MEMORANDUM

TO: Council, SSC and AP Members

FROM: Clarence G. Pautzke
Executive Director

DATE: September 9, 1996

ESTIMATED TIME

4 HOURS

SUBJECT: BSAI Bairdi & Opilio Bycatch Caps

ACTION REQUIRED

(a) Final action on PSC limits for Bering Sea Tanner Crab and Snow Crab.

BACKGROUND

Final Review of Proposed Crab PSC Limits

In June, the Council adopted revised PSC limits for red king crab taken in trawl fisheries as part of Amendment 37. Specifically, the Council recommended adoption of a stairstep based PSC limit for red king crab in Zone 1. Based on the 1996 abundance estimate (10.2 million mature females and 20.3 million lbs of effective spawning biomass), the PSC limit for 1997 will be 100,000 red king crab.

Amendment 37 PSC limits for Zone 1 red king crab.

Abundance	PSC Limit
Below threshold or 14.5 million lbs of effective spawning biomass (ESB)	35,000 crabs
Above threshold, but below 55 million lbs of ESB	100,000 crabs
Above 55 million lbs of ESB	200,000 crabs

The Council did not make any recommendations regarding PSC limits for Tanner and snow crabs at the June meeting. Rather, the Council formed an industry group to meet before the September meeting and attempt to arrive at a consensus position on allowable bycatch limits for Tanner and snow crab taken in Bering Sea trawl fisheries. The committee members are listed below:

Dave Hanson, Moderator
Vince Curry
Kris Fanning
Dave Fraser
Teressa Kandianis
Brent Paine
Gary Painter
Jeff Stephan

The Committee met on August 29-30, and agreed upon acceptable PSC limits for C. bairdi Tanner crabs taken incidentally in trawl fisheries. The terms of the negotiated agreement are included as **ItemC-1(a)**. The negotiated PSC limits are based on total abundance of bairdi crab as indicated by the NMFS trawl survey. Based on 1996 abundance (185 million crabs), the PSC limit for C. bairdi in 1997 would be 750,000 crabs in Zone 1 and 2,100,000 crab in Zone 2 under the negotiated agreement. The committee was unable to reach an agreement

on a preferred alternative for a snow crab (C. opilio) PSC limit. Members did indicate that they would be willing to meet again and attempt to negotiate an agreement, however.

At this meeting, the Council is scheduled to take final action on PSC limits for Tanner and snow crab. An executive summary from the EA/RIR is included as **Item C-1(b)**. In June, the AP recommended adoption of Alternative 1, status quo, for snow crab. The AP was unable to identify a preferred alternative for Tanner crab, however. The crab plan team recommended a stairstep abundance-based PSC limit for Tanner crab and a PSC limit for snow crab of 11 million crab in Zone 2.

A summary of Tanner and snow crab bycatch in groundfish fisheries is provided in the tables below.

Tanner crab bycatch in the 1992-1995 BSAI groundfish fisheries, by zone (all gears/targets).

	Zone 1	Zone 2	Other areas	Total
1992	1,144,671	2,699,256	448,106	4,292,033
1993	1,040,166	2,329,840	51,820	3,421,826
1994	765,283	1,736,273	43,426	2,544,982
92-94 Ave	983,373	2,255,123	181,117	3,419,614
93-94 Ave	902,724	2,033,057	47,623	2,983,404
1995	923,088	1,341,894	34,874	2,299,856

Snow crab bycatch in the 1992-1995 BSAI groundfish fisheries, by zone (all gears/targets).

	Zone 1	Zone 2	Other areas	Total
1992	104,844	11,996,347	5,561,358	17,662,549
1993	40,611	8,922,155	5,797,956	14,760,722
1994	25,334	11,424,057	1,032,736	12,482,127
92-94 Ave	56,930	10,780,853	4,130,683	14,968,466
1995	94,307	4,338,013	963,469	5,395,789

On August 30, 1996, the following agreement was reached by the negotiating committee on PSC caps for C. bairdi in the Bering Sea trawl fisheries.

PSC caps for bairdi:

The PSC limit for Tanner crab taken in Bering Sea trawl fisheries will be based on total abundance of C. bairdi as indicated by the NMFS annual bottom trawl survey as follows:

Area	Abundance*	PSC Limit
Zone 1	0 - 140 million crabs	0.5% of abundance
	140 - 270 million crabs	750,000 crabs
	270 - 400 million crabs	850,000 crabs
	over 400 million crabs	1,000,000 crabs
Zone 2	0 - 183 million crabs	1.2% of abundance
	183 - 290 million crabs	2,100,000 crabs
	290 - 400 million crabs	2,550,000 crabs
	over 400 million crabs	3,000,000 crabs

* Abundance is the total population index (sum of all size/sex groups) of the Eastern District (east of 173° W) from the NMFS trawl survey.

Caveats and Recommendations:

1. These PSC limits will be subject to a 3 year review.

2. In the interim, other approaches to PSC limits will be analyzed. These approaches include basing PSC limits on number of mature crabs, weight of crabs, and mortality of crabs taken in trawl fisheries.

Industry Support:

All parties here below signed will support this agreement at the North Pacific Fishery Management Council meeting through Secretarial review and approval. The Committee strongly recommends that the NPFMC approve this agreement without change. Any substantive change from this agreement releases the parties from supporting said agreement.

BERING SEA FISHERY SIMULATION MODEL RESULTS FOR VARIOUS CRAB CAPS

by David Ackley, ADF&G

The Bering Sea fishery simulation model was employed to estimate the economic impacts of reducing crab caps in the Bering Sea. A general discussion of the model follows in the next section, and a detailed discussion can be found in Amendments 21a and 21b, as well as in the EA/RIR for Amendment 37 (NPFMC 5/10/96, pp.64-66 and Appendix 8). Detailed output from the model was not provided for this section in order to conserve space, and because the output is similar to other model runs in this amendment.

The Bering Sea fishery simulation model was modified to include the bycatch of *Chionoecetes opilio* crab and assign caps for this species. The value data for C. bairdi, C. opilio and red king crab were updated for this analysis as well. The model was run with the most constraining options in place to examine the greatest expected changes from Status Quo. Model runs using both the 1993 and 1994 data sets included the following options: (1) Status Quo which included a three month closure of the Red King Crab Savings Area; (2) a Zone 1 cap for bairdi crab of 850,000 and a Zone 2 bairdi crab cap of 1.5 million crab; (3) a Zone 1 cap of 35,000 red king crab; (4) a Zone 2 cap of 11 million opilio crab; (5) a run with all of the above caps in place (850,000 Zone 1 bairdi, 1.5 million Zone 2 bairdi, 11 million Zone 2 opilio, and 35,000 Zone 1 red king crab) as well as the closure of the Red King Crab Savings Area; (6) a run with all of the above caps, the Red King Crab Savings Area closure, and the Northern Bristol Bay closure (7) the caps and closures as above in (6) with the additional constraint of a 6 million opilio crab cap in Zone 2; and (8) The June 1996 Council action to close the Red King Crab Savings Area on an annual basis, close Northern Bristol Bay to trawling (the 2 block opening not included in this analysis), and based on population size, set the Zone 1 cap of red king crab at 100,000 crab. In addition (8) applies a Zone 1 cap on bairdi at 750,000 crab and the Zone 2 bairdi cap at 2.1 million crab.

The model runs which examined the impacts of various area alternatives for the Red King Crab Savings Area were presented in the EA/RIR for Amendment 37. The impacts of the Northern Bristol Bay Closure were estimated by model runs and presented in sections 4.0 and 6.0. The results of the cap analysis runs presented here can be compared with the previous runs with the caution that splitting Tanner crab into bairdi and opilio separately may have changed the bycatch rates of areas, and that the crab values have been updated. Details of the model and assumptions are available in the draft EA/RIR for Amendment 37.

The bycatch of the crab species in 1993 and 1994, largely because of existing caps, were not generally in excess of the most restrictive options used in the model runs, and often were below the more restrictive caps. For instance, under Status Quo in the 1993 data, 7.5 million opilio crab were estimated to be bycaught in Zone 2 in the absence of a cap, and in 1994 approximately 10 million opilio crab were estimated to be bycaught in Zone 2. The cap used for opilio crab was 11 million, so that only specific fisheries might be affected by the opilio cap, since the overall cap of 11 million exceeded the bycatch from all fisheries in each year. Thus the model does not capture the impacts of years in which the bycatch rates for any of the species might be higher. Similarly, the impacts of a cap might be less than the model predicts if crab were caught at a higher rate in 1993 or 1994 than would happen in future fisheries, as was the case in 1994. The bycatch of red king crab predicted by the model from 1994 data was approximately 90,000 red king crab with the 3 month Red King Crab Savings Area closure in place, while in 1995 the actual number bycaught was approximately at the most restrictive cap of 35,000 crab.

The constraints on the fishing fleet by the individual crab caps (Alternatives Bairdi (850,000 Zone 1, 1.5 million Zone 2); Red (35,000 Zone 1); and Opilio (11 million Zone 2) resulted in changes in net benefits to the Nation from Status Quo of less than approximately $500,000 under the 1993 data set (attached Table). This is because the bycatch of each crab species available to the model was similar to the caps in that year. The model runs based on the 1994 data estimated decrements to the net benefits to the Nation of from approximately $1 million

to $4.8 million. The reduction of the red king crab cap to 35,000 resulted in the greatest change from Status Quo under both the 1993 and 1994 data.

Model runs to estimate the impacts of all three management measures in place concurrently were also made using the 1993 and 1994 data. These runs simulated a closure of the Red King Crab Savings Area for the first three months of the year, a closure of the Northern Bristol Bay area, and caps of 850,000 bairdi crab in Zone 1, 1.5 million bairdi crab in Zone 2, 11 million opilio crab in Zone 2, and 35,000 red king crab in Zone 1 (indicated as RKC,Caps,N.BB in the attached Table). With these constraints in place, the estimated net benefits to the Nation decreased by approximately $1.4 million using the 1993 data set and by approximately $3.9 million using the 1994 data set.

Reducing the opilio cap to 6 million crab in addition to all of the proposed closures and caps above reduced the estimated net benefits to the action from status quo by approximately $1.4 million using the 1993 data and by approximately $11.1 million using the 1994 data (indicated as RKC,Cap,BB,6 mil.Op in the attached Table). The reason there was no change from all proposed closures and caps in place using the 1993 data and decreasing the opilio cap by 5 million crab was that the bairdi caps closed the Zone 2 fisheries which would have been impacted by the reduced caps. Using the 1994 data, it was the opilio cap rather than the bairdi cap which was more constraining. The overall bycatch of opilio crab was not greatly reduced in 1993 from status quo because the bairdi crab closure caused fishing to occur outside of Zone 2 where opilio crab bycatch is still substantial.

Additional runs to estimate the impacts of measures taken in June 1996 with the most recent (September 1996) suggested caps for bairdi crab in place were also made (indicated as RKC,current,BB in the attached Table). Under these runs with the 1993 and 1994 data the following assumptions applied: (1) Annual closure of the Red King Crab Savings Area; (2) Annual closure of Northern Bristol Bay (due to programming difficulty and time available, the summer opening of two blocks for yellowfin sole fishing was not included as an option); (3) a 100,000 red king crab cap in Zone 1 based on current population estimates for 1996; (4) a Zone 1 cap of 750,000 bairdi crab and a Zone 2 cap of 2.1 million bairdi crab. The estimated net benefits to the nation decreased by approximately $1.2 million using the 1993 data set and by approximately $2.2 million using the 1994 data set. These decrements in net benefits to the Nation represent changes from Status Quo of 0.4% and 0.8% in the 1993 and 1994 data sets, respectively.

Table . Summary of total catch, bycatch, total gross and net values of catch and bycatch, and estimated total net benefits to the Nation under status quo and combinations of bairdi, opilio and red king crab caps - 1993 and 1994 data.

Model runs based on 1993 data

Alternative	Total Catch	Total Retained Catch	Total Gross Value	Total Net Value	Tanner Crab	Opilio Crab	Red King Crab	Halibut	Chinook Salmon	Other Salmon	Herring	Gross Value Bycatch	Net Value Bycatch	Total Gross minus Bycatch Gross	Total Net minus Bycatch Net
Status Quo	1,809,778	1,552,688	$847,189,115	$315,373,429	2,278,571	14,941,488	63,692	3,708	50,506	98,496	746	$46,719,083	$20,923,772	$800,470,032	$294,449,657
Bairdi	1,807,370	1,551,953	$846,410,232	$315,091,474	2,093,271	14,238,044	61,082	3,663	50,508	98,496	746	$44,682,729	$20,103,812	$801,727,503	$294,987,662
Red	1,812,070	1,552,768	$846,615,608	$315,238,220	2,330,484	15,029,742	63,987	3,691	50,549	98,496	746	$47,071,607	$21,050,105	$799,744,001	$294,188,114
Opilio	1,809,264	1,552,380	$846,974,451	$315,295,721	2,268,976	14,873,835	63,692	3,708	50,508	98,496	746	$46,604,656	$20,879,579	$800,369,795	$294,416,142
Bairdi,Red,Opilio	1,800,044	1,548,209	$843,358,594	$313,986,781	2,084,468	13,248,501	56,844	3,638	50,549	98,496	746	$43,699,035	$19,701,343	$799,659,559	$294,285,438
RKC,Caps,N.BB	1,792,522	1,543,523	$839,924,271	$312,743,556	2,115,971	13,416,553	54,936	3,601	50,403	98,496	631	$43,686,418	$19,651,917	$796,237,853	$293,091,639
RKC,Cap,BB,6 mil.Op	1,792,522	1,543,523	$839,924,271	$312,743,556	2,115,971	13,416,553	54,936	3,601	50,403	98,496	631	$43,686,418	$19,651,917	$796,237,853	$293,091,639
RKC,current,BB	1,802,213	1,547,987	$843,711,202	$314,114,888	2,304,461	15,166,112	60,923	3,672	50,436	98,953	634	$46,698,720	$20,871,349	$797,012,482	$293,243,539

Model runs based on 1994 data

Alternative	Total Catch	Total Retained Catch	Total Gross Value	Total Net Value	Tanner Crab	Opilio Crab	Red King Crab	Halibut	Chinook Salmon	Other Salmon	Herring	Gross Value Bycatch	Net Value Bycatch	Total Gross minus Bycatch Gross	Total Net minus Bycatch Net
Status Quo	1,803,803	1,538,805	$827,694,490	$305,508,379	2,597,799	10,914,052	90,030	4,576	42,216	49,528	1,600	$51,225,167	$23,341,231	$776,469,322	$282,167,148
Bairdi	1,786,906	1,528,925	$821,268,068	$303,180,458	2,344,968	11,808,740	90,900	4,743	41,992	49,531	1,612	$50,915,043	$23,329,385	$770,353,025	$279,851,073
Red	1,784,587	1,530,085	$809,049,182	$298,758,777	2,401,238	10,234,614	45,766	4,266	41,987	49,528	1,611	$46,985,008	$21,420,894	$762,064,174	$277,337,884
Opilio	1,803,653	1,535,666	$827,078,518	$305,285,397	2,500,570	11,349,426	89,894	4,870	42,216	49,528	1,600	$52,179,102	$23,696,895	$774,899,416	$281,388,502
Bairdi,Red,Opilio	1,785,714	1,548,466	$818,242,888	$302,471,879	1,970,888	11,871,255	45,950	4,487	42,273	49,531	1,612	$46,202,502	$21,268,206	$772,040,386	$281,203,674
RKC,Caps,N.BB	1,764,899	1,533,632	$809,665,495	$299,366,870	1,914,034	12,042,348	46,873	4,459	42,295	49,531	1,586	$45,807,519	$21,095,858	$763,857,976	$278,271,012
RKC,Cap,BB,6 mil.Op	1,694,281	1,501,448	$784,411,138	$290,224,793	1,483,508	9,607,004	46,473	4,416	42,295	49,531	1,580	$40,906,334	$19,174,679	$743,504,804	$271,050,114
RKC,current,BB	1,791,207	1,529,788	$822,715,053	$303,705,815	2,545,413	11,058,983	91,518	4,798	42,009	49,529	1,588	$51,965,200	$23,767,083	$770,749,853	$279,938,753

