

MEMORANDUM

TO: Council, SSC and AP Members
FROM: Chris Oliver *Chris*
Acting Executive Director
DATE: February, 2001
SUBJECT: BSAI Crab Management

ESTIMATED TIME
1 HOUR

ACTION REQUIRED

Receive report from Crab Plan Team.

BACKGROUND

In October, the BSAI Crab Plan Team provided comments on a proposal to reduce opilio bycatch limits in trawl fisheries and prohibit trawling in areas with opilio crab. The Council requested the crab plan team to examine the 2000 bycatch of opilio crab in trawl fisheries within the C. Opilio Bycatch Limitation Zone (COBLZ) and Area 517, and consider possible boundary line changes for the COBLZ relative to previous industry negotiations on opilio bycatch management measures.

The Team met by teleconference on January 25 to discuss this matter. The Team recommended maintaining status quo for opilio bycatch limits, but suggested that the Council discuss including opilio in the vessel incentive program (VIP). Minutes are attached as Item D-2 (a).

**Draft Minutes of the Bering Sea/Aleutian Islands Crab Plan Team Meeting,
January 25, 2001**

Members Present

Wayne Donaldson (ADF&G)
Gretchen Harrington (NMFS, vice-chair)
Rance Morrison (ADF&G)
Doug Pengilly (ADF&G, chair)
Bob Otto (NMFS)

Herman Savviko (ADF&G)
Tom Shirley (UAF)
Shareef Siddeek (ADF&G)
Jack Turnock (NMFS)
Dave Witherell (NPFMC)

Also present: Gordon Blue, Dorothy Childers, John Gauvin, John Hendershedt, Sue Salvesson (NMFS), Karen Wood Dibari, Jie Zheng, Kristen Mabry

The Bering Sea/Aleutian Islands (BSAI) Crab Plan Team met via teleconference on January 25, 2001. The purpose of the meeting was to review the bycatch of *Chionoecetes opilio* crab during 2000 in trawl fisheries within the *C. opilio* Bycatch Limitation Zone (COBLZ) and Area 517, and to consider possible boundary line changes for the COBLZ relative to previous industry negotiations on *opilio* bycatch management measures.

Review of the 2000 trawl fishery *opilio* bycatch

Dave Witherell provided a summary table of *opilio* bycatch inside the COBLZ, outside the COBLZ, inside Area 517, and total in the trawl fisheries for 1998, 1999, and 2000 (attached). Total estimated trawl fishery bycatch of *opilio* was down from 4.1 million crabs in 1998, but up from 1.4 million crabs in 1999, to 3.0 million crabs in 2000. Within the COBLZ the trawl bycatch was 2.2 million crabs; the bycatch in Area 517 was 0.1 million crabs.

Bob Otto provided charts of catch (number) per nautical square mile of immature female, mature female, sublegal male, and legal male *opilio* by station during the 2000 NMFS eastern Bering Sea trawl survey (attached). Immature and mature female *opilio* were largely contained within the COBLZ. Males were more broadly distributed, but highest densities of sublegal males and, to a lesser extent, legal males were encountered in the COBLZ. Bottom temperatures during the survey, which may affect *opilio* distribution, were "average." Otto suggested that the trends in *opilio* bycatch levels over 1998-2000 corresponded with the *opilio* survey population estimates for those survey years: the increase in bycatch during 2000 relative to 1999 corresponded with a more than doubling of the population estimate between 1999 and 2000.

Public Comments and Discussion

Comments were provided by John Gauvin, Gordon Blue, and Karen Wood Dibari. John Gauvin estimated 1.0 – 1.3 million crabs in the *opilio* trawl bycatch during 2000 could be attributed to five vessels in the yellowfin sole fishery and provided a table listing the "top fifty" *opilio* vessel-weeks during the 2000 yellowfin sole fishery (attached table). He also stated that those five vessels were the only vessels that did not participate in the industry's SeaState bycatch monitoring program. Gauvin suggested that the Council institute a vessel incentive program (VIP) for the yellow fin sole

fishery to control bycatch of *opilio* and offered 25 *opilio* per ton as a standard for reducing bycatch that is achievable by vessels. Gordon Blue supported a VIP program for the yellow fin sole fishery and stressed the need for vigilance in bycatch monitoring. Karen Wood Dibari encouraged the Plan Team to continue scrutinizing *opilio* bycatch levels and distribution relative to the *opilio* stock levels and distribution. Dorothy Childers asked if the 1996 Industry Agreement on Snow Crab PSC Limits would be subjected to its five year review and Dave Witherell answered that the Plan Team had reviewed the Agreement last year during the development of the Bering Sea *opilio* Rebuilding Plan.

Sue Salveson provided answers to team members on implementing and enforcing a VIP program. She said that VIP programs are a positive step for reducing bycatch, but that there are potential problems due to resources for enforcing VIP programs and the pressures that VIPs can exert on the observers. Rance Morrison noted that a VIP program could still provide a deterrent even without the resources to fully prosecute all offenders.

