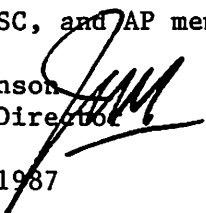


M E M O R A N D U M

TO: Council, SSC, and AP members

FROM: Jim H. Branson
Executive Director 

DATE: March 12, 1987

SUBJECT: King and Tanner Crab Fishery Management Plans

ACTION REQUIRED

Review status of the Board of Fisheries, a summary of the Seattle crab hearing, and an update from the Crab Management Committee on development of a new crab FMP. Receive public comments on Secretarial Amendment to repeal Tanner Crab FMP.

BACKGROUND

A joint meeting with the Alaska Board of Fisheries on shellfish management to discuss issues of mutual interest and proposed regulatory changes is usually scheduled for this time of year. Because of changes in state administration the Board will not meet on shellfish this year. The state intends to manage the 1987 king and Tanner crab fisheries using the same regulations as last year, so it should not be necessary for the Council and Board to meet jointly.

The Council held its annual king and Tanner crab hearing in Seattle on March 4. A summary of the testimony and discussion is included as item D-1(a).

During March 3-4, the Crab Management Committee met with members of the Crab Plan Team to review the first working draft of a combined king and Tanner Crab FMP for the Bering Sea and Aleutian Islands area. Considerable discussion was held on the management measures, the roles different management agencies would have, and the procedure for appeal of preseason and inseason management decisions. A report summarizing the committee meeting is provided as item D-1(b). An oral report may also be available. With the advice provided to them, the plan team will work on a new draft and are scheduled to meet again with the committee prior to the next Council meeting.

Following the decision to develop a combined king and Tanner crab FMP in December, the Council asked the Secretary to continue emergency regulations repealing the Tanner crab FMP and to develop a Secretarial Amendment repealing the plan prior to expiration of the emergency rule on April 29, 1987. A Secretarial Amendment has been prepared and a Notice of Availability filed on February 23. The public review period is scheduled to end on April 23. NMFS has requested that the Council provide an opportunity for public comment on the Secretarial Amendment during its meeting. Final implementation of the amendment is scheduled for April 29.

SUMMARY

North Pacific Fishery Management Council Hearing
on King and Tanner Crab Management

Northwest & Alaska Fisheries Center
Seattle, Washington

March 4, 1987

In accordance with the Bering Sea/Aleutian Islands King Crab Fishery Management Plan, the North Pacific Fishery Management Council conducted their sixth annual public hearing, outside of Alaska, on shellfish management on Wednesday, March 4, 1987, in Seattle. The hearing was chaired by Rudy Petersen, with Council members Bob McVey, and Mark Pedersen representing Council member Blum, in attendance. With membership of the Alaska Board of Fisheries changing, no one from the Board could attend; however the proceedings from this hearing will be submitted to the Board. Support staff present were Clarence Pautzke, Steve Davis, and Denby Lloyd, NPFMC; Fred Gaffney, ADF&G; Bill Robinson, Ray Baglin, and Jerry Reeves, NMFS; and John Pedrick, Jr., NOAA-GC. The hearing convened at 1:30 p.m. with an overview of the agenda and a status report on the king and Tanner crab FMPs by Steve Davis and Ray Baglin. Approximately ten members of the public attended the hearing and a synopsis of individual testimony is given below.

David Hoopes, Seattle, recommends that the Council develop a new crab management plan in concert with a groundfish FMP. He believes that an FMP based on an ecosystem approach is preferable to species-by-species or fishery-by-fishery management. A transcript of his testimony was provided to the Council and Board and is available at the Council office.

