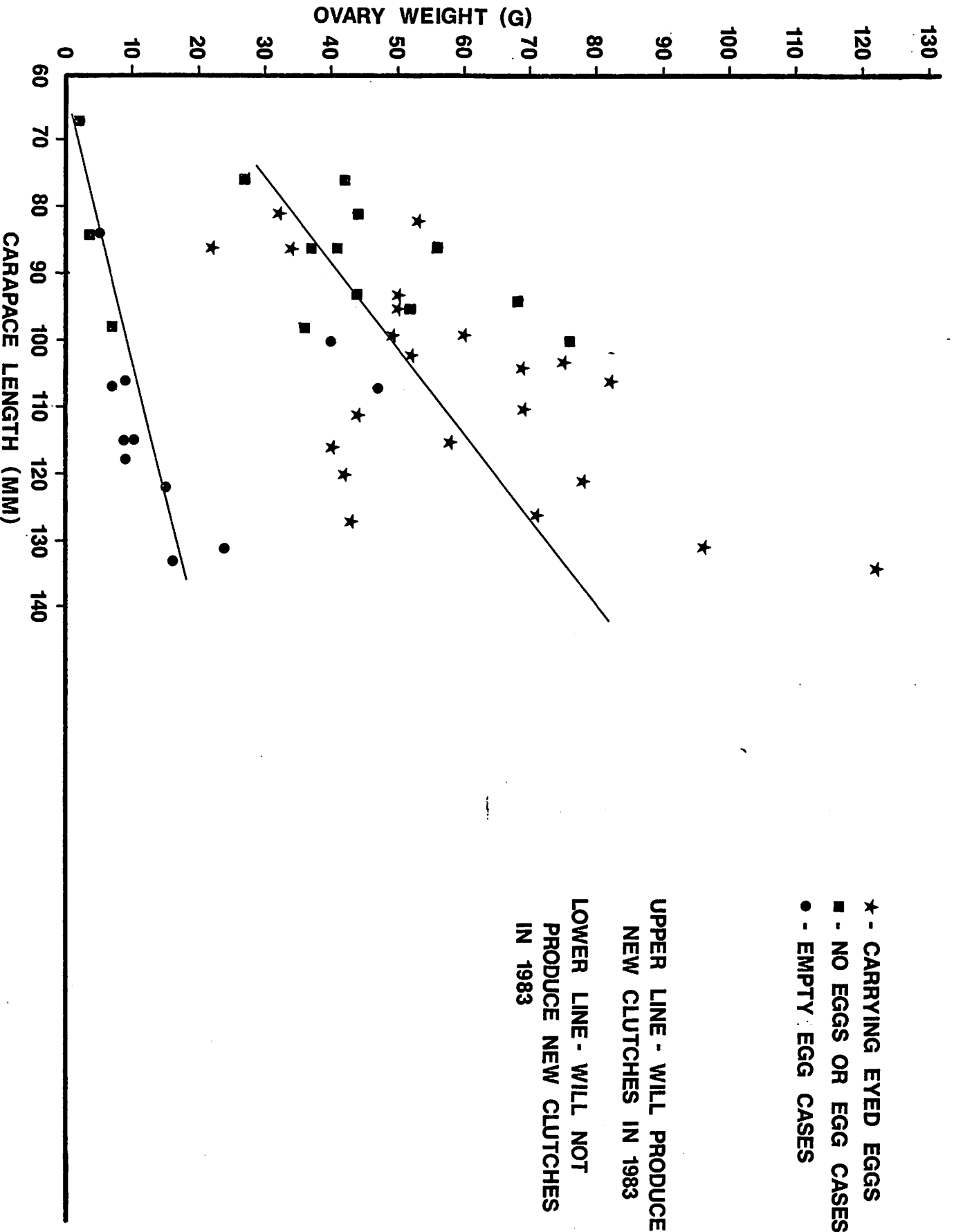


Figure 7.--Ovary weights of female red king crab taken in the February, 1983 Miller Freeman survey of the eastern Bering Sea.

A Summary of NMFS Data on Golden
King Crab with Proposed Size Limits
and Fishing Seasons

Report to: North Pacific Fishery
Management Council and the Alaska
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Anchorage, Alaska
March 24-30, 1983

Robert S. Otto
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Summary

A limited amount of data on golden (or brown) king crab biology is available.