DIFFERENCE FROM STATUS QUO

Model runs based on 1993 data

Alternative	Total Catch	Total Retained Catch	Total Gross Value	Total Net Value	Tanner Crab	Opilio Crab	Red King Crab	Halibut	Chinook Salmon	Other Salmon	Herring	Gross Value Bycatch	Net Value Bycatch	Total Gross minus Bycatch Gross	Total Net minus Bycatch Net
Status Quo															
Bairdi	-2,408	-735	-$778,883	-$281,956	-185,300	-703,444	-2,610	-46	0	0	0	-$2,036,354	-$819,961	$1,257,471	$538,005
Red	2,292	80	-$373,507	-$135,210	51,913	88,254	296	-17	42	0	0	$352,524	$126,333	-$726,031	-$261,543
Opilio	-514	-308	-$214,664	-$77,708	-9,595	-67,653	0	0	0	0	0	-$114,427	-$44,193	-$100,237	-$33,515
Bairdi,Red,Opilio	-9,734	-4,479	-$3,830,521	-$1,388,649	-194,103	-1,692,988	-6,847	-70	42	0	0	-$3,020,047	-$1,222,429	-$810,473	-$164,220
RKC,Caps,N.BB	-17,256	-9,165	-$7,264,844	-$2,629,874	-162,600	-1,524,935	-8,756	-107	-104	0	-115	-$3,032,665	-$1,271,855	-$4,232,179	-$1,358,018
RKC,Cap,BB,6 mil.Op	-17,256	-9,165	-$7,264,844	-$2,629,874	-162,600	-1,524,935	-8,756	-107	-104	0	-115	-$3,032,665	-$1,271,855	-$4,232,179	-$1,358,018
RKC,current,BB	-7,566	-4,721	-$3,477,913	-$1,258,542	25,890	224,624	-2,769	-38	-71	457	-112	-$20,362	-$52,424	-$3,457,550	-$1,208,118

Model runs based on 1994 data

Alternative	Total Catch	Total Retained Catch	Total Gross Value	Total Net Value	Tanner Crab	Opilio Crab	Red King Crab	Halibut	Chinook Salmon	Other Salmon	Herring	Gross Value Bycatch	Net Value Bycatch	Total Gross minus Bycatch Gross	Total Net minus Bycatch Net
Status Quo															
Bairdi	-16,897	-7,881	-$6,426,422	-$2,327,921	-252,831	894,688	870	168	-224	2	12	-$310,124	-$11,846	-$6,116,298	-$2,316,075
Red	-19,216	-6,740	-$18,645,308	-$6,749,601	-196,561	-679,438	-44,265	-310	-228	0	11	-$4,260,160	-$1,920,337	-$14,385,148	-$4,829,264
Opilio	-151	-1,140	-$615,972	-$222,982	-97,229	435,374	-137	295	0	0	0	$953,935	$555,664	-$1,569,907	-$778,646
Bairdi,Red,Opilio	-18,089	9,661	-$9,451,621	-$3,036,500	-626,911	957,203	-44,080	-88	58	2	12	-$5,022,665	-$2,073,026	-$4,428,956	-$963,474
RKC,Caps,N.BB	-38,905	-3,173	-$18,028,995	-$6,141,509	-683,766	1,128,294	-43,157	-116	79	2	-14	-$5,417,648	-$2,245,373	-$12,611,347	-$3,896,136
RKC,Cap,BB,6 mil.Op	-109,522	-35,358	-$43,283,351	-$15,283,586	-1,114,291	-1,307,047	-43,558	-159	79	2	-20	-$10,318,833	-$4,166,552	-$32,964,518	-$11,117,034
RKC,current,BB	-12,596	-7,017	-$4,979,436	-$1,802,564	-52,386	144,911	1,488	221	-206	1	-12	$740,033	$425,831	-$5,719,469	-$2,228,395

Bairdi = 850,000 Zone 1 cap, 1.5 million Zone 2 cap; Opilio = 11 million Zone 2 cap; Red = 35,000 Zone 1 cap. 6 mil. Op = Zone 2 Opilio cap of 6 million crab.
Current = 100,000 RKC, annual RKC closure;750,000 Zone 1 Bairdi; 2.1 million Zone 2 Bairdi.

AGENDA C-1
SUPPLEMENTAL
SEPTEMBER 1996

DRAFT Minutes of the Bering Sea/Aleutians Islands Crab Plan Team Meeting, September 5, 1996

Members Present:

Joshua Greenberg (UAF)
Ken Griffin (ADF&G)
Rance Morrison (ADF&G)
Peggy Murphy (ADF&G, chair)
Jerry Reeves (NMFS)
Kim Rivera (NMFS)
Bob Otto (NMFS)
Doug Pengilly (ADF&G)
Tom Shirley (UAF)
Dave Witherell (NPFMC)

The Bering Sea/Aleutian Islands Crab Plan Team me by Teleconference on September 5, 1996. The Team discussions focused on the following agenda:

Introduction
Approval of May 17 and 20, 1996 minutes
Review 1996 status of stocks and GHLs for Bering Sea/Aleutian Islands crab
Summary of June 1996 Council decisions on red king crab and August 1996 industry negotiations for Tanner and snow crab PSC limits
Groundfish FMP proposal concerning crab bycatch in Pacific Cod pot fishery
Research related to temperature, wind speed and crab viability.
Review progress and release dates for FMP update and SAFE document.

The Crab Plan Team welcomed Kim Rivera back as the representative for the NMFS Alaska Region Office. Team meeting minutes from May 17 and 20 were approved. Dave Witherell noted the Team was admonished for making PSC limit recommendations. The Team discussed it's rational for recommended PSC limits noting conservation concerns for both red king crab and Tanner crab, and the uncertainty surrounding the status of the snow crab stock. The Team also referred to it's terms of reference and members concurred that their actions to address PSC limits were reasonable.

Public requests for addition of two topics to the agenda were granted.

Review of 1996 status of stocks and guideline harvest levels (GHLs) for Bering Sea king, Tanner and snow crabs

Bob Otto reviewed survey assessment of each stock and Doug Pengilly discussed GHLs.

St. Matthew blue king crab population looks good. Abundance is at a medium to high level and stable. Some question remains as to the precision of the abundance estimate from area swept method because a portion of the blue king crab habitat is rocky and untrawlable. The question is then raised whether the population abundance is over or underestimated. Bob indicated that it is most likely underestimated and this is corroborated by results of the 1995 ADF&G pot survey of the area and a 1983 tagging study. Doug stated the abundance of mature male crabs was well above the threshold level of 0.60 million males > 104 mm carapace length (CL). An exploitation

rate of 20% applied to the 5.2 million mature males yielded a GHL of 4.3 million pounds.

Pribilof blue king crab population abundance is similar to last year and the abundance index for males >119 mm CL is well above the threshold of 0.77 million crabs. Recruitment to the stock is uncertain. Pribilof red king crab abundance is reduced compared to last year. No hot spot was observed in this year's survey which had contributed to the high abundance in the past. Low CPUE of Pribilof red king crab in the 1995 commercial fishery is also indicative of reduced abundance. There is no established threshold for the Pribilof Island red king crab stock. The pribilof Islands fishery will open with a combined harvest of blue and red king crab. A GHL of 1.8 million pounds is based on a 20% exploitation level applied to the estimated abundance of mature male blue king crab and some expected incidental catch of red king crab.

Bristol Bay red king crab abundance increased from 1995 to 1996 but the population is still considered to be at a low level compared to historic abundance. Legal red king crab abundance is low and should remain stable if anticipated recruitment occurs. One cohort that is ubiquitous on the grounds and has been followed for three years should mature next year. The area swept estimate of abundance and the length based analysis (LBA) estimate of abundance are close. The LBA estimated abundance of mature female crabs at 10.2 million crabs and an effective spawning biomass of 20.3 million pounds. The stock is above threshold of 8.4 million females > 89 mm CL and an effective spawning biomass of 14.5 million pounds. Effective spawning biomass is below 55 million pounds so the abundance of mature male crab is multiplied by a 10% harvest rate to calculate the GHL. The 1996 Bristol Bay red king crab GHL is 5 million pounds. This stock condition places the PSC limit for red king crab in 1996/1997 at 100,000 crabs.

Doug Pengilly, Bob Otto and Rance Morrison answered questions from public concerning percent change in abundance of Bristol Bay red king crab between 1995 and 1996 and inseason management of the king crab fisheries.

Bob Otto discussed the survey results for Tanner crab. Abundance of legal males declined from the 1995 survey but recruit males declined even more. Bob noted that these declines were not statistically significant. The majority (72%) of the harvestable stock is located between 163° and 168° longitude and can be characterized as "dirty" crab. There is a large mode of crabs just smaller than legal size that has not grown as evidenced by old shells. Most likely these crabs will dissipate prior to recruiting. The stock is considered fragile. There are no promising modes that lead to stock increase. Decreased stock abundance is probable. Doug Pengilly noted that the Tanner crab fishery opens concurrently with the red king crab fishery. Given legal Tanner crab are concentrated between 163° and 168° W. longitude and their very old shell condition, only incidental harvest of Tanner crabs is expected during the red king crab fishery. Therefore the area east of 163° W will not be managed for a Tanner crab GHL. A GHL of 6.2 million pounds was set for Tanner crab west of 163° W. longitude.

Survey results for snow crab indicate the population of large crabs has approximately doubled since last season. The huge mode of small crab west of 173° is declining, dissipating, and showing an increased incidence in bitter crab. Several hypothesis for the rapid decline in the abundance of small crab were discussed by the Team. A large year-class of cod, a known

predator of snow crab, is now prevalent. Given the likelihood that snow crab are a transboundary stock, the potential for significant foreign harvest across the international dateline was mentioned. Rance Morrison indicated there is no record of recent activity across the line. The Team also discussed the potential for increased mortality due to bitter crab syndrome which is lethal, highly contagious, and can be spread to uncontaminated areas as evidenced by the past outbreak in Southeast Alaska.

A GHL of 117 million pounds of male snow crab was based on 58% harvest rate of crab 4 inches and greater. No Eastern or Western Subdistrict guidelines were established as the crab were located predominately in the Eastern Subdistrict.

Summary of June 1996 Council decisions on red king crab and August 1996 industry negotiations for Tanner and snow crab PSC limits

Dave Witherell recapped the Council actions taken at the June 1996 meeting to protect red king crab in Bristol Bay. The Council adopted the stairstep PSC limits based on effective spawning biomass that the plan team recommended. The Council adopted a year-round closure of the red king crab savings area with opening of the area from 56° to 56° 10' when the Bristol Bay red king crab GHL>0. The Council also adopted the Team's recommendation for the Nearshore Bristol Bay Closure Area: prohibit all trawling on a year-round basis in the area east of 162° W., with the exception of an area bounded by 159° to 160° W and 58° to 58° 43' N. that would remain open to trawling during the period April 1 to June 15 each year. The Council recommended all vessels fishing for groundfish in the Red King Crab Savings Area and the area bounded by 159° and 160° W. have 100% observer coverage. In addition, the Council recommended closure areas and crab PSC limits be evaluated on a regular basis.

The Council assigned Tanner and snow crab PSC limits to an industry Negotiation Team that met August 29 and 30, 1996. Dave Witherell explained the Tanner crab PSC limits agreed on at negotiations and noted there was no agreement on PSC limits for snow crab. The Negotiating Team recommended the PSC limits be subject to review in 3 years and in the interim, other approaches to PSC limits would be analyzed. All members of the Crab Plan Team applauded the efforts of the Negotiation Team to reach agreement on PSC limits for Tanner crab. The Team supports the PSC limits negotiated for Tanner crab.

The Team turned their attention next to snow crab. Dave Witherell indicated there was a high probability that negotiations would be resumed at some future point to address snow crab PSC limits so the Team did not revisit their previous recommendation for an opilio PSC limit. The Team supports negotiation of snow crab PSC limits by industry. The Team noted the 1996 survey showed a harvestable surplus of snow crabs for the next few years followed by no recruitment to the harvestable stock due to the precipitous decline in abundance of small snow crab. The Team voiced several concerns given survey results. First, they noted the potential for higher bycatch of snow crab with the increased abundance of larger mature crabs. Second, the Team emphasized that if recruitment slows or fails as projected in the near future, then PSC limits are important to protect remaining breeding crabs. It was then brought to the plan teams attention that a very small sample size was used to determine the mean size of snow crab bycatch in

groundfish trawls. That fact instigated the following discussion of PSC currency, methodology for PSC accounting and it's subsequent expansion to the trawl fleet.

Crab PSC Discussion

The Crab Plan Team embarked on a detailed discussion of crab PSC currency and accounting for the following reasons:

1) previous discussions by the SSC and Crab Plan Team on PSC currency;
recommendation by the Council in June to reevaluate PSC limits on a regular basis;
3) continued conservation concerns for red king and Tanner crabs;
potential lack of recruitment to the snow crab stock in the near future;
recommendations by the Negotiating Team to review PSC limits and analyze new approaches to PSC accounting; and
repeated qualification in the Crab Plan Team's recommended PSC limits to review PSC currency as better data become available.

The Team recognized that any PSC limitation necessitates an observer sampling plan to account for the prohibited species bycatch. The Team acknowledges that prioritization of data collected on board groundfish vessels is beyond their purview but would like to submit the following list of issues needing resolution to insure a statistically sound accounting system for crab PSC.

The Team feels crab PSC limits should be based on the crab impacted by the groundfish trawl fleet. The team is concerned about how representative basket samples of a haul are of haul bycatch of crab and how representative are individual hauls of the total fleet i.e. how precise are current estimates of the number of crabs bycaught? Future discussions of PSC sampling would benefit from availability of the review of the bycatch sampling program.

Limited special project sampling to accommodate data needs for evaluation of crab bycatch in amendment 37/41 EA/RIR may not be sufficient to develop a robust sampling plan for accounting of PSC of crab. Size selectivity of trawl gear used to take the samples and the geographic area fished are but two factors that may influence the number and size of crabs bycaught. Initial sampling plans may need to be tailored to optimize a future sampling program.

The Team is also concerned that sexing, counting, then weighing crabs as a unit does not result in a representative average size of the crab bycaught. For example: ovigerous female crabs weigh a great deal more than females without an egg clutch; and a count of 14 male crabs, ten immature and 4 old shell mature would lead to an average weight corresponding to a mature crab when in fact most were immature. Additional concerns of the Team were decreased vitality of damaged crab and expected mortality of molting and soft shell crab encountering trawl gear.