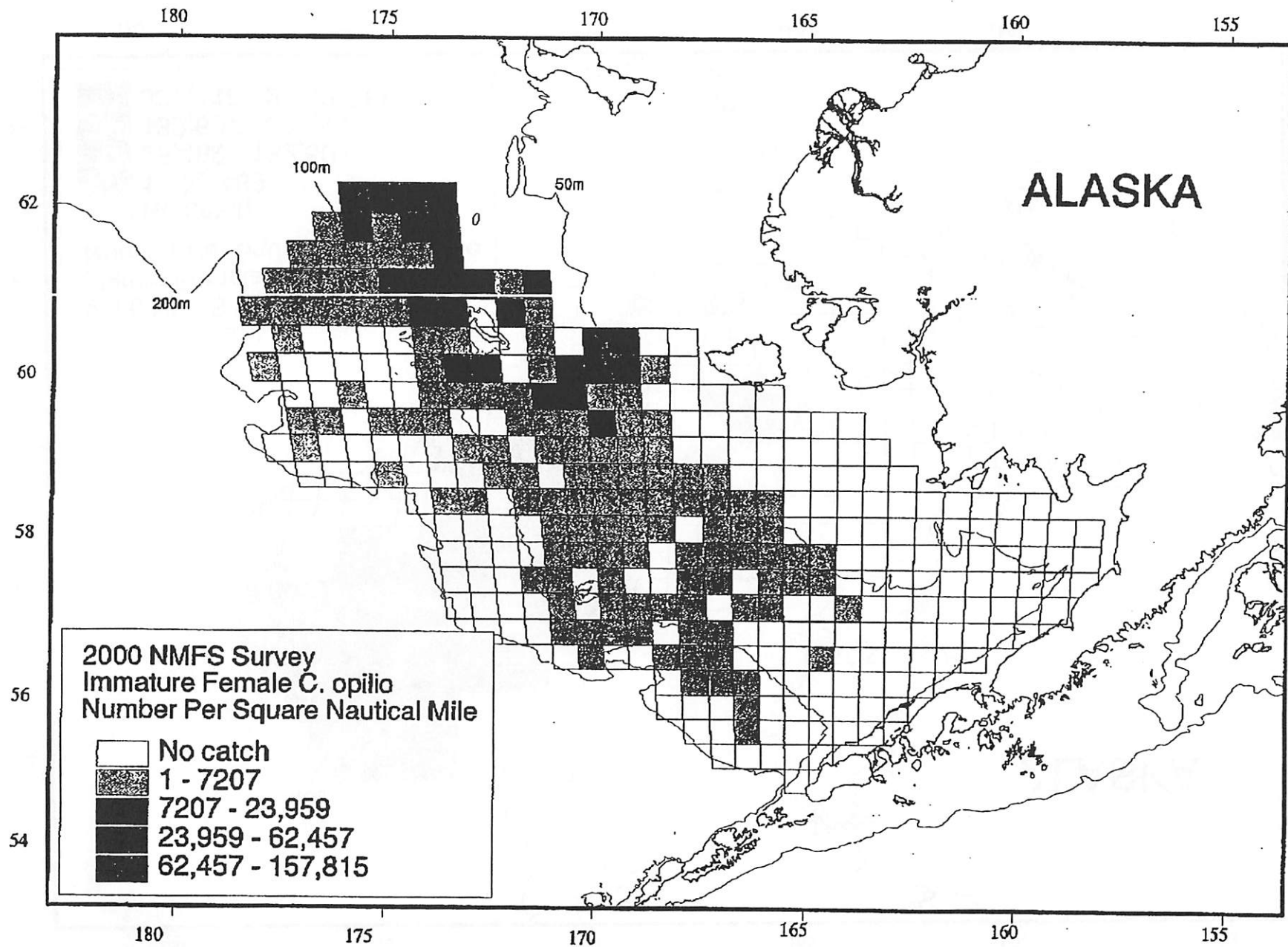
Crab Plan Team Recommendations

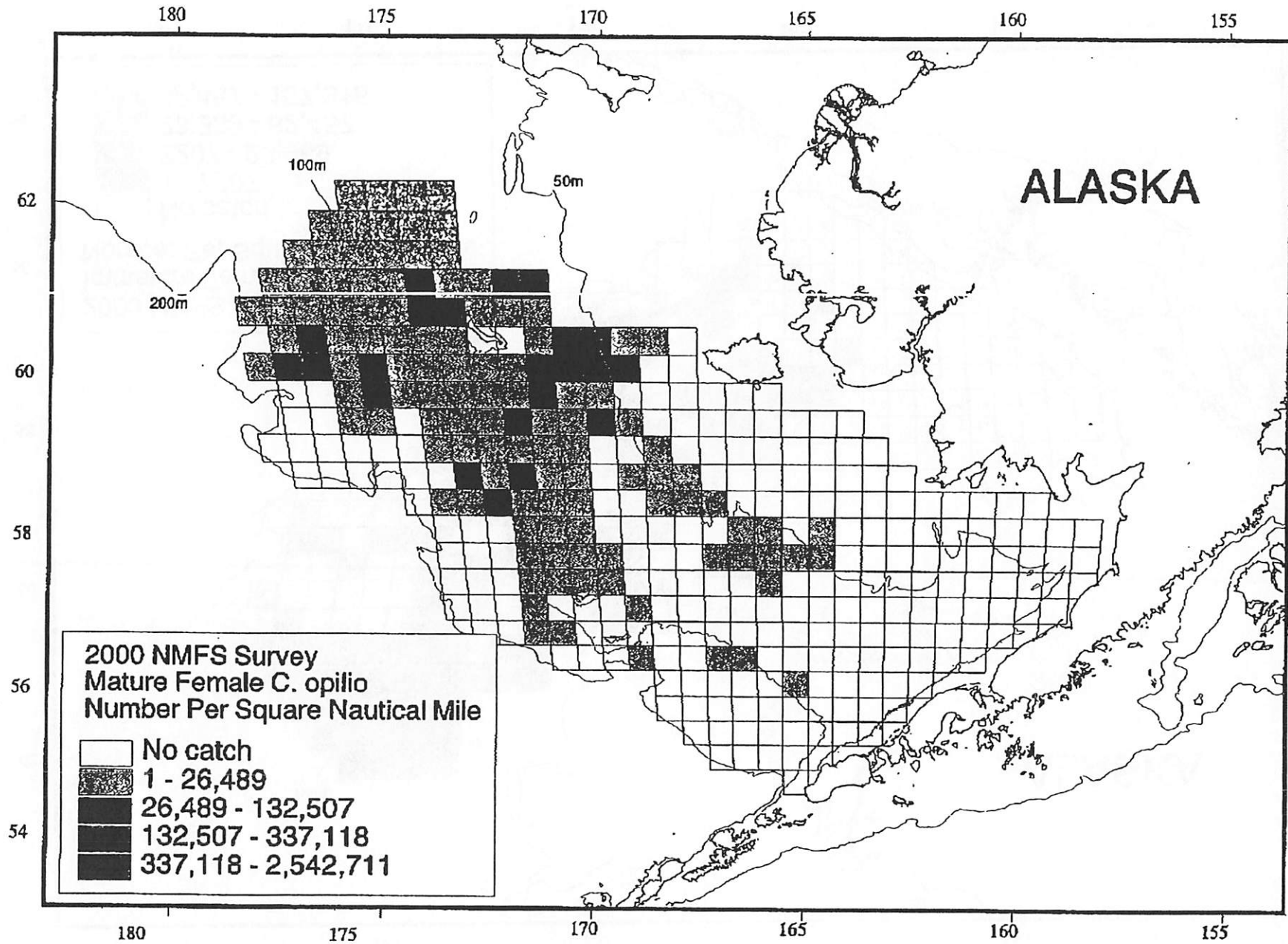
The Plan Team voted unanimously to recommend that bycatch outside of the COBLZ not be counted towards triggering the closure of the COBLZ, that the COBLZ not be expanded to include Area 517, and that the Council should consider a VIP program in the yellow fin sole fishery with consideration of 25 *opilio* per ton as the initial standard.

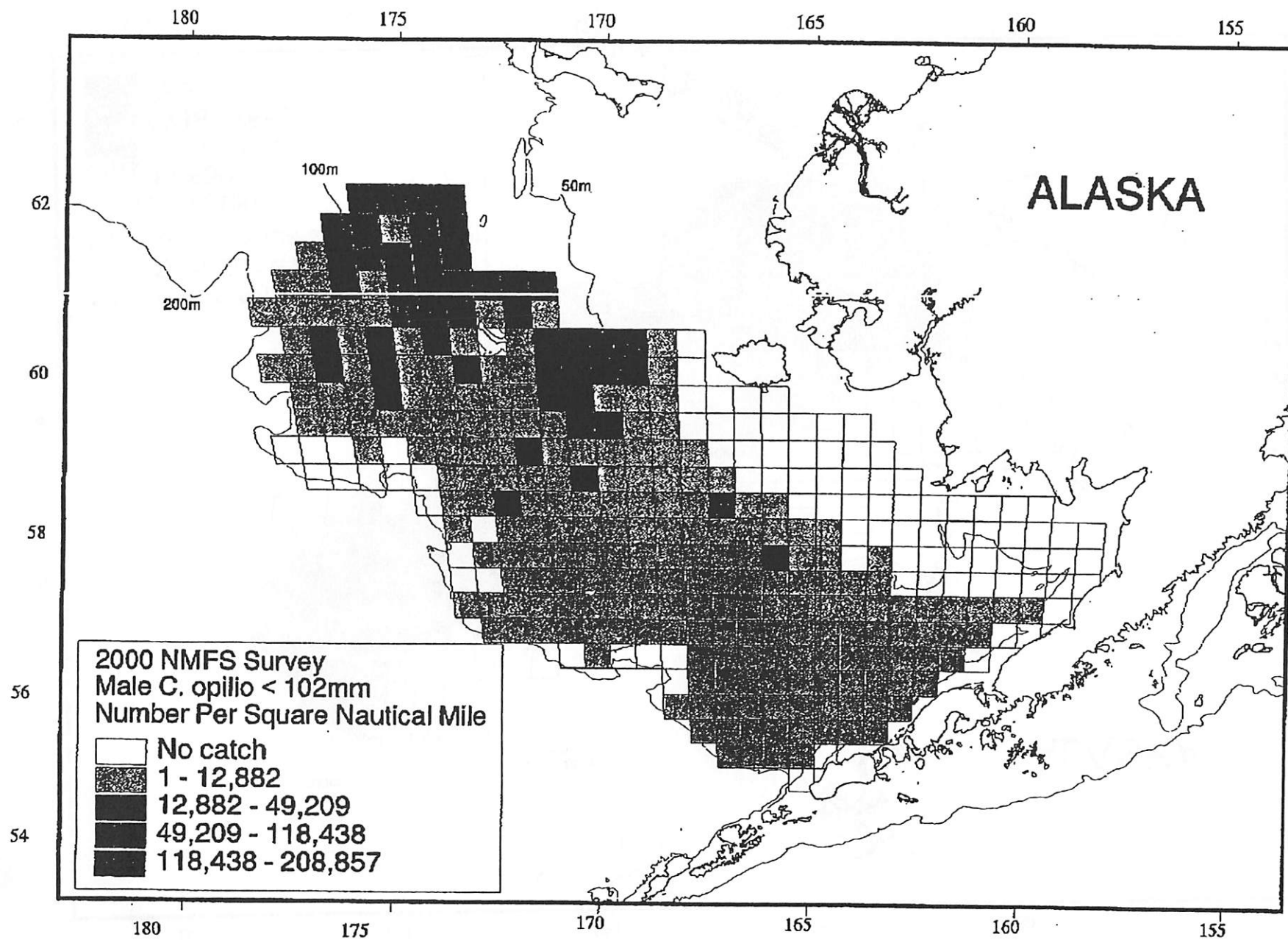
The Plan Team had reviewed the current bycatch control limits and COBLZ boundaries twice during 2000 and did not find that the survey distribution and trawl bycatch of *opilio* reported for 2000 provided new information indicating a need to change those bycatch controls. The COBLZ still appears to provide the best boundaries for controlling bycatch of *opilio*. The same problems with lowering the 4.5 million crab bycatch "ceiling" at low stock levels, that the Plan Team recognized during their reviews in 2000, still remain. The increase in bycatch during 2000 relative to 1999 appears to be due to an increase in *opilio* abundance and the actions of a few vessels. The Plan Team does not wish to disrupt the fishing opportunities of the majority of the trawl fleet for the actions of an apparently few vessels that are not minimizing their bycatch. Lowering the bycatch limits at low stock levels could do exactly that. VIPs, on the other hand, could provide a mechanism for behooving all vessels to minimize bycatch of *opilio* without disrupting the fishing opportunities for those vessels already working to minimize their bycatch.