Analyses of these data indicate that:

- 1) Size at maturity for both sexes is 90-100 mm carapace length in areas along the Bering Sea shelf (especially Northern District) but may be somewhat larger in the Aleutian Islands.
- 2) Carapace length (mm) is related to width by the formula: width = $-1.77 + 1.073$ (carapace length).
- 3) Allowing for a 5 mm difference between fishermen's and biologists' width measures, and for two years growth (at 15% per annum), legal size should be 143 mm (5.6 inches) carapace width for the Northern District.
- 4) Due to limited data and a possibly larger size at maturity, the size limit should remain at 165 mm (6.5 inches) carapace width in southern districts of the Bering Sea and in the Aleutians.
- 5) Data on the timing of spawning and molting indicate that current fishing seasons (September - February) are reasonable for southern districts of the Bering Sea and the Aleutian Islands but should be later (November-April) in the Northern District of the Bering Sea.

INTRODUCTION

Golden king crab (Lithodes aequispina) are referred to as brown king crab in Alaska fisheries regulations. Fisheries for this species were minor or incidental to other king crab fisheries until recently. Declining abundance of red and blue king crab (Paralithodes camtschatica and P. platypus) stocks in almost all areas of the state, as well as high dockside prices, lead to rapid development of directed fisheries over the past two fishing seasons. Landings for the 1982-1983 season are in excess of six million pounds.

There has been little biological research on golden king crab because fisheries were minor and because the species occurs in deeper water than that usually covered by stock assessment surveys. By consequence, only a limited amount of biological data are available and there are no estimates of stock abundance. This report is a summary of data pertinent to establishing size limits.

METHODS

Data are available from four resource assessment cruises (trawls) and a special study conducted aboard a commercial fishing vessel (pots). Times and approximate areas of data collection were as follows:

<u>Collection</u>	<u>Time</u>	<u>Area</u>
1) F/V <u>Discovery Bay</u>	July 1979	Unimak Pass to Pribilof Islands, 100-400 fathoms
2) R/V <u>Chapman</u>	July 1981	Northwest of Zhemchug Canyon (68°N, 178°W), 250 fathoms
3) R/V <u>Miller Freeman</u>	Feb. 1981	Unimak Pass to Pribilof Islands, 100-300 fathoms
4) R/V <u>Miller Freeman</u>	Feb. 1983	Unimak Pass to Pribilof Islands, 100-300 fathoms
5) Commercial vessel	Jan.-Feb. 1983	Eastern Aleutians, 100-300 fathoms

Data included observations of female reproductive condition (231 crabs), male reproductive condition (112), length-width measurements (212), and length-weight measurements (120). Data were analysed by tabulating the frequency of males and females in various reproductive states by size groups and by use of linear regression.

LENGTH-WIDTH AND LENGTH-WEIGHT RELATIONSHIPS

Linear regression resulted in the following relationships:

$$\text{Carapace width without spines (mm)} = -1.775 + 1.073 (\text{carapace length}); R\text{-squared} = 0.988, \\ N = 212.$$

$$\log_e (\text{weight in grams}) = -7.908 + 3.091 \log_e (\text{carapace length}); R\text{-squared} = 0.976, \\ N=120,$$

or,

$$\text{weight (g)} = 0.00037 (\text{carapace length})^{3.091}$$

These relationships allow conversion of the current legal size (6.5 inches or 165 mm) to carapace length and weight. Conversions are necessary because biologists standardly use carapace length as a measure of size and measure carapace width without spines. I assumed that the difference between widths measured with and without spines was 5 mm (this may be low). From above, a legal crab is larger than about 160 mm in width

without spines or 151 mm carapace length and weighs in excess of 1840 g or 4.1 pounds.

SIZE AT MATURITY AND LEGAL SIZE

As judged by the size at which 50% of the females are carrying eggs or empty egg cases (Fig. 1), females reach maturity at about 95 mm carapace length in areas along the eastern Bering Sea shelf (collection 1 to 4 combined). The apparent size at maturity for females from the Aleutians, however, is about 107 mm. This difference might result from different sampling methods (trawl vs. pot) or may reflect real differences in the size at maturity between the two areas.

Males were judged as mature if their reproductive tracts (testes and vas deferens) were white and opaque as opposed to clear and translucent. By this criterion, males reach maturity at about 95 mm in the eastern Aleutians. No observations of male maturity were taken during trawl surveys.

