AGENDA B-1
OCTOBER 2004

Executive Director's Report

October meeting in DC

In the September 8 Council mailing I included the draft agenda and hotel information for the Council member workshop being sponsored by NOAA Fisheries in Baltimore later this month. I will provide you more detail as it becomes available. I and a couple other staff will participate along with whichever Council members are able to attend.

Update on March 2005 Conference

As I mentioned in June, at the agreement of the eight Regional Council Chairs and NOAA Fisheries, we are once again taking the lead in organizing a national fisheries conference for this coming spring in Washington, D.C. *Managing our Nation's Fisheries II - Focus on the Future*, will be held March 24-26 at the Omni-Shoreham Hotel and Conference Center, and will focus on a few key issues relative to Magnuson-Stevens Act reauthorization and the report from the U.S. Commission on Ocean Policy. These include ecosystem plan development, strengthening science in the management process, and criteria for IFQ or similar program development. Panel structure and format are still being finalized by a conference organizing committee (which includes myself, Ms. Madsen, and representatives from NOAA and a few of the other Councils), but we expect to have only a few panels with fewer participants than the 2003 conference, to allow us to focus on key issues and increase audience participation. I will provide all of you with additional details in the next month or so.

University of Washington Symposium

Dr. David Fluharty and a number of others are organizing a symposium at the University of Washington November 15-16. "*Improving Fisheries Management: Melding Science and Management Systems*" will have presenters and panel sessions focusing on trophic level interactions, bycatch, habitat, and governance. A number of government agencies are supporting the symposium and will also participate. I will provide further details following this meeting when I get a final agenda from the organizers.

AFS Annual meeting in 2005

As many of you may be aware, the 135th annual meeting of the American Fisheries Society is going to be held in Anchorage next September. Our own Bill Wilson is general Chair for this meeting, and I expect that we, along with many others involved in Alaska fisheries, will be participating in one way or another in this meeting. A notice of that meeting and first call for papers is included under B-1(a).

Update on Council meeting schedules

We are now confirmed to meet in Girdwood (Alyeska Hotel) in June 2005. The dates will be June 1 through June 3 for SSC, June 1 through June 6 for the AP and June 3 through June 9 for the Council. Note this is four days earlier than the previous schedule. Details on hotel, transportation, etc. will be provided to you as we get a bit closer to the meeting date. We have also worked with the Hilton Hotel and rescheduled our October 2006 meeting to occur in Dutch Harbor instead of Anchorage.

New Economist on board

Jim Richardson, long-time Alaskan fisheries economist, has joined the Council staff on a full-time, temporary basis, for a period of at least two years. Jim will work on a variety of projects beginning in November, but will be primarily devoted to the Gulf of Alaska rationalization program for the immediate future. Welcome aboard Jim!

EZ Biz update

We have set up our EZ-Biz account with Alaska Airlines and are utilizing it on a trial basis. Once we get the kinks worked out Gail will be contacting all of you with specific information on how to access and book your airline reservations through this system.

Bering Sea Fisheries Research Foundation

The use of fishing industry obtained scientific information relevant to fisheries management has received, in recent years, a renewed focus and support nation-wide. Last year Dr. Gary Stauffer at the Alaska Fisheries Science Center suggested development of a long-term cooperative research program between NMFS, ADF&G, and the Bering Sea crab industry. Member of the industry responded to that suggestion by forming the Bering Sea Fisheries Research Foundation (BSFRF). Information on the Foundation is contained under B-1(b). Representative from the Foundation are here to provide the Council a brief report on their formation and activities to date.

BSAI pollock certified to MSC standard

Last week the Marine Stewardship Council (MSC) announced the conclusion of its extensive review, and certified the BSAI pollock fishery to its MSC standard (as a well managed, sustainable fishery), "albeit with a number of improvements, noted in its report as conditions, which must be made over time in order for the fishery to maintain its certified status". The press release is under B-1(c). A finding for the Gulf of Alaska pollock fishery is expected in a few weeks.

Evening reception and workshops

There will be an evening reception tonight (Wednesday) here, hosted by ALFA and other industry supporters- time to be announced. Tomorrow night (Thursday), in the Exhibit Room across the hall, there will be a presentation on sperm whale and longline interactions in the Gulf of Alaska. It is open to all interested persons.

AMERICAN FISHERIES SOCIETY
135TH ANNUAL MEETING
ANCHORAGE, ALASKA
SEPTEMBER 11-15, 2005
www.wdafs.org/Anchorage2005

"CREATING A FISHERIES MOSAIC: CONNECTIONS ACROSS JURISDICTIONS, DISCIPLINES, AND CULTURES"

A "mosaic" represents a whole that is greater than the sum of its parts.

We expect you will find the collection of events, symposia, and contributed papers to be a stimulating mosaic of fishery and aquatic science, culture, and adventure.

First call for symposia, papers, and posters: see September issue of Fisheries, or contact Anchorage 2005 program co-chairs, right.

ALREADY SCHEDULED:

- Capacity-based Modeling for Pacific Salmon.
- Groundfish Fishery Management in the North Pacific
- Anadromous and Catadromous Fishes Symposium.
- Human Dimensions in Fisheries.
- Native Peoples' Fisheries.
- Hooking Injury/Mortality.
- Salmon 2100 Project.

These are just a few of the many "early run" sessions. Check the Anchorage 2005 website for new information: www.wdafs.org/Anchorage2005

Courtesy ACVB

ANCHORAGE 2005

General chair:
Bill Wilson
(907) 271-2809
bill.wilson@noaa.gov

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Eric Knudsen
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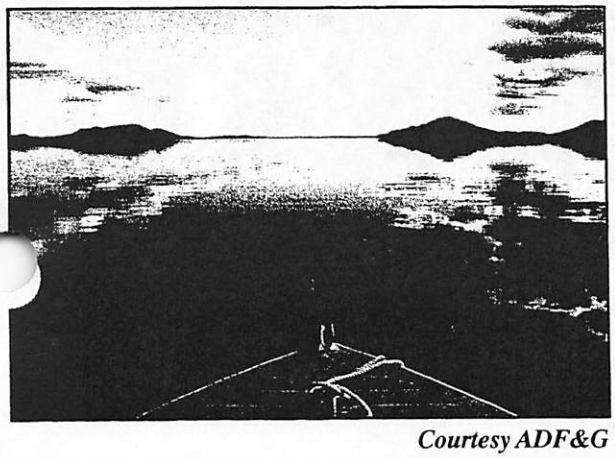


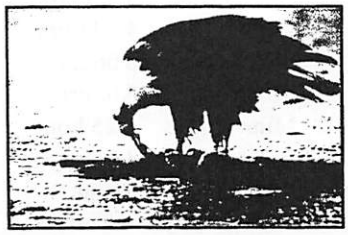
Courtesy ADF&G

CONCURRENT EVENTS:

Wakefield Fisheries Symposium on Pacific Rockfishes
www.uaf.edu/seagrant/Conferences/Wakefield.htm

Alaska Chapter AFS annual meeting
www.fisheries.org/afs-ak

Western Division AFS annual meeting
www.wdafs.org

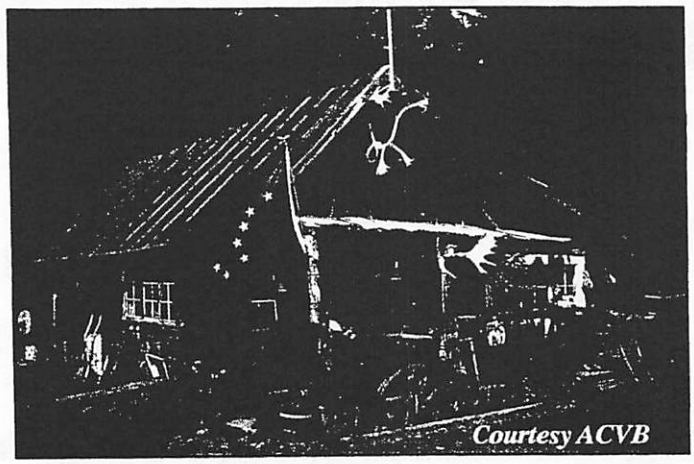


Courtesy ACVB

Welcome to

Alaska in September...

Alaska has about 640,000 residents occupying 570,000 square miles, or 365 milllion acres of land. Alaska is the largest state, about 2.3 times the size of Texas and about one-fifth the size of the Lower 48 states.



Accommodations:

Conference hotel:
Hilton Anchorage
Conference rate: $115 USD single or double.
500 West Third Ave.
voice 1-907-272-7411
fax 1-907-265-7044
Many other accommodations are available, check the visitor websites below.

Maps & Visitor Info:

Anchorage Convention & Visitor's Bureau
www.Anchorage.net
State of Alaska official visitor information
www.travelalaska.com

September Almanac:

- Average temperature +50° F / 10°C
- Average high 57° F / 13° C
- Average low 43° F / 6° C
- Daylight hours: 14 hours
- Average precipitation: 0.10"
- Temperate marine climate and low humidity
- Time zone: Alaska Standard Time: one hour behind Pacific Standard Time; four hours behind Eastern Standard Time

Average Air Travel Times to Anchorage from:

Atlanta	7 hours
Chicago	5.5 hours
Dallas	5.5 hours
Denver	4.5 hours
Detroit	6 hours
Los Angeles	5 hours
Minneapolis	5.25 hours
New York City	8 hours
Phoenix	6 hours
Salt Lake City	4.5 hours
Seattle	3.25 hours
Washington D.C.	8.5 hours

What to Wear:

Alaska is very informal, and in Anchorage casual wear is welcome virtually everywhere. For outdoor activities, layer with a light rainproof jacket and a fleece vest or sweater. Most hiking trails in the Southcentral area are very well maintained, and many are wheelchair accessible.

Attractions - Anchorage:

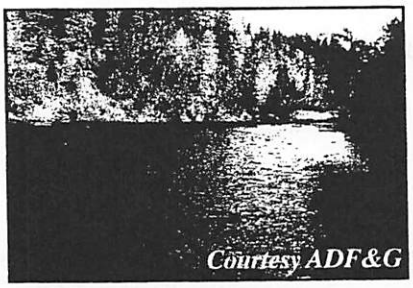
- Anchorage Museum of History and Art
- Alaska Native Heritage Center
- Potter Marsh / Anchorage Coastal Wildlife Refuge migratory bird viewing area
- The Alaska Zoo
- Elmendorf State Fish Hatchery
- Alaska Botanical Garden
- Concerts, galleries, fine dining
- Walking tours, flightseeing, sport fishing, horseback riding, hiking, mountain biking

Day Trips:

- Seward SeaLife Center
- Portage Glacier
- Kenai National Wildlife Refuge
- Independence Mine
- Musk Ox Farm
- Big Game Alaska
- Many outdoor activities, including salt and fresh water sport fishing, hiking, recreational mining, dog sled rides, kayaking, river rafting, big game hunting

Sport Fishing:

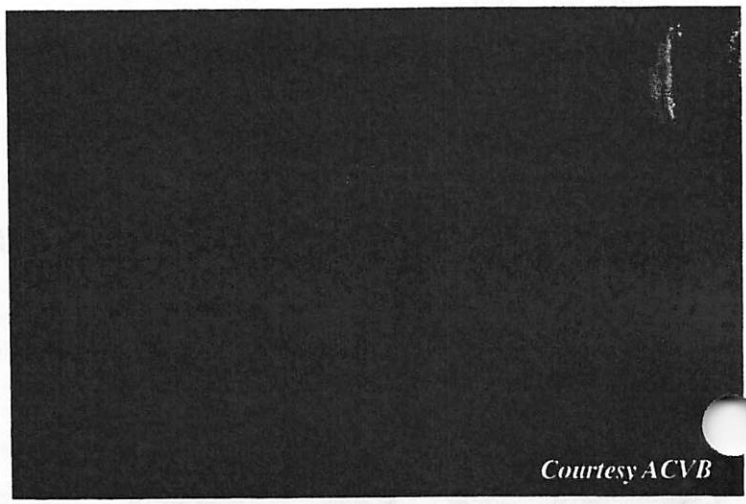
September fisheries: Coho salmon, rainbow/steelhead trout, Arctic char/Dolly Varden, northern pike, halibut. Contact the Alaska Department of Fish and Game, Division of Sport Fish, Southcentral Region Information Center at (907) 267-2218 or browse the large site at www.sf.adfg.state.ak.us/statewide/SF_home.cfm



Above: Old miner's cabin and visitor's attraction at Crow Creek Mine, 35 miles south of Anchorage. Left: Steelhead anglers on the Anchor River, Mile 157 of the Sterling Highway.

Wildlife Viewing/ Hunting:

September wildlife: moose; brown and black bear; pika; raptor, songbird and shorebird migration; sea lions; mountain goats. Contact the Alaska Department of Fish and Game Division of Wildlife Conservation Anchorage Regional Information Center at (907) 267-2257, or visit www.wildlife.alaska.gov



North America's tallest peak, Mount McKinley. The entrance to Denali National Park and Preserve is 240 miles to the north of Anchorage.

BSFRF

BERING SEA FISHERIES RESEARCH FOUNDATION
620 6TH ST. SOUTH KIRKLAND, WA. 98033
FORGING COOPERATIVE RESEARCH PARTNERSHIPS IN THE BERING SEA

Mission and Goals of the Bering Sea Fisheries Research Foundation

Mission: Assist in developing and determining the best scientific approach and information for management of the Bering Sea fisheries, so that those fisheries will produce the optimum yield while ensuring the protection and conservation of those resources.

BSFRF is dedicated to a long-term approach in fulfilling its mission.

Goals.

- Coordinate and participate in a cooperative research program with NMFS, ADF&G, and fisheries stakeholders.
- BSFRF strives to have the maximum industry participation in a scientifically focused, apolitical atmosphere.
- Examine alternative shellfish stock assessment methodologies, with particular focus on the East Coast Canadian methods and fishery management, for their applicability to the North Pacific.
- Retain knowledgeable consultant(s) to advise, and to speak for the Foundation in chosen situations.
- Initiate and adhere to a formally structured critical peer review process, which has full public participation in a clearly transparent setting.
  e.g. Such as the stock assessment and TAC setting methodology associated with the BS groundfish fisheries
- Provide funding for:
  - ❖ An objective and independent review and analysis of all current crab management plans, and all models upon which they are based. Including existing as well as "developing" models for the BSAI crab resources
  - ❖ Review and analysis of the parameters making up the "overfishing" and "overfished" definitions, including Biological Reference Points.
  - ❖ Additional survey tows in 2005 to acquire better information for use in determining the best method of assessing BSAI crab stocks. Tow structure based on Canadian methods and/or other alternative methods as is agreed to be viable and valuable by the cooperative participants

- Funding will be provided by fisheries stakeholders, Federal and State Governments, and research grants.
- Member funding should be prorata based on the value each entity receives from the resource.
  - ❖ The objective is for participating stakeholders, fishermen, processors and Community Development Quota Organizations to contribute a monetary assessment to fund the Foundation at the time of product delivery.

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B S F R F

History of the Bering Sea Fisheries Research Foundation

The North Pacific fishing industry has a unique history of *pulling together* at various critical times in response to need. This has generally resulted in some portion of the industry stepping forward, laying the groundwork, achieving the goal, and disbanding the group after the objective has been achieved.

We have all known that more research was necessary, but the chore of keeping a group together has always been difficult.

The crab industry has been confronted with numerous challenges of significant proportions in recent years.

- The 1996 re-authorization of the Magnuson-Stevens Fishery Conservation and Management Act, required managers to develop criteria for determining when a fishery is "overfished," and to develop a plan to "rebuild" those designated fisheries.
- Rightly or wrongly, this requirement has resulted in the development of new criteria, and new management models that have not had the oversight of the public process we are accustomed to with groundfish.

They have not had the benefit of being adequately reviewed by peers or critiqued by the affected industry.

- The industry has struggled through and endured, low and relatively low biomass estimates, as well as continuous and numerous season closures. These issues and approaches have created a chronic situation, causing the industry to re-think its short-term approach and recognize the need to focus on the long-term for solutions.

THE FOUNDATION

Dr. William Hogarth, Director of NOAA Fisheries (NMFS) has made it clear that he values cooperative research with industry. In fact, one of the goals of Dr. Hogarth, and NMFS as it fulfills its obligations under the Magnuson-Stevens Act, is the **"Further development of cooperative research efforts."** Dr. Hogarth clearly understands and appreciates the contribution that industry can make to advancement and accomplishment of NMFS research goals.

In September of 2003, **Dr. Gary Stauffer** of the Alaska Fisheries Science Center (AFSC) in Seattle wrote an open letter to the Bering Sea Crab Industry. Dr. Stauffer invited and encouraged the industry to join with the National Marine Fisheries Service and the Alaska Department of Fish and Game in a **long-term cooperative research program**.

- Several industry participants rose to that challenge and the **Bering Sea Fisheries Research Foundation "BSFRF"** came into being. To date, the Foundation has the participation of 63 fishing vessels, 1 domestic processing company, 1 international processing company and 1 Alaskan Community Development Quota Organization; with interest being expressed by numerous other stakeholders.

This process began near the end of the long, exhausting, and polarizing process of rationalizing the BSAI crab industry. Recognizing the potentially negative lingering effects of this polarization, the Foundation chose as one of its primary operational objectives that the **"BSFRF strives to have the maximum industry participation in a scientifically focused, apolitical atmosphere."** We have proceeded in that vein and been ever mindful of that goal.

It has been 18 months of all consuming effort and hard work to get the Foundation to where it is today. The Foundation persevered and accomplished its 1st year goals; we now stand poised to look forward to the future:

THE RESEARCH

Based on discussions with ADF&G, it was determined that ADF&G would not be a direct participant, but would be kept in the loop at all times. In consultation with NMFS, BSFRF chose **A Research Plan** for its first year, which included the following:

- Increased sampling in the standard Opilio survey area with the goal of increasing the confidence interval.
- Making tows outside the standard area to determine if 1) the distribution of mature Opilio has changed, and document where the most westerly, eastern and Northern boundaries of the species range may be.
- Making tows with a tickler chain attached to the standard net and comparing the numbers of animals in those tows, with the number in the standard tows.
- Making tows in a newly-designed grid pattern to aid in determining the shape of a variogram, which was a need pointed out by BSFRF consultant, Dr. Gerard Conan.
- Augment NMFS collection of basic biological, distribution and abundance data for the marbled eelpout (lycodes raridens)

The Foundation worked with Ken Tippett to charter the F/V Sea Wolf. We were fortunate in retaining John Gruver to Captain the Sea Wolf. Ken Weinberg, Rich McIntosh of NMFS and Skip Gish, ADF&G, and a college intern student, among others, contributed to the high level of success for our maiden voyage. The cooperative nature of BSFRF's program apparently extended to the Sea Wolf charter as all onboard worked successfully and efficiently together.

The results of our research demonstrate that we have been able to accomplish our 1st years Goals:

- Increased sampling in the standard area improved the confidence interval, as well as evidencing a larger biomass.
- Tows outside the standard area showed a shift in the distribution of mature animals. Due to weather, only one tickler chain tow was made. But interestingly, there were approximately 4 times as many crab animals in that tow when compared with a standard tow. When the standard tow was made within 2/10ths of a miles of the tickler chain tow.
- The variogram project will yield important information for the future.

The Foundation was, and continues to be at the forefront in urging a study to determine the extent of the problem whereby the survey net caught a lower CPUE in deeper water than in shallower water.

The Foundation is actively advocating and working to open up the GHL / TAC setting process so that the crab seasons GHL's are set in a manner similar to the process for determination groundfish which has the benefit of a transparent public process.

THE FUTURE

The Foundation's near-term goals are:

- Examine alternative shellfish assessment methodologies, with particular focus on the East Coast Canadian methods of stock assessment and fishery management, for their applicability to the North Pacific.
- Fund additional survey tows in 2005 to acquire better information for use in determining the best method of assessing BSAI crab stocks.
- Provide funding for an objective and independent review and analysis of all current crab management plans and all models upon which they are based. Including existing as well as "developing" models for the BSAI crab resources
- Provide funding for review and analysis of the parameters making up the "overfishing" and "overfished" definitions, including Biological Reference Points.