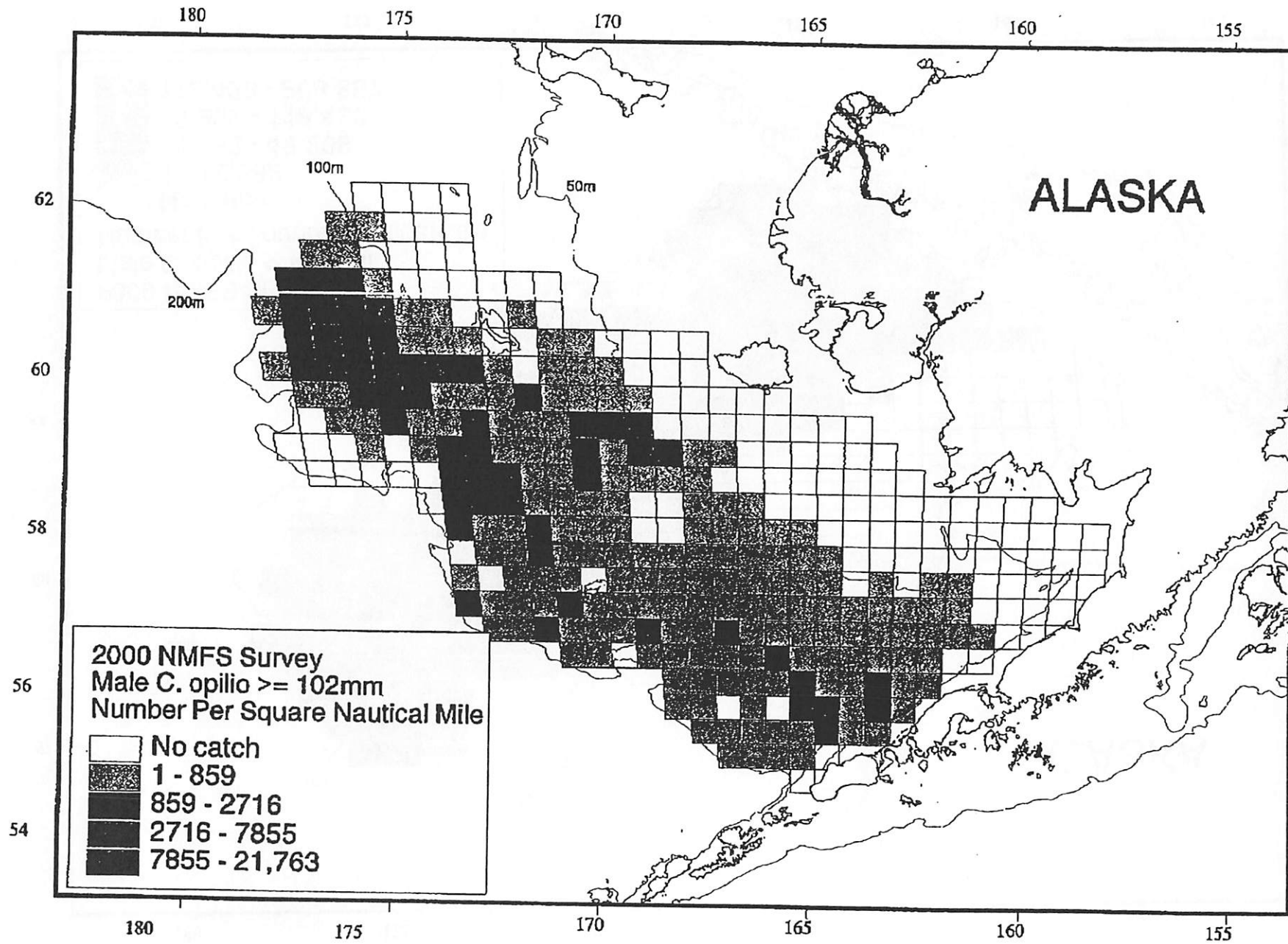
Catch of *C. opilio* crab (numbers) taken incidentally in BSAI trawl fisheries, inside and outside the COBLZ and within area 517, by fishery and year, 1998-2000.

<u>Year</u>	<u>Fishery</u>	<u>Inside COBLZ</u>	<u>Outside COBLZ</u>	<u>Total</u>	<u>Area 517</u>
1998	yellowfin sole	2,057,426	420,984	2,478,410	134,833
	rock sole	56,665	418,710	475,375	32,601
	Pacific cod	49,780	207,891	257,671	56,815
	flathead sole	343,904	321,261	665,165	285,389
	other fisheries	<u>90,737</u>	<u>118,602</u>	<u>209,339</u>	<u>65,085</u>
	TOTAL	2,598,512	1,487,448	4,085,960	574,723
1999	yellowfin sole	378,964	223,709	602,673	51,861
	rock sole	2,294	85,325	87,619	1,029
	Pacific cod	22,390	248,712	271,102	53,822
	flathead sole	254,149	66,107	320,256	55,020
	other fisheries	<u>1,370</u>	<u>77,681</u>	<u>79,051</u>	<u>39,694</u>
	TOTAL	659,167	701,534	1,360,701	201,426
2000	yellowfin sole	1,861,033	513,079	2,374,112	61,140
	rock sole	15,600	132,445	148,045	1,175
	Pacific cod	50,245	84,130	134,375	9,145
	flathead sole	266,340	52,212	318,552	32,638
	other fisheries	<u>16,259</u>	<u>22,685</u>	<u>38,944</u>	<u>13,718</u>
	TOTAL	2,209,477	804,551	3,014,028	117,816









			<u>Opilio/mt</u>	<u>Obs. Hauls</u>	<u>Samples</u>	<u>Sample Wt.</u>
1	5/20/00 ALASKA WARRIOR	BSATRWY	298.079	20	20	6.004
2	5/20/00 ALASKA JURIS	BSATRWY	243.868	15	15	4.332
3	5/20/00 ALASKA SPIRIT	BSATRWY	214.635	23	23	7.539
4	5/27/00 ALASKA SPIRIT	BSATRWY	161.73	23	23	8.055
5	9/30/00 ALASKA SPIRIT	BSATRWY	131.964	9	9	2.629
6	10/21/00 ALASKA WARRIOR	BSATRWY	127.229	9	9	2.527
7	9/30/00 ALASKA RANGER	BSATRWY	120.753	11	10	2.964
8	9/30/00 ALASKA WARRIOR	BSATRWY	120.469	16	16	4.416
9	5/20/00 ALASKA VICTORY	BSATRWY	114.585	15	15	3.606
10	5/27/00 ALASKA VICTORY	BSATRWY	114.32	15	15	3.755
11	5/27/00 ALASKA RANGER	BSATRWY	99.707	16	16	4.212
12	5/13/00 SEAFREEZE ALASKA	BSATRWY	99.457	12	11	2.883
13	10/7/00 ALASKA WARRIOR	BSATRWY	92.983	15	15	4.079
14	5/27/00 ALASKA JURIS	BSATRWY	90.545	16	16	4.245
15	10/7/00 ALASKA VICTORY	BSATRWY	90.222	15	15	4.505
16	7/1/00 ALASKA VICTORY	BSATRWY	89.313	12	12	3.747
17	5/20/00 ALASKA RANGER	BSATRWY	87.548	16	16	4.818
18	10/7/00 ALASKA SPIRIT	BSATRWY	85.317	11	11	3.195
19	11/25/00 ALASKA SPIRIT	BSATRWY	79.329	6	6	1.802
20	6/10/00 ALASKA JURIS	BSATRWY	77.142	15	15	3.402
21	10/7/00 ALASKA RANGER	BSATRWY	76.661	13	13	4.127
22	11/11/00 ALASKA SPIRIT	BSATRWY	69.596	7	7	2.266
23	9/30/00 ALASKA VICTORY	BSATRWY	67.428	13	13	4.395
24	9/30/00 ALASKA JURIS	BSATRWY	67.209	13	13	3.925
25	10/28/00 ALASKA SPIRIT	BSATRWY	66.458	17	17	4.875
26	10/21/00 ALASKA JURIS	BSATRWY	60.587	5	5	1.577
27	11/4/00 ALASKA JURIS	BSATRWY	59.666	4	4	1.216
28	11/11/00 ALASKA WARRIOR	BSATRWY	53.589	10	10	2.69
29	10/14/00 ALASKA JURIS	BSATRWY	53.29	12	12	3.575
30	6/10/00 ALASKA RANGER	BSATRWY	51.589	7	7	2.304
31	10/28/00 ALASKA JURIS	BSATRWY	50.91	13	13	4.505
32	5/6/00 ALASKA JURIS	BSATRWY	50.66	12	12	3.358
33	9/2/00 ALASKA WARRIOR	BSATRWY	50.052	9	9	2.456
34	10/21/00 ALASKA VICTORY	BSATRWY	49.045	7	7	2.32
35	10/21/00 ALASKA RANGER	BSATRWY	48.852	10	10	3.051
36	11/4/00 SEAFISHER	BSATRWY	48.493	6	6	1.98
37	11/11/00 ALASKA JURIS	BSATRWY	48.168	9	9	2.83
38	10/14/00 ALASKA RANGER	BSATRWY	47.983	10	10	3.136
39	11/18/00 ALASKA SPIRIT	BSATRWY	45.9	9	9	2.963
40	10/28/00 ALASKA WARRIOR	BSATRWY	45.73	7	7	2.163
41	10/28/00 ALASKA VICTORY	BSATRWY	45.319	14	14	4.561
42	10/21/00 ALASKA SPIRIT	BSATRWY	45.047	15	15	4.117
43	11/11/00 ALASKA RANGER	BSATRWY	44.849	11	11	3.153
44	10/14/00 ALASKA WARRIOR	BSATRWY	43.968	13	13	4.053
45	5/13/00 ALASKA JURIS	BSATRWY	43.138	12	12	3.14
46	10/7/00 ALASKA JURIS	BSATRWY	41.743	10	10	3.278
47	9/2/00 ALASKA VICTORY	BSATRWY	41.393	7	7	1.822
48	11/18/00 ALASKA VICTORY	BSATRWY	40.77	8	8	2.5
49	8/5/00 ALASKA SPIRIT	BSATRWY	40.67	17	17	4.639
50	6/24/00 ALASKA VICTORY	BSATRWY	40.33	16	16	4.916