Observations by other investigators are as follows:

<u>Investigator</u>	<u>Area</u>	<u>Conclusion and Notes</u>
Clausen (NMFS, Auke Bay Lab)	near Juneau, S.E. Alaska	All females greater than 100 mm carapace length were mature as judged by presence of eggs or mature ovaries (memo: Clausen to Reeves, Feb. 18, 1983)
Somerton	Northwest of Zhemchug Canyon, north-central Bering Sea	Females, 50% mature at 97 mm; males mature at 92 mm carapace length. Females judged mature by presence or absence of eggs or egg cases; males by relative size of chelaped (claw). Unpublished report.
Hiramoto and Sato	Central Japan	15% of females with eggs at 126 mm carapace width, 60% for females of 136 mm carapace width (Japanese Journal of Ecology 20(5): 165-170, English (abstract)
Rodin	West Kamchatka Peninsula	Females 106-148 mm carapace width carrying eggs. Rybnoe Khozyaistvo 46(6); 11-13 (Translation by S. Pearson, NWAFC)

Even allowing that golden king crab are slightly wider than they are long, the Japanese data are far out of line with observations taken elsewhere. In Alaskan waters, the size at maturity (50%) is almost certainly larger than 90 mm and smaller than 110 mm. Most likely the size at maturity is about 95 mm, and with the exception of females from

the eastern Aleutians, does not show much variation from area to area.

Sizes at maturity estimated for other Bering Sea king crabs area as follows:

<u>Species/Sex</u>	<u>Length at 50% Maturity</u>	<u>Male length at Legal Width</u>
Blue king crab (Pribilof Islands)		
Male	108 mm	138 mm
Female	96 mm	
Blue king crab (St. Matthew Island)		
Male	77 mm	120 mm
Female	81 mm	
Red king crab (Bristol Bay)		
Male	100 mm	138 mm
Female	90 mm	

Red and blue king crab in the Bering Sea south of 58°N latitude increase in length by an average of 15 mm at each molt when 100 mm in initial carapace length. There are, however, no growth data available for blue king crab from the St. Matthew Island area.

Excluding St. Matthew Island, legal size is set at about two molting increments larger than the size at male maturity, and incremental growth is about 15% of carapace length. Assuming that incremental growth for golden king crab is also 15% and that males mature at 100 mm, legal size would be set at a width corresponding to 130 mm carapace length. Using the regression equation presented above and allowing a 5 mm difference between biologists' and fishermen's methods of measuring width, legal size would be 143 mm or 5.6 inches.

The best size at maturity data available for golden king crab is that presented by Somerton. Somerton's data were taken in the Northern District of ADF&G management Area Q and indicate that maturity is reached at sizes somewhat smaller than 100 mm carapace width. Allowing for some error on the conservative side, I recommend that legal size in the Northern District of Area Q be set at 5.5 inches (140 mm)

In the Aleutian Islands, there is some indication that maturity is reached at

sizes in excess of 100 mm and I recommend that the legal size remain at 6.5 inches (165 mm) until the problem is further studied.

No data on size at maturity are available for males from the eastern Bering Sea south of 58°N and only 66 females have been examined. Of these females, 33 were immature crab less than 80 mm and hence provide little insight as to the size at maturity. Because of the paucity of available data, and the close proximity of this area to the eastern Aleutians, I recommend that the size limit in areas of the Bering Sea south of 58° be set at 6.5 inches (165 mm) until more information becomes available.

TIMING OF MOLTING, SPAWNING AND FISHING SEASONS

Data collected from the eastern Aleutians during January-February, 1983, established that spawning begins at about that time (Fig. 2). Since spawning coincides with molting these data also indicate the beginning of the molting season. Females with new (uneyed) eggs, old (eyed) eggs and empty egg cases were collected. Females with new eggs were smaller than those with eyed eggs or empty egg cases. In other king crabs, females that are spawning for the first time spawn earlier than those that have spawned previously (and are carrying last year's clutch). This pattern also seems true for golden king crabs.

Other collections also provide information on the timing of spawning as follows:

<u>Collection/Time</u>	<u>Area</u>	<u>Number of mature crab with:</u>		
		<u>New Eggs</u>	<u>Eyed Eggs</u>	<u>Empty Egg Cases</u>
Miller Freeman Feb. '81 Feb. '83	Pribilofs to Unimak	6	1	4
Discovery Bay July '79	Pribilofs to Unimak	8	0	1
Chapman July '81	North-central Bering Sea	16	9	7

The Miller Freeman collections indicate that spawning also starts in February between the Pribilof Islands and Unimak Pass. We also observed molting males during

February. The Discovery Bay collection suggests spawning is largely over by July although some spawning may still occur. The Chapman collection indicates that spawning was in progress in July in the Northern District and is corroborated by Somerton's observations.

From these data, I conclude that spawning and molting probably occur from February to July in southern Districts of the Bering Sea and in the Aleutians, and during mid-summer in the Northern District. Accordingly, legal king crab seasons (September-February) currently in force for these areas are probably adequate and I recommend that they be adopted for golden king crab as well.

