REPORT OF THE ELEVENTH ANNUAL CONFERENCE OF THE PARTIES TO THE CONVENTION ON THE CONSERVATION AND MANAGEMENT OF POLLOCK RESOURCES IN THE CENTRAL BERING SEA

September 5-8, 2006
Warsaw Poland

1. Opening of the Conference

Mr. Sebastian Filipek-Kazimierczak, Under-Seceretary of State for the Ministry of Agriculture and Rural Development (Poland), welcomed the delegations of the Parties to the Convention on the Conservation and Management of Pollock Resources in the Central Bering Sea to the Eleventh Annual Conference. He invited the representatives of People's Republic of China (China), Japan, Republic of Korea (Korea), Poland on behalf of European Community, the Russian Federation (Russia), and the United States of America (US), to present opening statements.

2. Welcome Address and Statements of the Delegates

Opening statements provided by the Parties are included in Appendix 1. A list of the participants is presented in Appendix 2.

3. Election

3.1. Chair

Mr. Zbigniew Karnicki, Science Director, Sea Fisheries Institute (Poland), was elected as Chair of the Eleventh Annual Conference.

3.2. Vice-Chair

Mr Zhou Yingqi, Professor, Shanghai Fisheries University (China) was elected Vice Chair.

3.3. Chair of Scientific and Technical Committee

Patricia Livingston (US) was elected the Chair of the Scientific and Technical Committee.

3.4. Rapporteur

LCDR Daniel Schaeffer (US) would serve as lead rapporteur with assistance from each of the member countries desiring to participate.

4. Adoption of the Agenda

The Agenda was adopted (Appendix 3).

5. Report of the Scientific and Technical Committee

The Chair of the Scientific and Technical (S&T) Committee reported on the results of the S&T Committee meeting of September 5-6, 2006 in Warsaw, Poland. The resulting report was distributed to the Parties (Appendix 4). The Chair summarized the S&T Committee discussions as follows:

5.1. Update catch and effort statistics

5.1.1. Tables of historical catch and effort statistics on pollock catch in the Bering Sea were updated and included in the final S&T report (Appendix 4).

5.2. Review results of trial fishing

5.2.1. Korea was the only nation that conducted trial fishing in the region in 2006. Preliminary results of the Korean trial fishing are included as an attachment to the S&T report (Appendix 4).

5.3. Review results of research cruises

5.3.1. The US reviewed results of the 2006 Bogoslof survey, described plans for the 2007 Bogoslof survey. The US also reported on stock assessments in the Eastern Bering Sea and Aleutian region.

5.3.2. Russia reported on the results of the Western Bering Sea (WBS) pollock research cruises.

5.4. Review the status of Aleutian Basin pollock stocks

5.4.1. The US stated that recent studies indicate that the pollock stock in the Central Bering Sea is low. It was further noted that there was no comprehensive survey that could be used to determine the status of the Aleutian Basin stock. Detailed information is included in the S&T report (Appendix 4).

5.5. Factors affecting recovery of the stocks

5.5.1. A lengthy discussion on this topic took place. It was acknowledged that numerous factors ranging from climate change to predation could affect pollock abundance. No one factor was identified as being solely responsible for the lack of recovery of pollock in the Convention Area.

5.6. The effects of the moratorium and its continuation

5.6.1. Japan and Korea noted that the moratorium has been in place for more than 13 years with no sign of recovery of pollock stocks in the Convention Area, and reminded the Parties that the objectives of the Convention are the conservation, management and utilization of pollock. Japan requested that additional methods be considered to fulfill the objectives of

the Convention.

5.6.2 In S&T sessions, the US and Russia explained their conservation measures on pollock stocks in their EEZ's.

5.7. Methodologies to determine Allowable Biological Catch (ABC) and AHL and Recommendation on AHL

5.7.1. Parties agreed that biomass should be determined using the indirect method in the Annex to the convention.

5.7.2 Consensus was not reached on how to set an AHL.

5.8. Other matters and recommendations of the S&T Committee

5.8.1. The genetics and survey workgroups should present annual reports to the next Annual Conference.

5.8.2. The S&T recommended convening a follow-on workshop to the Yokohama workshop on stock genetics.

6. Action Items

6.1. The review of scientific data and conservation measures of the Coastal States related to pollock fishing in the Bering Sea

6.1.1. The US and Russia submitted fishery catch statistics and research results which were included in the S&T report. (Appendix 4)

6.2. The establishment of a plan of work for the Scientific and Technical Committee

6.2.1 The Parties supported the issues raised by the S&T committee to continue to coordinate functions for the two working groups with an annual report to the Annual Conference on the progress of the workshops.

6.2.2 The Chair stated that it had been agreed last year to have the genetics meeting, so there is no reason to wait until the next conference. Japan will lead to work out details with the other Parties to determine time and location for the workshop to be held in 2007.

6.3. The establishment of the Allowable Harvest Level

6.3.1. China, Japan, Korea and Poland submitted a proposal to establish AHL for pollock in the central Bering Sea in 2007 (appendix 5).

6.3.2 The US referred to the Annex, Part I, paragraph (c), and noted that basin biomass is near historically low levels, and that all Parties agreed that the present biomass level has not reached 1.67 million metric tons. Therefore, the US stated that because biomass has not

yet reached the biomass target stated in the Convention, AHL should be set at zero. More compelling scientific evidence would be needed before deviating from the Convention provisions.

6.3.3 Japan stated that the US stance is the same as stated in the provisions of the convention. During the S&T Committee Meeting, all Parties agreed that scientific data is insufficient to provide an estimate, so the Parties lack the proper information to estimate the biomass abundance. Japan feels the establishment of AHL by the joint proposal is the best way to proceed.

6.3.4 Korea stated that from a scientific point of view, AHL can be established even though the amount is a very low level and would not support commercial fishing opperations.

6.3.5 The Chair summarized the situation, stating that the Parties basically had two different positions: China, Japan, Korea, and Poland submitted a proposal to set AHL, while the US and Russia supported setting AHL at zero. The Chair stated that because consensus was not reached, there was no choice but to set AHL according to Convention Article VII, which refers to the procedure outlined in Annex Part I, paragraph (c), and setting the AHL for 2007 at zero.

6.4. The establishment of the Individual National Quotas

6.4.1. The Chair stated that since AHL could not be established, no individual national quotas could be established.

6.5. The adoption of appropriate conservation and management measures based upon the advice of the Scientific and Technical Committee

6.5.1. The Chair stated that all parties should avoid fishing on juvenile pollock and coordinate research in the Aleutian basin area.

6.6. The establishment of the terms and conditions for trial fishing in 2007

6.6.1 Poland proposed that the Parties reaffirm that any Party wishing to conduct trial fishing will abide by the Convention provisions and previously adopted terms and conditions adopted in 1999 regarding trial fishing.

6.7. Trial fishing plans

6.7.1. Russia will not be conducting trial fishing in the convention area, but it will be conducting research in the deep-sea areas in the Russian EEZ of the Aleutian basin.

6.7.2 Korea plans to conduct trial fishing with two vessels in 2007. Korea will provide details of the trial fishing to the other parties (appendix 6). The type of equipment used on the commercial vessels used by Korea to conduct trial fishing will not permit the use of data loggers. The US stated it would be pleased to help Korea establish the ability to utilize data loggers on trial fishing vessels.

6.7.3 Japan is considering the possibility of conducting trial fishing in 2007 by one vessel.

6.7.4 The US does not intend to conduct trial fishing in 2007.

6.8. Reception of reports relating to measures taken to investigate and penalize violations of the Convention

6.8.1. No actions were taken in 2006.

6.8.2 US presented a report on monitoring and enforcement efforts in 2006 (appendix 7).

6.9. The consideration of matters related to the conservation and management of living marine resources other than pollock in the Convention Area

6.9.1. The US requested that vessels conducting trial fishing collect information on all living marine resources and that such information be provided to the Parties.

6.10. Meeting Observers

6.10.1. The Parties agreed to the same observer rules for 2007 that have been in use since 1998 (recorded in the Report of the Second Annual Conference, 1997, Part 6.J.10).

7. Twelfth Annual Conference

7.1. Time and Location

7.1.1 China agreed to host the Twelfth Annual Conference. China plans to hold the meeting in Beijing in early September 2007. Exact details will be placed on the web site when arrangements are finalized.

7.2. Election of Chair and Vice-Chair

7.2.1 China nominated Dr. Zhou Ying Qi as Chairman for the Twelfth Annual Conference.

7.2.2 Russia will inform the parties at a later date of its nomination to serve as the Vice Chair for the Twelfth Annual Conference. Preliminary plans are to hold the Thirteenth Annual Conference in Kaliningrad.

8. Other Business

8.1. No other business was discussed.

9. Closing Statements

No written closing statements were provided by the Parties.

Appendices:
1. Opening Statements.
2. Delegation List
3. Plenary Agenda.
4. Report of the Scientific and Technical Committee.
5. Joint Proposal by China, Japan, Korea and Poland for Establishing AHL.
6. Korean Trial Fishing Plan for 2007.
7. US Coast Guard Enforcement Report.

The 11 to Annual Conference of the Parties to the Convention to the

Convention on the Conservation and Management of Pollock Resources

in the Central Bering Sea

September 5 - 8, 2006

Opening Statement of China

Good morning.
Mr. Chairman, Distinguished delegates, Ladies and Gentlemen,

It's a great honor for us to be here in Warsaw for the 11th Central Bering Sea Pollock Conference. On behalf of my delegation, I'd like to express our sincere appreciation to the Government of Poland for providing the excellent facility to hold this conference, also I'd like to extend my thanks to our Polish friends for the hospitality we received in this beautiful city.

In the past more than a dozen years, we have discussed Pollock resource in the central Bering Sea in many respects since we have voluntarily agreed and established a moratorium in 1993 for the Pollock resource recovery. But 13 years past, even we have managed to maintain the minimum level of fishing effort in this area, unfortunately we are still failed to see any signs of recovery for the Pollock resource in the Convention area. Now, it was acknowledged that number of factors could affect Pollock abundance. However, no one factor was identified as sole responsible for the delay of stock recovery in the Central Bering Sea. So we need further research and continuously exchange information, so as to attain better understanding on this issue.

Last year, our colleagues from Russia had made elaborate survey plan in the convention area, we are waiting for the outcomes from the scientists. Mr. Chairman, I do hope with all the delegations' efforts and contributions on this meeting, we can achieve fruitful outcomes so that we can persuade our fishermen to keep hopeful and patient for the re-opening of the fishery in the near future.

Once again, I'd like to express my highly regards to our hosts for all the hard work they have done for this meeting. And welcome all the delegates come to Beijing for the meeting of next year.

Thank you.

BERING CONVENTION
Warsaw, 5-8 September 2006

EC Opening Speach

Mr Chairman, Distinguished Delegates, Ladies and Gentlemen,

It is a pleasure for the European Community to be present for the first time at the Annual Meeting of the Convention on the Conservation and Management of Pollock Resources in the Central Bering Sea. We are following the work of this organisation with great interest.

As you are all well aware and as already stated by the Polish Delegation at your meeting in 2004, Poland has become a Member of the EU. Given the Community's exclusive competence in fisheries, the European Commission takes over the responsibility of representing Member States in all international relations. However, given the fact that the EC has not yet become a member of this Convention and the fact that Poland remains member until this date, Poland will speak on behalf of the EC at this annual meeting and will reflect the Community position.

As you all know, the European Community is committed to RFMOs and the key role they play in the long term conservation and sustainable use of stocks and to the importance of the strengthening and modernising these organisations. The European Community is a member of almost all the existing RFMOs and is an observer in those to which it has not yet acceded. Furthermore, we are currently active in the establishment of new RFMOs.

Thank you

OPENING STATEMENT OF THE JAPANESE DELEGATION

Mr. Chairman, distinguished delegates, my name is Hiromi Isa and on behalf of the Japanese delegation I would like to make an opening statement.

I am very happy to be able to meet you all at the eleventh annual conference.
For that reason I wish to express our sincere gratitude to all the representatives of the Polish Government engaged in preparations for the conference

More than 10 years have passed since the implementation of moratorium, which is the most severe conservation and control measure. However the results of pursued surveys show that the decrease of resources is still continuing.
This demonstrates that while moratorium contributed for prevention of central Bering Sea depletion caused by fishery, it has no impact on stock recovery.

The purpose for this Convention is conservation, management and reasonable exploitation of Pollock resources of central Bering Sea.
Our country stands on position that based on scientific rationale, AHL should be established even if the amount is very low. Therefore including collaboration on research activities to collect all the necessary scientific data, we wish to cooperate with all the Convention Parties to set AHL.

In conclusion, I would like to express our hope that this year annual conference shall be productive.

And now let me introduce members of our delegation
Hiromi ISA, Deputy Director, Far Seas Fisheries Division, Department of Resources Management, Fisheries Agency

Akira NISHIMURA , Chief, Grounfish Biology Section, Subarctic Fisheries Resources Division, Hokkaido National Fisheries Research Institute, Fisheries Research Agency

Hajime ONISHI, Secretary, National Federation of Medium Trawlers

Thank you for your attention. Mr. Chairman thank you very much

THE ELEVENTH ANNUAL CONFERENCE OF THE PARTIES TO THE CONVENTION ON THE CONSERVATION AND MANAGEMENT OF POLLOCK RESOURCES IN THE CENTRAL BERING SEA

September 5-8, 2006 – Warsaw, Poland

Opening Statement
Republic of Korea

Good morning Mr. Chairman, distinguished delegates, and ladies and gentlemen.

I am honored to be here in Warsaw to participate in the 11th Annual Conference of the Parties to the Convention on the Conservation and Management of Pollock Resources in the Central Bering Sea. I'd like to express my sincere appreciation to the Government of Poland for hosting this meeting and giving us the opportunity to visit this beautiful city in Warsaw.

All the member countries have cooperated and promoted mutual understanding to effectively manage the Bering Sea Pollock resources under the Convention regime. We have conducted extensive scientific research and made every effort to restore Pollock stocks. But unfortunately, despite the moratorium on Pollock fishing in the Convention area, we can't see any sign of recovery.

We do hope that this Convention will be meaningful and productive. Yet, we regret to say that some parties seem to have become doubtful about the value of this Convention. Considering the results of the research, it seems even more crucial for us to focus on conservation and management of Pollock resources. But, we should not neglect the need to achieve optimum utilization. These are objectives of this regime. I am optimistic that in this meeting the atmosphere will be more open to different opinions and we will have more active exchange of information and viewpoints. Thank you.

And I would like to introduce my delegation to you. I am Gyoo Ho Park, Head of the Korean Delegation, from the Ministry of Maritime Affairs and Fisheries. My left side, he is Mr. Jeong Seok Park, Assistant Director of the Ministry of Maritime Affairs and Fisheries. The next one, he is Dr. Hyun Su Jo, from National Fisheries Research and Development.

OPENING STATEMENT OF THE REPUBLIC OF POLAND

Mr President, Distinguished Delegates, Ladies and Gentlemen,

On behalf of the Government of the Republic of Poland I would like to welcome you to Warsaw, the capital of Poland, to the Annual Conference on the Protection and Management of Alaska Pollock Stock in the Central Part of the Bering Sea.

Poland, participant of the World Summit on Sustainable Development in Johannesburg, September 2002, is interested in restoration of world stock of fish to the levels which will facilitate the introduction of such a procedure for the exploitation as to guarantee stabilisation of fisheries.

For 10 years we have been discussing the rules of Alaska Pollock stock management in the area of the Convention, yet the fundamental objective of restoration and exploitation of the Alaska Pollock stock of the Aleutian Basin has not been reached to date. Despite considerable scientific effort of all Member States aimed at the determination of reasons for such condition, many issues remain unsolved. Alaska Pollock stock in the area of the Convention has not been exploited virtually for 15 years. Pursuant to the Convention the stabilisation of biomass of Alaska Pollock on a considerably low level of 250 thousand tonnes does not allow to resume catches automatically. We however find that it is possible to exploit Alaska Pollock to a very limited extent, which will not result in unfavourable modifications in the biological condition of the stock. I hope that a compromise is possible in this respect.

Fisheries of this Convention were basic fisheries of the Polish distant-water fleet. Restriction of access to Alaska Pollock stock resulted in considerable reduction of distant-water fleet. The possibility to resume exploitation of Alaska Pollock stock on the Bering Sea could create chance for use of the rather small potential of Polish fleet. This is why Poland is keenly interested in the restoration of Alaska Pollock stock and its rational exploitation. Decisions made during this Conference will be of great significance to Polish distant-water fishery.

I hope that scientific information obtained during the meeting of the Scientific, Technical and Economic Committee for Fisheries will facilitate the determination of the current condition of Alaska Pollock stock in the area of the Convention and will help the Conference to take decisions which satisfy all the parties interested.

I wish you a fruitful meeting, hoping that after all meetings and discussions concerning the Alaska Pollock stock you will be willing to go on a tour of Warsaw and visit Warsaw historical places and locations of great significance in the current times.

ELEVENTH ANNUAL CONFERENCE
OF THE PARTIES TO THE CONVENTION
ON CONSERVATION AND MANAGEMENT OF POLLOCK
RESOURCES IN THE CENTRAL BERING SEA

SEPTEMBER 05 – 08, 2006, WARSAW, REPUBLIC OF POLAND

OPENING STATEMENT
BY THE RUSSIAN FEDERATION

Mr. Chairman,
Ladies and Gentlemen,

It is a great honor for the Russian Federation to take part in the 11-th Conference of the Parties to the Convention on Conservation and Management of Pollock resources in the Central Bering Sea. On behalf of the Russian Delegation I would like to thank the Government of the Republic of Poland for organizing this meeting.

The main objective of this Conference is to add up data on qualitative and quantitative distribution of pollock in the Central Bering Sea and adjacent regions to the multiannual database.

The studies performed each new year enhance our knowledge allowing us to expand and make more profound our understanding of the regularities of functioning of the Central Bering Sea ecosystems where pollock occupies central position. As other nations, Russia is hopeful that the scientifically based conservation techniques employed in the Central Bering Sea will help to restore the abundance of pollock, and fisheries in the enclave will be resumed. We expect that the joint work during the upcoming week will bring us to a new level of knowledge, and will enable us to make correct decisions.

Now may I introduce members of the Russian Delegation.

ELEVENTH ANNUAL CONFERENCE OF THE PARTIES TO THE CONVENTION ON THE CONSERVATION AND MANAGEMENT OF POLLOCK RESOURCES IN THE CENTRAL BERING SEA

OPENING STATEMENT

UNITED STATES DELEGATION

Mr. Chairman, distinguished delegates, ladies and gentlemen, the United States delegation is honored to be able to participate in this 11th Annual Conference of the Parties to the Central Bering Sea Pollock Agreement in Poland. My name is Loh-Lee Low and I am with the National Marine Fisheries Service. On behalf of the U.S. delegation, I would like to thank Poland for hosting this conference. When the Annual Conference was held in Gydinia in 2001, the full delegation of the United States was unable to attend. We were represented by an official from the U.S. Embassy here in Warsaw. We are pleased to be here with a full delegation this time. It is the first visit to Poland for many of the U.S. delegation members and we very much look forward to experiencing the hospitality of the Polish people.

We continue to experience a moratorium on commercial fishing for pollock stocks in the Convention Area. We know that 13 years is not a long time to wait for the recovery of many fish stocks, although it is a long time in the life of a commercial fisherman. We are still operating under Objectives 2 and 3 of the Convention—to restore and maintain the pollock resources in the Bering Sea at levels which will permit their maximum sustainable yield and to cooperate in the gathering and examining of factual information concerning pollock in the Bering Sea.

The U.S. delegation is looking forward to discussions in the Scientific and Technical Committee this week on the status of pollock stocks in the Convention Area and the factors affecting their recovery. 2006 has been an unusual year for pollock in U.S. waters. Our bottom trawl and echo-integration trawl surveys revealed unusual patterns of pollock distribution and abundance on the eastern Bering Sea shelf. Bottom temperatures collected from these surveys indicate colder water conditions than in recent years and we have detected greater scattering of pollock and fewer pollock in many areas than expected. We hope that insights from fishing and research from the other Parties will help us better understand what is happening to the pollock. This summer, the United States unfortunately was not able to extend its hydroacoustic trawl survey into Russian waters. We are looking forward to learning about the research and status of stocks in the Navarin Basin area from the Russian delegation.

We understand that three Korean vessels were able to conduct trial fishing in the Central Bering Sea in July and August. We look forward to learning the results of Korea's efforts. We would also like to express our appreciation to Korea for its compliance with the requirements for trial fishing this year.

We ask the Parties to renew efforts this week to advance understanding of the dynamics of

Central Bering Sea pollock stocks. The United States is ready to begin that work.

Mr. Chairman, I would like to introduce the U.S. delegation…[read delegation list]

List of Participants

CHINA

BAOYING Zhu
Post: Senior Officer
Organization: Ministry of Agriculture, Division of International Cooperation, Bureau of Fisheries
Phone: +86 10 64192974
Fax: +86 10 64192951
E-mail: inter – coop@agri.gov.cn

YING QI Zhou
Post: Professor
Organization: Shanghai Fisheries University
Phone:+86 21 65710350
Fax: + 86 21 6570350
E-mail: yqzhou@shfu.edu.cn

JAPAN

Hiromi ISA
Post: Assistant Director
Organization: Fisheries Agency, Far Seas Fisheries Division, Department of Resources Management
Phone: 813 3502 2443
Fax: 813 3591 5824
E-mail: isa_hiromi@nm.maff.go.jp

Akira NISHIMURA
Post: Associate Division Director for Research
Organization: Fisheries Research Agency, Subarctic Fisheries Resources Division, Hokkaido National Fisheries Research Institute
Phone: +81 154 92 1726
Fax: +81 154 91 9355
E-mail: anishimu@fra.affrc.go.jp

Hajime ONISHI
Post: Secretary
Organization: National Federation of Medium Trawlers
Phone: (Tokyo)813(3508)0361
Fax: 813 (3508)0364

Gerard JASTRZĘBSKI
Interpreter

Sławomir SZULC
Interpreter

KOREA

Gyoo Ho PARK
Post: Director
Organization: Ministry of Maritime Affairs & Fisheries
Phone: + 82 2 3674 6030
Fax: + 82 2 3674 6996
E-mail: park0301@hanmail.net

Jeongseok PARK
Post: Assistant Director of International Cooperation Team
Organization: Ministry of Maritime Affairs & Fisheries
Phone: + 82 2 3674 6994
Fax: + 82 2 3674 6996
E-mail: jspark@momaf.go.kr

Hyun- Su JO
Post: Scientist
Organization: National Fisheries Research & Development Institute
Phone: + 82 51 720 2331
Fax: + 82 51 720 2337
E-mail: hsjo@nfrdi.re.kr

POLAND

Sebastian FILIPEK-KAŹMIERCZAK
Post: Under-Secretary of State
Organization: Ministry of Agriculture and Rural Development
Phone: + 48 22 623 15 14
Fax: + 48 22 623 11 02
E-mail:

Stanisław PODLEWSKI
Post: Director, Fisheries Department
Organization: Ministry of Agriculture and Rural Development
Phone: +48 22 623 14 71
Fax: +48 22 623 22 04
E-mail: stanislaw.podlewski@minrol.gov.pl

Leszek DYBIEC
Post: Deputy Director
Organization: Ministry of Agriculture and Rural Development, Fishery Department of Ministry
Phone: +48 22 628 96 84
Fax: +48 22 623 22 04
E-mail: leszek.dybiec@minrol.gov.pl

Lidia KACALSKA- BIEŃKOWSKA
Post: Head of Division
Phone: +48 22 623 25 66
Fax: +48 22 623 22 04
E-mail: l.kacalska@minrol.gov.pl

Jakub WOLSKI
Post: Ambassador
Organization: Ministry of Foreign Affairs
Phone:
Fax:
E-mail:

Piotr DOLATA
Post: Expert
Organization: Ministry of Foreign Affairs
Phone:
Fax:
E-mail:

Zbigniew KARNICKI
Post: Deputy Director
Organization: Sea Fisheries Institute
Phone: + 48 58 735 62 36
Fax: + 48 58 735 61 10
E-mail: zkarnicki@mir.gdynia.pl

Jerzy JANUSZ
Post: Head of Division
Organization: Sea Fisheries Institute, Department of Biology and Fish Resource Conservation
Phone: +48 58 735 62 14
Fax: +48 58 735 61 10
E-mail: jjanusz@mir.gdynia.pl

Anna JOHANSSON
Post: International and Regional Arrangements
Organization: European Commission
Phone: +32 2 296 68 11
Fax: +32 2 295 57 00
E-mail: anna.Johansson@ec.europa.eu

Krzysztof RYCHLICKI
Post: President – General Director
Organization: Deep Sea Fishing, Processing and Trading Enterprise DALMOR
E-mail: krychlicki@dalmor.pl

Tomasz DYBEK
Post: Specialist
Organization: Deep Sea Fishing, Processing and Trading Enterprise DALMOR
Phone: +48 58 6276514
Fax: + 48 58 6202886
E-mail: tdybek@dalmor.pl

Jarosław ZIELIŃSKI
Post: Director
Organization: North Atlantic Producers Organization
Phone/fax: + 48 58 668 30 66
E-mail: jarek@paop.org.pl

Tomasz JADOWSKI
Post: Lawyer
Organization: North Atlantic Producers Organization
Phone: + 48 22 840 89 20
Fax: + 48 22 840 89 22
E-mail: paop@paop.org.pl

RUSSIAN FEDERATION

Boris N. KOTENEV
Post: Director
Organization:VNIRO
Phone: +7 495 264 93 87
Fax: +7 495 264 91 87
E-mail: vniro@vniro.ru

Alexander I. GLUBOKOV
Post: Chief of the Department
Organization: VNIRO
Phone: + 74 95 264 9143
Fax: + 74 95 264 9021
E-mail: glubokov@vniro.ru

Yury RYAZANTSEV
Post: Leading engineer
Organization: VNIRO
Phone: +7 495 264 1785

Igor V. MELNIKOV
Post: Deputy Director
Organization: TINRO
Phone: +7 4232 400 311
Fax: +7 4232 300 752
E-mail: melnikov@tinro.ru

Oleg G. ZOLOTOV
Post: Senior scientist
Organization: KamchatNIRO
Phone: +7 415 2 12 34 24
Fax: +7 415 2 11 27 01
E-mail: kamniro@mail.kamchatka.ru

Dimitry A. Ginzburg
Post:Inspector
Organization: Federal Security Service Department
Phone: +8 093 548 3315

Jury N. GRISZYN
Post: Councillor
Organization: Embassy of the Russian Federation in Poland
Phone/fax + 48 22 625 21 02

UNITED STATES

Dr. Loh-Lee LOW
Post: International Fishery Research Coordinator
Organization: Alaska Fisheries Science Center, NOAA
Phone: +206 526 4190
Fax: +206 526 6723
E-mail: loh-lee.low@noaa.gov

Steven J. BARBEAUX
Post: Fishery Research Biologist
Organization: Alaska Fisheries Science Center, Resource Ecology and Fisheries Management Division, NOAA
Phone: +206 526 4211
Fax: +206 526 6723
E-mail: steve.barbeaux@noaa.gov

Patricia A. LIVINGSTON
Post: Director
Organization: Alaska Fisheries Science Center, Resource Ecology and Fisheries Management Division
Phone: +206 526 4172
Fax: +206 526 6723
E-mail: pat.livingston@noaa.gov

Jeff PASSER
Post: Special Agent in Charge
Organization: Office for Law Enforcement, Alaska Enforcement Division
Phone: +907 586 7225
Fax: +907 586 7200
E-mail: jeff.passer@noaa.gov

Paul E. NIEMEIER
Post: Foreign Affairs Specialist
Organization: Office of International Affairs, NOAA
Phone: +301 713 2276
Fax: +301 713 2313
E-mail: paul.niemeier@noaa.gov

Jonathan C. POLLARD
Post: Deputy Alaska Regional Counsel
Organization: NOAA Alaska Region, Office of the General Counsel
Phone: + 907 586 7047
Fax: +907 586 7263
E-mail: jonathan.pollard@noaa.gov

K. Alexandra CURTIS
Post: Oceans Officer
Organization: U.S. Department of State, Bureau of Oceans and International Environmental and Scientific Affairs
Phone: +202 647 5808
Fax: +202 736 7350
E-mail: curtiska@state.gov

Capt. Michael CERNE
Post: Chief of Planning & Force Readiness
Organization: 17th U.S. Coast Guard District
Phone: +907 463 2226
Fax: +907 463 2216
E-mail: michael.b.cerne@uscg.mil

LCDR Lisa A. RAGONE
Post: Chief, Fisheries Law Enforcement
Organization: U.S. Department of Homeland Security, U. S. Coast Guard
Phone: +907 463 2223
Fax: +907 463 2216
E-mail: lisa.a.ragone@ uscg.mil

LCDR Daniel E. SCHAEFFER
Post: Commanding Officer
Organization: U. S. Coast Guard, North Pacific Regional Fisheries Training Center
Phone: +907 487 5662
Fax: +907487 5716
E-mail: daniel.e.schaeffer@uscg.mil

David BENSON
Post: Government Relations
Organization: Trident Seafoods Corporation
Phone: +206 783 3818
Fax: +206 781 7883
E-mail: davebenson@tridentseafoods.com

Alvin R. BURCH
Post: Executive Director
Organization: Alaska Draggers Association
Phone: +907 486 3910
Fax: +907 486 6292
E-mail:alaska@ptialaska.net

Earl E. KRYGIER
Post: Extended Jurisdiction Program Manager
Organization: Alaska Department of Fish and Game
Phone: +907 267 2111
Fax: +907 267 2442
E-mail: earl_krygier@fishgame.state.ak.us

Rick LAUBER
Post: Fishing Industry Consultant
Organization: Aleutian Pribilof Island Community Development Association
Phone: +907 463 3669
Fax: +907 463 3622
E-mail: RickLauber@aol.com

Paul MACGREGOR
Post: General Counsel
Organization: At-Sea Processors Association
Phone: +206 285 5139
Fax: +206 285 1841
E-mail: pmacgregor@mundtmac.com

Dr. Richard MARASCO
Post: Fishery Economist
Organization: Attending on Behalf of the North Pacific Fishery Management Council
Anchorage
Phone/fax: +425 788 2546
E-mail: richmarasco@hotmail.com

Brent C. PAINE
Post: Executive Director
Organization: United Catcher Boats
Phone: +206 282 2599
Fax: +206 282 2414
E-mail: bpaine@ucba.org

Bill TWEIT
Post:
Organization: Department of Fish and Wildlife, Distant Waters and Columbia River Policy Lead,
Washington
Phone: +360 902 2723
Fax: +360 902 2158
E-mail: tweitwmt@dfw.wa.gov

Thorn SMITH
Post: Executive Director
Organization: North Pacific Longline Association
Phone: +206 282 4639
Fax: +206 282 4684
E-mail: thorndog@worldnet.att.net

CHAIR
Patricia A. LIVINGSTON

SC CHAIR
-

INTERPRETETER
Beata BADUCHOWSKA
Małgorzata TRYBA
Tadeusz TRYBA

Agenda for the Eleventh Annual Conference

ELEVENTH ANNUAL CONFERENCE OF THE PARTIES TO THE CONVENTION ON THE CONSERVATION AND MANAGEMENT OF POLLOCK RESOURCES IN THE CENTRAL BERING SEA

September 5-8, 2006 Warsaw, Poland

1. Opening of the Conference

2. Welcome Addresses and Opening Statements of the Delegates

3. Election (Chair, Vice-Chair, Chair of Scientific & Technical Committee, and Rapporteur) 4.

Adoption of the Agenda

5. Report of the Scientific and Technical Committee

6. Action Items
- **6.1.** The review of scientific data and conservation measures of the Coastal States related to pollock fishing in the Bering Sea
- **6.2.** The establishment of a Plan of Work for the Scientific and Technical Committee 6.3. The establishment of the Allowable Harvest Level
- **6.4.** The establishment of the Individual National Quotas
- **6.5.** The adoption of appropriate conservation and management measures based upon the advice of the Scientific and Technical Committee
- **6.6.** The establishment of the Terms and Conditions for Trial Fishing in 2007 6.7. Trial Fishing Plans in 2007
- **6.8.** Reception of reports relating to measures taken to investigate and penalize violations of the Convention
- **6.9.** The consideration of matters related to the conservation and management of living marines resources other than pollock in the Convention area 6.10. Meeting Observers

7. Twelfth Annual Conference
- 7.1. Time and Location
- 7.2. Election of Chair and Vice-Chair

8. Other Business

9. Closing Statements

11th ANNUAL CONFERENCE OF THE PARTIES TO THE CONVENTION ON THE CONSERVATION AND MANAGEMENT OF POLLOCK RESOURCES IN THE CENTRAL BERING SEA

REPORT OF THE MEETING OF THE SCIENTIFIC AND TECHNICAL COMMITTEE

5-6 September 2006 –Warsaw, Poland

Final: 07 September 2006

Delegations from Japan, People's Republic of China, Poland, the Republic of Korea (Korea), the Russian Federation (Russia), and the United States (US) participated in a meeting of the Scientific and Technical (S&T) Committee in conjunction with the 11th Annual Conference of the Parties to the Convention on the Conservation and Management of Pollock Resources in the Central Bering Sea in Warsaw, Poland.

1. Opening remarks

Patricia Livingston (US), Chair of the Scientific and Technical Committee, opened the meeting at 11:00, 5 September 2006. A list of the participants is provided (attachment 1).

2. Appointment of Rapporteur

Mr. Steven Barbeaux (US) was appointed as lead rapporteur. Each delegation agreed to select rapporteurs to aide Mr. Barbeaux with this function.

3. Adoption of Agenda

3.1 There were no changes or additions to the proposed agenda (attachment 2).

4. Discussion of Science Issues

4.1. Update catch and effort statistics

4.1.1. Dr. Loh Lee-Low (US) provided the latest catch statistics for the North Pacific pollock fisheries in a handout (attachment 3: Table 1 and Table 2).

4.1.2.The Russian delegation indicated that the catch for the Navarin region should be updated to 211,000 t as of August 15, 2006. The Russian delegation indicated that the Navarin Region fishery would continue and that the quota was set at 467,000. They also indicated that the Olyotorskiy-Karagin Region was closed to directed pollock fishing. The Navarin Region is synonymous with the Russian Western Bering Sea statistical fishing zone and includes all waters of the Russian EEZ east of 170º E longitude. The Olyotorskiy-Karagin Region is synonymous with the Russia Karagin statistical fishing subzone and includes Bering Sea Waters

west of 170º E longitude.

4.2. Review results of trial fishing

Dr. Hyun-Su JO (Korea) presented preliminary results from the 2006 Korean trial fisheries (Attachment 4). Only one pollock was taken during the course of the entire trial fishing operation. A full report will be submitted once the observers have returned from sea and data have been fully analyzed including acoustic information. There was no other trial fishing reported by the member nations for 2006.

4.3. Review results of research cruises

4.3.1. Mr. Steve Barbeaux (US) presented a review of the results of the 4-11 March 2006 echo-integration-trawl survey of pollock in the southeastern Aleutian Basin near Bogoslof Island by the R/V MILLER FREEMAN and described plans for the 2007 Bogoslof survey. The cruise was able to complete acoustic data collection and completed 14 trawl hauls. The pollock biomass estimate for the Bogoslof Island area was 240,000 t (attachment 3 and attachment 5).

4.3.2. The next survey is planned for 1-11 March 2007, with similar tracklines as 2006. The survey will be conducted by both the R/V OSCAR DYSON and R/V MILLER FREEMAN. Which vessel will be used for the official biomass estimate will be determined at a later date. The US extended an invitation to all convention parties to participate in the planned 2007 research survey. The US requested as early a notice as possible (minimum of two months) to include visiting scientists on planned research cruises. Korea indicated that it would like to have one scientist participate in the Bogoslof survey.

4.3.3. Dr. Alexander Glubokov (Russia) provided a detailed report on research in the Navarin Region in 2006 and presented the preliminary data from a bottom trawl survey conducted by the R/V Pioneer Nickolayeva in August 2006 (attachment 6). These results show a possible increase in abundance of pollock in the Navarin region from the 1996-2002 levels to 533,000 t for a 14,658 nm^2 area. Dr. Glubokov indicated that this survey was part of the Russian contribution in 2006 to what they hope will become part of a wider Bering-Aleutian Pollock International Survey (BAPIS) program.

4.3.4. Dr. Glubokov (Russia) presented results from genetic studies conducted on pollock samples taken from the Eastern and Western Bering Sea and Sea of Okhotsk (attachment 7). Results indicated the greatest differences between pollock from the Sea of Okhotsk and other regions analyzed. There appeared to be larger differences between Eastern and Western Bering Sea samples than between samples from within the Western Bering Sea. Dr. Glubokov indicated that the Russian Federation is interested in continuing this work and would like to obtain tissue samples from a wider range of pollock, but that all tissue must be collected from spawning aggregations. Dr. Loh Lee-Low (US) indicated that Dr. Mike Canino has the lead for pollock genetic research at the Alaska Fisheries Science Center and that the Russian findings and request would be forwarded to Dr. Canino.

4.4. Review the status of Aleutian Basin pollock stocks

4.4.1. Mr. Steve Barbeaux (US) presented the stock assessment for the Eastern Bering Sea and Aleutian Islands pollock stocks (attachment 3 and attachment 8). The latest Eastern Bering Sea and Aleutian Islands stock assessments can be found at http://www.afsc.noaa.gov/refm/stocks/assessments.htm. The Eastern Bering Sea assessment shows a decline in pollock abundance in 2006. Both the EIT and Bottom trawl surveys show a marked decline which was predicted in the 2005 stock assessment due to the apparent lack of new recruitment between 2001 and the present. The ABC for the Eastern Bering Sea is expected to decline to at least 1.1 million t by 2008 from and average of 1.41 million t for 2000-2005.

4.4.2. Poland asked the US to explain the unusual decrease of pollock biomass in the Eastern Bering Sea from ~11 million t in 2003 to about 4.5 million in 2006. The US delegation pointed out that the 2003 bottom trawl survey was highly imprecise with a variance due to one extreme trawl catch of pollock. The stock assessment model fits the 2003 survey at a much lower biomass level and therefore the decline is not as steep as perceived from the survey estimates.

4.4.3. Mr. Steve Barbeaux (US) presented results from the Aleutian Islands Cooperative Acoustic Survey Study (AICASS) conducted in February – April 2006 (attachment 3 and attachment 9). The 2006 AICASS was a feasibility study to determine if it was possible to conduct acoustic surveys from small commercial fishing vessels in the Aleutian Islands area. Results indicate that it is possible.

4.5. Factors affecting recovery of the stocks

4.5.1. Dr. Alexander Glubokov presented an analysis of climate change and walleye pollock biomass in the Aleutian Basin (attachment 10). The presentation showed the correlation of biomass of some stocks with climate variables and he specifically showed a forecast of Aleutian Basin pollock based on a smoothed climate index created from three climate variables. The model shows an increase in stock by the next decade. The US delegation thanked the Russian delegation for this presentation but wanted to caution on the use of simple correlations since we know the systems controlling the stock levels are very complex, especially in the face of global warming and its apparent affects in the Arctic.

4.5.2. The Japanese delegation wanted to stress the importance of conserving juvenile pollock on the shelf. The US delegation stated that there are significant economic incentives for the industry to avoid small fish which are not marketable. The other aspect they wished the S&T to consider is that the US has 100 % observer coverage. If the industry catches too many young fish, the quota is effectively reduced in the following years. The US delegation stated that they have two observers on every boat. Observers measure the size composition of the catch. The US conservation goals are on female spawning biomass, they have very strict quota regulations, when the quota is reached the fishery is closed. Pollock caught in other fisheries are also counted against this quota.

4.5.3. The Russian delegation proposed that it is necessary to unite research efforts of all Convention nations and increase the study of Bering Sea pollock reproduction and subpopulation structure for a better understanding of factors affecting the recovery of the Aleutian basin stocks.

4.5.4. The meeting concluded that numerous factors influence basin pollock stock recovery. The factors discussed included climate change, predation, and possible changes in migration route. No one factor was identified as being solely responsible for the lack of biomass recovery. The parties agreed that continued research is required.

4.6. The effects of the moratorium and its continuation

4.6.1. The Korean, Japanese, and Polish delegations voiced their concerns that after 13 years of moratorium the stock has not appeared to recover and that perhaps the parties should consider other management options. Conservation and management issues need to be addressed in a broader geographical context including migration and spawning areas in waters adjacent to the convention area.

4.6.2. Russian delegation suggested that it would be useful to improve survey techniques, in particular conducting ichthyoplankton surveys would aid in the understanding of the effects of climate variability on early life stage survival.

4.7. Methodologies to determine Allowable Biological Catch (ABC) and Allowable Harvest Level (AHL)

4.7.1. Mr. Steve Barbeaux (US) presented on the techniques used by the US NPFMC Science and statistical committee to set ABC in the US Bogoslof region (attachment 3 and attachment 11).

4.7.2. The parties discussed options for ABC but it was the feeling of the S&T that these discussions were premature and that the S&T needed to first determine the appropriate method for calculating the biomass in the whole Aleutian Basin.

4.7.3. All parties agreed that there is insufficient scientific and technical information to determine a biomass in the whole Aleutian Basin.

4.7.4. Japan voiced concern that lacking estimation of the biomass from the whole basin area a direct calculation of ABC could not be applied.

4.7.5. All parties agreed that since there was insufficient science and technical information available to allow the parties to establish the Aleutian basin pollock biomass the biomass will be determined as per the Annex of the Convention Section b.

4.8. Recommendation on AHL

4.8.1. Korea recommended that AHL be set equal to ABC. Poland, China, and Japan concurred.

4.8.2 The US recommended that the AHL be set in the Annual conference.as AHL determinations should consider issues broader than the scientific and technical issues. Russia supported the US position.

5. Discussion of Enforcement and Management Issues

5.1. Trial fishing terms and conditions for 2007

5.1.1. The Japanese stated that they wished to conduct trial fishing in November 2006 but do not have specific plans as of yet. If trial fishing was not possible they proposed to conduct a scientific survey in the Aleutian basin area in November 2006. Plans would be set by September 30 and they would be able to provide plans to the other parties to the convention within the first week of October.

5.2. Components and Recommendations

5.2.1. No further components or recommendations were discussed.

6. Other Matters and Recommendations

6.1.1. The parties agreed that the Genetics and Survey working groups should provide an annual report on progress to the S &T committee at the annual conference.

6.1.2. The S&T committee wanted to reaffirm the recommendation that a group led by Dr. Nishimura (Japan) and consisting of members from each delegation (Korea: Dr. Soon-Song Kim, Russia: Dr. Alexander Glubokov, Poland: Dr. Jerzy Janusz, US: Dr. Mike Canino, China: Mr. Liu, Xiaobing) should be organized to discuss the planning of a workshop on pollock genetics similar to that convened in Yokohama, Japan. This workshop should use the recommendations from the Seattle workshop as a basis for their agenda. The genetics workshop plan will be discussed and decided upon by the S&T delegates at the next annual meeting.

7. Report to the Annual Conference

7.1. The Chair of the S&T gave the S&T report to the Annual Conference.

8. Closing Remarks

8.1. The Chair thanked all the participants of the S&T for their thoughtful discussions, and thanked the rapporteurs for compiling the written report. With that, the Chair closed the S&T meeting on Thursday, September 7, 2006.