David Benton, Chair
North Pacific Fishery Management Council
605 West 4th Avenue
Anchorage, Alaska 99501

February 9, 2001

Re: Report from Crab Plan Team on Opilio Bycatch in Trawl Fisheries

Dear Chairman Benton:

Due to other commitments, the Center for Marine Conservation (CMC) will likely be unable to be present at the meeting when the Council addresses the Crab Plan Team report regarding opilio crab bycatch in trawl fisheries. However, we submit these comments for your consideration.

CMC's mission is to protect ocean ecosystems and conserve the global abundance and diversity of marine wildlife through science-based advocacy, research and public education. Headquartered in Washington, DC, CMC has regional offices in Alaska, California, Florida and Virginia and field offices in Maine, Santa Barbara and Santa Cruz, California, and the Florida Keys. We are very concerned about the serious decline of the Bering Sea snow crab stock, the lack of information known about the stock, the bycatch problems, and habitat needs of snow crab. In November 2000, we submitted comments to NMFS regarding the deficiencies in the snow crab rebuilding plan and now that the plan has been approved without modification, our concerns remain. In addition, we have reviewed the proposal put forth by the Alaska Marine Conservation Council (AMCC) to reduce opilio bycatch limits in trawl fisheries and prohibit trawling in areas with opilio crab. We are disappointed the Crab Plan Team did not recommend that the Council adopt AMCC's suggestions to reduce trawl bycatch of snow crab.

In October, the Council requested the BSAI Crab Plan Team to examine the 2000 bycatch of opilio crab in trawl fisheries within the C. Opilio Bycatch Limitation Zone (COBLZ) and Area 517, and consider possible boundary line changes for the COBLZ relative to previous industry negotiations on opilio bycatch management measures. The Team recommended maintaining the status quo for opilio bycatch limits, but suggested that the Council discuss including opilio in the vessel incentive program (VIP).

CMC supports the Council's examination of the bycatch of opilio in trawl fisheries. As evidenced by the overfished status of opilio crab and the need for a rebuilding plan, this stock has experienced a severe decline and warrants serious attention to ensure that the stock rebuilds as quickly as possible. We are very concerned, however, with the Plan Team's recommendation that the status quo be maintained, with only the addition of including opilio crab in the VIP program.

Unreliable Annual Abundance Estimates

Apparently to justify not recommending additional meaningful bycatch reduction measures, the Crab Plan Team's January 25, 2001 Minutes state that "the increase in bycatch during 2000 relative to 1999 corresponded with a more than doubling of the population estimate between 1999 and 2000."¹ We question, however, the abundance estimate for the year 2000 and believe it overestimates the number of females and total population. (See attached Table 5 *Annual abundance estimates (millions of crabs) for eastern Bering Sea snow crabs (C. opilio) from NMFS surveys*, NMFS Report to Industry on the 2000 Eastern Bering Sea Crab Survey, November 2000.) NMFS claims that the total abundance was 3241.2 million crabs in 2000, increased from 1401.0 million in 1999. In large part, this increased abundance is attributed to the supposed tripling of the large females, from 474.3 million crabs in 1999 to 1480.8 million in 2000, and the doubling of the small females, from 315.5 million crabs in 1999 to 648.4 million crabs in 2000. The 2000 abundance estimate for large females is based on one survey tow where approximately one-half of the mature females of the whole survey occurred. In addition, two-thirds of the crabs in the survey were oldshell females. If there were so many oldshell females in 2000, the 1999 abundance estimates should have been much higher.

The unreliable abundance estimate of female snow crabs is highlighted in *NMFS Report to Industry*: "This increase brought the estimated spawning biomass above the MSST but is suspect since the mature female estimate is heavily influenced by a single extraordinarily high catch." (*Report* at 20).

It is critical to note the $\pm 101\%$ confidence interval limit associated with the large female estimate, $\pm 58\%$ limit associated with the small female estimate, and the $87 \pm \%$ limit associated with the total female abundance estimate, as well as the $67 \pm \%$ limit associated with the grand total crab abundance. Typically, the confidence intervals associated with abundance estimates are approximately $\pm 30\%$, as seen with the estimates for abundance of male crabs and other crab stocks. Given the low confidence levels associated with the female crab estimates, it seems clear that the grand total estimate is based on unreliable estimates of female crab abundance.

It is extremely troubling that the Plan Team is relying on abundance estimates at face value given the low confidence levels associated with the estimates. At a minimum, the large female abundance estimates should be halved to account for the uncertainty in the survey estimates. Ideally, additional surveys in numerous locations should be conducted to arrive at more reliable population estimates.

Ineffective VIP Program

We question the effectiveness of the VIP program. At the joint meeting of the Council and the Board of Fish earlier this week, there was recognition about the ineffectiveness of the

¹ The total estimated trawl fishery bycatch of opilio over doubled, from 1.4 million crabs in 1999 to 3.0 million in 2000.

VIP program for other stocks. Dr. Balsiger noted the problems with low confidence levels in the data that make prosecuting violations virtually impossible. In addition, there are potential problems due to lack of NMFS resources for enforcing VIP programs and the pressures that VIPs can exert on observers. While the use of VIP programs may be a positive component in reducing bycatch, relying on the VIP program alone to reduce opilio bycatch does not go far enough to ensure bycatch reduction.

We recommend that the Council take additional measures to understand and address the opilio crab bycatch in trawl fisheries.

Removing the 4.5 Million Crab Floor

The trawl bycatch has doubled since 1999 and the Plan Team's is relying on the 2000 abundance estimates in its recommendation to largely maintain the status quo. As we stated earlier, we seriously question the validity of the current snow crab abundance estimates. Consequently, it is a mistake to rely on the 2000 abundance estimates to explain the increased trawl bycatch. The Council should take the opportunity to review the 1996 Industry Agreement on Snow Crab PSC Limits and eliminate the current PSC "floor."

A 1996 Industry Agreement on Snow Crab PSC Limits set the snow crab PSC cap at .1133% of the Bering Sea snow crab abundance index, with a minimum PSC of 4.5 million snow crabs and a maximum of 13 million crabs. In 1998, the Council adopted a provision to reduce snow crab bycatch by an additional 150,000 crabs as part of the regulation prohibiting the use of bottom trawl gear for pollock fisheries.

The Draft Minutes from the Crab Plan Team meeting on January 25, 2001 represent that in response to a question whether the 1996 Industry Agreement would be subject to its five year review, Council staff answered that "the Plan Team had reviewed the Agreement last year during the development of the Bering Sea opilio Rebuilding Plan." The Plan Team review did not involve changes to the Agreement. CMC recommends that the Council reevaluate the decision that the Industry Agreement remains unchanged.

The Environmental Assessment (EA) for Amendment 14, the Bering Sea snow crab rebuilding plan, states the following in support of removing the current 4.5 million crab floor:

Bycatch caps, particularly in fisheries that use gear that is potentially destructive to habitat, may be the most effective means to protect the habitat of stocks from fishery impacts when habitat requirements and vulnerability are poorly understood. Bycatch caps can serve to decrease effort in areas of good habitat (as indicated by high densities of the protected species) without burdening other fisheries with overly protective exclusion zones. The analysts suggest that bycatch trends be closely monitored in the future to determine if current PSC limits are negatively affecting stock recovery. In that regard, trawl bycatch staying below 0.1133% of the total snow crab population would be preferable to the 4.5 million floor when stocks are low. (EA at 35) (emphasis added).

The extremely unreliable abundance levels, the lack of information about snow crab biology, bycatch mortality, and habitat warrant bycatch reduction measures such as removing the floor in the 1996 Industry Agreement and setting the snow crab PSC limit at .1133 percent of total survey abundance (minus 150,000 crabs) with a maximum of 12.85 million crabs.

Expand the COBLZ Area

Snow crabs taken within the C. Opilio Bycatch Limitation Zone (COBALZ) accrues towards the PSC limits established for individual trawl fisheries. Upon attainment of a snow crab PSC limit apportioned to a particular trawl fishery, that fishery is prohibited from fishing with the snow crab zone.