In the Northern District, the situation is less clear but available data suggest that the fishing season should start somewhat later (November-April) if ice and weather conditions will allow.

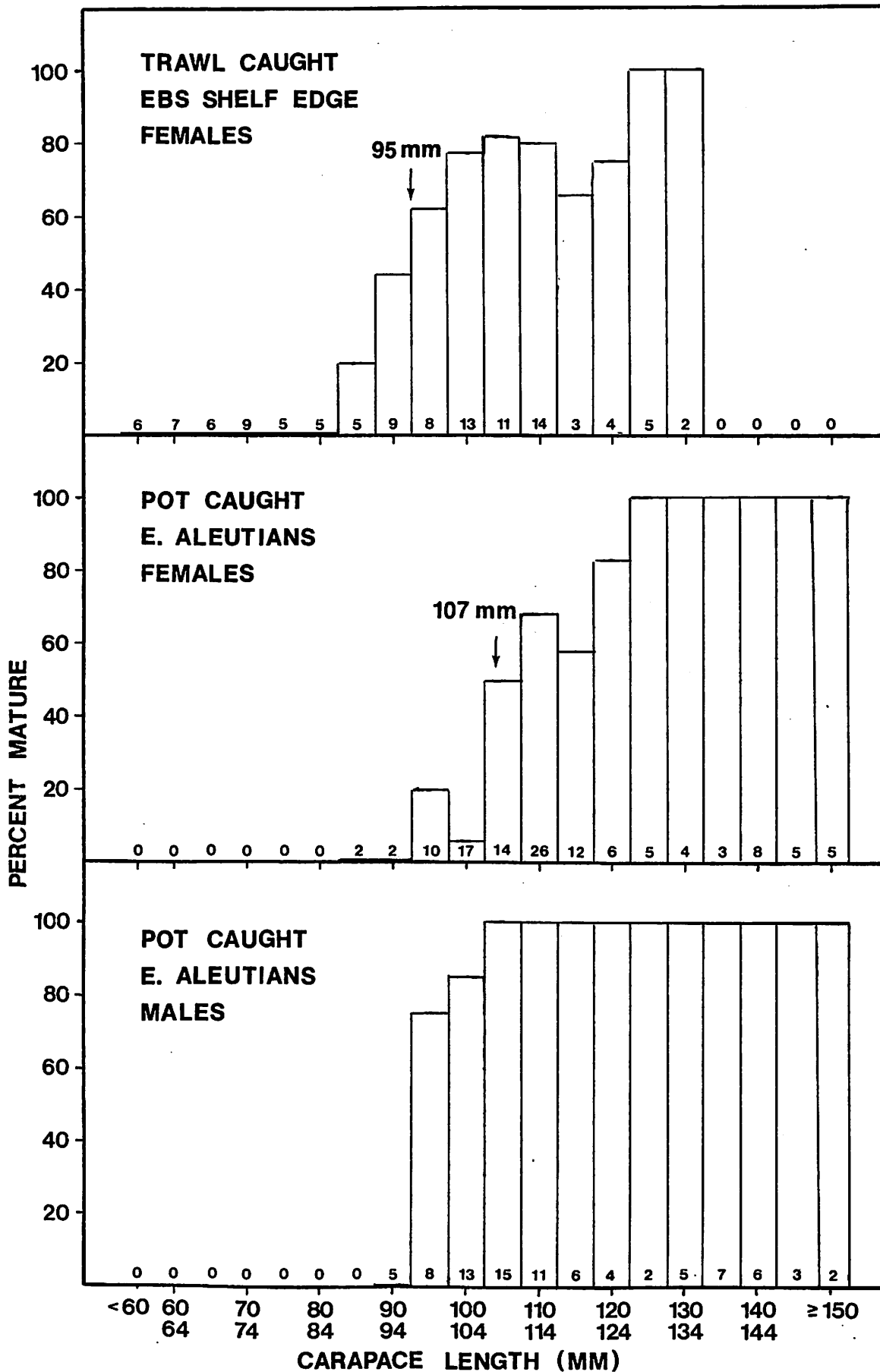


Figure 1.--Frequency of mature crab by 5 mm carapace length intervals for golden king crab (*Lithodes aequispina*) collected along the continental slope in the Aleutian Islands and the eastern Bering Sea (numbers at bottom of each panel are sample sizes).