Arni Thomson, Alaska Crab Coalition, Seattle, proposed that managers consider a split king crab season (fall/spring) in Bristol Bay to test the feasibility of eventually having a combined king and C. bairdi crab fishery immediately prior to the C. opilio fishery. One advantage of this proposal is that with a spring season, meat recovery or yield will be increased. Currently, the harvest guideline is based on the number of male king crab that is surplus to reproductive needs of the stock. The number of male crab is then applied to an estimate of average weight to produce a harvest guideline for the fishery expressed in pounds. The Coalition believes that by harvesting half the guideline in the winter/early spring months (prior to molting) will provide the same number of king crab to the fishery but at a higher average weight. King crab harvested after molting and in the fall are usually "light" crab (i.e., following the molt, it takes awhile for crab to grow into their new, larger shell). A higher average weight could produce a higher exvessel value of the catch. Another advantage of the proposal is that by scheduling king and Tanner crab fisheries together (where possible), start-up costs and handling of crab will be reduced. This proposal will be developed further by the Coalition and submitted to the Board and Council in the future.

Bill Woods, SeaAlaska Products, Seattle, supports the Alaska Crab Coalition proposal. From an economic perspective, the crab in the winter/spring are of better quality (meat and fill) as seen by processors when the king crab

fishery went year-long (1960s-1970s). He also supported a conservation rationale of a combined king/Tanner crab fishery to reduce handling of sublegal crab. Handling of female king crab can be reduced by closing waters east of 162°W longitude to the fall fishery.

Kevin Kaldestad, fisherman, Seattle, supports the Coalition proposal because it will improve crab CPUE.

Kris Poulsen, fisherman, Seattle, is a member of the Alaska Crab Coalition and supports the split-season proposal. It will increase the poundage of crab harvested while keeping the number of king crab taken the same. Crabs are also more robust to handling in the spring compared to the post-molt period in the fall, therefore handling mortality should be reduced.

Thorn Smith, North Pacific Fishing Vessel Owners' Assn., Seattle, recommends that NMFS extend the 1987 C. opilio fishery in the northwest portion of the Bering Sea since this area is not surveyed very well. This year, the opilio harvest guideline is lower and fishermen hope that if CPUE remains high, the season will be extended by NMFS. NPFVOA is concerned that with budget cuts, ADF&G may not be able to monitor CPUE rates as closely as in prior years, and that this could affect the outcome of the season extension decision.

NPFVOA is also developing a proposal for next year that will look at the possibility of lowering the minimum size limit for king crab. The current minimum size limit is 6½". The Association has asked the Northwest & Alaska Fisheries Center to examine this question. Preliminary results from the analysis suggest that a reduction of the size limit may not have an adverse effect on reproductive potential. Further analysis at the Center is planned.

CRAB MANAGEMENT COMMITTEE
DRAFT MEETING SUMMARY
March 3-4, 1987

The Crab Management Committee met in Seattle on March 3-4, 1987. Larry Cotter chaired the meeting and the following members were present: Lloyd Cannon, Bob McVey, Rudy Petersen, Thorn Smith, Jeff Stephan, Arni Thomson, John Winther, Bill Woods, and Fred Gaffney for Don Collinsworth.

Others in attendance included Steve Davis, Clarence Pautzke, Bill Robinson, Ray Baglin, John Pedrick, Denby Lloyd, Sam Hjelle, Alf Sorvik, Jerry Reeves, Bud Kerns, Ted Evans, Bill Orr, Al Burch, Bob Ayers, and Konrad Uri.

A revised fishery management plan for Bering Sea and Aleutian Islands king and Tanner crab, drafted by Ray Baglin of the Alaska Region of NMFS, was reviewed by Bill Robinson. The draft plan now contains ten major sections:

1. Introduction
2. Procedures for Implementation
3. Finding of Consistency
4. Description of Fishery Management Unit
5. TALFF and JVP
6. Management Objectives
7. Management Measures
8. Council/NMFS Interaction with Board of Fisheries
9. Appeals Procedures
10. Appendices

The Committee reviewed all sections and had the following comments and recommendations.

Finding of Consistency

Section 3 contains procedures for determining whether existing state regulations are consistent with the Magnuson Act and other applicable law. One alternative is for the Secretary to review all regulations and make a

consistency determination as the FMP is developed and implemented. The other alternative is to not address consistency in the FMP but leave all regulations open to appeal. Evidently there has been a preliminary review by the NMFS Alaska Regional Office of state king crab regulations with regards to consistency to the Bering Sea and Aleutian Islands King Crab FMP. NMFS plans to make that analysis available to the Committee.