In addition to its collaboration with NMFS scientists, The Foundation is working with two private-sector scientists: Steve Hughes of Natural Resources Consultants, Seattle, Washington and Dr. Gerard Conan of Marine Geomatics in St. Johns, Newfoundland, Canada

- Mr. Hughes has been with NRC since 1981. Prior to that, he was a biologist with the Bureau of Commercial Fisheries and NMFS.
- Dr. Conan is a crab research scientist from East Coast Canada. He has studied c. opilios extensively, and has published numerous papers that are quoted extensively by his peers within the scientific community.

Caroline Woffenden wrote:

Apologies for cross posting.

For immediate release

For more information contact:
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Duncan Leadbitter +612 9524 8400 for Asia Pacific media enquiries

BSAI Alaska Pollock Fishery Certified to MSC Standard
- After nearly 4 years, process concludes for one of two Alaska Pollock fishery assessments -

London, UK - the Marine Stewardship Council (MSC) today announces the conclusion of an extensive review of the Bering Sea Aleutian Islands (BSAI) pollock fishery against the MSC's Principles and Criteria for Sustainable Fishing (the MSC Standard). After a lengthy scientific review SCS, based in Emeryville California, recommends that the fishery is certified to the MSC Standard, albeit with a number of improvements, noted in its report as conditions, which must be made over time in order for the fishery to maintain its certified status.

The final report for the BSAI pollock fishery assessment, which has been underway since early 2001, was issued in June 2004 when any organisations opposed to the recommendation were given 21 days to signal their plans to file an objection.

An initial objection was lodged with SCS by the Trustees for Alaska on behalf of the Alaska Oceans Program, Greenpeace International, National Environmental Trust and Oceana in August 2004. After a response from SCS the objecting parties were given 14 days to submit a further objection to the MSC setting out their reasons for continuing the objection. The MSC received this further objection on 23 September 2004 and following careful consideration over a 5-day time frame it was decided, by independent members of the MSC Board of Trustees, that the further objection lodged fell outside the guidelines for allowing a further objection to be heard and that an objections panel will therefore not be convened for the BSAI pollock fishery. Therefore, the Determination made by the certification body will become the final decision, thus the fishery will be certified by SCS.

The Gulf of Alaska pollock fishery, whose assessment process is approximately three weeks behind the BSAI fishery, is still to be concluded. The deadline for submission of a further objection to this assessment must be submitted to the MSC Board by 15 October 2004. If a further objection is lodged by that date, the MSC Board of Trustees will have five days in which to decide whether the objection will be allowed to be heard.

Revealing the reasons for the decision not to allow a further objection on the BSAI pollock fishery Determination the MSC Board of Trustees panel stated:

'The members of the Board of Trustees entrusted with the responsibility for making this decision

acknowledge the high quality of submissions made by the objectors and the certification body and the professionalism and seriousness displayed to date by each of the parties in the conduct of this important process.

'The Final Report by SCS on the BSAI fishery contains some 827 pages of detailed assessment against the MSC's Principles and Criteria for Sustainable Fishing. It describes the assessment process undertaken by SCS and the stakeholders consulted. The report provides stakeholder submissions, the peer review reports and submissions made at the Draft Report stage, and describes how these were incorporated into the Final Report. The report ultimately sets out the Determination by SCS's independent assessment team about whether or not the fishery should be certified.'

Using MSC Board policy to guide their decision, the Trustees analysis of the issues argued by the objectors revealed that the further objection is invalid, hence it will not establish an Objections Panel.

A full copy of the document detailing the decision to allow or dismiss a further objection on the BSAI pollock fishery Determination is available at www.msc.org

Brendan May, outgoing Chief Executive of the MSC after five years in post, commented:

'The Bering Sea/Aleutian IslandsPollock fishery has been subject to robust and rigorous scrutiny under the MSC programme. It is hard to find a more thorough certification and auditing process for any commodity in the world than the MSC has developed for fisheries. An independent third party certification body and its expert team of scientists and lawyers has made the determination that this fishery meets the standard set by the MSC's Principles and Criteria for Sustainable Fishing. This follows an extensive review lasting nearly four years. The MSC has strict guidelines requiring its accredited certifiers to cast the net far and wide when gathering the views of NGOs and other stakeholders during an assessment process. They are able to influence the choice of assessment team, the roadmap process for assessment, the nominations for independent peer reviewers, the content of draft certification reports and no stone has been left unturned in soliciting every opinion available on this fishery. There are few other auditing processes in the environmental sector or any other which require this level of stakeholder engagement. This is why conservation groups like the WWF support the MSC so actively around the world. The MSC standards themselves require the highest levels of compliance and the requirement that fisheries continually improve after certification, improvements which must be annually audited, further enhance the credibility of the programme. It is the rigour of the standard which explains why, more than 7 years into the programme, only 11 fisheries worldwide have been MSC certified.'

The MSC's environmental standard for well-managed and sustainable fisheries uses an objective, scientifically verifiable method of assessment. This is embodied in the MSC's Principles and Criteria for Sustainable Fishing (the MSC Standard) that took two years to develop and included eight regional working groups around the world and two expert drafting sessions. Involved in this process were fisheries and environmental scientists, fisheries managers and government representatives, environmental groups and a range of stakeholders from the seafood sector - from catching to processing and retailing.

The MSC used the United Nations Food and Agriculture Organisation's Code of Conduct for Responsible Fisheries as its starting point to develop the MSC Standard. This encompasses the general principles of good fisheries management and fisheries sustainability regardless of a fishery's size, scale, complexity, geography or technology.

As an accreditation body operating under ISO standards the MSC must be apolitical, impartial and independent. The MSC works hard to maintain this integrity, working with both industry and conservation organisations, as well as other stakeholders who share a common goal - sustainable fisheries.

The At-Sea Processors Association (APA) sought certification of two pollock fisheries - BSAI and Gulf of Alaska which together constitute the world's largest whitefish fishery. The BSAI Alaska pollock fishery is a mid-water trawl fishery which accounts for approximately 30 percent of all fish harvested by volume in the United States. The assessment process began in January 2001 with the draft report for the Bering Sea Aleutian Islands portion released in September and the draft report on the Gulf of Alaska fishery posted in November 2003. The final reports are available on the MSC website.

The certification is valid for five years and is subject to annual audits by an independent certification body to confirm that required improvements are being made. No product from the fishery can bear the MSC eco-label identifying it as being from a well-managed source until chain of custody / traceability requirements have been met ensuring that fish from the certified fishery are not mixed with uncertified fish in the supply chain. If chain of custody standards are met products from the BSAI pollock fishery products from that fishery will carry the MSC eco-label, enabling consumers to quickly and easily identify the best environmental choice in seafood.

The BSAI Pollock fishery joins 10 fisheries already certified to the MSC Standard.

*** ENDS ***

Notes to Editors:

* The MSC was established in 1997 by Unilever and WWF (World Wildlife Fund) and has been independent since 1999.
* Fisheries voluntarily come forward to be assessed against the MSC Standard by independent certifiers accredited by the MSC.
* BSAI pollock fishery joins 10 fisheries which have been certified as sustainable by the MSC to date: Western Australian rock lobster, Thames Blackwater herring, Alaskan salmon, New Zealand hoki, Burry Inlet cockles, South West handline-caught mackerel, Loch Torridon nephrops, South Georgia toothfish, South African hake and Mexican baja lobster.
* There are over 40 fisheries at some stage of the certification process.
* The certifiers and lists of processors/suppliers who carry MSC approved products are available on the MSC website: www.msc.org
* The MSC is governed by a Board of Trustees, chaired by the Rt. Hon. John Gummer MP.

For further information please visit www.msc.org or contact:

Caroline Woffenden for UK media enquiries
UK Communications Manager
MSC
Email: Caroline.Woffenden@msc.org
Tel: +44 (0) 20 7350 4000 / +44 (0)7740 492 792

OR

Brendan May
Chief Executive

Email: Brendan.May@msc.org
Tel: +44 (0) 20 7350 4000

The Rt. Hon John Gummer MP, Chairman MSC, will be available for selected media interviews

NB - Brendan May will be leaving the MSC on 7th October. Thereafter please contact:
Rupert Howes
Email: Rupert.Howes@msc.org
Tel: +44 (0)20 7350 4000

Jim Humphreys for US media enquiries
North American Director
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Tel: +1 206 6910 188 / +1 206 9100 532

Duncan Leadbitter for Asia Pacific media enquiries
Regional Director - Asia Pacific
MSC
Email: Duncan.Leadbitter@msc.org
Tel: +612 9524 8400 / +614 3982 2515

For further information on the pollock fishery assessment process please contact:

Dr. Chet Chaffee
Scientific Certification Systems
2000 Powell St., Suite 1350
Emeryville, CA 94608
(650) 969-1366 Telephone
(650) 969-4731 Fax
E-mail: chaffe3@attglobal.net

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Description: Pollock_BSAI_certifiedFINAL.doc
Download Status: Not downloaded with message

Public Testimony Sign Up Sheet
Agenda Item B - Items

	NAME (PLEASE PRINT)	AFFILIATION
~~1~~	Beau Stewart	BSA - SSL report & VMS
~~2~~	SANDRA MOLLER	ALENT ENTERPRISE CORP.
~~3~~ 1	Terry Leitzell	Inside Passage
~~4~~	BRENT PAINE	UCB
~~5~~	THURN SMITH	NPCA/MCA
~~6~~	PAUL MACGREGOR	APA
~~7~~	Dennis Parker	Arctic Storm
8	~~Julie Bonney~~	~~AFDF~~
~~9~~	Ken Tippett	AK BOAT CO
~~10~~	CLEM TILLION	Alent Corp.
~~11~~	Frank Kelty	City of UNALAska
~~12~~	Kevin Kennedy	TDX Corp.
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NOTE to persons providing oral or written testimony to the Council: Section 307(1)(I) of the Magnuson-Stevens Fishery Conservation and Management Act prohibits any person " to knowingly and willfully submit to a Council, the Secretary, or the Governor of a State false information (including, but not limited to, false information regarding the capacity and extent to which a United State fish processor, on an annual basis, will process a portion of the optimum yield of a fishery that will be harvested by fishing vessels of the United States) regarding any matter that the Council, Secretary, or Governor is considering in the course of carrying out this Act.

B-1 handout 10-6-04 8:30 a
(along w/ spiral-bound booklet)

BERING SEA FISHERIES RESEARCH FOUNDATION
620 6TH ST. SOUTH KIRKLAND, WA. 98033
FORGING COOPERATIVE RESEARCH PARTNERSHIPS IN THE BERING SEA
BSFRF

October 6, 2004

Ms. Stephanie Madsen
Chairman
North Pacific Fisheries Management Council
Via Handout
Sitka Council Meeting

Dear Madam Chair,
I am very sorry that I am not here in person, but a personal matter that could not be changed has kept me from doing this in person. It is with great excitement and enthusiasm that the Directors of the Bering Sea Fisheries Research Foundation (BSFRF) sit here with Gary Stauffer of the National Marine Fisheries Service, Alaska Science Center to introduce you and the Council Members to the newest research foundation to jointly fund fisheries scientific research projects with NMFS in the Bering Sea and Aleutian Islands. The BSFRF was incorporated as a tax exempt Alaska entity in April, 2004. Sixty eight harvesters, one processor, one CDQ Group and one associate member contributed over $100,000 to initially fund the Foundation.

Prior to and subsequent to the formation of the Foundation, numerous formal and informal meetings transpired between members of PNIAC, NMFS, ADF&G and other interested parties of the fishing community to best assess what to do to further scientific research of crab and other species in the BSAI area. The Directors of the Foundation along with NMFS staff have spent countless hours in the formation of the Foundation and the ultimate MOU that was signed. This accomplishment did not come without having to scale barriers and mistrust that had been put up during the crab rationalization process. With industry members coming together these barriers started to come down and the Foundation was formed.

NMFS, through the guidance of Gary Stauffer and his staff, gave us a window to enter into an MOU with the Agency to do an opilio crab project during the 2004 Summer Season. The Foundation worked with Stauffer and his staff in both Seattle and D.C. and on May 6th, 2004, an MOU was signed by Dr. Hogarth on behalf of NMFS and the Foundation. As Gary Stauffer stated on the signing, "This is the start of a new era of Jointly Funded Scientific Research that is embraced by both the Agency and the Fishing Industry".

The Foundation engaged ADF&G at the inception of the MOU and they followed the progress of the Foundation and the MOU as well as participated in the Summer Survey by supplying a scientist to the MOU protocol. Though not a party to the MOU today, it is the Foundation's goal to have ADF&G help shape the scientific research projects that will better the advancement of gathering scientific data to meet the goals of the Magnuson Stevens Act, the Foundation and the MOU.

You and the Council will during the following short presentation hear the history of putting a protocol together to do this summer's jointly funded survey, the preliminary results of the survey and what the future holds for the Foundation and the MOU. We still have barriers and mistrust to overcome, but daily we are working with industry participants to bring the industry together to work to make the Foundation fund projects to improve the scientific research used daily to conserve and protect our fisheries.

Thank you Madam Chair and Members of the Council for allowing us to introduce to you the BSFRF.

Sincerely,

Terrance L Cosgrove

B-1 handout 10-6-04 8:30 am

BERING SEA FISHERIES RESEARCH FOUNDATION
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B S F R F

Mission and Goals of the Bering Sea Fisheries Research Foundation

Mission: Assist in developing and determining the best scientific approach and information for management of the Bering Sea fisheries, so that those resources will be conserved and protected while producing the optimum yield.

BSFRF is dedicated to a long-term approach in fulfilling its mission.

Goals.

- Coordinate and participate in a cooperative research program with NMFS, ADF&G, and fisheries stakeholders.
- BSFRF strives to have the maximum industry participation in a scientifically focused, apolitical atmosphere.
- Examine alternative shellfish stock assessment methodologies, with particular focus on the East Coast Canadian methods and fishery management, for their applicability to the North Pacific.
- Retain knowledgeable consultant(s) to advise, and to speak for the Foundation in chosen situations.
- Initiate and adhere to a formally structured critical peer review process, which has full public participation in a clearly transparent setting.
  e.g. Such as the stock assessment and TAC setting methodology associated with the BS groundfish fisheries
- Provide funding for:
  - ❖ An objective and independent review and analysis of all current crab management plans, and all models upon which they are based. Including existing as well as "developing" models for the BSAI crab resources
  - ❖ Review and analysis of the parameters making up the "overfishing" and "overfished" definitions, including Biological Reference Points.
  - ❖ Additional survey tows in 2005 to acquire better information for use in determining the best method of assessing BSAI crab stocks. Tow structure based on Canadian methods and/or other alternative methods as is agreed to be viable and valuable by the cooperative participants

- Funding will be provided by fisheries stakeholders, Federal and State Governments, and research grants.
- Member funding should be prorata based on the value each entity receives from the resource.
  - ❖ The objective is for participating stakeholders, fishermen, processors and Community Development Quota Organizations to contribute a monetary assessment to fund the Foundation at the time of product delivery.

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B S F R F

History of the Bering Sea Fisheries Research Foundation

The North Pacific fishing industry has a unique history of *pulling together* at various critical times in response to need. This has generally resulted in some portion of the industry stepping forward, laying the groundwork, achieving the goal, and disbanding the group after the objective has been achieved.

We have all known that more research was necessary, but the chore of keeping a group together has always been difficult.

The crab industry has been confronted with numerous challenges of significant proportions in recent years.

- The 1996 re-authorization of the Magnuson-Stevens Fishery Conservation and Management Act, required managers to develop criteria for determining when a fishery is "overfished," and to develop a plan to "rebuild" those designated fisheries.
- Rightly or wrongly, this requirement has resulted in the development of new criteria, and new management models that have not had the oversight of the public process we are accustomed to with groundfish.

They have not had the benefit of being adequately reviewed by peers or critiqued by the affected industry.

- The industry has struggled through and endured, low and relatively low biomass estimates, as well as continuous and numerous season closures. These issues and approaches have created a chronic situation, causing the industry to re-think its short-term approach and recognize the need to focus on the long-term for solutions.

THE FOUNDATION

Dr. William Hogarth, Director of NOAA Fisheries (NMFS) has made it clear that he values cooperative research with industry. In fact, one of the goals of Dr. Hogarth, and NMFS as it fulfills its obligations under the Magnuson-Stevens Act, is the **"Further development of cooperative research efforts."** Dr. Hogarth clearly understands and appreciates the contribution that industry can make to advancement and accomplishment of NMFS research goals.

In September of 2003, **Dr. Gary Stauffer** of the Alaska Fisheries Science Center (AFSC) in Seattle wrote an open letter to the Bering Sea Crab Industry. Dr. Stauffer invited and encouraged the industry to join with the National Marine Fisheries Service and the Alaska Department of Fish and Game in a **long-term cooperative research program**.

- Several industry participants rose to that challenge and the **Bering Sea Fisheries Research Foundation "BSFRF"** came into being. To date, the Foundation has the participation of 63 fishing vessels, 1 domestic processing company, 1 international processing company and 1 Alaskan Community Development Quota Organization; with interest being expressed by numerous other stakeholders.

This process began near the end of the long, exhausting, and polarizing process of rationalizing the BSAI crab industry. Recognizing the potentially negative lingering effects of this polarization, the Foundation chose as one of its primary operational objectives that the **"BSFRF strives to have the maximum industry participation in a scientifically focused, apolitical atmosphere."** We have proceeded in that vein and been ever mindful of that goal.

It has been 18 months of all consuming effort and hard work to get the Foundation to where it is today. The Foundation persevered and accomplished its 1st year goals; we now stand poised to look forward to the future:

THE RESEARCH

Based on discussions with ADF&G, it was determined that ADF&G would not be a direct participant, but would be kept in the loop at all times. In consultation with NMFS, BSFRF chose **A RESEARCH PLAN** for its first year, which included the following:

- Increased sampling in the standard Opilio survey area with the goal of increasing the confidence interval.
- Making tows outside the standard area to determine if 1) the distribution of mature Opilio has changed, and document where the most westerly, eastern and Northern boundaries of the species range may be.
- Making tows with a tickler chain attached to the standard net and comparing the numbers of animals in those tows, with the number in the standard tows.
- Making tows in a newly-designed grid pattern to aid in determining the shape of a variogram, which was a need pointed out by BSFRF consultant, Dr. Gerard Conan.
- Augment NMFS collection of basic biological, distribution and abundance data for the marbled eelpout (lycodes raridens)

The Foundation worked with Ken Tippett to charter the F/V Sea Wolf. We were fortunate in retaining John Gruver to Captain the Sea Wolf. Ken Weinberg, Rich McIntosh of NMFS and Skip Gish, ADF&G, and a college intern student, among others, contributed to the high level of success for our maiden voyage. The cooperative nature of BSFRF's program apparently extended to the Sea Wolf charter as all onboard worked successfully and efficiently together.

The results of our research demonstrate that we have been able to accomplish our 1st years Goals:

- Increased sampling in the standard area improved the confidence interval, as well as evidencing a larger biomass.
- Tows outside the standard area showed a shift in the distribution of mature animals. Due to weather, only one tickler chain tow was made. But interestingly, there were approximately 4 times as many crab animals in that tow when compared with a standard tow. When the standard tow was made within 2/10ths of a miles of the tickler chain tow.
- The variogram project will yield important information for the future.

The Foundation was, and continues to be at the forefront in urging a study to determine the extent of the problem whereby the survey net caught a lower CPUE in deeper water than in shallower water.

The Foundation is actively advocating adjusting the GHL / TAC setting process, so that the crab season GHL / TAC's are set in a manner consistent with groundfish. A method which has the benefit of a fully transparent public process.

THE FUTURE

The Foundation's near-term goals are:

- Examine alternative shellfish assessment methodologies, with particular focus on the East Coast Canadian methods of stock assessment and fishery management, for their applicability to the North Pacific.
- Fund additional survey tows in 2005 to acquire better information for use in determining the best method of assessing BSAI crab stocks.
- Provide funding for an objective and independent review and analysis of all current crab management plans and all models upon which they are based. Including existing as well as "developing" models for the BSAI crab resources
- Provide funding for review and analysis of the parameters making up the "overfishing" and "overfished" definitions, including Biological Reference Points.