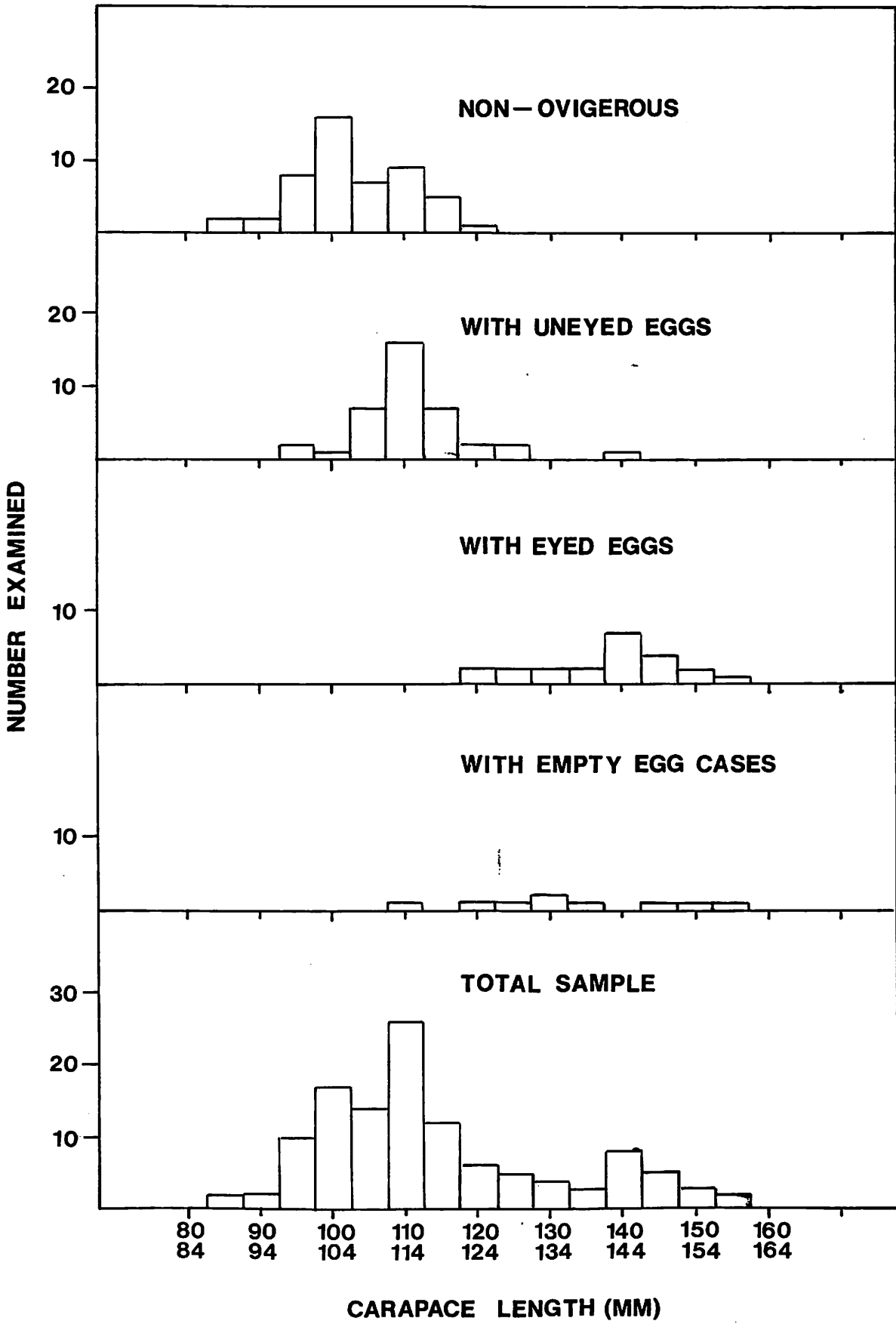


Figure 2.--Size frequencies of female golden king crab (*Lithodes aquispina*) collected during January and February, 1983, from the continental slope north of the Aleutian Islands at depths from 100 to 300 fathoms.

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or,

$$\text{weight (g)} = 0.00037 (\text{carapace length})^{3.091}$$

These relationships allow conversion of the current legal size (6.5 inches or 165 mm) to carapace length and weight. Conversions are necessary because biologists standardly use carapace length as a measure of size and measure carapace width without spines. I assumed that the difference between widths measured with and without spines was 5 mm (this may be low). From above, a legal crab is larger than about 160 mm in width

without spines or 151 mm carapace length and weighs in excess of 1840 g or 4.1 pounds.

SIZE AT MATURITY AND LEGAL SIZE

As judged by the size at which 50% of the females are carrying eggs or empty egg cases (Fig. 1), females reach maturity at about 95 mm carapace length in areas along the eastern Bering Sea shelf (collection 1 to 4 combined). The apparent size at maturity for females from the Aleutians, however, is about 107 mm. This difference might result from different sampling methods (trawl vs. pot) or may reflect real differences in the size at maturity between the two areas.