Description of Management Unit

Some Committee members favored reopening the issue of including the Gulf of Alaska in the FMP. The Committee did not follow up on that recommendation.

Management Objectives

The Committee reviewed the draft objectives and noted that the Council may want to review and reestablish the objectives for crab management.

Management Measures

This section contained all the measures normally employed to manage the crab fisheries. The Committee reviewed each in detail and assigned them to one of three categories:

- Category 1: FMP regulations fixed in the plan and requiring an amendment to change.
- Category 2: Framework type regulations wherein the Board can change them, but must follow criteria set out in the plan.
- Category 3: Regulations left to the Board and are more or less silent in the FMP.

Following considerable discussion, the Committee arranged the measures by category as follows:

Category 1
(FMP)

Category 2
(Framework)

Category 3
(Board of Fish)

OY/MSY

Legal Gear Types

Pot Limits

Sex Restrictions

Registration Areas

Guideline Harvest Levels

Size Limits

Inseason Adjustments

Reporting Requirements

Fishing Seasons

Gear Placement

Gear Storage

Tank Inspections

Legal Gear Configuration

Two measures, permit requirements and observers, were set aside or reserved until further analysis could be done. The two permit alternatives basically are whether or not a federal permit will be required. The Committee requested representatives of NMFS/NOAA and ADF&G to jointly lay out the issues involved, including payments of fees, and report back at the next meeting.

The observer section had two alternatives, defer to a state observer program or require vessels to take federal observers if requested by the NMFS Alaska Regional Director. The Committee recommended reserving that section until NMFS/NOAA finalizes its policy on domestic observers.

Limited entry was briefly discussed as a management measure. The Committee recommended setting the issue aside for the time being.

Council/NMFS Interactions with Board and Appeals Procedures

The Committee discussed the role of NMFS and the Council in participating in the Board process. The main concerns were that proposals be made available to the Council with sufficient lead time for review and that NMFS and Council representatives be allowed to participate and advise during the Board meetings.

Of main concern to the Committee is that Board regulations take effect in a timely fashion even if appealed by concerned parties. This will result in a much more orderly fishery than in past years when disparities between state and federal regulations resulted from the latter having to go through full federal review prior to implementation.

The Committee voiced concern that a very clear road map be laid out on appeals procedures, particularly whether all state appeals would have to be exhausted before appealing through the federal system. One approach would be to require a serial appeals procedure for preseason Board actions when more time is available, but allow for parallel appeals through state and federal systems for inseason adjustments.

NMFS indicated that a formal appeals procedure would need to be in the FMP. However, interested parties should give considerable thought to how NMFS, the Council, and the state should interact in decision making and appeals procedures.

Fred Gaffney was requested to summarize the state appeals process. This will be reviewed by NOAA General Counsel and reported back to the Committee at their next meeting.

Future Schedule

The summary of the appeals procedures should be available within three weeks and a new revised FMP should be available in late April, perhaps by April 27. Committee members will then have early May to review the document with their constituents and report back to the Committee which will meet two days before the Council's May 20 meeting in Anchorage.

It is hoped that after the May meeting the plan team will have enough direction to further revise the fishery management plan and complete the associated economic and environmental impact studies during the summer. The revised plan and decision documents will be inserted into the 1988 crab management cycle. This cycle calls for the new plan to be implemented sometime in late 1988, perhaps in time for the 1988-89 winter fishery.