In addition to its collaboration with NMFS scientists, The Foundation is working with two private-sector scientists: **Steve Hughes** of Natural Resources Consultants, Seattle, Washington and **Dr. Gerard Conan** of Marine Geomatics in St. Johns, Newfoundland, Canada

- Mr. Hughes has been with NRC since 1981. Prior to that, he was a biologist with the Bureau of Commercial Fisheries and NMFS.
- Dr. Conan is a crab research scientist from East Coast Canada. He has studied c. opilios extensively, and has published numerous papers that are quoted extensively by his peers within the scientific community.

BSFRF

BERING SEA FISHERIES RESEARCH FOUNDATION

620 6TH ST. SOUTH KIRKLAND, WA. 98033

FORGING COOPERATIVE RESEARCH PARTNERSHIPS IN THE BERING SEA

FOR IMMEDIATE RELEASE

Date: *July 9, 2004*

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The Bering Sea Fisheries Research Foundation has teamed up with National Marine Fisheries Service (NMFS) to conduct a cooperative research project this summer for opilio crab in the Bering Sea. The Foundation chartered the fishing vessel Sea Wolf for 20 days, which has arrived at the fishing grounds with NMFS scientists on board. They will add to the existing NMFS crab trawl survey by making up to an additional 90 survey tows, weather and time permitting, in the standard survey area, as well as tows outside the standard survey area. The additional tows, if completed, represent a 41% increase from past surveys.

The Foundation, which was formed this year by fishermen, processors and CDQ groups, is a non-profit organization to support research essential to the conservation and management of fishery resources in the Bering Sea. A long-term Memorandum of Agreement has been established with NMFS to work together in designing and funding research projects.

Gary Painter, a charter member of the Foundation stated, "The idea for joint research has been discussed between the industry and NMFS for years, but now that idea has become reality. I'm glad I could be a part of this process and look forward to many years of working with the agency in getting better scientific information in the North Pacific. I believe that the cooperative research the Foundation jointly sponsors will be invaluable to the industry, NMFS, and the Alaska Department of Fish and Game."

"The first project of this new crab cooperative research program is getting underway this week with the departure of the F/V Sea Wolf. I hope this very significant event is the start of a long-lasting commitment to work as partners to improve our science base and understanding for the management of crab resources," said Gary Stauffer, Director, Resource Assessment and Conservation Engineering Division for the Alaska Fisheries Science Center in Seattle.

The Foundation has raised to date over $100,000 to cover 50% of the costs of the survey this summer. National Marine Fisheries Service, in addition to supplying the fuel and survey equipment, has supplied the scientists and administrative people to make the survey successful. The total cost for this summer's survey will exceed $200,000. Plans are to continue research on crab in future years, as well as other species in the Bering Sea.

Cooperative Research
General Background Information

Science Board Discussions

Information referenced in a memorandum from William W. Fox, Jr. to William Hogarth regarding NMFS policy on cooperative research funding and based on Science Board discussions:

> "While cooperative research programs and projects have existed in NMFS for most of the Agency's history, it is only in the last few years that Congress has begun specifying or "earmarking" funds for cooperative research projects, with the expectation that this money is to be passed directly to the research partners. Participation in cooperative research with industry is not a serious burden to NMFS' Science Center infrastructure or staff where the scale of activity is relatively small and there is sufficient program staff. However, if the projects are successful it is only a matter of time before the extent of the research grows to the point where the Science Center cannot keep up without internal funding to support their participation.
>
> In regions with existing programs, such as in the Northeast, the response of the Science Center to the large influx of cooperative research funding has been to place heavy workload demands on staff and to borrow resources (both personnel and other) from the ongoing stock assessment program. Industry has expected that the Center participate by providing coordination, study design, instrumentation, data management, and analysis. Centers are also expected to certify results and ensure their delivery into the management system.
>
> The Science Board was also concerned that in some regions where the stock assessment programs are smaller or are being developed, the need to keep up with a growing demand for cooperative research may prevent development of appropriate internal programs that are central to the agency's mission of providing scientific advice to management. In addition, while some regions may not need internal funds in the early stages of developing a cooperative research program, if successful, eventually they all will.
>
> The Science Board is asking that the Agency decide on guiding principles for funding and supporting cooperative research that are clearly defined and can be articulated by all Agency representatives to Department of Commerce and Administration decision-makers, to interested Congressional staff, and to industry and the general public. The Science Board expressed concern that if NMFS uses the money targeted for cooperative research to fund the fishing industry and universities to conduct research and stock assessments without Agency participation or involvement, the Agency risks placing itself in the position that eventually such research could be judged in competition with NMFS' own stock assessments and advice. This would be counter-productive to the Agency mission and significantly affect its ability to provide the best scientific advice for management decisions. Furthermore, cooperative research must include NMFS involvement in the planning, development, and

execution because NMFS has the responsibility of identifying research areas that are needed in order to provide the information required for management both in the short-term and long-term. The Science Board stated that the ramifications of not clearly identifying the Agency costs involved in a long-term cooperative research effort could be damaging to the Agency's infrastructure and the health of programs critical to the Agency's core mission of stewardship of the Nation's living marine resources."

The Science Board proposed the following Agency policy on cooperative research (Note that no action was taken on this proposed policy):

"NMFS will be a proponent of cooperative research, provided that NMFS is a full partner and participant in the development, design, and administration of the cooperative research program. This will require additional internal funding and staffing of NMFS scientists to participate in the design and development of research to supplement our current fisheries research programs and independent surveys for stock assessments, and the program support needed to administer and coordinate cooperative programs."

The following is some general information on cooperative research programs. Some of this information will be modified and merged with other workshop documents following the regional cooperative research coordinators workshop.

Definition of Cooperative & Collaborative Research

The definition of cooperative vs. collaborative research depends on the level of involvement of the fishermen, with the level of involvement increasing in collaborative research. Collaborative research entails involvement of industry/stakeholders in all phases of the research program, including survey/statistical design, conducting of research, analysis of results, and communication of results. The degree of cooperation between fishermen and scientists will depend on regional and fisheries-specific research/data needs and opportunities, program and survey costs, and potential benefits of the proposed research. It is important in the development of cooperative research programs that expectations be clarified and agreed upon prior to initiation of the research program. Expectations include use of high scientific standards, research that is practical and cost-effective, and utility of information for use in fisheries management.

Potential Problems

Common problems associated with unsuccessful cooperative research programs include:

- Poor project oversight and coordination
- Research fishing gains economic importance over scientific value
- Research results are leaked prior to peer review and evaluation
- Lack of resources to administer and analyze projects

Potential Benefits

Some benefits of cooperative research include 1) increase the precision and expand the scope of resource surveys, 2) provide supplemental information about fishing operations, 3) use the knowledge gained from fishing to help design and implement research, and 4) build mutual understanding and respect among participants. Benefits of cooperative research programs will be recognized by fishermen, scientists and fishery managers, with the overall benefit of improving the assessment and management of fish stocks. Benefits to fishermen include the collection of more and better data at lower cost, increased understanding of data collection and research programs, being involved as true partners, potential for additional catch, and cash or in-kind (additional quotas) payments. Benefits to managers/scientists include obtaining additional data, improved access to vessels and time at sea, taking advantage of fishermen knowledge, development of effective partnerships (which will improve buy-in to the management process), professional advancement, and additional resources for getting necessary work done. Cooperative research is also attractive because, at times, NMFS allows retention and sale of fish caught during the project to fund the research that may otherwise be too costly to conduct.

National and Regional Programs

Funding was provided by Congress for a national cooperative research program starting in FY2001. These funds are administered by NOAA Fisheries Headquarters and are distributed to the regional programs to assist in further implementation of cooperative research projects. In 2004, projects funded through national funds included:

- Operating expenses for the Northeast and Northwest cooperative research programs (staff, equipment, supplies)
- Supplemental funding for the Northeast, Southeast, and Northwest cooperative research programs (funds used to further support existing programs)
- Cooperative resource surveys for sardine and groundfish and an albacore tagging study in the Southwest
- Cooperative research on rockfish, sablefish, crabs, walleye pollock and cod, as well as gear selectivity, conservation engineering, and habitat projects in Alaska
- Lobster tagging in the Pacific Islands

Currently there are regional cooperative research programs in all six NOAA Fisheries Regions and/or Science Centers. The overall goals of all regional programs is to enhance the data upon which fisheries management decisions are made by supplementing NOAA Fisheries existing resource surveys and other research programs, and to facilitate collaboration and communication between fishermen and scientists.

Programs in the Northeast and Southeast are funded through specific Congressional line items. The Northeast Cooperative Research Program Initiative (CRPI) was initiated in 1999 and conducts cooperative research through both short- and long-term projects. Administration of the program is

by the Northeast Regional Office and the Northeast Fisheries Science Center. The long-term cooperative research programs are focused on fisheries independent data, as well as fisheries dependent data. Specific long-term programs include an industry-based survey, a study fleet, and an Atlantic cod tagging program. The Northeast Regional Office administers a competitive grants process for short-term cooperative research projects such as habitat studies, marine mammal studies, and socioeconomic research. The CRPI also provides funds to the New England Fishery Management Council for cooperative research activities.

Congressional funding for the Southeast Cooperative Research Program (CRP) was appropriated in 2001. This program is administered by the Southeast Fisheries Science Center, assisted by the State/Federal Liaison Office in the Southeast Regional Office. The program is a competitive Federal assistance program that issues grants for short-term cooperative research projects. General research priorities were determined through a workshop held in April 2002.

Funding was provided through a Congressional line item in FY2004 for the Northwest. The Northwest cooperative research program is coordinated and administered by the Northwest Fisheries Science Center. There are four focus areas to this program including a program to fund research proposals initiated by industry, specific requests for local commercial fishing vessels to provide platforms for surveys and research, a port liaison program to identify and compensate fishermen for their assistance, and the design and maintenance of a cooperative research website.

As of 2004, the Southwest, Alaska, and Pacific Island cooperative research programs are funded through funds provided under the national cooperative research line item (i.e., specific Congressional appropriations are not available to support these programs). These programs are coordinated through the regional Science Centers. It should be noted, however, that cooperative research has been conducted in all regions using other funding sources besides the cooperative research line items.

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Relevant Information on Cooperative Research Programs
Legislation, Strategic Plans, Reports

There are several NMFS documents that provide general guidance on research priorities, including the Magnuson-Stevens Act as amended in 1996, New Priorities for the 21st Century: NOAA's Strategic Vision (2003), the NOAA Fisheries Strategic Plan (2004), and the National Research Council Report on NMFS Cooperative Research Programs (2004).

Magnuson-Stevens Act (1996)

The Magnuson-Stevens Act as amended by the Sustainable Fisheries Act in 1996 has the following items related to fisheries research:

Section 402. Information Collection

(b) Resource Assessments.

(1) The Secretary may use the private sector to provide vessels, equipment, and services necessary to survey the fishery resources of the United States when the arrangement will yield statistically reliable results.

(2) The Secretary, in consultation with the appropriate Council and the fishing industry –

(A) may structure competitive solicitations under paragraph (1) so as to compensate a contractor for a fishery resources survey by allowing the contractor to retain for sale fish harvested during the survey voyage;

(B) in the case of a survey during which the quantity or quality of fish harvested is not expected to be adequately compensatory, may structure solicitations so as to provide that compensation by permitting the contractor to harvest on a subsequent voyage and retain for sale a portion of the allowable catch of the surveyed fishery; and

(C) may permit fish harvested during such survey to count toward a vessel's catch history under a fishery management plan if such survey was conducted in a manner that precluded a vessel's participation in a fishery that counted under the plan for purposes of determining catch history.

(3) The Secretary shall undertake efforts to expand annual fishery resource assessments in all regions of the Nation.

Section 404. Fisheries Research

(a) IN GENERAL. The Secretary shall initiate and maintain, in cooperation with the

Councils, a comprehensive program of fishery research to carry out and further the purposes, policy, and provisions of the Act. Such program shall be designed to acquire knowledge and information, including statistics, on fishery conservation and management and on the economics and social characteristics of the fisheries.

(b) STRATEGIC PLAN. Within one year after the date of enactment of the Sustainable Fisheries Act, and at least every 3 years thereafter, the Secretary shall develop and publish in the Federal Register a strategic plan for fisheries research for the 5 years immediately following such publication. The plan shall -

(1) identify and describe a comprehensive program with a limited number of priority objectives for research in each of the areas specified in subsection (c);

(2) indicate goals and timetables for the program described in paragraph (1);

(3) provide a role for commercial fishermen in such research, including involvement in field testing;

(4) provide for collection and dissemination, in a timely manner, of complete and accurate information concerning fishing activities, catch, effort, stock assessments, and other research conducted under this section; and

(5) be developed in cooperation with the Councils and affected States, and provide for coordination with the Councils, affected States, and other research entities.

(C) AREAS OF RESEARCH

Areas of research are as follows:

(1) Research to support fishery conservation and management, including but not limited to biological research concerning the abundance and life history parameters of stocks of fish, the interdependence of fisheries or stocks of fish, the identification of essential fish habitat, the impact of pollution on fish populations, the impact of wetland and estuarine degradation, and other factors affecting the abundance and availability of fish.

(2) Conservation engineering research, including the study of fish behavior and the development and testing of new gear technology and fishing techniques to minimize bycatch and any adverse effects on essential fish habitat and promote efficient harvest of target species.

(3) Research on the fisheries, including the social, cultural, and economic relationships among fishing vessel owners, crews, U.S. fish processors, associated shoreside labor, seafood markets, and fishing communities.

(4) Information management research, including the development of a fishery information base and an information management system under section 401 that will permit the full use of information in the support of effective fishery conservation and management.

NOAA Fisheries' Requirements for Improved and Integrated Conservation of Fisheries, Protected Resources and Habitat (November 2002)

- Chartered Vessel Days at Sea

  The NOAA Fisheries Data Acquisition Plan (1998) indicated that a minimum of 6,005 days-at-sea (DAS), comprised of NOAA ships, charters, and cooperative cruises, would be required to address the information requirements of the agency's mandates. In FY 2002 NOAA Fisheries anticipates 4,303 DAS within its base program, leaving a shortfall of 1,702. Even when all six new FSVs are on-line, there will still be a need for substantial additional charter vessel days-at- sea since these are primarily replacement vessels. In addition, the long lead-times to launch the additional replacement FSVs impedes NOAA Fisheries' ability to collect new and additional data, generate new stock assessments, and deliver improved scientific advice in the short term, so charter vessel days are needed immediately to fill the gap. The addition of new charter vessel DAS will address the chronic shortfall in fisheries-independent resource survey and data collection needs that result, in part, from oversubscribed NOAA FSV schedules, and the expanded requirements for more frequent and higher quality assessments.

- Cooperative Research

  NOAA Fisheries gains tremendously by partnering with the fishing industry to assist in its assessments. Our research vessels cannot be in all places at all times. Use of commercial and recreational vessels to "fill in the gaps" in our surveys (both in time and geographic location) is required to help to meet the shortfalls. Industry vessels can be used: for fine-scale surveys; to survey closer inshore than our large vessels; to test fishing gear that minimizes wasteful bycatch; at multiple locations simultaneously for tag/recapture studies; and serve as an early warning system for significant biological and oceanographic events as part of a long-term study fleet. Fishing vessels are also appropriate platforms for standardized stock assessment surveys that use gears less sensitive to changes in vessel type, such as traps, pots and longlines. Self-contained vans containing specialized acoustic or laboratory equipment could be placed aboard larger vessels to extend fishing vessel capabilities similar to FSVs. The industry participants also possess a wealth of knowledge on resource distribution of individual species and stocks that we can use to fine tune and interpret our broader-scale multispecies surveys.

New Priorities for the 21st Century: NOAA's Strategic Vision (2003)

NOAA has recently updated the structure and content of its strategic plan to better address NOAA

mandates (July 9, 2003) NOAA's focus through 2008 will be on four Mission Goals:

1. Protect, restore, and manage the use of coastal and ocean resources through ecosystem-based management.
2. Understand climate variability and change to enhance society's ability to plan and respond.
3. Serve society's needs for weather and water information.
4. Support the Nation's commerce with information for safe, efficient, and environmentally sound transportation (NOAA, 2003).

Six factors were identified as essential to achieving the NOAA vision:

- improving the information base for stewardship,
- determining abundance and yield,
- reducing bycatch,
- eliminating overcapacity and overfishing,
- conservation and recovery, and
- protecting and restoring living marine resources.

NOAA's focus through 2008 will be on four Mission Goals:

Goal 1: Protect, restore, and manage the use of coastal and ocean resources through ecosystem-based management.

One of the Goal 1 strategies is focused on industry partnerships, and states that: "NOAA Fisheries gains tremendously by partnering with the fishing industry to conduct cooperative research. Over the next 5 years collaboration and inclusiveness of the industry in our science program will be expanded. Our research vessels cannot be in all places at all times and local knowledge and fisheries expertise can be gained only in cooperation with our constituents. Use of commercial and recreational vessels to fill in the gaps in our surveys (both in time and geographic location) is required to help to meet the shortfalls. Industry vessels can be used: for fine-scale surveys; to survey closer inshore than our larger vessels; to test fishing gear that minimizes bycatch; at multiple locations simultaneously for tag-recapture studies; and serve as an early warning system for significant biological and oceanographic events as part of a long-term study fleet. Fishing vessels are also appropriate platforms for standardized stock assessment surveys that use gears less sensitive to changes in vessel type, such as traps, pots and longlines. Industry participants also possess a wealth of knowledge on resource distribution of individual species and stocks that we can use to fine tune and interpret our broader-scale multispecies surveys."

NOAA Fisheries Strategic Plan (2004)

The research priorities of NMFS may be grouped into the four major areas (with several subareas) defined by Congress:

1. Research to support fishery conservation and management
2. Conservation engineering research
3. Research on the fisheries
4. Information management research

NMFS is also responsible for ensuring that this information, and thus the management decisions for which it provides the foundation, is understood and its validity accepted by user groups and other constituents. To accomplish this, the MSFCMA has mandated that NMFS provide a role for commercial fishers in our fisheries research. An obvious role is in operating charter surveys, but less visible means include providing information and knowledge about changes in species abundance and distribution, ideas and testing of bycatch reduction technology, and reviewing assessment methods and results.

The NOAA Fisheries Strategic Plan (2004) provides several specific references to cooperative programs involving commercial and recreational fishermen and/or the fishing industry, including:

- Assess, through cooperation with fishers, habitat changes over the past decade.

- Encourage coordination and collaboration of stakeholders to achieve regional and national goals by establishing frameworks for regional cooperation among the private and public sectors.

- Continue to conduct studies to determine the magnitude of bycatch of overfished stocks and options to reduce it (Conservation engineering). NMFS is working in cooperation with the fishing industry and gear manufacturers to find designs that meet conservation needs while recognizing the financial constraints of fishers.

NMFS is committed to maximizing the research contribution of the fishing industry and other nongovernment participants in the fisheries. Across the NMFS regions, the industry is providing advice in research planning, in formal reviews of research programs, and, where possible, in research operations. Examples of research involvement include: 1) provision of expertise, ideas, chartered vessels and crew for surveys and bycatch gear development; 2) keeping logbooks of species catches, including bycatch; and 3) industry efforts to develop gear, gear modifications, and fishing practices to reduce bycatch.

Specific goals and objectives relevant to cooperative research include:

GOAL 2: Through conservation engineering research contribute to efforts to reduce bycatch and adverse effects on EFH, promote efficient harvest of target species, and improve the data from fishery surveys.

Objective 2.3: Work through domestic and international cooperative relationships with industry and environmental groups, including take reduction teams, special task forces, and other needed scientific collaborations.

Objective 2.6: Work in cooperation with the fishing industry and gear manufacturers to improve gear selectivity, design and field test new gear designs and modifications, and evaluate gear regulations.

GOAL 5: Improve the effectiveness of external partnerships with fishers, managers, scientists, conservationists, and other interested groups.

Objective 5.1: Promote a cooperative network of partners in the coordination of fisheries research.

Objective 5.2: Develop infrastructure for long-term, continuous working relationships with partners to address fisheries research issues.

Objective 5.3: Sponsor symposia and conferences for partners to exchange information and identify major fisheries research initiatives.

Objective 5.4: Solicit partners' views on fisheries research needs.