Males were judged as mature if their reproductive tracts (testes and vas deferens) were white and opaque as opposed to clear and translucent. By this criterion, males reach maturity at about 95 mm in the eastern Aleutians. No observations of male maturity were taken during trawl surveys.

Observations by other investigators are as follows:

<u>Investigator</u>	<u>Area</u>	<u>Conclusion and Notes</u>
Clausen (NMFS, Auke Bay Lab)	near Juneau, S.E. Alaska	All females greater than 100 mm carapace length were mature as judged by presence of eggs or mature ovaries (memo: Clausen to Reeves, Feb. 18, 1983)
Somerton	Northwest of Zhemchug Canyon, north-central Bering Sea	Females, 50% mature at 97 mm; males mature at 92 mm carapace length. Females judged mature by presence or absence of eggs or egg cases; males by relative size of chelaped (claw). Unpublished report.
Hiramoto and Sato	Central Japan	15% of females with eggs at 126 mm carapace width, 60% for females of 136 mm carapace width (Japanese Journal of Ecology 20(5): 165-170, English (abstract)
Rodin	West Kamchatka Peninsula	Females 106-148 mm carapace width carrying eggs. Rybnoe Khozyaistvo 46(6); 11-13 (Translation by S. Pearson, NWAFC)

Even allowing that golden king crab are slightly wider than they are long, the Japanese data are far out of line with observations taken elsewhere. In Alaskan waters, the size at maturity (50%) is almost certainly larger than 90 mm and smaller than 110 mm. Most likely the size at maturity is about 95 mm, and with the exception of females from

the eastern Aleutians, does not show much variation from area to area.

Sizes at maturity estimated for other Bering Sea king crabs area as follows:

<u>Species/Sex</u>	<u>Length at 50% Maturity</u>	<u>Male length at Legal Width</u>
Blue king crab (Pribilof Islands)		
Male	108 mm	138 mm
Female	96 mm	
Blue king crab (St. Matthew Island)		
Male	77 mm	120 mm
Female	81 mm	
Red king crab (Bristol Bay)		
Male	100 mm	138 mm
Female	90 mm	

Red and blue king crab in the Bering Sea south of 58°N latitude increase in length by an average of 15 mm at each molt when 100 mm in initial carapace length. There are, however, no growth data available for blue king crab from the St. Matthew Island area.

Excluding St. Matthew Island, legal size is set at about two molting increments larger than the size at male maturity, and incremental growth is about 15% of carapace length. Assuming that incremental growth for golden king crab is also 15% and that males mature at 100 mm, legal size would be set at a width corresponding to 130 mm carapace length. Using the regression equation presented above and allowing a 5 mm difference between biologists' and fishermen's methods of measuring width, legal size would be 143 mm or 5.6 inches.

The best size at maturity data available for golden king crab is that presented by Somerton. Somerton's data were taken in the Northern District of ADF&G management Area Q and indicate that maturity is reached at sizes somewhat smaller than 100 mm carapace width. Allowing for some error on the conservative side, I recommend that legal size in the Northern District of Area Q be set at 5.5 inches (140 mm)

In the Aleutian Islands, there is some indication that maturity is reached at

sizes in excess of 100 mm and I recommend that the legal size remain at 6.5 inches (165 mm) until the problem is further studied.

No data on size at maturity are available for males from the eastern Bering Sea south of 58°N and only 66 females have been examined. Of these females, 33 were immature crab less than 80 mm and hence provide little insight as to the size at maturity. Because of the paucity of available data, and the close proximity of this area to the eastern Aleutians, I recommend that the size limit in areas of the Bering Sea south of 58° be set at 6.5 inches (165 mm) until more information becomes available.

TIMING OF MOLTING, SPAWNING AND FISHING SEASONS

Data collected from the eastern Aleutians during January-February, 1983, established that spawning begins at about that time (Fig. 2). Since spawning coincides with molting these data also indicate the beginning of the molting season. Females with new (uneyed) eggs, old (eyed) eggs and empty egg cases were collected. Females with new eggs were smaller than those with eyed eggs or empty egg cases. In other king crabs, females that are spawning for the first time spawn earlier than those that have spawned previously (and are carrying last year's clutch). This pattern also seems true for golden king crabs.