DRAFT

An Assessment of the Minimum Size Limit for
Bristol Bay Red King Crabs

J. E. Reeves

Summary of Biological Analysis

March 1987

The most recent work on this subject (Alverson 1980) indicated that a minimum size limit in the range of 5.5-6.0" carapace width was more appropriate than the 6.5" limit in effect then and now. This conclusion was based on yield-per-recruit analyses using the available parameters at the time. Subsequent to this study, the status of the stock has changed dramatically. Mortality has increased substantially, bringing about a precipitous decline in the stock to an historic low point. As mortality is a key variable in yield-per-recruit studies, a re-evaluation is in order to determine the current status of the size limit. Further, since yield-per-recruit analysis does not address the question of impacts on reproductive viability, and since the reproductive stock is at a low level, the effect of a lower minimum size limit on reproduction must be examined. This study re-examines the yield-per-recruit basis for minimum size limits, and assesses their impact on the reproduction of the stock.

Yield Per Recruit

The analysis of recent survey data indicates that natural mortality for sublegal adult males is around .6, as compared to values around .2 used in the 1980 work by Alverson. The result of higher mortality ("natural" may not be appropriate to the extent that handling kills sublegals) on yield-per-recruit analysis can be seen in fig. 1. The peak biomass shifts to a lower age at entry as mortality on sublegals increases. The age at peak biomass is the appropriate age at entry to the fishery at very high levels of F. The appropriate age at entry is less than the "peak" (or critical) age if actual F is less, which it is. Thus, because of a higher M a lower age at entry is warranted, based on yield-per-recruit analysis. For an intense fishery, this age approaches age 5, and even lower for the current level of effort. An age 5 crab would be in the 4.5-5.0" carapace width range.

Fig. 2 shows the disparity between the current minimum size regulation and current estimates of mortality. The "low mortality" curve represents an M of .1, which would have to be in force to justify a 6.5" size limit (age 8-9 age at entry) using yield-per-recruit rationale.

Effect on Reproduction

Red king crabs become sexually mature at around age 5 (4.5"-5.0" carapace width). While females are known to mate successfully at this size, there is some question (based on underwater observations in natural habitat) regarding the size at which males enter into mating. Thus, this study examines two hypothetical sizes of maturity for males, 110mm carapace length (about 5.2" cw) and 120mm (about 5.7"), assuming in effect that all males ≥ 110 mm, or 120mm, are successful maters, and all males < 110 mm don't take part in reproduction.

For each survey year from 1970 through 1986 sex ratios (F:M) and size ratios (male avg. wt.:female avg. wt.) were calculated for the two hypothetical sizes of male maturity. Upon these, estimates of clutch fullness were regressed to see what relationships might exist between average clutch size in the population, the sex ratio and the size ratio. Example scatterplots are shown in figs. 3 and 4 for sex ratio and size ratio. The following table indicates no correlations exist for the ranges examined.

Ratio	Males \geq	R-squared	X range
-----	-----	-----	-----
Sex	110	0.05	.3-2.5
"	120	0.06	.4-4.2
Size	110	0.06	2.0-2.9
"	120	0.02	2.4-3.2

①

The effect of lower minimum size limits on these ratios under current stock conditions was examined by simulating the 1986 Bristol Bay stock and fishery. A range of size limits from 6.5" to 5.0" was imposed in .25" increments, and post-fishery sex and size ratios were calculated based on the stock remaining, as well as total catch and average size in the catch. Handling mortality on sublegal males was allowed to vary between 0 and .7. Males remaining after fishing was calculated using

$$N_i(1 - u_i - h_i u_{my} + h_i u_i)$$

where u_i = sizegroup-specific exploitation rate, $i = 1, \dots, \text{max}$

h_i = fraction of captured sublegals
that are killed

N_i = population immediately prior to
fishing.