The Team concluded that measurement of each crab counted would verify size of bycaught crab and future PSC limits could then be based potentially on a more representative currency. Notation of crab condition and presence or absence of eggs would be highly desirable for more detailed definitions of currency such as biomass and application of a mortality schedule.

In summary, the Team's primary concerns with assessing crab PSC are :
the precision of the bycatch sampling program;
need for multi-staged sampling programs for crab PSC including geographic distribution of samples and sampling fraction; and
measurement of crab carapace width (length for red king crab) and notation of female ovigerity and crab condition.

The intent of the Crab Plan Team is not to criticize rather to provide their guidance on potential enhancement of the program that collects data concerning crab PSC.

Groundfish FMP proposal concerning crab bycatch in Pacific Cod pot fishery

Mr. John Gauvin asked the Team to comment on a Groundfish Fishery Management Plan Amendment Proposal submitted to the Council to implement a Bering Sea PSC cap for the groundfish pot fishery for red king crab in Zone 1 and Tanner crab in Zones 1 and 2. Dave Witherell pointed out two issues with the proposal, one is biological conservation of red king and Tanner crab and the other concerns fairness and equity of bycatch accounting among all gear types. The Crab Plan Team recommended the proposal be given a high priority for analysis. Should an EA/RIR be drafted for the proposed amendment the Team noted particular topics it would find of interest would include crab condition, crab maturity, characteristics and history of development of the groundfish pot fishery, and a summary of observer data collected and coverage by geographic area.

Research on effect of wind chill factor on *C. opilio*.

Dave Benson asked the Team to briefly describe the research on the combined effects of temperature, wind speed and crab vitality. Peggy Murphy indicated no laboratory studies or directed field studies had been completed on the subject. However, the NMFS, Auke Bay Laboratory did study the relationship between cold air exposure and Tanner and red king crab mortality. A new project has been initiated by ADF&G to estimate historical handling mortality rates of Bristol Bay red king crabs and Eastern Bering Sea Tanner crabs from cold air exposure.

Review progress and release dates for FMP update and SAFE document.

The Crab Plan Team will issue the administrative update of the crab FMP and the Crab Plan Team SAFE document in February prior to the joint Board of Fisheries and NPFMC meeting.

Others in Attendance: David Ackley, Dave Benson, Susie Byersdorfer, Larry Byrne, Tom Casey, Bill Donaldson, John Gauvin, Brent Paine, Lisa Polito, and Donn Tracy.

STOCK STATUS OF BRISTOL BAY RED KING CRABS IN 1996

By

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PURPOSE

The purpose of this report is to provide timely information to the fishing industry and public on the status of the Bristol Bay stock of red king crabs *(Paralithodes camtschaticus)* in 1996. We briefly review stock assessment methodology, current stock status, implications for the crab fishery and bycatch management, and an outlook for the future. The Alaska Department of Fish and Game (ADF&G) plans this report as the first in a series of annual reports on stock status on Bering Sea and Aleutian Islands crab stocks for which population estimation models are applied.

STOCK ASSESSMENT METHODS

The National Marine Fisheries Service (NMFS) has conducted annual trawl surveys of the eastern Bering Sea since 1968. This multispecies survey is conducted during summer by two vessels each equipped with an eastern otter trawl with 83 ft headrope and 112 ft footrope. Stations are sampled in the center of a systematic 20X20 nm grid overlaid in an area of approximately 141,000 nm^2. The sampled area is estimated, and fish and invertebrate catches from each station are sampled, enumerated, measured and weighed. Survey results and area-swept estimates of abundance are published annually (Stevens et al. 1996) for the major stocks: Bristol Bay and Pribilof Islands red king crabs, St. Matthew and Pribilof Islands blue king crabs *(Paralithodes platypus)*, and eastern Bering Sea Tanner *(Chionoecetes bairdi)*, snow *(C. opilio)*, and hair crabs *(Erimacrus isenbeckii)*. Status of Bering Sea groundfish stocks are reported separately (NPFMC 1995).

The annual NMFS trawl survey is an essential tool for gathering good data on the status of crab and groundfish stocks in the eastern Bering Sea. Yet, year-to-year variation associated with shifts in oceanographic conditions lead to changes in species distribution and subsequent availability to survey gear. These changes cause measurement errors in area-swept abundance estimates unrelated to true changes in population size. Estimates from previous year's surveys coupled to commercial catch records and onboard observer data provide extremely valuable information to decipher real population changes from survey measurement errors. To accomplish this, we developed a length-based analysis (LBA) that makes use of detailed size, sex, and shell condition data from trawl surveys, onboard and dockside catch samples, and annual commercial harvest data. We feel that LBA estimates based on multiple years of data and multiple data sources are generally more accurate than area-swept estimates from current-year survey data alone. Accordingly, the LBA estimates are used to manage the red king crab fishery in Bristol Bay.

CURRENT STOCK STATUS

LBA estimates of Bristol Bay red king crab abundance and 95% bootstrap confidence limits for 1996 are shown in Table 1. Historical changes in legal male and mature female

abundance are graphed in Figure 1. Because trawl survey catches of small juveniles are unreliable, we restricted our analysis to males ≥95 mm carapace length (CL) and females ≥90 mm CL that appear to be fully recruited to the surveyed stock (Zheng et al. 1995a). Abundance estimates of all recruited size classes of males and females show slight increases from 1995. Estimated recruitment of males to the surveyed stock increased from 2.2 to 3.6 million crabs whereas estimated recruitment of females jumped from 1.8 to 3.9 million crabs. The most significant change for fishery management purposes was the increase of estimated mature female abundance to 10.2 million crabs. In 1995 the estimated abundance of mature females was 8.451 which was judged to be at the threshold of 8.4 million females, and the commercial fishery remained closed for the second consecutive year (Zheng et al. 1996). Using the most recent (1996) survey data, the hindcast abundance of mature females in 1995 increased slightly to 8.565 million (Table 1). The difference between the two estimates of 1995 abundance are attributable to growth of small females to the fully-recruited size classes and the collection of a second year of data on these young females.

LBA estimates compare very favorably with our preliminary area-swept survey estimates for 1996. The LBA estimate of 7.7 million mature males is slightly greater than the area-swept estimate of 7.6 million, whereas the LBA estimate of 5.3 million legals is slightly lower than the area-swept estimate of 5.6 million. The LBA estimate of 10.2 million mature females is less than the area-swept estimate of 12.0 million. Because LBA attempts to smooth out measurement errors, LBA estimates will be sometimes higher and sometimes lower than area-swept estimates.

Much of the change in stock status from 1995 to 1996 is attributable to recruitment of young crabs to the surveyed stock (Figure 2). Over the past three years there has been a general increase in the abundance of small males (<115 mm CL) and females (<105 mm CL). Larger females have generally been declining slowly since 1994 due to senescence and a recent lack of successful year classes. Males between 120-140 mm CL have declined for the same reasons. On the other hand, the absence of a commercial fishery has permitted the population to accrue more large males (>140 mm CL) during 1994-1995. Reduced trawl bycatch of red king crabs from 280,000 in 1994 to 45,000 in 1995 (NPFMC 1996) may well have contributed to the favorable changes in stock.

Despite stock improvements, the Bristol Bay stock of red king crabs remains quite low (Table 1). The current effective spawning biomass (ESB)[1] of 20.3 million pounds is less than half of the target rebuilding level of 55 million pounds. Recruitment levels of males and females are the 5th and 8th lowest, respectively, among the 24 years of recruitment estimates. Nonetheless, these recruitment levels are the highest seen since 1992 (males) and 1989 (females).

[1] ***Effective spawning biomass*** is the estimated biomass of mature female crabs that the population of mature male crabs could successfully mate in a given year.

FISHERY MANAGEMENT IMPLICATIONS

Bristol Bay Red King Crab Fishery

In March 1996 the Alaska Board of Fisheries adopted a new fishery management strategy to promote stock rebuilding and optimal harvest of the Bristol Bay red king crab stock. The strategy sets an annual guideline harvest level (GHL) by harvest rate coupled to a fishery threshold. When the stock is at or below threshold of 8.4 million mature females (>90 mm CL) or 14.5 million pounds of ESB, the fishery is closed. When the stock is above both of these criteria, GHL is determined by the abundance of mature and legal-sized males. A reduced mature male harvest rate of 10% is applied to promote stock rebuilding when ESB is below the target rebuilding level of 55 million pounds. Once the stock is rebuilt (at or above 55 million pounds of ESB) a 15% harvest rate is applied to mature male abundance. To prevent a disproportionate harvest of large male crabs, the GHL is capped so that no more than 50% of the legal male crabs may be harvested in any one year.

In 1996, the Bristol Bay red king crab stock is above threshold because the mature female abundance estimate was 10.2 million crabs and ESB was 20.3 million pounds. By applying bootstrapping procedures to our LBA, we estimated that the 95% confidence levels of mature female abundance were 8.145 to 13.788 million females. Thus, there is some small chance (about 5%) that the true abundance of mature females is less than the threshold of 8.4 million mature females. However, this risk is tolerable, because a conservative (10%) harvest rate promotes stock rebuilding. By applying the 10% harvest rate times the mature male abundance of 7.795 million crabs, we estimate a harvest of 779,500 crabs. Because 779,500 is only 15% of the legal male abundance, the 50% cap is not required. By multiplying 779,500 crabs times an average weight of 6.36 pounds per legal crab, we estimated a GHL of 5.0 million pounds for 1996. This GHL was announced by ADF&G news release on August 14, 1996. The fishery will open at noon on November 1, 1996.

Eastern Bering Sea Tanner Crab Fishery

The status of the Bristol Bay red king crab stock has implications on the eastern Bering Sea Tanner crab fishery. In years, such as 1994 and 1995, when the red king crab fishery was closed, the waters of the eastern Bering Sea east of 163° West longitude do not open for Tanner crab fishing by regulation 5 AAC 35.519. This area closure, coupled to regulation 5 AAC 35.525 that restricts vertical tunnel entrances to 3 inches, reduces potential impacts of the Tanner crab fishery on depressed king crab stocks. Because the red king crab fishery will open in 1996, the Tanner crab fishery will not be restricted to areas west of 163° W by this regulation. In 1996, the Tanner crab season in waters east of 168° W will open and close concurrent with the red king crab fishery. This promotes efficiency in these crab fisheries while reducing handling and bycatch. A news release issued August 29, 1996 stated that 10 days after the closure of the Bristol Bay red king crab season the Tanner crab fishery will reopen between 163° and 173° W with a GHL of 6.2 million pounds.

Bering Sea Groundfish Trawl Fisheries

In June 1996, the North Pacific Fishery Management Council (NPFMC) recommended to the Secretary of Commerce two crab bycatch measures that depend on the status of red king crabs in Bristol Bay. First, the NPFMC established new guidelines for setting annual prohibited species catch (PSC) limits for red king crabs caught during groundfish trawl fisheries. Previously, the PSC limit was 200,000 red king crabs in Bycatch Limitation Zone 1 in the eastern Bering Sea. Pending approval by the Secretary of Commerce, the new PSC limit for any year is set as a function of estimated ESB of Bristol Bay red king crabs in the prior year (Figure 3). PSC limits are linked to the same ESB levels that lead to adjustments in harvest rate for the crab fishery. When the ESB is less than or equal to 14.5 million pounds or mature females are less than or equal to 8.4 million crabs, the crab fishery is closed and the PSC is set at 35,000 crabs. When ESB exceeds 14.5 million pounds but is less than 55 million pounds, the PSC is 100,000 crabs. Finally, when ESB is greater than or equal to 55 million pounds the PSC becomes 200,000 crabs. Given the estimates of mature female abundance and ESB for 1996, the PSC limit for groundfish trawl fisheries in the Bering Sea is set at 100,000 crabs for 1997.

Second, to protect adult red king crabs and their habitat the NPFMC established a year-round closure to non-pelagic trawling in the Red King Crab Savings Area (162° to 164° W, 56° to 57° N). In years in which there is a red king crab fishery in Bristol Bay, the portion of the Red King Crab Savings Area bounded by 56° to 56° 10' N latitude remains open to the rock sole fishery. Therefore, owing to the red king crab fishery in November 1996, the rock sole fishery will have access to this 10' area during the 1997 fishery. For this area a separate bycatch limit is established not to exceed 35% of the red king crab prohibited species catch (PSC) limits apportioned to the rock sole fishery.

FUTURE OUTLOOK

Accurate predictions of future status of the Bristol Bay stock of red king crabs are not possible at this time. In 1997, the eastern Bering Sea survey will be repeated, results will be incorporated into the LBA, and the fishery will be managed by current harvest strategy.

We can offer some speculations about future stock status. Indeed, there are reasons for cautious optimism and other reasons for pessimism. For instance, many other red king crab stocks (e.g., Cook Inlet, Kodiak, Dutch Harbor) failed to recover today -- more than 15 years after a stock collapse in the early 1980s. On the other hand, stocks in Norton Sound and Southeast Alaska show that depressed red king crab stocks are capable of recovery.

An examination of the recruitment time series for Bristol Bay red king crabs (Table 1) shows that the data are highly autocorrelated. That is, good years tend to follow good years and poor years tend to follow poor years. It is conceivable that improved recruitment during 1996 may represent the leading edge (i.e., fastest growing segment) of a year class that

has not yet fully recruited to the survey gear. If so, it is possible that the stock may experience increasing recruitment over the next couple of years. However, note that increasing recruitment from 1990 to 1992 was followed by a decline from 1992 to 1994.

An understanding of year class success would be a great asset to predictions of future crab stock changes. Research is currently being conducted into the roles of spawning stocks and environmental factors on recruitment of red king crabs (Zheng et al. 1995a,b; Tyler and Kruse, in press). A stock-recruit curve was fit to data on ESB and recruitment that incorporates both stock (density-dependent) and environmental (autocorrelated) effects (Figure 4). Implications of the density-dependent component are that low recruitment results from low spawning stocks and moderate recruitment results from high spawning stocks. When stocks are intermediate, the probability of strong recruitment is greatest.

In fact, there has been slight improvement in recruitment from the 1987, 1988 and 1989 year classes (Figure 4). These were associated with increasing parental ESB levels of 24.5, 28.4, and 31.2 million pounds, respectively (Table 1). Yet, the recruits during these three years are less than expected from the stock-recruitment curve (Figure 4). ESB levels during spawning years 1990-1993 were 24.6 to 27.0 so there is some reason to believe that resultant year classes will be of similar magnitude to the 1987-1989 year classes. Given the low probability of a strong year class in the near future, the key to stock rebuilding will be to patiently accumulate effective spawning biomass toward the 55 million pound target level. It is hoped that recent changes in crab harvest strategy, trawl bycatch management, and crab habitat protection measures will promote this outcome.

A number of hypotheses have been proposed about effects of predation, food, and physical oceanographic conditions on king crab recruitment (Tyler and Kruse, in press). However, the general decline of crab recruitment since the late 1970s in Bristol Bay corresponds to broad trends in many physical and ecological factors, and it is not yet possible to draw definitive conclusions about cause and effect. Shifts in some physical oceanographic and ecological conditions of the Bering Sea and Gulf of Alaska seem related to the Aleutian Low Pressure System. Yearly trends in atmospheric pressure for January reveal a deepening of the Aleutian Low during the late 1960s through mid-1970s and a weakening of the Aleutian Low during the late 1970s through the late 1980s (Tyler and Kruse, in press). Thus, there is a general correspondence between air pressure and recruitment. The strength of the Aleutian Low Pressure System explains about 36% of the variability in red king crab recruitment in Bristol Bay. During recent years, 1989-1994, the Aleutian Low deepened again reminiscent of the late 1960s to mid-1970s, so there is some reason to think that environmental conditions may favor higher survival of the 1989-1994 year classes than occurred in the previous decade. However, more years of data are required to know whether the barometric pressure relationship with recruitment has true predictive value, and, if so, further research is needed to identify the underlying causes.