Other collections also provide information on the timing of spawning as follows:

<u>Collection/Time</u>	<u>Area</u>	Number of mature crab with:		
		<u>New Eggs</u>	<u>Eyed Eggs</u>	<u>Empty Egg Cases</u>
Miller Freeman Feb. '81 Feb. '83	Pribilofs to Unimak	6	1	4
Discovery Bay July '79	Pribilofs to Unimak	8	0	1
Chapman July '81	North-central Bering Sea	16	9	7

The Miller Freeman collections indicate that spawning also starts in February between the Pribilof Islands and Unimak Pass. We also observed molting males during

February. The Discovery Bay collection suggests spawning is largely over by July although some spawning may still occur. The Chapman collection indicates that spawning was in progress in July in the Northern District and is corroborated by Somerton's observations.

From these data, I conclude that spawning and molting probably occur from February to July in southern Districts of the Bering Sea and in the Aleutians, and during mid-summer in the Northern District. Accordingly, legal king crab seasons (September-February) currently in force for these areas are probably adequate and I recommend that they be adopted for golden king crab as well.

In the Northern District, the situation is less clear but available data suggest that the fishing season should start somewhat later (November-April) if ice and weather conditions will allow.

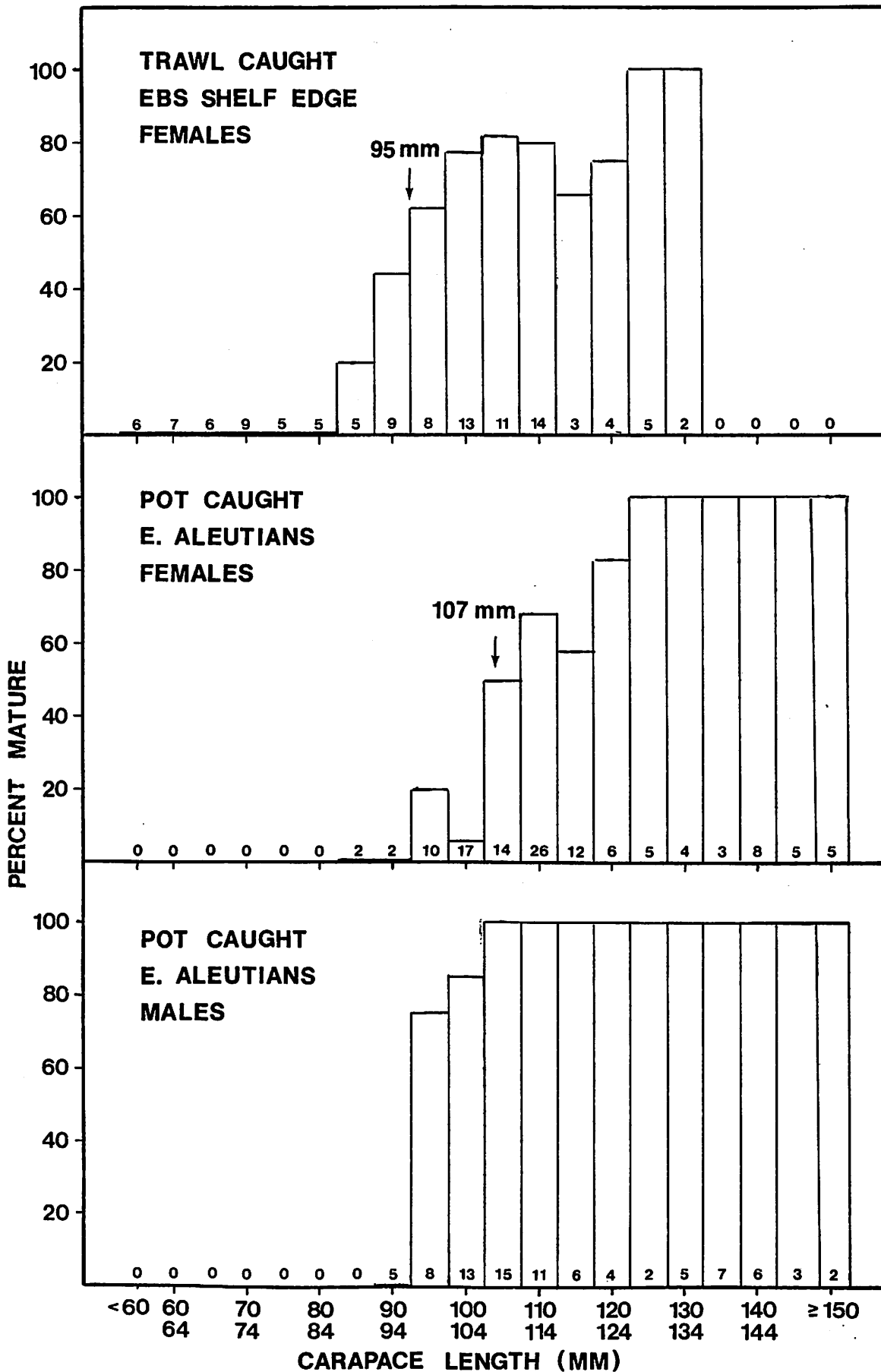


Figure 1.--Frequency of mature crab by 5 mm carapace length intervals for golden king crab (*Lithodes aequispina*) collected along the continental slope in the Aleutian Islands and the eastern Bering Sea (numbers at bottom of each panel are sample sizes).