Selected summarized results are presented below:

For males >109mm :

Size Limit	Handling mort.=0		Handling mort.=.7		Handling deaths (mins.)
	Sex Ratio	Size Ratio	Sex Ratio	Size Ratio	
6.50"	0.33	2.33	0.43	2.41	5.90
6.25"	0.36	2.31	0.44	2.40	5.10
6.00"	0.38	2.31	0.45	2.40	4.50
5.75"	0.41	2.33	0.46	2.41	3.80
5.50"	0.45	2.38	0.47	2.43	3.00
5.25"	0.48	2.44	0.48	2.45	2.40
5.00"	0.49	2.45	0.49	2.45	1.70

For males >119mm :

2

Size Limit	Handling mort.=0		Handling mort.=.7		Handling deaths (mins.)
	Sex Ratio	Size Ratio	Sex Ratio	Size Ratio	
6.50"	0.48	2.62	0.59	2.69	5.90
6.25"	0.52	2.62	0.61	2.69	5.10
6.00"	0.58	2.65	0.63	2.71	4.50
5.75"	0.64	2.71	0.65	2.73	3.80
5.50"	0.66	2.74	0.66	2.74	3.00
5.25"	0.66	2.74	0.66	2.74	2.40
5.00"	0.66	2.74	0.66	2.74	1.70

Sex ratios increase as the size limit is lowered, but only moderately. The reasons for this are that males are currently significantly more abundant than females and the exploitation rate is

moderate. With the introduction of handling mortality, the sex ratio starts at a higher level but changes less. None of the simulations produced sex ratios that are outside of the range examined in terms of population average clutch size .

Size ratios either decrease somewhat and then increase slightly, or show a slight increasing trend as the size limit is lowered, depending on the minimum size selected for effective male mating. This is explained by the tendency for the average size of mature males remaining after the fishery to stabilize as the cropping of the stock becomes more uniform as the size limit is progressively lowered. This effect is illustrated in fig. 5. Handling mortality has an effect similar to that for sex ratios. The overall effect of lower size limits on the size ratio is minimal, and resultant ratios are within the observed range .

Simulated catches and average weight per crab in the catch are shown as follows:

Size Limit	Catch (mln.lbs.)	Avg. Wt. (lbs.)
6.50"	11.6	5.1
6.25"	15.6	4.8
6.00"	19.2	4.5
5.75"	22.4	4.3
5.50"	25.2	4.0
5.25"	27.5	3.8
5.00"	29.7	3.6

3

As the size limit is reduced the exploitable stock increases and the average size of individuals in the stock decreases. To the extent that handling mortality is a factor, deaths are converted to catch as the size limit is lowered, as is shown by the previous two tables. It is concluded that a lowering of the minimum size limit to some point within the range examined would increase the catch. Adverse impacts on population clutch size are not likely to result from such an action.

Literature Cited

Alverson, D.L. 1980. An analysis of size limitation for the Alaskan red king crab. Natural Resources Consultants, Mimeo.Rpt. 60 p.