ICES 2000 Annual Science Meeting
Theme Session on Cooperative Research with the Fishing Industry: Lessons Learned

Summary of Presented Papers:

Many cooperative research projects begin in a variety of ways, including initiation when resource conditions change rapidly, development for species that are difficult to assess, development for species that are only recently exploited or offer promise of a new fishery, development for fisheries where no standardized assessment methods exist. Almost all of the papers emphasized the importance of getting the projects off to a good start. This generally entailed defining a realistic scope of work, negotiating roles and responsibilities, and developing timetables. Scientists should take responsibility for experimental design and analyses, while fishermen have greater knowledge of the capture process and techniques. Several presenters emphasized the complementary roles of fishermen and scientists. Should maintain a degree of flexibility - rigid adherence to the scientific protocols or preconceived notions could blind scientists to new insights.

Many presenters noted quality control and assurance issues. It is important to devise realistic data collection procedures. A need to calibrate methods was noted by several authors - multi-vessel surveys and direct comparison with existing fishery-independent surveys both require validation.

Many of the long-term institutional frameworks for handling the varied types of data remain to be worked out. Most studies are not yet incorporated into traditional databases maintained by government agencies. Ultimately, such considerations need to be addressed if the results of these projects are to be available to the broader scientific and industry communities.

The importance of communication was stressed in all of the papers. Frequent communication, both formal and informal, is necessary. Rapid feedback is important to prevent small problems from becoming insurmountable ones. Development and use of more understandable approaches was advocated.

Building trust between groups does not come overnight, particularly if relationships have been tense in the past. Therefore, it is often necessary to validate new approaches in small steps. Several papers noted that it is not necessary to conduct such research with the entire fleet. One-on-one communications and projects often create good will throughout the fishing fleet.

General Discussion

Standardization and consistency of methodology were considered to be essential to the success of these initiatives. Where standardization cannot be achieved (e.g., vessels used in surveys), the issue can often be addressed through proper statistical design. In terms of quality and credibility, validation of the information through other data collection systems (e.g., Vessel Monitoring Systems), fisheries observers, or by calibration of the equipment when using acoustic methods is paramount.

Cooperative research with industry is not necessarily cheaper and often requires a considerable time investment from the scientists and industry. Fisheries institutions and harvesters must invest in the process. However, these costs can be offset by unexpected benefits (e.g., data collected that can be used to examine other issues, greater acceptance of assessment results) that are difficult to quantify.

For these studies to be successful, a structured, yet flexible approach, established at an early stage is required. Frequent exchange of information, transparent communication, an openness to compromise by both parties, a commitment to resolve issues, identification of roles and responsibilities, and detailed written agreements are important elements of this approach.

A number of challenges were also identified, including the following:

- Need to manage the expectations of all parties in that research may not provide expected

results:

- may not necessarily result in improved stock status
- will not always lead to increased harvest
- may lead to increased fisheries management restrictions

- Researchers need to determine to what extent scientific trade-offs are acceptable
- Concerns that the industry partnership could evolve to produce undesirable results in terms of access to the resource (e.g., greater access to those involved in research)
- Initiatives must have the acceptance from the entire fisheries management system, not just the scientists
- Issues of data accessibility and ownership by government and industry

National Research Council Reports

Improving the Collection, Management, and Use of Marine Fisheries Data (2000)

Recommendation on Cooperation and Communication with Industry: NMFS should identify approaches that maintain the statistical rigor needed for long-term fishery assessments, while making the best use of local knowledge among commercial fishermen with expertise about specific stocks and gear types that are efficient at catching targeted stocks. NMFS should consider hiring commercial fishermen to participate in surveys (in addition to opportunities for unpaid participation) to see how sampling gear is used and where the surveys are conducted. NMFS also should carry out some joint sampling cruises using NMFS and commercial vessels, with exchanges of crew.

Harms and Sylvia (1999) suggested that collaborative research between fishermen and scientists should be undertaken only if there is (1) equal partnership in planning and implementation, (2) adequate funding, (3) competent management, and (4) commitment to begin small and build on success. If cooperative research is to be adopted on a broader basis, institutional changes in both industry and government agencies will be needed, and the recommendations of Harms and Sylvia should be considered.

National Research Council Report on NMFS Cooperative Research Programs (2004)
This document provides a valuable review of NMFS cooperative research programs. Specific recommendations included:

- Cooperative research should be considered as a usual and normal approach for conducting fisheries research.

- In designing cooperative research projects, the applicability of the results to the overall success of the fishery must be considered.

- Congress and NMFS should give serious consideration to establishing and funding regional research boards to: prioritize and coordinate the use of dedicated funding

(earmarks and line items) for cooperative research projects in each region, evaluate NMFS-dedicated research projects for their potential as cooperative research, foster communication of research results, and evaluate cooperative research projects and programs. A national steering committee consisting of the chairs of each regional research board should also be formed to provide coordination among regions and facilitate communication with the NMFS national office. NOTE: This recommendation is not supported by NMFS.

- A majority of cooperative research funds should be allocated through a competitive review process. The remaining monies should be used for rapid response, seed money, and administration.

- Commercial fishing vessels used for cooperative fisheries research by NMFS should meet all U.S. Coast Guard requirements for operation and manning so as to ensure safe operations.

- NMFS should ensure that appropriate liability insurance is secured for all cooperative fisheries research activities so as to protect the financial interests of all participants involved in cooperative research.

- NMFS should streamline and standardize all permitting procedures for conducting cooperative research projects so as to ensure uniform treatment and rapid processing of all applications in all regions.

- NMFS and operators of commercial fishing vessels should use comprehensive contracting procedures so as to minimize confusion and maximize opportunity for all fishermen to participate in cooperative research.

- All participants in cooperative research should ensure the independent status of observers and the confidentiality of the data collected.

- For larger and more complicated cooperative research programs, specific advisory committees should be formed.

- Expectations, requirements, and procedures, including the development of agreements carefully detailing the responsibilities of all participants, should be clarified at the beginning of every project.

- Appropriate administrative overhead should be included in all budgetary allocations.

- NMFS scientists who participate in cooperative research should be given equal opportunity for professional advancement along with their counterparts who do not participate in cooperative research.

- NMFS should recognize and hire individuals with the interpersonal and communication skills necessary for cooperative research.

- NMFS should require that a communications plan for outreach, progress reports, and dissemination of the final results be part of every cooperative research project plan.

U.S. Commission on Ocean Policy

Recommendations Relevant to Cooperative Research:

Regional Fishery Management Council Input on Research Priorities

RFMC members need access to reliable information to do their jobs. The NMFS science program has done well in providing biological information to manage single species. However, the research program is less well positioned to answer many other pressing questions. Generally, questions that involve interactions among fisheries, habitat, and other protected species, as well as social science and economic questions, have received less attention than traditional stock assessment science and fishery biology. The move toward ecosystem-based management, including considerations such as essential fish habitat, highlights these shortcomings. As the agency charged with responsibility for federal fishery management, NMFS should ensure that its research agenda supports the information needs of the RFMCs.

Recommendation 19–7. The Regional Fishery Management Councils and their Scientific and Statistical Committees should develop an annual, prioritized list of management information needs and provide it to the National Marine Fisheries Service (NMFS). NMFS should incorporate these needs to the maximum extent possible in designing its research, analysis, and data collection programs.

The lists of RFMC information needs will also be of great value to the regional ocean information programs discussed in Chapter 5, which would be responsible for crafting regional research strategies to meet management needs. Fisheries research and data requirements should also be included as an integral part of planning for the Integrated Ocean Observing System discussed in Chapter 26.

The Value of Cooperative Research

Involving fishermen in the research process, referred to as cooperative research, is a promising approach that can produce benefits for the fishermen, the scientists, and ultimately the management process. Underutilized fishing vessels can provide cost-effective research platforms to expand the scope of data gathering and create an additional source of income for fishing communities waiting for stocks to recover. Fishing vessels are usually significantly less expensive to operate than traditional research vessels, while still suitable for many types of research. Scientists can also benefit from the knowledge and experience gained by fishermen

during years at sea. Increased interaction and rapport between fishermen and fishery scientists is another benefit of cooperative research. In many regions of the country, fishermen are skeptical of the science and analysis used to support fisheries management. Until the 1990s, scientists rarely included fishermen in either the design or data collection phases of their research. This has fed the perception in fishing communities that scientists do not understand fishing and do not value the experiences of fishermen. Greater involvement of fishermen in research programs appears to have been successful in reversing this perception and promoting better understanding between fishermen and scientists. In 1977, when NMFS stock assessments indicated that bowhead whales off Alaska's North Slope were at extremely low levels, the International Whaling Commission proposed a ban on all whaling, including that done for subsistence. The indigenous whaling community, convinced that the assessment had under-counted whales, provided NMFS scientists with additional information on whale locations and migration patterns based on traditional knowledge. The scientists revised their survey protocols to incorporate this new information, determined that they had in fact underestimated the whale population, and allowed the subsistence harvest to continue.

Similarly, in 1999, initial estimates indicated that Atlantic monkfish were severely overfished and a management plan was created to curtail fishing and rebuild the stock. When fishermen contended that the NMFS survey was missing significant stocks of monkfish in deeper waters, NMFS initiated a cooperative research program to investigate. The results indicated that monkfish were indeed present in significant numbers in deeper waters, allowing managers to reduce the severity of catch restrictions. In both of these examples, anecdotal or traditional information was not unconditionally accepted. Instead, scientists used data from fishermen as the basis for further investigation. Scientists can benefit from fishermen's experience by incorporating their suggestions into the design of research programs. At the same time, fishermen need to realize that informal information can only be used in decision making after it has been tested and verified according to a methodical, scientific process.

Cooperative research has the potential to be applied quite broadly. Although fishery-specific research, particularly experiments with new or modified gear types, is the most obvious application, others should be considered. The RFMC lists of information needs, suggested above in Recommendation 19–6, will be helpful in selecting topics for cooperative research. For example, NOAA should organize its oceanographic research programs to take advantage of cooperative opportunities, as should scientists conducting economic or social science research related to oceans and coasts.

Recommendation 19–9. Congress should increase support for an expanded, regionally-based cooperative research program in the National Oceanic and Atmospheric Administration (NOAA) that coordinates and funds collaborative projects among scientists and commercial and recreational fishermen. NOAA should develop a process for external evaluation and ranking of all cooperative research proposals to ensure the most worthwhile projects are funded, the most capable performers are undertaking the research, and the information produced is both scientifically credible and useful to managers.

Other Cooperative Programs

Saltonstall-Kennedy Grant Program

The Saltonstall-Kennedy Grant Program has had direct industry involvement and investment since its inception decades ago. Industry members submit proposals, usually with considerable cost sharing, to conduct research in conservation engineering, to develop fisheries for underutilized species to relieve pressure on traditional species, and to improve the after-catch utilization of captured species.

Summary of Funding History

Program	Appropriated Funds
National Cooperative Research Program	FY01 - $2.993 million FY02 - $2.750 million FY03 - $1.043 million FY04 - $2.721 million
Northeast Cooperative Research Program - Research Partners Program 1/	FY99 - $1.88 million FY00 - $4 million FY01 - $15 million FY02 - $8.25 million FY03 - $3.726 million FY04 - $2.846 million
Southeast Cooperative Research Program 1/	FY01 - $2.495 million FY02 - $3.0 million FY03 - $3.229 million FY04 - $3.216 million
South Carolina Cooperative research	FY04 - $1.979 million
Alaska	Funded under National Cooperative Research Program
Northwest Cooperative Research Program (groundfish) 1/	FY04 - $989K
Southwest	Funded under National Cooperative Research Program
Pacific Islands	Funded under National Cooperative Research Program

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Alaska Fisheries Science Center
Resource Assessment and Conservation Engineering Division
7600 Sand Point Way Northeast
BIN C15700, Building 4
Seattle, Washington 98115-0070

September 26, 2003

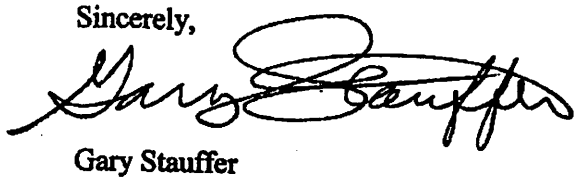
Open Letter to the Bering Sea Crab Industry

Over the past couple years, we have been approached by a number of folks involved in the Bering Sea crab fishery about the possibility of setting up a cooperative research program to improve our confidence in the annual assessment of Bering Sea crabs, particularly our annual Eastern Bering Sea crab/groundfish trawl survey. Our Center is very interested in working with the industry and Alaska Department of Fish and Game to establish a cooperative research program. Under the Magnuson-Stevens Act we are encouraged to use the resources of the private sector to survey fishery resources given an acceptable scientific plan. Also under Title 15 Section 1525 of the US Code, we are authorized to engage in joint projects with non-profit or research organizations and other agencies on matters of mutual interest. Joint projects with private entities are not authorized. As a result we will need to partner with a formal non-profit industry organization which, we would hope, would have the support of all of the Alaska and Northwest components of the crab industry.

Our goal is to establish a long-term cooperative research program that utilizes the resources and talents within the industry, Alaska Department of Fish and Game (ADFG) and NOAA Fisheries. One of the first steps to be undertaken is for the industry to establish a non-profit foundation with a Board of Directors from the industry. The Board's principal function would be to develop project priorities in collaboration with agency scientists and to identify, collect and disburse industry funding and other support. A second step would be for the Board and the Agencies to formalize the partnership though a Memorandum of Understanding (MOU) that meets the legal requirements of all parties. This MOU should be a multi-year commitment assuming an annual availability of funds. The Agencies will need to identify scientists to serve as advisors to the board to assist in the development of a research agenda and project priorities. The Agencies will also need to identify sufficient funds and resources to support the cooperative program. To have the program in place for the 2004 summer field season, these first two steps need to be completed relatively soon so that we have sufficient time to plan the research effort, schedule vessels, and identify a science team to undertake the proposed research.

We are committed to meeting with representatives from the industry and ADFG to begin working on developing this collaboration. We look forward to receiving your comments to our proposal and to working with all entities to build this partnership. I will serve as the interim point of contact for NOAA Fisheries. I can be reached at 206 526-4170 or at gary.stauffer@noaa.gov.

Sincerely,



Gary Stauffer
Director, Resource Assessment and
Engineering Division

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
P.O. Box 21668
Juneau, Alaska 99802-1668

August 17, 2004

To the Crab Industry:

Over the past two weeks, we have heard from members of the crab industry about using the new National Marine Fisheries Service (NMFS) population assessment model for the eastern Bering Sea snow crab (*Chionoecetes opilio*) in setting the guideline harvest levels (GHL) for 2004 and beyond. Our intention for the upcoming 2005 snow crab fishery is to provide Alaska Department of Fish and Game with snow crab abundance estimates derived from the same NMFS annual Bering Sea summer trawl survey as in past years. Projected abundance estimates derived from the new snow crab assessment model will be provided for informational purposes only.

We fully anticipate that the survey-based analysis of snow crab abundance for this coming season will include samples collected from the survey conducted aboard the F/V Sea Wolf sponsored by the cooperative project of the Bering Sea Fisheries Research Foundation and NMFS.

In 2003, the North Pacific Fishery Management Council (NPFMC) instructed the Crab Plan Team to revise the overfishing criteria to more accurately reflect new scientific information concerning crab biology and population dynamics. The Crab Plan Team established a committee that has been working on revising the overfishing criteria. The Crab Plan Team will review the committee's progress at their upcoming meeting from September 20 through 22, in Juneau, Alaska. Additionally, the NPFMC's Scientific and Statistical Committee will review and critique the various crab population assessment models and associated overfishing criteria. The Crab Plan Team is scheduled to present the revised criteria to the NPFMC for initial review in June 2005.

Under the revised overfishing criteria, the stock assessment models currently being developed will be the primary tools for projecting the crab stock abundance estimates that will be used to determine stock status and set annual GHLs. The rebuilding harvest strategies developed under the current overfishing criteria for the overfished stocks of Bering Sea Tanner crab, St. Matthews blue king crab, Pribilof Islands blue king crab, and Bering Sea snow crab, could potentially be modified as the result of revisions to the overfishing criteria. Depending on when we implement the overfishing criteria, the earliest that the snow crab model could be used in setting the GHL would be for the January 2007 fishery.

The revised overfishing criteria and associated stock assessment models will be a significant departure from the current methods used to estimate crab abundance and stock status. Members of the public and the fishing community have expressed an interest in learning more about the criteria and the associated models. We will schedule workshops to explain to interested members of the public the modeling approach, model assumption, input data, and modeling results. And, if necessary, we will arrange for additional reviews by an independent panel of experts.

If you have any questions, comments, or concerns, please contact Dr. Gary Stauffer at (206) 526-4170 or Gary.Stauffer@noaa.gov.

Sincerely,

James W. Balisger
Administrator
Alaska Region

Distribution:

Arni Thomson
Jeff Stephan
Tom Casey
Steve Minor
Terry Cosgrove
Glenn Reed
Dave Benson
Royal Aleutian
Don Giles
Linda Kozak
Robin Samuelson
Brent Paine
Gary Painter

MEMORANDUM OF AGREEMENT
ESTABLISHING A JOINT PROJECT
BETWEEN THE
ALASKA FISHERIES SCIENCE CENTER
NATIONAL MARINE FISHERIES SERVICE
U.S. DEPARTMENT OF COMMERCE

AND

BERING SEA FISHERIES RESEARCH FOUNDATION

Agreement No. AKC-39

I. PARTIES

This Memorandum of Understanding (MOU) establishes an agreement between the Alaska Fisheries Science Center (AFSC), National Marine Fisheries Service (NMFS), U.S. Department of Commerce (DOC) and the Bering Sea Fisheries Research Foundation (BSFRF), which is a non-profit organization. In 2004, both parties have agreed to conduct a joint project which will add supplemental bottom trawl survey stations to the AFSC's annual bottom trawl survey to improve the precision of the population and biomass estimates resulting from the survey. It is the intention of both parties to conduct joint projects in future years in relation to the biology and assessment of Bering Sea crabs and to establish new agreements to carry out those projects. Both parties support a multiyear research partnership to conduct cooperative projects on Bering Sea crabs. This agreement only applies to the first year cooperative effort.

II. AUTHORITIES

NMFS is authorized to enter into this Agreement with the BSFRF pursuant to the Department of Commerce's Joint Project Authority, 15 U.S.C. 1525. NMFS has determined that this arrangement is of mutual benefit to both parties and that the costs will be equitably apportioned. The NMFS has programmatic authority to engage in areas of research to support the conservation and management of marine fisheries resources pursuant to the Magnuson-Stevens Fishery Conservation and Management Act, 16 U.S.C. 1801 et seq.

III. PURPOSE

Pursuant to this agreement, the parties will work jointly to improve the knowledge of the biology, abundance, and distribution of eastern Bering Sea king crabs, Tanner crabs, and snow crabs. As directed by the Magnuson-Stevens Fishery Conservation and Management Act, the NMFS conducts research in the eastern Bering Sea on the distribution, abundance, and biology of stocks of king crabs, Tanner crabs and snow crabs. Annual bottom trawl stock assessment surveys and research conducted by the NMFS provide basic information utilized by NMFS, the

Alaska Department of Fish and Game, and the North Pacific Fishery Management Council to annually assess the status of eastern Bering Sea crab stocks and to develop and implement management measures to manage crab fisheries in the eastern Bering Sea and provide for conservation of the resource. The BSFRF is a non-profit organization formed by members of the fishing industry and public to support research essential to the conservation and management of eastern Bering Sea crab resources. The need for additional research on the biology of Bering Sea crabs and additional stock assessment survey effort to improve the precision of stock abundance estimates is acknowledged and apparent to both parties. By joining efforts on mutually agreed upon joint projects, the parties to this Agreement believe the understanding of the biology and assessment of eastern Bering Sea crab stocks can be greatly improved.

The NMFS has determined that this project cannot be done at all or done as effectively without the participation of the BSFRF because the NMFS has insufficient fiscal and personnel resources to carry out the activities described in this agreement without the assistance of the BSFRF. Participation from the BSFRF provides access to valuable traditional knowledge and information gained by participants in the commercial fisheries that have the potential for improving our basic understanding and knowledge of crab biology and populations. The joint project is necessary and essential to further the mission of the Department in that it furthers the Department's mission under the Magnuson-Stevens Fishery Conservation and Management Act to manage and conserve the nation's living marine resources.