We recommend that the Council look at the geographic locations of the bycatch taken by the different trawl fisheries. It is important to discern the bycatch rates in the regional populations of opilio crab, and not look only at the overall bycatch rates by the trawl fisheries. Such an inquiry will help to identify specific areas where crabs are vulnerable as bycatch in trawl fisheries. The COBLZ area should be expanded to include areas of high concentration of trawl bycatch.

Protect Snow Crab Habitat through Marine Protected Areas

The Council should consider creating marine protected areas as a precautionary action to protect habitat for vulnerable snow crab populations. We recognize that there is limited information about snow crab habitat. NMFS eastern Bering Sea trawl survey, from which important snow crab habitat was determined, contains geographic and seasonal limitations. First, the survey "does not cover the entire distribution of snow crabs in the Bering Sea and that areas of important snow crab habitat likely exist beyond the northern borders of the surveyed area." (EA at 33). Next, the Bering Sea snow crab's life history suggests that "immigration of unknown magnitude to the survey area may occur from northern areas." (EA at 33). Additionally, the survey data only reflects the distribution exhibited in the summer months. (EA at 33-34).

Clearly, research is necessary to understand the habitat needs of snow crabs in order to best protect essential habitat for the stock. However, until such information is known, the Council and NMFS should act precautionary and protect any possible snow crab habitat from any adverse impacts. As reflected in the September 2000 Crab Plan Team Minutes, the Team has suggested that habitat conservation be done through a system of marine protected areas and research reserves. We applaud this idea and urge the Council to consider marine reserves to protect snow crab habitat. Specifically, the Council should consider a bottom-trawl closure north of 58 degrees, protecting 82 percent of female crabs and a seasonal bottom-trawl closure from March to June in areas of highest trawl bycatch to protect snow crab during sensitive life-stages. The Council should also develop additional habitat conservation plans for snow crab that include experimental designs for monitoring the effects of conservation measures and research directed at understanding the biology and ecology of snow crab.

Need for Additional Information on Effects of Trawling on Habitat

CMC urges the Council to recommend that NMFS conduct research on the current and potential effects of trawling on snow crab habitat.

Little work has been done showing a direct connection between the effects of trawling on habitat complexity and the population of managed fish. None has been done in the North Pacific. . . . More research is needed in three areas . . . : (1) the spatial extent of fishing-induced disturbances; (2) the effects of specific gear types, along a gradient of effort, on specific habitat types; and (3) the role of seafloor habitats in the population dynamics of fishes. A fourth area of needed research involves investigating the life histories of affected non-commercial invertebrates, their relationships to one another, and to managed stocks of fish and shellfish. Little is known about these invertebrates. Until more is known, it is difficult to judge the affects of observed reductions in diversity and structural heterogeneity on the mortality, growth, and recruitment rates of important species. (EA at 47).

It is clear that trawling can impact the bottom habitat where snow crabs live and forage. According to the EA which cited a review of twenty-two studies worldwide, "mobile fishing gear reduced habitat complexity in three ways: (1) the epifauna is removed or damaged; (2) sedimentary bedforms are smoothed and bottom roughness is reduced; and (3) taxa are removed which produce structure, including burrows and pits." These findings are consistent with finding of the studies in the North Pacific. (EA at 44-46).

Trawling intensity has increased in the southern portion of the Bering Sea snow crab range, possibly inhibiting the stock's recovery. Given the precipitous decline of the stock abundance, the general information about trawling habitat impacts, and the lack of information about trawling impacts specific to snow crab habitat, it is critical to study the effects of fishing practices on bottom habitat and ensure appropriate protections against any habitat impacts.

Lack of Information Regarding Bycatch Mortality

While it is necessary to look at the bycatch in the trawl fisheries, the bycatch in the crab fisheries must be recognized as very significant.² There is a lack of information, however, detailing the amounts of snow crab bycatch mortality due to handling mortality, catching mortality, ghost fishing, and direct gear impacts. Consequently, to understand the actual scope of the bycatch problem, research must be directed in this area.

Uncertainty and the Need for Precaution

There is much uncertainty regarding the biology of Bering Sea snow crabs. Additional information is needed regarding the aging and growth patterns, terminal molt for males, migration, egg clutch size, stock separation, locations of juvenile rearing areas, locations of

² In 1999, the total bycatch was 41,666,447. (EA at 15).

mating pairs and aggregations, and the significance of the disappearance of the southern distribution of snow crabs.

Overall there are shortcomings in the data regarding snow crabs. Surveys have been conducted in the summer only. There has been incomplete observer coverage. Additionally, there have been changes in surveys and observer coverages from previous decades. Given the unreliable abundance estimates, the large amount of information that is unknown about the biology of the stock, the amount of bycatch mortality from the various sources, and habitat needs of the stock, it is imperative that the Council employ a large amount of precaution in addressing the recovery of the stock.

Need for Programmatic EIS on Crab Fisheries

We understand that NMFS intends to conduct a programmatic Environmental Impact Statement (EIS) for the Bering Sea Crab Fishery Management Plan in the coming year. An EIS is very necessary, especially considering that the only three officially recognized overfished stocks in the North Pacific are crab. Moreover, an EIS will evaluate both the directed crab and groundfish fisheries impacts on crab stocks and discuss the large amounts of unknown information regarding snow crab biology, bycatch mortality, snow crab habitat needs and the impacts of other fisheries on its recovery. We strongly suggest that the Council recommend to NMFS that it begin the EIS process as soon as possible.

Conclusion

The Center for Marine Conservation is extremely concerned that the Crab Plan Team is using unreliable abundance estimates to justify largely maintaining the status quo regarding reducing bycatch in the trawl fisheries. We urge the Council to adopt meaningful trawl bycatch reduction measures such as removing the PSC limit, expanding the COBLZ area, and creating marine protected areas to protect important snow crab habitat. We look forward to participating in the upcoming process to develop a comprehensive EIS on the crab fisheries.

Thank you for the opportunity to comment.

Sincerely,



Stacey Marz
Alaska Region Fish Project Manager

Table 5. Annual abundance estimates (millions of crabs) for eastern Bering Sea snow crabs (*C. opilio*) from NMFS surveys (all districts combined).

Carapace Width(mm) Width(in)	Males				Females			Grand Total
	Small	Large	V. Large	Total	Small	Large	Total	
	<102 ¹ <4.0	≥102 ¹ ≥4.0	≥110 ≥4.3		<50 <2.0	≥50 ≥2.0		
1981	1889.1	54.5	22.2	1943.6	668.6	2607.6	3276.2	5219.8
1982	2003.0	70.2	21.7	2073.2	402.6	2255.8	2658.4	4731.7
1983	1782.8	75.3	22.1	1858.1	673.1	1228.4	1912.6	3771.0
1984	1237.4	153.2	73.9	1390.6	610.5	581.7	1192.2	2582.9
1985	547.8	74.9	40.7	622.7	258.2	123.5	381.7	1004.3
1986	1179.0	83.1	45.9	1262.1	790.6	422.0	1212.5	2474.5
1987	4476.0	144.3	66.4	4620.3	2903.0	2795.0	5698.0	10318.3
1988	3467.2	171.0	90.1	3638.2	1235.3	2322.7	3556.0	7194.2
1989	3646.1	187.1	81.2	3833.2	1922.8	3790.7	5713.4	9546.6
1990	2860.4	420.3	188.7	3280.7	1463.3	2798.1	4261.4	7542.1
1991	3971.2	484.1	323.0	4455.3	3289.0	3575.0	6863.9	11319.2
1992	3158.4	256.4	163.8	3414.8	2433.9	1914.3	4348.2	7763.0
1993	5596.6	135.0	77.9	5731.5	3989.8	1982.6	5972.4	11703.9
1994	4282.5	71.6	39.9	4354.0	3417.6	1674.3	5091.8	9445.9
1995	4086.8	68.8	30.9	4155.6	2090.3	2409.4	4499.7	8655.3
1996	2700.1	171.6	64.8	2871.7	1189.0	1364.2	2553.2	5424.9
1997	1490.8	305.7	160.9	1796.6	927.9	1383.1	2311.0	4107.5
1998	1014.7	254.6	139.2	1269.3	803.0	1160.8	1964.0	3233.3
1999	517.0	94.2	55.8	611.1	315.5	474.3	789.8	1401.0
2000	1035.8	76.1	40.7	1111.9	648.4	1480.9	2129.3	3241.2
East (%) ²	46.4	46.4	57.0	46.4	46.1	70.1	62.8	57.2
<u>Limits</u> ³								
Lower	725.1	52.5	28.5	800.6	272.3	0.0	276.8	1077.4
Upper	1346.6	99.7	52.9	1423.2	1024.4	2976.6	3981.7	5405.0
±%	30	31	30	28	58	101	87	67

¹ Values prior to 1984 are interpolated from 5 mm width classes.

² Percent of size group in Eastern District (east of 173°).

³ Mean ± 2 standard errors for most recent year.