The current harvest strategy for Bristol Bay red king crabs should promote stock rebuilding regardless of whether improved future recruitment results from increased effective

spawning biomass, higher survival associated with more favorable environmental conditions, or a combination of both. Also, the threshold buffers against stock collapse should the recent increase in recruitment prove not to be sustained.

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Table 1. Annual abundance estimates (millions of crabs), effective spawning biomass (millions of pounds), and 95% confidence intervals for red king crabs in Bristol Bay as calculated by length-based analysis. Size measurements are carapace length.

	Males					Females		
Year	Recruits	Small (95-109 mm)	Pre-rec. (110-134 mm)	Mature (>119mm)	Legal (>134 mm)	Recruits	Mature (>89 mm)	Effective Spawning Biomass
			a. Abundance Estimates and Spawning Biomass					
1972	NA	13.635	15.182	18.668	10.088	NA	59.632	55.949
1973	33.561	21.708	28.440	23.626	10.588	32.855	69.667	65.373
1974	21.878	14.974	36.869	35.869	15.185	28.173	71.223	97.343
1975	32.985	21.330	37.480	43.008	21.243	21.755	65.804	116.186
1976	48.805	31.563	47.984	51.076	26.035	34.298	75.024	128.791
1977	57.745	37.775	64.589	65.327	30.957	72.172	118.540	171.947
1978	21.549	15.842	61.576	78.543	40.876	46.737	119.878	199.930
1979	12.681	8.809	37.795	75.326	48.378	18.837	92.982	166.904
1980	24.681	15.798	26.556	60.160	44.213	35.990	93.616	166.383
1981	17.188	11.653	17.541	18.618	9.467	13.618	71.523	59.787
1982	23.277	15.132	16.720	10.685	2.912	17.154	29.724	24.940
1983	12.927	8.980	13.733	9.183	2.477	4.828	10.030	16.728
1984	18.106	11.764	13.087	8.430	2.320	11.704	13.461	16.961
1985	11.225	7.706	11.136	7.152	1.784	4.798	7.146	10.699
1986	6.525	4.662	13.386	12.108	4.334	3.917	9.101	14.474
1987	7.002	4.693	11.784	14.203	6.683	8.911	15.532	24.525
1988	6.599	4.457	10.645	14.771	8.260	5.705	16.987	28.427
1989	5.448	3.727	9.729	15.684	9.670	5.515	17.885	31.232
1990	1.466	1.208	7.261	15.043	10.103	0.895	13.923	26.921
1991	4.007	2.564	5.173	11.923	8.452	3.762	13.931	27.062
1992	5.820	3.806	6.072	9.907	6.641	3.473	13.625	26.709
1993	1.994	1.791	6.620	9.724	5.787	2.191	12.122	24.601
1994	0.923	0.827	5.053	8.047	4.476	0.420	9.263	20.329
1995	2.220	1.488	3.915	7.837	5.116	1.799	8.565	18.640
1996	3.604	2.443	4.334	7.795	5.258	3.937	10.183	20.263
			b. 95% Confidence Limits in 1996:					
Lower	2.879	NA	3.535	6.408	4.201	2.900	8.145	NA
Upper	4.509	NA	4.943	8.704	5.993	6.277	13.788	NA

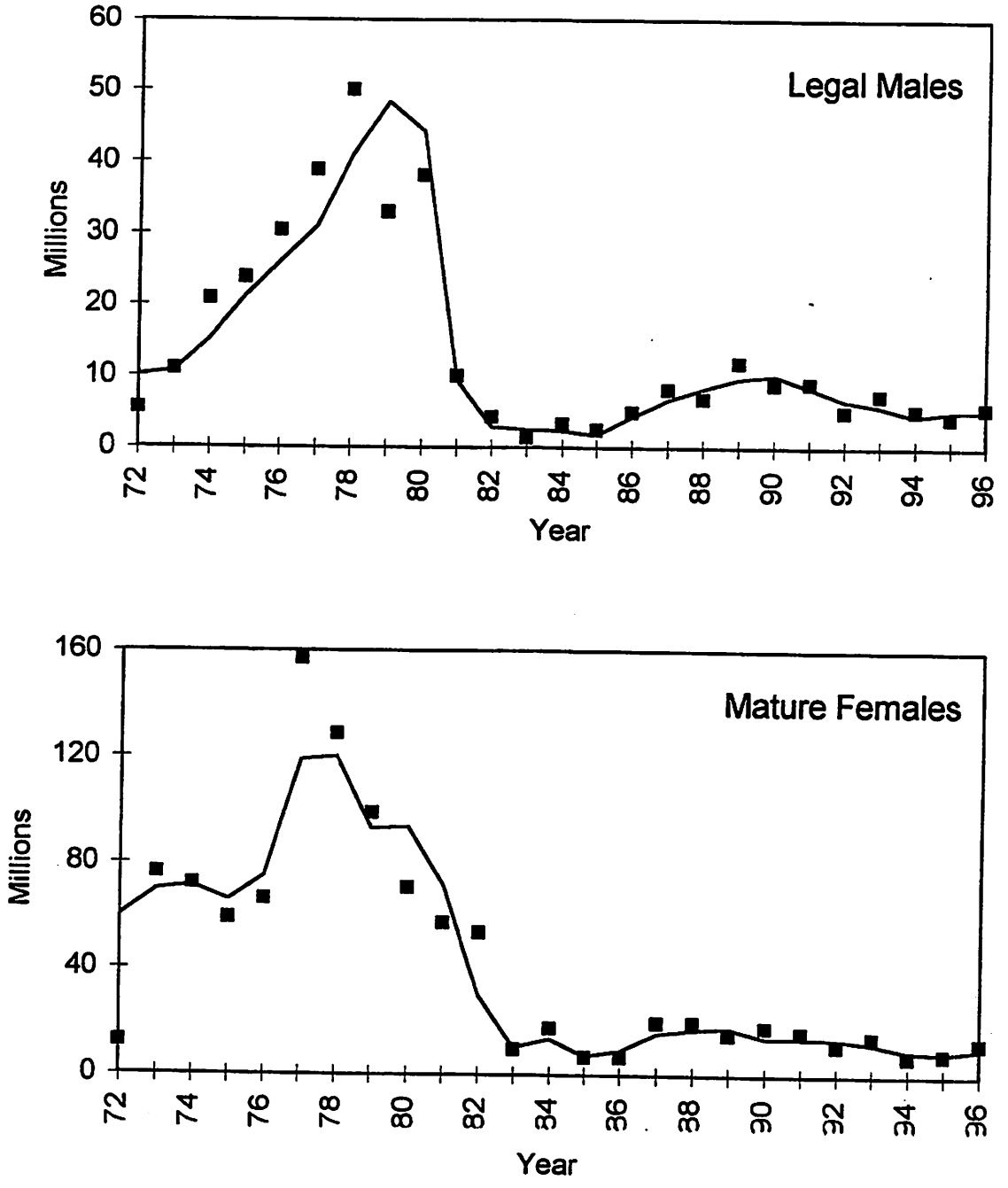

Figure 1. Comparison of abundance estimates (millions of crabs) of Bristol Bay red king crabs from area-swept estimates (dots) and length-based analysis (line) for legal males (top panel) and mature females (bottom panel).

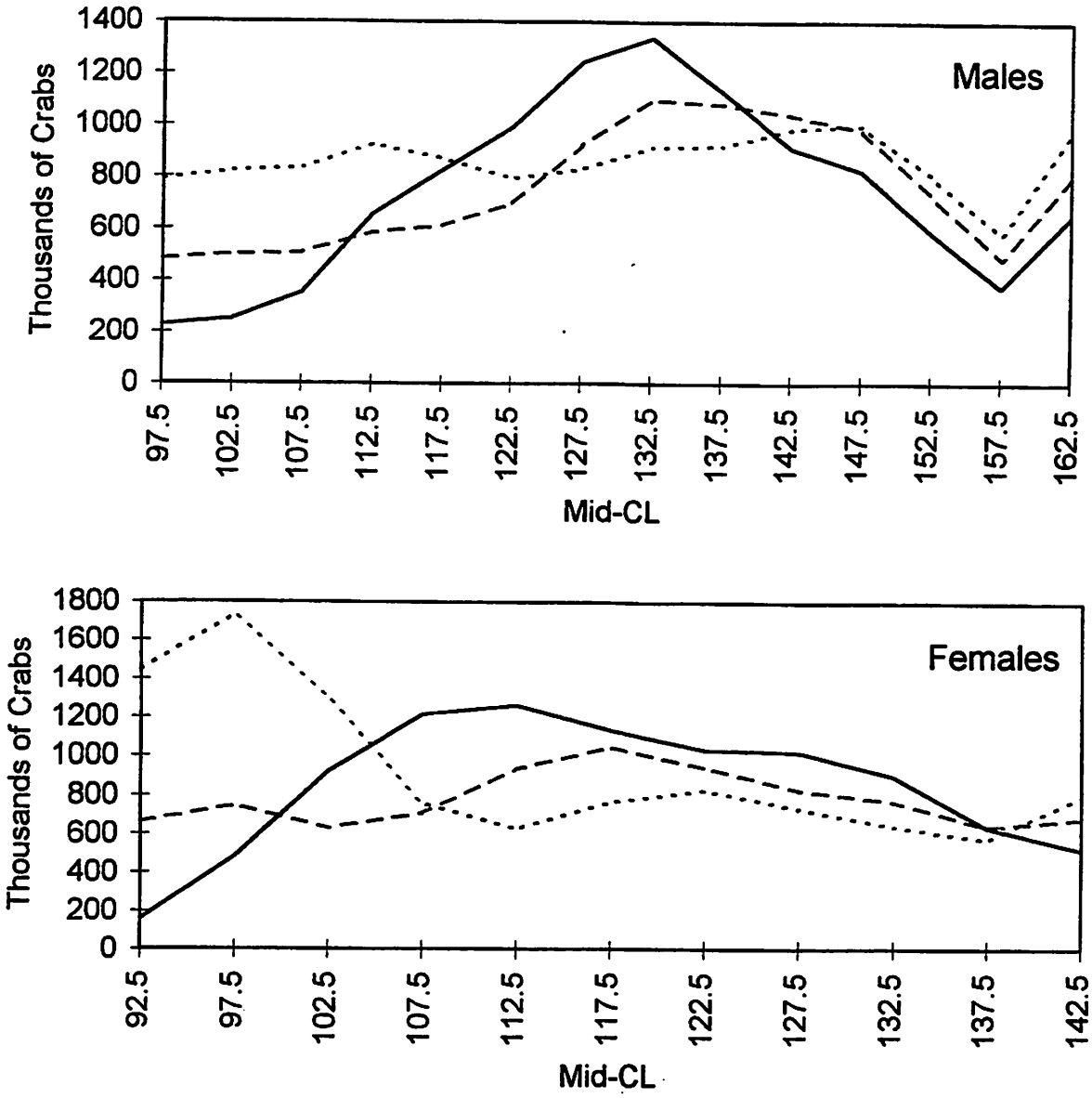

Figure 2. Size-frequency distributions of male (top panel) and female (bottom panel) red king crabs in Bristol Bay as estimated by length-based analysis for 1994 (solid line), 1995 (dashed line), and 1996 (dotted line).

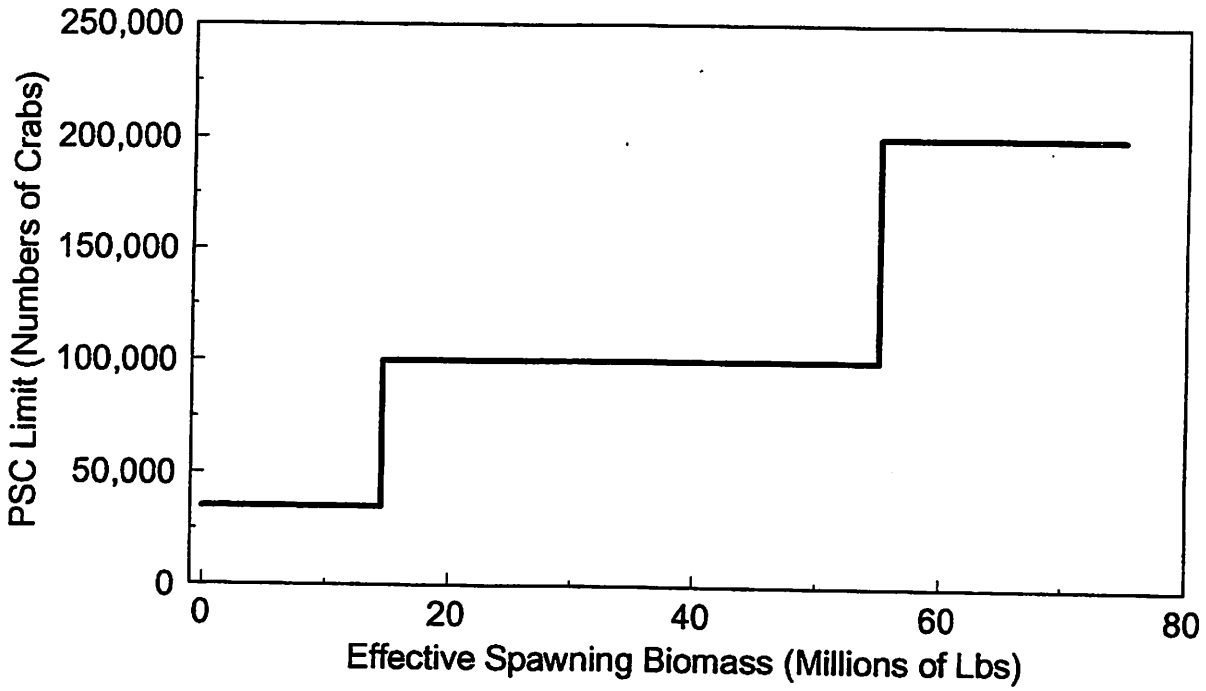

Figure 3. PSC limit of red king crabs in groundfish trawl fisheries in Zone 1 in the eastern Bering Sea in any year as a function of estimated effective spawning biomass (ESB) of Bristol Bay red king crabs in the prior year. PSC = 35,000 crabs if ESB ≤ 14.5 M pounds or if mature females ≤ 8.4 million crabs (not shown); PSC = 100,000 crabs if 14.5 < ESB ≤ 55 M pounds and if mature females > 8.4 million crabs; and PSC = 200,000 if ESB > 55 M pounds.