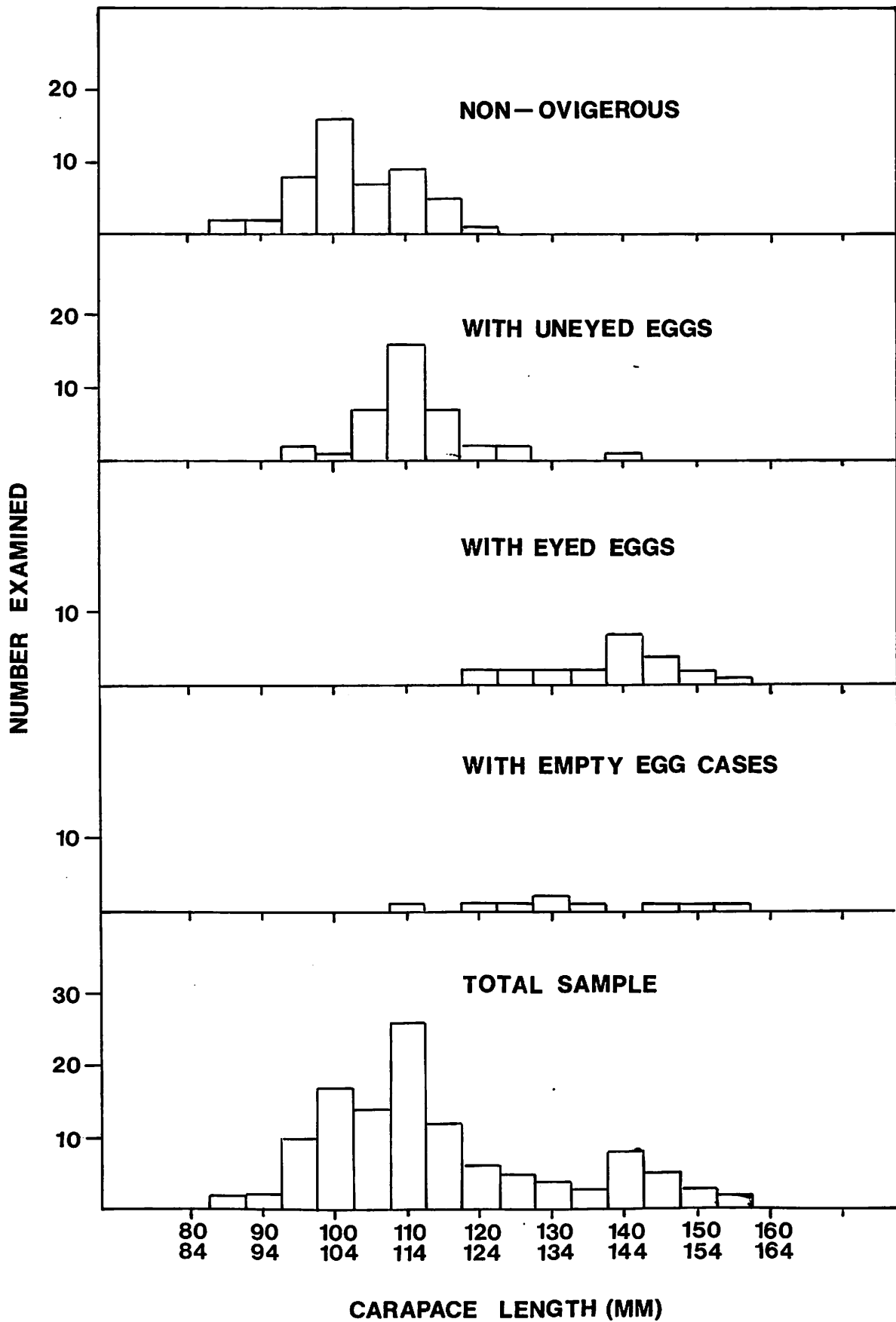


Figure 2.--Size frequencies of female golden king crab (*Lithodes aquispina*) collected during January and February, 1983, from the continental slope north of the Aleutian Islands at depths from 100 to 300 fathoms.