List of Attachments:
1. S&T Committee Participants for 2006
2. S&T Agenda for 2006
3. Supporting Information Submitted by the United States Delegation to the 11th Annual Conference of the Parties to the Convention on the Conservation and Management of Pollock Resources in the Central Bering Sea, with amended tables (pdf)
4. Preliminary report on the Korean trial fishing for walleye pollock in the Convention Area in the Bering Sea in 2006 - Korea
5. Results of 2006 Bogoslof EIT Survey – USA (Powerpoint)
6. Preliminary results from the Navarin Region bottom trawl survey conducted by the R/V Pioneer Nikolayeva – Russia
7. Summary of Russian population genetic research of pollock in 2006 – Russia
8. US Stock assessment presentation – USA (Powerpoint)
9. 2006 Aleutian Islands Cooperative Acoustic Survey Study – USA (Powerpoint)
10. Climate change and walleye pollock biomass in the Aleutian Basin - Russia (Powerpoint)
11. US methods for setting ABC in the Bogoslof Region – USA (Powerpoint)

List of Participants

CHINA

BAOYING Zhu
Post: Senior Officer
Organization: Ministry of Agriculture, Division of International Cooperation, Bureau of Fisheries
Phone: +86 10 64192974
Fax: +86 10 64192951
E-mail: inter – coop@agri.gov.cn

YING QI Zhou
Post: Professor
Organization: Shanghai Fisheries University
Phone:+86 21 65710350
Fax: + 86 21 6570350
E-mail: yqzhou@shfu.edu.cn

JAPAN

Hiromi ISA
Post: Assistant Director
Organization: Fisheries Agency, Far Seas Fisheries Division, Department of Resources Management
Phone: 813 3502 2443
Fax: 813 3591 5824
E-mail: isa_hiromi@nm.maff.go.jp

Akira NISHIMURA
Post: Associate Division Director for Research
Organization: Fisheries Research Agency, Subarctic Fisheries Resources Division, Hokkaido National Fisheries Research Institute
Phone: +81 154 92 1726
Fax: +81 154 91 9355
E-mail: anishimu@fra.affrc.go.jp

Hajime ONISHI
Post: Secretary
Organization: National Federation of Medium Trawlers
Phone: (Tokyo)813(3508)0361
Fax: 813 (3508)0364

Gerard JASTRZĘBSKI
Interpreter

Sławomir SZULC
Interpreter

KOREA

Gyoo Ho PARK
Post: Director
Organization: Ministry of Maritime Affairs & Fisheries
Phone: + 82 2 3674 6030
Fax: + 82 2 3674 6996
E-mail: park0301@hanmail.net

Jeongseok PARK
Post: Assistant Director of International Cooperation Team
Organization: Ministry of Maritime Affairs & Fisheries
Phone: + 82 2 3674 6994
Fax: + 82 2 3674 6996
E-mail: jspark@momaf.go.kr

Hyun- Su JO
Post: Scientist
Organization: National Fisheries Research & Development Institute
Phone: + 82 51 720 2331
Fax: + 82 51 720 2337
E-mail: hsjo@nfrdi.re.kr

POLAND

Sebastian FILIPEK-KAŹMIERCZAK
Post: Under-Secretary of State
Organization: Ministry of Agriculture and Rural Development
Phone: + 48 22 623 15 14
Fax: + 48 22 623 11 02
E-mail:

Stanisław PODLEWSKI
Post: Director, Fisheries Department
Organization: Ministry of Agriculture and Rural Development
Phone: +48 22 623 14 71
Fax: +48 22 623 22 04
E-mail: stanislaw.podlewski@minrol.gov.pl

Leszek DYBIEC
Post: Deputy Director
Organization: Ministry of Agriculture and Rural Development, Fishery Department of Ministry
Phone: +48 22 628 96 84
Fax: +48 22 623 22 04
E-mail: leszek.dybiec@minrol.gov.pl

Lidia KACALSKA- BIEŃKOWSKA
Post: Head of Division
Phone: +48 22 623 25 66
Fax: +48 22 623 22 04
E-mail: l.kacalska@minrol.gov.pl

Jakub WOLSKI
Post: Ambassador
Organization: Ministry of Foreign Affairs
Phone:
Fax:
E-mail:

Piotr DOLATA
Post: Expert
Organization: Ministry of Foreign Affairs
Phone:
Fax:
E-mail:

Zbigniew KARNICKI
Post: Deputy Director
Organization: Sea Fisheries Institute
Phone: + 48 58 735 62 36
Fax: + 48 58 735 61 10
E-mail: zkarnicki@mir.gdynia.pl

Jerzy JANUSZ
Post: Head of Division
Organization: Sea Fisheries Institute, Department of Biology and Fish Resource Conservation
Phone: +48 58 735 62 14
Fax: +48 58 735 61 10
E-mail: jjanusz@mir.gdynia.pl

Anna JOHANSSON
Post: International and Regional Arrangements
Organization: European Commission
Phone: +32 2 296 68 11
Fax: +32 2 295 57 00
E-mail: anna.Johansson@ec.europa.eu

Krzysztof RYCHLICKI
Post: President – General Director
Organization: Deep Sea Fishing, Processing and Trading Enterprise DALMOR
E-mail: krychlicki@dalmor.pl

Tomasz DYBEK
Post: Specialist
Organization: Deep Sea Fishing, Processing and Trading Enterprise DALMOR
Phone: +48 58 6276514
Fax: + 48 58 6202886
E-mail: tdybek@dalmor.pl

Jarosław ZIELIŃSKI
Post: Director
Organization: North Atlantic Producers Organization
Phone/fax: + 48 58 668 30 66
E-mail: jarek@paop.org.pl

Tomasz JADOWSKI
Post: Lawyer
Organization: North Atlantic Producers Organization
Phone: + 48 22 840 89 20
Fax: + 48 22 840 89 22
E-mail: paop@paop.org.pl

RUSSIAN FEDERATION

Boris N. KOTENEV
Post: Director
Organization:VNIRO
Phone: +7 495 264 93 87
Fax: +7 495 264 91 87
E-mail: vniro@vniro.ru

Alexander I. GLUBOKOV
Post: Chief of the Department
Organization: VNIRO
Phone: + 74 95 264 9143
Fax: + 74 95 264 9021
E-mail: glubokov@vniro.ru

Yury RYAZANTSEV
Post: Leading engineer
Organization: VNIRO
Phone: +7 495 264 1785

Igor V. MELNIKOV
Post: Deputy Director
Organization: TINRO
Phone: +7 4232 400 311
Fax: +7 4232 300 752
E-mail: melnikov@tinro.ru

Oleg G. ZOLOTOV
Post: Senior scientist
Organization: KamchatNIRO
Phone: +7 415 2 12 34 24
Fax: +7 415 2 11 27 01
E-mail: kamniro@mail.kamchatka.ru

Dimitry A. Ginzburg
Post:Inspector
Organization: Federal Security Service Department
Phone: +8 093 548 3315

Jury N. GRISZYN
Post: Councillor
Organization: Embassy of the Russian Federation in Poland
Phone/fax + 48 22 625 21 02

UNITED STATES

Dr. Loh-Lee LOW
Post: International Fishery Research Coordinator
Organization: Alaska Fisheries Science Center, NOAA
Phone: +206 526 4190
Fax: +206 526 6723
E-mail: loh-lee.low@noaa.gov

Steven J. BARBEAUX
Post: Fishery Research Biologist
Organization: Alaska Fisheries Science Center, Resource Ecology and Fisheries Management Division, NOAA
Phone: +206 526 4211
Fax: +206 526 6723
E-mail: steve.barbeaux@noaa.gov

Patricia A. LIVINGSTON
Post: Director
Organization: Alaska Fisheries Science Center, Resource Ecology and Fisheries Management Division
Phone: +206 526 4172
Fax: +206 526 6723
E-mail: pat.livingston@noaa.gov

Jeff PASSER
Post: Special Agent in Charge
Organization: Office for Law Enforcement, Alaska Enforcement Division
Phone: +907 586 7225
Fax: +907 586 7200
E-mail: jeff.passer@noaa.gov

Paul E. NIEMEIER
Post: Foreign Affairs Specialist
Organization: Office of International Affairs, NOAA
Phone: +301 713 2276
Fax: +301 713 2313
E-mail: paul.niemeier@noaa.gov

Jonathan C. POLLARD
Post: Deputy Alaska Regional Counsel
Organization: NOAA Alaska Region, Office of the General Counsel
Phone: + 907 586 7047
Fax: +907 586 7263
E-mail: jonathan.pollard@noaa.gov

K. Alexandra CURTIS
Post: Oceans Officer
Organization: U.S. Department of State, Bureau of Oceans and International Environmental and Scientific Affairs
Phone: +202 647 5808
Fax: +202 736 7350
E-mail: curtiska@state.gov

Capt. Michael CERNE
Post: Chief of Planning & Force Readiness
Organization: 17th U.S. Coast Guard District
Phone: +907 463 2226
Fax: +907 463 2216
E-mail: michael.b.cerne@uscg.mil

LCDR Lisa A. RAGONE
Post: Chief, Fisheries Law Enforcement
Organization: U.S. Department of Homeland Security, U. S. Coast Guard
Phone: +907 463 2223
Fax: +907 463 2216
E-mail: lisa.a.ragone@ uscg.mil

LCDR Daniel E. SCHAEFFER
Post: Commanding Officer
Organization: U. S. Coast Guard, North Pacific Regional Fisheries Training Center
Phone: +907 487 5662
Fax: +907487 5716
E-mail: daniel.e.schaeffer@uscg.mil

David BENSON
Post: Government Relations
Organization: Trident Seafoods Corporation
Phone: +206 783 3818
Fax: +206 781 7883
E-mail: davebenson@tridentseafoods.com

Alvin R. BURCH
Post: Executive Director
Organization: Alaska Draggers Association
Phone: +907 486 3910
Fax: +907 486 6292
E-mail:alaska@ptialaska.net

Earl E. KRYGIER
Post: Extended Jurisdiction Program Manager
Organization: Alaska Department of Fish and Game
Phone: +907 267 2111
Fax: +907 267 2442
E-mail: earl_krygier@fishgame.state.ak.us

Rick LAUBER
Post: Fishing Industry Consultant
Organization: Aleutian Pribilof Island Community Development Association
Phone: +907 463 3669
Fax: +907 463 3622
E-mail: RickLauber@aol.com

Paul MACGREGOR
Post: General Counsel
Organization: At-Sea Processors Association
Phone: +206 285 5139
Fax: +206 285 1841
E-mail: pmacgregor@mundtmac.com

Dr. Richard MARASCO
Post: Fishery Economist
Organization: Attending on Behalf of the North Pacific Fishery Management Council Anchorage
Phone/fax: +425 788 2546
E-mail: richmarasco@hotmail.com

Brent C. PAINE
Post: Executive Director
Organization: United Catcher Boats
Phone: +206 282 2599
Fax: +206 282 2414
E-mail: bpaine@ucba.org

Bill TWEIT
Post:
Organization: Department of Fish and Wildlife, Distant Waters and Columbia River Policy Lead,
Washington
Phone: +360 902 2723
Fax: +360 902 2158
E-mail: tweitwmt@dfw.wa.gov

Thorn SMITH
Post: Executive Director
Organization: North Pacific Longline Association
Phone: +206 282 4639
Fax: +206 282 4684
E-mail: thorndog@worldnet.att.net

CHAIR
Patricia A. LIVINGSTON

SC CHAIR
-

INTERPRETETER
Beata BADUCHOWSKA
Małgorzata TRYBA
Tadeusz TRYBA

11th ANNUAL CONFERENCE OF THE PARTIES TO THE CONVENTION ON THE CONSERVATION AND MANAGEMENT OF POLLOCK RESOURCES IN THE CENTRAL BERING SEA

AGENDA OF THE MEETING OF THE SCIENTIFIC AND TECHNICAL COMMITTEE

5-7 September 2005 – Warsaw, Poland

1. **Opening remarks**

2. **Appointment of Rapporteur**

3. **Adoption of Agenda**

4. **Discussion of Science Issues**
   - 4.1. Update catch and effort statistics
   - 4.2. Review results of trial fishing
   - 4.3. Review results of research cruises
   - 4.4. Review the status of Aleutian Basin pollock stocks
   - 4.5. Factors affecting recovery of the stocks
   - 4.6. The effects of the moratorium and its continuation
   - 4.7. Methodologies to determine Allowable Biological Catch (ABC) and Allowable Harvest Level (AHL)
   - 4.8. Recommendation on AHL

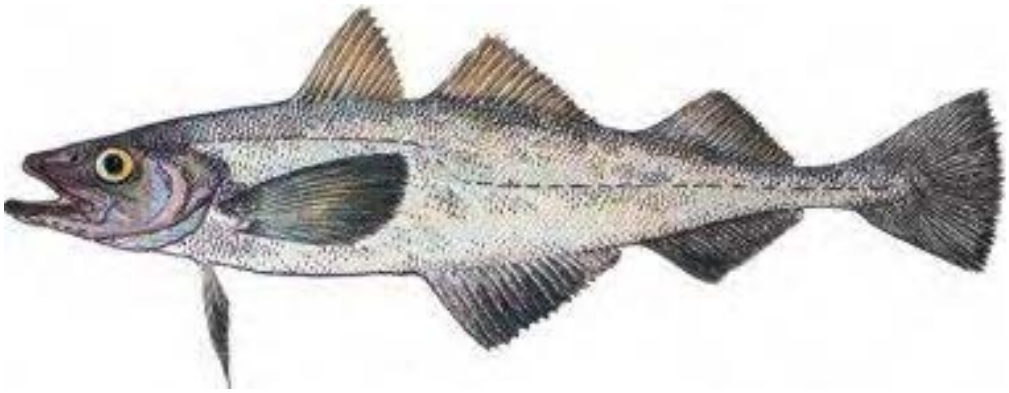
5. **Discussion of Enforcement and Management Issues**
   - 5.1. Trial fishing terms and conditions for 2005
   - 5.2. Components and Recommendations

6. **Other Matters and Recommendations**

7. **Report to the Annual Conference**

8. **Closing Remarks**

Supporting Information Submitted by the United States Delegation to the Eleventh Annual Conference of the Parties to the Convention on the Conservation and Management of Pollock Resources in the Central Bering Sea



September 5-8, 2006
Warsaw, Poland

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Year	Olyotorskiy-Karagin (W of 170E)	Navarin Region (E of 170E)	Donut Hole	Bogoslof	Aleutian Region	Eastern Bering Sea	Total Bering Sea
1977	265,000				7,625	978,370	1,250,995
1978	417,000				6,282	979,431	1,402,713
1979	546,000				9,504	935,714	1,491,218
1980	825,000				58,156	958,280	1,841,436
1981	1,133,000				55,516	973,502	2,162,018
1982	976,000				57,978	955,964	1,989,942
1983	1,006,000				59,026	981,450	2,046,476
1984	252,000	503,000	181,200		81,834	1,092,055	2,110,089
1985	134,000	488,000	363,400		58,730	1,139,676	2,183,806
1986	297,000	570,000	1,039,800		46,641	1,141,993	3,095,434
1987	349,000	463,000	1,326,300	377,436	28,720	859,416	3,403,872
1988	475,000	852,000	1,395,900	87,813	30,000	1,228,721	4,069,434
1989	345,000	684,000	1,447,600	36,073	15,531	1,229,600	3,757,804
1990	582,000	232,000	917,400	151,672	79,025	1,455,193	3,417,290
1991	326,000	178,000	293,400	264,760	78,649	1,217,301	2,358,110
1992	282,000	315,000	10,000	160	48,745	1,164,440	1,820,345
1993	288,000	389,000	1,957	885	54,074	1,198,790	1,932,706
1994	204,000	288,900	NA	556	53,224	1,197,224	1,743,904
1995	79,000	427,300	Trace	264	60,184	1,169,614	1,736,362
1996	34,000	753,000	Trace	389	26,597	1,102,579	1,916,565
1997	30,000	735,000	Trace	163	24,721	1,036,789	1,826,673
1998	25,000	719,000	Trace	8	22,053	1,058,288	1,824,349
1999	46,000	639,000	Trace	1	965	889,561	1,575,527
2000	15,000	507,000	Trace	29	1,174	1,019,067	1,542,270
2001	25,000	526,000	0	61	788	1,247,305	1,799,154
2002	8,000	370,000	0	22	1,134	1,331,416	1,710,572
2003	14,600	411,200	0	24	1,653	1,491,356	1,918,833
2004	6,200	424,500	0	0	1,150	1,493,394	1,925,244
2005	4,400	446,800	0	0	1,622	1,483,398	1,936,220
2006*		211,000	0	0	1,599	1,097,872	

* US data through 19 August 2006: Russian Federation data through 15 August, 2006

Sources of Data

U.S. Data, 1979-1992 from Pollock stock assessment document at 7th Annual Conference
1993-2006 data from web site: www.fakr.noaa.gov
Navarin Data, 1994-2001 (from Russian pollock stock assessment document presented by the Russian Party at the 6th annual conference in Poland)
Navarin Data, 1984-1993 (from The Aleutian Basin Pollock Stock in 2001 written by TINRO and presented at 6th annual conference)

Table 2. Estimated Biomass (mt) of Pollock in the Aleutian Basin region of the Convention Area based on assumption that the Bogoslof Survey biomass represents sixty percent of the Aleutian Basin biomass.

Year	Bogoslof Biomass from Surveys, mt	Basin Biomass (Extrapolated Biomass)	Catch mt	Exploitation Rate (%)
1984			181,200	?
1985			363,400	?
1986			1,039,800	?
1987			1,326,300	?
1988	2,396,000	3,993,333	1,395,900	35
1989	2,084,000	3,473,333	1,447,600	42
1990			917,400	?
1991	1,283,000	2,138,333	293,400	14
1992	888,000	1,480,000	10,000	1
1993	631,000	1,051,667	1,957	0
1994	490,000	816,667	0	0
1995	1,020,000	1,700,000	0	0
1996	582,000	970,000	0	0
1997	342,000	570,000	0	0
1998	432,000	720,000	0	0
1999	393,000	655,000	0	0
2000	270,000	450,000	0	0
2001	208,000	346,667	0	0
2002	227,000	378,333	0	0
2003	198,000	330,000	0	0
2004	No survey		0	0
2005	253,000	421,667	0	0
2006*	240,000	400,000	0	0

* 2006 numbers are preliminary

Table 3. Summary of Trial Fisheries on Pollock in the Central Bering Sea Donut Hole Area

Year	Dates	Nation	No. Vessels	Vessel Name	Vessel Days	Data Source (Annual Conference Report)	Catch (KG)	Catch Number
2006	Jul 20-Aug 20	Korea	1	Oriental Angel (Keuk Dong Co	6	11th	0.0	0
2006	Jul 20-Aug 20	Korea	1	Nambuk Ho (Nambuk Fish Co	9	11th	0.0	0
2006	Jul 22-Aug 22	Korea	1	Joosung Ho (Hansung Enterprise Co)	9	11th	0.7	1
2003	Mar 12-26	Korea	2	Man Jeck No. 21, O Yang Ho - 2	27	9th	2.6	2
2003	Oct - Nov	Korea	1	O-Ryong 503	15	9th	0.0	2
2003	Nov 15-27	Russia	1	Pioner Nikolayeva	13	9th	1.6	1
2001	Nov 11-14	China	2	Ming Zhu, Kai Feng	8	7th	0.0	0
2001	Jun 7 - Jul 14	China	1	Kai Tuo	38	6th	*~24.0*	16
2000	Jan 12 - Feb 3	Korea	1	Oriental Discoverer	23	5th	0.0	0
2000	May 11-20	Korea	1	Oriental Ange	10	5th	0.0	0
2000	May 20 - Jun 28	China	1	Kai Chuang	40	5th	*~64.5*	43
1999	Aug 17-30	Poland	1	Homar	14	Polish Delegatior	2.3	2
1999	Apr 29 - May 3	Poland	1	Acamar	5	Polish Delegatior	2.9	2
1998	Sep 3-8	Poland	1	Acamar	6	Polish Delegatior	3.3	2
1997	Oct 12-15	Poland	1	Acamar	4	Polish Delegatior	0.0	0
1997	Aug 16-19	Russia	1	Vigo	4	2nd	0.0	0
1997	Jun & Aug	China	2	?	8	2nd	*< 900.0*	*< 600*
1996	?	China	1	?	?	2nd	?	?
1996	Sep 1-11	Poland	1	Acamar	11	Polish Delegation	244.2	184
1995	Oct 13 - Nov 10	Poland	1	Homar	29	Polish Delegation	?	12
1995	Oct 18 - Nov 12	Poland	1	Acamar	25	Polish Delegation	40.3	31
1993	Jul 2 - Sep 4	Poland	1	Adm. Arciszewski	63	Polish Delegatio	627,500	470,454
1993	Jun 6-14	Japan	1	?	9	unpub ms	?	?
1993	Jul 13-22	Japan	1	?	10	unpub ms	?	?
1993	Nov 12-17	Japan	1	?	6	unpub ms	?	?
1993	Dec 8-17	Japan	1	?	6	unpub ms	?	?

? indicates unknown
Italics indicate non-reported estimated number

Table 4. United States Pollock Catches in metric tons, 1993-2006

Year	E. Bering Sea	Aleutians	Bogoslof	Gulf of Alaska
1993	1,198,790	54,074	885	108,066
1994	1,197,224	53,224	556	110,890
1995	1,169,614	60,184	264	73,248
1996	1,102,579	26,597	389	37,106
1997	1,036,789	24,721	163	89,893
1998	1,058,288	22,053	8	123,805
1999	889,561	965	1	93,422
2000	1,019,067	1,174	29	23,643
2001	1,247,305	788	61	70,485
2002	1,331,416	1,134	22	50,712
2003	1,491,356	1,653	24	48,573
2004	1,493,394	1,150	50	60,929
2005	1,483,398	1,622	0	80,040
Through 29 July 2006	920,683	1,596	0	43,128
Catch Quota for 2006	1,485,000	19,000	10	79,650
Remaining Quota	398,837	17,401	10	36,146

Note: (Data from http://www.fakr.noaa.gov/sustainablefisheries/catchstats.htm)

Table 5. Pollock assessment numbers determined for management of the U.S. 2006 pollock fisheries

Area	OFL	ABC	TAC	TAC/ABC
Eastern Bering Sea	2,090,000	1,930,000	1,485,000	0.77
Aleutians Region	39,100	29,400	19,000	0.65
Bogoslof	50,600	5,500	10	0.00
Gulf of Alaska	110,100	79,650	79,650	1.00

Notations: OFL = Overfishing Level, ABC = Acceptable Biological Catch, TAC = Total Allowable Catch

Table 6. Summary of more recent studies of genetic stock structure in walleye pollock
(Table compiled by Mike.Canino@noaa.gov)

Study	Area	Marker	Results
Mulligan et al. 1992	Eastern BS and GOA	mtDNA RFLP	significant genetic heterogeneity. Donut Hole and Bogoslov more similar than Adak or GOA
Shields and Gust 1995	BS, Aleutians, GOA	mtDNA sequence	no genetic heterogeneity among samples. Pooled samples Western BS differentiated from Eastern BS, Donut Hole (n = 8)
Kim et al. 2000	Korea -Bogoslov	mtDNA RFLP	no significant genetic heterogeneity
Olsen et al. 2002	Western north Pacific, Eastern BS, GOA, PWS	mtDNA RFLP allozyme microsatellites	east -west heterogeneity between Asian and N American populations regional heterogeneity among GOA samples (PWS vs SHEL) Discordant results between BS and GOA - significant differentiation observed with allozymes and mtDNA but in different years
O'Reilly et al. 2004	Western north Pacific, North Central BS, Eastern BS, GOA, Puget Sound	microsatellites	weak structuring (global F_{ST} = 0.004) genetic isolation by distance over moderate scales (~1500 km) sign. genetic differentiation between NCBS and GOA
Canino et al. 2005	Western north Pacific, North Central BS, Eastern BS, GOA, Puget Sound	pantophysin (*Pan* I) locus	stronger differentiation than observed with microsatellites (global F_{ST} = 0.038) north-south cline in *Pan* I allele frequencies correlated with water temperature North Central BS sample differentiated from Eastern BS and PWS sample
Grant et al. In press	reanalysis of mtDNA data from first 4 studies above, plus new mtDNA sequence data from Puget Sound	mtDNA	Five haplotypes gave range of F_{ST} estimates from 0.011-0.058. most common haplotype showed north-south cline and was correlated with water temperature and geographic distance haplotype numbers and homozygosity revealed widespread departures from neutrality, suggesting the effects of temperature-mediated selection in the EBS and North Pacific

Approaches for setting ABC in the Bogoslof Region under US Fishery Management practices

James Ianelli and Steve Barbeaux
AFSC NMFS/NOAA
Seattle WA 98115

Stock status summary

The National Marine Fisheries Service has conducted echo-integration-trawl (EIT) surveys for Aleutian Basin pollock spawning in the Bogoslof Island area annually since 1988, with three exceptions: a Bogoslof Island area EIT survey was not conducted in 1990, 2004 and in 1999 the survey was conducted by the Fisheries Agency of Japan. The annual Bogoslof Island area EIT survey results (Fig 1) suggest that the spawning population can be described in three periods with regards to geographic distribution, dominant year class, and total biomass. In the first period,1988-93, pollock covered a wide area surrounding Bogoslof Island and the population was dominated by the 1978 year class. The average estimated biomass in the "specific area" was 1.456 million t. During the second period, 1994-99, the primary spawning location shifted to inside Samalga Pass, and the population was dominated by the 1989 year class. The average estimated biomass declined to 0.543 million t. During the third period, 2000-present, the primary spawning locations were Samalga Pass and to a lesser extent, northeast Umnak Island. Year-class dominance has alternated between the 1989 and younger year classes (1992, 1996, and 2000) and the average biomass is about 0.231 million t (Honkalehto et al 2005).

The 1989 year class moved into the Bogoslof Island area and was partly responsible for the 1995 increase (Fig. 2), but the abundance of all ages increased between 1994 and 1995. The decrease between 1995 and 1996 was followed by a continued decline in 1997. This suggests that the 1995 estimate may have been over-estimated, or that conditions in that year affected the apparent abundance of pollock. The summary Bogoslof Island area EIT survey biomass estimates, 1988-2006, are shown in Table 1. The 2006 Bogoslof EIT survey shows a 38% increase in the numbers of pollock under 50 cm FL from the 2005 survey with the largest increase in fish between 43 and 49 cm FL. Although age-at-length results from the 2006 survey are not yet available, this size range is consistent with 5-6 year old fish. The current population levels on the eastern Bering Sea shelf, and the absence of extremely large year classes, suggests that pollock distribution throughout the Bering Sea has shifted. The extent that this is due to environmental causes is unclear.

The information available for pollock in the Aleutian Basin and the Bogoslof Island area indicates that these fish belong to the same "stock". The pollock found in winter surveys are generally older than age 5 and are considered distinct from eastern Bering Sea pollock. Data on the age structure of Bogoslof-Basin pollock show that a majority of pollock in the Basin originated from year classes that were also strong on the shelf, 1972, 1978, 1982, 1984, 1989, 1992, 1996, and 2000 (Fig. 3). There has been some indication that there are strong year classes appearing on the shelf that have not been coincidentally as strong (in a relative sense) in the Bogoslof region (Ianelli et al., 2001). The conditions leading to strong year classes of pollock in the Basin appears to be density related and may be functionally related to abundance on the shelf. Additional information relating the total mortality of the 1992 cohort shows that the estimate is much higher than expected in the Bogoslof region compared to the EBS shelf (Fig. 4).

Differences in spawning time and fecundity have been documented between eastern Bering Sea pollock and Aleutian Basin pollock. Pollock harvested in the Bogoslof Island fishery (Area 518) have noticeably different age compositions than those taken on the eastern Bering Sea shelf. For example, the average number of age 15 and older pollock observed from the Bogoslof EIT survey since 1988 is 18% while for

the same period in the EBS region, age 15 and older averages only 2% (by number for all fish older than age 7). Pollock in the northern shelf have a similar size at age as Aleutian Basin pollock although a very different age composition. However, Aleutian Basin pollock may not be an independent stock. Very few pollock younger than 5 years old have ever been found in the Aleutian Basin including the Russian portion. Recruits to the basin are coming from another area, most likely the surrounding shelves either in the US or Russian EEZ.

Computation of ABC and OFLs

Since 1999 the North Pacific Fishery Management Council (NPFMC) have generally been presented with a number of alternative methods for computing ABC values for the Bogoslof region. These have included:

1) Using a biomass-adjusted harvest rate rule (with 2,000,000 ton estimate as a target stock size) with an estimate of a F_{ABC} based on growth, natural mortality, and maturation rate.

2) Using a harvest rate as a simple fraction of natural mortality rate (e.g., F_{ABC} =0.75M) .

3) An approach using a simple age-structured model.

The NPFMC Science and Statistical Committee (SSC) considered the third approach using an age-structured model to be inappropriate since it covered only part of the stock. The approach 1) and 2) above are provided below for comparison (along with alternative assumptions about F_{ABC} level for 1). The section included in this document reviews the details of the current NPFMC's Tier system for setting ABCs and OFLs.

Using method 1) above and given the survey estimate of exploitable biomass of 0.240 million t and M = 0.2 and considering of a target stock size of 2 million tons, the F_{ABC} level is computed as:

$$F_{abc} \le F_{40\%} \bullet \left(\frac{B_{2005}}{B_{40\%}} - 0.05 \right) \Big/ \left(1 - 0.05\right) .$$

Assuming that $F_{40\%}$ = 0.27 (as in past assessments), this gives a fishing mortality rate of 0.0199 that translates to an exploitation rate of 0.0197. This value multiplied by 240,000 t, gives a **2007 ABC of 4,775 t for the Bogoslof region.** The value assumed for $F_{40\%}$ that is critical for this calculation was based on uncertain assumptions about selectivity, natural mortality, growth, and maturation. Some of these assumptions were reevaluated here using a simple knife-edged selectivity at age 4 and age 5. Female pollock were specified to be 50% mature by age 5 and immature for younger pollock and 100% mature for older pollock with a natural morality of 0.3. This results in an $F_{40\%}$ level of 0.22 for age-4 knife edge assumption and $F_{40\%}$ = 0.33 for the age-5 knife-edge assumption. These two scenarios provide ABCs for 2007 that would be 3,891 t or 5,836 t for the age-4 and age-5 knife edge assumptions, respectively. Clearly, these rules are sensitive to assumptions about expected selectivity, assumed growth, natural mortality, and maturation rates.

The approach for computing ABC levels under 2) above (a Tier 5 computation) simply uses the most recent survey biomass estimate applied to an adjusted natural mortality. Given a value of *M=0.3* then the ABC level would be (2006 survey biomass × M × 0.75) of **54,000 t** at a biomass of 240,000 t. With M = *0.2,* the ABC would be 36,000 t.

Further work on developing a simple age-structured model tuned to the EIT winter survey data (Fig. 5) suggest that, by the same NPFMC rules used for setting groundfish ABCs, the current Bogoslof stock size is about 75% of the target level ($B_{40\%}$) and that the "unfished" level (given observed recruitment at age 6 to this region) is approximately 330,000 t (female spawning biomass). This is substantially lower than the 1 million t "target" currently in use. Forward simulations using this model result (and fishing using

the maximum permissible ABC) shows that the 90 percentile range of female SSB is between about 50,000 t and 430,000 t while under a no-fishing scenario, this range increases to nearly 1 million t (Fig. 6). This reflects the main characteristic that seems to prevail for basin pollock: they are highly susceptible to year-class variability.

In summary, there is a range of ABC levels that have been calculated under the NPFMC guidelines. The second approach results in the highest ABC level since the levels are not adjusted by some perceived target level. The first approach results in ABC levels that are nearly an order of magnitude lower due to the built-in adjustment to recover stock sizes to a target level. This approach was sensitive to assumptions about selectivity (and maturation rates). The age-structured model, while not accepted by the SSC due to stock structure concerns, could be argued to represent an alternative method to set ABCs and subsequent TACs. In practice, all of these approaches undergo scientific review each year in light of available data. The NPFMC has a record of being very conservative and setting a low ABC level and NMFS has responded by prohibiting any directed pollock fishery in this region.

Literature cited

Honkalehto, T., D. McKelvey, and N. Williamson. 2005. Results of the March 2005 echo integration-trawl survey of walleye pollock (*Theragra chalcogramma*) conducted in the Southeast Aleutian Basin near Bogoslof Island, Cruise MF2005-03. AFSC Processed Report 2005-05

Ianelli, J.N., T. Buckley, T. Honkalehto, N. Williamson and G. Walters. 2001. Bering Sea-Aleutian Islands Walleye Pollock Assessment for 2002. *In*: Stock assessment and fishery evaluation report for the groundfish resources of the Bering Sea/Aleutian Islands regions. North Pac. Fish. Mgmt. Council, Anchorage, AK, section 1:1-105.

Ianelli, J.N.,S. Barbeaux, G. Walters, T. Honkalehto, and N. Williamson. 2004. Bering Sea-Aleutian Islands Walleye Pollock Assessment for 2004. *In*: Stock assessment and fishery evaluation report for the groundfish resources of the Bering Sea/Aleutian Islands regions. North Pac. Fish. Mgmt. Council, Anchorage, AK, section 1:37-126.
http://www.afsc.noaa.gov/refm/docs/2004/EBSpollock.pdf

Table 1. Biomass of pollock as surveyed in the Bogoslof region, 1988-2006. Note that in 1999 the Fishery Agency of Japan conducted the survey.

Biomass (millions of t)

Year: 1988	1989	1990	1991	1992	1993	1994	1995	1996
2.4	2.1	-	1.3	0.9	0.6	0.49	1.1	0.68

Year: 1997	1998	1999	2000	2001	2002	2003	2004	2005
0.39	0.49	0.48	0.30	0.23	0.23	0.20	-	0.253

Year: 2006
0.24

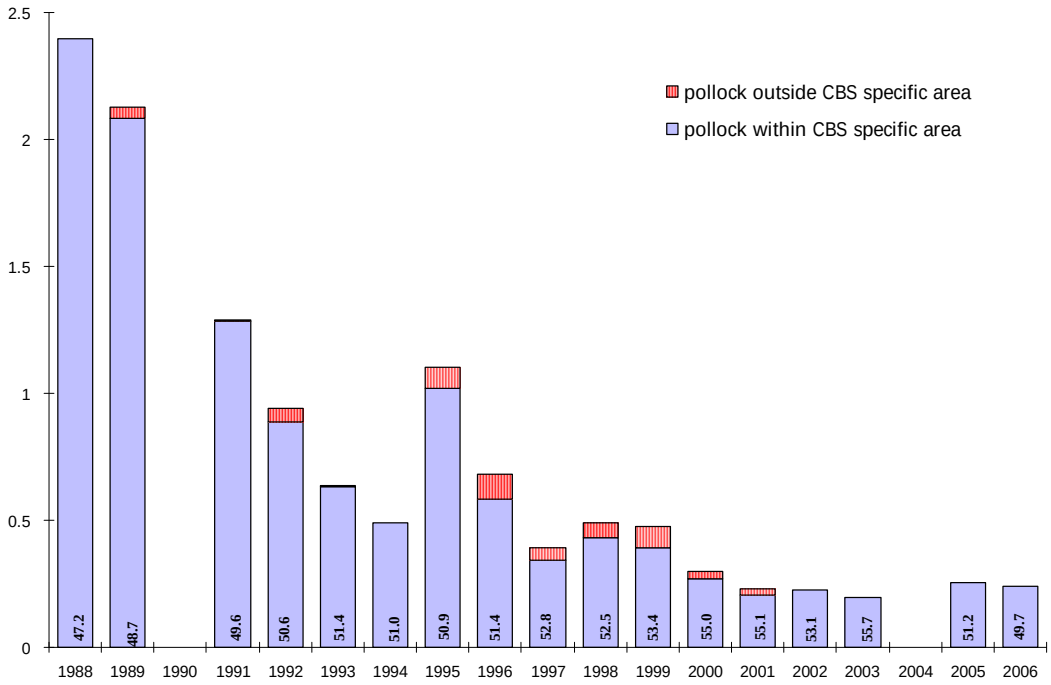


Figure 1. Pollock biomass estimates from the 1988-2005 Bogoslof Area EIT surveys in millions of tons. There were no surveys in 1990 and in 2004. Numbers are mean fork length in centimeters.

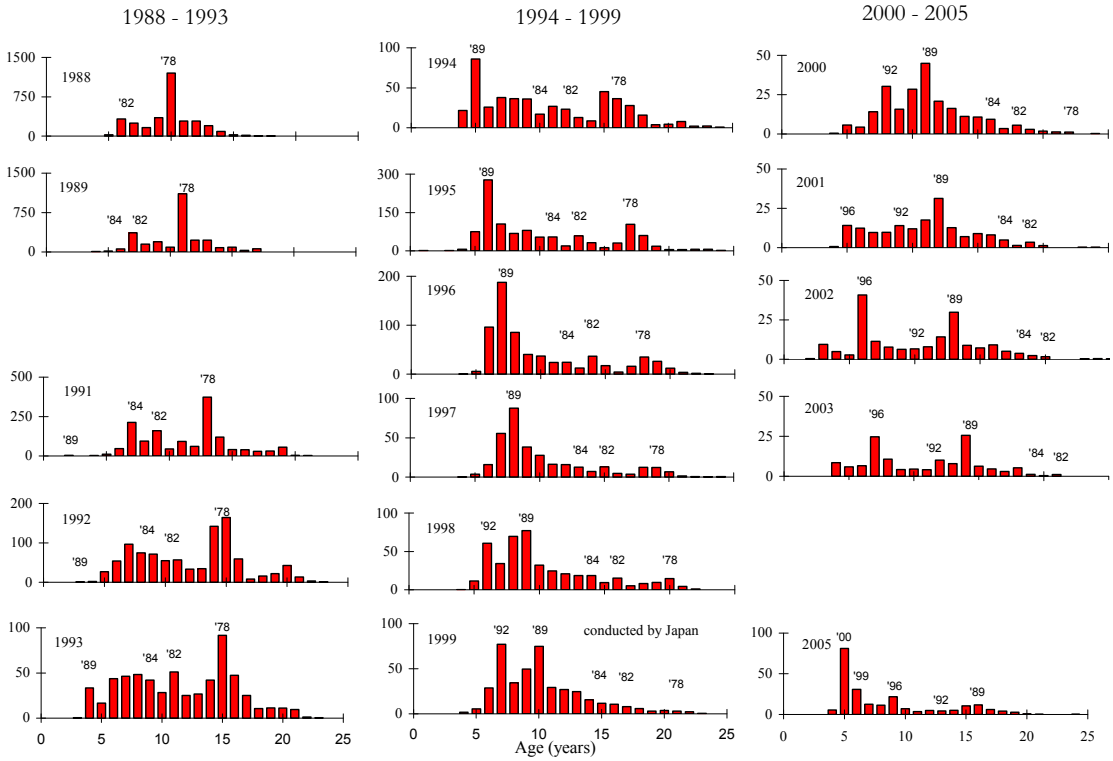


Figure 2. Numbers-at-age estimates (millions) obtained during echo integration-trawl surveys of walleye pollock near Bogoslof Island in winter 1988-2003. Major year classes are indicated. The United States conducted all but the 1999 survey (Japan). No survey was conducted in 1990. Note y-axis scales differ.

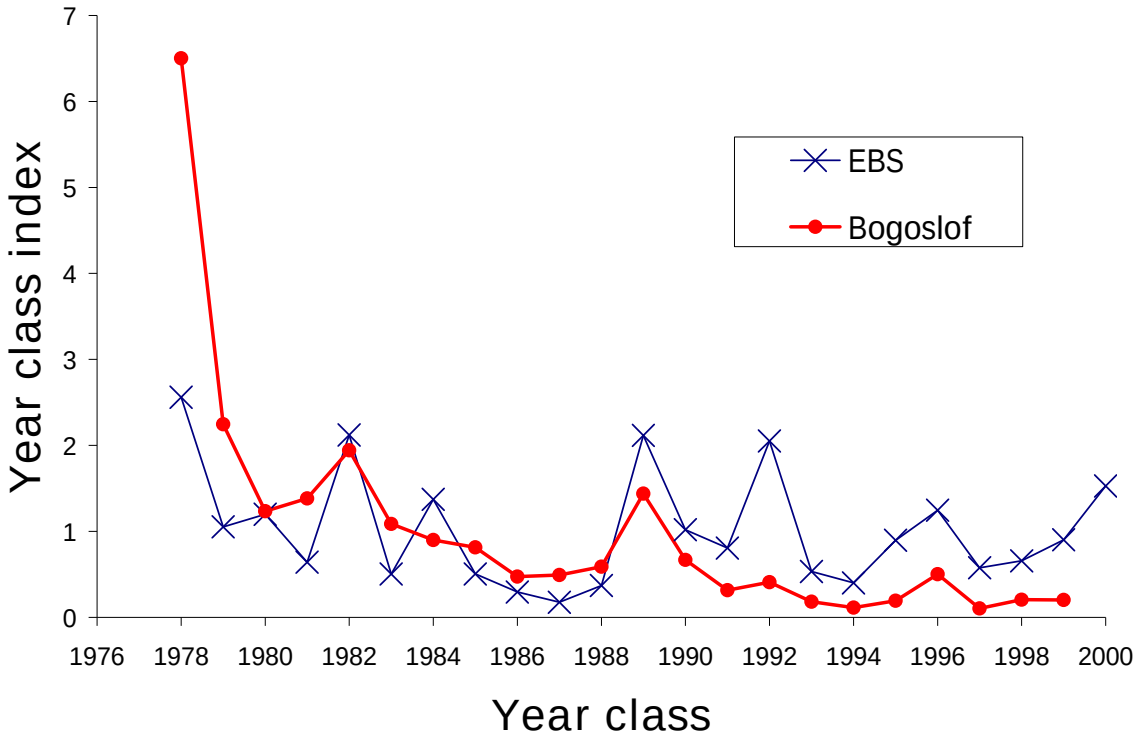


Figure 3. Relative year-class strengths (normalized to have a mean value of 1) for pollock as observed (averaged) from the Bogoslof EIT surveys and from a simple age-structured model for the Bogoslof Island stock compared with those observed from the main EBS pollock stock assessment model (Ianelli et al. 2004).

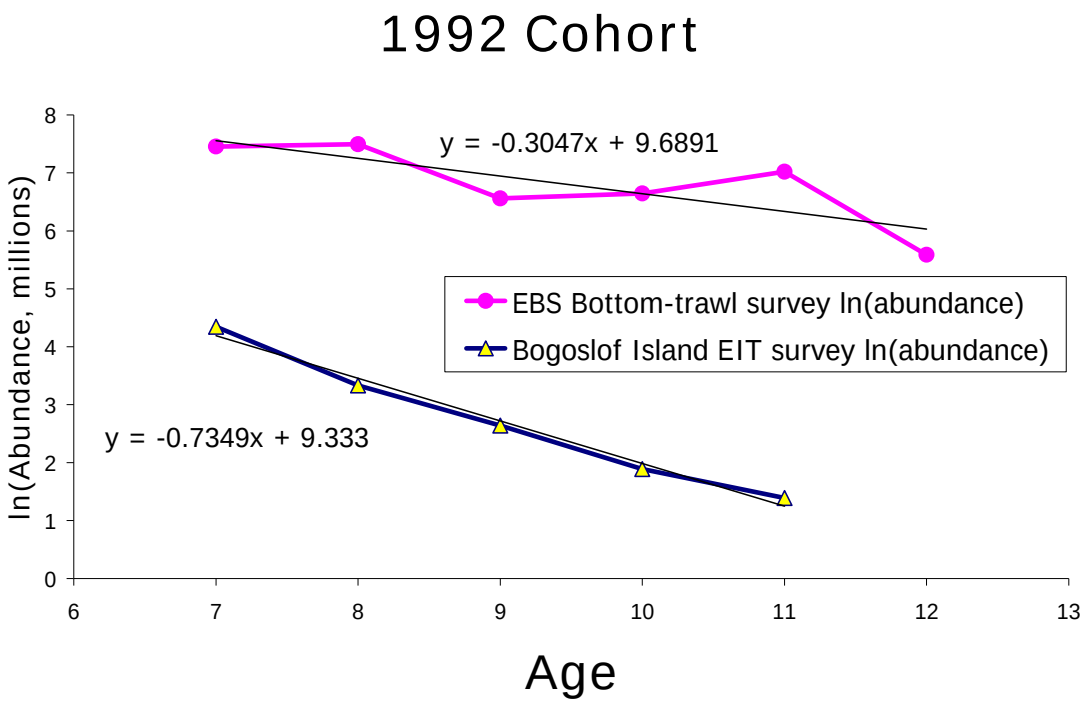


Figure 4. The 1992 pollock cohort abundances-at-age as observed from the EBS summer bottom trawl survey (top lines) and from the EIT survey in the Bogoslof region (lower lines).