RED KING CRAB BIOMASS DISTRIBUTION

LEGAL M = .5, SUBLEGAL M VARIES

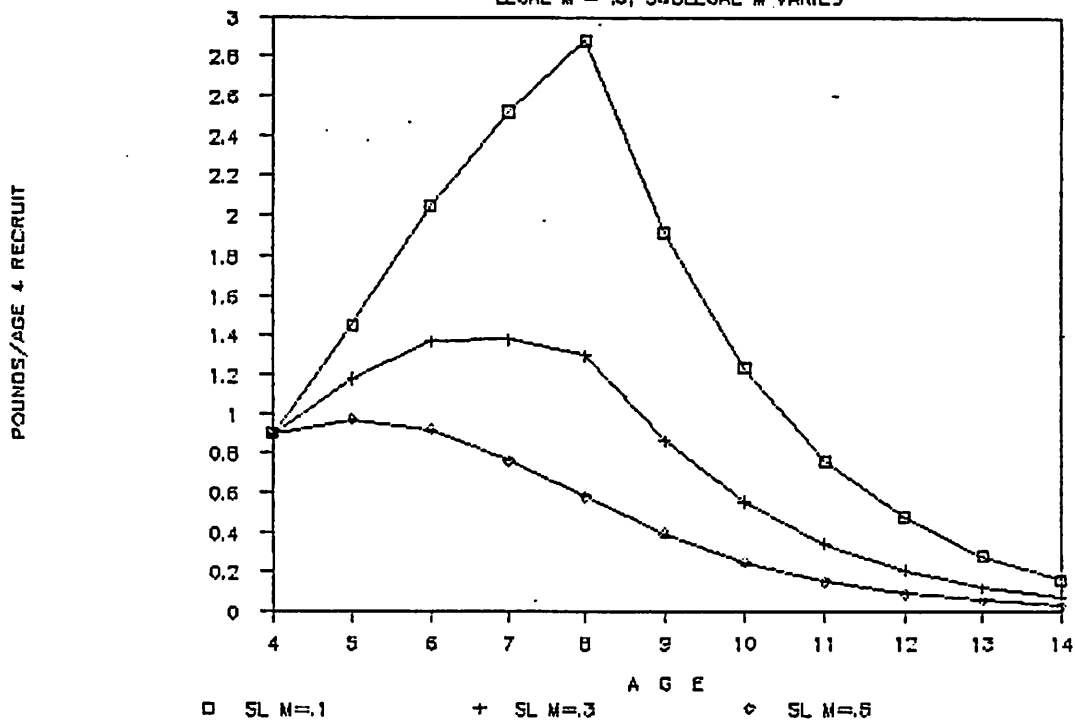


FIG. 1

RED KING CRAB BIOMASS DISTRIBUTION

LOW VERSUS HIGH MORTALITY

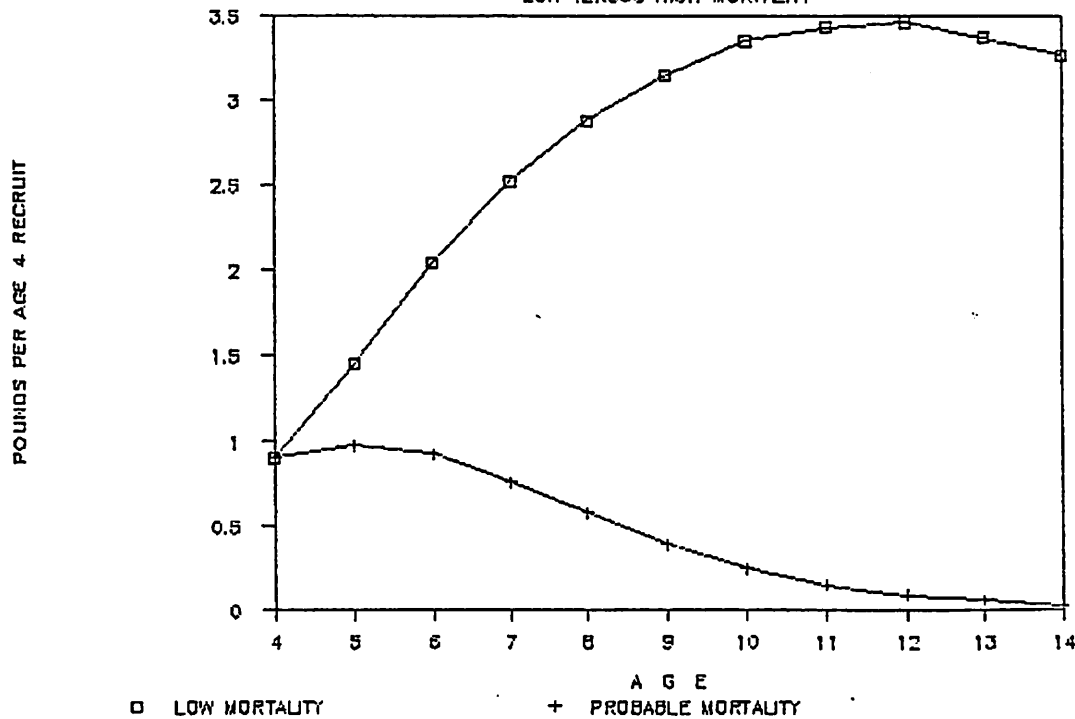