IV. MUTUAL INTEREST OF THE PARTIES

The joint research and survey assessment of eastern Bering Sea crabs at issue in this agreement is of mutual interest to the parties because it will improve the parties' understanding of Bering Sea crab biology and the assessment of the condition of the stocks of crabs. This is important to the NMFS because of its responsibility under the Magnuson-Stevens Fishery Conservation Act to manage and conserve the living marine resources of the United States. It is of importance to the BSFRF because of their contributing members' interest in ensuring the long-term conservation and sustainability of Bering Sea crab stocks on which their livelihood depends.

V. RESPONSIBILITIES OF THE PARTIES

A. The NMFS shall:

a. Provide scientific expertise in the design of the joint crab survey work to be conducted in 2004. Depending on the resources available to the BSFRF and agreement between the NMFS and the BSFRF (to be reflected in an amendment to this agreement), the joint survey will be 25 to 30 days.

b. Provide fuel for the vessel chartered by the BSFRF during the agreed upon joint survey.

c. Provide 3 scientific staff, one of which will serve in the role of Chief Scientist during the agreed upon joint survey. These staff will collect and record the scientific survey data throughout the survey. Basic staff labor/benefits, overtime and travel round-trip between

either Seattle, WA or Kodiak, AK and Dutch Harbor, AK will be included in providing staff to work on the joint survey.
d. Agree that all members of the scientific staff will follow the instructions of the captain of the vessel regarding the safe operation of the vessel and the safety of the crew and scientific field party.
e. Provide 2 NMFS standard 83/112 bottom trawls as used in the AFSC's annual eastern Bering Sea bottom trawl survey, and associated trawl doors, rigging, and trawl repair materials to be used during the joint survey.
f. Provide the required scientific instruments, sampling supplies and equipment and trawl mensuration instruments needed by the NMFS scientific staff to collect and record data equivalent to that collected during the AFSC's annual eastern Bering Sea bottom trawl survey.
g. Provide staff and resources needed for the editing and analysis of the survey data and in cooperation with the BSFRF produce a report on the results of the joint survey effort.
h. Provide the edited data and results from the joint survey to the Alaska Department of Fish and Game (ADF&G) along with the data and results for snow crab from the AFSC's 2004 standard annual Bering Sea survey. Final reporting on the results of the joint survey by the NMFS in the AFSC's Report To Industry on the 2004 Eastern Bering Sea Crab Survey will be completed by November 30, 2004.

B. The BSFRF shall:
a. Provide a trawl vessel that is acceptable to the NMFS, at no cost to the NMFS except for fuel as specified above, and available for the entire period of the joint survey. The chartered vessel will at a minimum meet the specifications of vessels chartered by the AFSC (Attachment #1) to conduct the annual eastern Bering Sea survey. The joint survey and therefore the charter of the vessel will 25 to 30 days.
b. Assure the NMFS that the captain and crew of the chartered vessel will follow the scientific operating plan developed by the NMFS to conduct the joint survey and will follow the direction of the AFSC's Chief Scientist in all aspects of the survey, except in matters relating to the safe operation of the vessel and the safety of the crew and scientific staff.
c. Agree to be responsible for all costs relating to the operation of the vessel and crew, except fuel as described above, including the vessel, captain and crew, lube oil, moorage fees, food for the crew and scientific staff, bedding, crew communications from the vessel to shore, and any repairs or maintenance to the vessel needed to maintain the vessel in proper and safe working condition throughout the joint survey.
d. If requested by the NMFS, provide through the vessel charter the assistance of one scientific staff member if the NMFS is unable to provide the needed 3 scientific staff needed for the joint survey operations.
e. Agrees to hold the NMFS harmless and non-liable for any costs or damages to the vessel or crew resulting from the NMFS's participation in the joint survey.

VI. EQUITABLE APPORTIONMENT OF COSTS

The costs of this activity are equitably apportioned between the NMFS and the BSFRF. The NMFS's estimated cost for this project of $127,190 represents from 44.2% to 44.8% of the project cost, depending on whether or not the option for the BSFRF to provide a contract biologist is needed (Attachment 2, which shows both options). The BSFRF's contribution to this project would be $157,000 without the option for provision of a contract biologist, which would represent 55.2% of the total project cost, whereas with the option to provide a contract biologist, the BSFRF's contribution would be $160,540 or 55.8% of the total cost.

VII. CONTACTS

The contacts for each party to this agreement are:

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The parties agree that if there is a change regarding the information in this section, the party making the change will notify the other party in writing of such change.

VIII. PERIOD OF AGREEMENT AND MODIFICATION/TERMINATION

This agreement will become effective when signed by both parties. The agreement will terminate on June 1, 2005, but may be amended at any time by mutual written consent of the parties. Either party may terminate this agreement by providing 90 days written notice to the other party. In the event this agreement is terminated, each party shall be solely responsible for the payment of any expenses it has incurred. This agreement is subject to the availability of funds by both parties.

IX. OTHER PROVISIONS

Performance by each party is dependent upon the receipt of the necessary funding and support required. In the case of the NMFS, this is dependent upon sufficient FY 2004 funding authority and for the BSFRF, it is dependent upon receipt of sufficient donations by members of the Foundation.

Should disagreement arise on the interpretation of the provisions of this agreement, or amendments and/or revisions thereto, that cannot be resolved at the operating level, the area(s) of disagreement shall be stated in writing by each party and presented to the other party for consideration. If agreement on interpretation is not reached within thirty days, the parties shall forward the written presentation of the disagreement to respective higher officials for appropriate resolution.

Under the Inspector General Act of 1978, as amended, 5 USC App. 3, a review of this agreement may be conducted at any time. The Inspector General of the Department of Commerce, or any of his or her duly authorized representatives, shall have access to any pertinent books, documents, papers and records of the parties to this agreement, whether written, printed, recorded, produced, or reproduced by any mechanical, magnetic or other process or medium, in order to make audits, inspections, excerpts, transcripts, or other examinations as authorized by law.

Any materials or statements offered to inform the public of the nature of this joint project, or to promote knowledge of the existence of the project and the parties, shall only be released to the public upon the mutual written agreement of the parties.

CFO for

William T. Hogarth, Ph.D.
Assistant Administrator for Fisheries

4/29/04
Date

Terry Cosgrove
President
Bering Sea Fisheries Research Foundation
620 Sixth Street South
Kirkland, Washington 98033

5/6/04
Date

DRAFT

SCIENTIFIC OPERATIONS MANUAL
2004 BSFRF-RACE COOPERATIVE OPILIO CRAB BOTTOM TRAWL SURVEY

F/V Sea Wolf

6-26 July, 2004

Alaska Fisheries Science Center
Resource Assessment and Conservation Engineering Division
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
7600 Sand Point Way NE, Bldg. 4
Seattle, Washington 98115-0070

June 22, 2004 (3:14pm)
C:\2004 crab industry\Plan\Operations plan.wpd

CONTENTS

Standard AFSC survey procedures are documented in the Scientific Operations Plan for the 2004 Eastern Bering Sea Crab-Groundfish Bottom Trawl Survey which serves as a companion document to this Operations Plan. Also contained in EBS survey operations plan are various Appendices containing the following pertinent information:

Appendix A - Vehicles, communications, and phone numbers
Appendix B - Standard survey station locations
Appendix C - Trawl rigging, repair, net plans, trawl warp measurement form, warp angle photographs, and net width and net height vs scope plots.
Appendix D - Instructions for catch processing
Appendix G - Collection and storage of otoliths
Appendix H - Standard AFSC data forms
Appendix I - Collectors permits

SAFETY, VESSEL SCHEDULE

Safety

Under International Law the vessel Captain is responsible for the safety of the vessel and crew. However, safety begins with training. There is a Charter Vessel Emergency Procedure Form (located in the Haul Log Book) that documents that the safety systems and emergency procedures have been discussed with **All** members of the Scientific Party and vessel crew before the vessel leaves the dock. It is the responsibility of the Field Party Chief to assure that this training has been conducted, this form signed by all those aboard, and returned to the Haul Log Book for return to Seattle at the end of the charter. **THIS IS MANDATORY**. An **At-Sea Field Safety Manual** will also be provided and must be reviewed by all scientific personnel. As part of the safety review all personnel should locate their survival suits and try them on. Please note that survival suits are available in three sizes: Intermediate, Regular, and Jumbo. The proper size selection will be provided to accommodate all personnel. Make sure that the survival suits are returned to the correctly labeled (size) storage bags after use. Practice until they become familiar and can be quickly put on. Locate a space to store them so that they are readily available should they be needed.

Vessel schedule

The 2004 BSRF-RACE survey will be conducted aboard the chartered fishing vessel, F/V Sea Wolf (vessel code 154). The survey will start July 6th in Dutch Harbor, Alaska and end on July 26th in Dutch Harbor.

EQUIPMENT, FUELING, COMMUNICATIONS

Fishing and sampling equipment will be delivered to FTS in Dutch Harbor. Arrangements are to be made with FTS to have these supplies delivered to the dock for loading. A few miscellaneous supplies, such as alcohol shipped to Jerry Hoff, and Oxygen under the specimen table for the Ocean Explorer, will also be located at FTS for this survey. The AFSC will issue a purchase order to Petro Star (North Pacific) to provide for the fuel used by the Sea Wolf. The fueling procedure is as follows:

1. One week before fueling at Dutch Harbor, inform Seattle of estimated fuel requirements and confirm fueling date.
2. Seattle will issue a purchase order.
3. After fueling, Field Party Chief signs for fuel.

INTRODUCTION

The Bering Sea Fisheries Research Foundation (BSFRF) and the Resource Assessment and Conservation Engineering (RACE) Division of the Alaska Fisheries Science Center (AFSC) are conducting a cooperative bottom trawl to sample high density locations of snow crab (*Chionoecetes opilio*). The major objectives of this survey are to: 1) sample additional stations within the standard annual Bering Sea bottom trawl survey area where the highest densities of mature male and female snow crab have been found in previous AFSC surveys for the purpose of determining the level of improvement in the estimation of snow crab abundance provided by adding additional sampling stations and to determine the shape of the density variogram for snow crab; 2) sample additional stations outside of the standard survey area to assess the distribution and abundance of mature male and female snow crab in these areas. Catch and effort data will be collected, in addition to the monitoring and collection of trawl performance data. Secondary survey objectives include: 1) the use of one vessel day to compare catches of the standard survey net to catches from the same net rigged with a tickler chain by alternating tows in the high density crab area; 2) the deployment of an underwater video camera system with artificial light on an as-time-permits basis at the end of a day following survey station sampling.

Sampling will take place in the general area north of lat. 58° to 63° and between long. 170° W and the U.S.-Russia Convention Line (Figure 1).

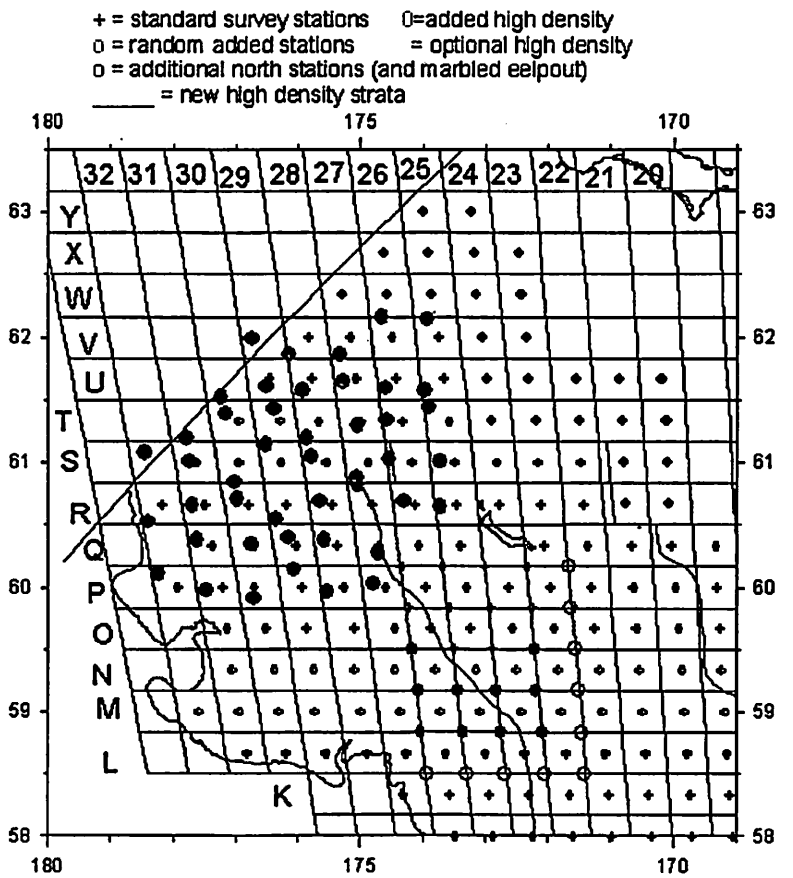

Figure 1. The 2004 BSFRF-AFSC Survey station plan.

4. Return the original form to Russ Nelson immediately upon return or by mail.

DUTCH HARBOR SERVICES: Factory Trawler Supply (FTS) is located next to the Dutch Harbor Airport. Their telephone number is 907 581-2490.

A vehicle, controlled by NOAA in Anchorage can be used on an "as available" basis. The vehicle is available through the NMFS Enforcement Office in Dutch Harbor. The office is located near the airport across from the Factory Trawler Supply building. **Contact: Rance Morrison in Dutch Harbor at 907-581-2062 (Rance.morrison@noaa.gov) . Jennifer Watson (Dutch Harbor Observer Program 907-581-2060) will be the contact person when Rance in on leave from July 1 - July 26).** The schedule of vehicle requests for the 2004 field season is shown in Appendix A. One person/vessel/leg will have approval to rent a vehicle in Dutch if necessary.

Communications
The Sea Wolf is scheduled to load and unload at the Aleska Dock (Tel:). The cell phone number for the Sea wolf is xxx. The Sea Wolf Inmarsat-C number is xxx.

Communications will be initiated through the Inmarsat-C system directly between the vessels and the RACE Division of the AFSC in Seattle and Kodiak. An email log is to be maintained by personnel using this resource. Inmarsat numbers and call signs for chartered vessels in 2004 are as follows:

Vessel	Call Sign	Survey Dates	Survey	Satellite Phone	Inmarsat# @stratosmobile.ne
F/V NWExplorer	WCZ9007	June 3 - Aug 11	EBS Slope	1-877-646-3292	436820110
F/V Sea storm	WCV9132	June 1 - Aug 9	Aleutian	N/A	436740310
F/ V Gladiator	WCZ9000	June 1 - Aug 9	Aleutian	1-877-713-4594	436769310
F/V Aldebaran	WYQ6160	June 1 - Aug 4	EBS Shelf	1-877-883-0884	430315820
F/V Arcturus	WAP2210	June 1 - Aug 4	EBS Shelf	1-877-231-3670	430315910
R/V Miller Freeman	WTDM	June 4 - Aug 3	EBS Shelf	011872330394120	430394110
F/V Ocean Explorer	WCZ9006	May 28 - June 9 Aug 14 - Aug 23	SPARE Habitat Research	0118721511602 (Irridium) 881-621-456017	436815810
F/V Sea Wolf		July 6-26	Crab Industry		

SOFTWARE AND DATA BACKUP

The following software had been installed on the 2004 computers:

Windows 2000 Professional Service Pack 3 Operating System
Microsoft Office 2000
Visual Basic Studio 6 Service Pack 5
Completed MSDN Library
Corel Suite 2000
S-Plus 3.3
Tides & Currents
Roxio CD Creator Platinum
Adobe Photoshop 5.5
Adobe Acrobat Reader 5.0
Media Grid
Quick C Compiler
Boxcar Pro 3.7
Winzip 7.0
PFE32 File Editor
Otolith XLS File
Stratos Manual
Mollusks Guide Book
Seaterm
Netmind Program
2004 ScanMenu Program
2004 Data Entry MDB Program
2004 Time/Overtime XLS File

Data backup protocol is documented in the **Computer User Guide** on each vessel. This manual is located in a file folder which includes backup copies of the computer software systems.

The original HAUL form with their respective field notebooks will be returned to Seattle and the original ON-DECK form will also be returned to Seattle. Also please copy the haul/log netmind notes and leave the originals onboard on the haul log book on the bridge. Please place the haul form, on deck catch form and length data sheets together, by haul in the notebooks. All the specimen data sheets should be stored together in the front of the book.

Haul/Log book
This notebook should be located on the vessel bridge. It's primary purpose is to document haul information at each trawling location. There is also other information provided in this notebook and includes:

Charter vessel emergency procedure forms
Fuel usage report
Setting and retrieval methods for the 81-112 sampling net documents
RACE calendar
Additional sampling charts
Overtime sheets
Software bug log
Haul logs

Net repair forms
Certification procedures of eastern Bering Sea bottom trawls
Wildlife Mk9 data logger instructions
Mk9 users guide
E-mail log forms, Inter-leg communications log,

SAMPLING LOCATIONS

The survey consists of 90 stations having varying priorities for completion (Figure 1). First priority stations are colored green (45 stations of which 43 are to be sampled, see explanation below) and blue (10 stations) on the station chart. The green stations are non-standard-survey stations randomly located within standard survey 20 x 20 nautical mile blocks (1 station per block) with an additional 4 stations added along the U.S.-Russia Convention Line. Two of these stations (S-32 and V-29) were placed on the Russia side of the Line by the randomization process and should **NOT** be sampled. The other two stations (T-31 and U-30) are located near the line and should be towed NE or E to prevent crossing the line. The blue stations are corner stations in the survey high density sampling area designed to expand the standard survey high-density area. Second priority stations are colored red (27 stations) and also pertain to sampling sites for marbled eelpout collections. Red stations represent a resampling effort of stations added to the 2001 survey designed to delineate the NE edge of the snow crab distribution. Two additional red stations (Y-24 and Y-25) not sampled in 2001 have been added to this survey. Red stations may be sampled by either the Aldebaran or the Arcturus during the AFSC survey if time allows. Active communications with those vessels about the sampling of the red stations is imperative. Third priority stations are colored yellow (10 stations) and are intended to further expand the standard survey high density sampling area. Yellow stations are to be sampled only if there is extra time at the end of the survey. The location of all stations in degrees and decimal degrees are shown in Appendix A.

Sampling site locations in which gear damage occurred during previous AFSC surveys are listed in a separate Good Haul - Bad Haul document provided to each survey vessel. In addition, we have been notified that the trawl fishery has been disposing of derelict crab pots at the intersections of even degrees of latitude and longitude. Field Party Chiefs are cautioned to keep particular track of these and any other stations where derelicts are found.

Marbled eelpout (*Lycodes raridens*) collection

AFSC survey data suggests the distribution and abundance of marbled eelpouts has declined sharply over the past 20 years. Life history data on this species is sparse, therefore we will be collecting some basic biological data. The following stations are to be sampled by either the two standard Bering Sea survey vessels, the Aldebaran and the Arcturus, or the Sea Wolf.

T-20,21,22,23,24
U-20,21,22,23,24
V-23,24
W-23,24,25,26,27
X-23,24,25,26
Y-24,25

Lengths should be taken as widely as possible. Otoliths should be collected to sample the entire size range. The otoliths are to be used to determine an age range, not an age distribution, so the collection can be fairly limited. Gather stomachs and ovaries as collecting space permits, with ovaries being the most important. Use the cloth bags provided with a Specimen Label. Buffer

(Sodium Acetate Trihydrate) has been provided to make up 10 liters of formalin mixture in 1 bucket.

BERING SEA CONTINENTAL SHELF BOTTOM TRAWL STANDARDIZATION

The Alaska Fisheries Science Center (AFSC) conducts four bottom trawl surveys, the eastern Bering Sea Shelf survey, and the Gulf of Alaska, Aleutian Islands, and eastern Bering Sea Upper Continental Slope Surveys. Since there are many similarities in the characteristics of these surveys, rather than presenting the complete operations manual for each survey as evidence for their compliance with the new NOAA trawl survey standardization protocols, only those pertaining to the eastern Bering Sea Continental Shelf groundfish survey are presented in this document.