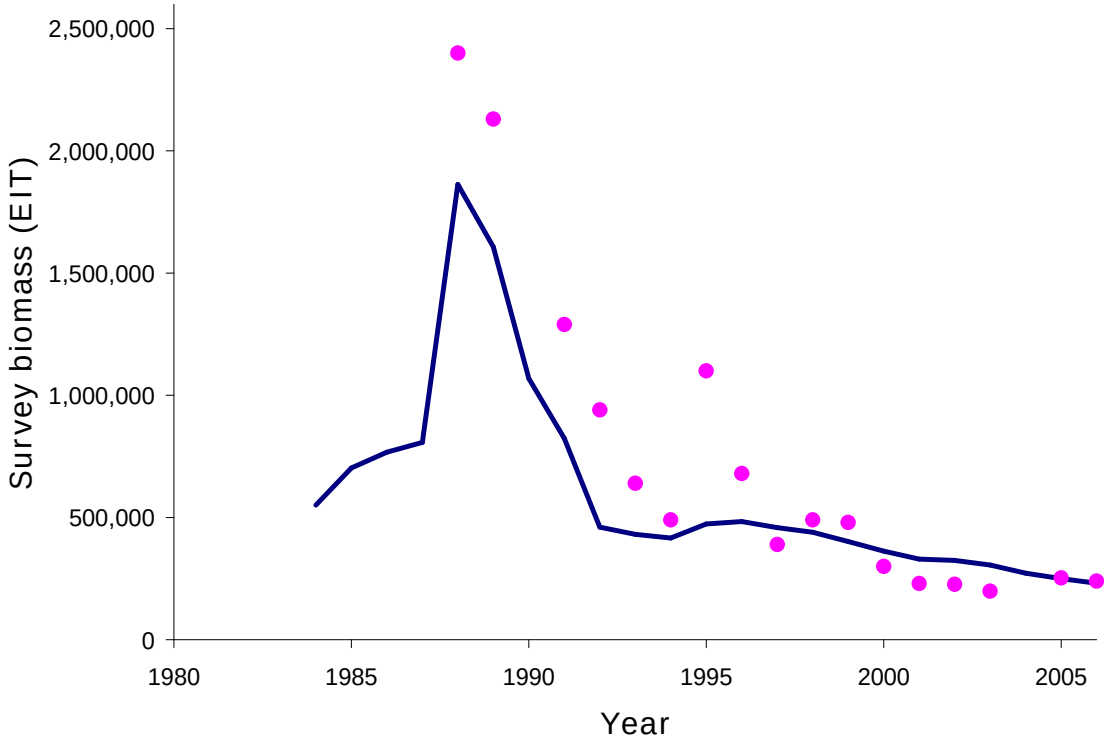


Figure 5. Simple age-structured model (line) tuned to the winter EIT Bogoslof pollock survey biomass estimates (points) 1984-2006.

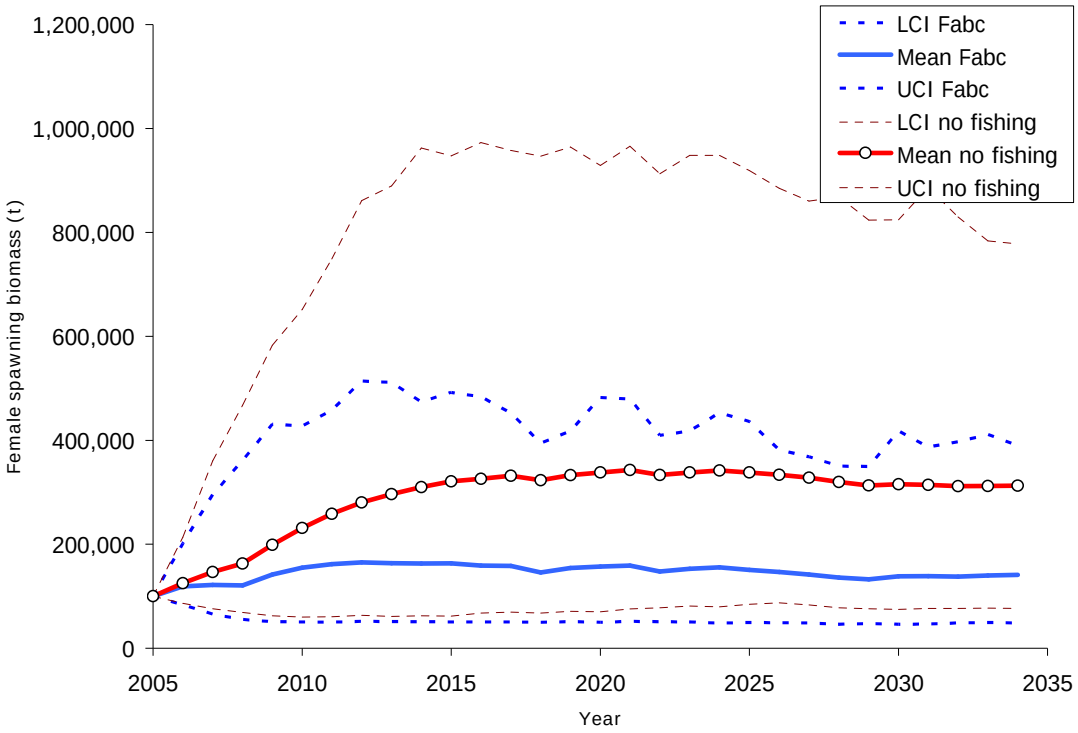


Figure 6. Projection simulations for Bogoslof region pollock based on the simple age structured model under no fishing and under fishing at the maximum permissible rate (as defined for the NPFMC for Tier 3 stocks).

Update on the status of Eastern Bering Sea pollock

August 2006

James Ianelli and Steve Barbeaux
AFSC NMFS/NOAA
Seattle WA 98115

The following is partly extracted from Ianelli et al. (2005). See http://www.afsc.noaa.gov/refm/docs/2005/EBSpollock.pdf for further details.

The pollock fishery in the Eastern Bering Sea (EBS) has averaged 1.41 million t of catch from 2000-2005 and stock levels have been above average. As the stock declines to average (or below) levels, the TAC and catch is anticipated to also decline as shown in the 2005 stock assessment (Ianelli et al. 2005).

In the summer of 2006, bottom trawl and echo-integration trawl surveys where conducted in the eastern Bering Sea and preliminary indications reflect the expected declines from recent high levels of pollock biomass. The biomass estimate from the 2005 NMFS summer bottom-trawl survey was 5.134 million tons, up 37% from the 2004 estimate of 3.756 million t. The 2006 bottom-trawl survey value is expected to be in the range of 2.8 – 3.6 million t based on 2005 model projections. The bottom temperatures collected from this survey indicate colder conditions than in recent years and the extent of the "cold pool" was greater (Fig. 1). This is thought to affect the distribution of pollock in the EBS. The preliminary biomass estimate from echo-integration trawl survey indicates about 1.49 million t, down from 3.3 million t estimated in 2004 but only about 13% lower than the value projected in the 2005 assessment. Stock levels for EBS pollock appear to be lower overall than estimated in 2005 and is likely a result of the uncertainty and relative age distribution of biomass (Fig. 2). The 2000 year class appears to be above average and the main age group available to the fishery. Subsequent year classes are currently estimated to be below average and apparently result in further short-term declines in abundance (Fig. 3). Projections indicate the ABC will be around 1.1 million t by 2008 (Fig. 4). While current stock levels are quite high, given the expected recruitment and array of year-classes available to this fishery, the stock is expected to decline in the next few years to below target levels.

The 2006 Fishery

Preliminary results for the 2006 fishery indicate that production rates were equal to or greater than in recent years except that the 2006 summer production appears to be slightly lower (Fig. 5). Salmon bycatch has increased in recent years and this has regulatory implications on the pollock fishery. Analyses on the bycatch patterns suggest that the increased levels of salmon bycatch are due to greater abundance of salmon in the area rather than changes in the spatio-temporal pattern of the pollock fishery (Fig. 6).

Currently, scientists at the AFSC continue to work closely with the industry and Universities to develop unique ways to evaluate movement patterns on small and medium-scales in the EBS. This includes opportunistically collected acoustic data aboard commercial fishing vessels and developing multi-area, age-specific seasonal movement models. These developments will help understand the dynamics and biology of pollock spawning and feeding aggregations and provide insight on the possible information that might be derived from a tagging program for pollock.

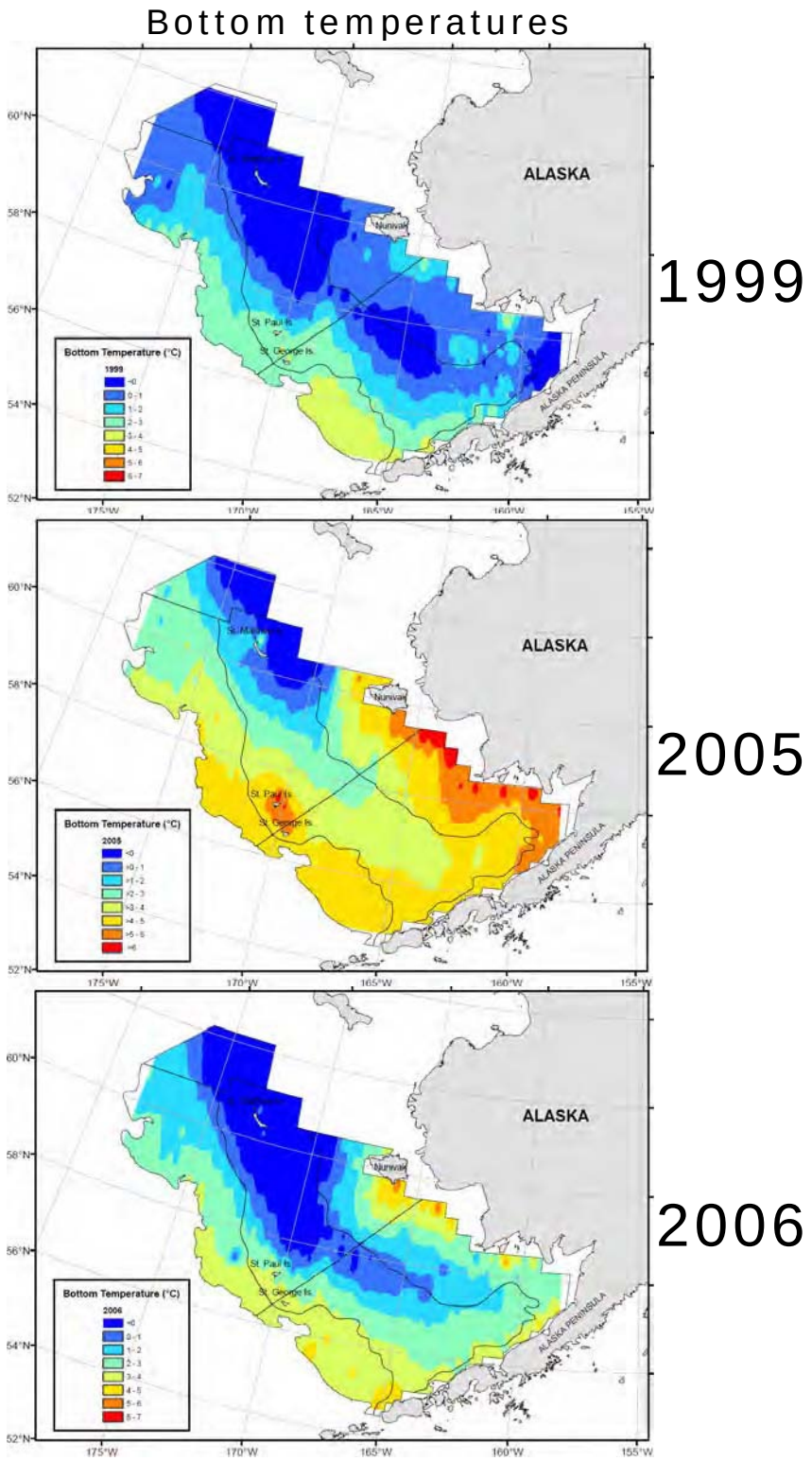


Figure 1. Summer bottom-temperature distributions observed during NMFS AFSC's bottom-trawl surveys for 1999 (the coldest year since 1982) compared to 2005 (middle panel) and 2006. Figure courtesy of Bob Lauth, NMFS Seattle.

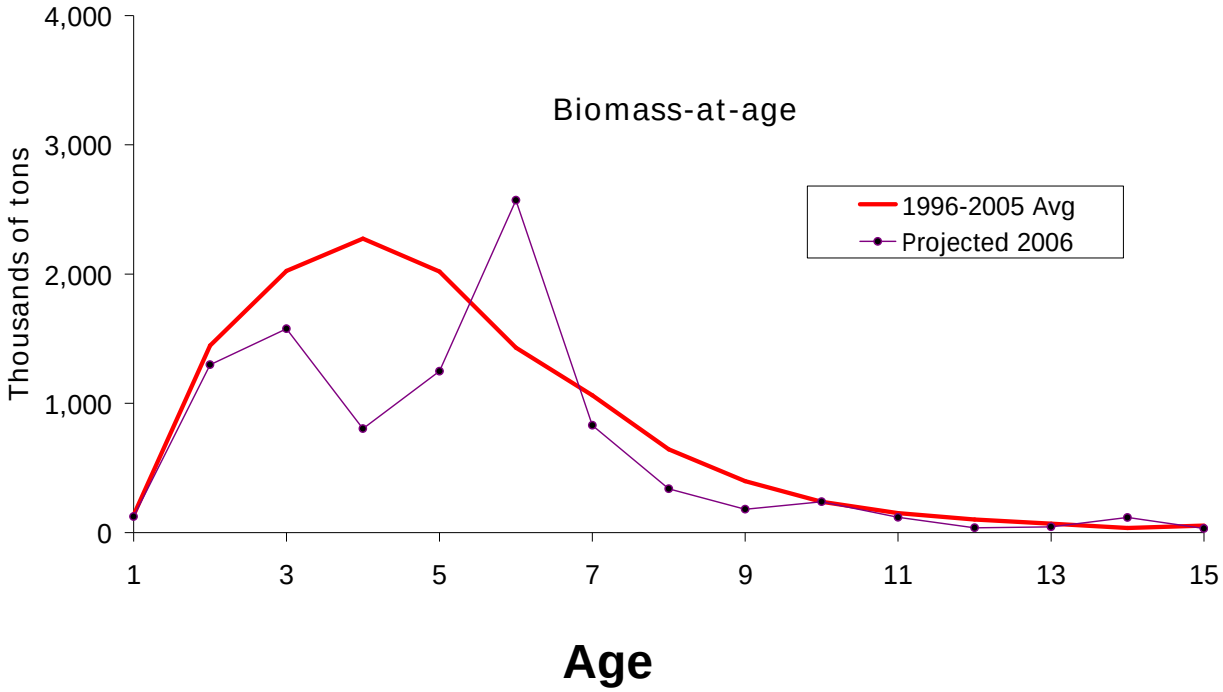


Figure 2. Estimates of the projected 2006 (from the 2005 EBS pollock assessment) compared to the average population biomass-at-age from 1996-2005.

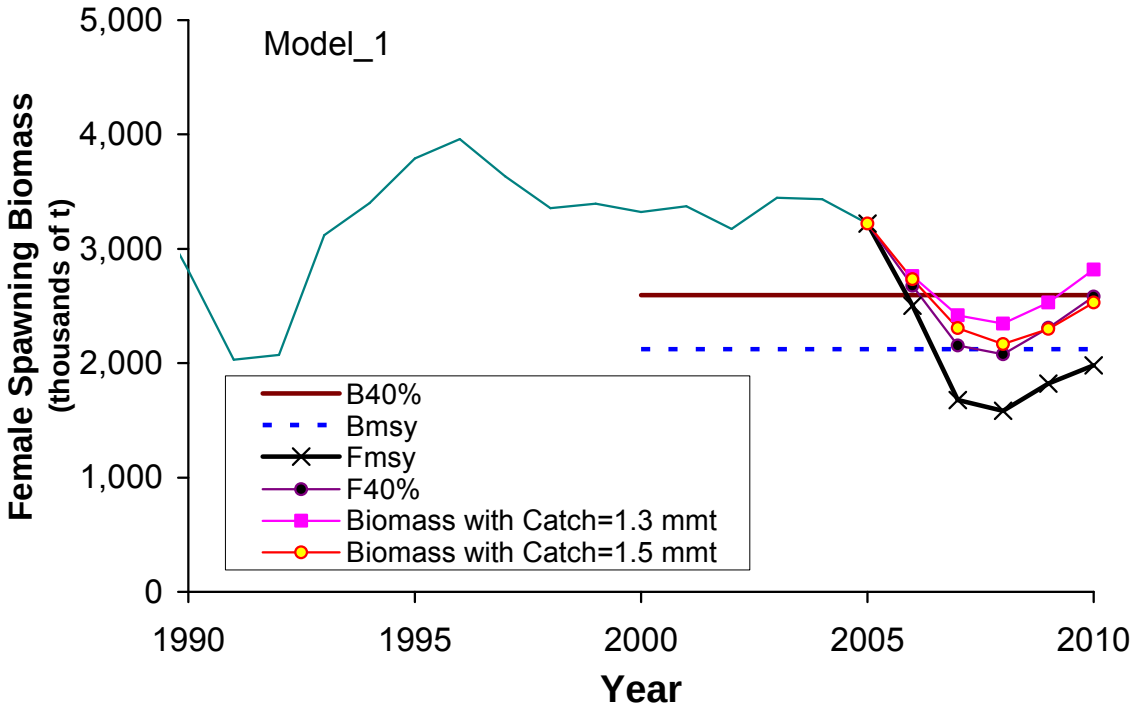


Figure 3. EBS walleye pollock female spawning biomass abundance trends, 1990-2010 as estimated by Ianelli et al., 2005 under different 2006-2010 harvest levels. Note that the F_{msy} and $F_{40\%}$ catch levels are unadjusted arithmetic mean fishing mortality rates. Horizontal solid and dashed lines represent the B_{msy}, and $B_{40\%}$ levels, respectively.

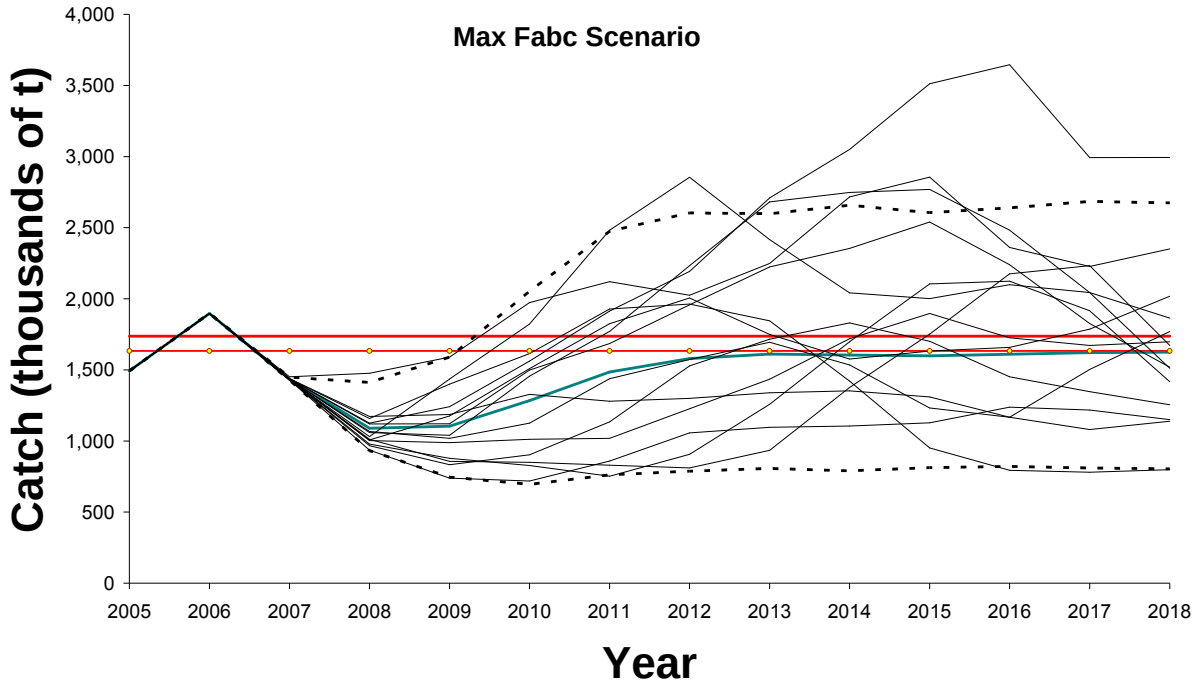
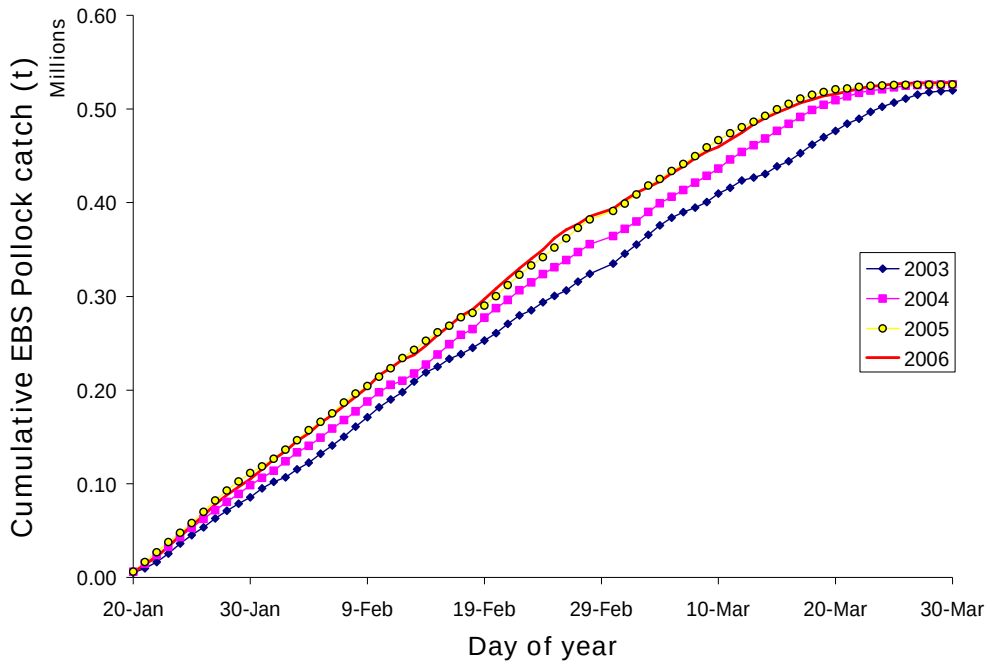
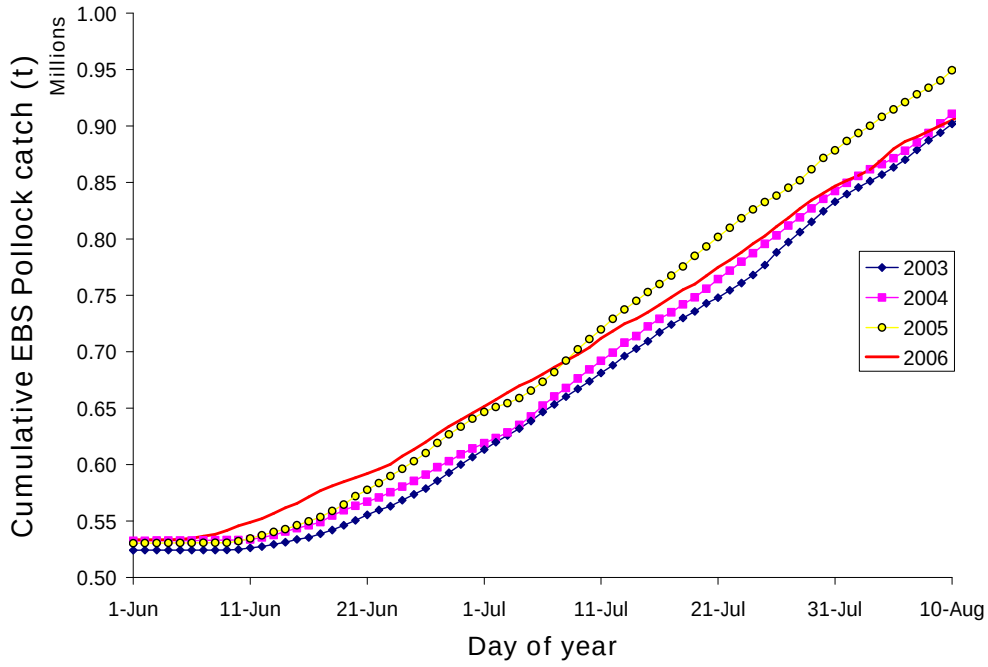


Figure 4. Projected EBS walleye pollock yield relative to the long-term expected values under $F_{35\%}$ and $F_{40\%}$ (horizontal lines) for Model 1. $B_{40\%}$ is computed from average recruitment from 1978-2005. Future harvest rates follow the guidelines specified for north Pacific groundfish such that the max $F_{ABC} = F_{40\%}$.



Jan-Mar



Jun-July

Figure 5. Cumulative catch levels for 2006 compared to recent years for the first season (top) and early summer season (bottom) based on solely observer data.

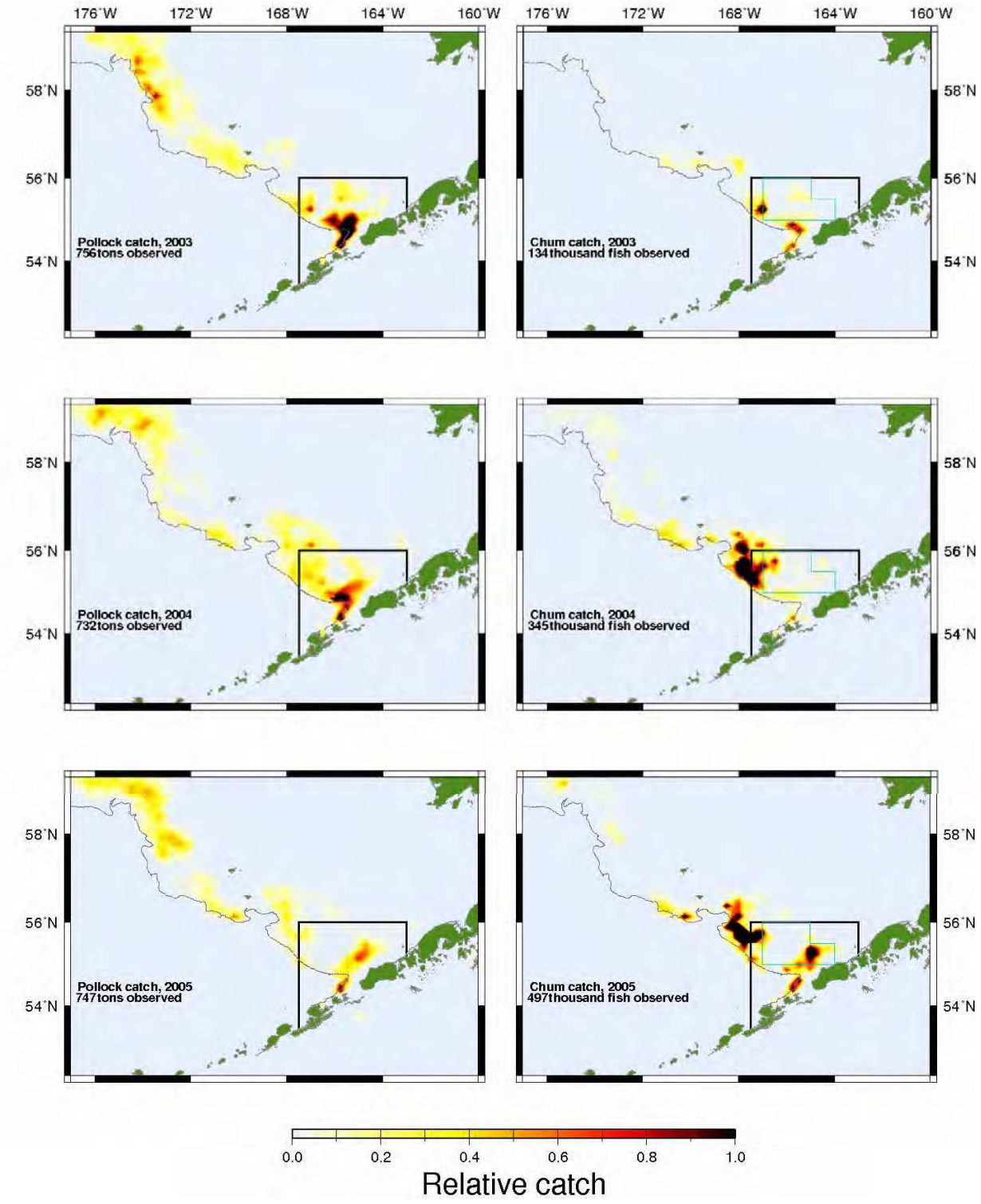


Figure 6. Concentrations of pollock catch (left panels) compared chum salmon bycatch (right panels) for 2004-2006, B-season pollock fishery. Thick line delineates SCA (sea lion conservation area) and the other box represents the salmon conservation area.

Update on the recent research activities and status of Aleutian Islands pollock

Steve Barbeaux and James Ianelli
AFSC NMFS/NOAA
Seattle WA 98115

The following is largely extracted from Barbeaux et al. (2005). See http://www.afsc.noaa.gov/refm/docs/2005/AIpollock.pdf for further details.

Walleye pollock are distributed throughout the Aleutian Islands with concentrations in areas and depths dependent on season. Generally, larger pollock occur in spawning aggregations during February – April. Three stocks of pollock are identified in the U.S. portion of the Bering Sea for management purposes. These are: eastern Bering Sea which consists of pollock occurring on the eastern Bering Sea shelf from Unimak Pass to the U.S.-Russia Convention line; the Aleutian Islands Region encompassing the Aleutian Islands shelf region from 170°W to the U.S.-Russia Convention line; and the Central Bering Sea—Bogoslof Island pollock. These three management stocks probably have some degree of exchange. The Bogoslof stock is a group that forms a distinct spawning aggregation that has some connection with the deep water region of the Aleutian Basin. Bailey et al. (1999) present a thorough review of population structure of pollock throughout the north Pacific region. Recent genetic studies using mitochondrial DNA methods have found the largest differences to be between pollock from the eastern and western sides of the north Pacific.

Previously, Ianelli et al. (1997) developed a model for Aleutian Islands pollock and concluded that the spatial overlap and the nature of the fisheries precluded a clearly defined "stock" since much of the catch was removed very close to the eastern edge of the region and appeared continuous with catch further to the east. In some years a large portion of the pollock removed in the Aleutian Islands Region was from deep-water regions and appear to be most aptly assigned as "Basin" pollock. This problem was confirmed and can be seen in the spatial distribution of historical catch patterns (Fig. 1). Hence, the data used here are organized to cover a region that is more consistent with survey observations and historical fishing patterns (Fig. 2).

The nature of the pollock fishery in the Aleutian Islands Region has varied considerably since 1977 due to changes in the fleet makeup and in regulations. During the late 1970s through the 1980s the fishing fleet was primarily foreign. In 1989, the domestic fleet began operating in earnest and has continued in the Aleutian Islands Region until 1999 when the North Pacific Fishery Management Council (NPFMC) recommended closing this region for directed pollock fishing due to concerns for Steller sea lion recovery. Length frequency data shows rather distinct characteristics when broken out by regions over this period (Fig. 3). There are notable similarities to the patterns over time for data from the eastern portion of the Aleutian Islands. This can also be seen from the mean-length of fish observed in the catch by these regions (Fig. 4). Another characteristic of the Aleutian Islands pollock is that mean length at age has changed substantially over time (Fig. 5). This pattern reflects the areas that are fished during these periods rather that actual changes in growth. I.e., during the early period, most of the pollock were caught towards the eastern edge of the Aleutian Islands region whereas the more recent period the pollock were from catch broadly distributed throughout the region.

The summer bottom trawl survey showed highly variable success in finding pollock in recent years, often with considerable concentrations toward the eastern edge (Fig. 6).

The R/V Kaiyo Maru conducted a survey between 170°W and 178°W longitude in the winter of 2002 after completing a survey of the Bogoslof region (Nishimura et al 2002; Fig. 7). Due to difficulties in operating their large mid-water trawl on the steep slope area they felt their catches in this area were insufficient for accurate

species identification and biomass estimation. They did however come up with some preliminary biomass estimations. For the entire area from 170°W and 178°W longitudes they estimated a biomass of 93,000 mt of spawning pollock biomass with between 61,000 mt estimated in the NRA east of 173°W and 32,000 mt in the remainder of the survey area to 178°W longitude. The largest aggregations in the NRA area were observed at 174°W longitude north of Atka Island. Most of the pollock echo sign was observed along the slope of the Aleutian Islands relatively near shore.

The directed Aleutian pollock fishery was reopened in March 2005, but little pollock was harvested. Of the 19,000 t of pollock allocated to the Aleutian Islands, 195 t were taken in the directed pollock fishery and 1,427 t were taken as bycatch in other fisheries. Reports from fishermen indicated that there was not adequate pollock sign outside of designated Steller sea lion critical habitat closure areas to justify continuation of the fishery. They also reported large quantities of Pacific Ocean perch in both the echosign and bycatch in the areas that vessels were allowed to fish.

In 2006 an acoustic survey study was completed aboard a 32m commercial trawler equipped with a 38kHz SIMRAD ES-60 acoustic system. The Aleutian Islands Cooperative Acoustic Survey Study (AICASS) was conducted to assess the feasibility of using a small commercial fishing vessel to estimate the abundance of pollock in waters off the central Aleutian Islands (Fig. 8). To verify the acoustic data and to support the study, 1000 t of groundfish were allocated to be harvested within an area that included waters within 20 nautical miles (nm) to 3 nm of Steller sea lion haulouts. Six acoustic surveys were successfully conducted between 14 March and 4 April 2006. The area from North Cape of Atka Island to Koniuji Island (~ 1 degree longitude) was surveyed three times while a smaller subset of this area was surveyed on three other occasions. The three larger surveys (180 nm2 with transect spacing at 1.5 nm) were conducted in the beginning (Survey 2), middle (Survey 4), and end (Survey 8) of the study period. Survey 5 was conducted parallel to the shelf break and covered only 9 nm2 (with transects spaced at 0.5 nm). This survey provided data useful for geostatistical analyses. Surveys 6 and 7 covered 72 nm2 with 1.0 nm transect and occurred in the middle of the large survey area coincident with the highest density of pollock. . Survey 2, conducted 14-15 March 2006, provided a biomass estimate for pollock of 8,910 t. The biomass estimate for subsequent surveys were lower (although not statistically significantly lower for Survey 4) and dropped significantly after Survey 4 to a low of 2,845 t for the final survey (Fig. 9). A total of 905t of pollock were harvested during the study, no other directed pollock fishing was conducted in the Aleutian Islands in 2006. As of 1 August 2006, 691t of pollock have been taken as bycatch in other fisheries. Since this is a roe fishery additional directed pollock harvests are not expected.

Process for setting ABC in Aleutian Islands

For many years, the Aleutian Islands pollock stock has lacked an age-structured model and the SSC has determined that the stock qualified for management under Tier 5. In the 2003 assessment, preliminary explorations of several age-structured models were provided, all of which focused on the portion of the stock to the west of 174°W. For the 2004 management cycle, five alternative age-structured models were developed and evaluated. The 2005 assessment focused on two of these models, one of which (Model 1) uses data only from the portion of the stock to the west of 174°W, and the other of which (Model 2) includes survey data from the entire Aleutian Islands management area. The Plan Team recommended the use of Model 2, but due to the uncertainty in the survey catchability coefficient recommended setting the ABC below the maximum permissible level. The Plan Team, in their review of the assessment recommended setting the 2006 ABC at the equilibrium level associated with an $F_{40\%}$ harvest rate, which was 43,200 t.

The SSC determined that the Aleutian pollock stock did not qualify for management under Tier 3 and the stock remained at Tier 5. This was largely for concerns about conservation and acknowledged uncertainty that interacts with stock structure uncertainties and a reliable survey (summer bottom-trawl surveys done every other year are currently undertaken). The SSC therefore recommended a maximum permissible ABC for 2006 was computed as the product of the most recent survey biomass estimate (130,451 t) and 75% of the natural mortality rate (0.30), resulting in an ABC of 29,400 t, and an OFL of 39,100 t . The actual TAC was specified


by congressional mandate at no more than 19,000 t. Under Tier 5, the stock is technically not evaluated for overfished determinations or whether it is approaching an overfished condition. Nonetheless, based on the best available information the stock is not considered overfished nor is it approaching an overfished condition.

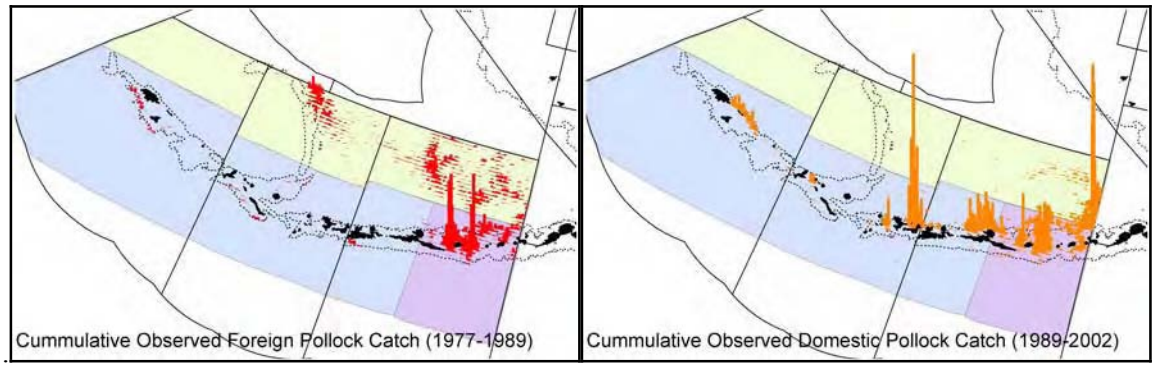


Figure 1. Observed foreign and J.V. (1978-1989), and domestic (1989-2002) pollock catch in the Aleutian Islands Area summed over all years and 10 minute latitude and longitude blocks. Both maps use the same scale (maximum observed catch per 10 minute block: foreign and J.V. 8,000 t and Domestic 19,000 t). Catches of less than 1 t were excluded from cumulative totals.

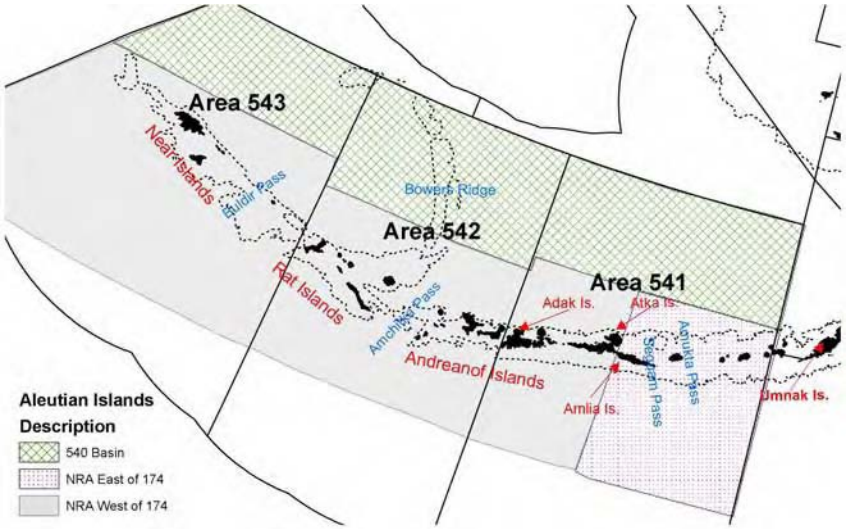


Figure 2. Regions defined for consideration of alternative data partitions for Aleutian Islands Region pollock. The abbreviation "NRA" represents the Near, Rat, and Andreanof Island groups.

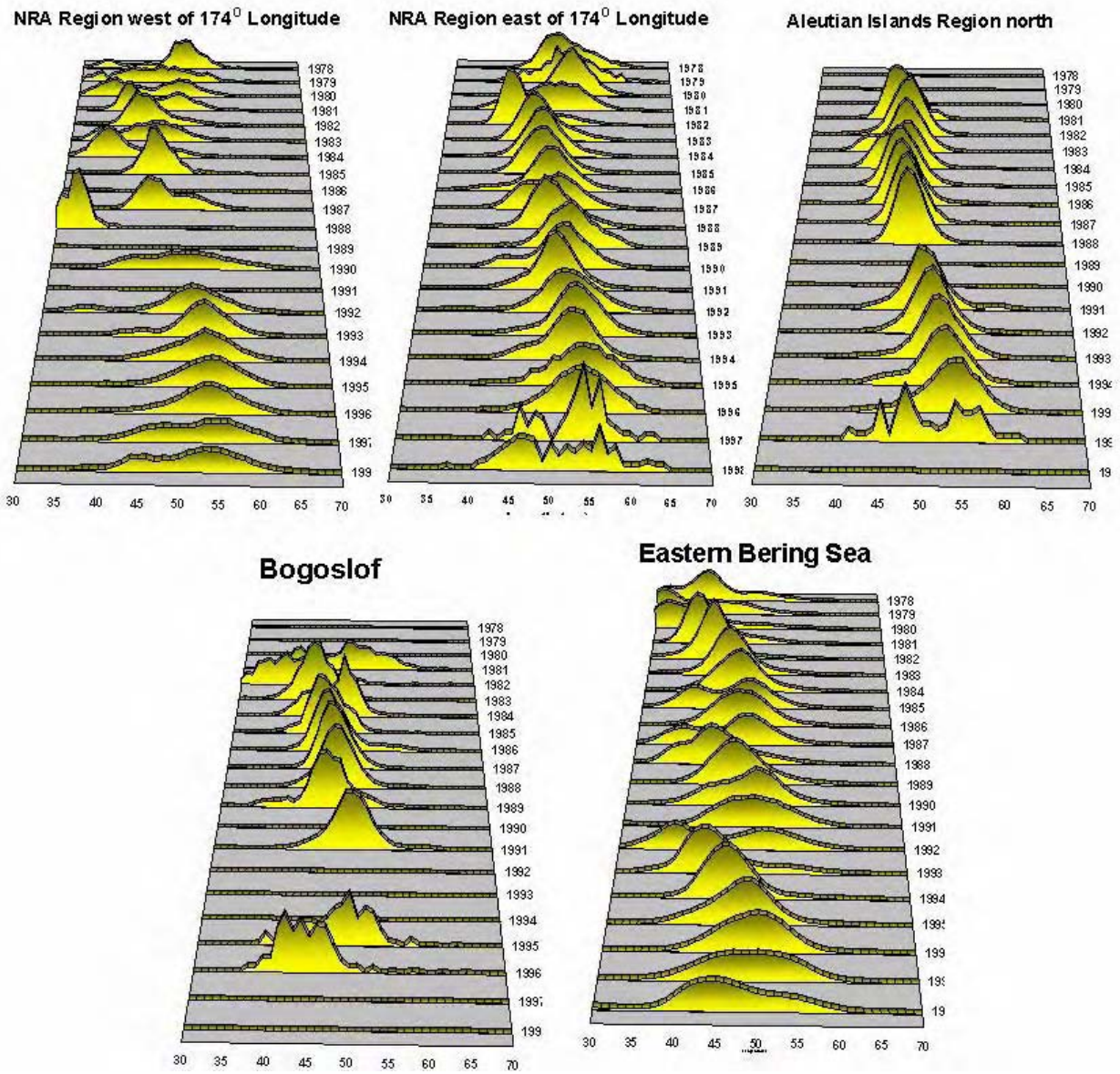


Figure 3. Pollock length frequency distributions by region.