Alaska Marine Conservation Council

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February 11, 2001

Chairman David Benton
North Pacific Fishery Management Council
605 West 4th Avenue, Suite 306
Anchorage, AK 99501-2252

RE: Agenda Item D-2, Crab Plan Team Report

Dear Chairman Benton,

Alaska Marine Conservation Council (AMCC) has raised conservation concerns since 1999 about basing snow crab rebuilding solely on a more conservative harvest strategy and not including habitat protection and bycatch reduction measures. We continue to have serious concerns about the effects of mobile gear on crab habitat, the potential for sublethal impacts on crab, and unobserved mortality that is not accounted for in bycatch data. AMCC reminds the NPFMC that the snow crab (*C. opilio*) population is in recovery status, and is in extremely poor condition exemplified by multiple years of little or no recruitment and significant reduction in reproductive females. If the snow crab population were healthy, perhaps the need for conservation measures would not be so critical.

We were pleased that the North Pacific Fishery Management Council (NPFMC) asked the Crab Plan Team to review the potential causes of increased snow crab bycatch in the 2000 trawl fishery and recommend appropriate conservation actions.

The Crab Plan Team made three recommendations:

1. Bycatch outside of the Snow Crab (*C. opilio*) Bycatch Limitation Zone (COBLZ) should *not* be counted towards triggering the closure of the (COBLZ);
2. The COBLZ should *not* be expanded to include Area 517; and
3. The NPFMC should consider a vessel incentive program in the yellowfin sole fishery with consideration of 25 snow crab per ton as the initial standard.

AMCC disagrees with conclusions drawn by the Plan Team to reach the first two recommendations, and we do not consider the third recommendation of a VIP for the yellowfin sole fishery sufficient in responding to the bycatch reduction and habitat protection needs of the recovering snow crab population. Because so little is known about the biology and ecology of the Bering Sea snow crab, and because the population estimates are extremely uncertain, the effects of bycatch and negative habitat impacts on the recovery of the snow crab are unclear. The current poor condition of the population warrants further investigation into the puzzle regarding the nature of bycatch and habitat impacts on snow crab and what conservation measures would aid in rebuilding.

Since the Plan Team meeting, AMCC developed new information showing high bycatch rates on vulnerable segments of the crab population outside the snow crab bycatch limitation zone. Our findings are displayed in attached maps and discussed in attached document, "Bycatch and Habitat Considerations for Snow Crab Rebuilding." To summarize our concerns:

- A significant portion of total snow crab bycatch in the trawl fisheries is taken outside of the snow crab bycatch limitation zone, but within snow crab essential fish habitat.
- The effects of bycatch and habitat disturbance are greater when the population is very low, and habitat protection and bycatch reduction measures are even more needed.
- More conservation is needed when major uncertainties exist regarding scientific understanding of the biology and ecology of the species, as well as human impacts through fishing.

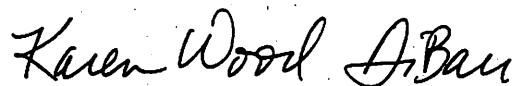
Recommendations

AMCC recommends the following:

- Conduct analysis to further illuminate the impacts of bycatch on local abundance both within and outside of the COBLZ.
- Consider the links between areas of high bycatch and habitat.
- Reconsider whether the bycatch floor should be lowered during times of low abundance.
- Reconsider extending the boundaries of the COBLZ.

Thank you for considering our concerns and recommendations. Please contact either of us with any questions.

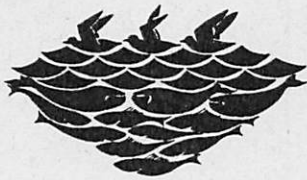
Sincerely,



Karen Wood DiBari
Program Director

Attachments:

1. Discussion paper on bycatch and habitat considerations for snow crab rebuilding.
2. AMCC/ECOTRUST maps of 1999 snow crab distribution, observed bycatch in trawl fisheries, and bycatch as percent of total abundance.
3. Snow crab essential fish habitat.



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Bycatch and Habitat Considerations for Snow Crab Rebuilding

February 11, 2001

Assumption that the Overall Bycatch Rate Parallels Population Growth Between 1999-2000 is Highly Uncertain

The Crab Plan Team states in the minutes of their January 25, 2001 teleconference that:

...The trends in opilio bycatch levels over 1998-2000 corresponded with the opilio survey population estimates for those survey years: the increase in bycatch during 2000 relative to 1999 corresponded with a more than doubling of the population estimate between 1999 and 2000.¹

The "more than doubling" of the population is a highly uncertain statement due to a recognized spike in the data from one anomalous trawl survey tow which yielded approximately half of all of the mature females counted in the whole survey. Crab scientists have clearly acknowledged in public meetings and documents that the data gathered in this one tow throw off the accuracy of the population estimate. As stated in the Report to Industry,

The majority of the 67% increase in total spawning biomass between 1999 and 2000 resulted from a three-fold increase in mature female biomass. This increase brought the estimated spawning biomass above the minimum stock size threshold (MSST) but is suspect since the mature female estimate is heavily influenced by a single extraordinarily high catch (in one survey tow). (emphasis added)²

In addition, scientists acknowledge differences in the size of crab that are caught as trawl bycatch (large crab) and those that are collected in the annual surveys upon which the population estimates are based (small crab). This discrepancy distorts the accuracy of the population estimates.

A shortcoming of the existing snow crab PSC limit, as based on total abundance, is due to the fact that minor changes in survey station or crab distribution can create major changes in the survey population estimate. This is because the population index is dominated by small animals and survey estimates of small crab and their distribution are highly variable from year to year. This potentially creates problems because annual PSC limits could be set disproportional to the

¹ BSAI Crab Plan Team. January 25, 2001. Draft Meeting Minutes.

² Alaska Fisheries Science Center. November 2000. Report to Industry on the 2000 Eastern Bering Sea Crab Survey, p. 20.

*abundance of the size of crab taken in trawl fisheries (which consists primarily of large crab).*³

The Report to Industry details the annual abundance estimates, which describes the total population estimate for 2000 as being within +/- 67 percent of the mean population, meaning that the population is estimated to fall somewhere within the range of 1.0774 billion and 5.4040 billion snow crab.⁴ Clearly, the actual population estimate of snow crab is highly uncertain. AMCC recognizes the difficulties scientists face in gaining an accurate picture of snow crab population due to challenges of data collection. For this reason, it is inappropriate to simply conclude that changes in the overall bycatch rates between 1999 and 2000 are due only to changes in population.

The Crab Plan Team Did Not Analyze the Characteristics of Bycatch Outside of the COBLZ

The Plan Team states in their meeting minutes that the Team:

*Reviewed the current bycatch control limits and COBLZ boundaries ...and did not find that the survey distribution and trawl bycatch of opilio reported for 2000 provided new information indicating a need to change those bycatch controls... The COBLZ still appears to provide the best boundaries for controlling bycatch of opilio.*⁵

The Crab Plan Team concluded the COBLZ is adequately protecting snow crab from excessive trawl bycatch mortality, yet a substantial amount of bycatch occurs outside of the COBLZ, as shown in the table below.⁶

Year	% Bycatch Outside COBLZ
1998	36.4%
1999	51.6%
2000	26.7%

Why is the bycatch outside the COBLZ important?

Bycatch outside the COBLZ is important for three important reasons.

³ North Pacific Fishery Management Council, Alaska Department of Fish & Game, and National Marine Fisheries Service. May 2000. A rebuilding plan for the Bering Sea *C. opilio* stock. P. 37.

⁴ Alaska Fisheries Science Center. November 2000. Report to Industry on the 2000 Eastern Bering Sea Crab Survey, p. 18.

⁵ BSAI Crab Plan Team. January 25, 2001. Draft Meeting Minutes.

⁶ Ibid. Based on the table, *Catch of C. opilio crab (numbers) taken incidentally in BSAI trawl fisheries inside and outside the COBLZ within area 517, by fishery and year, 1998-2000.*

1. The large males in the southern part of essential snow crab habitat could play an important role in reproduction because large females need large males to successfully reproduce.
2. Blocks of high bycatch rates (observed) are occurring in core essential habitat, and trawling may have significant adverse impacts on the quality of that habitat. (The COBLZ does not completely contain the core area of essential habitat.)
3. The southern end of snow crab distribution (south of the COBLZ) is showing severe decline in abundance. Given lack of understanding about the biological significance, it is prudent to include it for the purpose of rebuilding.

AMCC testified at the January 25, 2001 Crab Plan Team meeting and urged the Plan Team to analyze observed bycatch as compared to local abundance in areas outside the COBLZ to gain further understanding of the characteristics of bycatch within and outside of the COBLZ. The Plan Team made their recommendations to the NPFMC without further analysis, so AMCC undertook the effort to gain an understanding of the bycatch puzzle in preparation for the NPFMC meeting.

Attached please find three maps based on NMFS survey and fishery data which describe snow crab bycatch patterns and population distribution in 1999:

- The distribution of the snow crab population relative to the COBLZ;
- Observed bycatch in the trawl fisheries; and
- Bycatch as a percent of local abundance.