Sampling trawl: The 83-112 Eastern bottom trawl will be used at all standard sampling stations sampled by the Arcturus and the Aldebaran. A glossary of trawl terms, gear specifications, and hookups are given in Appendix C. The bridle and door configuration for the 83-112 will be identical to that used since the 1982 eastern Bering Sea shelf survey. Field Party Chiefs and/or Net Mensuration Operators are instructed to maintain records of nets and the tow numbers for which they were used. Net serial numbers are stamped on a chrome band located at each end of the headrope. The trawl doors are paired and visibly marked with identical serial numbers. Specific information on the standardized gear hookups will also be maintained, such as connecting the trawl warp to the center hole in the otter door bail and attaching the tail chains in the center attachment position. Any other details concerning the operation of the gear will also be noted. This information must all be kept in the Haul Log Book aboard each vessel at all times.

The Field Party Chief will have the vessel Captain document the method of net deployment and retrieval which should remain consistent for the duration of the survey. When documenting these procedures attention should be paid to setting speeds, engine rpm, throttle, variable pitch, and PTO use and timing. Remember, our objective is to land the net in its standard fishing configuration and at the end of the tow pull the net off bottom as quickly as possible. Finally, note whether the captain follows a constant heading during a tow or maintains a steady course over ground by changing rudder angle throughout the tow. This documentation must go into and remain in the Haul Log Book.

WARP MEASUREMENT STANDARDIZATION

NOAA trawl survey standardization protocols (Protocol 1) require that two independently-calibrated measuring methods or devices shall be used on each trawl warp, one of which will measure the warp in real time. For AFSC bottom trawl surveys, the two measurement methods will be: 1) warps measured and marked at sea using in-line Olympic counters, and 2) warps measured in real time using geometric counters associated with the auto-trawl system. When trawling, warps are to be let out so that the mark representing the target scope is aligned with a specified reference location on the vessel which is to coincide with a specific value obtained from the winch geometric counters. If the mark is aligned in the correct position but the geometric counters yield an unexpected value, then a length discrepancy has occurred. Protocol

1 further states that at no time during survey operations may the difference in warp lengths between the port and starboard wire exceed 4% of the distance between otter doors measured around the bridles and footrope. For the 83/112 Eastern survey this 4% rule equates to 7.0 m. If, during the survey, the total difference between starboard and port side warp marks and the geometric counters ever exceeds 7 m, then survey towing must halt immediately, the reason must be identified, and the problem resolved before survey towing can be resumed. If the problem can not be resolved, contact Seattle for further instructions. Warps are to be measured and verified at the beginning of the survey, then checked again following any serious hang which could cause the wire to stretch or break, as well as at the end of the survey.

The measurement of trawl warps should be performed carefully to avoid accidental towing with unequal warp lengths which could lead to degradation in trawl performance. Basically, warps will be measured, and marks painted at 25 fm (45.73 m) intervals, ranging 50 to 325 fm. While warps are being measured with the in-line counter, a table will be developed containing the corresponding winch geometric counter value at each 25 fm mark. Once a warp has been measured and marked out to 325 fm, it will be retrieved, and the proper placement of marks is to be verified by zeroing the in-line counter, and sending the warp out again while checking in-line counter values at each mark. More detailed instructions are given below. If the difference between the first and second measurement of any mark exceeds two tenths of one percent (0.2%) of the total amount of wire out (1 m per 500 m [275 fm] of warp), then the entire marking procedure must be repeated. When finished with the first warp, the opposite warp will then be measured in the same manner using the same in-line counter. It is important to make sure that the warp is layered evenly across the winch drum before beginning warp measurement. It is also recommended that the vessel be cruising at a speed between 3.5 and 4.0 knots and that the net be set out with the codend open. Marking of warps should be performed atop of the shelter decks with participating personnel wearing float coats for safety reasons.

Painted marks must be maintained neatly over the course of the survey, particularly the zero reference mark explained below. It is recommended that paint marks be 12-18" in length and double marks be used at the 100 fm increments. *Measured lengths will correspond to the side of the painted mark closest to the vessel's stern.*

In order to meet the requirements of the NOAA warp measurement protocol, the following procedures for measuring and marking trawl warps are provided as a guide. Having the captain switch the geometric counter readouts to METERS would improve our ability to determine warp differential more accurately than if the readouts were in fathoms. Detailed documentation of the procedures used is important, so that the same process can be used at any time during the survey if needed, as well as at the end of the survey. A "Warp Measurement Standardization Form" (Appendix C) has been developed to record pertinent values and procedures used in the measuring process. Extra copies of the form are located in the Haul Log Book, in addition to an electronic copy placed on CD, to be carried to the vessel and properly stored by the Leg 1 FPC.

Warp measurement with the in-line counter

The first step to proper warp measurement is to select a reference position on the vessel (identical for each warp) where the measured marks will align once the net has been set and the winch brakes set. Two locations used in the past are: 1) at the trawl blocks (note - maintaining paint marks at this location is difficult); and 2) over the shelter deck aft of the winch (note - measuring the distance from the trawl winch to the selected reference position, then tying a line from shelter deck rail to shelter deck rail can assist in making sure the marks on both warps are properly aligned. Maintaining marks on the shelter deck is also safer than at the trawl blocks). The reference position for your vessel will be jointly determined by the captain and the FPC. Marks must be visible from the wheelhouse. Record the reference position and the distance of the reference position to the level wind at the center of the winch on the warp measurement

standardization form. Documenting the process used to measure and mark warps at the start of the survey is necessary so that subsequent captains and FPCs will follow proper methodology. Wire marking is most accurate when performed on an outbound warp in calm seas.

After selecting the "reference position" for your marks:
1) Set the net with the codend open while maintaining a 3.5 to 4.0 knot vessel speed.
2) Pull the doors up to the trawl block and attach the in-line counter to the first warp 2-3 m from the winch, Secure the in-line counter to the level wind forward and somewhere aft to keep it from moving back and forth. Note: when letting warp out, carefully apply downward pressure on the counter to keep it from jumping around. Wear gloves when doing this.
3) Measure the distance from the counter to the winch level-wind with a tape, and record this distance in the notes section of the warp measurement standardization form. You will attach the counter on the other warp using this same distance as will any FPC following you who must verify marks such as at the end of the survey when marks are verified.
4) Zero both the in-line counter and the trawl winch geometric counters.
5) Let out enough warp to lower the door just beneath the surface. This will be the **"zero reference point."** Record the in-line counter value on the warp measurement standardization form in the notes section (for example, the door is out 20 m from the trawl block when just below the surface. Later, when the opposite wire is measured, you will let out the same amount of warp and make a zero reference mark).
6) Zero the in-line counter again.
7) Record the value shown on the trawl winch geometric counter (Note: the geometric counter can be re-zeroed at this point or maintain its zero wire length reference when the doors are snug to the trawl blocks, captain's choice. However, in either case, document the geometric zero point chosen).
8) Now, paint a bold mark on the warp at your reference position. This is your starting point (zero reference mark) for measuring and marking the warp in 25 fm intervals. This mark *MUST BE MAINTAINED* for the duration of the survey.
9) Drying the paint with a heat gun will help make the marks last longer.
10) After the zero reference mark has been painted, let out 50 fm (91.5 m) of warp. Make a temporary mark at the reference position (note: all marks can be made more permanent after verifying the distance between measurements is less than 0.2% of the wire out (in this case 0.2% of 91.5 m is 0.2 m. Allowable error between measurements at each 25 fm interval is shown on the warp measurement standardization form).
11) Have the captain record the winch geometric counter value on another copy of the form.
12) This process of marking the wire and recording in-line counter vs. autotrawl readings should be carried out in 25 fm (45.73 m) intervals out to 325 fathoms (note: the warp measurement standardization form shows the metric equivalent to each of the 25 fm intervals).
13) The gear may then be retrieved to the zero reference mark, the in-line counter zeroed and the warp measured again, remembering that if a difference of 0.2% of the wire out is found between any mark, then bring the warp back to the zero reference point and repeat the verification process. You may find that marks must be moved. Once marks are correctly verified they can be increased in size and made more permanent by drying with a heat gun.
14) Upon completion of warp measurement on one side, transfer the in-line counter to the opposite wire, remembering to attach it at the same distance from the level wind and repeat the marking process, beginning with establishing the zero reference mark by pulling the doors up to the block, zeroing the in-line and the geometric counters, then letting out the same amount of wire as you did for the previous warp in order to lower the door to just beneath the surface. *The same in-line counter must be used to measure both warps.*
15) When finished, combine the captain's geometric counter values with the values you obtained with the in-line counter. Finish filling out the notes and store the completed form in the Haul Log Book up in the wheelhouse. This form is to remain on the vessel until the survey is completed.

16) Make a large font spread sheet for the captain showing the appropriate port and starboard geometric counter values at each of the survey 25 fm warp intervals.
17) On a tow-by-tow basis, we will be keeping track of the difference between 'expected' geometric counter value recorded on the warp measurement standardization form and the actual reading for that tow. This difference will be recorded for each tow and each warp on the daily Trawl Haul Form, also located in the wheelhouse.
18) If during the survey, the difference between the two measured warps, when comparing tabled values vs. geometric counter values, become greater than 7 m (4% of the door-to-door cable distance, i.e., sum of door legs, door leg extensions, bridle lengths, and footrope) operations must be suspended until a cause is found and resolved. It would be wise to keep a sharp eye out for differences in warp lengths caused by stretching following a severe hang.

Calibration of warp measurement devices
Calibration of the Olympic model 750-N in-line wire counter will occur during annual maintenance before the unit is sent out to sea. Once at sea, visually inspect the unit to ensure that it was not damaged during transport. If it was damaged use the other counter provided. If both units appear to have been damaged or if during use a counter is dropped or you suspect it is not operating properly then it will need to be calibrated at sea, against a known length of warp (at least 50 m). The preferred method for calibrating an in-line meter at sea is documented in the video file **calibration.avi** contained on CD using the red plastic covered wire brought up from Seattle (Note: Our calibration wire must be stored below deck in a dry place along with the box which holds the in-line counters). The measuring process should be repeated three times, recording values on the trawl warp measurement form in the space provided, and an average used. **(See Trawl Warp Measurement Standardization Form in Appendix C. Copies of this form are also found in the Haul/Log notebook on the Bridge).**

An alternative method for calibrating or checking the in-line counter for accuracy can be done as follows:
1) Set the trawl with the doors just underwater at a speed of 4 knots,
2) Mark the warp with a piece of tape near the trawl block,
3) With a tape measure, measure from this mark forward, in increments, until a distance of at least 50 m of warp has been measured, then again mark with tape,
4) attach the in-line counter to the warp in an accessible location and secure fore and aft with rope,
5) With the in-line counter, measure the distance from the aft tape mark to the forward tape mark (warp going out). Repeat 2 more times.
6) Calculate a calibration coefficient (i.e. known length / measured length) from the average of the three measurements.

Calibration of the geometric counters
Set the read-out for the geometric counters to meters, if possible. During the warp marking process, record the warp length measured by the geometric counter for each 25 fm mark starting at the zero reference position on the trawl warp mensuration form. These reference lengths will be used during trawling operations to determine if stretching or shrinkage of the warps has occurred.

Warp mark verification during survey operations
During normal survey operations, the length of warp used on each tow will be verified by performing a test based on the left and right warp lengths measured by the geometric wire meters relative to the tabled values of the reference lengths. The procedure used will be as follows:
1) Set the trawl with the warp mark at the reference position.
2) Compare the length determined by the geometric meter for that tow with the tabled value and enter the signed difference on the Haul Log Form for each warp, (e.g., if the port tabular value

was 202 m and now reads 203 m, then the signed difference is +1 m. If the starboard tabular value was 197 m and now reads 195 m, then the signed difference is -2 m. The difference of the signed differences +1 m and -2 m is 3 m. This is within the critical 7 m value and is therefore acceptable).
3) If the difference of the signed differences from both warps exceeds the 7 m critical value, then retrieve the gear, check for uneven wraps on the winch, and reset the trawl.
4) If, after resetting, an unacceptable difference persists then each warp will need to be measured again. Of course, if a warp is damaged or repaired in any manner, it shall be re-calibrated.

Determination of critical value
According to Protocol 1, the maximum allowable offset between trawl wires is 4% of the distance from door to door as measured around bridles and footrope. For the trawls used by the AFSC, this critical value is determined as follows:

Poly Nor'eastern trawl:
Door legs = 50'/side, bridles = 180'/side, footrope=120'
critical length = (50 + 50 + 180 + 180 + 120) * 0.04
= 23.2 feet = 7.1 meters

83-112 Eastern trawl:
Door legs = 50'/side, bridles = 180'/side, setback= 2'/side, footrope=112'
critical length= (50 + 50 + 180 + 180 + 2 + 2 +112) * 0.04
= 23.0 feet = 7.0 meters

Proper care and stowage of in-line meters
During use, avoid any rough treatment of wire counters (for example do not leave them laying out on deck, or allow them to slide around, or drop them between decks) and thoroughly clean after each use with undiluted Simple Green detergent (if available) with particular attention to remove warp grease buildup on roller. Rinse thoroughly with fresh water and allow the meter to dry completely before placing in case (dry in engine room) and store in dry area, such as in the aft lazarette. Note: When in port, the boxes used to store the in-line counters should be stowed away in the lazarette when the large hatch can be opened.

Once the warps have been properly measured, the Field Party Chiefs will select a location to test the fishing equipment and operational systems.

STANDARD SURVEY OPERATIONAL PROCEDURES

Use of autotrawl systems
Use of autotrawl systems in a dynamic mode to maintain equal tension on dual warps will NOT be used during the eastern Bering Sea bottom trawl surveys. This rule exists in order to maintain operational standards that have existed since 1982 when the 83-112 bottom trawl became the standard sampling net, thereby maintaining the time-series.

Tuning of gear/operational procedures
At the beginning of leg1, warps shall be marked as discussed above. Field Party Chief's will select a location to test the fishing equipment and operational systems. Vessels shall make parallel side-by-side 30 minute tows at 3 knots, using the standard setting/retrieval procedures (below). Vessels shall make parallel tows approximately 1/4 mile apart. Tests tows will be conducted with the codends closed. Net configuration will be monitored with net mensuration

gear, bathythermograph and bottom contact sensors. Net configuration measurements should fall within the limits seen during past surveys (see Figure, page C19 in Appendix C). The total catch shall be compared between vessels and discussed between FPC's. This exercise is done to check for gross errors in gear and operational procedures. If problems in gear or operational procedures are found or if there is a large difference in total catch weight between vessels (>50%), reasons for the problems should be investigated and problems remedied before starting the survey.

Scope ratio
The following scope table will be used for determining the amount of wire to be set given the depth of the survey station location.

Suggested scopes by depth for the 83-112 trawl in the eastern Bering Sea crab-groundfish trawl survey.

Depth Range (*rounded to nearest fm*)	Scope
1 to 21 fm	75 fm (137.16 m)
22 to 29 fm	100 fm (182.88 m)
30 to 38 fm	125 fm (228.60 m)
39 to 47 fm	150 fm (274.32 m)
48 to 57 fm	175 fm (320.04 m)
58 to 67 fm	200 fm (365.76 m)
68 to 78 fm	225 fm (411.48 m)
79 to 90 fm	250 fm (457.20 m)
91 to 102 fm	275 fm (502.92 m)
103 to 114 fm	300 fm (548.64 m)
115 to 128 fm	325 fm (594.36 m)

FPC's will discuss this table with the skipper and ensure that this guideline is adhered to. It is understood that some events, including current velocity and weather, may create a need to deviate. Should a deviation occur, skippers must document and provide justification on the haul information form. It may be that 75 fm is too much for the inshore special stations and it may be difficult to keep the trawl doors erect. The warps are marked at 50 fm for that use if necessary. Have the skipper document if used.

Definition of day-time towing
All tows will be made during daylight hours only. All tows will be made between 0.5 hr after sunrise and 0.5 hr before sunset. Sunrise and sunset times at a given latitude-longitude will be available on the government provided GPS units to be used starting in 2004.

Location of sampling sites and procedures to use if stations are not suitable for towing
Tow locations are predetermined stations: the center point of each square in a 20 x 20 nautical mile grid, except where additional stations are allocated to obtain more precise estimates of blue king crab abundance near the Pribilof Islands and St. Matthew Island. All station locations are listed in Appendix A. The skipper shall begin the tow at a position before the station location, such that middle of each approximately 1.5 mile tow shall cross the center point of that station location.

For stations that cannot be completed at the listed station due to untrawlable bottom, an alternate location shall be chosen which is no further than 5 nautical miles away from this center point (eg. within the same grid square). A list of stations for which poor tow performances have

occurred in past surveys is provided in a separate document (good-tow / bad-tow log). This document also provides a list of alternate locations for these poor performance stations. These alternate station locations were successfully completed within those grid squares during past EBS surveys.

Monitoring footrope contact with the sea bed using a bottom contact sensor
Trawl footrope contact with the sea floor will be monitored at 1 second intervals ("averaging on") using a calibrated bottom contact sensor (BCS) connected to the center of the footrope by a spring-loaded, quick release, detachable mounting system. This system consists of: 1) a stainless steel footrope clamp with plastic bushing, that bolts onto the footrope, such that it pivots freely and remains connected to the footrope at all times; and 2) a BCS, housed in a keyed sled, that snaps into the footrope clamp by means of a spring pin when deploying the net, and quickly detaches at the end of each tow for downloading data. In order to accommodate the new assembly, a slight modification to the net hangings is required see photo Appendix C (page C-16). This consists of removing several chain links at the footrope center and attaching twine hangings to the two links left intact. Then, instead of picking up 4 mesh per chain hanging loop, a 4-2-4-2-4 mesh hanging scenario was adopted. Pictures of the BCS have been provided on page C-16 in Appendix C, as well as, in the Haul Log Book. Pictures include: 1) footrope clamp components; 2) the proper angle of the sled (in the event you suspect the sled got bent and would thus alter the calibration tilt angles, compare side-by-side to another sled. If it is not the same then tag the sled and retire it.); 3) attachment to the footrope; 4) use of a safety line; and 5) modifications to the footrope chain and twine hangings to accommodate the BCS.

Cautions:
1) Even though the footrope clamp stays with the footrope, at NO time should the BCS and sled be wrapped into the net reel.

2) Because the BCS pivots freely about the footrope, it can swing into the net once it drops below the stern ramp. The net mind operator should stand back at the stern and watch to be sure the BCS hangs freely beneath the net once in the water. Letting the net out too fast has also caused the BCS to flip into the net.

3) Because these units are dragged though a variety of sediment types, the quick release spring mechanism can and will foul. When attaching the keyed sled into the clamp's pin be sure the pin springs back into the locked position. A distinct "**click**" can be heard when the pin locks into place. If the pin becomes difficult to depress, then it is likely fouled with sediment. A quick flooding of the chamber with the deck hose usually dislodges the foreign matter expediently. However, if the hose does not work then disassembly may be required.

4) Attach a safety line to the BCS such that it will not interfere with its pivoting action.

5) Remember to turn the BCS off (sleep mode) after each tow and then wake it up before each deployment refer to Scanmar cookbook in Haul Log Book for directions. This will create a short junk file on the shuttle.

Reporting the relative warp angle behind the vessel (crabbing)
During the 2004 survey, we will be collecting data on the relative trawl warp angle behind the vessel, otherwise known as "net crabbing". This information is to be collected from the wheelhouse by the net mensuration operator and recorded on a tow-by-tow basis on the backside of the Trawl Log Form located in the Trawl Log Book.

Three (3) observations should be made per tow, between brakeset and haulback, at approximately 10 minute intervals (e.g., 10, 20, and 29 min). The time of each observation is to be recorded as well.

The net mensuration operator is to evaluate the relative warp angle of the "inboard" pointing warp when standing at the aft corner wheelhouse window (either from the port side if the net is crabbing to starboard or from the starboard side if the net is crabbing to port). First, determine whether the trawl is off to the port or the starboard side of the vessel (remember, when you are looking at the stern of the vessel and the net is off to your left, then it is crabbing to starboard side). Next, when the vessel is upright (midway through a roll) categorize the observed warp angle into one of four relative measures (see description photos page C-18, Appendix C), then record your observation on the form by circling the appropriate description:
1) **None** - the trawl is straight behind the vessel,
2) **Slight** - no section of the trawl warp is blocked by the aft gantry leg as it disappears from sight behind the vessel (see photo 1)
3) **Moderate** - the aft gantry blocks the aft end of the warp from sight (see photo 2)
4) **Severe** - the warp crosses the aft gantry so that the end can be seen entering the water behind the stern ramp, or if the angle is larger then the warp end is concealed by the opposite side of the stern (see photo 3).