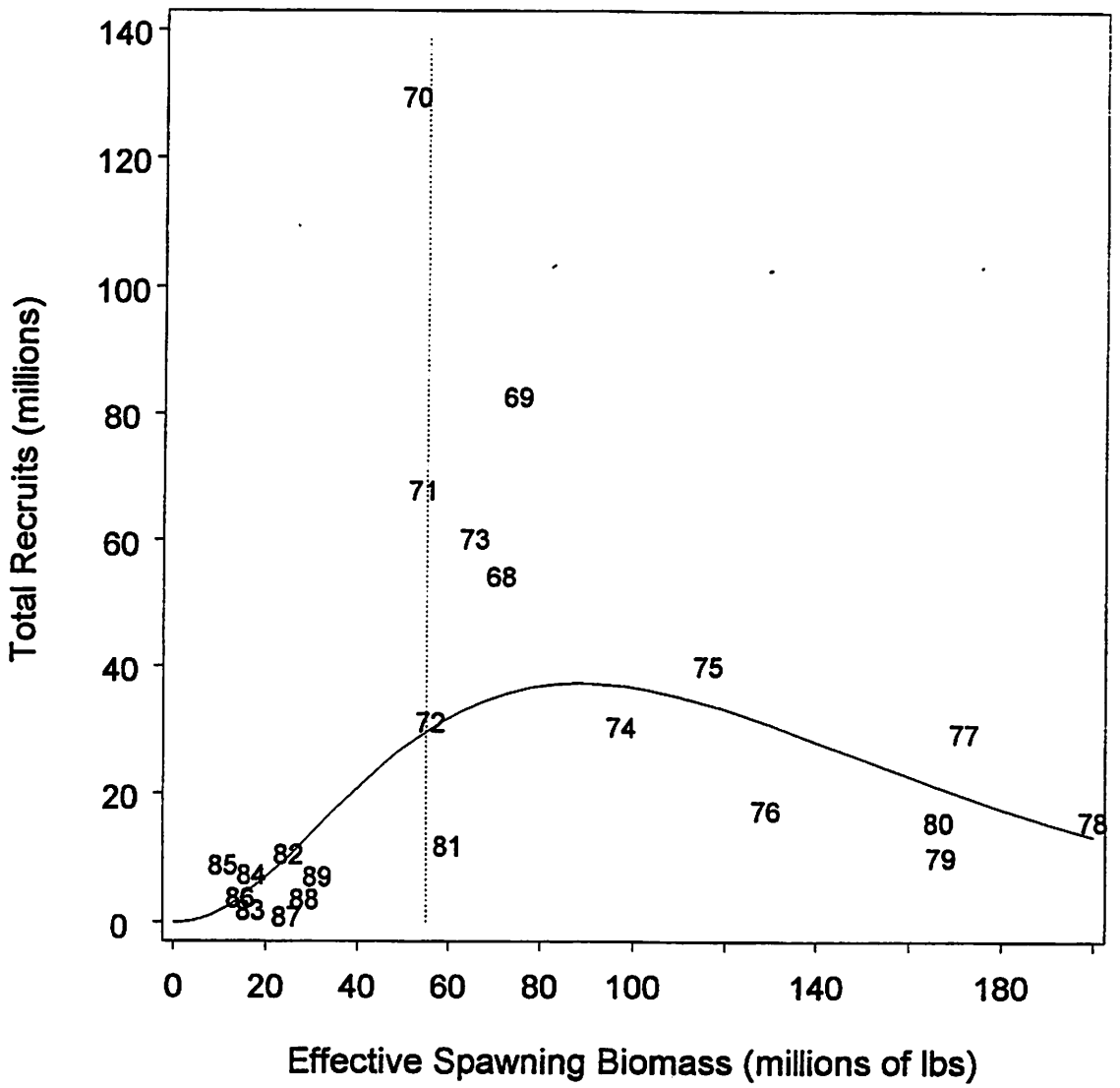

Figure 4. Stock-recruit relationship for Bristol Bay red king crabs. Recruits are age 6.2 from date of hatching corresponding to a 7-year lag from spawning to recruitment. Numbers refer to brood year (year of spawning). Effective spawning biomass is defined in the text. The vertical dotted line indicates the target rebuilding level of 55 million pounds of effective spawning biomass.

BERING SEA FISHERY SIMULATION MODEL RESULTS FOR VARIOUS CRAB CAPS

by David Ackley, ADF&G

The Bering Sea fishery simulation model was employed to estimate the economic impacts of reducing crab caps in the Bering Sea. A general discussion of the model follows in the next section, and a detailed discussion can be found in Amendments 21a and 21b, as well as in the EA/RIR for Amendment 37 (NPFMC 5/10/96, pp.64-66 and Appendix 8). Detailed output from the model was not provided for this section in order to conserve space, and because the output is similar to other model runs in this amendment.

The Bering Sea fishery simulation model was modified to include the bycatch of *Chionoecetes opilio* crab and assign caps for this species. The value data for C. bairdi, C. opilio and red king crab were updated for this analysis as well. The model was run with the most constraining options in place to examine the greatest expected changes from Status Quo. Model runs using both the 1993 and 1994 data sets included the following options: (1) Status Quo which included a three month closure of the Red King Crab Savings Area; (2) a Zone 1 cap for bairdi crab of 850,000 and a Zone 2 bairdi crab cap of 1.5 million crab; (3) a Zone 1 cap of 35,000 red king crab; (4) a Zone 2 cap of 11 million opilio crab; (5) a run with all of the above caps in place (850,000 Zone 1 bairdi, 1.5 million Zone 2 bairdi, 11 million Zone 2 opilio, and 35,000 Zone 1 red king crab) as well as the closure of the Red King Crab Savings Area; (6) a run with all of the above caps, the Red King Crab Savings Area closure, and the Northern Bristol Bay closure (7) the caps and closures as above in (6) with the additional constraint of a 6 million opilio crab cap in Zone 2; and (8) The June 1996 Council action to close the Red King Crab Savings Area on an annual basis, close Northern Bristol Bay to trawling (the 2 block opening not included in this analysis), and based on population size, set the Zone 1 cap of red king crab at 100,000 crab. In addition (8) applies a Zone 1 cap on bairdi at 750,000 crab and the Zone 2 bairdi cap at 2.1 million crab.

The model runs which examined the impacts of various area alternatives for the Red King Crab Savings Area were presented in the EA/RIR for Amendment 37. The impacts of the Northern Bristol Bay Closure were estimated by model runs and presented in sections 4.0 and 6.0. The results of the cap analysis runs presented here can be compared with the previous runs with the caution that splitting Tanner crab into bairdi and opilio separately may have changed the bycatch rates of areas, and that the crab values have been updated. Details of the model and assumptions are available in the draft EA/RIR for Amendment 37.

The bycatch of the crab species in 1993 and 1994, largely because of existing caps, were not generally in excess of the most restrictive options used in the model runs, and often were below the more restrictive caps. For instance, under Status Quo in the 1993 data, 7.5 million opilio crab were estimated to be bycaught in Zone 2 in the absence of a cap, and in 1994 approximately 10 million opilio crab were estimated to be bycaught in Zone 2. The cap used for opilio crab was 11 million, so that only specific fisheries might be affected by the opilio cap, since the overall cap of 11 million exceeded the bycatch from all fisheries in each year. Thus the model does not capture the impacts of years in which the bycatch rates for any of the species might be higher. Similarly, the impacts of a cap might be less than the model predicts if crab were caught at a higher rate in 1993 or 1994 than would happen in future fisheries, as was the case in 1994. The bycatch of red king crab predicted by the model from 1994 data was approximately 90,000 red king crab with the 3 month Red King Crab Savings Area closure in place, while in 1995 the actual number bycaught was approximately at the most restrictive cap of 35,000 crab.

The constraints on the fishing fleet by the individual crab caps (Alternatives Bairdi (850,000 Zone 1, 1.5 million Zone 2); Red (35,000 Zone 1); and Opilio (11 million Zone 2) resulted in changes in net benefits to the Nation from Status Quo of less than approximately $500,000 under the 1993 data set (attached Table). This is because the bycatch of each crab species available to the model was similar to the caps in that year. The model runs based on the 1994 data estimated decrements to the net benefits to the Nation of from approximately $1 million

to $4.8 million. The reduction of the red king crab cap to 35,000 resulted in the greatest change from Status Quo under both the 1993 and 1994 data.

Model runs to estimate the impacts of all three management measures in place concurrently were also made using the 1993 and 1994 data. These runs simulated a closure of the Red King Crab Savings Area for the first three months of the year, a closure of the Northern Bristol Bay area, and caps of 850,000 bairdi crab in Zone 1, 1.5 million bairdi crab in Zone 2, 11 million opilio crab in Zone 2, and 35,000 red king crab in Zone 1 (indicated as RKC,Caps,N.BB in the attached Table). With these constraints in place, the estimated net benefits to the Nation decreased by approximately $1.4 million using the 1993 data set and by approximately $3.9 million using the 1994 data set.

Reducing the opilio cap to 6 million crab in addition to all of the proposed closures and caps above reduced the estimated net benefits to the action from status quo by approximately $1.4 million using the 1993 data and by approximately $11.1 million using the 1994 data (indicated as RKC,Cap,BB,6 mil.Op in the attached Table). The reason there was no change from all proposed closures and caps in place using the 1993 data and decreasing the opilio cap by 5 million crab was that the bairdi caps closed the Zone 2 fisheries which would have been impacted by the reduced caps. Using the 1994 data, it was the opilio cap rather than the bairdi cap which was more constraining. The overall bycatch of opilio crab was not greatly reduced in 1993 from status quo because the bairdi crab closure caused fishing to occur outside of Zone 2 where opilio crab bycatch is still substantial.

Additional runs to estimate the impacts of measures taken in June 1996 with the most recent (September 1996) suggested caps for bairdi crab in place were also made (indicated as RKC,current,BB in the attached Table). Under these runs with the 1993 and 1994 data the following assumptions applied: (1) Annual closure of the Red King Crab Savings Area; (2) Annual closure of Northern Bristol Bay (due to programming difficulty and time available, the summer opening of two blocks for yellowfin sole fishing was not included as an option); (3) a 100,000 red king crab cap in Zone 1 based on current population estimates for 1996; (4) a Zone 1 cap of 750,000 bairdi crab and a Zone 2 cap of 2.1 million bairdi crab. The estimated net benefits to the nation decreased by approximately $1.2 million using the 1993 data set and by approximately $2.2 million using the 1994 data set. These decrements in net benefits to the Nation represent changes from Status Quo of 0.4% and 0.8% in the 1993 and 1994 data sets, respectively.

Table ummary of total catch, bycatch, total gross and net values of catch a... ycatch, and estimated total net benefits to the Nation under status qu and combinations of bairdi, opilio and red king crab caps - 1993 and 1994 data.

Model runs based on 1993 data

Alternative	Total Catch	Total Retained Catch	Total Gross Value	Total Net Value	Tanner Crab	Opilio Crab	Red King Crab	Halibut	Chinook Salmon	Other Salmon	Herring	Gross Value Bycatch	Net Value Bycatch	Total Gross minus Bycatch Gross	Total Net minus Bycatch Net
Status Quo	1,809,778	1,552,688	$847,189,115	$315,373,429	2,278,571	14,941,488	63,692	3,708	50,508	98,496	746	$46,719,083	$20,923,772	$800,470,032	$294,449,657
Bairdi	1,807,370	1,551,953	$846,410,232	$316,091,474	2,093,271	14,238,044	61,082	3,663	50,506	98,498	746	$44,682,729	$20,103,812	$801,727,503	$294,987,662
Red	1,812,070	1,552,768	$848,815,608	$315,238,220	2,330,484	15,029,742	63,987	3,691	50,549	98,498	746	$47,071,607	$21,050,105	$799,744,001	$294,188,114
Opilio	1,809,264	1,552,380	$848,974,451	$315,295,721	2,268,976	14,873,835	63,692	3,708	50,506	98,496	748	$46,604,656	$20,879,579	$800,369,795	$294,416,142
Bairdi,Red,Opilio	1,800,044	1,548,209	$843,358,594	$313,986,781	2,084,468	13,248,501	56,844	3,638	50,549	98,496	748	$43,699,035	$19,701,343	$799,659,559	$294,285,438
RKC,Caps,N.BB	1,792,522	1,543,523	$839,924,271	$312,743,556	2,115,971	13,416,553	54,936	3,601	50,403	98,496	631	$43,688,418	$19,651,917	$796,237,853	$293,091,639
RKC,Cap,BB,6 mil.Op	1,792,522	1,543,523	$839,924,271	$312,743,556	2,115,971	13,416,553	54,936	3,601	50,403	98,496	631	$43,688,418	$19,651,917	$796,237,853	$293,091,639
RKC,current,BB	1,802,213	1,547,987	$843,711,202	$314,114,888	2,304,461	15,168,112	60,923	3,672	50,436	98,953	634	$46,698,720	$20,871,349	$797,012,482	$293,243,539

Model runs based on 1994 data

Alternative	Total Catch	Total Retained Catch	Total Gross Value	Total Net Value	Tanner Crab	Opilio Crab	Red King Crab	Halibut	Chinook Salmon	Other Salmon	Herring	Gross Value Bycatch	Net Value Bycatch	Total Gross minus Bycatch Gross	Total Net minus Bycatch Net
Status Quo	1,803,803	1,538,805	$827,694,490	$305,508,379	2,597,799	10,914,052	90,030	4,576	42,216	49,528	1,600	$51,225,167	$23,341,231	$776,469,322	$282,167,148
Bairdi	1,786,906	1,528,925	$821,268,068	$303,180,458	2,344,968	11,808,740	90,900	4,743	41,992	49,531	1,612	$50,915,043	$23,329,385	$770,353,025	$279,851,073
Red	1,784,587	1,530,065	$809,049,182	$298,758,777	2,401,238	10,234,614	45,766	4,266	41,987	49,528	1,611	$46,965,008	$21,420,894	$762,084,174	$277,337,884
Opilio	1,803,653	1,535,666	$827,078,518	$305,285,397	2,500,570	11,349,426	89,894	4,870	42,216	49,528	1,600	$52,179,102	$23,896,895	$774,899,416	$281,388,502
Bairdi,Red,Opilio	1,785,714	1,546,466	$818,242,868	$302,471,879	1,970,888	11,871,255	45,950	4,487	42,273	49,531	1,612	$46,202,502	$21,268,206	$772,040,366	$281,203,674
RKC,Caps,N.BB	1,764,899	1,533,632	$809,665,495	$299,366,870	1,914,034	12,042,346	46,873	4,459	42,295	49,531	1,586	$45,807,519	$21,095,858	$763,857,976	$278,271,012
RKC,Cap,BB,6 mil.Op	1,694,281	1,501,448	$784,411,138	$290,224,793	1,483,508	9,607,004	46,473	4,416	42,295	49,531	1,580	$40,906,334	$19,174,679	$743,504,804	$271,050,114
RKC,current,BB	1,791,207	1,529,788	$822,715,053	$303,705,815	2,545,413	11,058,963	91,518	4,798	42,009	49,529	1,588	$51,965,200	$23,767,063	$770,749,853	$279,938,753