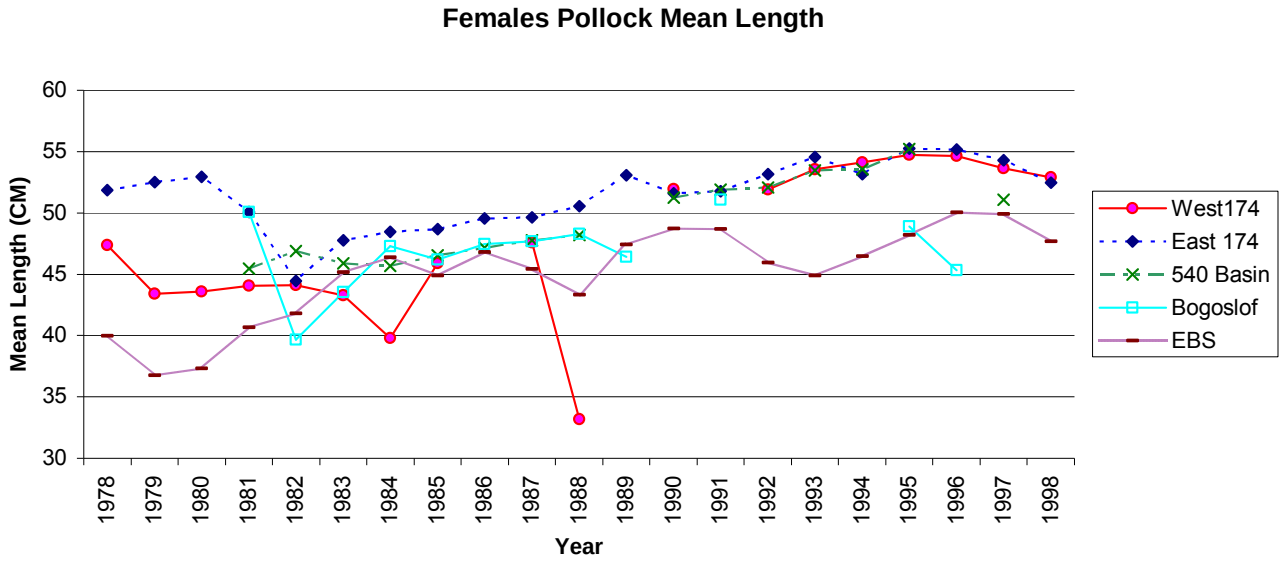


Figure 4. Mean length of female pollock in the catch from various areas based on observer data.

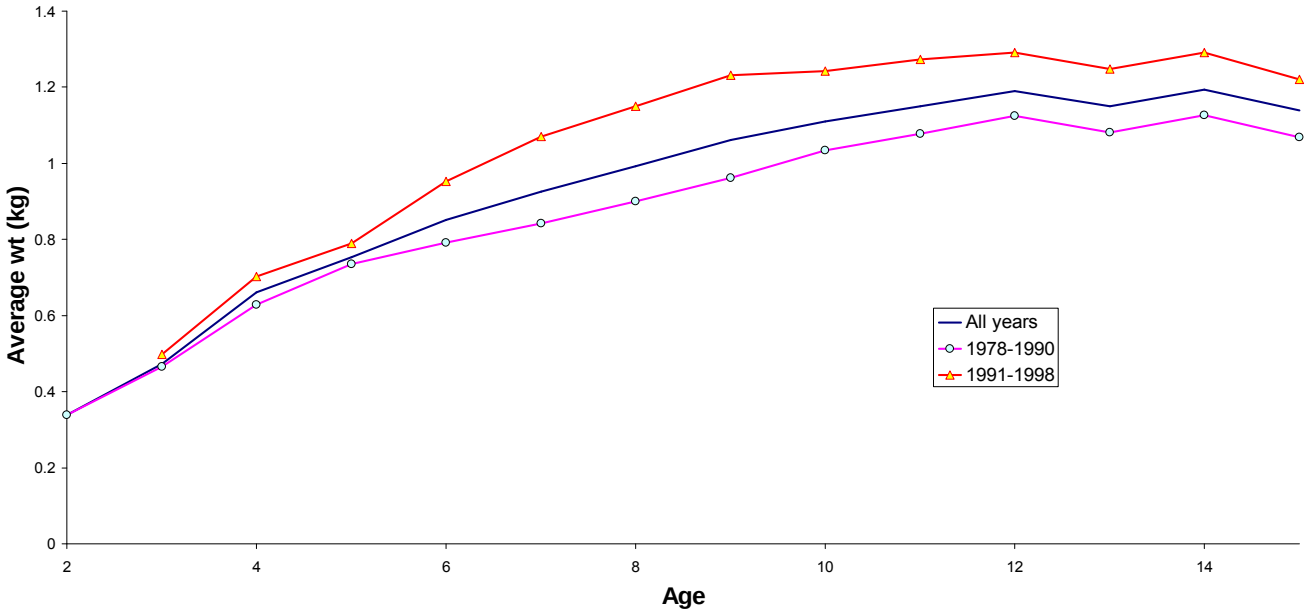


Figure 5. Average weight-at-age for Aleutian Islands pollock for all years combined, 1978-1990, and 1991-1998.

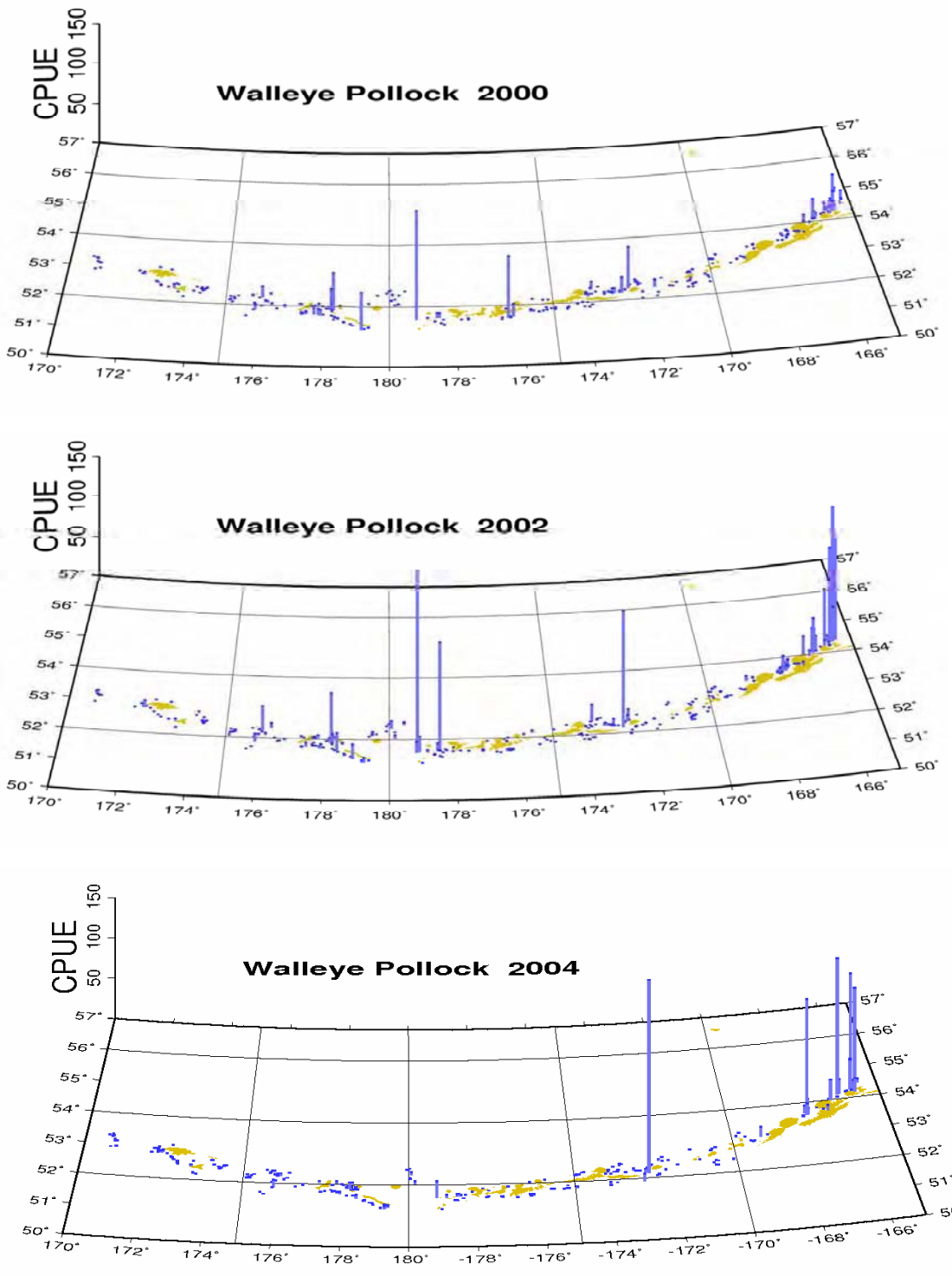


Figure 6. Catch per tow of pollock in the Aleutian Islands Region and east of 170°W during summer months from bottom-trawl surveys, 2000-2004.

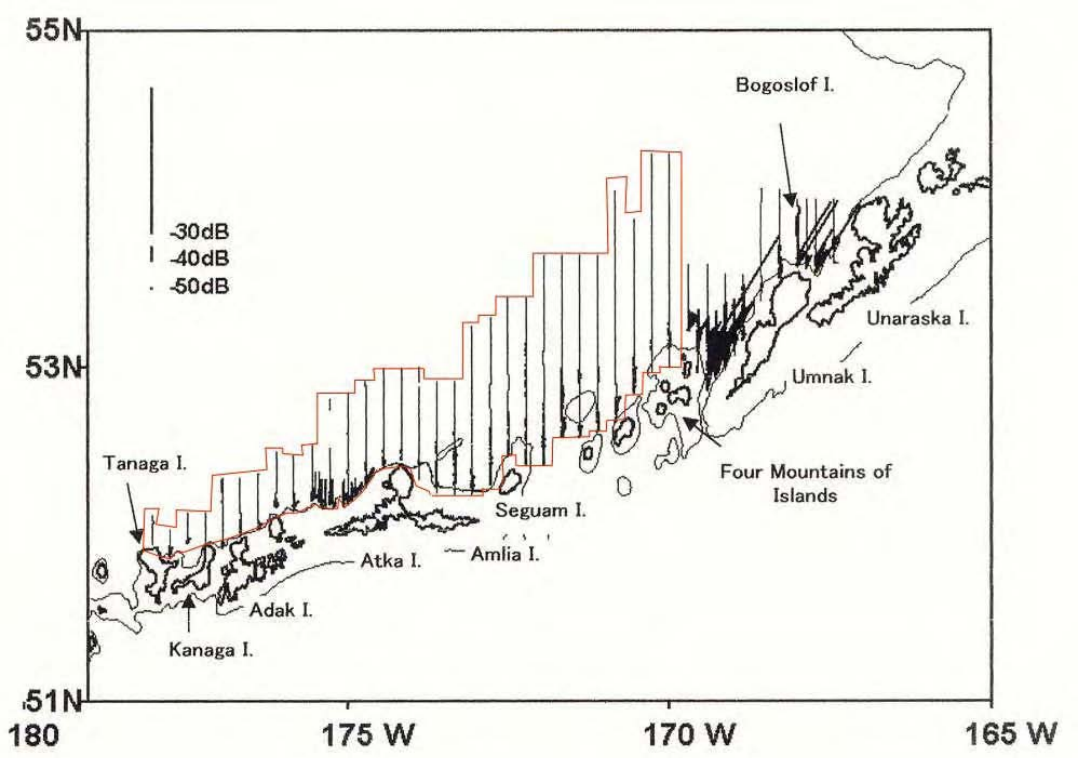


Figure 7. R/V Kaiyo Maru 2002 echo integration-trawl survey observed S_A. Please note that in the the encircled area is leg 2.

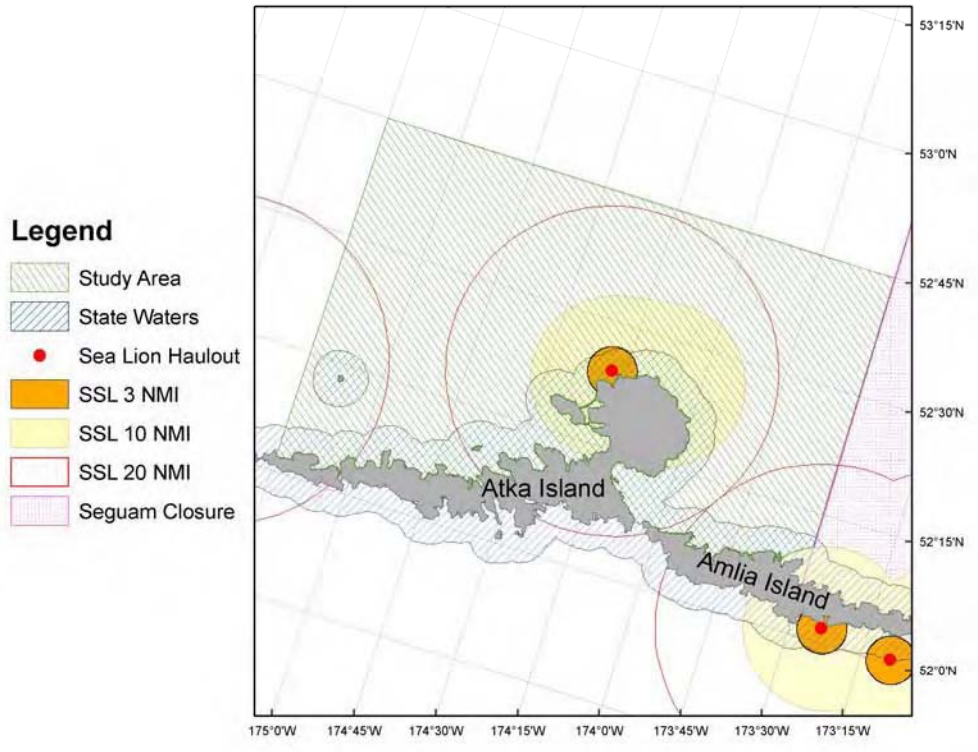
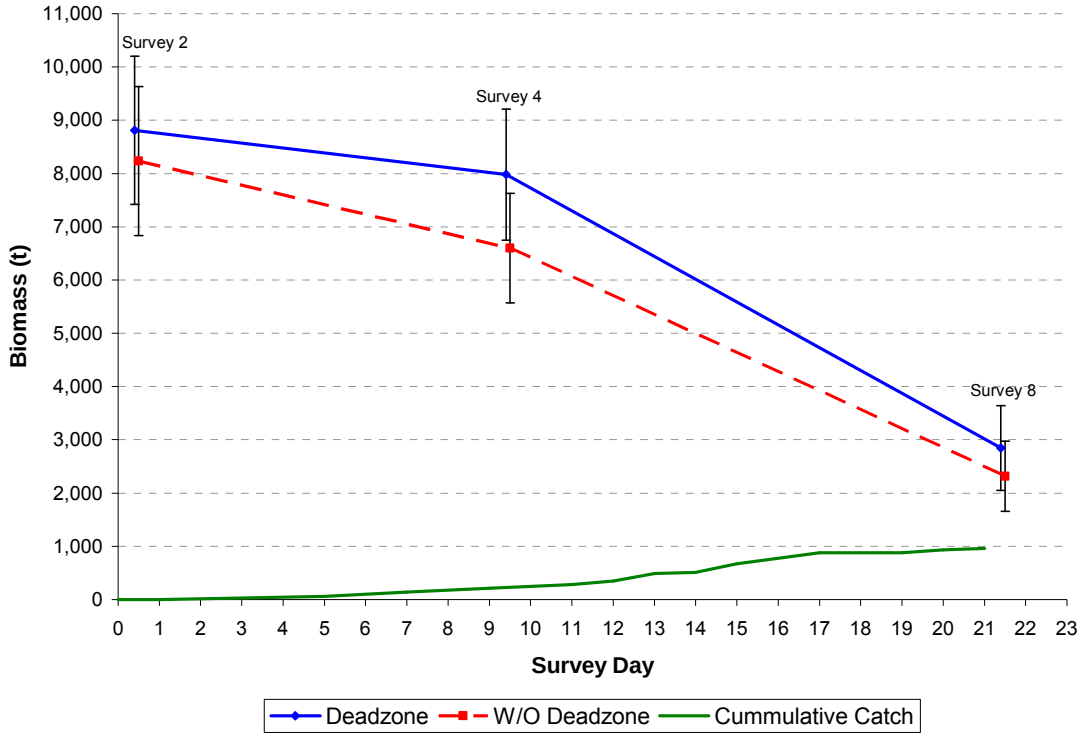


Figure 8. 2006 AICASS site within the Central Aleutian Islands.



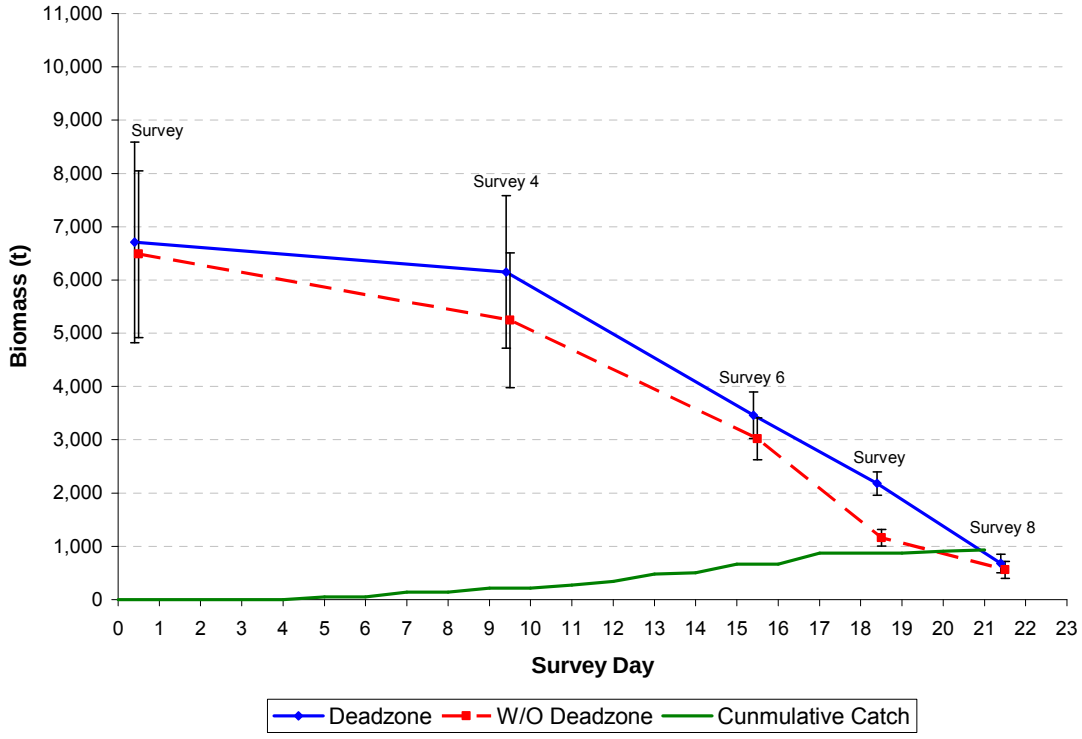


Figure 9: Pollock abundance estimation and cumulative catch for large (top) and small (bottom) survey areas. Note error bars are $\pm 1.96 \times E_i \times B_i$.

2006 Aleutian Islands Cooperative Acoustic Survey Study

Steve Barbeaux
AFSC NMFS/NOAA
Seattle WA 98115

In March-April 2006 the Aleutian Islands Cooperative Acoustic Survey Study (AICASS) was conducted to assess the feasibility of using a small (< 35 m) commercial fishing vessel to estimate the abundance of walleye pollock (*Theragra chalcogramma*) in waters off the central Aleutian Islands. NMFS currently has limited resources to conduct acoustic surveys of pollock in the Aleutian Islands subarea. The acoustic and biological information from the study is being used to assess: 1) if it is feasible to conduct acoustic surveys in the Aleutian Islands using commercial fishing vessels, 2) if the data collected are of sufficient quality for management purposes, and 3) the extent that fine scale spatial and temporal management measures may be biologically reasonable. The project was envisioned as a first step in the development of a co-management/co-monitoring system that would involve the Aleut Corporation (the local Alaskan native corporation that has been allocated the pollock quota for this area), local fishermen, and NMFS. This could potentially lead to limited pollock harvests that explicitly accounts for the needs of Steller sea lion (*Eumetopias jubatus*) within critical habitat.

The project was conducted aboard the F/V Muir Milach, a 32 m stern trawler (Fig. 1), in three activity phases: (1) evaluating the commercial fishing vessel's appropriateness as an acoustic sampling platform; (2) opportunistically collecting acoustic data of pollock distribution around two sites, Kanaga Sound and Atka Island (Fig. 2) and (3) direct acoustic and biological data sampling at one of the study sites. To verify the acoustic data and to support the study, 1000 mt of walleye pollock was allocated to be harvested within an area that included waters within 20 nautical miles (nm) to 3 nm of Steller sea lion haulouts.

A SONAR-self noise test was conducted on 15 February 2006 to assess the noise characteristics of the vessel and determine the optimum vessel speed for conducting the survey. An engine speed of 1200 rpm was determined to be optimal for acoustic surveying resulting in a survey speed between 6 and 8 knots and a signal to noise ratio of at least 10:1 (Fig. 3). The acoustic system calibration followed standard sphere calibration protocols (Foote et al. 1987) and were conducted prior to and post study to ensure system reliability. Sphere calibration showed that the system was stable during the duration of the survey. These tests therefore allowed us to conclude that the acoustic data from the F/V Muir Milach were of sufficient quality for abundance estimation.

Opportunistic acoustic data were collected by the F/V Muir Milach within two proposed study sites during the Pacific cod (*Gadus macrocephalus*) fishing season in February 2006. In consultation with the fishing vessel captain and upon review of the opportunistic acoustic data, a survey area inside the Atka Island study site, east of North Cape, Atka Island and west of Kasatochi Island, was selected because the area had the highest observed densities of pollock and had less area closed to fishing due to proximity to Steller sea lion haulouts.

The primary factor thought to affect the ability to survey from small vessels in the Aleutian Islands in the winter months is the weather. Between 13 March and 6 April 2006 the winds were primarily

southerly, between 90° and 270°, and hourly average wind speed ranged from 0.5 kts to 20.9 kts with a median and mean of 5.9 kts and 6.9 kts respectively (Fig. 4). Between 13 March and 6 April the maximum daily wind gusts exceeded 30 kts for 19 of the 25 days and exceeded 50 kts for 9 of the 25 days. Surveying and commercial fishing were suspended from 16 March through 17 March due to high southeasterly winds with gusts exceeding 50 kts. Although other strong wind events occurred during the survey period, they did not affect the ability of the vessel to fish or conduct surveys.

Six acoustic surveys were successfully conducted between 14 March and 4 April 2006. The area from North Cape of Atka Island to Koniuji Island (~ 1 degree longitude) was surveyed three times while a smaller subset of this area was surveyed on three other occasions. The three larger surveys (180 nm^2 with transect spacing at 1.5 nm) were conducted in the beginning (Survey 2), middle (Survey 4), and end (Survey 8) of the study period. Survey 5 was conducted parallel to the shelf break and covered only 9 nm^2 (with transects spaced at 0.5 nm). This survey provided data useful for geostatistical analyses. Surveys 6 and 7 covered 72 nm^2 with 1.5 nm transect and occurred in the middle of the large survey area coincident with the highest density of pollock. All survey transects were designed to sample 5 nm offshore after the shelf break (181 m isobath) and 1 nm inshore from the shelf break. To reduce survey time, an adaptive strategy was implemented and transects were ended when it was determined that pollock sign was no longer encountered along a transect. Small trawl tows (< 10 mt) were conducted during the surveys to identify acoustic sign. Between survey periods the vessel was allowed to commercial fish until it reached capacity (~165 t). The catch was then delivered to the Adak Fisheries fish processing plant on Adak Island. Biological samples including length, weight, maturity, otoliths, and fin clips were collected from both the verification and commercial tows. Physical oceanographic data were also collected throughout the survey using a Sea-bird conductivity-temperature-depth (CTD) system.

Between 14 March and 4 April 2006 six successful surveys were completed resulting in relatively precise estimates of biomass for the survey area over time. Survey 2, conducted 14-15 March, provided a biomass estimate for pollock of 8,910 t. The biomass estimate for subsequent surveys were lower (although not statistically significantly lower for Survey 4) and dropped significantly after Survey 4 to a low of 2,845 t for the final survey (Table 2, Fig. 5, Fig. 6, and Fig. 7)

The size of pollock captured in the verification and commercial trawls varied between 35 cm and 75 cm (Fig. 8) with a mean length of males at 56.9 cm and females at 58.5 cm. For all of the verification and commercial trawl hauls 55% of the pollock were female. Male pollock averaged 1.58 kg while females were somewhat larger, averaging 1.80 kg. The age data revealed that the age 6 and age 5 pollock (2000 and 1999 year classes) were the most abundant (Fig. 9).

In total, 965 t of fish were harvested during this study the majority of which (97% or 935 t) were harvested from the smaller area covered in Survey 6 and 7 (Fig. 10). Most (77%) of the harvest (745 t) occurred after Survey 4 (Day 9). The pollock biomass apparently declined by 68% in the large survey area during the three weeks of the study. In the smaller "fished" area, the decline was estimated at 90% (Fig 3). The "unfished" region showed no significant difference in biomass estimates between Surveys 2 and 8. Further analyses are needed to evaluate the cause the decline in the fished area. A conservative estimate on the change in biomass over the study period is about 4,000 t—much greater than the amount of pollock caught. A trend in the maturity data (Fig. 11) shows that the pollock began to show signs of active spawning only at the end of the study period. This could


indicate that fish were moving out of the area to spawn. This may account for some of the observed declines.

In short the 2006 AICASS was successful. In addition to achieving its scientific objectives, this project fostered an excellent working relationship between NMFS, the Aleut Enterprise Corporation, and the fishing industry. Local participation and stakeholder involvement enhances NMFS ability to provide responsible stewardship of this important marine resource. Future work should consider the expansion of this technique to survey more areas within the Aleutian Islands to determine the health and behavioral dynamics of this stock within Steller sea lion critical habitat.

References

Foote, K.G., Knudsen, H.P., Vestnes, G. , MacLennan, D.N., and Simmonds, E.J. 1987. Calibration of acoustic instruments for fish density estimation: a practical guide. ICES Cooperative Research Reports, Int. Counc. Explor. Sea Coop. Res. Rep. No. 144, 69p.

Table 1: Summary of 2006 AICASS surveys.

Survey	Dates	Survey Day	Spacing (nm)	Number of Transects	Survey Area (nm^2)
2	14-15 Mar.	1	1.5	18	180
4	23-24 Mar.	9	1.5	18	180
5	24 Mar.	10	0.5	7	9
6	28-29 Mar.	14	1.0	12	72
7	1 Apr.	19	1.0	12	72
8	3-4 Apr.	21	1.5	18	180

Table 2: Abundance estimation for 2006 AICASS surveys.

Survey	Area (nm^2)	Deadzone (Y/N)	Biomass (t)	Relative Precision (E_i)	High Biom. (t)	Low Biom. (t)	Density (t / nm^2)
2	180	N	8233.8	8.67%	9632.5	6835.1	45.7
2	180	Y	8809.9	8.04%	10198.4	7421.4	48.9
2	72	N	6484.5	12.29%	8046.1	4922.9	90.1
2	72	Y	6706.6	14.32%	8589.2	4824.0	93.1
4	180	N	6600.4	7.96%	7630.1	5570.7	36.7
4	180	Y	7980.2	7.87%	9210.6	6749.8	44.3
4	72	N	5246.4	12.31%	6512.6	3980.2	72.9
4	72	Y	6149.8	11.89%	7582.5	4717.1	85.4
5	9	N	890.8	5.29%	983.2	798.4	99.0
5	9	Y	1036.6	4.75%	1133.1	940.1	115.2
6	72	N	3015.0	6.64%	3407.4	2622.6	41.9
6	72	Y	3458.5	6.44%	3894.9	3022.1	48.0
7	72	N	1159.0	6.83%	1314.2	1003.8	16.1
7	72	Y	2179.7	5.05%	2395.4	1964.0	30.3
8	180	N	2313.6	14.51%	2971.6	1655.6	12.9
8	180	Y	2845.2	14.24%	3639.0	2051.4	15.8
8	72	N	559.2	14.32%	716.1	402.3	7.8
8	72	Y	677.0	12.96%	848.9	505.1	9.4

Figures

Figure 1: At port in Adak, Alaska, the F/V Muir Milach, a 32 m stern trawler was used to conduct the 2006 Aleutian Islands cooperative acoustic survey study.

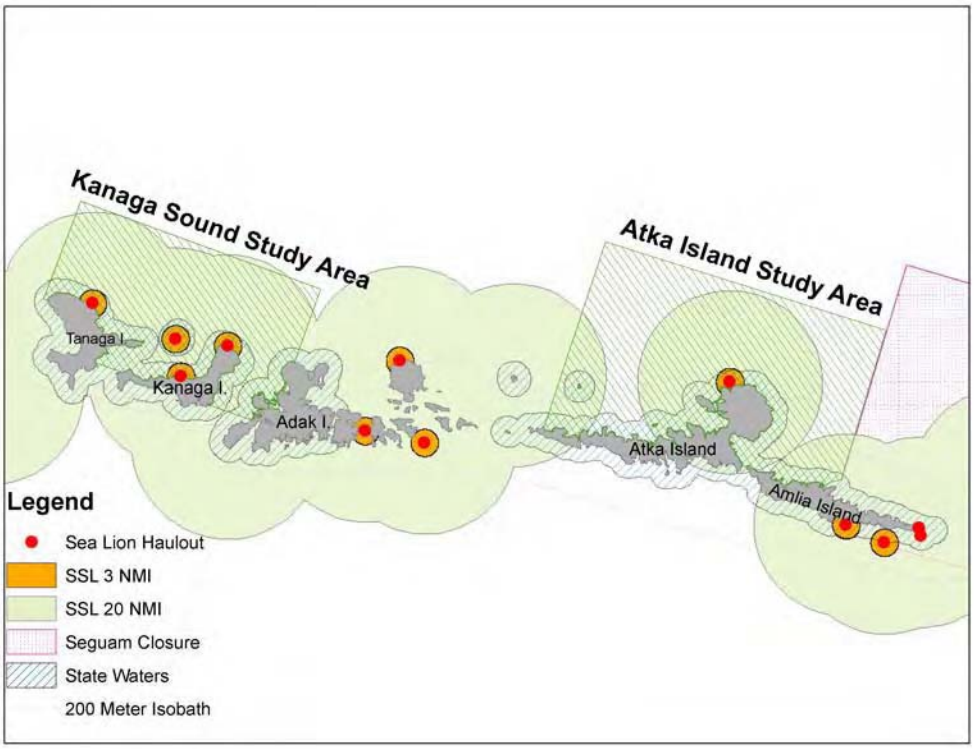


Figure 2: Proposed 2006 AICASS sites within the Central Aleutian Islands

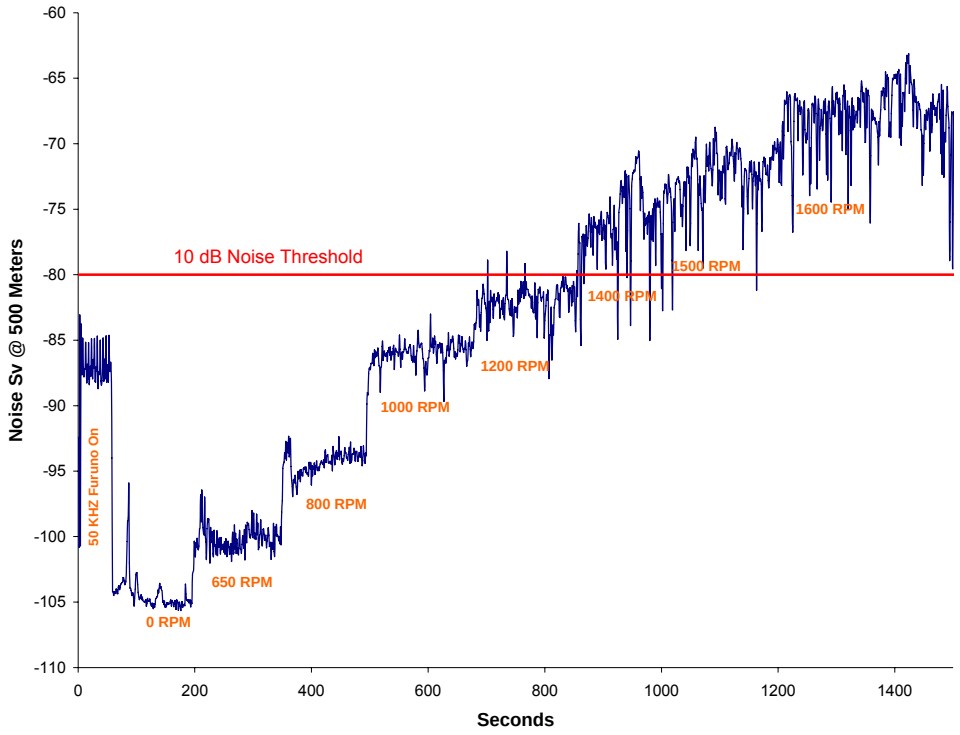


Figure 3: F/V Muir Milach 15 February 2006 Sonar-self noise test with -80dB threshold at different levels of engine RPM.

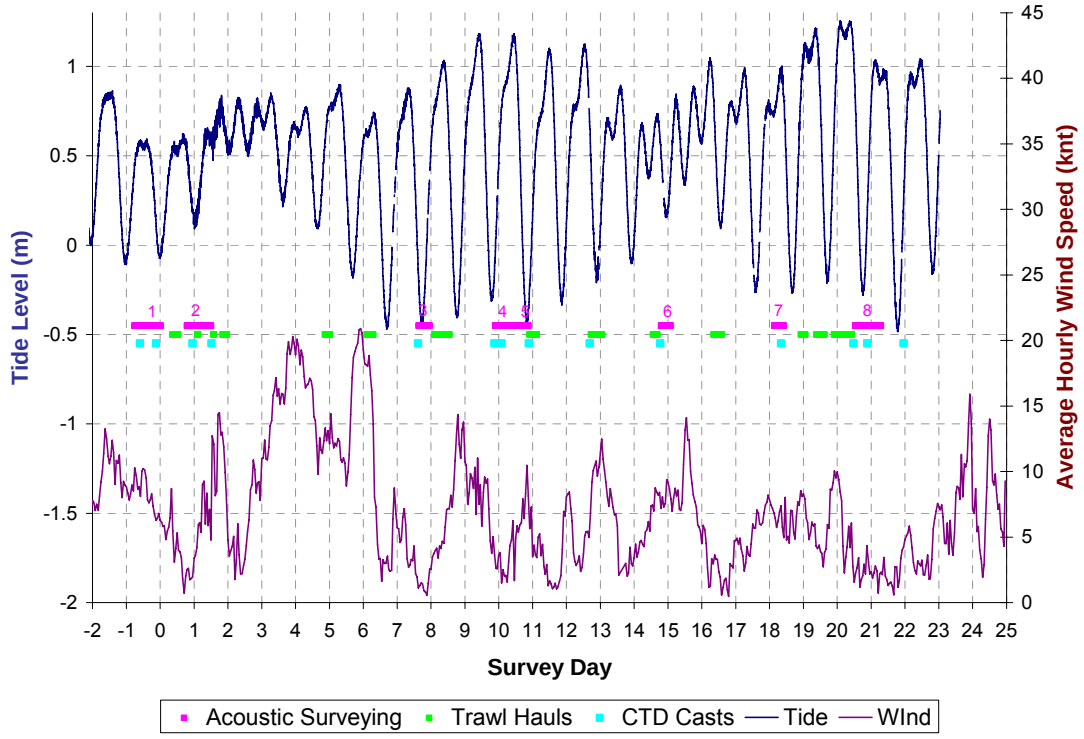
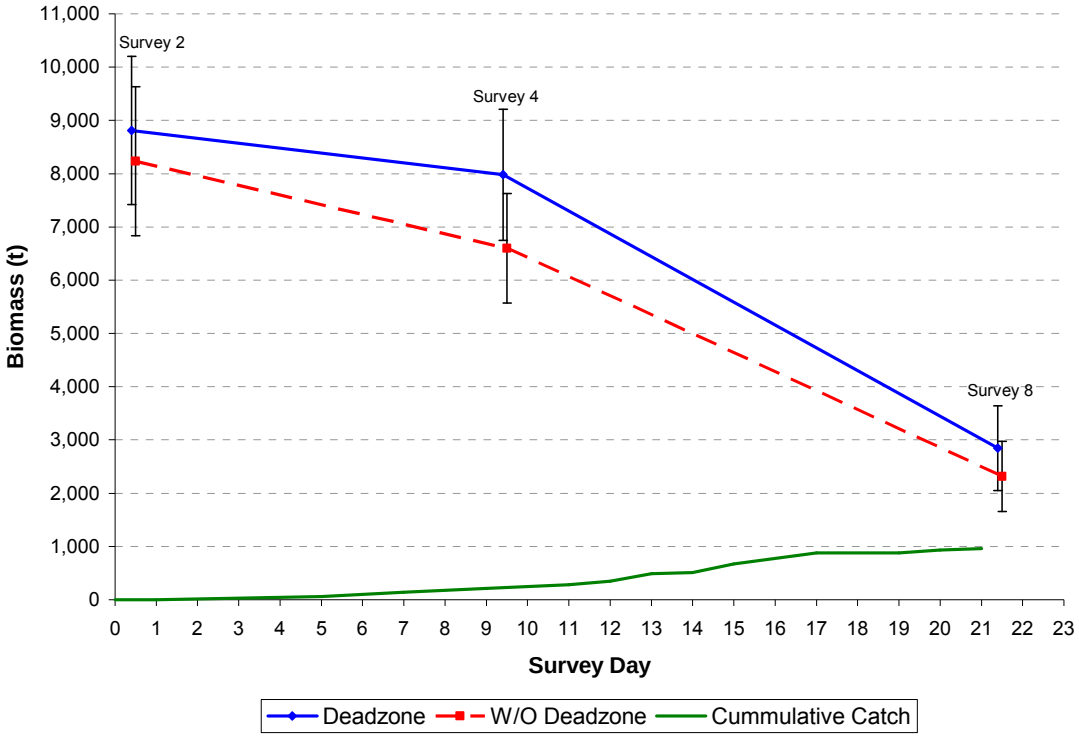


Figure 4: Weather and tide fluctuations relative to survey activities. Survey number is in pink. Wind speed and tide data from Adak, Alaska station ADKA2 – 9461380 (NOAA 2006).



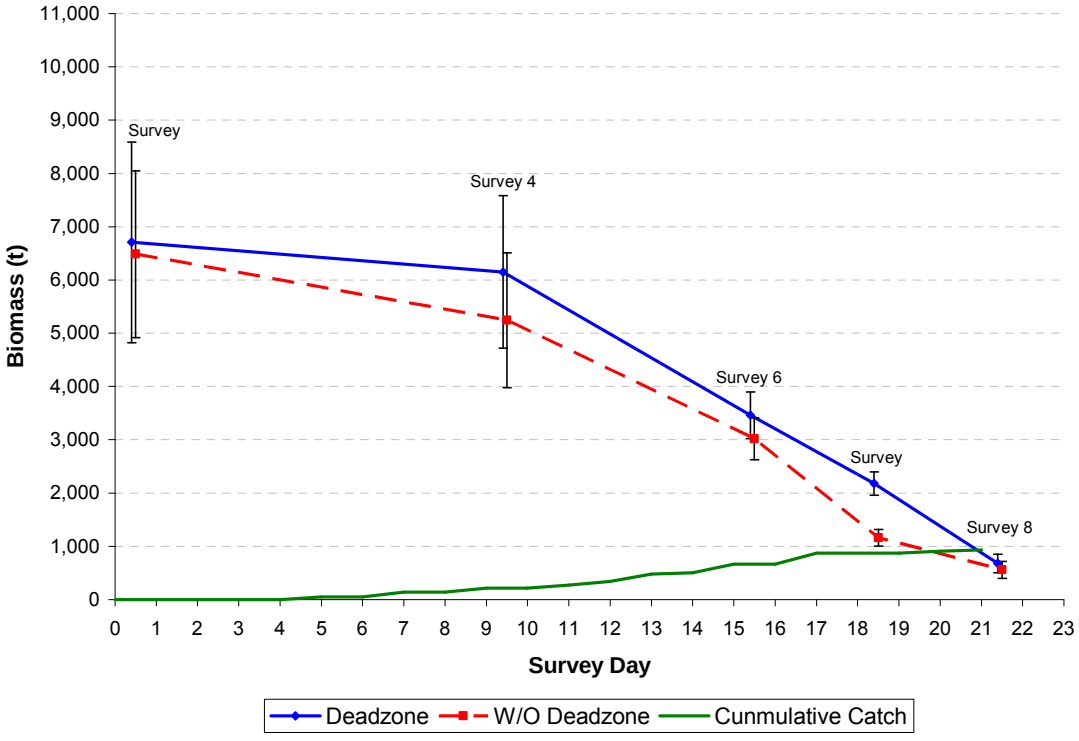


Figure 5: Pollock abundance estimation and cumulative catch for large (top) and small (bottom) survey areas. Note error bars are $\pm 1.96 \times E_i \times B_i$.

Figure 6: 2006 AICASS distributions of pollock. Figures from left to right correspond to Surveys 2, 4, 6, 7, and 8.

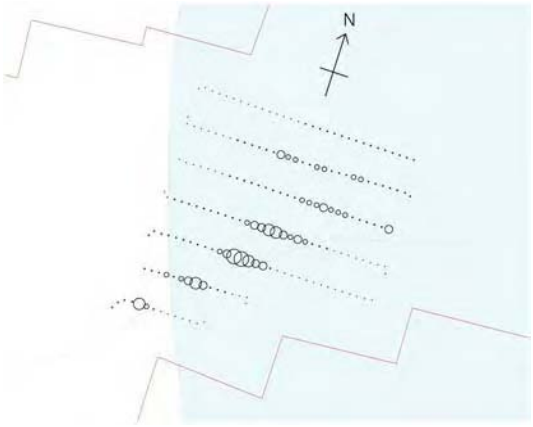


Figure 7: 2006 AICASS Survey 5 distribution of pollock. Please note that the axes of the map are different from Figure 6.

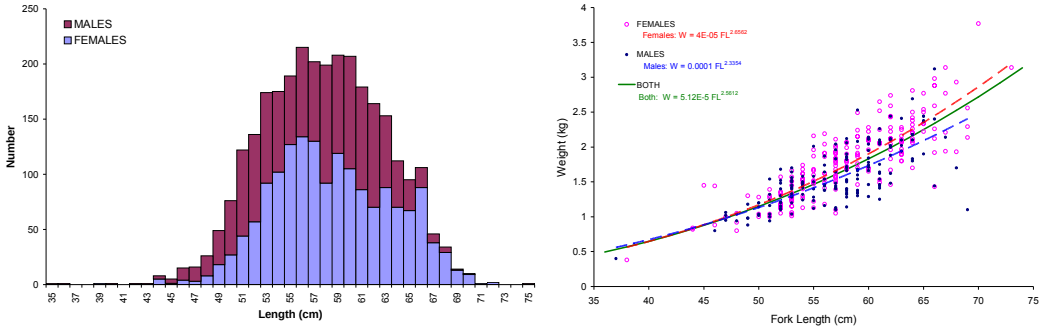


Figure 8: Pollock length frequency and weight at length from the 2006 AICASS.

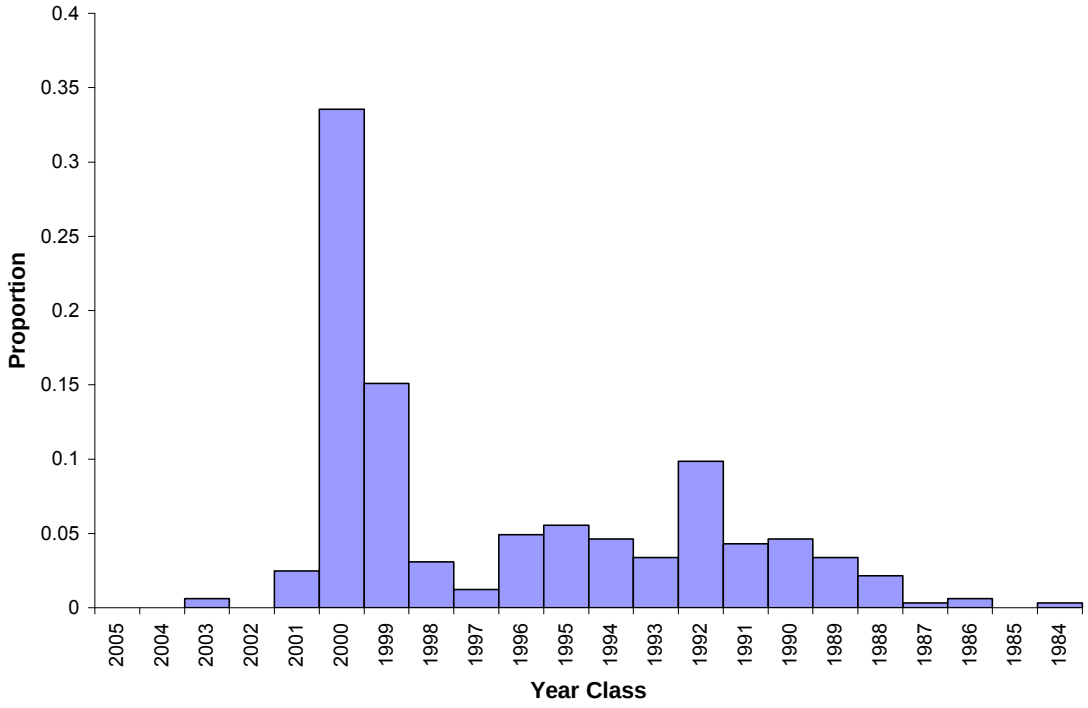


Figure 9: Age composition from the otolith data collected during the 2006 AICASS.