Vessel course change:
Normally, when towing the skipper sets a course with the autopilot. Steering is controlled by an allowable range of rudder angle to maintain his desired heading. Sometimes however, he may make a change, for example if crabbing is too severe. We would like to train the skipper to tell us when a change is made and why. When a course change is made, make note on the Haul Log Form (i.e., time of change, new course, new rudder angle, and what affect the course change had on the warp angle by making another observation a few minutes after the skipper makes the change). Open communications with the skipper is necessary to collect this data accurately.

Direction of tows
Tows will be made in the direction of the next tow. Due to the survey design, most tows will be made in either a north or south direction, with the exception of corner stations. Tow direction may be different from above if the skipper determines that safety is a concern, or if the net performance in terms of trawl configuration is severely compromised (e.g. doors falling over due to tow in direction of a strong current). The skipper must notify the FPC and document in the haul form the reason for any deviation of the standard towing direction.

Speed of Tow
The skipper is responsible for maintaining a constant towing speed of 3-knots from the time of brake-set to haul back. Monitoring of tow speed will be accomplished in real time using the GPS unit supplied by the scientific party. Should this government provided GPS fail, the skipper should use the vessel instrumentation that he/she believes most closely matches that of the government. In such cases, the skipper/FPC will document in the haul form the instrumentation used to monitor tow speed.

Duration of Tow
Thirty minute tows shall be conducted at all standard stations, unless otherwise instructed by the FPC. Cases where tows might be shorter than 30 minutes include gear hang-ups, avoidance of untrawlable bottom, avoidance of unusually large catches too large to handle, and other factors related to vessel safety. In such cases, acceptable tows may be no shorter than 10 minutes in duration. In cases where tows are shortened due to extremely high concentrations of fish seen on the echo-sounder, fish sign must have been consistently high at all times during the tow for it to be considered acceptable.

Criteria for determining the success of a tow and procedures to use if a tow was unsuccessful

A successful tow is defined as a tow for which there has been at **least 10 minutes** that the trawl was fishing on the bottom in the standard fishing configuration as determined by net mensuration, bathythermograph, and bottom contact instrumentation. As instructed above, 30 minutes tows are the standard and should be completed as such unless otherwise instructed by the FPC.

In addition, tows for which there has been any loss of fish or invertebrates [e.g. due to tear(s) in the net] or where the net was not fishing in the standard fishing configuration, are considered unsuccessful. Tows for which obstructions in the net (e.g. derelict crab pots) that could have potentially affected the CPUE will also be considered unsuccessful.

In some cases, if a tear-up or gear obstruction has occurred at the time of haulback, and it has been determined that there was no loss of fish/invertebrates and the catch rate was not affected, then tow may be considered successful. This assumes that at least 10 minutes of on bottom time was achieved. If a tear-up or obstruction occurs, and it is determined that it occurred at the beginning or middle of the tow, or it cannot be determined when the tear or obstruction happened, then tow must be considered unsuccessful.

Stations considered unsuccessful tows will be re-towed, unless factors beyond the control of the survey party make it impossible to complete the station within the grid square (e.g. extreme current or ice coverage). The FPC will make the final decision as to whether the tow was successful or not and whether it will be re-towed.

Vessel and winch operation during trawl deployment and retrieval

The trawls shall be set in such a manner that they are in fishing configuration when they first touch the sea floor (**equilibrium time**). At the end of the tow (**haul back time**), the net should immediately leave the sea floor and discontinue sampling the bottom. Prior to the survey, skippers from the newly chartered vessels will provide written documentation specifying the exact procedures that best accomplish the objectives above. These procedures will be maintained aboard the vessel and by scientific personnel for as long as these vessels participate in the survey. These procedures shall not be deviated from regardless of the change in skippers or year of survey. The FPC shall ensure that these procedures are maintained by the vessel crew.

FPC responsibility

All aspects of the survey operation will overseen by the FPC. Final decisions regarding station locations and station scheduling are the responsibility of the FPC. Vessel operation, trawl gear deployment and retrieval, and all matters related to vessel safety will be the responsibility of the vessel crew.

It is the responsibility of both the FPC and the Skipper of the vessel to keep lines of communication open between survey vessels, not only for safety purposes, but to ensure that all operations are proceeding in the manner outlined here.

A haul number should be recorded every time the doors enter the water. The FPC is responsible for completing the haul-position form for each haul, and should include information on location, depth, net number, net mensuration, bottom and weather conditions. All relevant fields on the haul-position form should be filled out. Time and position should be manually recorded every five minutes during the tow. Sea surface and bottom temperatures from the Sea-Bird should also be recorded on the haul form, as should any information that the FPC deems pertinent to interpreting what happened during the tow or analyzing the data. It is better to err on the side of including too much data than too little. Long comments may be continued on the back of the

haul form (after checking box on the front of the form) if the space provided at the bottom of the page is insufficient. The only place that comments about a specific tow should be recorded on this form. If known, the exact location and time of tears, hang-up and gear conflicts should be recorded. The information on the haul-position form should be entered into the haul-position program as soon as possible after each tow.

Gear repairs
Each vessel will be provided with net repair forms for logging all major net repairs (Appendix C). These forms are located in the Haul-Log Book. Minor repairs of small holes do not need to be logged, but a sketch in the diagram section of the net repair form should illustrate all other repairs, and relevant comments should be added. These forms make it possible to track net damage and may facilitate the process of choosing a net towards the end of the survey. Net width and net height given scope, using scope table for the 83-112 bottom trawl is shown on page C 19 in Appendix C.

During past 2004 BSRF-RACE cooperative opilio crab surveys the beginning of the tow has been designated at cable brake-set time which has also been used as equilibrium time. The end of the tow has been designated as cable brake release time. **Continue to record beginning of tow as cable brake set time. The end of the tow will be designated as cable brake release time. Actual on-bottom, off-bottom times will be evaluated and set via the Net mind plot program and bottom contact sensor during each leg.** The Netmind gear mensuration equipment and bottom contact sensors will be used aboard both vessels. **A Seabird system will replace the MBT system used on previous surveys.**

Record the number of the Seabird used at each haul in the HAUL LOG. The Seabird's, Netmind units, and bottom contact sensor should be used on every tow possible where bottom topography indicates that the gear can be safely retrieved. The number of Netmind wing spread units are limited. These units will be used sparingly in accordance with guidelines described in a separate document. In order to obtain as much information as possible the Netmind program will be initiated when the net hits the water. It will continue to run until the net is retrieved and the trawl doors reach the surface. Equilibrium time will be marked at brake set and haulback will be marked at brake release. When this data is reviewed in the Netmind program, any differences between actual on bottom time/locations with brake set and release times/locations can be assessed.

USE OF FORMALIN

When mixing 10% buffered seawater solution into the specimen collection barrels the following considerations should be taken:1. FPC and/or Deck Boss will designate 1 person responsible for working with chemicals.

- Before working with chemicals read provided MSDS (Material Data Safety Sheet) and proper handling procedure for each chemical. Also consult the At Sea Safety Document section: Essential Hazardous Material Information (pg. 26).

- Always wear Personal Protective Equipment (PPE): impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact and communicate your activities to those around you who may not be wearing Personal Protective Equipment.

- Use chemical safety goggles (vapor proof) and/or a full face shield when splashing is possible.
- Use provided pumps for transferring chemicals from big to small containers. Always work in a well-ventilated area.
- For accidental spills or skin contact: consult MSDS for particular chemical.
- Educate yourself on the location and use of the eye wash station. -Maintain eye wash fountain and quick-drench facilities in work area.
- Conduct all transferring and mixing of large quantities of chemicals when weather/vessel is calm (i.e. at dock, when anchored, when drifting in the evening).
- Chemicals should be stored either on deck, in science lab/shack or other secured areas where flammable liquids may be stored. Never store chemicals or specimen samples below deck or in living quarters. Original cardboard packaging box for 1gal and 5 gal Formalin bottles should be kept dry. Specimen buckets/ barrels should be securely tied down at all times.

For making 10% Formalin solution in specimen barrels:

1) Add 20 liters (5 gallons) seawater to the blue barrel.

2) Add 2 liters full strength formaldehyde (35% formaldehyde) to the seawater.

34) Mix well.

4) Specimens and additional seawater may be added to the barrels until they are full.

5) Clearly label barrel or bucket and secure to solid object.

Guidelines for Shipment of Voucher Collections

Specimens in 10% formalin for 5 days or more: See proper guidelines in previous section for handling Formaldehyde. Use a pump to remove the 10% formalin from the large blue drums. All formalin-fixed specimens should be transferred to and shipped in seawater. Other than sealing drums and buckets properly, no additional shipping care or documentation for these specimens is required.

The excess 10% formalin must be neutralized with Formalex (4:1 for 10% formalin). When Formalex is added to 10% formalin the mixture will turn cloudy. Let mixture sit for 3 hours, and visually check to see if neutralized. Once neutralized, the top 3/4 of mixture will be reasonably clear and the lower 1/4 will remain cloudy. If temperatures are cold it may take longer to neutralize. A maximum soak time of 24 hours is sufficient to neutralize 10% formalin in the event the visual inspection fails. The neutralized solution can be disposed of at sea.

Specimens in 10% formalin for less than 5 days: Leave specimens in 10% formalin and prepare for shipping in a sealed DOT-approved drum or bucket. Properly label the container as containing "biological samples in 10% Formalin" and ship according to guidelines in the Safety Manual.

Specimens in 70% Ethanol for 3 days or more: Use a pump to remove the 70% ethanol from the large blue drums and wear the proper safety attire including safety goggles and gloves. The specimens can be shipped moist with trace amounts of ethanol; do not rinse the preserved specimens in water. Because only a trace amount of ethanol remains, no additional shipping care or documentation for these specimens is required, but do ensure the lids are tightly sealed and taped.

Specimens in 70% ethanol for less than 3 days: Leave specimens in 70% ETOH and prepare for shipping in a sealed DOT-approved drum or bucket. Properly label the container as Flammable and containing "biological samples in 70% ETOH" and ship according to guidelines in the At Sea Safety Manual.

INVERTEBRATE SAMPLING

Crab will be sampled as outlined in the "Manual of Crab Sampling Methods for the Trawl Survey in the Eastern Bering Sea". Crab data will be entered on a microcomputer via the CRAB Data Entry Program. Documentation for the program can be found in the Kodiak Lab Special Studies Notebook. All microcomputer printouts will be placed in the binders provided. All crab data will be edited in the field. Editing documentation for the CRAB Data Entry Program can be found in the Special Studies Notebook. Copies of the crab and haul/position data will be brought back to Kodiak at the end of each leg. Instructions for the copying of data are contained in the CRAB Data Entry program User's Guide. One set of data diskettes should be hand carried back to Kodiak while the other should be given to the Seattle Groundfish Chief to be taken to Seattle with groundfish data. NONE OF THE DISKETTES SHOULD BE SUBJECTED TO EITHER METAL DETECTORS OR X-RAY MACHINES. Bypass these security devices by having the diskettes hand examined.

All king crab species, all *Chionoecetes* crab species, the hybrid *C. bairdi* x *C. opilio*, and *Erimacrus* will be entered on the microcomputer and weights and numbers will be recorded on the On Deck Sampling Form.

Appendix A. Station position in decimal degrees.

Green		
P-27	60.0250	174.7973
P-28	59.9583	175.5306
P-29	60.1417	176.0671
P-30	59.9083	176.7197
P-31	59.9750	177.4706
P-32	60.1083	178.2328
Q-27	60.2750	174.7178
Q-28	60.3750	175.5892
Q-29	60.3917	176.1566
Q-30	60.3417	176.7487
Q-31	60.3750	177.6261
R-25	60.6417	173.7187
R-26	60.6917	174.2974
R-27	60.8250	175.0512
R-28	60.6917	175.6453
R-29	60.5417	176.3578
R-30	60.7083	176.9786
R-31	60.6583	177.7013
R-32	60.5250	178.4002
S-25	61.0083	173.7211
S-26	61.0250	174.5377
S-27	60.8750	175.0571
S-28	61.0417	175.7885
S-29	61.1417	176.5281
S-30	60.8417	177.0223
S-31	61.0083	177.7365
S-32 (NO)	61.0750	178.4447
T-25	61.4417	173.9087
T-26	61.3417	174.5734
T-27	61.2917	175.0442
T-28	61.1917	175.8671
T-29	61.4250	176.3813
T-30	61.3917	177.1630
T-31	61.1917	177.7862
U-25	61.5750	173.9637
U-26	61.5917	174.6047
U-27	61.6417	175.2733
U-28	61.5750	175.9274
U-29	61.6083	176.5081
U-30	61.5250	177.2355
V-25	62.1417	173.9248
V-26	62.1583	174.6689
V-27	61.8583	175.3251
V-28	61.8583	176.1446
V-29 (NO)	61.9917	176.7416

Blues		
ON2726	59.5000	174.1667
ON2423	59.5000	172.2000

Resume

Dr. Gerard Y. CONAN

Address:

3307 Rte 910, Baltimore (New Brunswick), NB E4H 1V2, Canada
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Present position: Marine Geomatics, Head of Consulting company.

Sample of assignments:

Contracts with Canadian, Moroccan, Chilean and French private fishing companies and associations.

Called as expert on advisory committee set up by Department of Fisheries and Oceans Canada

Scientific advice provided to the Bering Sea Fisheries Research Foundation.

Contract as Aquatic Resources Expert, FAO (United Nations) Resident Expert, P-5-2, at Institut National de Recherche Halieutique (INRH), Casablanca, Morocco.

Nationality: Canadian

Languages:	*Working level (FAO scale A beginner to C fluent):*
English	C (Working language, graduate university degrees)
French	C (Undergraduate university degrees)
Spanish	C (Taught university courses in Spanish)

Educational/trade qualifications:

From:	*To:*	*Teaching Institution*	*Diploma/Degree*
1964	1968	Faculté des Sciences de Rennes (France)	Licence es Sciences de la Vie
1968	1969	Université Pierre et Marie Curie (Paris, France)	Maîtrise en Biologie Animale
1970	1972	University of California at San Diego (USA)	Master of Sciences
1975	**1978**	**Scripps Institution of Oceanography (UCSD, USA)**	**Ph.D. in Biological Oceanography**

Employment history:

From: To:

1997 1998 Marine Resources Expert (FAO Resident Expert at Institut National de Recherche Halieutique) P-5-2 TCO

Scientific Advisor to the Director. Fisheries and Aquaculture. Set up a program for **Direct Assessments and Automated Mapping of Aquatic Resources**, train scientific personnel through formal and at sea courses. Provide advice for computer storage and analysis of fisheries statistics data bases. Provide expertise to the Minister of Fisheries on setting up management plans for Aquatic Resources. Meet fishermen representatives. Identify international consultants for specialised expertise. Attend COPACE meetings for fisheries management on West African coast. French, Moroccan Arabic dialect (some basics for fieldwork).

1982 1997 Senior Research Scientist, Department of Fisheries and Oceans Canada, RES 2 to RES 4

Research on Gulf of St. Lawrence fisheries. Co-ordinate research with fishermen representatives and provide scientific advice to fisheries managers. Conduct research on biological cycles, **oceanic environmental factors triggering reproduction and affecting recruitment, mapping & assessment of aquatic living resources benthic (lobster, snow crab) and pelagic (herring)**. Collect data by trawling, acoustic detection, aerial surveys, scuba and mini-submarine diving, acoustic tagging, radioisotope markers. Process information by statistical analysis and modelling of commercial and survey data, **computer programming, geostatistics and mapping (GIS)**. Teach as Adjunct Professor (Dept. Biology and Dept. Mathematics Université de Moncton). Direct 1 Ph.D. and 3 Master theses. English and French (Classified fully bilingual by Public Service Canada).

1990 1991 Visiting Professor. Sabbatical at CSIC, Instituto de Ciencias del Mar, Barcelona, Spain

Teach courses on, **mapping and assessment of aquatic resources** using Spatial Statistics, and on **harvested species life cycles and ecology**. Design **assessment of marine resources**. Co-direct a research cruise, process data and publish results. Spanish and Catalan.

75 1982 Cadre Scientifique. Centre National pour l'Exploitation des Océans, Paris, France.

Research in **Ecology, Fisheries Science, population dynamics and bio-economic modelling, harvested species life cycles, Norway lobster, Lobster, scallops, shrimps, crabs**. Attend frequent consultative meetings and co-ordinate research with fisheries representatives. Teach as Adjunct Professor at Université de Bretagne Occidentale. Direct 6 Master and 4 Ph. D. theses. Population modelling, statistics, biological data and market analysis. French.

1972 1974 Visiting Professor at Universidád Católica de Valparaíso, Chile.

Teach courses of **Fisheries Science.Research on New Fisheries Resource Assessments. Statistical analysis of data sets. Design field sampling on fisheries, research on spiny lobster, crabs, shrimps**. Publish results. Spanish, Occasionally French or English.

1970 1972 Research Assistant. Scripps Institution of Oceanography, and National Marine Fisheries Service (NOAA) USA.

Research in Fisheries Science, **Population Dynamics, Modelling, data analysis. Recruitment of fish stocks, crustacean physiology (Dr Reuben Lasker**, National Marine Fisheries Service, NMFS). **Participate to research cruises on planktonic stages and physical oceanography, and to lab research on physiology of fish and crustacean larvae**. Experimentation on rearing of fish and crustacean larvae. Rearing of genitors in tanks. Work in population dynamics directed by **Patrick K. Tomlinson (IATTC)**. English.

1969 1970 Visiting Scientist. Royal Academy of Sweden. Fiskebackskil Laboratory.

Research on rocky shore ecosystems and **stratification of fjords fauna according to water mass layers.** Sampling by scuba diving. English.

1968 1970 Assistant de Recherche. Muséum National d'Histoire Naturelle. Paris, France.

Research on systematics and biology of Marine Invertebrates. Field research by Scuba diving cruises aboard research ships. Received Scientific tutoring from Professor Drach and Professor Tessier. Publish results. French.

Other Working Experience:

1989 1990 Chairman, convenor and co-editor of an international symposium of the International Council for the Exploration of the Sea (ICES).

1988 1989 DFO Science Officer in charge, design and building of 60 foot research ship Opilio. Prepare specifications and supervise set up of on board science facilities and sampling gear. Budget of 2 000 000 Can $.

1987 1990 Chairman and convenor of three different spatial statistics working group (ICES). Geostatistical design and analysis of surveys of Marine Resources. **Assessments and mapping. Benthic stocks and pelagic stocks surveyed by acoustics.**

1983 1994 Core Member, Canadian Atlantic Fisheries Scientific Advisory Committee (CAFSAC). Participate in preparing advisory documents for Fisheries Managers and to the Minister on the state of Atlantic stocks. Prepare and present scientific communications, write reports on meeting proceedings as rapporteur.

1983 1986 Chairman of the Shellfish Committee, (ICES). Organise and chair annual meetings, prepare reports and recommendations on stock management.

1978 1982 Visiting Professor. Institut National Agronomique de Tunis. Tunisia.

Taught statistics, population dynamics and fisheries resource assessments during intensive short session courses. Directed a thesis on bio-economic feasibility of Aquaculture of soles. Research on penaeid shrimp trawl fisheries.

1978 1979 Co-ordinator for biological research. International program for assessment of the fates and the effects of the Amoco Cadiz oil spill in Brittany (France). CNEXO/NOAA/EPA.

Managed international research contracts (1 000 000 US $ budget) and conducted own research on growth and mortality in flat fish and clams affected by the oil spill. Co-edited three books. Published results.

1976 1996 Member of the Shellfish Committee of ICES.

Represented Canada at the meetings.

Additional Pertinent Information:

Publications:

Authored or co-authored **120 scientific communications and publications.**

Supervised two postdoctoral fellowships:

Mikio Moriyasu. Life cycle of lobster in the southern Gulf of St Lawrence, Canada.
Michel Starr. **Triggering of reproduction in populations of benthic crustacean species by oceanic environmental factors, such as senescent phytoplankton blooms, effects on determinism of recruitment.**

Supervised and co-supervised graduate research theses:

18 graduate research theses including master and Ph.D, three theses on mapping and assessment of stocks by spatial statistics.