DIFFERENCE FROM STATUS QUO

Model runs based on 1993 data

Alternative	Total Catch	Total Retained Catch	Total Gross Value	Total Net Value	Tanner Crab	Opilio Crab	Red King Crab	Halibut	Chinook Salmon	Other Salmon	Herring	Gross Value Bycatch	Net Value Bycatch	Total Gross minus Bycatch Gross	Total Net minus Bycatch Net
Status Quo															
Bairdi	-2,408	-735	-$778,883	-$281,956	-165,300	-703,444	-2,610	-46	0	0	0	-$2,038,354	-$819,981	$1,257,471	$538,005
Red	2,292	80	-$373,507	-$135,210	51,913	88,254	298	-17	42	0	0	$352,524	$126,333	-$726,031	-$261,543
Opilio	-514	-308	-$214,664	-$77,708	-9,595	-67,653	0	0	0	0	0	-$114,427	-$44,193	-$100,237	-$33,515
Bairdi,Red,Opilio	-9,734	-4,479	-$3,830,521	-$1,386,649	-194,103	-1,692,988	-6,847	-70	42	0	0	-$3,020,047	-$1,222,429	-$810,473	-$164,220
RKC,Caps,N.BB	-17,256	-9,165	-$7,264,844	-$2,629,874	-162,600	-1,524,935	-8,756	-107	-104	0	-115	-$3,032,665	-$1,271,855	-$4,232,179	-$1,358,018
RKC,Cap,BB,6 mil.Op	-17,256	-9,165	-$7,264,844	-$2,629,874	-162,600	-1,524,935	-8,756	-107	-104	0	-115	-$3,032,665	-$1,271,855	-$4,232,179	-$1,358,018
RKC,current,BB	-7,566	-4,721	-$3,477,913	-$1,258,542	25,890	224,624	-2,769	-36	-71	457	-112	-$20,382	-$52,424	-$3,457,550	-$1,206,118

Model runs based on 1994 data

Alternative	Total Catch	Total Retained Catch	Total Gross Value	Total Net Value	Tanner Crab	Opilio Crab	Red King Crab	Halibut	Chinook Salmon	Other Salmon	Herring	Gross Value Bycatch	Net Value Bycatch	Total Gross minus Bycatch Gross	Total Net minus Bycatch Net
Status Quo															
Bairdi	-16,897	-7,881	-$6,426,422	-$2,327,921	-252,831	894,688	870	168	-224	2	12	-$310,124	-$11,846	-$6,116,298	-$2,316,075
Red	-19,216	-6,740	-$18,645,308	-$6,749,601	-198,561	-679,438	-44,265	-310	-228	0	11	-$4,260,160	-$1,920,337	-$14,385,148	-$4,829,264
Opilio	-151	-1,140	-$615,972	-$222,982	-97,229	435,374	-137	295	0	0	0	$953,935	$555,664	-$1,569,907	-$778,646
Bairdi,Red,Opilio	-18,089	9,661	-$9,451,621	-$3,036,500	-626,911	957,203	-44,080	-88	58	2	12	-$5,022,665	-$2,073,026	-$4,428,956	-$963,474
RKC,Caps,N.BB	-38,905	-3,173	-$18,028,995	-$6,141,509	-683,766	1,128,294	-43,157	-116	79	2	-14	-$5,417,648	-$2,245,373	-$12,611,347	-$3,898,138
RKC,Cap,BB,6 mil.Op	-109,522	-35,358	-$43,283,351	-$15,283,586	-1,114,291	-1,307,047	-43,558	-159	79	2	-20	-$10,318,833	-$4,166,552	-$32,964,518	-$11,117,034
RKC,current,BB	-12,596	-7,017	-$4,979,438	-$1,802,564	-52,388	144,911	1,488	221	-206	1	-12	$740,033	$425,831	-$5,719,489	-$2,228,395

Bairdi = 850,000 Zone 1 cap, 1.5 million Zone 2 cap; Opilio = 11 million Zone 2 cap; Red = 35,000 Zone 1 cap. 6 mil. Op = Zone 2 Opilio cap of 6 million crab.
Current = 100,000 RKC, annual RKC closure;750,000 Zone 1 Bairdi; 2.1 million Zone 2 Bairdi.

Public Testimony on Crab Bycatch

September 1996

Arni Thomson - Alaska Crab Coalition
Ed Wyman - Neptune Marine Products
Steve Hughes - United Catcher Boats
Dave Fraser - F/V Muir Milach

C-1

ALASKA CRAB COALITION

3901 Leary Way (Bldg.) N.W., Suite #6 • Seattle, WA 98107 • (206) 547-7560 • FAX (206) 547-0130

DATE: September 13, 1996

TO: Mr. Richard B. Lauber, Chairman
North Pacific Fishery Management Council
604 West 4th Avenue, Ste. 306
Anchorage, Alaska 99501-2252

FROM: Arni Thomson
Executive Director Arni Thomson

RE: COMMENTS ON AGENDA ITEM C-1 BSAI BAIRDI AND OPILIO BYCATCH CAPS, BSAI AMENDMENT 41

RECOMMENDATION FOR SLIDING SCALE ABUNDANCE-BASED PSC CAP FOR BSAI SNOW CRAB TO BE SET AT THE AVERAGE OBSERVED BYCATCH RATE FOR 1992-1995--.135%

The ACC participated in the August 29-30 industry negotiations on bairdi and opilio crab PSCs through its representative, Kris Fanning.

At this time, the ACC wishes to endorse the rate and total abundance based sliding scale PSC agreement negotiated by the industry representatives for bairdi crab. However, the ACC encourages ADF&G and the NPFMC to revise the PSC framework, when the survey data becomes available, to be more consistent with the king crab framework that is based on estimates of mature animal abundance.

During the negotiations, the ACC, after lengthy review of the Amendment 41 EA RIR narrative and data recommended a sliding scale abundance-based PSC framework for snow crab. The EA RIR analysis lends considerable support for using the average rate of opilio bycatch (as a percentage of total population) 1992-1995, as the basis for the sliding scale framework. (Reference NPFMC EA RIR for BSAI Amendment 41, May 10, 1996, pages 24, 152, 158, 192 and 193.)

The average rate for all BSAI areas during this period is .135% of total abundance.

Establishing this rate based PSC--for all BSAI areas--will result in little or no foregone fisheries opportunities for the trawl groundfish industry, however it will provide some protection for opilio stocks in the future.

Enclosures 5

Table 3.12 Historical estimates of Tanner crab taken as bycatch in Bering Sea trawl fisheries. 1978-1995. Source: NPFMC 1989. Stevens et al. 1996.

Year	Crab Population (millions)	Bycatch (millions)	Bycatch as Percent of Population
1978	440.40	4.10	0.93
1979	377.00	7.50	1.99
1980	983.00	3.70	0.38
1981	745.10	1.60	0.21
1982	355.80	0.40	0.11
1983	410.50	0.60	0.15
1984	252.50	0.70	0.28
1985	84.70	0.90	1.06
1986	208.30	0.60	0.29
1987	486.80	0.50	0.10
1988	630.20	NA	NA
1989	949.90	NA	NA
1990	782.50	NA	NA
1991	767.00	1.67	0.22
1992	438.50	4.04	0.92
1993	254.90	3.41	1.34
1994	192.00	2.50	1.30
1995	189.90	2.30	1.21

SNOW CRAB BYCATCH, ZONE 2 PLUS OTHER BSAI AREAS

Table 3.13 Historical estimates of snow crab taken as bycatch in Bering Sea trawl fisheries. 1978-1995. Source: NPFMC 1989, Stevens et al. 1996.

Year	Crab Population (millions)	Bycatch (millions)	Bycatch as Percent of Population
1992	7,763	17.44	0.22
1993	11,704	14.63	0.13
1994	9,446	12.35	0.13
1995	8,655	5.4	0.06
Average 92-95	9,392	12.45	0.135

Table 6.15 Crab bycatch in BSAI groundfish fisheries, by zone, as a percent of NMFS survey index of abundance (all areas and size categories), 1992-1995.

	Zone 1 Bycatch	Bering Sea Survey Index of Abundance	Bycatch as Percent of Index
Red King Crab			
1992	131,921	33.90	0.39
1993	184,563	47.50	0.39
1994	244,716	34.00	0.72
1995	35,638	39.90	0.09
Average 92-95	149,210	38.83	0.40

	Zone 1 Bycatch	Zone 2 Bycatch	Bering Sea Survey Index of Abundance	Zone 1 Bycatch as Percent of Index	Zone 2 Bycatch as Percent of Index
Tanner crab					
1992	1,144,671	2,699,256	438.50	0.26	0.62
1993	1,040,166	2,329,840	254.90	0.41	0.91
1994	765,283	1,736,273	192.00	0.40	0.90
1995	923,088	1,341,894	189.90	0.49	0.71
Average 92-95	968,302	2,026,816	268.83	0.39	0.79

	Zone 2 Bycatch	Bering Sea Survey Index of Abundance	Zone 2 Bycatch as Percent of Index
Snow Crab			
1992	11,996,347	7,763.00	0.15
1993	8,922,155	11,704.00	0.08
1994	11,424,057	9,446.00	0.12
1995	4,338,013	8,655.00	0.05
Average 92-95	9,170,143	9,392.00	0.10

Note: Survey indices in million of crabs.

Data indicate that the recent level of red king crab bycatch in trawl fisheries (1991-1995 average of 0.16 millio is low relative to the 1978-1989 average of 0.44 million red king crab (Table 3.11). This reduction may be in part to reduced crab abundance and increased regulation of the trawl fishery. Regulations in effect in 1989 and thereafter for domestic fisheries included current crab PSC limits and trawl closure areas 512 and 516 (see Appendix 4). Although bycatch numbers are lower, bycatch accounts for a higher proportion of the total crab population as indexed by the NMFS survey. Since 1992, bycatch removals have equated to 0.13 to 0.82 percent of the total red king crab population.

Tanner Crab

A total of 2.3 million Tanner crab were taken as bycatch in the 1995 BSAI groundfish fisheries (Table 3.10). Bycatch of Tanner crab has been reduced in recent years, down significantly from 4.3 million in 1992. Most Tanner crab bycatch is taken in the trawl fisheries (about 98%) and to a lesser extent in the longline (1.5%) and groundfish pot fisheries (0.5%). Although Tanner crabs are bycaught in nearly every trawl fishery, the yellowfin sole fishery takes the largest share, followed by the rock sole/other flatfish fisheries. Bycatch is highest in NMFS statistical areas 509 and 513; and large numbers of Tanner crab area also consistently taken in areas 517 and 521. Data indicate that the recent level of Tanner crab bycatch in trawl fisheries (1992-1995 average of 3.06 million) is high relative to the 1978-1987 average of 2.06 million (Table 3.12).

Tanner crab bycatch in the 1992-1995 BSAI groundfish fisheries, by zone (all gears/targets).

	Zone 1	Zone 2	Other areas	Total
1992	1,144,671	2,699,256	448,106	4,292,033
1993	1,040,166	2,329,840	51,820	3,421,826
1994	765,283	1,736,273	43,426	2,544,982
92-94 Ave	983,373	2,255,123	181,117	3,419,614
93-94 Ave	902,724	2,033,057	47,623	2,983,404
1995	923,088	1,341,894	34,874	2,299,856

Snow Crab

Bycatch of snow crab in BSAI groundfish fisheries totaled 5.4 million crab in 1995 (Table 3.10). Bycatch has been drastically reduced since 1992, when 17.66 million snow crab were taken in groundfish fisheries (Table 3.13). Most snow crab bycatch is taken in the trawl fisheries (99%) and to a lesser extent in the longline (0.7%) and groundfish pot fisheries (0.3%). Although snow crabs are bycaught in nearly every trawl fishery, the yellowfin sole fishery takes the vast majority (70% on average 1992-1994). Bycatch is highest in the areas north and east of the Pribilof Islands, corresponding to NMFS statistical areas 513, 514, and 521 (NPFMC 1994). Relatively few snow crab are taken in Zone 1. On the other hand, about 75% of the snow crab bycatch comes from the area encompassed by the existing crab protection Zone 2. This is not surprising given that Zone 2 encompasses most of the adult population (Figure 3.6). Average snow crab bycatch in Zone 2 was about 10.8 million crabs, or about 0.11% of the NMFS total population index on average, 1992-1994. Bycatch of snow crab in 1995 was much lower than in previous years, totaling 5,395,788 crabs. Of the total, 4,338,013 snow crabs were taken in Zone 2, corresponding to 0.05 % of the total population index.

Snow crab bycatch in the 1992-1995 BSAI groundfish fisheries, by zone (all gears/targets).

	Zone 1	Zone 2	Other areas	Total
1992	104,844	11,996,347	5,561,358	17,662,549
1993	40,611	8,922,155	5,797,956	14,760,722
1994	25,334	11,424,057	1,032,736	12,482,127
92-94 Ave	56,930	10,780,853	4,130,683	14,968,466
1995	94,307	4,338,013	963,469	5,395,789

AVERAGE 92-95-OTHER AREAS .035% OF TOTAL POPULATION

Table 3.6. Annual abundance estimates (millions of crabs) for snow crabs (C. opilio) from NMFS surveys (all districts combined). Source: Stevens et al. 1994.

	Males				Females			
		Large	V. Large		Small	Large		Grand
Size[1](mm)	<102	≥102	≥110	Total	<50	≥50	Total	Total
Width(in)	<4.0	≥4.0	≥4.3		<2.0	≥2.0		
1982	*	*	21.7	2073	403	2256	2658	4732
1983	*	*	22.1	1858	673	1228	1913	3760
1984	1237	153	73.9	1391	610	582	1192	2583
1985	548	75	40.7	623	258	123	382	1004
1986	1179	83	45.9	1262	791	422	1212	2474
1987	4439	151	70.0	4590	2919	2929	5849	10438
1988	3467	171	90.1	3638	1235	2323	3556	7194
1989	3646	187	81.2	3833	1923	3791	5713	9546
1990	2860	420	188.7	3281	1463	2798	4261	7542
1991	3971	484	323.0	4455	3289	3575	6864	11319
1992	3158	256	164.8	3414	2434	1914	4348	7762
YEAR- 1993	5597	135	77.9	5732	3990	1983	5972	11704
1994	4283	72	39.9	4354	3418	1674	5092	9446
1995	4087	69	30.9	4156	2090	2409	4500	8655
East(%)[2]	61	60	50	61	24	56	40	50
Limits[3]								
Lower	3229	47.5	21.0	3283	1526	1735	3465	6748
Upper	4945	90.1	40.8	5028	2655	3084	5535	10563
±%	21	31	32	21	27	28	23	22

[1] Carapace width (mm).
[2] Proportion of size group in Eastern District.
[3] Mean ± 2 standard errors for most recent year.
* Estimates not available at present time.

Table 6.14 PSC limits for snow crab in Zone 2, within range proposed under Alternative 3. Limits based on a percentage of abundance as determined by NMFS trawl survey index of all sizes. 1995 abundance = 8.655 million crabs in all Districts.