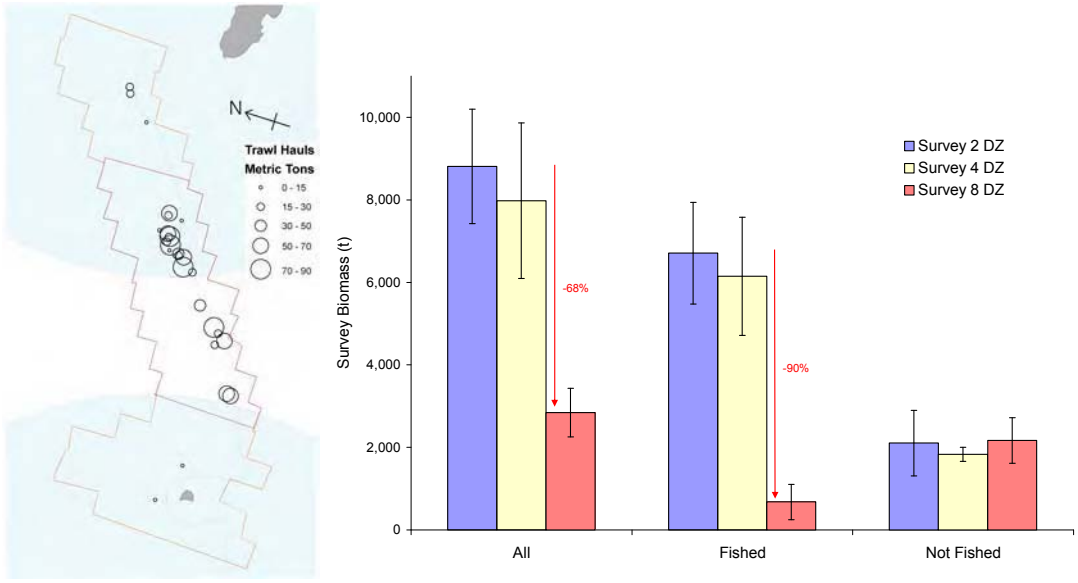
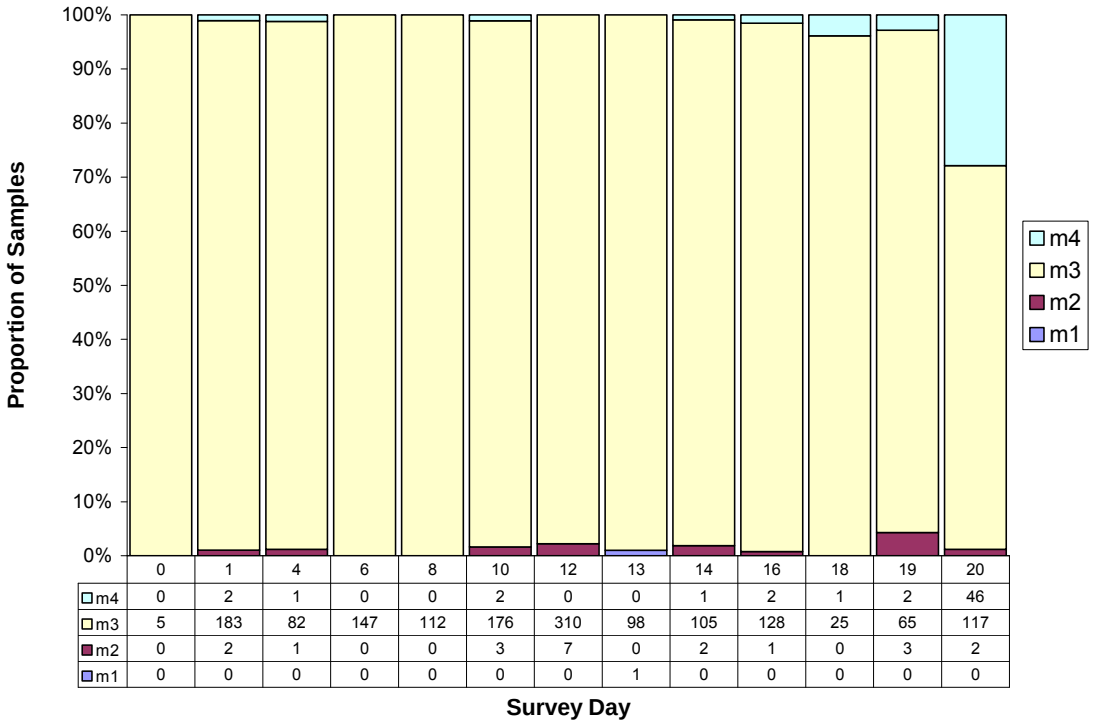


Figure 10: Trawl haul start locations (left) and pollock biomass estimates (right). The area encircled is the large survey area ("All") and the red lines are the small survey area ("Fished") and the orange lines are the "Not Fished region". The blue shaded regions are Steller sea lion critical habitat.



	0	1	4	6	8	10	12	13	14	16	18	19	20
m4	0	2	1	0	0	2	0	0	1	2	1	2	46
m3	5	183	82	147	112	176	310	98	105	128	25	65	117
m2	0	2	1	0	0	3	7	0	2	1	0	3	2
m1	0	0	0	0	0	0	0	1	0	0	0	0	0

Figure 11: Female pollock maturity over the duration of the 2006 AICASS. Gonad stages are: M4-actively spawning, M3-prespawning, M2-developing, M1-immature. Note: no M5-spent fish were observed.

Results of the March 2006 Echo Integration-Trawl Survey of Walleye Pollock (*Theragra chalcogramma*) Conducted in the Southeastern Aleutian Basin Near Bogoslof Island, Cruise MF2006-03

by Denise McKelvey, Taina Honkalehto, and Neal Williamson

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INTRODUCTION

Scientists from the Midwater Assessment and Conservation Engineering Program of the Alaska Fisheries Science Center (AFSC) regularly conduct echo integration-trawl (EIT) surveys to estimate spawning walleye pollock (*Theragra chalcogramma*) abundance in the southeastern Aleutian Basin (Honkalehto et al. 2005). These surveys were conducted annually between 1988 and 2006 with the exception of 1990 and 2004. The biomass estimate for pollock within the Central Bering Sea (CBS) Convention Specific Area obtained during these surveys provides an index of abundance for the Aleutian Basin pollock stock[1]. The results presented here are from the EIT survey carried out 4-11 March 2006 aboard the NOAA ship *Miller Freeman*, Cruise MF2006-03. This report summarizes observed pollock distribution and biological composition, and provides a biomass estimate. It also summarizes oceanographic observations and acoustic system calibration results.

METHODS

Itinerary

3 Mar	Embark scientists in Dutch Harbor, AK.
4-9 Mar	Calibration of acoustic system in Captains Bay. EIT survey of the southeastern Aleutian Basin near Bogoslof Island.
9-10 Mar	Orthogonal transects and gear testing.
11 Mar	In port Dutch Harbor, AK.

[1] Convention on the Conservation and Management of Pollock Resources in the Central Bering Sea, Annex (Part 1), Treaty Doc. 103-27. 1994. Hearing before the Committee on Foreign Relations United States Senate, 103rd Congress, 2nd Session. Washington: U.S. Government Printing Office.

Acoustic Equipment

Acoustic data were collected with a Simrad ER60[2] echo sounding system using 18, 38, 120, and 200 kHz split beam transducers (Simrad 2004, Simrad 1997, Bodholt and Solli 1992). The transducers were installed on the NOAA ship *Miller Freeman*, a 66-m stern trawler equipped for fisheries and oceanographic research, on the bottom of a retractable centerboard extending 9 m below the water surface. Data from all four frequencies were logged with SonarData EchoLog 500 (v. 3.45). Raw data for each frequency were also logged using ER60 software (v.2.1.2). Echo integration-trawl survey methods were similar to those described in Simmonds and MacLennan (2005). Results presented here were based on the 38 kHz data, which were analyzed using SonarData Echoview (v. 3.45.53) PC-based post-processing software.

Trawl Gear

Echosign was sampled using an Aleutian wing 30/26 trawl (AWT). This trawl was constructed with full-mesh nylon wings, and polyethylene mesh in the codend and aft section of the body. The headrope and footrope each measured 81.7 m (268 ft). Mesh sizes tapered from 325.1 cm (128 in) in the forward section of the net to 8.9 cm (3.5 in) in the codend. The net was fitted with a 32-mm (1.25-in) nylon mesh codend liner. The AWT was fished with 82.3 m (270 ft) of 1.9-cm (0.75-in) diameter (8 H19 wire) non-rotational dandylines, 226.8-kg (500-lb) or 340.2-kg (750-lb) tom weights on each side, and 5 m^2 Fishbuster trawl doors [1,247 kg (2,750 lb) each]. Vertical net opening and depth were monitored with a WESMAR third wire netsounder system attached to the trawl headrope. The net opening ranged from 23 to 37 m and averaged 29 m while fishing.

Oceanographic Equipment

Physical oceanographic data collected during the cruise included temperature/depth profiles obtained with a Sea-Bird Electronics temperature-depth probe (SBE-39) attached to the trawl headrope, and conductivity-temperature-depth (CTD) observations collected with a Sea-Bird CTD system at the calibration site. Sea surface temperature and salinity data were measured using the

[2] Reference to trade names or commercial firms does not imply endorsement by the National Marine Fisheries Service, NOAA.

Miller Freeman's Sea-Bird Electronics SBE-21 probe located mid-ship, approximately 5 meters below the water line. These and other environmental data were recorded using the ship's Scientific Computing System (SCS). Sea surface temperature data were subsampled and kriged for graphical representation.

Survey Design

The survey began 4 March north of Unalaska Island at about 167°W longitude, proceeded west to the Islands of Four Mountains near 170°W, and concluded on 9 March (Fig. 1). A random start position was generated for the first transect, which resulted in a new start location 0.5 nmi west of start location used in 2005. From that point, the survey followed 35 north-south, parallel transects spaced 3 nmi apart that covered 1,803 nmi^2 of the CBS Convention Specific Area. The average transecting speed was 11 knots. Echo integration data were collected 24 hours a day between 14 m from the surface and 0.5 m off the bottom, unless the bottom exceeded 1,000 m, the lower limit of data collection. Acoustic system settings used during the collection (Table 1) were based on results from acoustic system calibrations from this and prior surveys. Trawl hauls were conducted to identify echosign and to provide biological samples. Average trawling speed was approximately 3 knots. Pollock were sampled to determine sex, fork length (FL), body weight, age, maturity, and ovary weight of selected females. Fork lengths were measured to the nearest centimeter. An electronic motion-compensating scale was used to weigh individual pollock specimens. For age determinations, pollock otoliths were collected and stored in 50% ethanol-water solution. Maturity was determined by visual inspection and categorized as immature, developing, pre-spawning, spawning, or post-spawning[3]. All data were recorded electronically using the Fisheries Scientific Computing System (FSCS) v.1.6 and stored in a relational database. Pollock ovary samples were collected for on-going fecundity research by AFSC scientists[4]. Whole fish were retained for studies of forage fish and for training fisheries observers. Visual counts of seabird species were made after most trawl hauls.

[3] ADP Codebook. 2005. Unpublished document. Resource Assessment and Conservation Engineering Division, Alaska Fisheries Science Center, NMFS, NOAA; 7600 Sand Point Way NE, Seattle, WA 98115

[4] B. Megrey, Alaska Fisheries Science Center, NMFS, NOAA; 7600 Sand Point Way NE, Seattle WA 98115

Standard sphere acoustic system calibrations (Foote et al. 1987) were made before and after the Bogoslof Island area survey to measure acoustic system performance. During calibration, the *Miller Freeman* was anchored at the bow and stern. Weather, sea state conditions, and acoustic system settings were recorded. A tungsten carbide sphere (38.1 mm diameter) and a copper sphere (64 mm diameter) were suspended below the centerboard-mounted transducers. The tungsten carbide sphere was used to calibrate the 38, 120 and 200 kHz systems. The copper sphere was used to calibrate the 18 kHz system. After each sphere was centered on the acoustic axis, split beam target strength and echo integration data were collected. Transducer beam characteristics were modeled by moving each sphere through the acoustic beam while collecting target strength data using Simrad EKLOBES software.

Data Analysis

The abundance of pollock was estimated by combining echo integration and trawl data. Echosign that was identified as pollock was binned at 0.5 nmi horizontal by 20 m vertical resolution, and stored in a database. Pollock length data from the 13 hauls that captured sufficient numbers of pollock (more than 75 individuals/haul) were combined into two length strata based on geographic proximity of hauls, and similarity in size composition data. Mean target strength per fish (dB) was estimated for each stratum by using the pollock target strength (TS) to length relationship (TS = 20 log FL – 66, where FL is fork length (cm); Traynor 1996). Mean fish weight-at-length for each length interval (cm) was estimated from the trawl data when there were five or more pollock for that length interval; otherwise weight at a given length interval was estimated from a linear regression of the natural logs of all the length and weight data. Numbers and biomass for each stratum were estimated as:

$$\text{Numbers} = \sum N_i = \sum \frac{\bar{s}_A \times A}{4 \times \pi \times 10^{\overline{TS_i}/10}}, \text{ for length } i, \text{ and}$$

$$\text{Biomass} = \sum \left(N_i \times \frac{\overline{W_i}}{1000} \right), \text{ metric tons,}$$

where N_i is numbers at length i, $\bar{s}_A$ (m^2/nmi^2, nautical area scattering coefficient, NASC; MacLennan et al. 2002) is echo integrated backscatter from pollock in the water column, A is length stratum area (nmi^2), $\overline{TS}_i$ is mean target strength (dB, per fish) of pollock for length i (cm), and $\overline{W}_i$ is mean weight of individual fish (kg) for length i. Total biomass or numbers were estimated by summing the strata estimates.

In the Bogoslof Island area, pre-spawning pollock aggregations are often densely packed and vertically and/or horizontally stratified by sex (Schabetsberger et al. 1999). Therefore it is not always possible to obtain an unbiased sample of lengths from these aggregations to estimate population size composition. For example, if females are densely schooled across the top of the aggregation, the trawl haul may contain mostly females and few males even though males were abundant in lower layers. At ages older than about 5 years, female pollock are longer than male pollock. Thus, biased estimates of sex composition from trawl hauls can result in biased estimates of population size and age composition. As in previous Bogoslof surveys, the sample sex ratio was assumed to be 50:50. A male size composition was derived by averaging proportions-at-length for each haul in the length stratum. The same was done for female fish. The two resultant size compositions were averaged to provide a stratum (sexes combined) size composition.

Relative estimation errors for the acoustic data were derived using a one-dimensional (1D) geostatistical method as described by Petitgas (1993), Williamson and Traynor (1996), and Rivoirard et al. (2000). Relative estimation error is defined as the ratio of the square root of the estimation variance to the estimate of acoustic abundance. Geostatistical methods are used for computation of error because they account for the observed spatial structure. These errors quantify only transect sampling variability. Other sources of error (e.g., target strength, trawl sampling) are not included.

RESULTS

Calibration

Acoustic system calibrations were conducted before, between, and after the winter EIT surveys in the Bering Sea and Gulf of Alaska (Table 1). The ER60 38-kHz collection system showed no significant differences in gain parameters or transducer beam pattern characteristics before and after the Bogoslof Island area survey, thus confirming that the acoustic system was stable throughout the survey.

Oceanographic Conditions

Most trawl haul sites occurred towards the southern end of the transects, where surface waters were warmer than 4.0°C (Fig. 1). Water temperature profiles at these sites indicated a well-mixed water column with little variation in temperature between the surface and deeper waters. Temperatures in the upper 615 m of the water column ranged from about 3.2° to 4.3°C, averaging 3.9°C, and where pollock traditionally occur in Bogoslof (300-600 m), temperatures averaged between 3.5° and 3.9°C (Fig. 2).

Biological Sampling

Biological data and specimens were collected from 14 trawl hauls (Tables 2 and 3; Fig. 1). Walleye pollock dominated all trawl catches and represented 99.4% of the total catch by weight and 89.6% by number (Table 4). Myctophids were the most common bycatch and contributed 8% by number (Table 4).

Length measurements ranging between 38 and 71 cm FL were collected from 3,681 pollock specimens (Table 3) to create the two length strata for scaling the acoustic data and computing size-specific population estimates. Pollock throughout this length range were encountered in both strata. Pollock from hauls 1-5 in stratum 1 "Umnak" were characterized by a dominant mode at 45 cm FL, and were used to scale the acoustic data in transects 1-18. Pollock from hauls 7-12 in stratum 2 "Samalga" had higher proportions of fish larger than 55 cm FL generating a bimodal distribution with modes at 47 and 60 cm FL. The Samalga stratum was used to scale transects 19 through 35.

Trawl catch sex ratios among hauls capturing more than 75 pollock ranged from 12% to 90% male. As observed in previous years, higher proportions of male pollock were captured in deeper layers of the water column.

Maturity stage data and length-weight data were collected for 963 pollock specimens, and otoliths from 593 specimens (Table 3). The unweighted maturity composition for males was 0% immature, 1% developing, 60% pre-spawning, 39% spawning, and 0% spent. The female maturity composition was 0% immature, 1% developing, 72% pre-spawning, 6% spawning, and 21% spent. Pollock maturity composition by length stratum indicated a larger percentage of spent females in the Unmak region than in the Samalga region (Fig. 3a), even though the average gonado-somatic index (GSI: ovary weight/body weight) for pre-spawning mature female pollock was similar for the two regions (0.18 for Umnak; 0.17 for Samalga). The average GSI for both regions combined was 0.17 (Fig. 3b), which was similar to the average GSI observed during recent years, and suggests that the survey's timing was similar to previous years in relation to peak spawning. The mean body weight-at-length for sexes combined was estimated using observed measurements for all but three length intervals (Fig. 3c). The mean weight-at-length for the remaining three length intervals was estimated by Weight (g) = .002616 * Fork Length (cm) $^{3.3272}$.

Pollock Distribution and Abundance

As in recent years, pollock were concentrated in two regions, northeast of Umnak Island, and just north of Samalga Pass at depths ranging from about 300-600 m (Fig. 4). About 58% of the survey biomass was observed in the Umnak area and 42% in the Samalga Pass area. Pollock in the Umnak region were primarily aggregated off Cape Idak along three transects, while pollock in the Samalga Pass region were concentrated mainly along four transects. Pollock tended to stay close to the sea floor in both regions until bottom depths reached about 350 m (Fig. 5). As the seafloor descended, pollock in the Umnak region maintained a pelagic depth of 400-475 m whereas in Samalga Pass, pollock fish depths continued to increase slightly with increasing bottom depths. Few pollock were encountered where bottom depths exceeded 1,000 m.

The abundance estimate for pollock in the Bogoslof area was 239 million fish weighing 0.240 million metric tons (Tables 5, 6, 7, Fig. 6). This was the highest abundance in terms of numbers of fish estimated since the 1999 Bogoslof EIT survey. The size composition was bimodal (Figs. 7 and 8) with major modes at 46 and 60 cm FL. The average fork length for the population was 49.7 cm, shorter than the 51 to 56 cm FL that have characterized the Bogoslof spawning pollock population since 1996 (Fig. 6). Based on the 1D analysis, the relative estimation error of the abundance estimate was 11.8% (Table 5).

DISCUSSION

In the 2006 Bogoslof EIT survey, a 38% increase over 2005 pollock numbers was observed for fish less than 50 cm FL. Although age-at-length results for the 2006 EIT survey are not yet available, age data from previous years suggest that fish 43-49 cm, where most of the increased abundance was observed, were about 5-6 years old (Fig 10; Honkalehto et al. 2005). This large increase is likely from incoming 6-year-olds of the 2000 year class, which was a relatively strong year class on the Bering Sea shelf (Ianelli et al. 2005). For the Bogoslof EIT survey time series, peak recruitment for dominant year classes has typically occurred at age 6 to 7. This would imply that peak 2000 year-class recruitment either occurred in 2006 or will occur in 2007.

In the 2000-2003 surveys, the Umnak stratum accounted for a relatively small portion (i.e., $\leq$ 26%) of the CBS Convention Specific Area biomass. In 2005, its contribution increased to 34%, and in 2006, 58% of the biomass was observed in the Umnak region. Note that of the younger female pollock (< 55 cm) present in each of the two areas, 66% in Umnak were spawning or had already spawned – compared with only 11% in Samalga Pass (Fig. 9). Smaller fish were present in Umnak. Once the 2006 age data are processed, they may provide evidence that these fish represent a year class not present in Samalga Pass.

At different stages in the Bogoslof EIT time series, the survey area and transect spacing have been modified to reflect changes in abundance and geographic distribution. Transect spacing of recent surveys (e.g., 2002, 2003, and 2005) was 5 nmi. In an effort to more efficiently sample the CBS Convention Specific Area, in 2006, transect spacing was reduced to 3 nmi and the northern extent of transects was shortened from what it was in the previous three survey years. This resulted in more transect coverage of the spawning aggregations. The abundance estimate's relative estimation error was the lowest since the EIT survey in 2001, suggesting that the change in survey design has improved the quality of the abundance estimates.

Fewer Pacific ocean perch were encountered in the 2006 survey than in 2005. This along with randomization of the starting transect location, and reduction of transect spacing from 5 nmi to 3 nmi in 2006, supports the suggestion (Honkalehto et al. 2005) that rather than the POP population increasing, the 2005 survey likely encountered a particular topographic feature or localized area where POP aggregated.

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SCIENTIFIC PERSONNEL

Name	Nationality	Position	Organization
Taina Honkalehto	USA	Chief Scientist	AFSC
Denise McKelvey	USA	Fishery Biologist	AFSC
Scott Furnish	USA	Computer Specialist	AFSC
Tyler Yasenak	USA	Fishery Biologist	AFSC
William Floering	USA	Fishery Biologist	AFSC
Robert Self	USA	Fishery Biologist	AFSC
Sandy Neidetcher	USA	Fishery Biologist	AFSC
Seok-Gwan Choi	Korea	Fishery Biologist	NFRDI

AFSC - Alaska Fisheries Science Center, Seattle, WA

NFRDI - National Fisheries Research and Development Institute, Distant Water Fisheries Resources Team, Busan City, Republic of Korea

Table 1.--Simrad ER60 38 kHz acoustic system description and settings during the winter 2006 echo integration-trawl survey of walleye pollock in the Bogoslof Island area and results from standard sphere acoustic system calibrations conducted before and after the survey.

		Calibrations		
	Survey system settings	13-Feb Three Saint's Bay, Alaska	4-Mar Captain's Bay, Alaska	22-Mar Uganik Bay, Alaska
Echosounder:	Simrad ER 60	--	--	--
Transducer:	ES38B	--	--	--
Frequency (kHz):	38	--	--	--
Transducer depth (m):	9.15	--	--	--
Pulse length (ms):	1.024	--	--	--
Transmitted power (W):	2000	--	--	--
Angle sensitivity:	21.9	--	--	--
2-Way beam angle (dB):	-21.0	--	--	--
Gain (dB)	26.43	26.43	26.46	26.46
Sa correction (dB)	-0.57	-0.57	-0.60	-0.56
3 dB beamwidth (deg)				
Along:	7.05	7.03	6.96	6.97
Athwart:	7.02	7.01	7.01	6.98
Angle offset (deg)				
Along:	0.03	0.02	0.04	0.01
Athwart:	0.02	0.03	0.02	0.03
Post-processing Sv threshold (dB):	-70	--	--	--
Standard sphere TS (dB)	--	-42.14	-42.14	-42.14
Sphere range from transducer (m):	--	24.78	21.52	18.95
Absorption coefficient (dB/m):	0.009931	0.009889	0.009942	0.009806
Sound velocity (m/s)	1467.0	1461.5	1460.8	1457.9
Water temp at transducer (°C):	--	3.4	3.3	2.9

Note: Gain and Beam pattern terms are defined in the "Operator Manual for Simrad ER60 Scientific echo sounder application (2004)" available from Simrad AS, Strandpromenaden 50, Box 111, N-3191 Horten, Norway.

Table 2.--Trawl station and catch data summary from the winter 2006 echo integration-trawl survey of walleye pollock in the Bogoslof Island area.

Haul	Gear	Date	Time	Duration	Start position		Depth (m)		Water Temp. (C)		Profile	Catch		
												Pollock		Other
No.	Type[1]	(GMT)	(GMT)	(minutes)	Latitude (N)	Longitude (W)	Footrope	Bottom	Gear depth[2]	Surface[3]	No.	(kg)	Number	(kg)
1	AWT	5-Mar	17:19	18.5	53 53.91	167 12.98	426	678	4.0	3.6	301	357	468	19
2	AWT	6-Mar	5:38	2.0	53 35.69	167 38.31	374	775	4.2	4.1	302	540	732	4
3	AWT	6-Mar	7:14	10.1	53 37.25	167 38.31	566	945	3.5	4.1	303	1,261	1,724	33
4	AWT	6-Mar	11:37	5.3	53 35.03	167 43.27	368	906	4.0	4.1	304	242	249	13
5	AWT	6-Mar	14:41	9.0	53 36.87	167 48.44	382	456	4.0	4.1	305	647	589	3
6	AWT	7-Mar	15:21	23.1	53 21.81	168 53.93	414	860	3.7	3.9	306	40	32	8
7	AWT	7-Mar	20:59	22.8	53 12.57	168 58.70	385	843	3.9	4.1	307	246	206	9
8	AWT	7-Mar	23:22	5.0	53 12.19	168 58.61	477	844	3.5	4.1	308	2,381	2,300	5
9	AWT	8-Mar	22:12	6.0	53 08.72	169 03.74	427	594	3.8	4.0	309	1,016	798	7
10	AWT	9-Mar	0:49	1.2	53 04.51	169 08.93	438	742	3.8	4.3	310	8,750	7,345	-
11	AWT	9-Mar	3:20	4.0	53 04.18	169 12.55	646	981	3.4	4.1	311	1,015	1,146	11
12	AWT	9-Mar	6:08	5.5	52 59.29	169 13.90	405	652	3.6	4.0	312	1,208	638	2
13	AWT	9-Mar	10:49	11.2	52 59.12	169 21.03	411	645	3.6	3.9	313	449	258	2
14	AWT	9-Mar	12:38	15.2	52 58.66	169 24.73	404	566	3.8	3.9	314	997	509	2

[1]Gear type: AWT = Aleutian wing trawl

[2]Average SBE temperature measured at the trawl headrope depth (about 29 m above the footrope) while fishing.

[3]SBE temperature measured at 1 m.

Table 3.--Numbers of biological samples and measurements collected during the winter 2006 echo integration-trawl survey of walleye pollock in the Bogoslof Island area.

	Pollock							
Haul No.	Lengths	Weights and Maturities	Otoliths	Ovary weights	Ovary samples	Whole fish	Seabird observations	Myctophid lengths
1	381	121	52	32	-	-	x	-
2	340	68	42	6	3	x	x	-
3	251	67	40	2	1	-	x	50
4	206	42	42	7	2	-	x	-
5	319	86	42	18	1	-	x	-
6	32	32	32	26	-	-	-	-
7	206	43	43	28	-	-	x	-
8	287	82	48	46	10	-	x	-
9	322	81	45	42	5	-	x	-
10	280	83	49	42	5	-	x	-
11	333	77	40	15	-	-	x	-
12	228	53	43	25	4	-	x	-
13	258	44	28	24	3	-	x	-
14	238	84	47	54	-	-	x	-
Totals	3681	963	593	367	34	1 site	13 sites	50

Table 4.--Catch by species from 14 midwater trawl hauls during the winter 2006 echo integration-trawl survey of walleye pollock in the Bogoslof Island area.

Species name	Scientific name	Weight (kg)	Percent by weight	Number
walleye pollock	*Theragra chalcogramma*	19,149.0	99.4	16,994
lanternfish unidentified	Myctophidae (family)	31.9	0.2	1,308
longnose lancetfish	*Alepisaurus ferox*	15.5	0.1	2
jellyfish unidentified	Scyphozoa (class)	14.5	0.1	38
squid unidentified	Teuthoidea (order)	14.3	0.1	107
chinook salmon	*Oncorhynchus tshawytscha*	10.1	0.1	11
Greenland turbot	*Reinhardtius hippoglossoides*	8.4	<0.1	1
Pacific ocean perch	*Sebastes alutus*	5.3	<0.1	5
smooth lumpsucker	*Aptocyclus ventricosus*	5.0	<0.1	4
grenadier unidentified	Macrouridae (family)	3.3	<0.1	1
lamprey unidentified	Petromyzontidae (family)	3.3	<0.1	9
northern lampfish	*Stenobrachius leucopsarus*	2.4	<0.1	209
northern smoothtongue	*Leuroglossus schmidti*	0.9	<0.1	160
arrowtooth flounder	*Atheresthes stomias*	0.6	<0.1	2
emarginate snailfish	*Careproctus furcellus*	0.6	<0.1	1
California headlight lampfish	*Diaphus theta*	0.3	<0.1	25
hatchetfish	Sternoptychidae (family)	0.3	<0.1	10
shrimp unidentified	Decapoda (order)	0.2	<0.1	75
twoline eelpout	*Bothrocara brunneum*	0.2	<0.1	1
Pacific viperfish	*Chauliodus macouni*	0.1	<0.1	2
Total		19,265.98		18,965

Table 5.--Estimates of walleye pollock biomass (in metric tons (t)) by survey area and management area from February-March echo integration-trawl surveys in the Bogoslof Island area between 1988 and 2006.

	Bogoslof Survey Area			Central Bering Sea Specific Area	
Year	Biomass (million t)	Area (nmi^2)	Relative estimation error (%)	Biomass (million t)	Relative estimation error (%)
1988	2.396	--	--	2.396	--
1989	2.126	--	--	2.084	--
1990	--	No survey	--	--	--
1991	1.289	8,411	11.7	1.283	--
1992	0.940	8,794	20.4	0.888	--
1993	0.635	7,743	9.2	0.631	--
1994	0.490	6,412	11.6	0.490	--
1995	1.104	7,781	10.7	1.020	--
1996	0.682	7,898	19.6	0.582	--
1997	0.392	8,321	14.0	0.342	--
1998	0.492	8,796	19.0	0.432	19.0
1999	0.475	Conducted by Japan Fisheries Agency		0.393	--
2000	0.301	7,863	14.3	0.270	12.7
2001	0.232	5,573	10.2	0.208	11.8
2002	0.227	2,903	12.2	0.227	12.2
2003	0.198	2,993	21.5	0.198	21.5
2004	--	No survey	--	--	--
2005	0.253	3,112	16.7	0.253	16.7
2006	0.240	1,803	11.8	0.240	11.8

Table 6.--Numbers-at-length estimates (millions) from February-March echo integration-trawl surveys of walleye pollock in the Bogoslof Island area. No surveys were conducted in 1990 or 2004. The 1999 survey was conducted by the Japan Fisheries Agency. Lengths are in centimeters.

Length	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
10	0	0	--	0	0	0	0	<1	0	0	0	0	0	0	0	0	--	0	0
11	0	0	--	0	0	0	0	<1	0	0	0	0	0	0	0	0	--	0	0
12	0	0	--	0	0	0	0	1	0	0	0	0	0	0	0	0	--	0	0
13	0	0	--	0	0	0	0	<1	0	0	0	0	0	0	0	0	--	0	0
14	0	0	--	0	0	0	0	<1	0	0	0	0	0	0	0	0	--	0	0
15	0	0	--	0	0	0	0	0	0	0	0	0	0	0	0	0	--	0	0
16	0	0	--	0	0	0	0	0	0	0	0	0	0	0	0	0	--	0	0
17	0	0	--	0	0	0	0	0	0	0	0	0	0	0	0	0	--	0	0
18	0	0	--	0	0	0	0	0	0	0	0	0	0	0	0	0	--	0	0
19	0	0	--	0	0	0	0	0	0	0	0	0	0	0	0	0	--	0	0
20	0	0	--	0	0	0	0	0	0	0	0	0	0	0	0	0	--	0	0
21	0	0	--	0	0	0	0	0	0	0	0	0	0	0	0	0	--	0	0
22	0	0	--	<1	0	0	0	0	0	0	0	0	0	0	0	0	--	0	0
23	0	0	--	2	0	0	0	0	0	0	0	0	0	0	<1	0	--	0	0
24	0	0	--	1	0	0	0	0	0	0	0	0	0	0	0	0	--	0	0
25	0	0	--	0	0	0	0	0	0	0	0	0	0	0	0	0	--	0	0
26	0	0	--	<1	0	0	0	0	0	0	0	0	0	0	0	0	--	0	0
27	0	0	--	0	0	0	0	0	0	0	0	0	0	0	0	0	--	0	0
28	0	0	--	0	0	0	0	0	0	0	0	0	0	0	0	0	--	0	0
29	0	0	--	0	0	0	0	0	0	0	0	0	0	0	0	0	--	0	0
30	0	0	--	0	0	0	0	0	0	0	0	0	0	0	<1	0	--	0	0
31	0	0	--	0	<1	0	0	0	0	0	0	0	0	0	0	0	--	0	0
32	0	0	--	0	<1	0	0	0	0	0	0	0	0	0	0	0	--	0	0
33	0	0	--	0	<1	0	0	0	0	0	0	0	0	0	<1	<1	--	0	0
34	0	0	--	0	0	0	0	<1	<1	0	<1	0	0	0	<1	<1	--	0	0
35	0	0	--	0	0	0	0	<1	0	<1	0	0	0	0	<1	0	--	0	0
36	0	0	--	0	<1	0	0	<1	<1	<1	<1	0	0	0	1	0	--	0	0
37	9	3	--	<1	0	0	0	<1	<1	<1	<1	0	0	0	1	<1	--	<1	0
38	6	0	--	2	<1	1	0	1	1	<1	1	0	0	<1	1	<1	--	1	<1
39	16	4	--	5	0	2	<1	4	1	1	3	<1	<1	<1	2	<1	--	2	<1
40	24	3	--	7	1	4	3	12	4	1	7	1	<1	1	3	<1	--	7	2
41	27	4	--	19	3	5	6	20	8	2	9	6	1	1	4	<1	--	11	5
42	48	23	--	23	7	7	9	40	14	3	11	8	1	1	2	<1	--	12	10
43	118	33	--	31	14	6	14	40	17	4	11	13	3	1	5	1	--	11	16
44	179	54	--	36	18	7	21	41	21	5	10	13	3	2	5	2	--	11	20
45	329	159	--	46	28	8	21	50	23	7	9	17	4	4	7	3	--	13	23
46	488	177	--	55	32	13	21	53	31	10	11	19	5	4	5	5	--	11	23
47	547	389	--	79	42	22	18	40	36	14	9	14	6	5	9	5	--	11	18
48	476	434	--	130	68	28	17	55	36	15	12	11	6	5	7	7	--	10	17
49	389	431	--	168	102	46	16	47	37	18	15	10	5	6	6	6	--	8	14
50	248	366	--	205	129	69	39	52	40	21	20	16	6	7	5	7	--	8	9
51	162	279	--	189	144	76	46	58	45	24	23	11	8	6	5	4	--	9	9
52	80	168	--	160	118	73	52	78	52	26	28	20	10	7	4	4	--	7	7

Table 6. Continued.

Length	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
53	48	85	--	122	106	73	49	81	52	26	35	17	13	7	6	4	--	7	5
54	19	50	--	63	67	66	43	88	53	31	41	21	16	8	7	3	--	7	5
55	12	13	--	40	41	50	37	81	48	28	38	33	21	12	9	5	--	8	3
56	4	5	--	17	27	29	26	69	40	24	35	38	20	13	12	7	--	6	6
57	3	8	--	8	13	14	17	58	37	22	30	33	24	17	13	7	--	7	5
58	1	1	--	4	6	9	10	47	28	17	27	36	23	15	14	10	--	6	7
59	0	0	--	1	5	3	6	31	19	13	18	23	16	13	12	9	--	8	5
60	0	0	--	1	1	1	3	17	12	12	13	15	13	11	12	13	--	7	7
61	2	0	--	1	<1	1	2	7	6	6	8	18	10	9	8	9	--	9	5
62	0	0	--	<1	<1	<1	1	4	2	3	5	13	7	6	6	7	--	7	5
63	0	0	--	0	0	0	<1	2	1	1	3	4	4	4	4	5	--	7	4
64	0	0	--	0	1	<1	0	1	<1	1	1	3	2	3	3	5	--	5	2
65	0	0	--	<1	0	0	0	<1	<1	<1	1	1	1	1	1	3	--	4	2
66	0	0	--	0	0	0	0	<1	0	<1	1	<1	<1	1	1	1	--	2	2
67	0	0	--	0	0	0	0	0	0	0	0	1	<1	<1	<1	1	--	2	1
68	0	0	--	0	0	0	0	1	0	0	<1	0	<1	<1	<1	<1	--	1	1
69	0	0	--	0	0	0	0	0	0	0	0	0	0	<1	0	<1	--	<1	<1
70	0	0	--	0	0	0	0	0	0	0	0	0	0	<1	<1	0	--	<1	<1
71	0	0	--	0	0	0	0	0	0	0	0	0	0	0	0	0	--	<1	<1
72	0	0	--	0	0	0	0	0	0	0	0	0	0	0	0	0	--	<1	0
73	0	0	--	0	0	0	0	0	0	0	0	0	0	0	0	0	--	<1	0
Total	3,236	2,687	--	1,419	975	613	478	1,081	666	337	435	416	229	171	181	134	--	225	239

Table 7.--Biomass-at-length estimates (metric tons) from February-March echo integration-trawl surveys of walleye pollock in the Bogoslof Island area. No surveys were conducted in 1990 or 2004. The 1999 survey was conducted by the Japan Fisheries Agency. Lengths are in centimeters.