Editorial work:

Former associate editor for the Canadian Journal of Fisheries and Aquatic Sciences for a two-year term. Former associate editor Scientia Marina.

Awards:

-1990 Spain, Sabbatical year grant from "Dirección General de Investigación Cientifica y Técnica", Ministry of Science and Education.

-1991 Canada, **"Group achievement merit award for an exceptional and distinguished contribution to the effectiveness and efficiency of the Public Service" signed by John Crosby, Minister, Department of Fisheries and Oceans Canada.**

-1997 Canada, "Distinctive service for extraordinary teamwork and support to the science and technology community" signed by the Chairman of the Professional Institute of the Public Service Canada and by the Secretary of Treasury Board Canada.

Computer literacy:

Extensive programming in HTB, FORTRAN, HPGL design of special tools for statistical analysis, geostatistics, stock assessment, mapping and for modelling.

Technical skills:

Formerly certified 180 feet fish card SCUBA diver, Scripps Institution of Oceanography, La Jolla, USA.
Certified professional diver class I. Trained by CETRAVIM, Marseille, France.
Certified Ice Diver (NAUI) Canada.

Government of Canada / Gouvernement du Canada

Science Branch
Department of Fisheries and Oceans
P. O. Box 5667
St. John's NF A1C 5X1

Fax No. 709-772-6100

July 5, 1999

To Whom It May Concern:

I highly recommend Dr. Gerard Y. Conan. Dr. Conan worked for 15 years for the Department of Fisheries and Oceans Canada, as a Research Scientist, a Section Head, and later a Division Chief.

Research

His personal research has dealt with a large spectrum of invertebrate and finfish species from the Atlantic coast of Canada, such as lobster (*Homarus americanus*), snow crab (*Chionoecetes opilio*), porcupine crab (*Neolithodes grimaldii*), Shrimp (*Pandalus spp.*), Scallop (*Chlamys islandica*), soft shell clam (*Mya arenaria*), and herring. He has also supervised research on mussels (*Mytilus edulis*), oysters (*Crassostrea virginica*), Bay scallop (*Argopecten irradians*) and Irish Moss (*Chondrus crispus*).

Dr. Conan is a well-respected researcher in the field of population dynamics, statistical analysis of data and population modelling. He is also well known for his work on the adaptations of life history and physiology of marine crustaceans to their natural environment, and subsequent incidence of these adaptations to the regulation of recruitment. Using his knowledge of mathematical tools, and natural history of the species, he has successfully designed original management schemes for important commercial species such as snow crab.

Some research highlights among his research achievements:

Dr. Conan was the first to introduce, adapt and develop the use of geostatistics to fisheries science by mapping and assessing scallop banks and later snow crab stocks in the Gulf of St Lawrence. He developed a special software package for mapping and assessing harvested stocks by geostatistical techniques. This methodology has now been used successfully for over 10 years for the assessment and management of snow crab stocks in the Southwest Gulf of St Lawrence. The surveys are now routinely financed by the industry.

His development of geostatistics in fisheries science have also been applied to analysis of acoustic data. He was the first to use geostatistics for mapping and assessments of schools of pelagic fish such as herring.

Dr. Conan was the first to demonstrate that male snow crab stop growing as they achieve a terminal moult characterised by a morphometric differentiation. This peculiarity of the life cycle of snow crab is now used in the models used for managing the snow crab stock in the Southwest Gulf of St. Lawrence.

Dr. Conan during deep sea dives aboard mini-submarines or the Canadian Navy discovered the existence of "pods" or high concentrations of female snow crab similar to those observed for Pacific species of snow crab and European spider crabs. These concentrations are a characteristic of the life cycle of these majid crabs and may have a considerable importance for the success of recruitment of snow crab.

Dr. Conan has used such sophisticated techniques as gamma ray low radioactivity radioisotope dating of snow crab carapaces for estimating the age and growth of snow crab and the annual period of moulting. This research was conducted in collaboration with "Centre des Faibles Radio Activités" CNRS-CEA of Gif sur Yvette, France.

Dr. Conan has lead a team of DFO scientists to the field observation and laboratory experimentation of a recruitment regulation mechanism for snow crab stocks. It was shown that the opportune time of the hatching of the eggs of female snow crab is detected from the rain of organic matter resulting from spring phytoplankton blooms. This mechanism precludes the match-mismatch theory of deregulation of recruitment success, by allowing the release of larvae only when food is available for their survival and growth.

The better understanding of the life cycle of snow crab in conjunction with the development of new assessment techniques using spatial statistics has allowed new techniques of management of snow crab stocks. The methodology is based on the definition of quotas each year before the opening of the fishing season, as a function of the results of the mapping and assessment of the abundance of the stocks.

Dr. Conan has published or co-published 105 publications, and scientific communications during his research work for the Department of Fisheries and Oceans Canada.

He has been on the editorial board of several internationally known scientific journals such as the Canadian Journal of Fisheries and Aquatic Sciences, Fisheries Research, and Scientia Marina.

Dr. Conan has represented the Research Scientists and the Department of Fisheries and Oceans Canada at several national and international scientific organisations such as the Departmental Science Advisory Committee, the Canadian Atlantic Fisheries Science Advisory Committee and the International Council for the Exploration of the Sea (ICES). He has been chairperson of several committees and working groups of ICES, and the convenor of an ICES international symposium.

Dr. Conan has trained numerous young scientists and directed theses, including five Master of Science theses, one "Ingénieur Halieute", one Ph.D, and two postdoctoral fellows. He has been an adjunct professor at the University of Moncton for two terms of three years.

Field work

Dr. Conan has a good experience of field research; he has participated and directed research missions aboard DFO research ships as well as fishing vessels. He has conducted research on lobster and snow crab by diving, including ice diving. In collaboration with the Canadian Navy, he organised and participated to deep-sea dives aboard mini submarines for the observation of snow crab and potentially harvestable deep crab resources.

Other technical skills

Working in collaboration with a naval architect and DFO ship management, Dr. Conan has been the Scientific Officer in charge of the design and construction of the Research Vessel Opilio for Fisheries and Oceans Canada.

Management

His management style has lead to a Merit Award from the Minister of Fisheries and Oceans, for group achievement in research and to a Distinctive Service Award from the Treasury Board of Canada and the Professional Institute of the Public Service, Canada for his performance in employer/employee group negotiations. Dr. Conan successfully performed in his special training for Middle Manager, Public Service Commission. Dr. Conan was a Section Head for many years and later Division Chief. At time he managed a personnel of up to 35 persons including 6 research scientists and a budget of 1000 K $. He has been the Director of the Marine Biology Research Centre on the Campus of Université de Moncton, a joint venture between Fisheries and Oceans Canada and the Université de Moncton. Dr. Conan was successful in obtaining non-Departmental external funding and grants for the research projects he directed.

Languages

He has an excellent knowledge of the two official languages of Canada. His mother tongue is French, and he was rated "E", in English. E stands for exempted from further testing"; it is the highest Public Service rating. Dr. Conan is also fluent in Spanish and spent one year on special science training at CSIC (the Spanish NRC) during his DFO service.

Multicultural environments

Dr. Conan can operate effectively in multicultural situations; his research has taken him into small, remote villages working with primary producers as well as with sophisticated international scientific circles. He can communicate very well, and develop and maintain friendly, yet professional relationships simultaneously with very different cultural and socio/economic groups having different or competing economic interests, or different mandates. Dr. Conan has deal with fishers, fish plant owners, Union representatives, Federal and Provincial Fisheries representatives, the Chief, Guardians and members of Native bands such as the Lennox Island Micmac band.

Sincerely,

L. W. Coady
Director, Special Projects

Canada

Snow crab (*Chionoecetes opilio*) assessment and management.

The life history vs. market value component

Prior to designing a survey, it is important to identify what one wishes to assess and for what purpose. A snow crab stock is made out of many biological categories of individuals displaying quite different morphological aspects and behavior on the grounds. The categories may also have quite different market values.

On the east coast this has led to the identification by the fishermen of "white", "pink", "clean shell", "dirty shell", "large claw", "small claw", "pygmies". The "clean shell" are bright red, they reach the highest commercial value, they a generally exported to Japan as fresh frozen sections. Other categories may be processed for meat extraction, providing a product of lesser commercial value. However most of the pygmies are smaller than the minimal legal commercial size, and will not be processed. "Whites" and "pinks" provide a low meat yield, and have the lowest commercial value; when the percentage of "whites" in the catch is higher than 20%, the fishery is stopped. "Whites" and to a lesser degree "pinks" are week, most will die when returned to the sea. Therefore, "grading" at sea is forbidden, i.e. discarding lower quality individuals in order to stock on high quality catch.

Given the above, fishermen are interested to obtain immediate separate assessments, of the different categories of crab, as well as estimates of how numerous these categories may be forecasted to be at a later time when the fishing season starts.

It also turns out that the different biological categories tend to segregate geographically into separate patches of category specific average area. Since the fishery is managed by quotas, fishermen are interested to obtain maps of the resource identifying concentrations of the different commercial categories. They wish to avoid spending time and money on locations where crab is of low commercial quality, and wish to harvest high concentrations of high quality crab. Providing such maps to the fishermen is a logical conservation measure as long as "no grading at sea" and quota policies are enforced. It allows protecting concentrations of categories having a low or nil commercial quality but a high reproductive value.

Having mapped and assessed the current categories of snow crab, in order to make any forecasts on their abundance, on a medium or even short-term range, implies understanding the natural history of the species in order to predict how each category will evolve in time and space.

Twenty years ago East Coat snow crab stocks were managed on the basis of erroneous assumptions about their life cycle and natural history. The models used were based on false premises and provided false results, the stock were declining although the models

predicted that this could not happen. After intensive field and lab experimental work these errors were corrected and a new, if not perfect image surfaced.

Snow crab settle to the grounds from a planktonic dispersal stage in the form of megalops. The small crabs are concentrated into high-density patches that tend to prevail in the same locations year after year. In this immature stage males and females do not segregate, they have a particular shape, different from adults, their gonads (internal reproductive organs) are not yet differentiated. We call them **immature** crabs. They will molt several times a year.

After molting and growing, the immatures achieve a special molt after which their gonads differentiate and start to be functional, producing some reproductive products, sperm and ovae, but do not appear to be fully sexually functional. Body shape changes after this molt but it has still not reached the final adult shape. I identified this stage and called it the "**juvenile** stage". Juveniles will grow at a rate of one or less molts per year. Male and female tend to form separate patches.

Finally juveniles will make one last molt in their lifetime and reach a full maturity stage that I called **morphometric maturity**. The crab of both sexes achieve a conspicuous change in shape at the onset of this **terminal** molt. Females develop a much larger abdomen for holding their eggs, males develop much larger claws for holding the female during mating and fighting with other males. The behavior of the males changes, they become quite aggressive, will catch and eat immatures, and deliberately kill juveniles particularly as these molt into "white" crabs. This killing behavior is inhibited by the presence of receptive mature females or females close to achieve the terminal molt. The morphometrically mature male will grab the female in one claw and hold it away from other morphometrically mature males while fencing them away with its remaining claw. Males and females segregate. Females form high concentration patches or clusters or "pods". They incubate eggs all year round and will spawn again as soon as their eggs hatch. Males form loose patches and roam a great deal, searching for concentration of females only once a year at the right time in the spring when they are ready for spawning. At this stage both males and females readily loose legs during fights, their shells start to get dirty from growth of epibionts (biological fouling) since the crab do not molt and regenerate anymore.

The morphometric maturity is reached over a wide range of sizes. Males can reach morphometric maturity before their grow to minimal commercial size, they will eventually accumulate on the grounds as dirty shelled "pygmies" since they are systematically returned to the sea by fishermen.

Cannibalism by the morphometrically mature males may be one important factor for regulating stock fluctuations. In non-harvested populations, most of the catch is made from large dirty shell morphometrically mature males, when a fishery starts to operate it makes room for clean shell newcomers.

Shortly after molting, snow crab have a wet paper consistency. Their shell will harden shortly, in a few days in the case of commercial size specimens, but body tissues will require a much longer time to grow and replenish the shell. Commercial size crab who molted in the spring will still not enter traps until mid summer, they will still be "whites" at that time and will gradually become "pinks" towards the fall but will reach full commercial quality only in the next spring. One year later they are already dirty shell crabs missing legs and of low commercial quality. Within the three to 5 next years they will have all died.

If I may summarize what I have learned, using this life schedule it is possible to forecast abundance of good quality snow crab several months to one to two years ahead of time from the results of a survey completed over a short time period once a year. Fifteen years of surveys have shown that there is no such a thing as a "Maximum Sustainable Yield" and that it would be very dangerous to use a fixed annual quota. Some years the fishery would hit far to high, some years far too low. Rather, stock abundance fluctuates naturally from year to year. Geographic quotas should be calculated each year from surveys and mapping of the resource and its categories. An adequate exploitation rate (quota/relevant biomass) can be chosen and refined year after year by trial and error in order to search for some kind of stability. The adequate exploitation rate may vary from stock to stock.

In the case of the Alaskan fishery, it would be important to check whether the same principles of life history could be applied for local snow crab or whether some adaptations would be required for the Pacific populations. From there on the survey design could probably be similar, but I would need to know what commercial crab categories are preferentially sought for matching the market and at what time of the year. The goals may not be the same than in the Gulf of St Lawrence, if the market is rather US than Japanese for instance.

The habitat vs. survey techniques component

One major factor frequently neglected in surveys is the geographic limits of the distribution of the harvestable stock. On the East Coast, the harvestable stock can be easily delimited as being resident of a particular body of water: the intermediate water mass easily identifiable on temperature/salinity versus depth profiles. The temperatures and salinities are very stable, temperature varies from -1 to +1 Degree C, and salinity is circa 32 per mil. Snow crab will move seasonally up and down a cliff to match these conditions, only making cursory incursions in mixing layers up to 4 Degrees C. The effect of sediment substrate is much less important, although snow crab tend to avoid purely rocky grounds where *Hyas spp.* prevail. It is therefore possible to identify tentative geographic limits for a survey by matching T/S profiles with depth contours.

The next useful information for designing the survey is a covariogram calculated separately for each category of snow crab. The covariogram reveals up to what distance, the **range**, samples may statistically appear to be similar. The average distance between

stations should be smaller than the range in order to drastically enhance the precision of a survey. On the East Coast, the range for morphometrically mature large males is usually about 15 nautical miles; it is only about 5 nautical miles for mature females.

In order to avoid bias in the estimates it is important to avoid selecting preferentially the locations of the stations. This could be achieved at the cost of a considerable loss of precision by randomly selecting the location of the sections. I prefer sampling randomly within coalescent cells of equal area distributed over the sampling field. The radius of the cells should be smaller than the range in order to enhance precision.

I use georeferenced information for mapping the resource and assessing. There are various options and methods that can be used on good data. The most important factor is not the method if it is correctly applied, but the quality of the georeferenced data. Data collected with no specific purpose tends to be very poorly georeferenced, in which case using coordinates information tends to create false information rather than improving the estimates.

Different species tend to be distributed differently geographically; this is basic knowledge in ecology. This entails that a multispecies georeferenced survey cannot be achieved adequately. Species must be studied one at a time, and ideally, one component category at a time. For commercial snow crab the emphasis is logically set on second year terminal molt morphometrically mature males, as these yield the best commercial component of the stock.

Ideally, georeferenced data should be obtained from point samples. Averaging stock abundance data over an area results in a loss of information. When sampling by trawling, the hauls should be as short as precision in touch down and lifting of the trawl as well as measurements of wing opening and distance covered on the grounds may allow. Further on, sampling within a trawl cod end is usually unrealistic. Fish are redistributed far from randomly by size, shape or density within the trawl. The catch should therefore be assessed *in toto*, not sampled within the cod end, and the smaller the catch, the easier it will be to assess.

The different categories of snow crab are sampled much more equally by trawling than by trapping. Traps tend to be very selective for commercial quality crabs, as this is what they are designed for. Large aggressive terminal molt males tend to exclude everything else from entering the traps. If one requires a representative picture of what is on bottom for managing the stock rather than a sole estimate of the best commercial quality crab component in the stock, a trawl survey is needed. Further on it is quite difficult to assign an area of influence to a trap. Crabs can be attracted by smell along prevailing currents from very remote locations. Unfortunately, there is usually very little information on bottom currents on fishing grounds. Traps located at close range will compete in attracting snow crabs from the vicinity, but may have a coactive attracting effect over long distances.

For snow crab surveys I recommend sampling by trawling over very short distances at low speed (300 m hauls with a wing opening averaging 10 m are generally adequate). The trawl should be specially designed to rake efficiently the grounds, not hover over bottom on rollers. The data should be accurately and precisely georeferenced, it should be processed by georeferencing methods in order to produce maps by commercial and biological category as well as global and regionalized estimates of biomass. Estimates of commercially harvestable biomass should also be produced regionally.

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CURRICULUM VITAE

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Education

B.S. (Biology), Western Washington University, 1967
M.S. (Biology), Western Washington University, 1969

Experience

1960-1964	Commercial fisherman, summer seasons
1968-1970	Fishery biologist, U.S. Bureau of Commercial Fisheries, Seattle
1970-1972	Fishery biologist, project leader, National Marine Fisheries Service, Seattle
1973-1976	Sub-task leader, Alaskan Groundfish Assessment, National Marine Fisheries Service, Seattle
1977-1981	Task leader, Latent Resource Assessment, National Marine Fisheries Service, Seattle
1981-1991	Owner, Natural Resources Consultants, Inc., Seattle
1992-1993	Owner/Executive Vice President, Natural Resources Consultants, Inc., Seattle
1994-1995	Owner/Vice President, Natural Resources Consultants, Inc., Seattle
1995-Present	Owner/President, Natural Resources Consultants, Inc., Seattle

Special Assignments and Activities

Chief scientist on 21 fishery research cruises in the Bering Sea, Gulf of Alaska, Aleutian Islands, West Coast (in excess of 1,000 days at sea), 1968-1981

Close working relationship with Pacific Fishery Management Council and North Pacific Fishery Management Council for more than 20 years, representing industry associations

Chief scientist, joint research venture (industry-government) on Alaska groundfish development 1974-1975

Chief scientist, joint research venture (industry-government) on Bering Sea clams, 1977-1978

Industry leader in Americanization of Alaska groundfish development, US/Japan and US/ROK industry-to-industry agreements, joint venture fisheries on pollock, cod, and flounder; and fully domestic fisheries, 1981-1989

Technical advisor, Midwater Trawlers Cooperative, 1983-1993

Technical director, United Catcher Boats, 1993-present

Industry leadership and research in bycatch reduction programs, 1988-present
NRC project manager, Somalia Fisheries Development, Northeast Africa, Gulf of Aden and East Indian Ocean, 1986-1987

Part owner and manager of 133-foot freezer trawler *Tremont,* 1985-1989

Expert witness, federal courts in Washington, Oregon, Alaska and Hawaii, and state courts in Washington, Oregon, and Alaska; fisheries loss analysis concerning business interruption, personal injury, vessel/gear operations and fishery resources, involving more than 700 legal cases, 1981-present

Publications

1968-1981	Author or co-author of 27 scientific and technical articles concerning a broad range of North Pacific and Alaska marine fish and shellfish resources
1981-Present	Author or co-author of more than 300 Natural Resources Consultants, Inc., private client reports and technical documents

Honors and Awards

National Marine Fisheries Service (NMFS) Special Achievement Award for outstanding rating, 1973

NMFS Special Achievement Award for outstanding rating, 1974

NMFS Nominee, Federal Employee of the Year Award, sponsored by the Seattle Federal Executive Board, 1974

NMFS Special Achievement Award for outstanding rating, 1975

Department of Commerce EEO Award, 1976

Jerry Jurkovich Award, Researcher, Communicator, Fisherman, 1985

Community Service

Volunteer Firefighter, Volunteer Lt. Firefighter last two years of service, Lynnwood, Washington, 1970-1978

PTA President, Lake Stickney Elementary School, 1982-1984

Port of Seattle Fisherman's Terminal Advisory Committee, 1999-present

Yukon Delta Fisheries Development Association Financial Advisory Board, 2001-present

Rocky Point Community Board of Directors, Camano Island, Washington, 2001-present