Crab Abundance (millions of crabs)	5.00E-03 % rate	0.10 % rate	0.15 % rate	0.20 % rate	0.25 % rate
0	0	0	0	0	0
500	25,000	500,000	750,000	1,000,000	1,250,000
1000	50,000	1,000,000	1,500,000	2,000,000	2,500,000
1500	75,000	1,500,000	2,250,000	3,000,000	3,750,000
2000	100,000	2,000,000	3,000,000	4,000,000	5,000,000
2500	125,000	2,500,000	3,750,000	5,000,000	6,250,000
3000	150,000	3,000,000	4,500,000	6,000,000	7,500,000
3500	175,000	3,500,000	5,250,000	7,000,000	8,750,000
4000	200,000	4,000,000	6,000,000	8,000,000	10,000,000
4500	225,000	4,500,000	6,750,000	9,000,000	11,250,000
5000	250,000	5,000,000	7,500,000	10,000,000	12,500,000
5500	275,000	5,500,000	8,250,000	11,000,000	13,750,000
6000	300,000	6,000,000	9,000,000	12,000,000	15,000,000
6500	325,000	6,500,000	9,750,000	13,000,000	16,250,000
7000	350,000	7,000,000	10,500,000	14,000,000	17,500,000
7500	375,000	7,500,000	11,250,000	15,000,000	18,750,000
8000	400,000	8,000,000	12,000,000	16,000,000	20,000,000
8500	425,000	8,500,000	12,750,000	17,000,000	21,250,000
8655	432,750	8,655,000	12,982,500	17,310,000	21,637,500
9000	450,000	9,000,000	13,500,000	18,000,000	22,500,000
9500	475,000	9,500,000	14,250,000	19,000,000	23,750,000
10000	500,000	10,000,000	15,000,000	20,000,000	25,000,000
10500	525,000	10,500,000	15,750,000	21,000,000	26,250,000

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September 19, 1996

Mr. Richard Lauber, Chairman
North Pacific Fishery Management Council
604 West 4th Ave., Suite 306
Anchorage, Alaska 99501-2252

RE: PUBLIC COMMENT ON AGENDA ITEM C-1 BSAI BAIRDI AND OPILIO BYCATCH CAPS RELATIVE TO THE COD POT FISHERY.

Thank you Mr. Chairman, for the record, my name is Ed Wyman. My company manufactures the Cod Trigger entrance device that is used by virtually all the cod pot fleet. We have been involved in the development of the cod pot fishery since its start in the late 1980's. Over the past 8 years, we have worked with fisheremen and pot manufacturers to develop cod pots that are both efficient and selective in their pursuit of Pacific cod.

I'd like to testify on the FMP proposal submitted by Tyson Seafoods seeking a Bering Sea PSC crab cap in the Pacific cod pot fishery. The Crab Plan Team recommended the proposal be given a high priority for analysis. I hope the following information will help inform the Council that the problem is certainly not of the magnitude that requires an FMP ammendment, much less any action at all.

As the Council is aware, the cod pot fishery has been granted an exemption from the halibut PSC caps since 1992 due to its minimal halibut bycatch and the low mortaility rate for those halibut that are caught. Through August 31 of 1996, the cod pot fleet has harvested 29,000 mt of Pacific cod with only 15 mt of halibut mortality. The main reason for this selective fishing capability is due to gear modifications made to the design of the cod pots. The use of halibut excluding devices on the cod pot's entrances restrict the entry of most halibut into the cod pots while allowing Pacific cod to freely enter the pot. NMFS regulations require that the maximum opening size for a groundfish pot entrance is 9" X 9". This opening size regulation has proven very effective in keeping halibut out of the cod pots. The smaller halibut that find their way through the excluders experience a very low mortality rate. Currently the mortality rate is set at 7 % for the Bering Sea cod pot fishery.

In addition to excluding halibut out of the cod pots, this opening restriction also helps keep most crab out of the cod pots. One of reasons behind my testimony today is to inform the Council of some additional pot gear modifications that can be made to further restrict the entrance of crab into cod pots, if it is indeed needed.

I would first like to clarify some of the crab bycatch numbers that get presented from various sources. Most of the crab bycatch in the cod pot fishery is listed as numbers of animals being caught with little or no reference to the fact that very few of these crab will become mortalities. Fishing with pots is a very passive fishing method with a very low mortality rate for not only halibut, but also for the crab that are discarded when targeting Pacific cod.

Mortality rates for crab discards are estimated to be anywhere from 2 % to 30 % depending on who you hear it from. Factors cited in setting the crab mortality rates include the time of year, areas fished, crab condition and other factors. These mortality rates are estimated by observing the actual crab fishery. If anything, the crab mortality rate in the cod pot fishery is less than in the actual crab fishery since the crab spend less time on deck due to no size sorting being required, as in the actual crab fishery. In addition to this fact, cod pot fishermen are often crab fishermen that have a vested interest in seeing that these crab are handled carefully and returned to the sea unharmed.

A 1995 report by NMFS scientist Brad Stevens in Kodiak provided some crab mortality rates that might be representative of the actual mortality encountered in the cod pot fishery. His on board studies indicated 2% of RKC and 10% of tanner crab died within 48 hr of handling. He also stated that " long term studies in controlled environments were unable to demonstrate any significant mortality of king or tanner crabs as a result of damage or repeated handling" .

The crab bycatch numbers to date for the 1996 cod pot fishery include 49,000 red king crab and an estimated 223,000 bairdi tanner crab. No numbers were available for Opilio tanner crab. Using Dr. Stevens respective mortality rates of 2 % and 10% would result in 980 red king crab mortality and 22,300 bairdi tanner crab mortality. This is hardly the amount of mortality that requires an FMP ammendment, much less any action.

Based on the actual crab mortality figures, I question if the problem is such a magnitude that it demands a high priority status. Observer data covering the past few years of the cod pot fishery also support the notion that very little crab mortality is found in the cod pot fishery.

If the Council feels that it needs to deal with this issue to reduce the amount of crab incidently caught in the cod pot fishery, this can easily done with a gear modification regulatory ammendment rather than a full blown FMP ammendment. The most obvious method to keep crab out of the cod pot is to simply block their access to the pot's entrances. This is done by taking advantage of the inherrent differences between cod and crab. Cod swim..... while crab crawl. Blocking the pot's tunnel ramp with a reverse angle web panel will block the crab from climbing the ramp while the cod easily swim over it to the entrance. Another solution would be to cover the ramp to the entrance with a vinyl cover that the crab are not able to climb up. Other methods are also available.

In summary, gear modifications can be made to cod pots to make them even more selective. I doubt that the actual crab mortality numbers even justify a regulatory ammendment requiring gear modifications. Despite the conservation concerns regarding Bering Sea crab stocks, the Pacific cod pot fishery should be one of the last places the Council looks to remedy the crab bycatch problem. Thank you.

Sincerely,

Ed Wyman

Ed Wyman

THE DIRTY DOZEN AWARDS
1996 To Date

WED	NAME	GEAR	TRGT	BAIRDI
03/23/96	NORTH COMMAND	POT	C	108
02/03/96	ARICA	TRW	R	94
06/15/96	ALASKAN ROSE	TRW	F	86
05/11/96	BERING SEA	POT	C	74
06/08/96	ALASKAN ROSE	TRW	F	73
07/20/96	SEA VENTURE	POT	C	72
07/13/96	PROSPERITY	TRW	L	56
06/08/96	BEAGLE	TRW	L	52
02/10/96	VAERDAL	TRW	C	44
04/13/96	ARICA	TRW	L	43
03/23/96	AURIGA	TRW	Y	40
06/22/96	CAPE HORN	TRW	Y	38

WED	NAME	GEAR	TRGT	O-TANN
07/13/96	ARCTIC SEA	POT	C	4410
07/20/96	CAPE HORN	TRW	L	194
08/03/96	ARICA	TRW	L	187
04/13/96	ARICA	TRW	L	161
07/13/96	CAPE HORN	TRW	F	152
07/20/96	ARICA	TRW	F	151
03/30/96	STARFISH	TRW	Y	145
07/27/96	CAPE HORN	TRW	L	137
07/13/96	ARICA	TRW	L	130
06/22/96	ARICA	TRW	C	130
06/01/96	ALASKA RANGER	TRW	Y	114
07/06/96	ARICA	TRW	F	101

WED	NAME	GEAR	TRGT	KING
07/20/96	BEAUTY BAY	POT	C	187
06/29/96	COURAGEOUS	POT	C	138
08/03/96	ARCTIC SEA	POT	C	86
04/27/96	BOUNTIFUL	POT	C	66
07/13/96	BEAUTY BAY	POT	C	31
03/30/96	BOUNTIFUL	POT	C	26
07/27/96	ARCTIC SEA	POT	C	23
07/06/96	BEAUTY BAY	POT	C	22
04/13/96	BOUNTIFUL	POT	C	18
04/20/96	BOUNTIFUL	POT	C	16
04/27/96	SEABROOKE	POT	C	13
01/20/96	ALASKAN ROSE	TRW	R	10

Target Codes

C = Pacific Cod
R = Rock Sole
F = Other Flatfish
L = Flathead sole
Y = Yellowfin sole

Rates are numbers of crab caught per metric ton of groundfish caught

Dirty Dozen Award Winners - Thru 8/96

Based on a sort of the PSC-Rates.dbf file from the NMFS BBS

Notes:
- Data was sorted using a groupby query which summed the number of weeks a vessel was over a given threshold PSC rate for a PSC species.
- The query also summed the number of observed hauls during those weeks and calculated a simple average PSC rate (not a weighted average).
- The PSC guidelines chosen were the VIP standards for trawl fisheries (for halibut and RKC), for non-VIP PSC the standard used was 10 bairdi/MT and 20 Other tanners/MT.
- The same crab rates were used for pot gear as for trawl. The longline rate for halibut was used was 100 kg/MT (10%).
- None of the PSC-Rate data from the NMFS BBS is adjusted for mortality. There are currently no VIP standard for non-trawl fisheries.
- The average bycatch rates by fishery are provide at the end of the "dirty dozen tables" for reference. These averages are also simple (non-weighted) averages.
- The data are sorted 1st on number of weeks, 2nd on rate and 3rd on number of observed hauls.
  (ie: given two vessels with equal numbers of weeks above a guidline and equal rates, the vessel with more observed hauls will be rank higher)

Long Line - P Cod - BSA

536 total observered vessel weeks -

94 vessel/weeks over 100 kg Halibut /MT groundfish

# Weeks> Guideline	Vessels Name	Av Halibut Kg/MT	# Obsrvd Hauls
9	FRONTIER SPIRIT	165.7	91
8	FRONTIER EXPLORER	145.3	63
7	LIBERTY BAY	138.1	69
7	COURAGEOUS	193.6	99
5	PATHFINDER	144.2	42
4	STORFJORD	175.8	33
4	ALASKAN SHORES	214.0	29
4	BEAUTY BAY	210.1	37
4	FRONTIER MARINER	144.1	24
4	YUKON QUEEN	188.5	36
3	SOJOURN	506.6	16
3	BARANOF	192.6	58

Long Line - Blk Cod - BSA

40 total observered vessel weeks -

21 vessel/weeks over 100 kg Halibut /MT groundfish

# Weeks> Guideline	Vessels Name	Av Halibut Kg/MT	# Obsrvd Hauls
2	GRANT	467.9	22
2	YUKON QUEEN	199.1	9
2	MARIA N	185.8	15
2	ALASKAN SHORES	144.9	19
1	NORTON SOUND	758.2	8
1	SOUTHERN SEAS	607.7	2
1	PROWLER	493.6	4
1	ALEUTIAN	456.9	10
1	ARROW	426.2	9
1	QUEST	425.8	10
1	REBECCA B	362.2	2
1	THOR	342.3	4

Long Line - Blk Cod - GOA

155 total observered vessel weeks - 68 over 100kg/mt

68 vessel/weeks over 100 kg Halibut /MT groundfish

# Weeks> Guideline	Vessels Name	Av Halibut Kg/MT	# Obsrvd Hauls
5	ZENITH	349.4	49
4	CLIPPER SURPRISE	415.8	64
4	PROWLER	399.3	49
4	BARANOF	327.3	59
3	OCEAN PROWLER	348.4	41
3	EVENING STAR	229.5	13
2	BALLAD	573.6	26
2	EL DAN	544.0	15
2	LILLI ANN	541.9	16
2	CLIPPER ENDEAVOR	390.7	26
2	JEANOAH	340.7	8
2	CAPRICE	308.7	12

Long Line - P Cod - GOA

27 total observered vessel weeks -

11 vessel/weeks over 100 kg Halibut /MT groundfish

# Weeks> Guideline	Vessels Name	Av Halibut Kg/MT	# Obsrvd Hauls
3	CLIPPER ENDEAVOR	135.4	21
2	KJEVOLJA	137.0	41
2	CLIPPER SURPRISE	234.8	24
1	STORFJORD	102.0	23
1	PREDATOR	150.8	8
1	HESSAFJORD	193.0	2
1	COLUMBIA	177.0	5

Pot Gear - P Cod - GOA

73 total observered vessel weeks -

10 vessel/weeks over 10 Bairdi /MT groundfish

# Weeks> Guideline	Vessels Name	Average Bairdi/MT	# Obsrvd Hauls
2	NORTHERN MARINE	156.2	20
2	INDEPENDENCE	47.8	9
2	MIDNITE SUN	30.7	6
1	MAR DEL SUD	953.9	1
1	SEA QUAIL	123.8	5
1	POINT OMEGA	74.7	2
1	AIREDALE	18.8	1

Pot Gear - P Cod - GOA

73 total observered vessel weeks -

0 vessel/weeks over 2.5 RKC /MT groundfish

# Weeks> Guideline	Vessels Name	Average RKC /MT	# Obsrvd Hauls

[illegible]r - P Cod - BSA

284 total observered vessel weeks -
15 vessel/weeks over 2.5 RKC /MT groundfish

Guideline	Vessels Name	RKC /MT	Hauls
5	BOUNTIFUL	26.8	73
3	BEAUTY BAY	80.0	47
3	ARCTIC SEA	37.8	56
2	COURAGEOUS	70.7	47
1	SEABROOKE	13.3	5
1	OCEAN BALLAD	3.9	4

Pot Gear - P Cod - [illegible]

284 total observered vessel weeks -
22 vessel/weeks over 10 Bairdi /MT groundfish

Guideline	Vessels Name	Bairdi/MT	Hauls
3	ATLANTICO	26.3	31
3	PACIFIC VENTURE	15.5	41
2	DENALI	25.8	11
2	OCEAN BALLAD	17.2	8
2	BOUNTIFUL	14.8	19
1	IRENE H	350.0	1
1	NORTH COMMAND	108.1	3
1	BERING SEA	74.2	5
1	SEA VENTURE	72.2	4
1	AMERICAN STAR	35.4	3
1	COURAGEOUS	26.5	22
1	SEABROOKE	22.7	5

Trawl - P Cod - BSA

476 total observered vessel weeks -
139 vessel/weeks over 30 kg Halibut /MT groundfish

Guideline	Vessels Name	Kg/MT	Hauls
4	PACIFIC CHALLENGER	59.6	21
4	RAVEN	54.1	23
4	DONA PAULITA	53.1	24
4	STARBOUND	49.1	53
4	HAZEL LORRAINE	46.1	18
4	NORTHERN GLACIER	40.9	36
3	CALIFORNIA HORIZON	96.2	34
3	AMERICAN EAGLE	90.0	23
3	ARGOSY	89.8	22
3	VIKING EXPLORER	63.5	18
3	PROSPERITY	59.4	28
3	VESTERAALEN	48.3	12

Trawl - P Cod - BSA

476 total observered vessel weeks -
15 vessel/weeks over 10 Bairdi /MT groundfish

# Weeks> Guideline	Vessels Name	Average Bairdi/MT	# Obsrvd Hauls
2	PROSPERITY	21.6	10
2	ARICA	11.9	33
1	VAERDAL	44.1	1
1	LEGACY	25.2	14
1	DONA PAULITA	22.3	8
1	DEFENDER	21.5	1
1	ALASKAN ROSE	20.2	14
1	VIKING EXPLORER	11.3	2
1	GOLDEN DAWN	11.2	4
1	HAZEL LORRAINE I	10.5	2
1	ARCTIC IV	10.4	14
1	DONA MARTITA	10.2	11