Length	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
10	0	0	--	0	0	0	0	<1	0	0	0	0	0	0	0	0	--	0	0
11	0	0	--	0	0	0	0	2	0	0	0	0	0	0	0	0	--	0	0
12	0	0	--	0	0	0	0	5	0	0	0	0	0	0	0	0	--	0	0
13	0	0	--	0	0	0	0	2	0	0	0	0	0	0	0	0	--	0	0
14	0	0	--	0	0	0	0	1	0	0	0	0	0	0	0	0	--	0	0
15	0	0	--	0	0	0	0	0	0	0	0	0	0	0	0	0	--	0	0
16	0	0	--	0	0	0	0	0	0	0	0	0	0	0	0	0	--	0	0
17	0	0	--	0	0	0	0	0	0	0	0	0	0	0	0	0	--	0	0
18	0	0	--	0	0	0	0	0	0	0	0	0	0	0	0	0	--	0	0
19	0	0	--	0	0	0	0	0	0	0	0	0	0	0	0	0	--	0	0
20	0	0	--	0	0	0	0	0	0	0	0	0	0	0	0	0	--	0	0
21	0	0	--	0	0	0	0	0	0	0	0	0	0	0	0	0	--	0	0
22	0	0	--	13	0	0	0	0	0	0	0	0	0	0	0	0	--	0	0
23	0	0	--	70	0	0	0	0	0	0	0	0	0	0	38	0	--	0	0
24	0	0	--	61	0	0	0	0	0	0	0	0	0	0	0	0	--	0	0
25	0	0	--	0	0	0	0	0	0	0	0	0	0	0	0	0	--	0	0
26	0	0	--	26	0	0	0	0	0	0	0	0	0	0	0	0	--	0	0
27	0	0	--	0	0	0	0	0	0	0	0	0	0	0	0	0	--	0	0
28	0	0	--	0	0	0	0	0	0	0	0	0	0	0	0	0	--	0	0
29	0	0	--	0	0	0	0	0	0	0	0	0	0	0	0	0	--	0	0
30	0	0	--	0	0	0	0	0	0	0	0	0	0	0	7	0	--	0	0
31	0	0	--	0	37	0	0	0	0	0	0	0	0	0	0	0	--	0	0
32	0	0	--	0	42	0	0	0	0	0	0	0	0	0	0	0	--	0	0
33	0	0	--	0	48	0	0	0	0	0	0	0	0	0	9	2	--	0	0
34	0	0	--	0	0	0	0	53	35	0	29	0	0	0	48	2	--	0	0
35	0	0	--	0	0	0	0	93	0	29	0	0	0	0	73	0	--	0	0
36	0	0	--	0	68	0	0	42	96	18	32	0	0	0	204	0	--	0	0
37	3,199	846	--	115	0	0	0	113	109	84	92	0	0	0	456	16	--	39	0
38	2,304	0	--	768	84	260	0	435	465	173	395	0	0	19	508	6	--	323	29
39	6,365	1,461	--	1,843	0	634	202	1,697	562	507	1,250	258	168	149	823	7	--	942	145
40	10,573	1,116	--	2,801	451	1,776	1,190	5,510	1,857	634	3,208	1,242	195	315	1,716	80	--	3,143	869
41	12,697	1,532	--	7,940	1,235	2,276	2,855	9,777	3,637	851	4,484	5,598	575	403	1,919	170	--	5,257	2,326

Table 7.--Continued

Length	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
42	24,360	10,704	--	10,812	3,316	3,571	4,990	20,730	7,012	1,387	5,652	7,223	674	464	1,307	251	--	6,158	5,378
43	64,253	16,516	--	15,540	6,760	3,089	8,021	22,332	9,190	2,158	6,407	12,079	1,511	770	2,885	437	--	6,318	9,034
44	104,733	29,588	--	20,103	9,877	4,006	12,963	24,863	12,735	3,018	6,048	11,877	1,622	1,562	3,642	1,166	--	6,398	11,836
45	206,586	93,899	--	28,059	16,329	4,818	13,823	32,817	14,927	4,824	5,592	16,278	2,848	2,966	5,117	2,128	--	8,145	15,091
46	328,735	113,092	--	36,235	20,645	8,835	15,081	37,303	21,637	7,399	7,774	17,678	3,289	3,218	4,174	4,079	--	8,122	16,667
47	394,741	268,496	--	56,880	29,146	16,669	13,565	30,184	26,425	10,786	6,653	13,933	5,002	4,095	7,420	3,823	--	8,682	14,277
48	367,368	323,170	--	101,488	51,983	22,214	13,658	44,572	28,658	12,233	9,528	11,280	5,191	4,548	6,062	5,873	--	7,934	14,524
49	320,630	345,632	--	141,399	84,329	39,811	14,414	40,477	31,599	15,951	12,766	10,698	4,659	5,654	5,646	5,747	--	7,115	12,801
50	217,890	314,778	--	187,006	115,614	63,571	36,256	47,785	35,907	19,593	18,837	18,373	5,466	6,794	4,904	6,956	--	7,453	8,940
51	152,084	258,067	--	186,358	140,004	75,524	46,297	57,291	43,272	23,896	23,203	12,204	8,364	6,361	5,004	4,232	--	9,035	9,558
52	79,654	166,322	--	170,855	124,034	77,721	55,851	81,793	53,696	28,549	29,109	23,427	10,816	7,605	3,992	4,883	--	7,711	7,312
53	50,739	89,721	--	139,671	120,309	83,189	55,151	90,342	57,294	29,783	39,234	20,486	14,509	8,203	6,504	4,764	--	8,074	5,941
54	21,211	56,681	--	77,905	82,110	79,461	52,329	104,021	61,504	38,168	48,567	25,270	19,059	10,064	8,249	4,115	--	8,735	6,430
55	14,191	16,270	--	52,506	53,286	64,342	47,770	102,318	59,033	35,853	47,461	39,463	27,179	16,246	12,509	6,435	--	11,061	4,877
56	5,580	6,059	--	23,541	38,564	39,556	35,451	91,962	52,765	33,144	47,627	46,764	27,212	17,977	16,277	10,745	--	8,930	9,602
57	3,886	10,681	--	12,470	19,710	20,781	24,453	81,885	52,000	31,736	42,594	40,641	34,562	24,987	19,422	10,852	--	9,814	6,813
58	1,395	1,220	--	6,603	9,188	14,391	15,826	70,522	40,581	26,309	41,160	44,788	34,255	23,153	21,834	15,700	--	9,735	10,528
59	0	0	--	1,284	7,872	4,376	9,546	48,878	28,918	21,031	28,241	28,362	26,252	20,390	19,158	14,905	--	13,976	8,888
60	0	0	--	2,743	2,631	1,989	4,716	28,240	19,749	20,509	21,604	18,174	22,075	19,263	20,581	23,011	--	13,186	11,377
61	2,561	0	--	2,195	562	1,756	3,644	11,855	10,762	11,428	14,301	22,618	18,519	16,883	14,659	17,326	--	16,771	8,337
62	0	0	--	780	600	372	1,826	7,951	3,578	6,439	9,748	15,120	12,972	11,334	12,296	14,954	--	13,268	9,718
63	0	0	--	0	0	0	200	3,978	2,835	2,999	6,344	5,181	7,033	7,722	8,207	11,240	--	14,025	7,997
64	0	0	--	0	1,363	415	0	1,074	863	1,489	1,777	3,198	4,277	5,489	5,719	10,540	--	10,001	5,553
65	0	0	--	938	0	0	0	495	578	1,096	1,156	1,833	1,660	2,730	2,463	7,281	--	9,033	4,367
66	0	0	--	0	0	0	0	163	0	329	1,251	403	534	1,132	1,515	3,582	--	5,120	4,679
67	0	0	--	0	0	0	0	0	0	0	0	863	520	715	583	1,954	--	5,161	3,264
68	0	0	--	0	0	0	0	2,570	0	0	276	0	403	426	777	746	--	2,157	1,716
69	0	0	--	0	0	0	0	0	0	0	0	0	0	55	0	391	--	933	644
70	0	0	--	0	0	0	0	0	0	0	0	0	0	100	61	0	--	381	467
71	0	0	--	0	0	0	0	0	0	0	0	0	0	0	0	0	--	99	74
72	0	0	--	0	0	0	0	0	0	0	0	0	0	0	0	0	--	118	0
73	0	0	--	0	0	0	0	0	0	0	0	0	0	0	0	0	--	109	0
Total	2,395,735	2,125,851	--	1,289,008	940,197	635,403	490,078	1,104,118	682,279	392,403	492,398	475,311	301,402	231,795	226,548	198,403	--	253,459	240,059

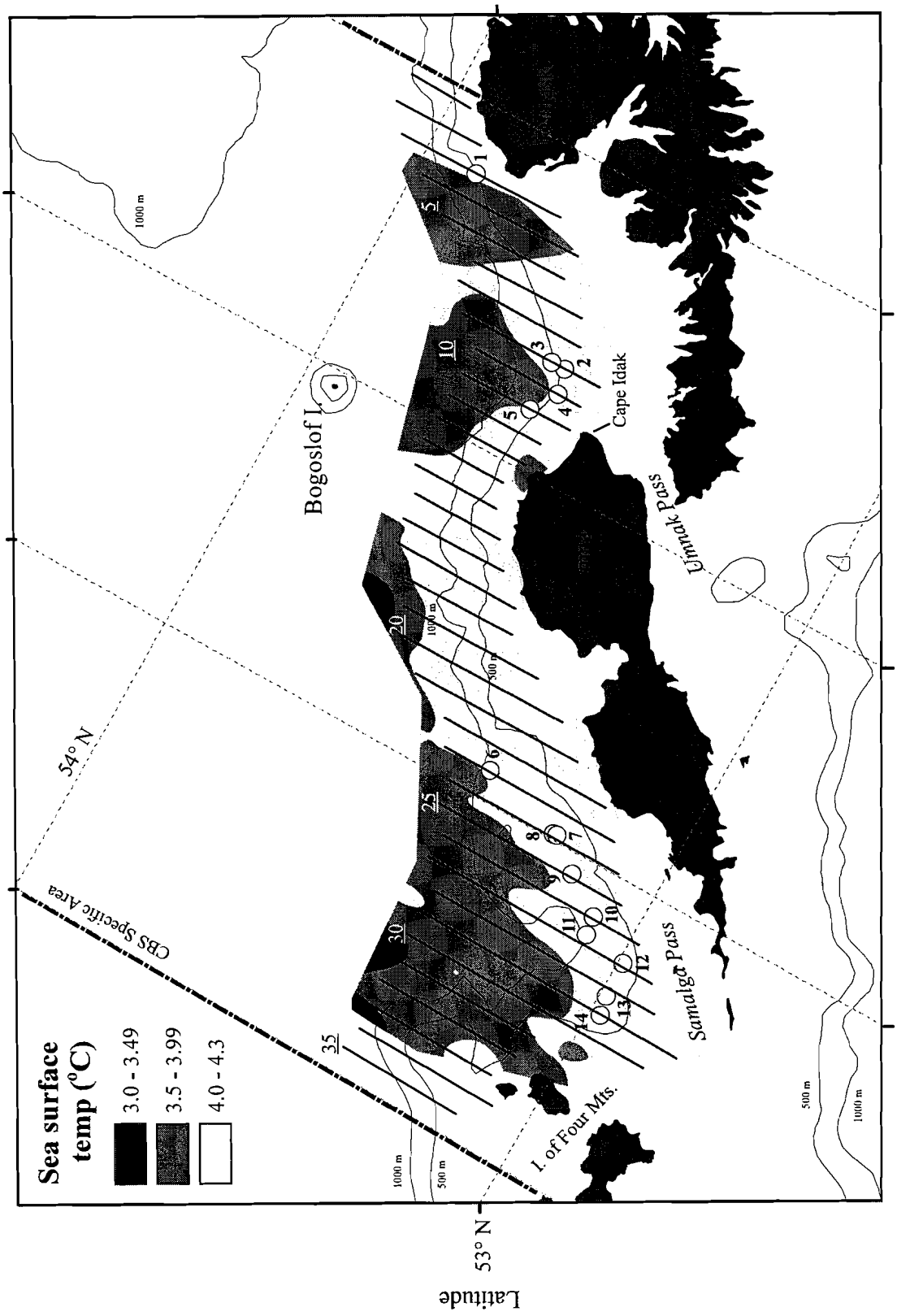


Figure 1.--Transects, haul locations, and sea surface temperature measured from the ship's sensor and recorded during the winter 2006 echo integration-trawl survey of walleye pollock in the Bogoslof Island area. Hauls are indicated by circles. Transect numbers are underlined. The dash-dotted line indicates the Central Bering Sea Specific Area.

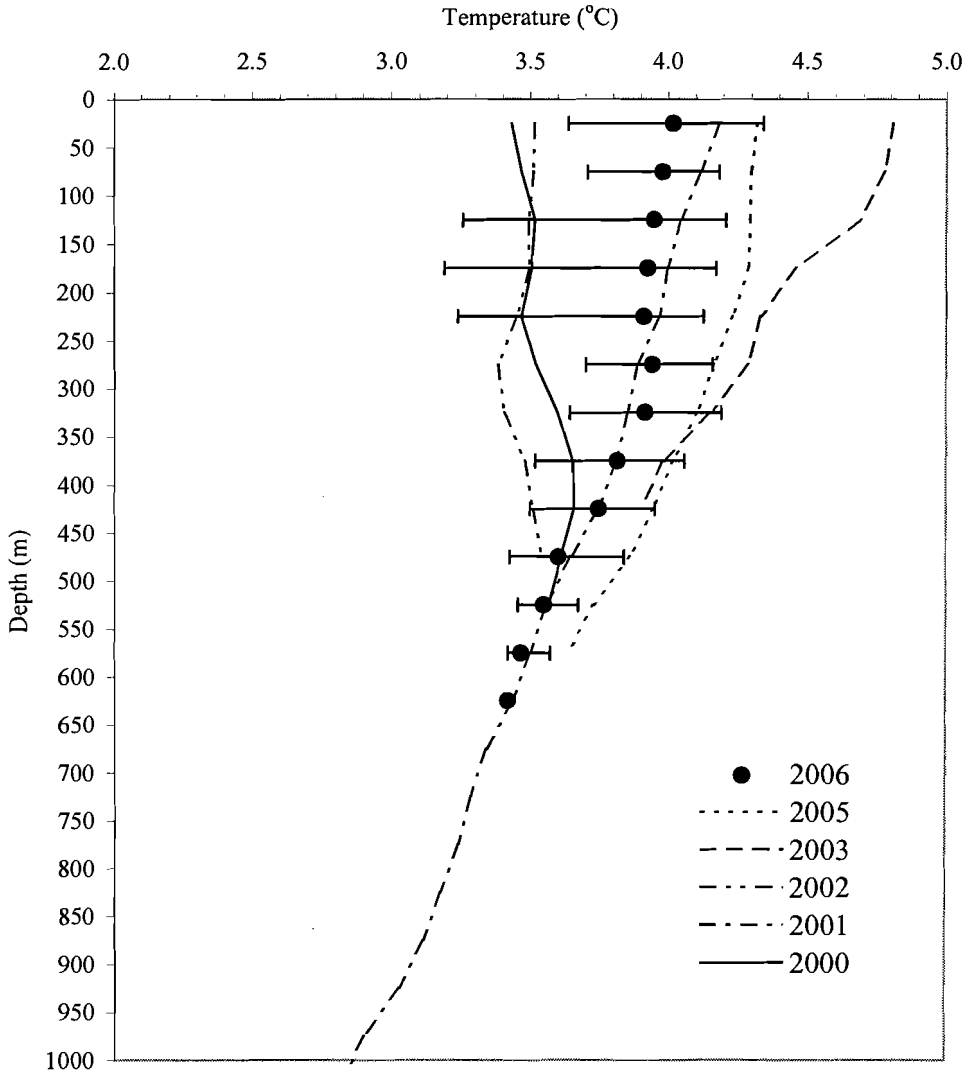


Figure 2.--Average temperature (°C) (symbols) by 50-m depth intervals observed during hauls from the winter 2000-2003, and 2005-2006 echo integration-trawl surveys of walleye pollock in the Bogoslof Island area. The horizontal bars represent temperature range observed during the 2006 survey.
Note: Temperature data from the 2003 survey were collected from only three locations.

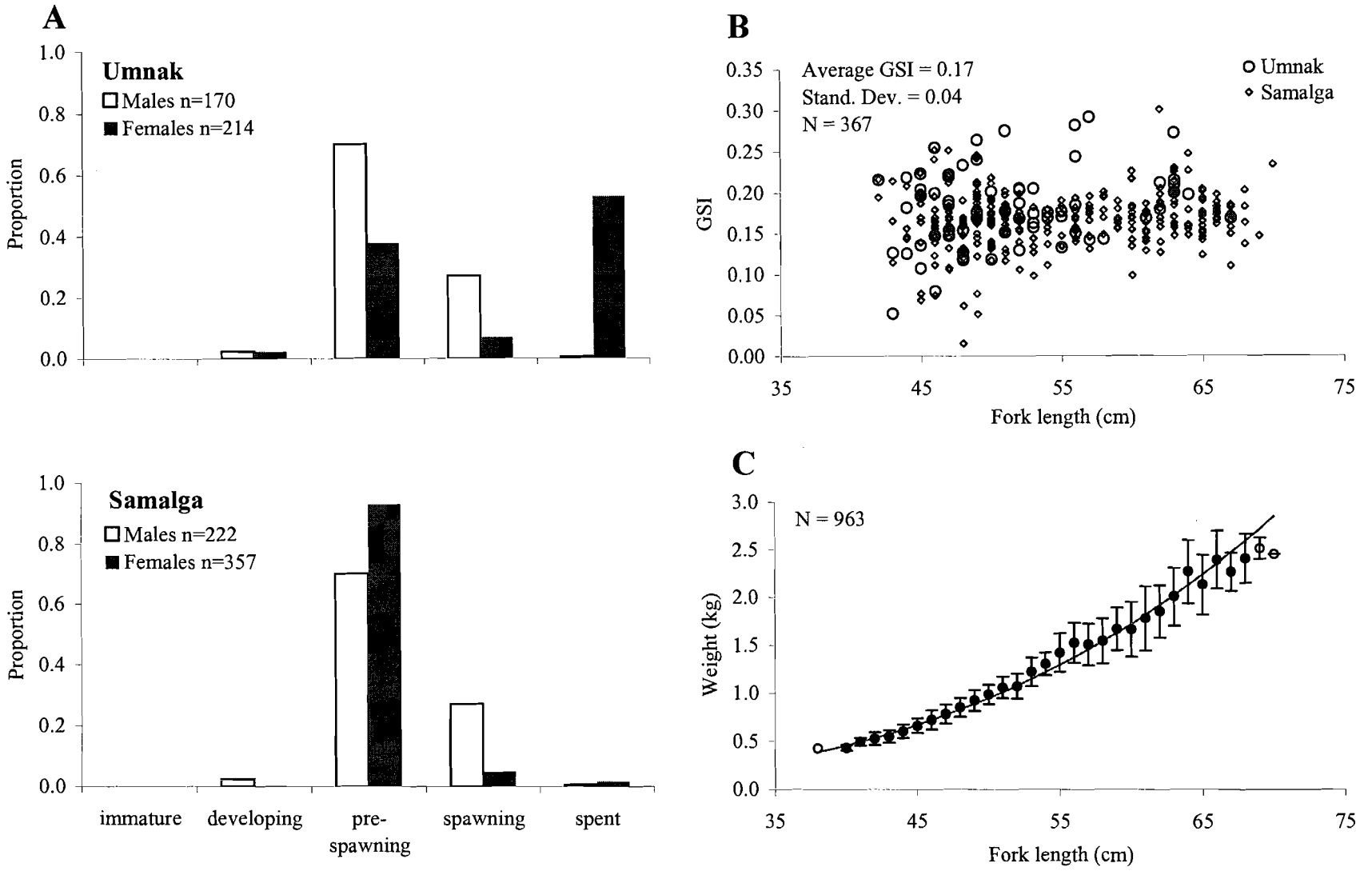


Figure 3.--Pollock maturity stages for length strata 1 and 2 (A), gonado-somatic index (GSI) for pre-spawning females as a function of fork length (cm) (B), and observed mean weight-at-length with a fitted regression line (sexes combined; hollow circles indicate fewer than five fish were measured) (C) observed during the winter 2006 echo integration-trawl survey of the Bogoslof Island area. Vertical bars indicate +/- one standard deviation.

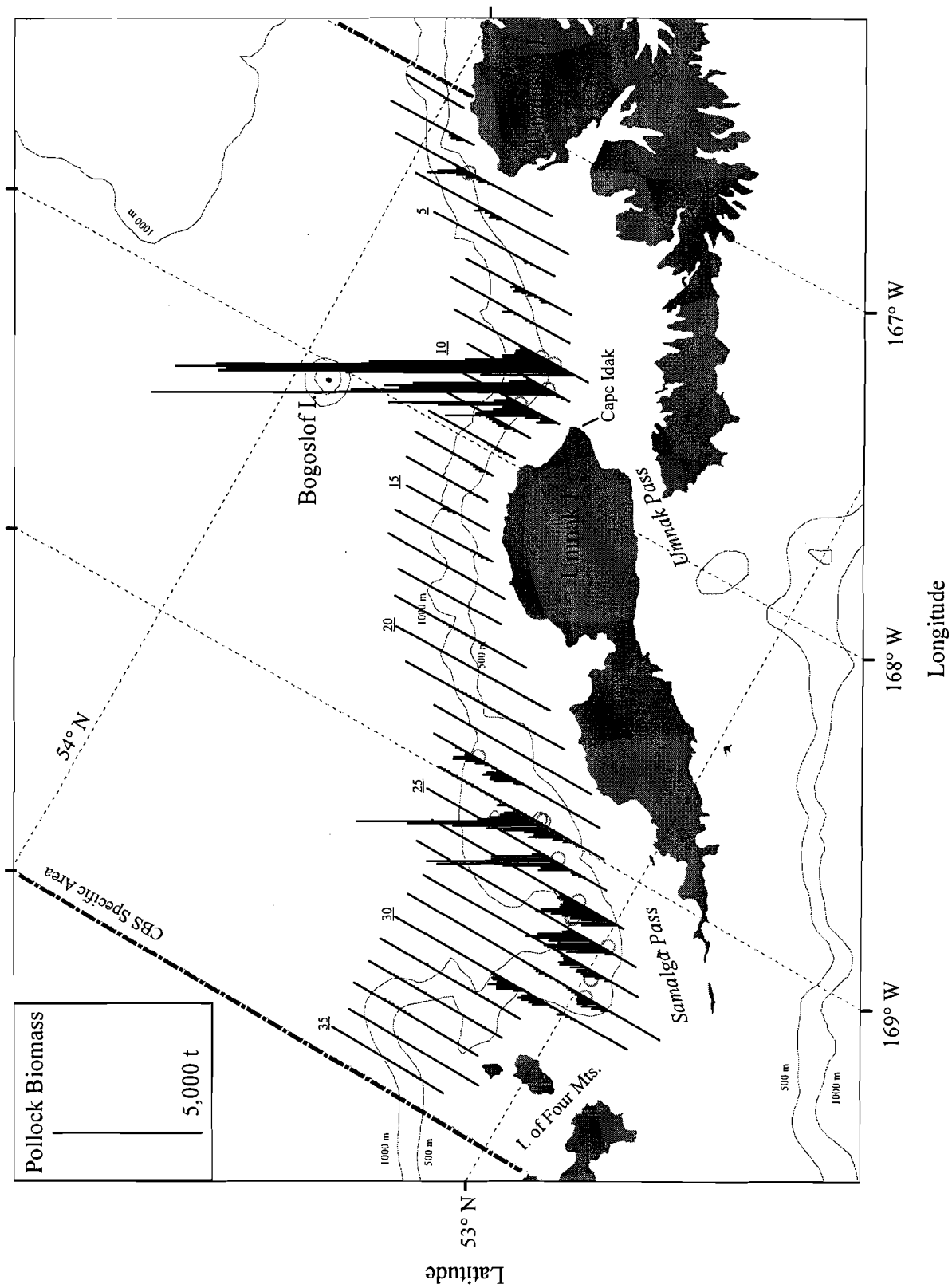


Figure 4.--Pollock biomass in metric tons (t) (vertical lines) and trawl hauls (circles) along tracklines from the winter 2006 echo integration-trawl survey of walleye pollock in the Bogoslof Island area. The Central Bering Sea Convention area is indicated by a dash-dotted line.

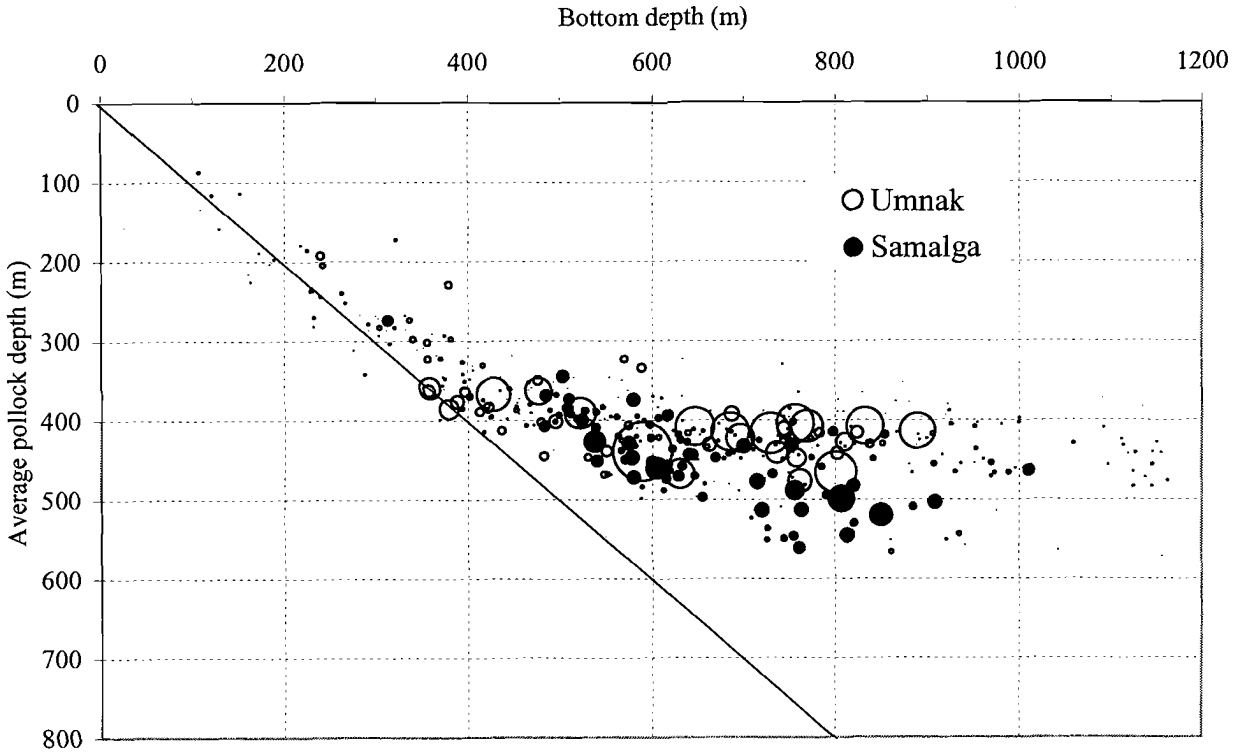


Figure 5.--Average pollock depth (weighted by biomass) versus bottom depth (m), per 0.5 nmi sailed distance for the Umnak and Samalga regions during the winter 2006 echo integration-trawl survey of walleye pollock in the Bogoslof Island area. Bubble size was scaled to the maximum biomass/0.5 nmi interval in the Umnak region (26,833.9 t). The diagonal line indicates where the average pollock depth equals bottom depth.

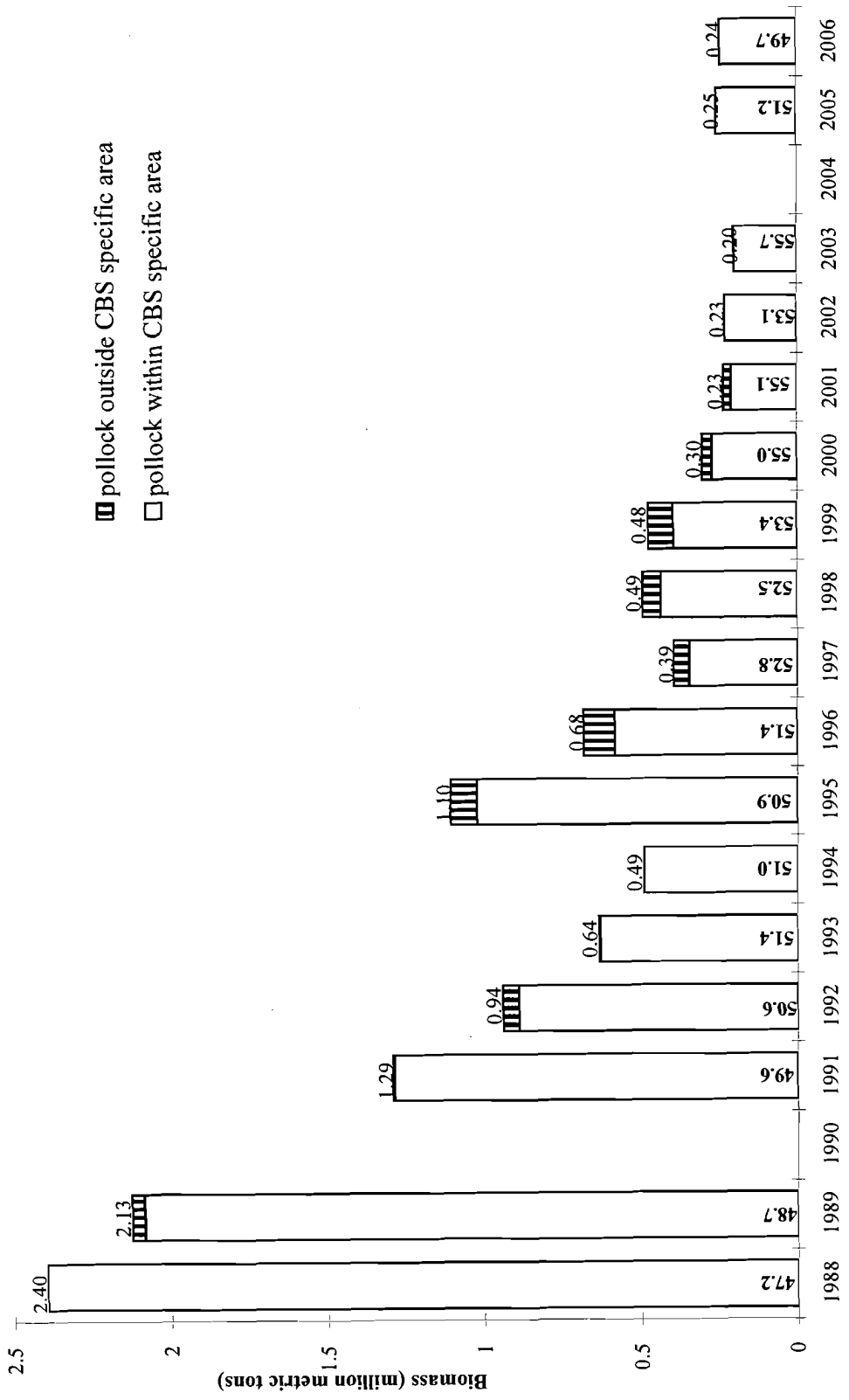


Figure 6.--Biomass estimates and average fork lengths obtained during winter echo integration-trawl surveys for walleye pollock in the Bogoslof Island area, 1988-2006. The United States conducted all but the 1999 survey, which was conducted by Japan. There were no surveys in 1990 or 2004. Total pollock biomass for each survey year is indicated on top of each bar and average fork length (cm) is indicated inside each bar.

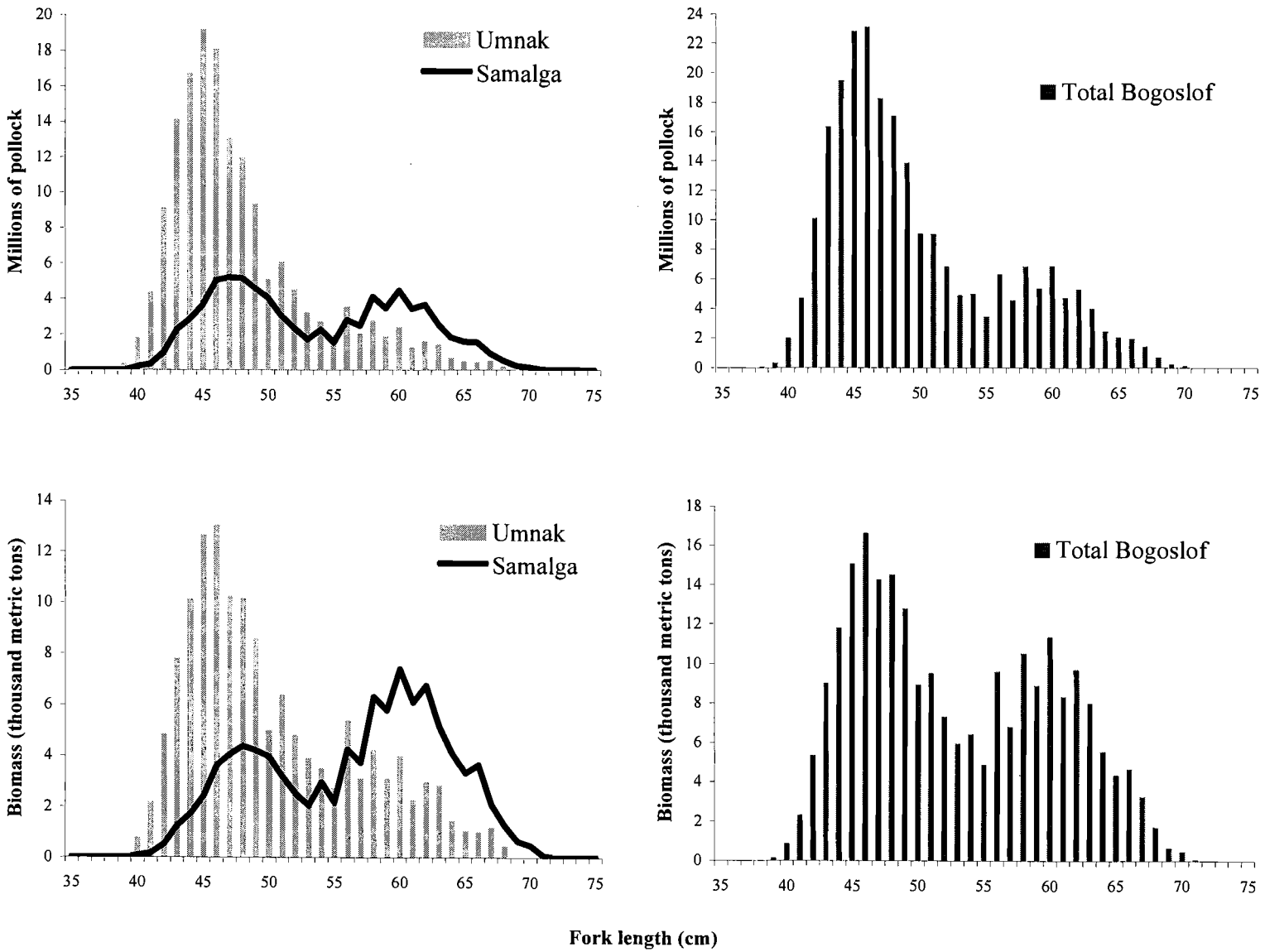


Figure 7.--Population at length (top) and biomass at length (bottom) estimates from the winter 2006 echo integration-trawl survey of walleye pollock in the Bogoslof Island area. Note Y-axis differences.

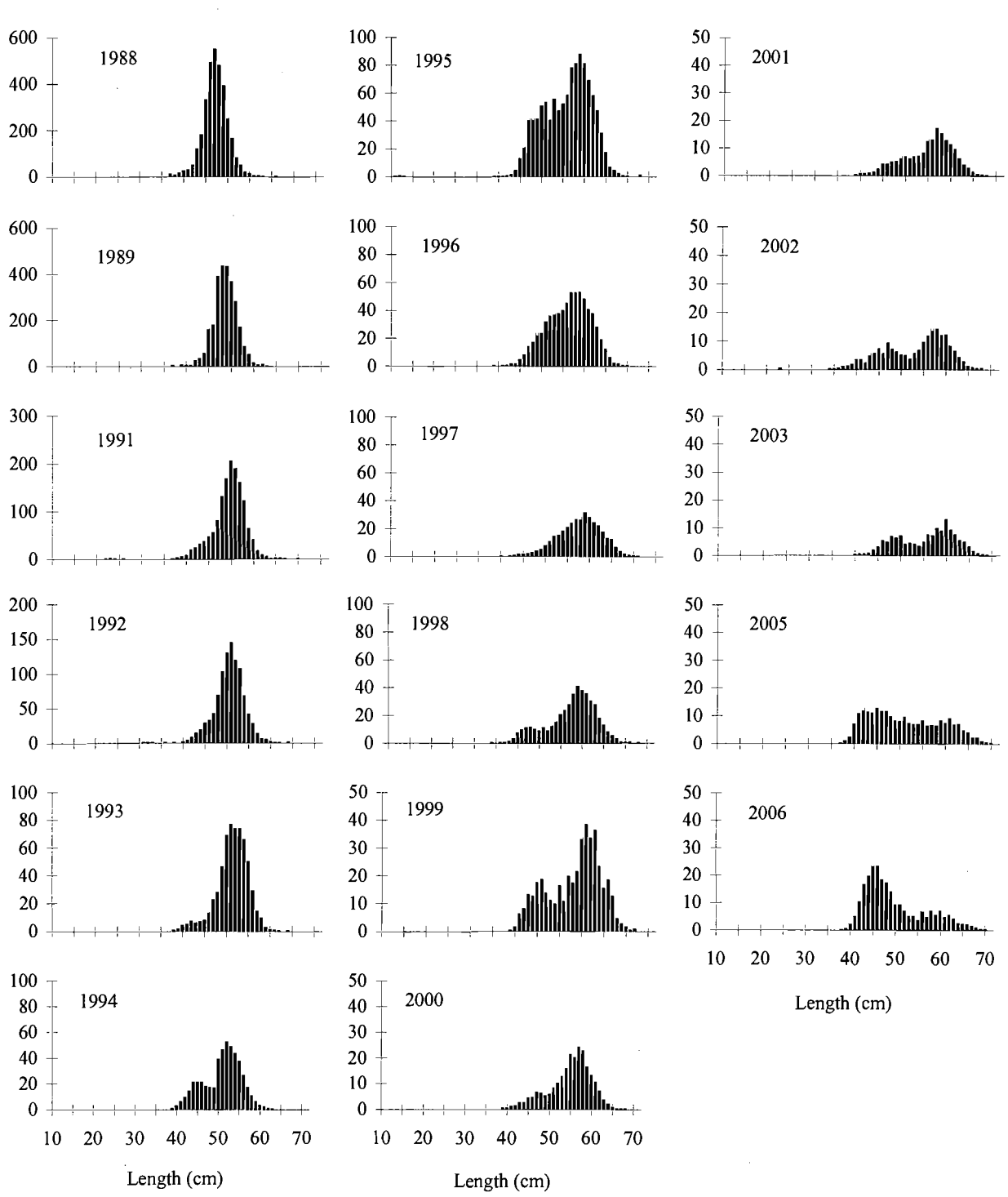


Figure 8.--Numbers-at-length estimates (millions) from winter echo integration-trawl surveys of spawning pollock near Bogoslof Island. The United States conducted all but the 1999 survey, which was conducted by Japan. There were no surveys in 1990 or 2004. Note y-axis scales differ.

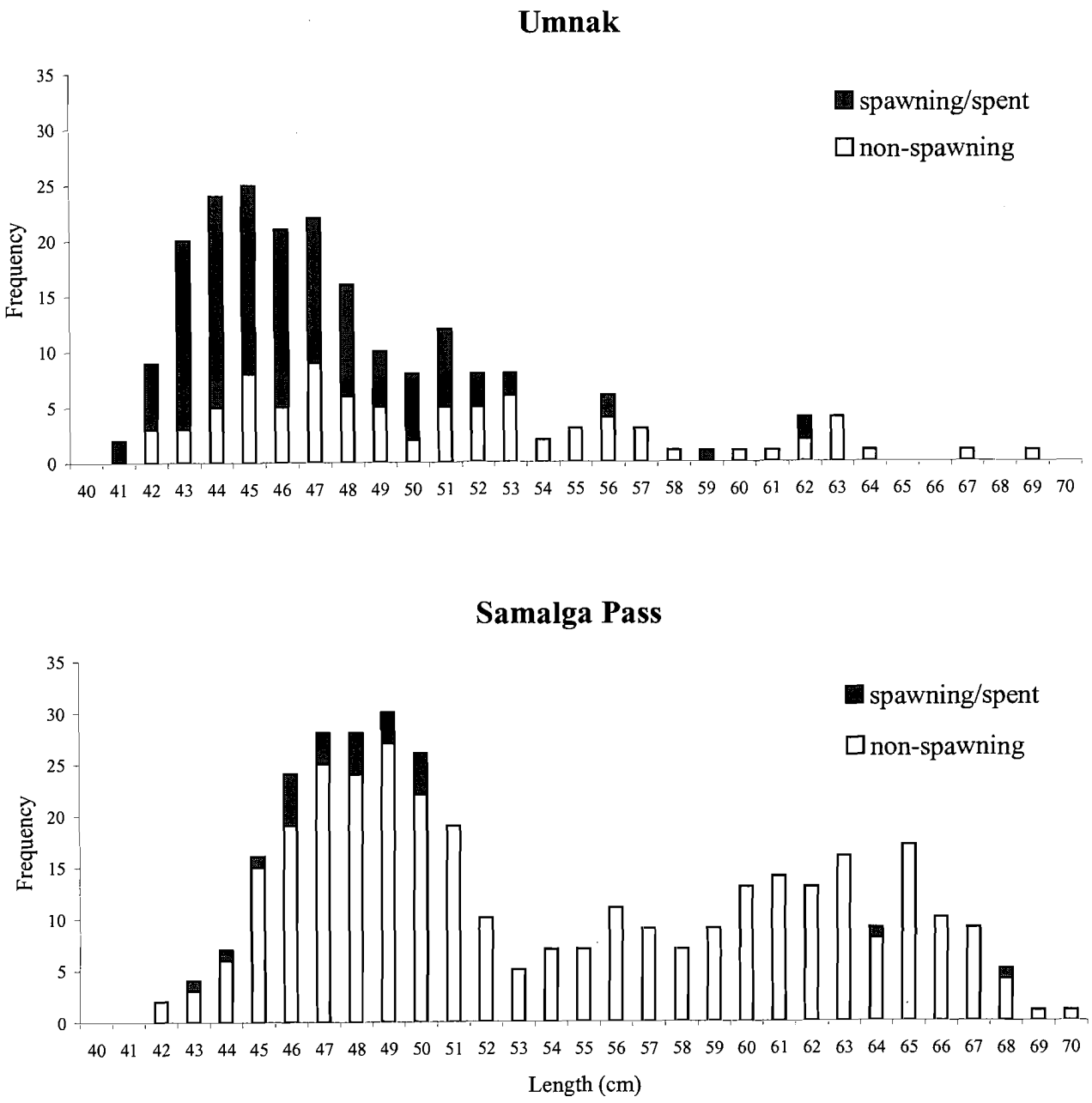


Figure 9.--Unweighted female pollock maturity at length for non-spawning and spawning-spent maturity stages observed in the Umnak and Samalga Pass regions during the winter 2006 echo integration-trawl survey of the Bogoslof Island area.

Preliminary Results from the Acoustic-Trawl Survey of the Eastern Bering Sea Shelf, MF-2006-08

All of the following results are preliminary

Comments should be directed to: Taina Honkalehto (206) 526-4237

Area / Time of Operations: Eastern Bering Sea shelf, between 161° and 179° W longitude, 3 June to 25 July 2006.

Materials:

Vessel: NOAA R/V *Miller Freeman* (built 1967, 215 ft, 1900 t, 1700 hp)

Acoustic System: Simrad ER60 echosounding system (18, 38, 120 and 200 kHz). The system calibrations conducted in June and July in Captains Bay, Dutch Harbor, AK showed no significant differences in gain parameters or transducer beam pattern characteristics from the previous (22 March 2006) calibration.

Nets: Aleutian wing trawl (AWT--midwater trawl, head/foot rope 270 ft, vertical opening 90 ft, codend liner 1.25 in), 83/112 bottom trawl without roller gear (32 mm codend liner), Methot trawl for sampling larval fish and zooplankton.

Miscellaneous: multiple opening/closing codend (MOCC), monofilament pocket nets for the AWT, lowered transducer (38 kHz).

Methods:

The survey design consisted of parallel, regularly spaced, generally north-south oriented transects (20 nmi spacing). The survey was conducted from east to west at transecting speeds of 11.5-12.5 kts with continuous acoustic data collection. Midwater (91 AWT, 5 Methot) and bottom (8 ea 83/112) tows collected biological and physical oceanographic data. The cruise was divided into three legs, with inports in Dutch Harbor, AK, in early and mid-June, and mid-July. During leg 2, the NOAA ship *Oscar Dyson* conducted transects alongside the *Miller Freeman* as part of an inter-vessel comparison experiment. Dedicated follow-the-leader inter-vessel comparison transects and paired trawling were also conducted in selected areas as part of the inter-vessel experiment. Permission to work in Russia was still not received by nearly the end of Leg 3 so the time that had been allocated to work in Russian waters was redirected towards survey-related research activities. The survey concluded a week earlier than planned.

Preliminary Findings:

Few pollock were observed on the six easternmost transects between Bristol Bay and north of Unimak Island. Observed numbers of pollock increased slightly north of Unimak Pass to the Pribilofs, and increased again west of the Pribilofs. However, significant pollock concentrations were not observed until west of about 175° W (Fig.1). East of the Pribilof Islands, pollock size composition ranged from 5 to 73 cm FL (Fig 2) with a dominant length mode at 48 cm. Between about 170° W and 175° W the length distribution was similar with lengths ranging from 10 to 79 cm and a dominant mode at 46 cm. West of about 175° W, juvenile and smaller adult pollock were observed with lengths that ranged between 10 and 76 cm, and formed modes at 37, 23 and 13 cm.

The preliminary 2006 pollock biomass estimate for the eastern Bering Sea shelf between the surface and 3 m was lower than the biomass estimated in 2004. About 25% was east of 170 W,35% was between 170° W and 175° W, and 40% was west of 175° W. In 2004, the final biomass estimate was 3,310,000 t with 31% east of 170° W and 69% west of 170° W.

The final two days of the cruise were dedicated to two trawl-oriented research projects. In the first project, the multiple opening/ closing codend device (MOCC) was outfitted with a camera in the intermediate section of the trawl looking aft to view the codend mouth. The objective was to use Wesmar third wire net sonde video, camera images and codend catches to estimate the transit time of fish through the entire length of the AWT. This information will be used to determine the appropriate time intervals for tripping the 3 MOCC codends. Four successful MOCC deployments were made with video recorded. Preliminary results indicated that about 10 min. were required for most fish to transit through the net. The second experiment employed methods to detect escapement of small pollock from the AWT. A Didson acoustic imaging instrument was installed on the AWT and directed to view the 16" meshes where an external "pocket" gillnet panel with small (1") monofilament mesh was attached to the underside of the AWT. Of four AWT deployments with a pocket net, one haul caught 2 pollock in the pocket net. Six Didson deployments were completed, resulting in 4 that showed good images of the net.

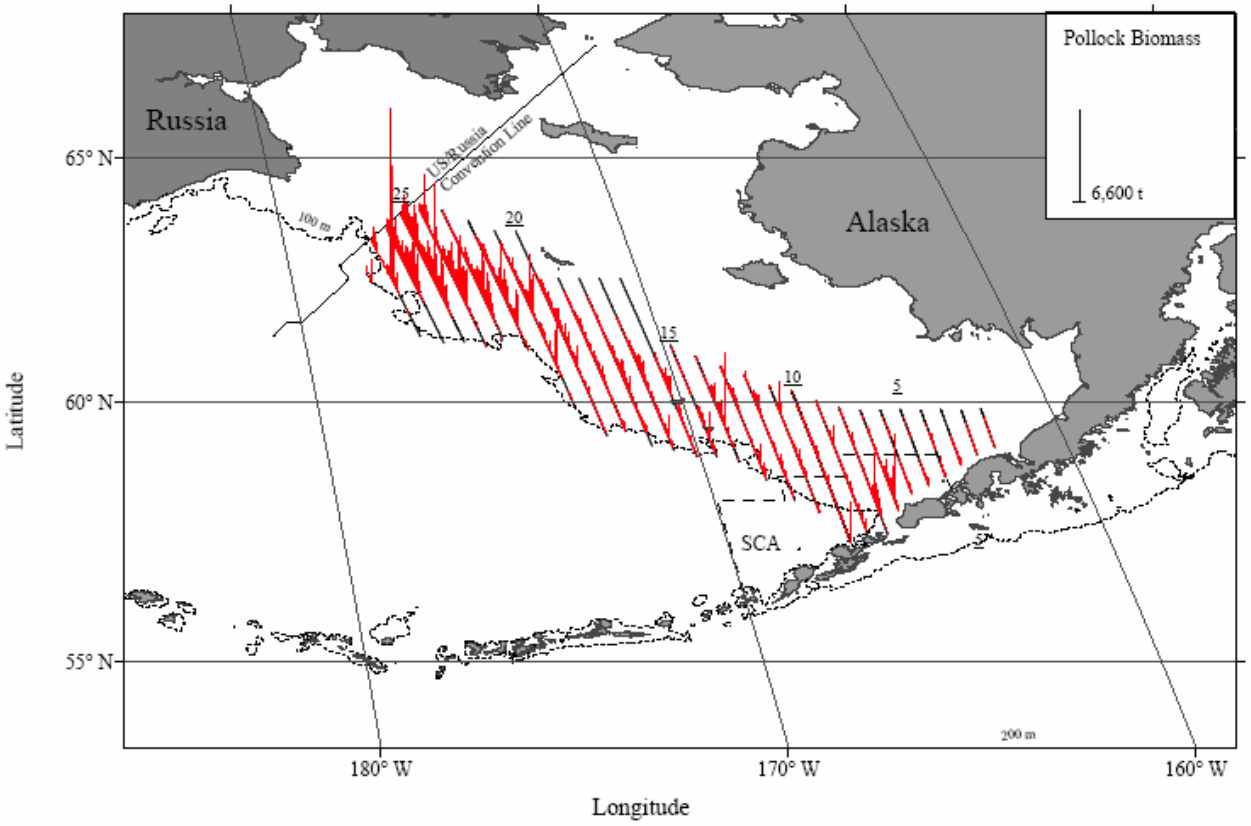


Figure 1. Estimated pollock biomass (in metric tons (t)) between 3 m off bottom and 12 m from the surface along tracklines surveyed during the summer 2006 echo integration-trawl survey of the Bering Sea shelf. The Steller sea lion Conservation Area (SCA) is outlined.