FIG. 2

PROPORTION FULL CLUTCH

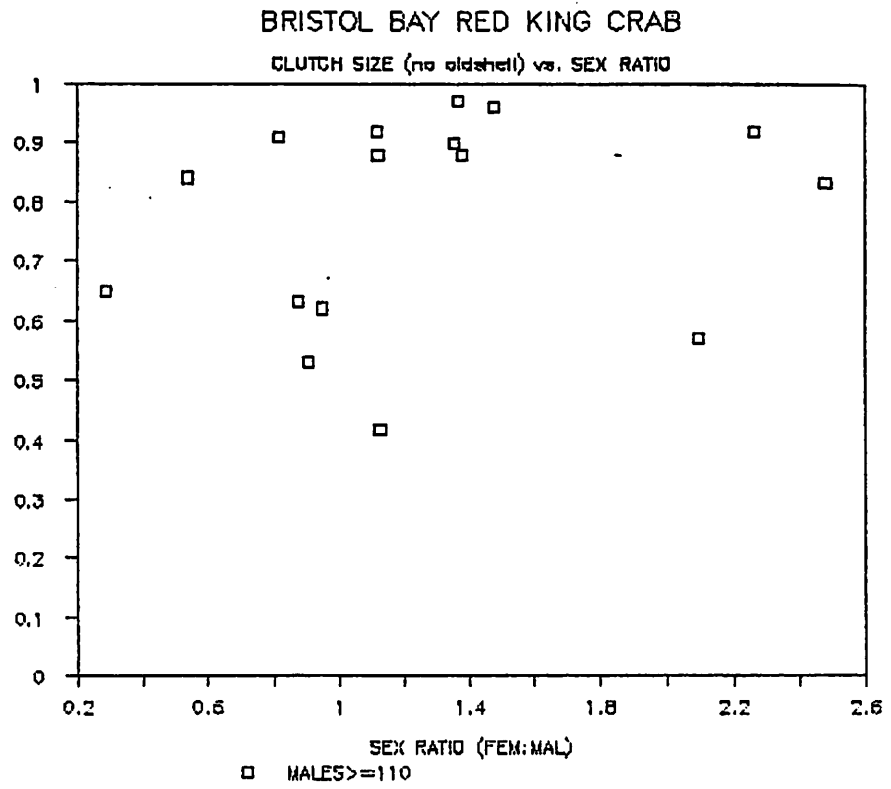


FIG. 3

PROPORTION FULL CLUTCH

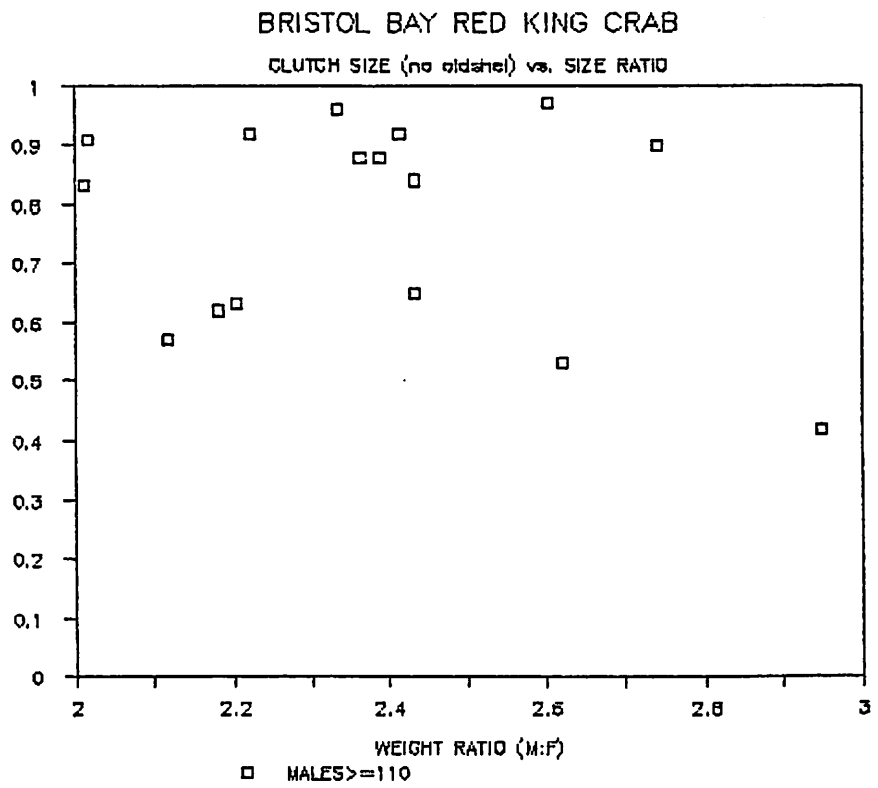
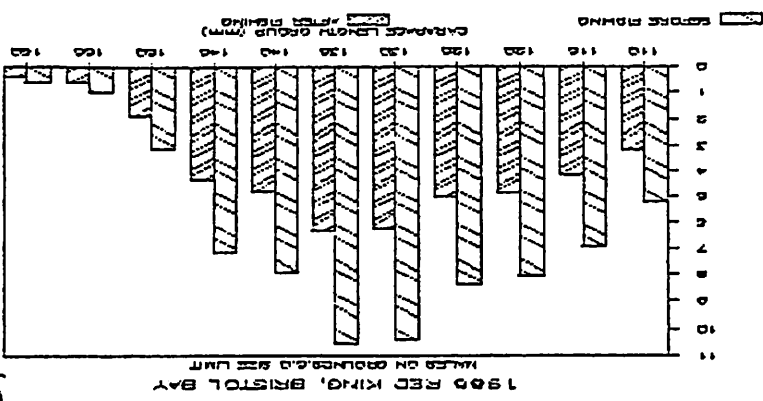