Trawl - P Cod - BSA

476 total observered vessel weeks -
3 vessel/weeks over 2.5 RKC /MT groundfish

# Weeks> Guideline	Vessels Name	Average RKC /MT	# Obsrvd Hauls
1	CAPE HORN	4.1	24
1	ARICA	3.9	23
1	BRISTOL ENTERPRI	3.0	14

Trawl - Yellowfin sole - BSA

176 total observered vessel weeks -
49 vessel/weeks over 6 kg Halibut /MT groundfish

# Weeks> Guideline	Vessels Name	Av Halibut Kg/MT	# Obsrvd Hauls
6	ENDURANCE	13.0	87
6	ARICA	12.2	105
4	ALASKA WARRIOR	17.2	33
3	BEAGLE	26.7	29
3	ALASKAN ROSE	23.9	28
3	ALASKA VOYAGER	12.1	17
3	ALASKA VICTORY	9.4	27
2	CONSTELLATION	23.9	32
2	ALASKA SPIRIT	16.1	18
2	DEFENDER	8.6	40
2	PROSPERITY	8.4	21
2	AURIGA	8.1	16

Trawl - Flatfish - BSA

461 total observered vessel weeks - 39 over 30kg/mt
39 vessel/weeks over 30 kg Halibut /MT groundfish

# Weeks> Guideline	Vessels Name	Av Halibut Kg/MT	# Obsrvd Hauls
7	ARICA	56.1	124
5	ALASKAN ROSE	66.0	75
4	PROSPERITY	39.1	58
3	FIERCE ALLEGIANCE	70.0	17
3	BEAGLE	33.8	38
2	DEFENDER	40.1	26
2	SEA POWER	35.0	19
1	PACIFIC KNIGHT	68.8	17
1	OCEAN PEACE	31.9	12
1	HARVESTER ENTERPR	35.3	24
1	GREAT PACIFIC	81.4	5
1	VAERDAL	38.0	5

Trawl - Flatfish - BSA

637 total observered vessel weeks - 63 over 10/mt
63 vessel/weeks over 10 Bairdi /MT groundfish

# Weeks> Guideline	Vessels Name	Average Bairdi/MT	# Obsrvd Hauls
14	ARICA	27.1	231
13	ALASKAN ROSE	25.4	170
7	PROSPERITY	24.4	102
4	BEAGLE	35.4	43
3	CAPE HORN	26.9	28
3	ARCTIC STORM	23.4	37
2	AURIGA	28.5	12
2	VAERDAL	22.4	14
2	ALASKA SPIRIT	18.5	22
2	ALASKA RANGER	16.5	15
2	ALASKA JURIS	14.2	20
2	SEA POWER	12.8	41

Trawl - Flatfish - BSA

637 total observered vessel weeks -
3 vessel/weeks over 2.5 RKC /MT groundfish

# Weeks> Guideline	Vessels Name	Average RKC /MT	# Obsrvd Hauls
1	ALASKAN ROSE	10.5	1
1	ALASKA SPIRIT	5.7	12
1	ARICA	5.1	1

Trawl - Flatfish - BSA
637 total observered vessel weeks -
47 vessel/weeks over 20 O-tanners /MT groundfish

# Weeks> Guideline	Vessels Name	Av Other Tannr/MT	# Obsrvd Hauls
10	ARICA	109.3	183
6	CAPE HORN	110.7	108
5	PROSPERITY	42.8	84
5	ALASKAN ROSE	41.2	68
3	AURIGA	32.6	23
2	STARFISH	83.3	11
2	ARCTIC STORM	40.4	36
2	CONSTELLATION	35.4	43
2	BERING ENTERPRISE	30.5	40
1	ALASKA RANGER	114.3	4
1	ENDURANCE	70.5	11
1	ALASKA VICTORY	67.1	17

Trawl - P Cod - GOA
114 total observered vessel weeks -
13 vessel/weeks over 30 kg Halibut /MT groundfish

# Weeks> Guideline	Vessels Name	Av Halibut Kg/MT	# Obsrvd Hauls
2	GREEN HOPE	73.9	15
1	HIGHLAND LIGHT	412.8	2
1	SEA POWER	197.5	15
1	CAPT'N ART	99.8	2
1	CARAVELLE	97.0	1
1	LISA MELINDA	91.7	1
1	CONSTELLATION	74.4	4
1	CAPE KIWANDA	55.5	4
1	PACIFIC RAM	46.2	9
1	PACIFIC ALLIANCE	37.4	9
1	ANITA J	31.1	5
1	NORDIC FURY	31.0	1

Trawl - Other - GOA
229 total observered vessel weeks -
112 vessel/weeks over 30 kg Halibut /MT groundfish

# Weeks> Guideline	Vessels Name	Av Halibut Kg/MT	# Obsrvd Hauls
7	BRISTOL ENTERPRISE	65.1	115
7	LEGACY	46.0	142
6	OCEAN HOPE 1	62.3	27
5	BERING ENTERPRISE	75.2	75
5	ALASKAN ROSE	43.6	100
4	TRAVELER	301.4	21
4	GREEN HOPE	82.9	9
4	ALLIANCE	81.2	36
4	VANGUARD	74.9	21
4	PACIFIC STAR	59.0	30
4	HARVESTER ENTERPRI	50.6	49
3	PROGRESS	115.9	28

Trawl - Other - GOA
229 total observered vessel weeks -
7 vessel/weeks over 10 Bairdi /MT groundfish

# Weeks> Guideline	Vessels Name	Average Bairdi/MT	# Obsrvd Hauls
3	GREEN HOPE	28.9	6
1	LESLIE LEE	17.3	12
1	ALASKAN	15.2	13
1	BRISTOL ENTERPRISE	10.7	6
1	DAWN	10.0	21

Trawl - P Cod - GOA
114 total observered vessel weeks -
5 vessel/weeks over 10 Bairdi /MT groundfish

# Weeks> Guideline	Vessels Name	Average Bairdi/MT	# Obsrvd Hauls
3	MAR DEL NORTE	72.2	12
1	CAPT'N ART	69.9	2
1	DOMINION	15.5	7

Average Rates from NMFS PSCRATE.DBF VIP File

BSA

GEAR	*TARGET*	*HAL*	*RKC*	*BAIRDI*	*HAULS*
HAL	C - P Cod	58.2	0.0	0.1	4787
HAL	S - Black Cod	187.1	0.0	0.0	246
POT	C - P Cod	6.2	2.3	4.3	2913
TRW	A - Atka Mackrel	1.8	0.0	0.0	1617
TRW	P - MW Pollock	0.1	0.0	0.0	3140
TRW	Y - Yellowfin Sole	5.2	0.0	3.5	2258
TRW	C - P Cod	24.5	0.0	1.5	3778
TRW	Other Bottom Trawl*	11.3	0.1	4.9	3804

*includes all targets except P/C/A/Y

GOA

GEAR	*TARGET*	*HAL*	*RKC*	*BAIRDI*	*# OBS HAULS*
HAL	C	89.2	0.0	0.0	228
HAL	S	170.6	0.0	0.0	1163
POT	C	8.5	0.0	23.2	328
TRW	C	19.6	0.0	2.9	759
TRW	P	0.1	0.0	0.0	196
TRW	B	2.3	0.0	0.0	35
TRW	Btm*	51.0	0.0	1.0	2119

*Includes all targets except P/C/A/B

Notes:
- PSC rates are simple averages of all observed vessel/weeks by target, unweighted by number of hauls by vessel.
- PSC rates are based on numbers or weight of animals caught, not on mortality.

The Squeaky Clean Dozen Awards
Vessels with 0 Bycatch of Halibut and Crab in a Week

GOA

Bottom Trawl*

# of weeks w no bycatch		# obs hauls
2	PACIFIC STAR	9
2	COLLIER BROTHERS	8
2	HAZEL LORRAINE	4
1	ALASKA VOYAGER	4
1	BRISTOL ENTERPRISE	14
1	TAASINGE	7
1	NIGHTWATCH	6
1	UNIMAK ENTERPRISE	5
1	PERSISTENCE	5
1	DEFIANT	5
1	MAR PACIFICO	3
1	OCEAN HOPE 1	3

Longline

# of weeks w no bycatch		# obs hauls
2	GRANT	8
2	GULF MAIDEN	5
2	YUKON QUEEN	3
2	SEA VALLEY II	2
1	MASONIC	7
1	TANI RAE	7
1	RED BARON	4
1	LUALDA	4
1	SOUTHEAST	3
1	ROCKY B	3
1	CAPE FLATTERY	2
1	MELISSA BETH	2

Pot Gear

# of weeks w no bycatch		# obs hauls
3	JEANOAH	15
2	TOTEM	5
2	SILVER SPRAY	4
2	ALSKA	4
2	PACIFIC VENTURE	3
1	PACIFIC MIST	6
1	ECHO BELLE	3
1	SEA QUAIL	3
1	ALASKA CHALLENGER	3
1	BUCCANEER	2
1	KATRINA-EM	2
1	BRITTANY	1

BSA

Bottom Trawl *

# of weeks w no bycatch		# obs hauls
4	NORTHERN JAEGER	71
4	ALASKA RANGER	36
4	ALASKA SPIRIT	31
3	ALASKA OCEAN	32
3	VICTORIA ANN	31
3	ELIZABETH F	16
3	PACIFIC ENTERPRISE	12
2	ALASKA VICTORY	24
2	ALASKA JURIS	18
2	OCEAN PEACE	17
2	ARCTIC III	12
2	SNOW KING	11

Longline

# of weeks w no bycatch		# obs hauls
2	YUKON QUEEN	7
2	ALEUTIAN	3
1	ALASKA MIST	6
1	REBECCA B	5
1	NORTHERN AURORA	4
1	ZENITH	3
1	CLIPPER SURPRISE	2
1	ARROW	2
1	THOR	1
1	MELISSA BETH	1
1	GRANT	1
1	AUGUSTINE	1

Pot Gear

# of weeks w no bycatch		# obs hauls
3	AMERICAN VIKING	17
2	ALEUTIAN BALLAD	44
2	CONSTELLATION	40
2	BULLDOG	34
2	SEA STAR	19
2	HANDLER	18
2	SAVAGE	2
1	ARCTIC SEA	28
1	LABRADOR	12
1	NORTH SEA	7
1	CASCADE	7
1	BRITTANY	6

Notes:
- * MW Pollock and Atka Mackrel were not included.
  Because of their extremly low bycatch rates, many more vessels in these fisheries achieved 0 bycatch weeks.
- The average bycatch rates by fishery are provide at the end of the "dirty dozen tables" for reference. These averages are also simple (non-weghted) averages.
- The data are sorted 1st on number of weeks, 2nd on rate and 3rd on number of observed hauls.
  (ie: given two vessels with equal numbers of weeks above a guidline and equal rates, the vessel with more observed hauls will be ranked higher)

The Grand Prize Winner

Most Categories
Most Often

Poster Child for the value of effective Individual Bycatch Accountability

WED	NAME	TARGET	HAL_ RATE	KING_ RATE	BAIRD_ RATE	OTANN_ RATE	# OBS HAULS	IF haul = 15 MT	Est Bairdi bycatch /week	Bairdi savings if rate was 10/MT	Est Othr Tanner bycatch /week
01/20/96	*ARICA*	R	0	**5.069**	0	0	1	15	0	0	0
01/27/96	*ARICA*	C	14.525	3.9	**13.373**	1.315	23	15	4,614	1,164	454
02/03/96	*ARICA*	R	**67.85**	0	**93.701**	3.436	20	15	28,110	25,110	1,031
02/10/96	*ARICA*	R	**42.541**	0	**36.738**	4.829	12	15	6,613	4,813	869
02/17/96	*ARICA*	R	15.896	0	**33.708**	1.396	22	15	11,124	7,824	461
02/24/96	*ARICA*	R	12.598	0	**23.437**	1.393	16	15	5,625	3,225	334
03/02/96	*ARICA*	F	20.908	0	**22.668**	11.005	21	15	7,140	3,990	3,467
03/09/96	*ARICA*	F	9.852	0	7.77	2.851	13	15	1,515		556
03/16/96	*ARICA*	Y	**10.266**	0	**13.251**	2.438	17	15	3,379	829	622
03/23/96	*ARICA*	Y	**13.927**	0	**11.436**	10.917	19	15	3,259	409	3,111
03/30/96	*ARICA*	Y	**11.748**	0	**14.471**	**60.288**	10	15	2,171	671	9,043
04/06/96	*ARICA*	L	**55.661**	0	8.531	19.218	19	15	2,431		5,477
04/13/96	*ARICA*	L	**60.408**	0	**42.536**	**161.237**	20	15	12,761	9,761	48,371
04/20/96	*ARICA*	Y	4.069	0	**14.457**	11.702	14	15	3,036	936	2,457
04/27/96	*ARICA*	Y	**11.81**	0	**16.681**	**72.698**	25	15	6,255	2,505	27,262
05/04/96	*ARICA*	Y	**17.96**	0	**27.649**	**70.886**	8	15	3,318	2,118	8,506
05/11/96	*ARICA*	Y	1.881	0.234	0.956	0.345	24	15	344		124
05/18/96	*ARICA*	Y	0.596	0	0	0	16	15	0		0
05/25/96	*ARICA*	Y	7.519	0.835	0	0	26	15	0		0
06/01/96	*ARICA*	F	1.047	0	0	0	18	15	0		0
06/08/96	*ARICA*	F	43.714	0	**18.565**	**68.744**	19	15	5,291	2,441	19,592
06/15/96	*ARICA*	Y	5.197	0	0	0	18	15	0		0
06/22/96	*ARICA*	C	44.32	0	**10.382**	**129.725**	10	15	1,557	57	19,459
06/29/96	*ARICA*	C	0	0	9.196	**91.187**	2	15	276		2,736
07/06/96	*ARICA*	F	25.122	0	0.799	**101.008**	24	15	288		36,363
07/13/96	*ARICA*	L	18.488	0	1.917	**129.83**	25	15	719		48,686
07/20/96	*ARICA*	F	13.559	0	2.34	**151.063**	18	15	632		40,787
07/27/96	*ARICA*	L	**84.385**	0	6.309	**90.309**	26	15	2,461		35,221
08/03/96	*ARICA*	L	37.8	0	**10.731**	**187.209**	8	15	1,288	88	22,465

Estimated total Bairdi bycatch in observed hauls	114,206
Bairdi savings if vessel had not exceeded a VIP of 10/MT -	65,941
Bairdi savings, assuming only 50% of hauls were observed -	***131,882***
Estimated total O-tanner bycatch in observed hauls	337,454

Notes:
- PSC rates in bold highlight are above the Halibut or RKC VIP rate for a fishery, or in the case of Bairdi and O-tanners, are above a guidline of 10/MT and 50/MT respectively.
- The last 3 columns are extrapolations based on the weekly bycatch rate of bairdi , multiplied by 15 MT groundfish per observed hauls only. The VIP postings do not provide any information on actual groundfish catch by vessel. However, 15 MT per haul is not an unrealistic estimate.
- IF the observer data posted on the VIP BBS is acurate and IF the assumption of 15 MT per haul is fair, and recognizing that observers sample only about 50 - 60% of hauls, this vessel could account for a very large fraction of the total estimated tanner crab bycatch. (as much as 225K Bairdi and 600K Opilio through August 3rd)