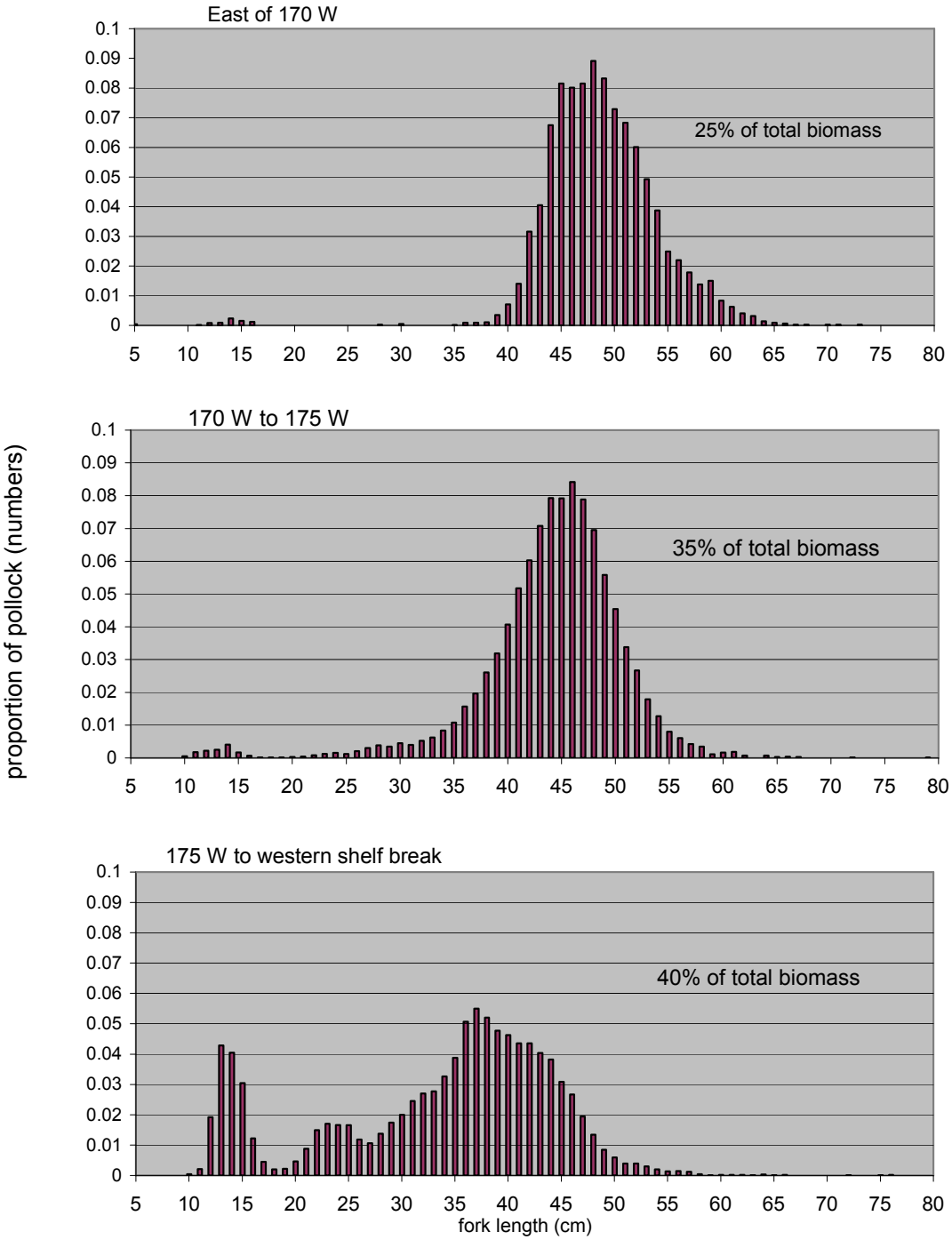


Fig. 2. Preliminary pollock length composition by area for the summer 2006 eastern Bering Sea shelf acoustic-trawl survey, MF2006-08.

Preliminary Report on the Korean Trial Fishing for Walleye Pollock in the Convention Area of the Bering Sea in 2006.

The trial fishing in the convention area of the Bering Sea (Donut hole) was conducted by three Korean commercial fishing vessel in 2006. First vessel, it was conducted by NAMBUK HO (5,549.02 G/T, Photo 1) in the Convention area during 9 days (Jul. 31 ~ Aug. 8. 2006). Second vessel, ORIENTAL ANGEL (5,210 G/T, Photo 2) of stern trawler conducted in the Convention area during 6 days (Jul. 31 ~ Aug. 5. 2006). Third vessel, JOONSUNG HO (2,866.0 G/T, Photo 3) of stern trawler conducted in the Convention area during 9 days (Jul. 31 ~ Aug. 8. 2006).

The main purpose of the trial fishing was to determine the geographical distribution of walleye pollock in the Convention area and to collect biological data of walleye pollock.

But walleye pollock was caught 1 fish (0.7kg) only during Korean trial fishing in 2006 (Table 1). Fig. 1 ~ 3 were presented the hydroacoustic tracklines and haul positions during the Korean trial fishing.

※ Korean observer did not come back yet. Therefore final report will be provide next meeting.

Photo 1. NAMBUK HO (5,549.02 G/T).

Photo 2. ORIENTAL ANGEL (5,210 G/T).

Photo 3. JOONSUNG HO (2,866.0 G/T).

Table 1. Catch information of Korean trial fishing in the Convention area in 2006

Vessel	Period of trial fishing	Haul	Catch	
			Pollock	Others
NAMBUK HO	Jul. 31 ~ Aug. 8. 2006	3	None	34.7 kg
ORIENTAL ANGEL	Jul. 31 ~ Aug. 5. 2006	3	None	Nine
JOONSUNG HO	Jul. 31 ~ Aug. 8. 2006	5	1 fish (0.7 kg)	3.7 kg
Total		**11**	**1 fish (0.7 kg)**	**38.4 kg**

※ The Others are composited of squids and smooth lumpsucker (*Aptocyclus ventricosus*).

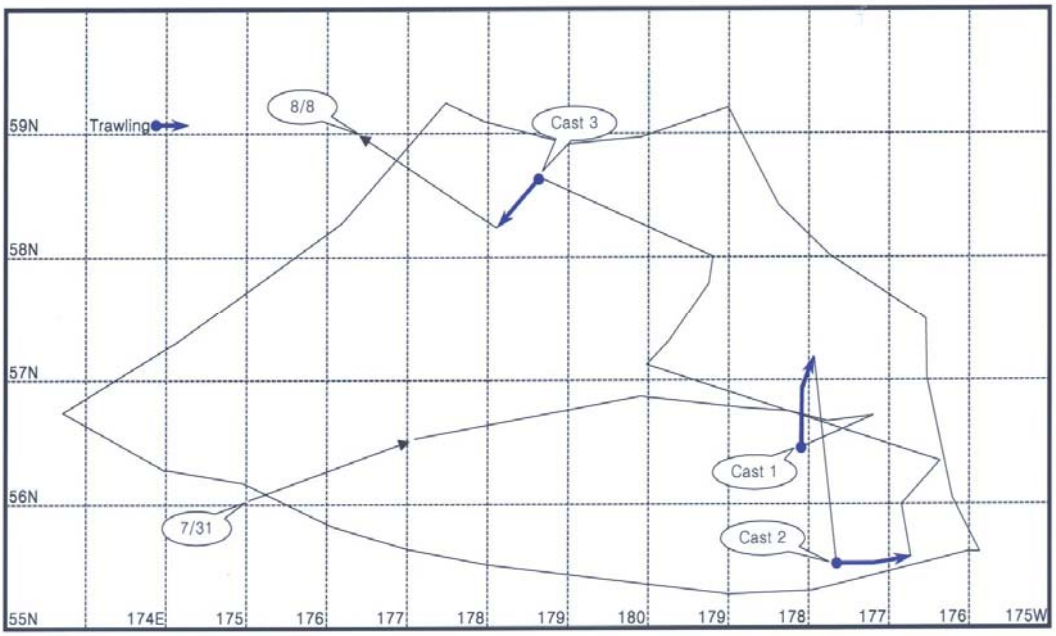


Fig. 1. Hydroacoustic trackline and haul positions (Bold line) of NAMBUK HO in convention area during Jul. 31 ~ Aug. 8. 2006.

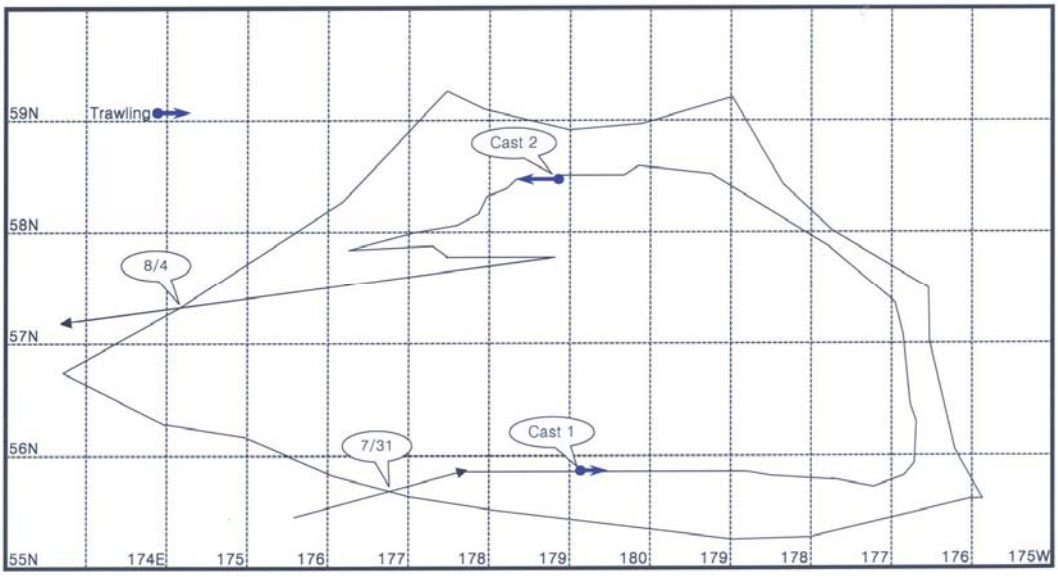


Fig. 2. Hydroacoustic trackline and haul positions (Bold line) of ORIENTAL ANGEL in convention area Jul. 31 ~ Aug. 5. 2006.

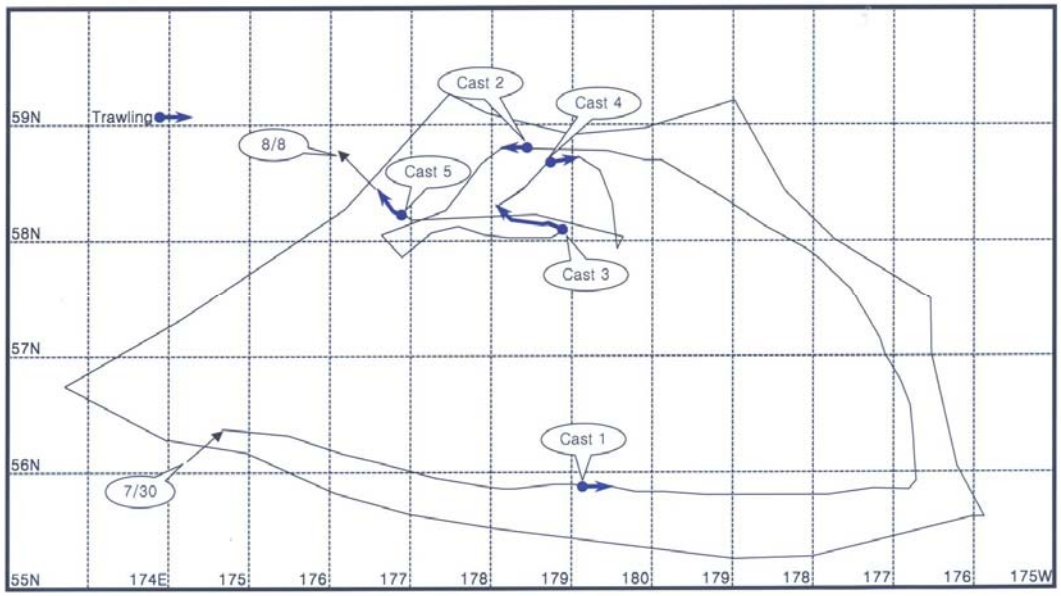
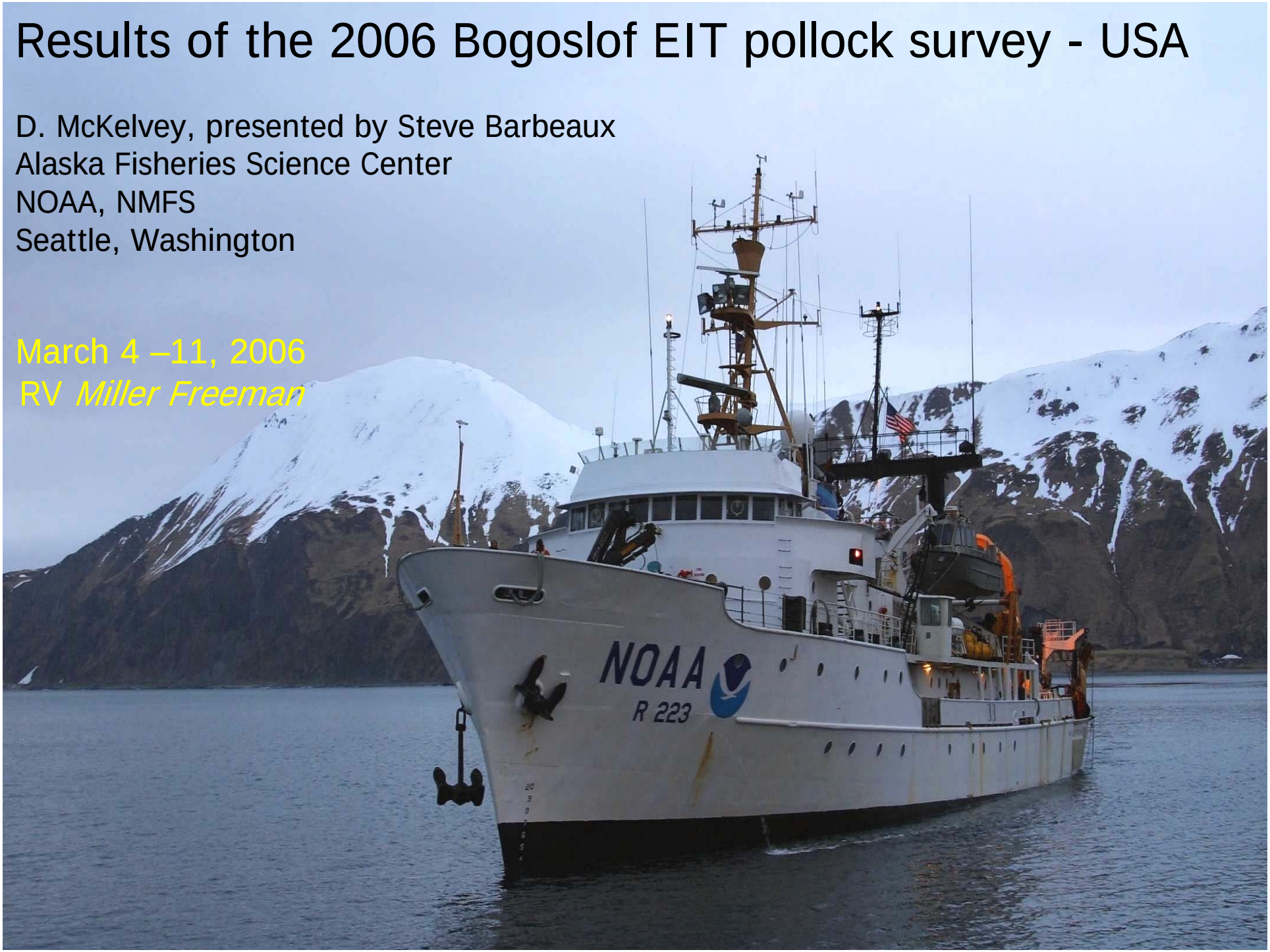


Fig. 3. Hydroacoustic trackline and haul positions (Bold line) of JOONSUNG HO in convention area during Jul. 31 ~ Aug. 8. 2006.

Results of the 2006 Bogoslof EIT pollock survey - USA

D. McKelvey, presented by Steve Barbeaux
Alaska Fisheries Science Center
NOAA, NMFS
Seattle, Washington

March 4 –11, 2006
RV *Miller Freeman*



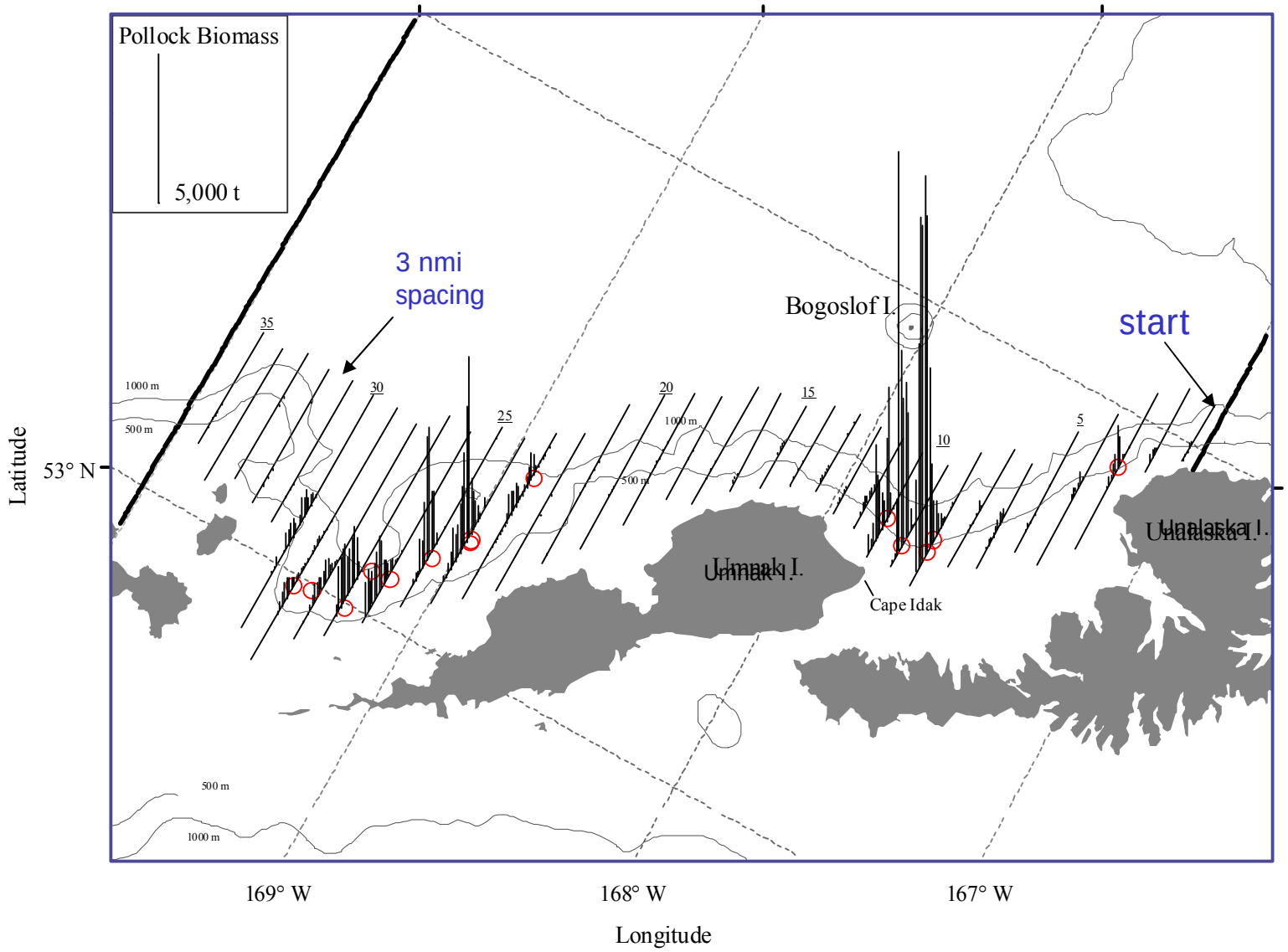
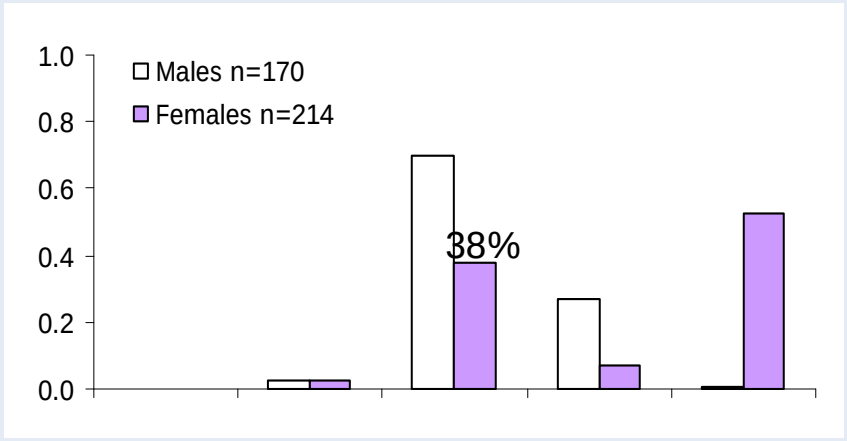
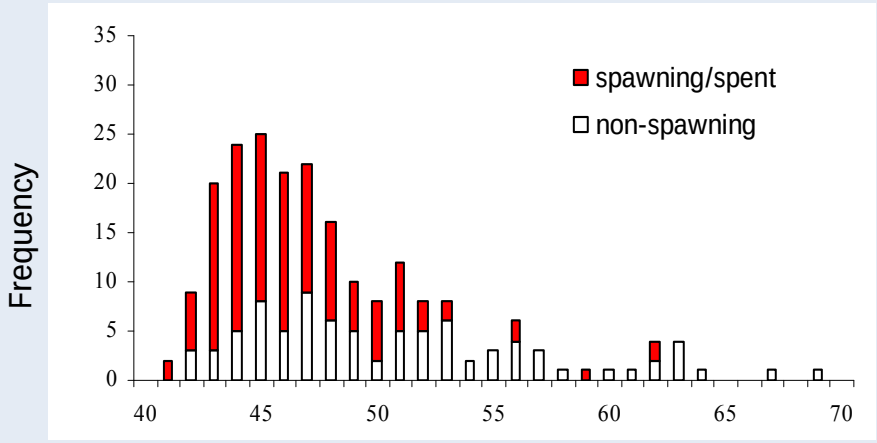


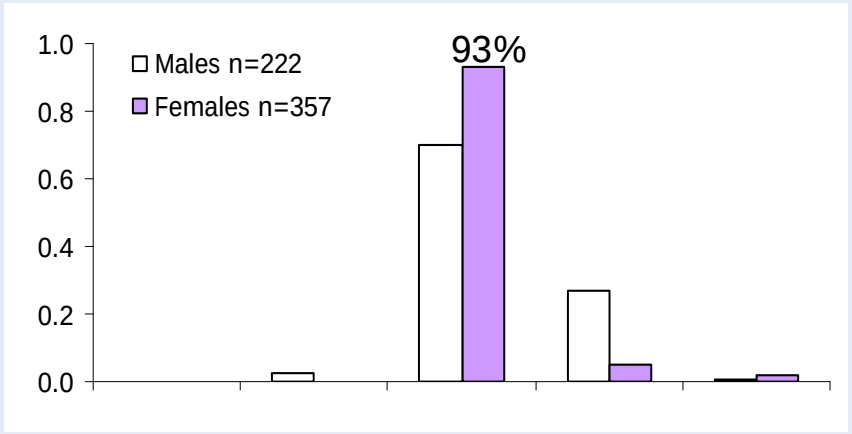
Figure 1. Trackline (35), trawl haul location (14 circles), and biomass (t) attributed to pollock observed during the winter 2006 EIT survey in the Bogoslof Island area.

Umnak





Samalga



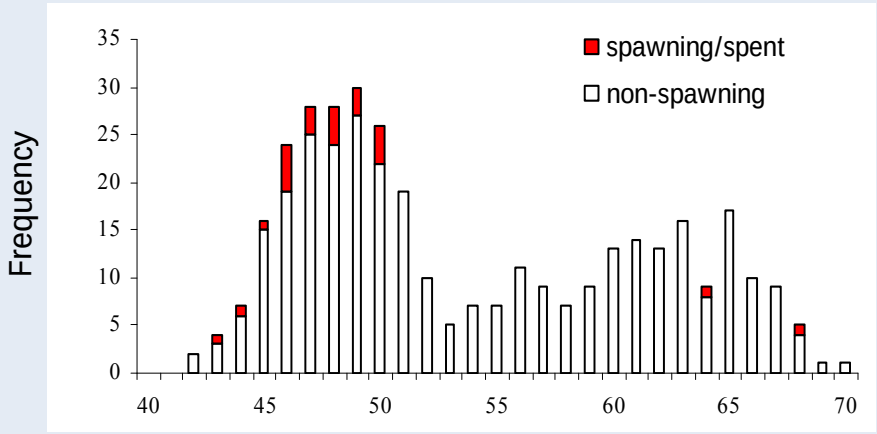


Figure 2. Pollock maturity stages by region (left), female pollock maturity (spawning/non-spawning) by fork length (cm) and region (right) from the winter 2006 EIT survey of walleye pollock in the Bogoslof Island area.

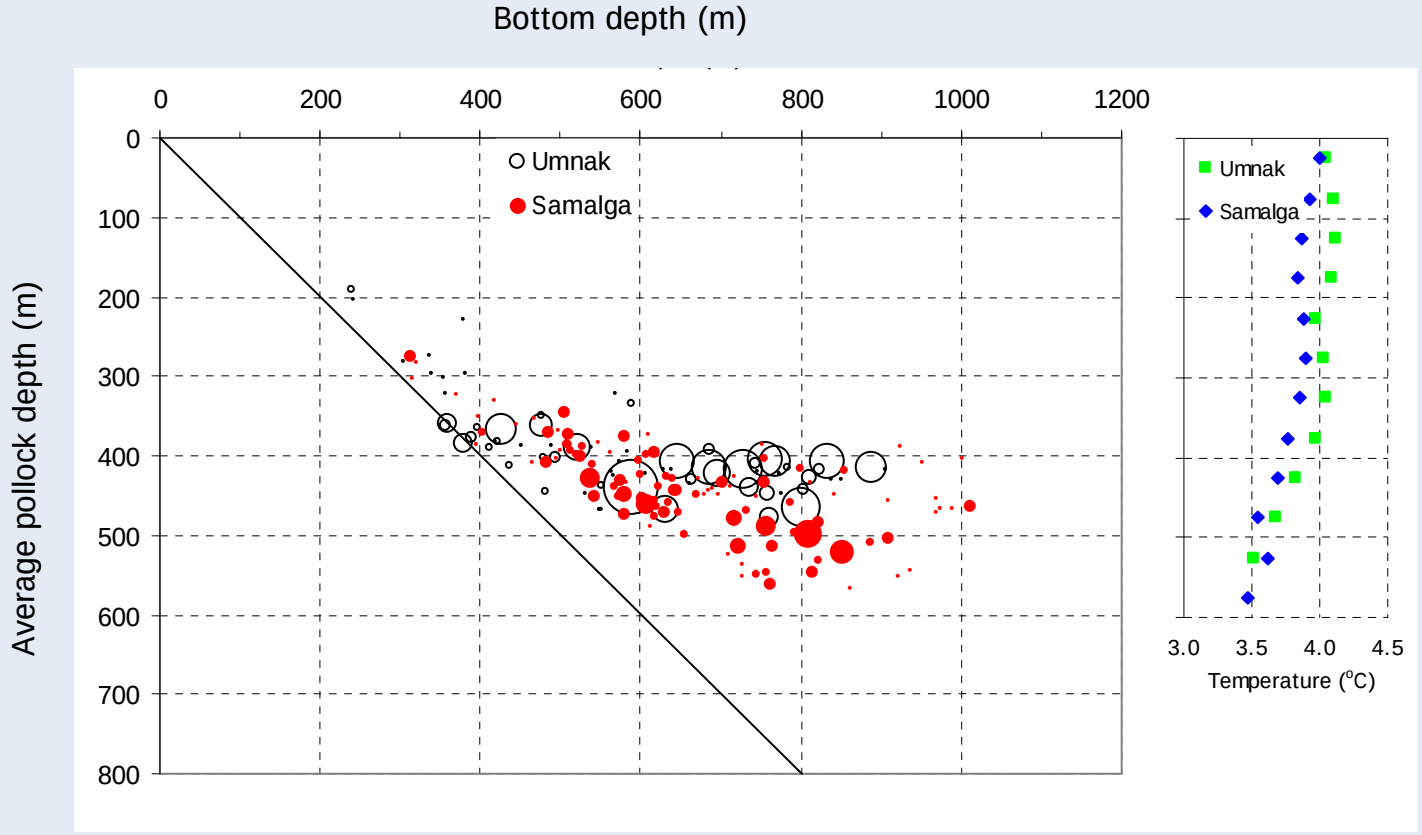


Figure 3. Average pollock depth (weighted by biomass) versus bottom depth, per 0.5 nmi sailed distance for Umnak and Samalga regions. Bubble size was scaled to the maximum biomass/0.5 nmi interval in the Umnak region (26,834 t) (left), and average temperature (°C) by 50-m depth intervals observed during hauls in the Umnak and Samalga regions (right).

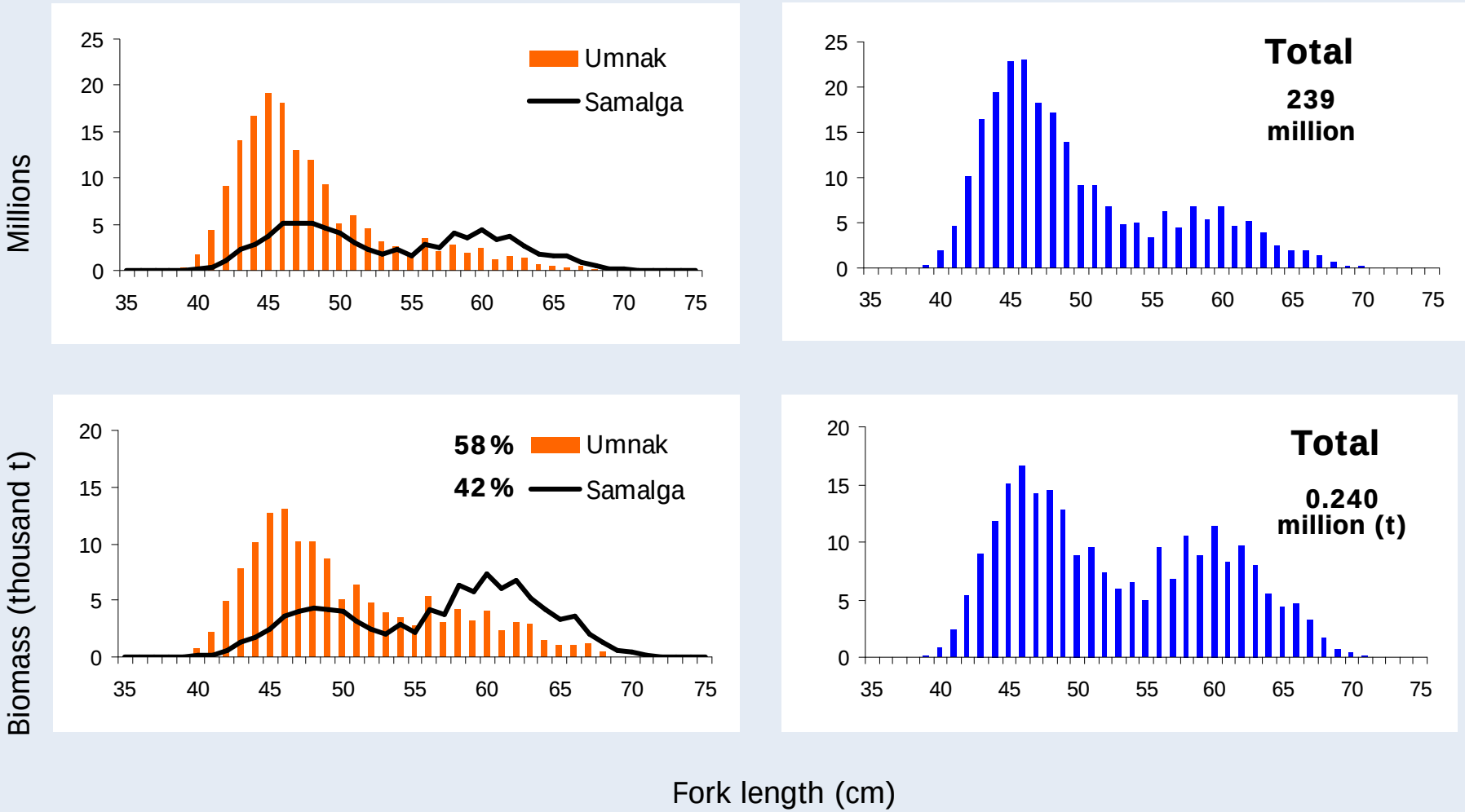


Figure 4. Population-at-length (top) and biomass-at-length (bottom) estimates from the winter 2006 EIT survey of walleye pollock in the Bogoslof Island area.

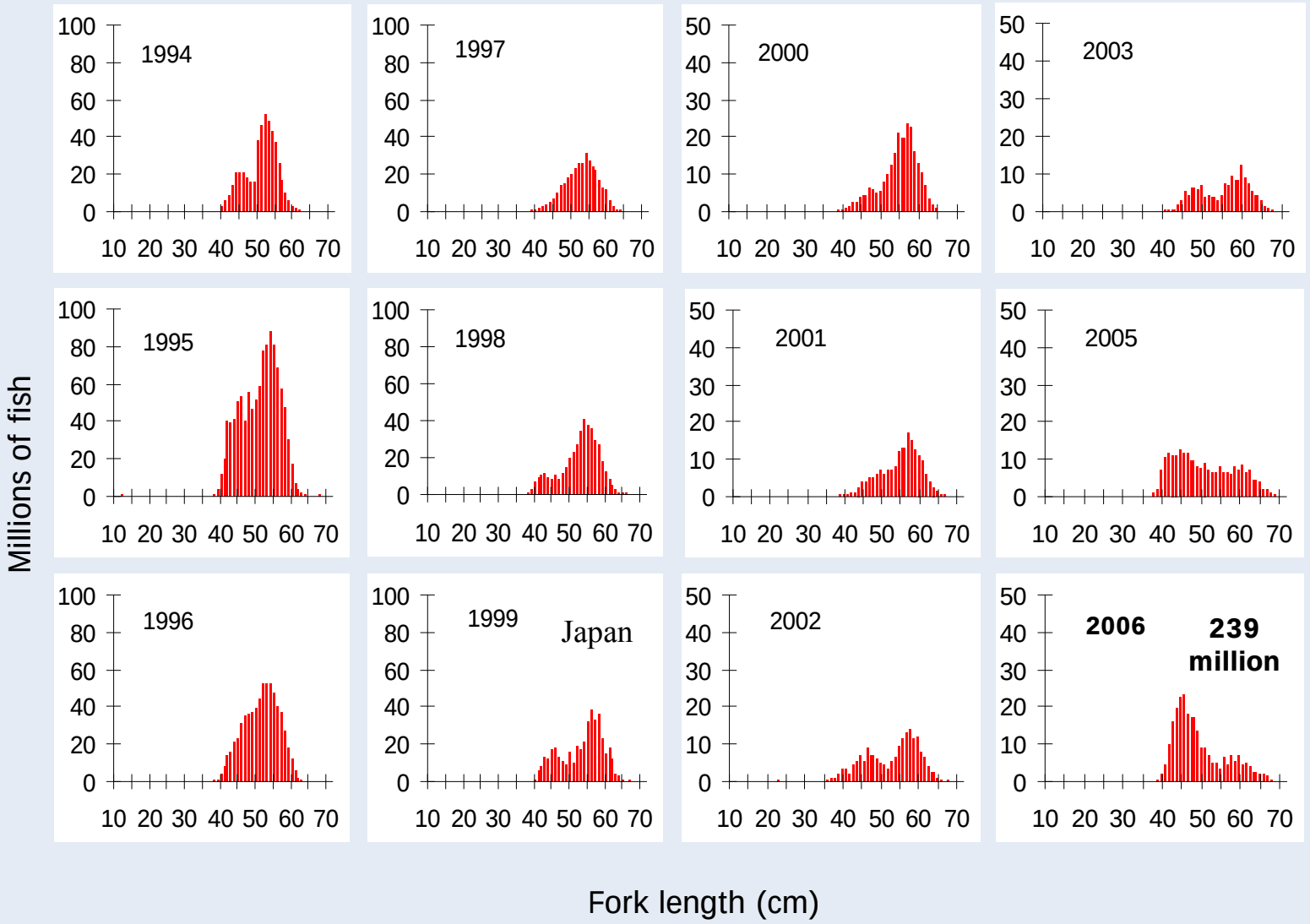


Figure 5. Numbers-at-length estimates (millions) from EIT surveys of spawning pollock near Bogoslof Island in winter 1994-2006. Y-axis scales differ.

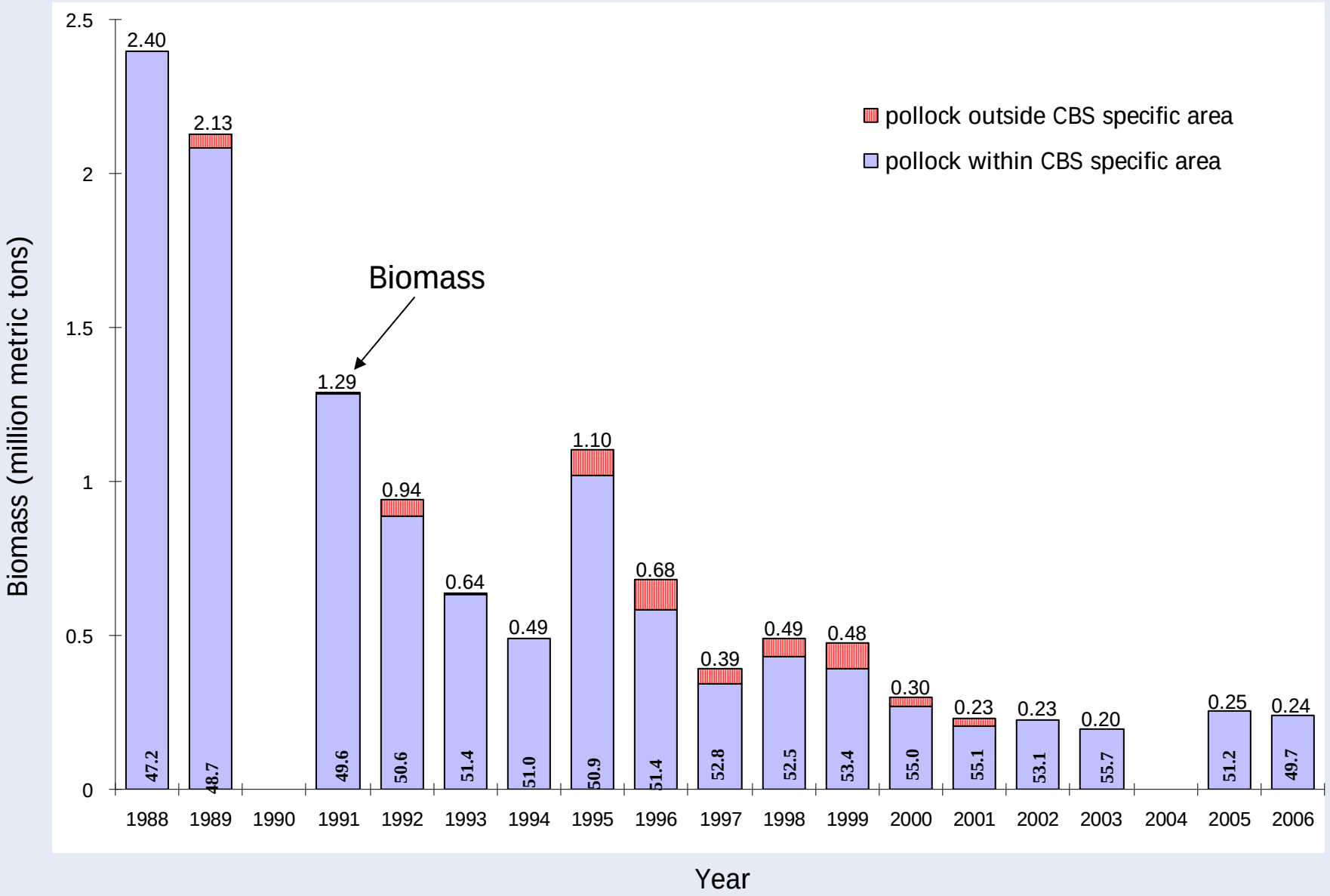
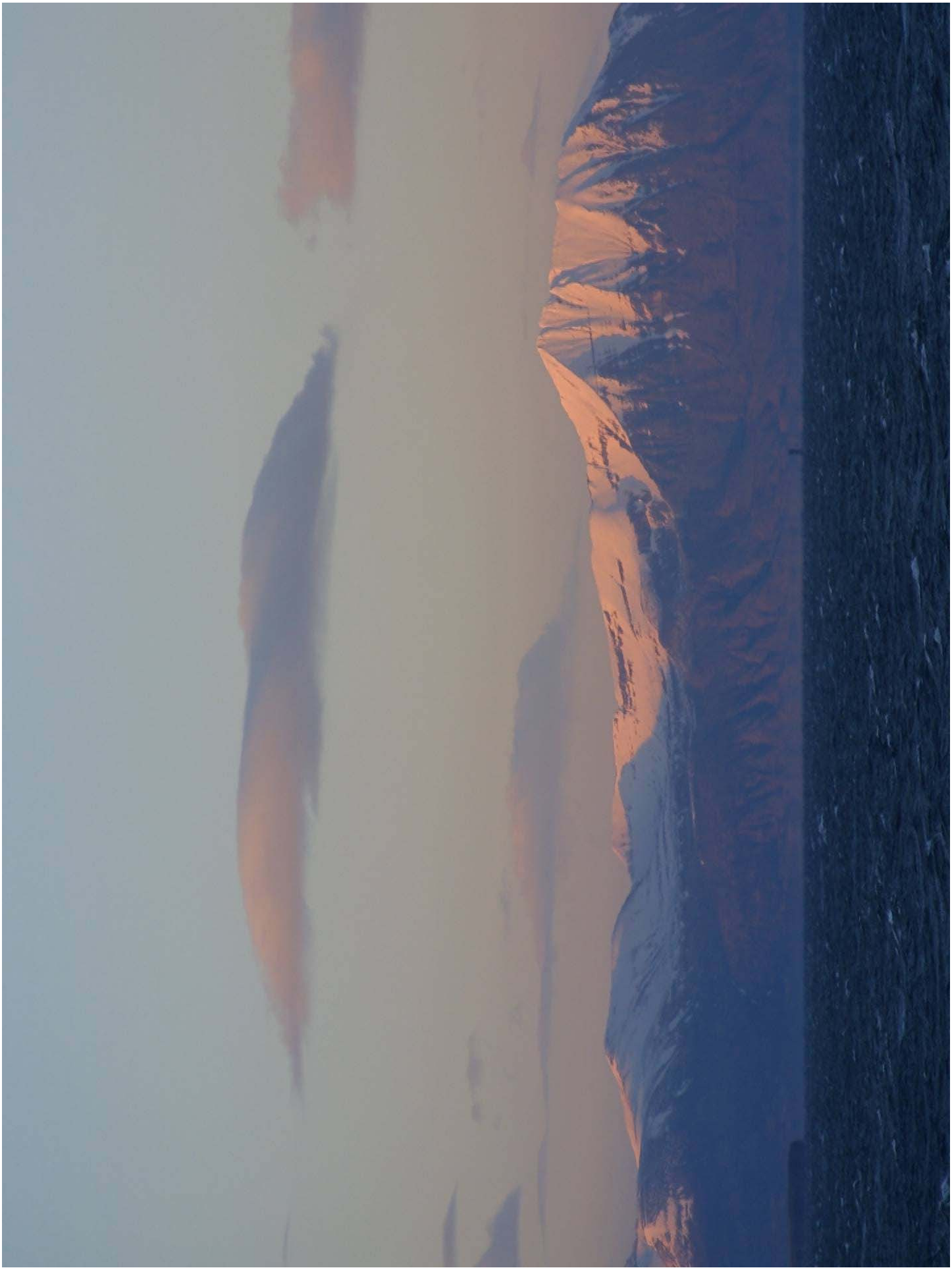


Figure 6. Biomass estimates (top of each bar) and average fork lengths (cm, inside bar) obtained during winter EIT surveys for walleye pollock in the Bogoslof Island area, 1988-2006.