The third map provides several pieces of new information. First, blocks of high bycatch rates, which on a local level are well above the adopted bycatch rate of 0.1133%, are located outside the COBLZ. Second, overlaying the map of essential snow crab habitat reveals that high bycatch of localized populations are occurring within both core essential habitat and to their documented general distribution.

The attached map of snow crab essential fish habitat shows both the known concentration (or core area) and general distribution. A comparison of the map of bycatch as a percent of local abundance with the map of essential fish habitat shows that high rates of bycatch are occurring in segments of the population *outside* of the snow crab's documented essential habitat. This again points to the uncertainty of scientific knowledge about the snow crab and its true range of habitat needs.

1. Importance of Large Males to Snow Crab Reproductive Success

The Rebuilding Plan evaluated habitat protection measures on the reproductive importance of juveniles and mature females, excluding males. Yet it is well documented that large snow crab males are important to the reproductive success of the population.

Males compete for the receptive females and subsequently guard them until they molt. Successful males are mostly adults and on average they are larger, have fewer missing limbs, and have harder shells than the overall population of adult

*males... Overall, the behaviors and strategies associated with snow crab mating form an intricate system.*⁷

According to agency scientists, the snow crab in the southern part of the range are larger and grow faster than those in the northern part of the range, raising questions about the importance of the southern crab to the overall population. The Snow Crab Rebuilding Plan states that an analysis of average size of crab caught as bycatch in the trawl fisheries indicates that trawl bycatch "consists of relatively large snow crabs (average size about 70 mm carapace width)."⁸

In addition to the role of the size of individual males in reproductive success, the ratio of male to female snow crab is important in genetic diversity and mating success for females.

*Many populations of snow crab exhibit cyclic or erratic recruitment pulses that lead to marked fluctuations in sex ratio. Additionally, fisheries may take a heavy toll of large adult males... Males began to guard females up to 33 days prior to their maturity molt, and overall the largest males were more successful in acquiring females and spent more time guarding than the smaller males... Females will have smaller and genetically less diversified sperm stores when sex ratios are female-biased than when they are male-biased (male:female ratios tested ranged from 1:30 to 1:2)... Any natural or anthropic event that biases sex ratios in favor of females will result in reduced mating success for individual females.*⁹

Unaccounted impacts on localized populations due to high observed bycatch rates may affect that population segment's reproductive success. In a recovery scenario, avoiding habitat degradation and bycatch is even more important to the health of the population, because adverse impacts have more pronounced consequences on a species in crisis.

2. Link Between Bycatch and Habitat

The Snow Crab Rebuilding Plan (May 2000) cites the importance of protecting habitat, especially when the population is in a depressed condition.

Given the current status of snow crab, it seems reasonable that the importance of snow crab EFH (essential fish habitat) in maintaining stock productivity should be a priority message contained in consultations on any proposed activities. To the extent feasible and practicable, this area should be protected from adverse impacts. EFH for BSAI snow crab should be considered as all habitats used by

⁷ Sainte-Marie, Bernard. Presented at Crab 2001 Lowell Wakefield Symposium on Crabs in Cold Water Regions, held January 17-20, 2001. Review of the Snow Crab mating system at first breeding of females. Abstract.

⁸ North Pacific Fishery Management Council, Alaska Department of Fish & Game, and National Marine Fisheries Service. May 2000. A rebuilding plan for the Bering Sea *C. opilio* stock. P. 37.

⁹ Rondeau, A. and B. Sainte-Marie. Presented at Crab 2001 Lowell Wakefield Symposium on Crabs in Cold Water Regions, held January 17-20, 2001. Male Snow Crabs adjust their reproductive effort to sociosexual context. Abstract.

*this stock, at least until such a time as the stock is above minimum stock size threshold (MSST).*¹⁰

As mentioned earlier, areas with high localized bycatch rates occur south of the COBLZ, but still within both the core area of essential habitat and the general crab distribution. In addition, areas of particularly high bycatch occur outside the documented essential habitat, but as per the rebuilding plan, should be considered essential habitat while the snow crab population is depressed. The fact that bycatch is occurring outside the general distribution range may be caused by the limitations of the annual trawl survey data, which is collected in the summer and therefore reflects only the summer distribution of snow crab.¹¹

The Rebuilding Plan states:

*Fishing is the only human activity that occurs in these areas and bottom trawling is the only fishing activity that could disrupt crab habitat. Bottom trawling can effect changes in bottom habitat through plowing of the sea floor, resuspension of sediments, and reducing habitat complexity (Vining et al 1997).*¹²

Because crab presence indicates habitat (at least until further scientific understanding is gained about the specific habitat needs of snow crab), areas where crab are caught as bycatch indicate habitat location. It would be helpful to have more information regarding the level and scale of seafloor impacts in the areas of high observed bycatch to determine if adverse habitat impacts in these areas are impeding snow crab recovery. Given that snow crab are in a recovering condition, however, it would be prudent to minimize habitat impacts throughout its range.

3. Potential Importance of Southern Area of Habitat to Rebuilding

It is unclear how important the southern area of snow crab habitat (outside of the COBLZ) is to the population. That area may have been used by snow crab in the past. The Rebuilding Plan analyzed distribution of juvenile and mature female snow crab between the years of 1990 and 1999, and concluded their core habitat is within the COBLZ.¹³ AMCC questions whether the most recent ten years are representative of historic snow crab distribution, and whether it is appropriate to assume that reproductive success is adequately managed for by focusing only on juvenile and mature female habitat needs. In fact, in 1978 the population of mature females extended south of the COBLZ boundaries. Currently, the boundaries of the COBLZ establish an incentive to fish harder outside of the COBLZ, disproportionately impacting the southern range of essential habitat. While this makes some logical sense since fishing effort has likely shifted to avoid triggering the bycatch cap inside the COBLZ, we do not agree that the habitat outside the COBLZ should be exempt from bycatch controls.

¹⁰ North Pacific Fishery Management Council, Alaska Department of Fish & Game, and National Marine Fisheries Service. May 2000. A rebuilding plan for the Bering Sea *C. opilio* stock. P. 41.

¹¹ Ibid. P. 39.

¹² Ibid. P. 40.

¹³ Ibid. P. 39.

Why should the NPFMC revisit the opilio bycatch floor when the population is depressed?

The Crab Plan Team states in their January 25, 2001 meeting minutes:

The same problems with lowering the 4.5 million crab bycatch "ceiling" [sic; should be floor] at low stock levels, that the Plan Team recognized during their reviews in 2000, still remain. The increase in bycatch during 2000 relative to 1999 appears to be due to an increase in opilio abundance and the actions of a few vessels.¹⁴

AMCC continues to assert that the status quo bycatch cap it is not sufficient when the population is depressed. As stated in the Rebuilding Plan,

For bycatch caps to be effective in protecting eastern Bering Sea snow crabs and their habitat, the current PSC limits for snow crabs in the groundfish trawl fisheries needs to be changed. The minimum 4.5 million animal bycatch cap may not provide protection when the snow crab stock is at low levels at which the stock and essential habitat may be most vulnerable. (emphasis added)¹⁵

As outlined earlier, the conclusion that the increase in observed bycatch 1999 and 2000 parallels an increase in snow crab abundance is based on highly uncertain assumptions.

Why isn't a VIP for the yellowfin sole fishery enough?

AMCC agrees that it is important to reduce bycatch among the entire trawl fleet, especially yellowfin sole because of the fleet's historically high snow crab bycatch. We also agree that measures should be taken to clean up the fishing of the five vessels that are taking most of the bycatch. AMCC does not, however, agree that a vessel incentive program is an adequate response to bycatch issues with regard to snow crab rebuilding because of demonstrated problems with vessel incentive programs. NMFS officials and others have raised concerns that VIPs are in effect not much more than a paper exercise because of the high levels of observer data and documentation required to successfully prosecute offenders. In addition, a VIP would not necessarily reduce habitat impacts in the southern part of snow crab distribution.

¹⁴ BSAI Crab Plan Team. January 25, 2001. Draft Meeting Minutes.

¹⁵ North Pacific Fishery Management Council, Alaska Department of Fish & Game, and National Marine Fisheries Service. May 2000. A rebuilding plan for the Bering Sea *C. opilio* stock. P. 40.