FIG. 4

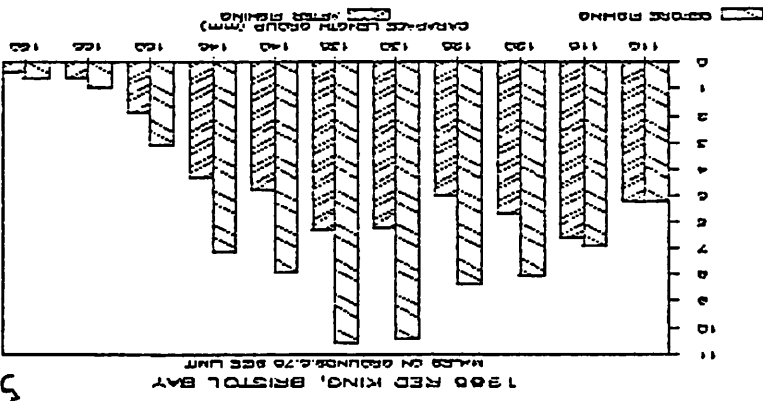
FIG. 5

WILKINS OF PAUNTS



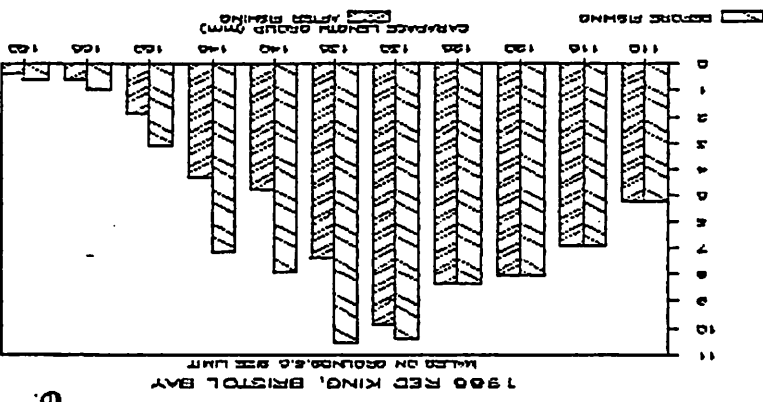
5.0"

WILKINS OF PAUNTS



5.75"

WILKINS OF PAUNTS



6.5"