Recommendations

AMCC recommends the following:

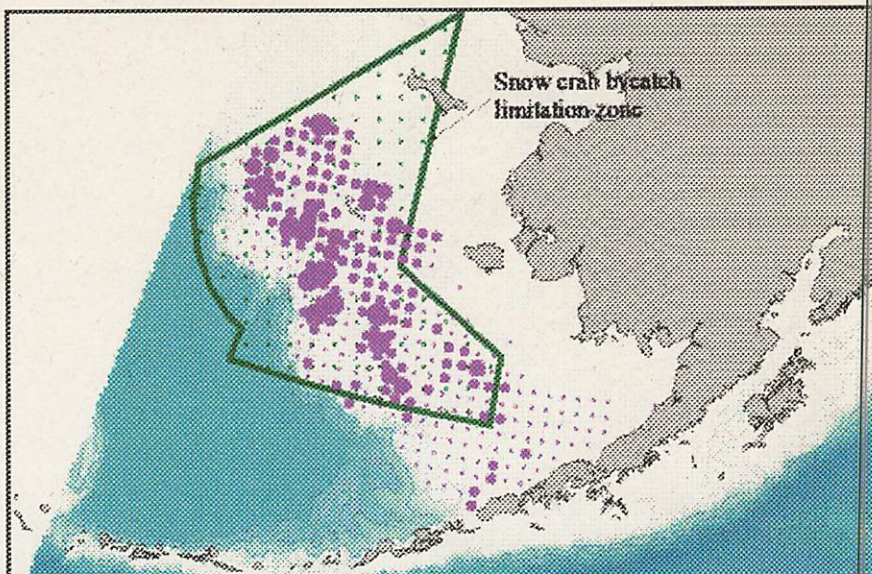
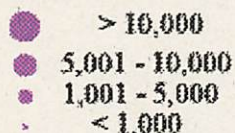
- Conduct analysis to further illuminate the impacts of bycatch on local abundance both within and outside of the COBLZ.
- Consider the links between areas of high bycatch and habitat.
- Reconsider whether the bycatch floor should be lowered during times of low abundance.
- Reconsider extending the boundaries of the COBLZ.

The *C. opilio* Bycatch Limitation Zone and disproportionate mortality observed in bycatch of trawl fisheries

Population Distribution

Approximately 9% of *opilio* occurred outside of the Bycatch Limitation Zone based on 1999 NMFS summer trawl surveys

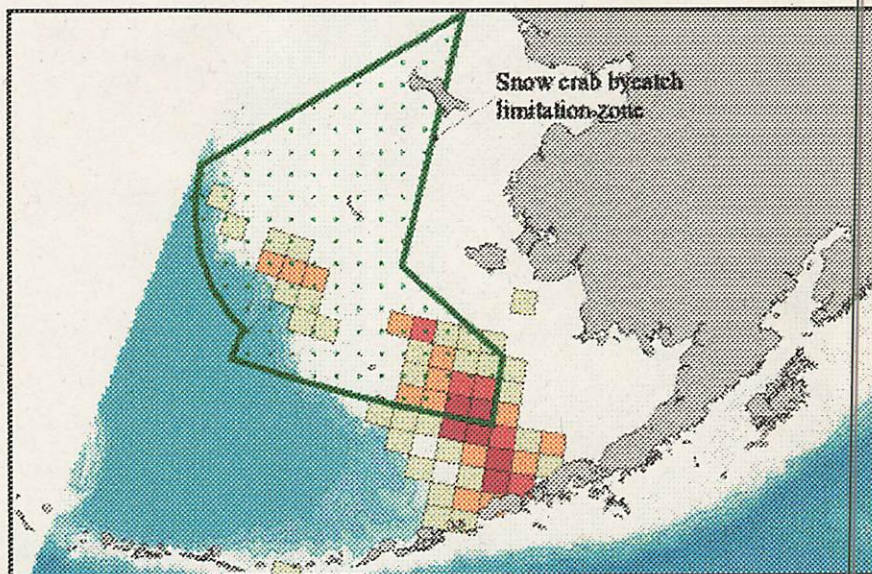
Area swept estimates:
(metric tons per sq. nautical mile)



Observed Bycatch in Trawl Fisheries

51% of observed bycatch of *opilio* in 1999 trawl fisheries occurred outside the Bycatch Limitation Zone and was not counted toward the PSC cap

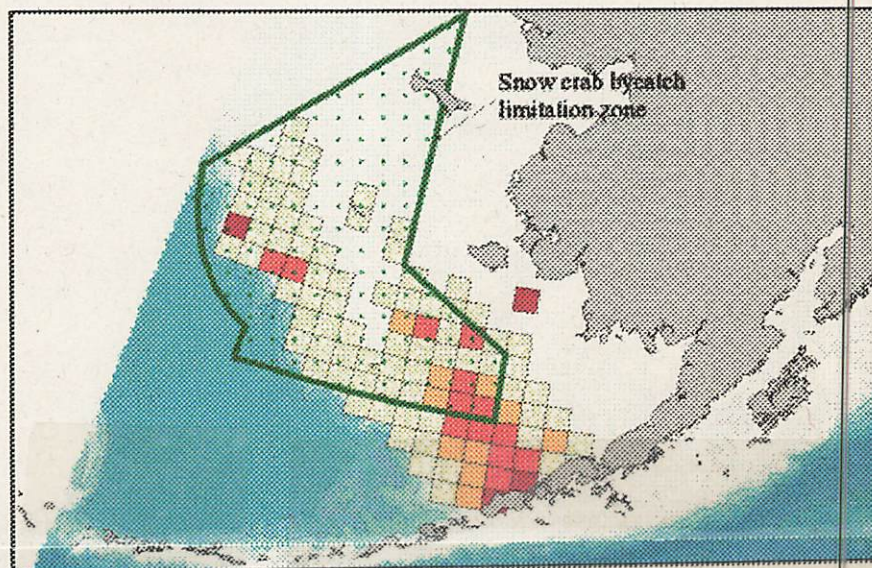
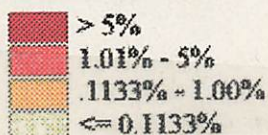
Observed bycatch of *opilio*
in trawl fisheries (kg)



Bycatch as Percent of Total Abundance

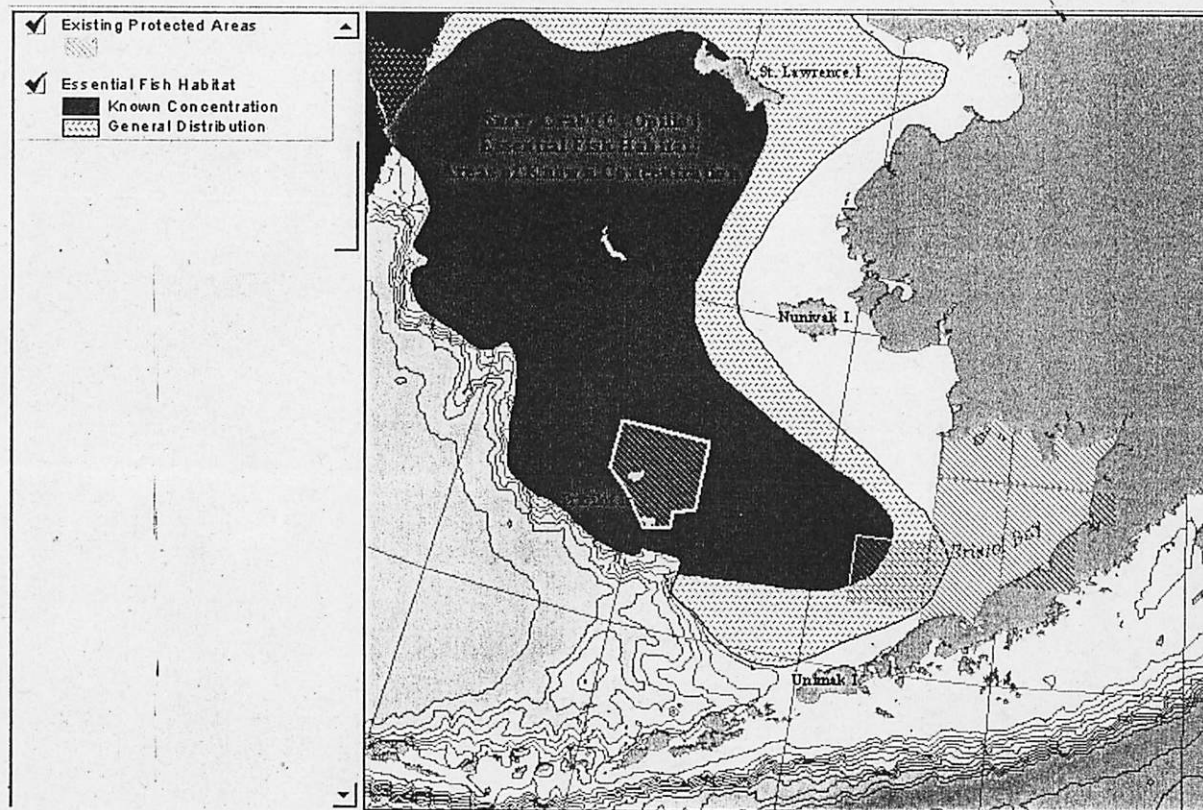
On average, the rate of observed bycatch of *opilio* outside the Bycatch Limitation Zone is greater than the PSC cap set at 0.1133% of total abundance

Observed bycatch as percent
of estimated biomass



Snow Crab Essential Fish Habitat

“The interim final rule for EFH states the following: in the case of an overfished stock, all habitats currently and historically used by the species should be considered essential. Therefore, EFH for BSAI snow crab should be considered as all habitats used by this stock, at least until such a time as the stock is above MSST.” - p. 41 Rebuilding Plan



Existing trawl closures protect approximately 4% of areas identified as Essential Fish Habitat for *opilio* crab