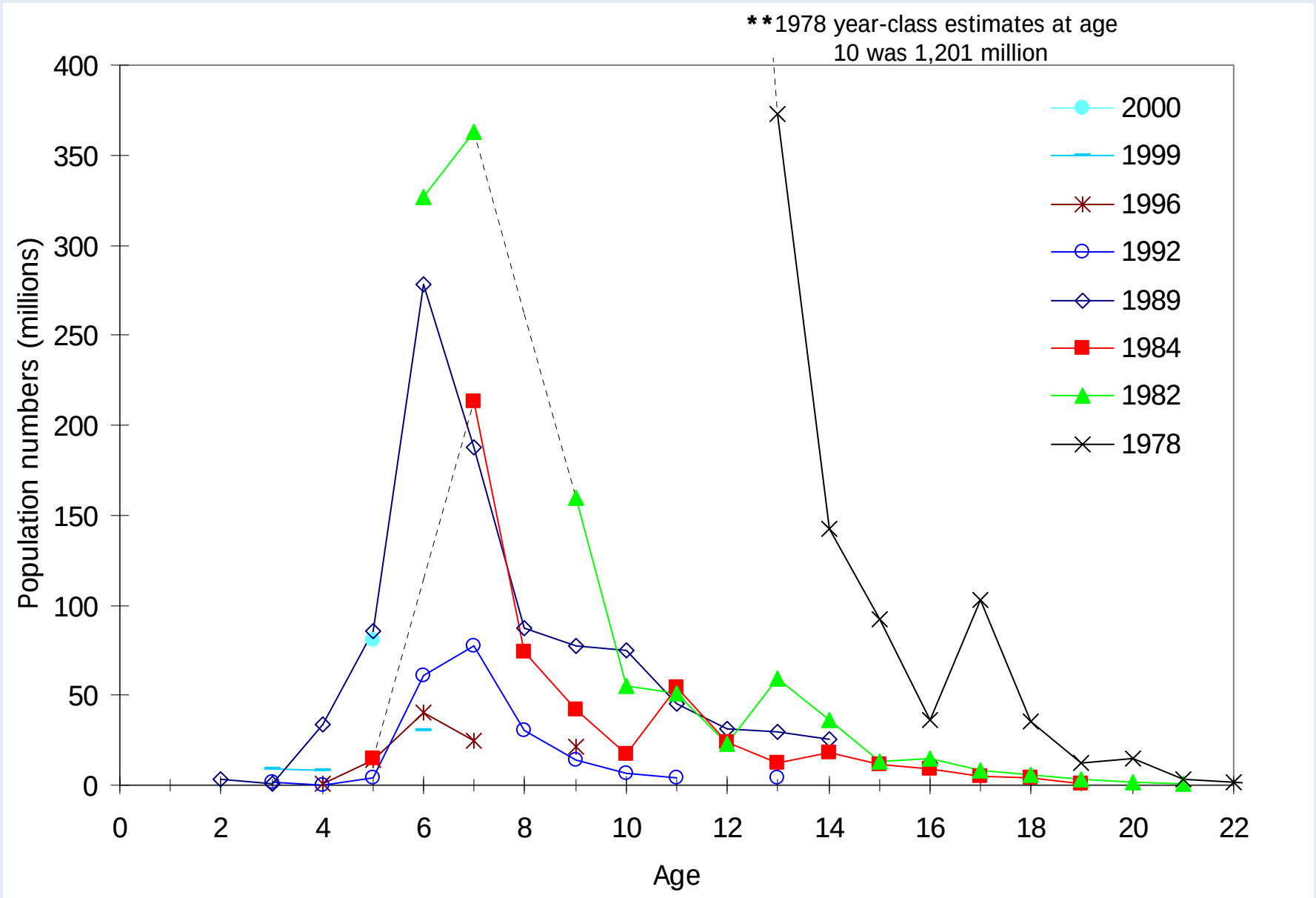


Figure x. Estimated population numbers at age for dominant year classes observed in winter EIT surveys of Bogoslof Island area spawning pollock. Data are from surveys conducted between 1988 and 2005.

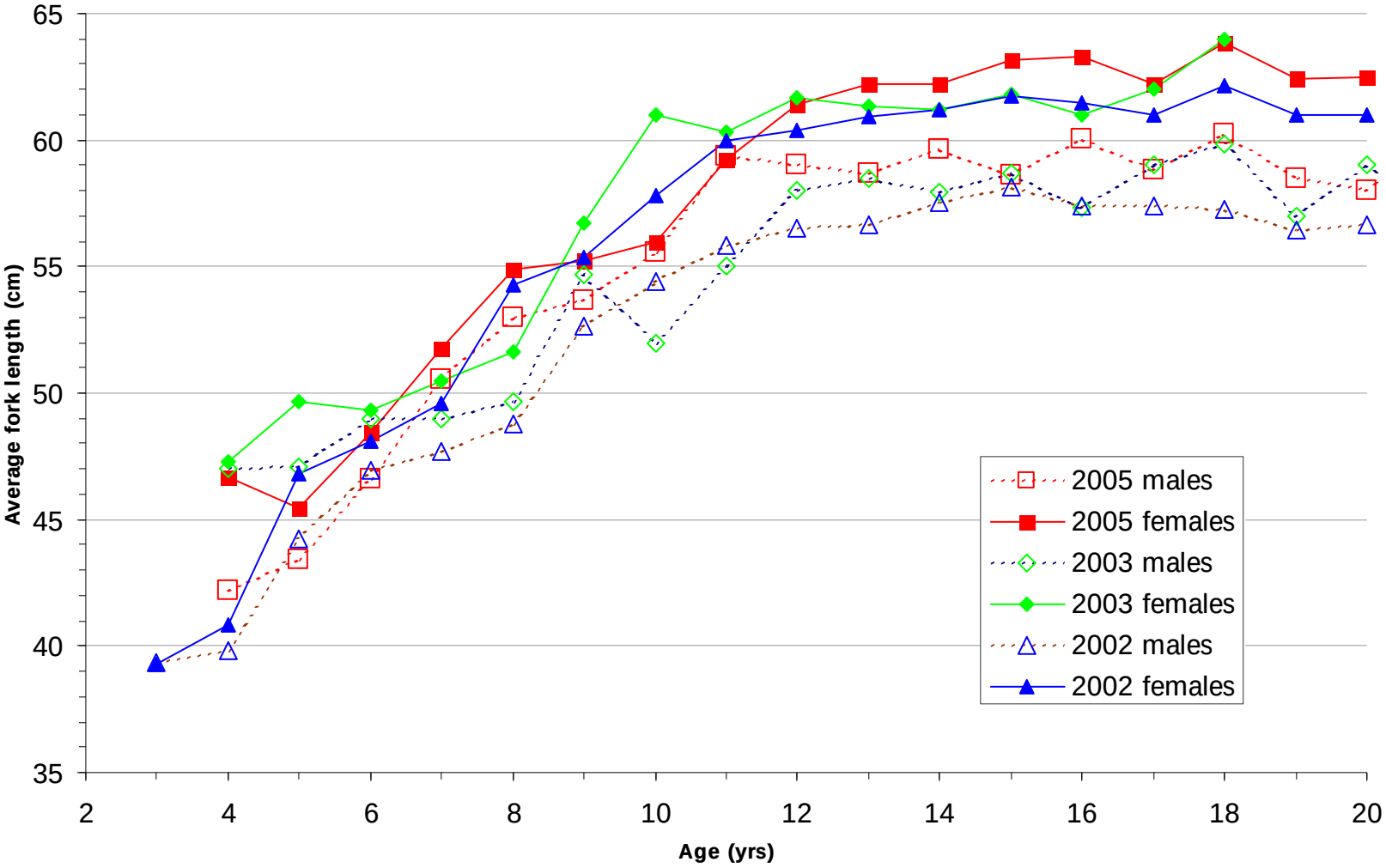


Fig x. Average length at age for pollock from the winter 2002, 2003 and 2005 echo integration-trawl surveys of the Bogoslof Island area.

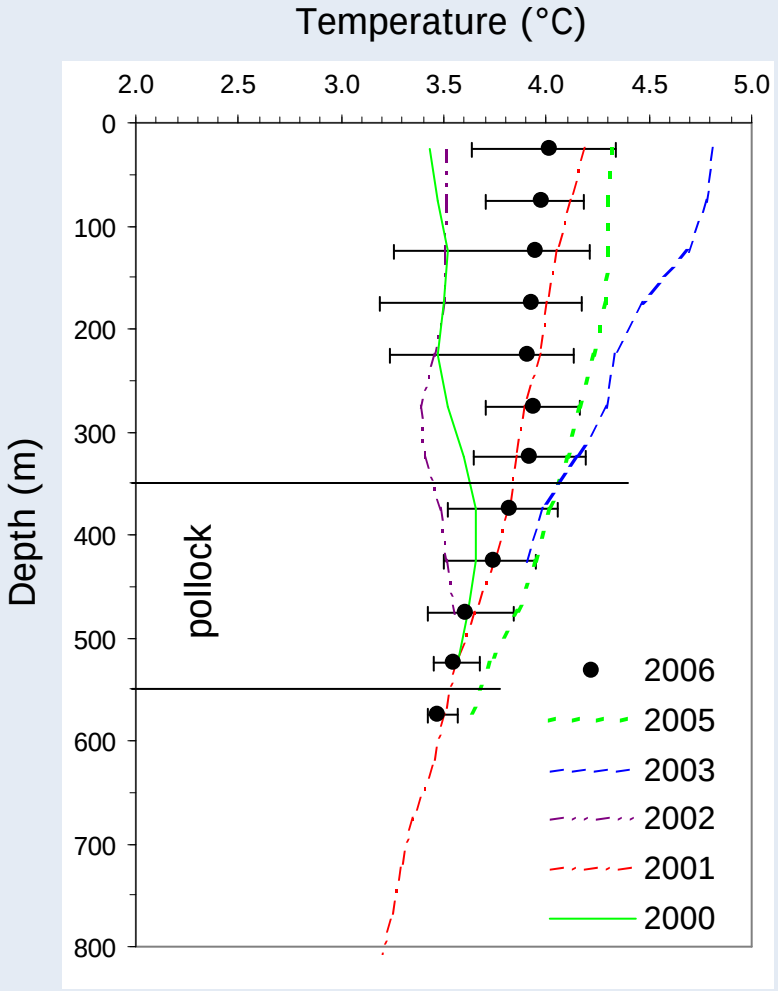
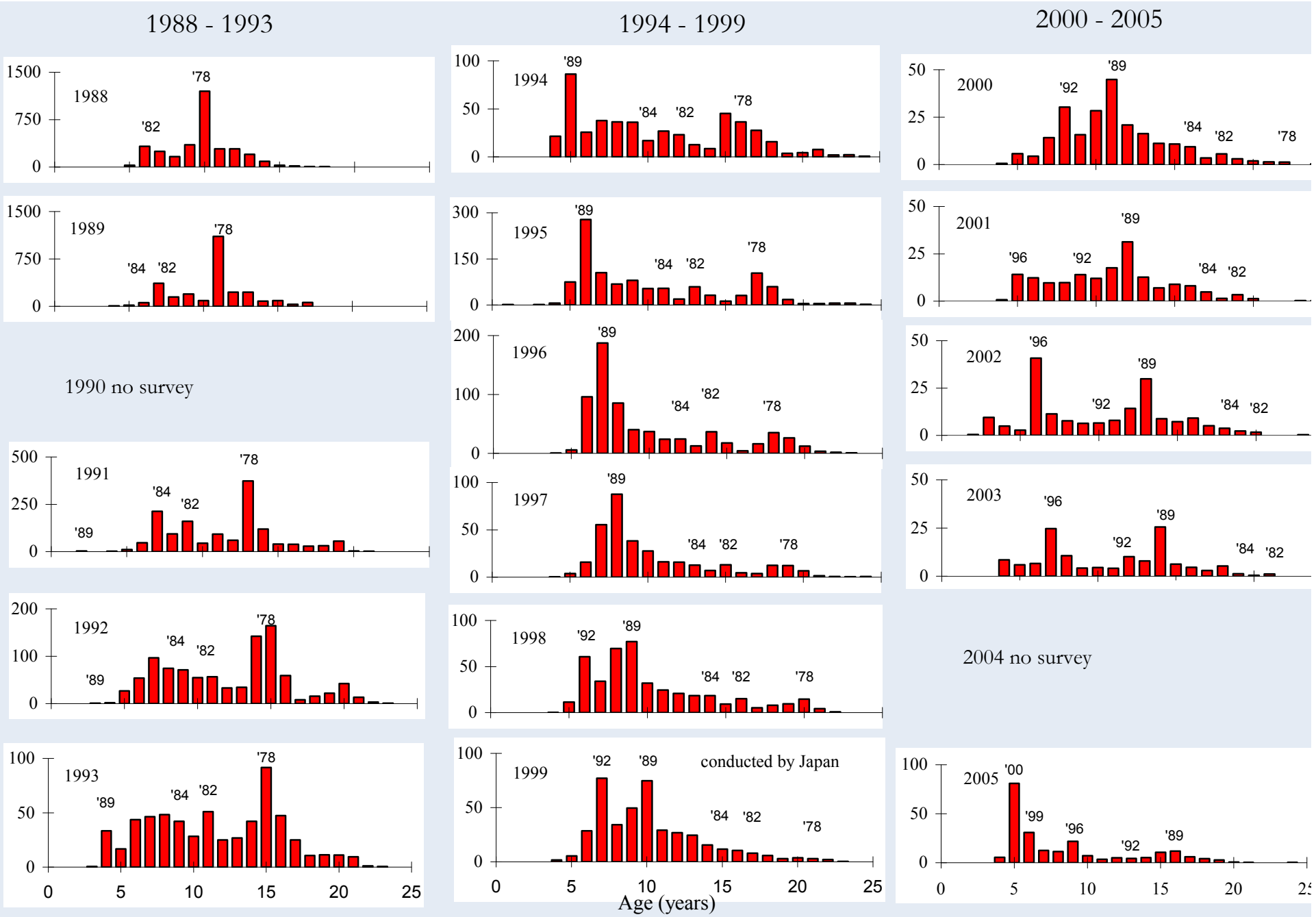


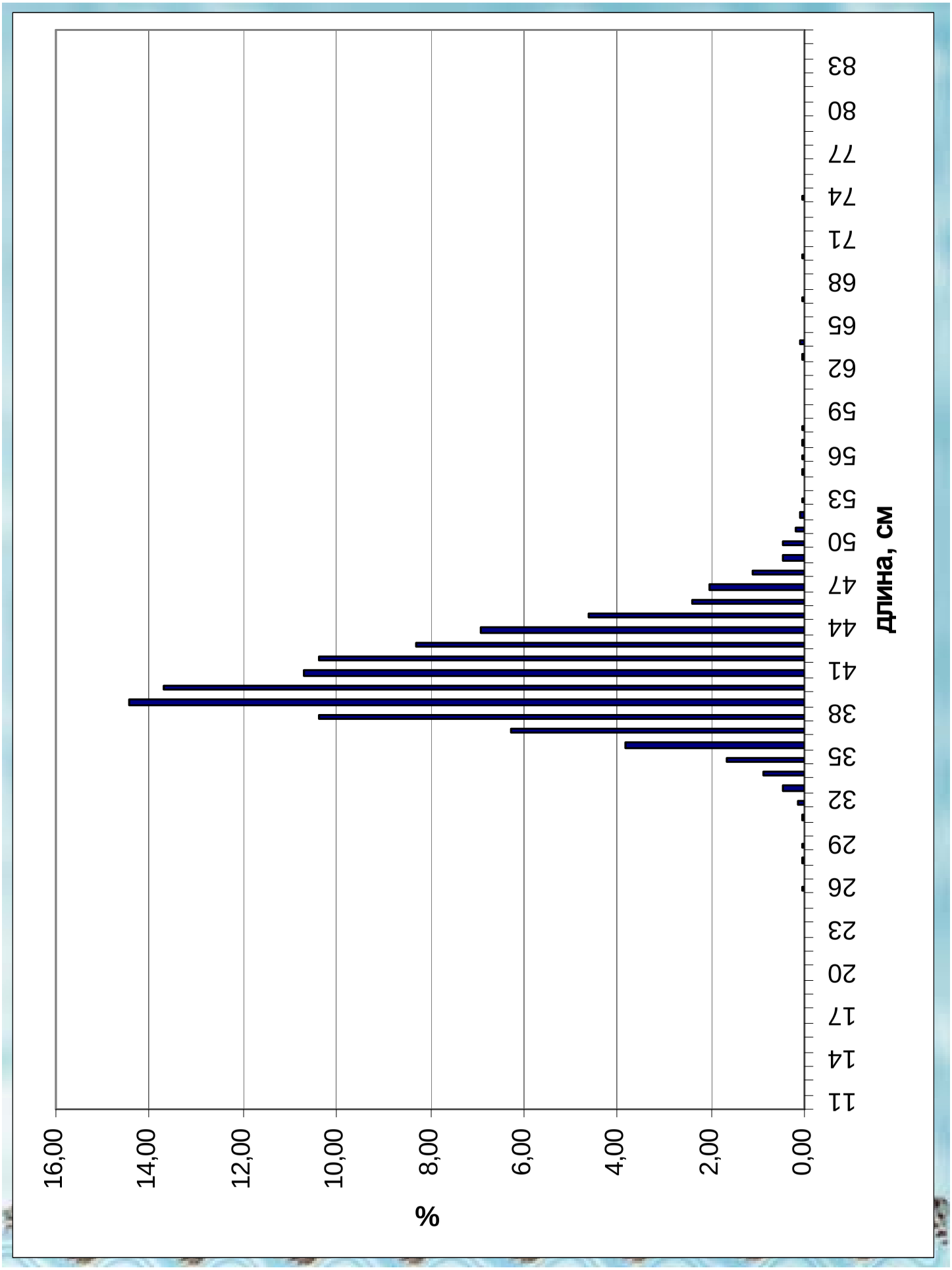
Figure x. Average temperature (°C) by 50-m depth intervals observed during hauls from the winter 2000-2003, and 2005-2006 EIT surveys of pollock in the Bogoslof Island area. The horizontal bars represent temperature ranges observed during the 2006 survey.



Numbers-at-age estimates (millions) from EIT surveys of pollock near Bogoslof Island.
Major year classes on the EBS shelf are indicated. Y-axes differ.

Preliminary Results from the Navarin Region Bottom Trawl Survey conducted by the R/V Pioneer Nikolayeva - Russia

By Dr. Alexander Glubokov


16,00
14,00
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6,00
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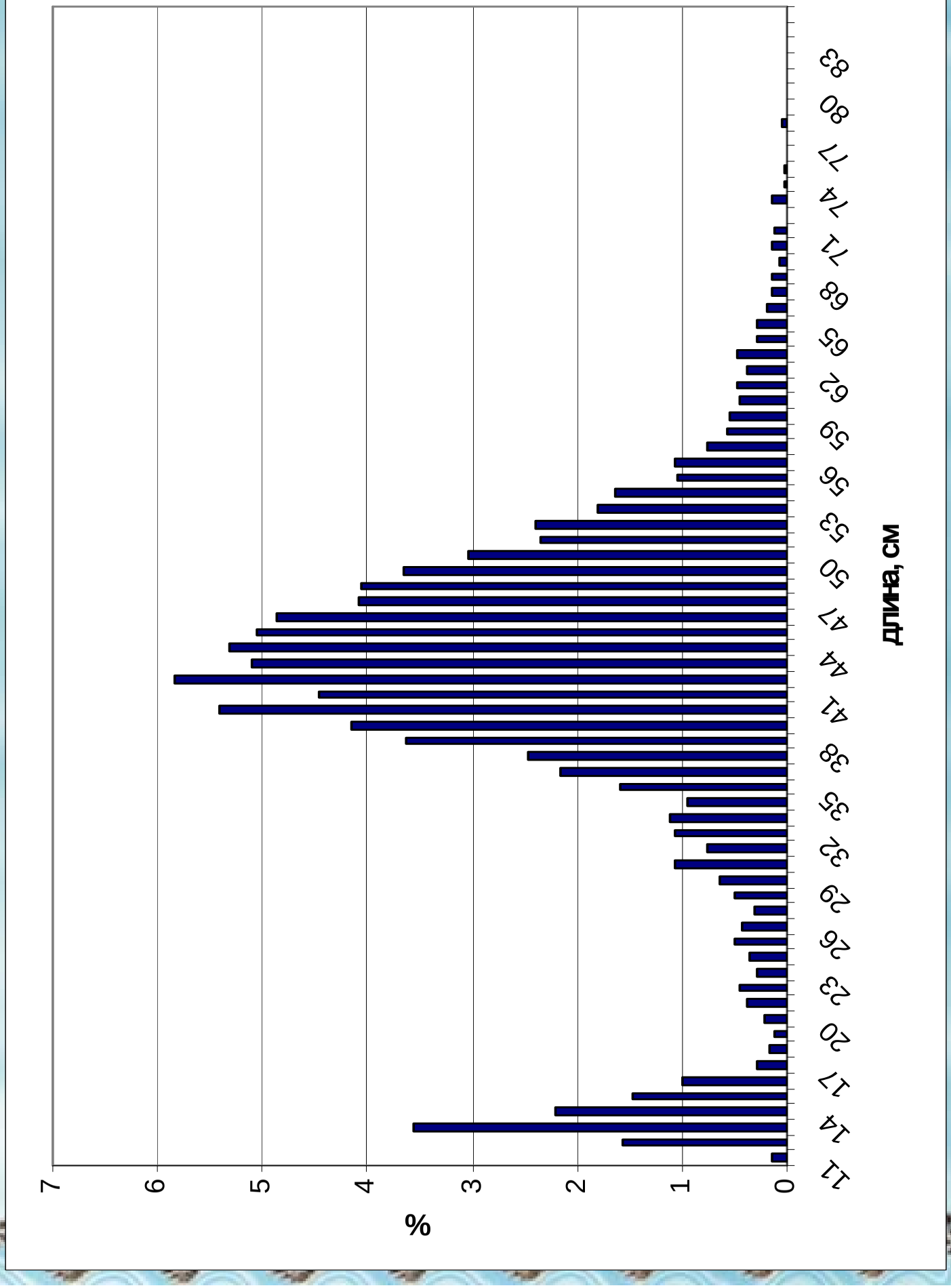
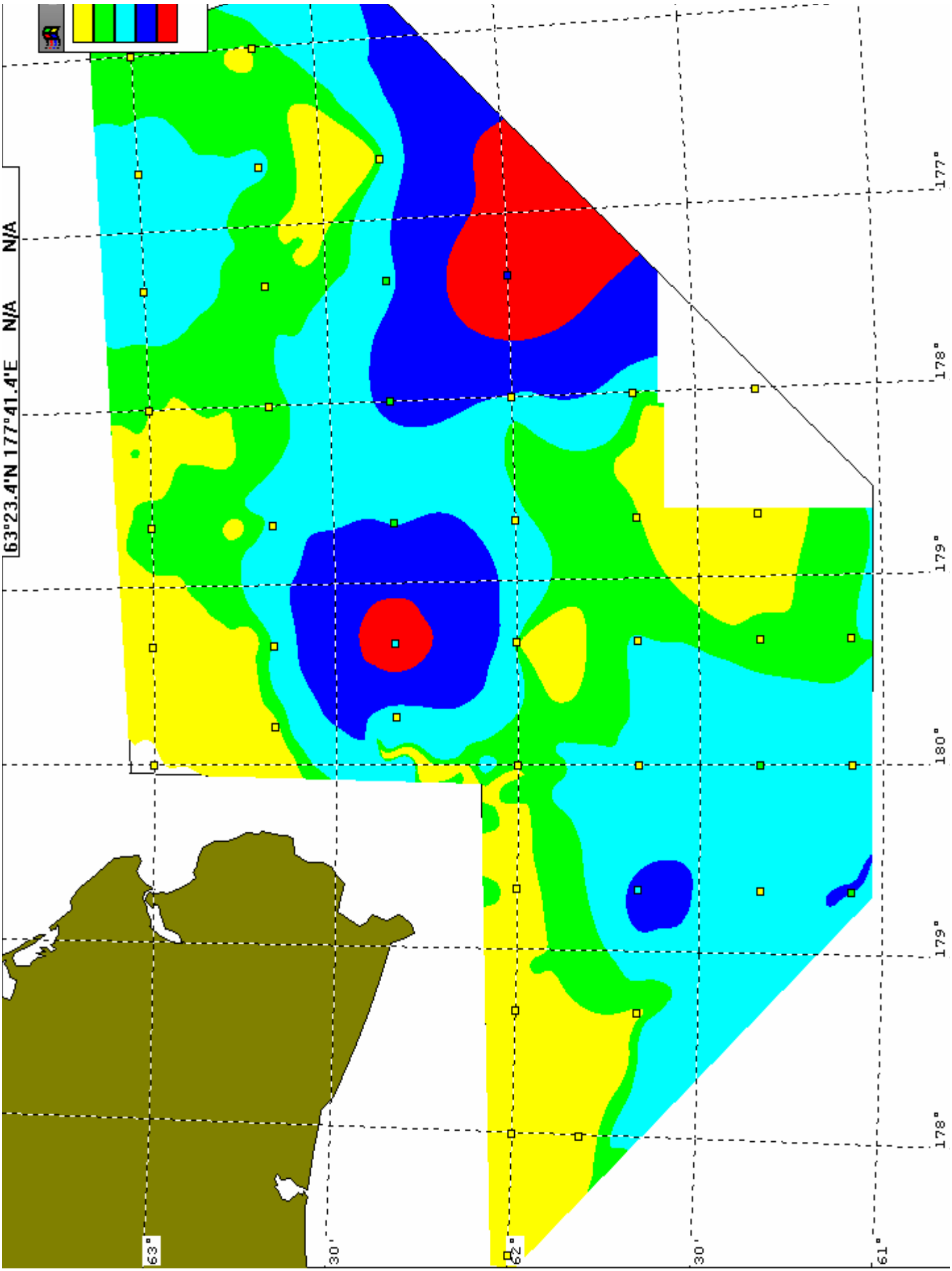
38
41
44
47
50
53
56
59
62
65
68
71
74
77
80
83
длина, см

редняя длина, см/ количество промеров		40,77/2488
инимальная-максимальная		26-74
ода		39
редняя масса, г	самки	637,77
	самцы	451,98
инимальная-максимальная	самки	100-2400
	самцы	43,5-1630
оля самцов, %		38,53
реобладающая стадия зрелости онад	самки	II-III - 79,23, III - 14,62
	самцы	II-III - 51,19, III - 39,29
аполнение желудка, балл		1,5
оля пустых желудков, %		22,94
реобладающие кормовые организмы		эуфаз. - 77,6, проч. ракообр. - 21,31, сельдь -1,09
оэффициент упитанности		0,606
СИ,%	самки	2,778
	самцы	0,81
СИ, %	самки	9,713
	самцы	9,58
оличество экз.:		218/48


%
0
1
2
3
4
5
6
7
длина, см
11
14
17
20
23
26
29
32
35
38
41
44
47
50
53
56
59
62
65
68
71
74
77
80
83

околение		2005	2004	2004	2003	2002	старше
едняя длина, см/ личество промеров		13,63/721	21,39/104	25,44/114	31,38/443	40,95/3247	51,51/2553
инимальная-ксимальная		11-16	20-23	24-27	28-34	35-45	46-83
ода		13	22	25	33	42	46
едняя масса, г	самки	23,38	75,2	124,15	222,7	519,32	1189,82
	самцы	22,38	80,42	121,75	226,65	502,22	972,47
инимальная-ксимальная	самки	11-43,5	50-100	90-175	135-330	260-830	550-3495
	самцы	14-31	50-235	65-165	140-325	200-825	585-2250
ля самцов, %		48,98	40,68	45,45	52,2	47,4	30,6
еобладающая адия зрелости над	самки	II-100	II –100	II - 97,56	II - 77,63, II-III - 18,42	II-III - 87,88, III -10,1	II-III - 92,69, III - 6,85
	самцы	II-100	II –100	II - 94,29	II - 44,58, II-III - 34,94	II-III - 68,13, III - 30,77	II-III - 91,75, III - 7,22
полнение желудка, лл		2,84	2,76	2,91	3,01	2,3	2,05
ля пустых желудков, %		8,16	0	1,3	1,87	8,38	0,12
еобладающие рмовые организмы		калянус - 91,49	калянус - 93,22	калянус - 92,21	калянус - 85,03	калянус - 36,65, "ч.р." - 16,15, минтай - 0,52	креветка - 39,56, "ч.р." - 21,84, минтай - 3,8, пр. рыба - 4,11
эффициент итанности		0,522	0,587	0,58	0,586	0,62	0,21
СИ,%	самки	1,382	-	-	0,873	2,163	2,533
	самцы	-	-	-	1,172	1,35	2,258
СИ, %	самки	9,33	-	-	11,38	11,229	7,642
	самцы	9,571	-	-	10,347	9,727	5,591
личество экз.:		49/14	59	77	159/22	192/22	317/19


63°23.4'N 177°41.4'E N/A N/A
177°
178°
179°
180°
179°
178°
63°
30'
62°
30'
61°

Thank you
for your attention

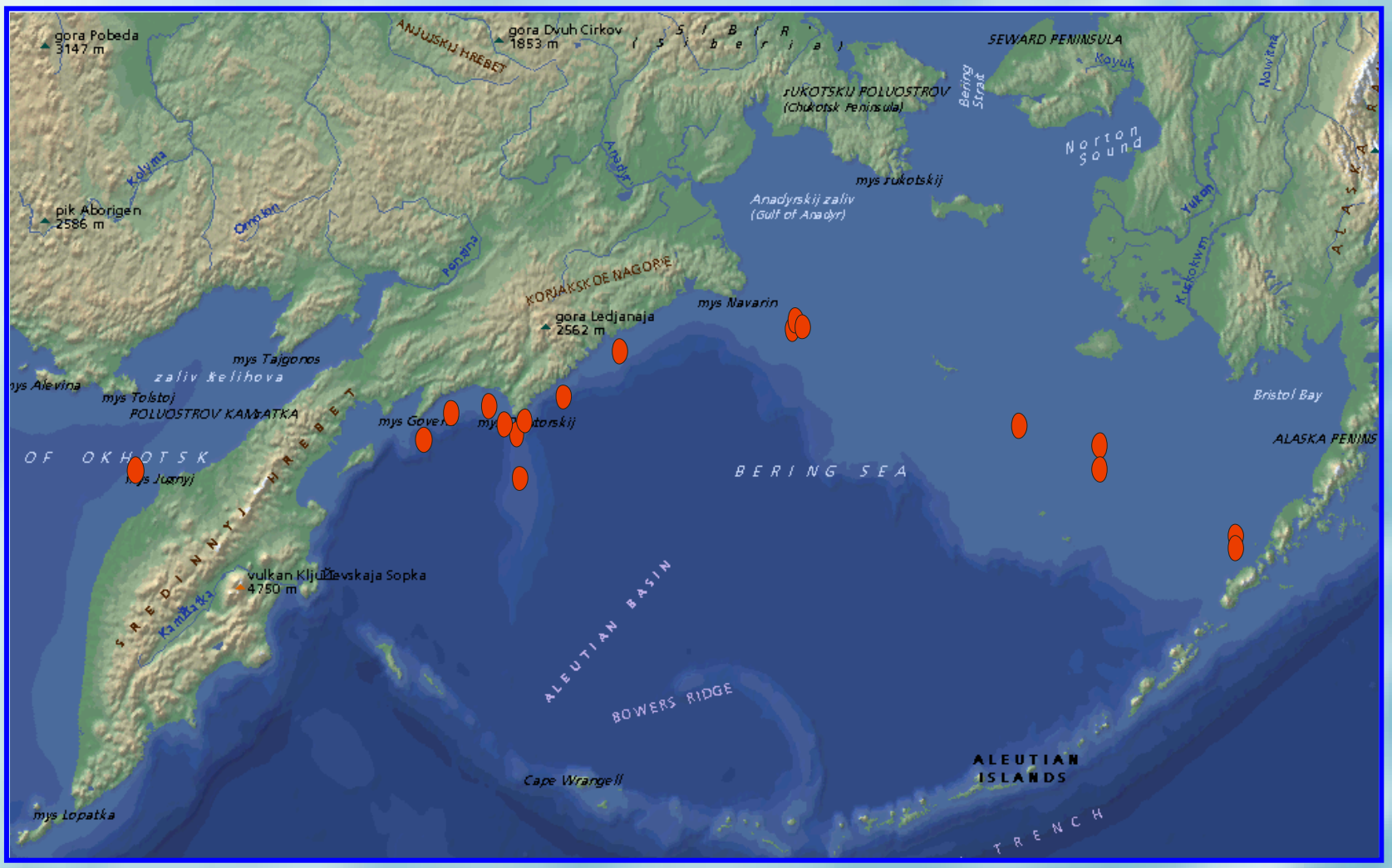
Summary of the Russian population genetic research of pollock in 2006.

Shubina E.A.[1], Glubokov A.I.[2], Ponomareva E.V.[1]

[1] Belozersky Institute, Department of Biology, Moscow State University, Russia

[2] Russian Federal Research Institute of Fisheries and Oceanography, Moscow, Russia

Sites of genetic sampling.



Sequences of microsatellite sites and their primers (F – forward; R – reverse).

Tch5 $(GATA)_{14}$
F: gcc tta ata tca cgc aca
R: tcg cat tga gcc tag ttt

Tch10 $(GGCT)_6CTCT\ (GTCT)_2$
F: gtc tct atg tct gtc ttt cta ttt g
R: acg aaa ccc aac cct gat t

Tch11 $(GATA)_{22}$
F: atc cat tgg tgt ttc aac
R: tcg agt tca gt gga caa

Tch12 $(GGTT)_{22}$
F: caa ttt gtc agc ctc tgt tac c
R: agt aca gct tga ttg ttt ctg gg

Tch13 $(GT)_9$
F: ttt ccg atg agg tca tgg
R: agt aca gct tga ttg ttt ctg gg

Tch14 $(GAAA)_{31}$
F: cat aca ttg gtc act ctt tct tac
R: aaa ctg ata tac gcc caa ct

Tch15 $(GA)_3(CA)_2GACA\ (GA)_5CAGATA(GA)_8$
F: aaa ctt cac ctg acc aac
R: gca aca caa ctt aat cat ct

Tch16 $(GTCT)_4$
F: gcc cat cgt tct att ctc
R: tgc tga cct gat gat tgg

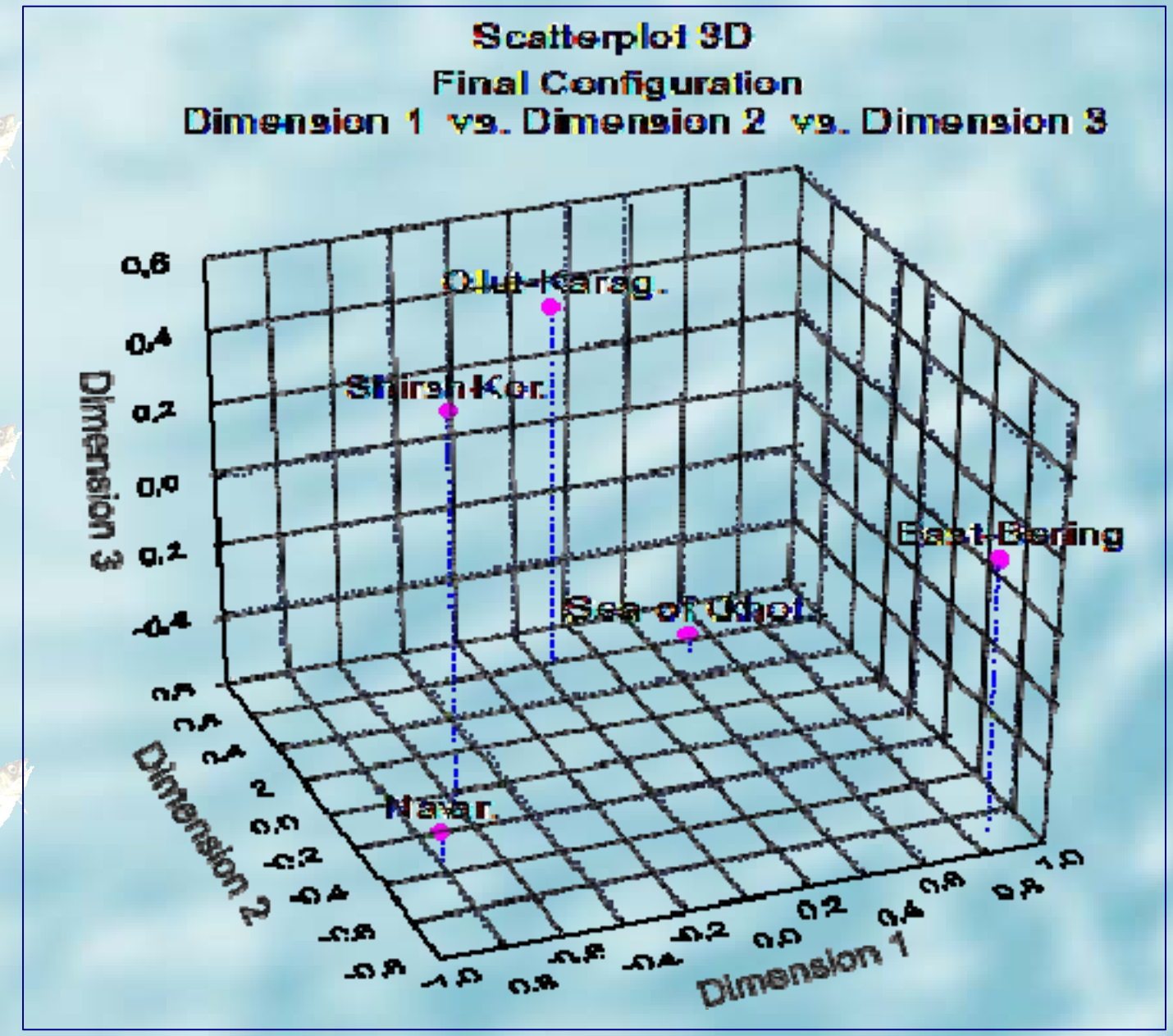
Tch17 $(GTCT)_{27}$
F: gtc tgt ctg ccc gtg agt
R: agc cag tgg cat ttg ttc

Tch18 $(GT)_{15}$
F: gga gat ggt gct aac tgg
R: aac gca cat gca cat acg.

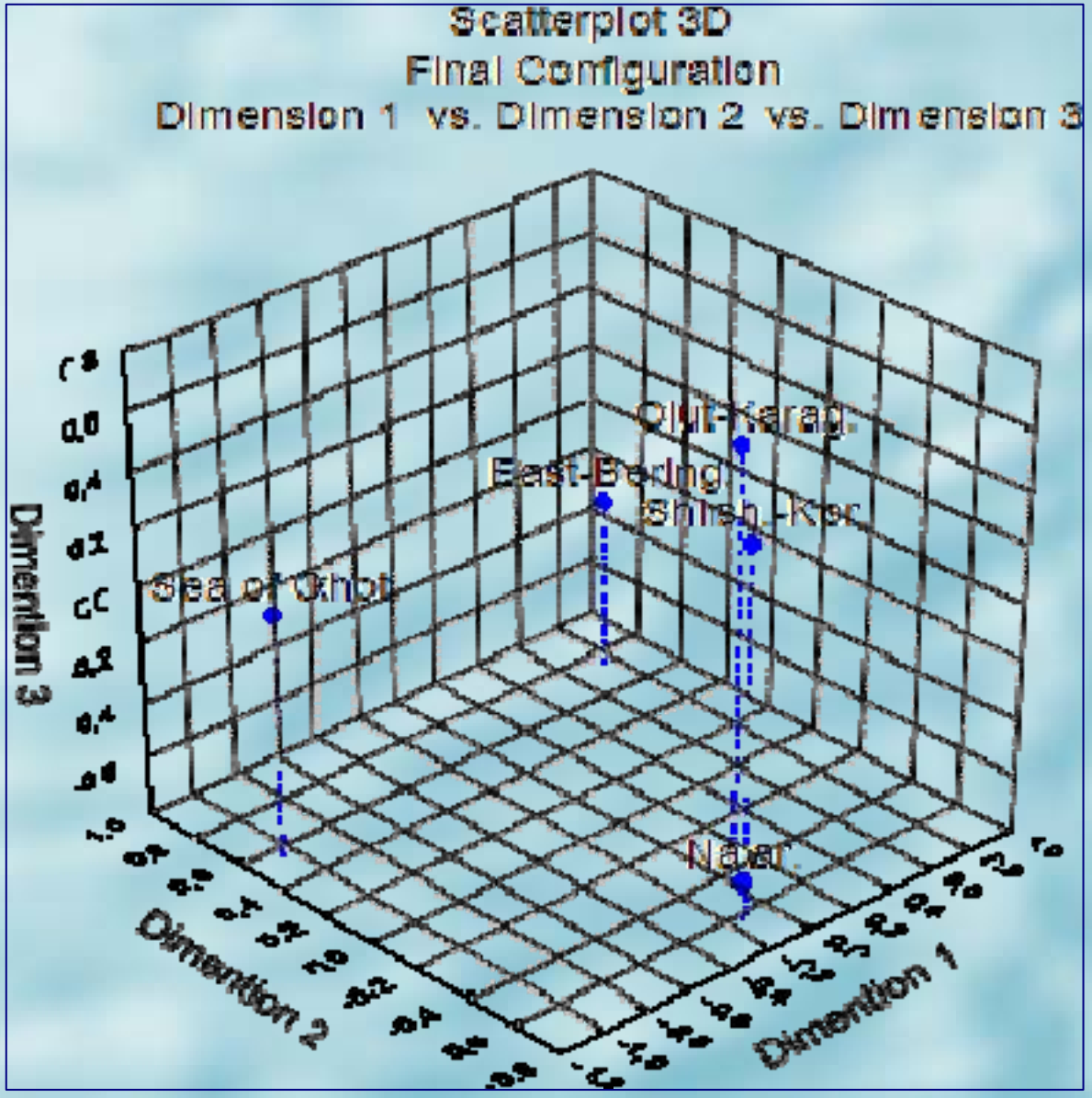
Tch19 $(GTCT)_{15}$
F: tat gct gat tgg tta ggc
R: gat cat ttg ttt cag aga gc

Tch20 "imperfect" locus $(GA)_5GGGAA(GGAA)_3GGAT(GGAA)_2GGAAT(GAAA)_{10}GAAG(GAAA)_5$
F: aca ttg taa acg gcg att c
R: tgg tta gtc tga gac cca g

Tch22 $(GACA)_6$
F: atc ata tct ggc caa gtt c
R: ctc tct ctg aat ccc tct g

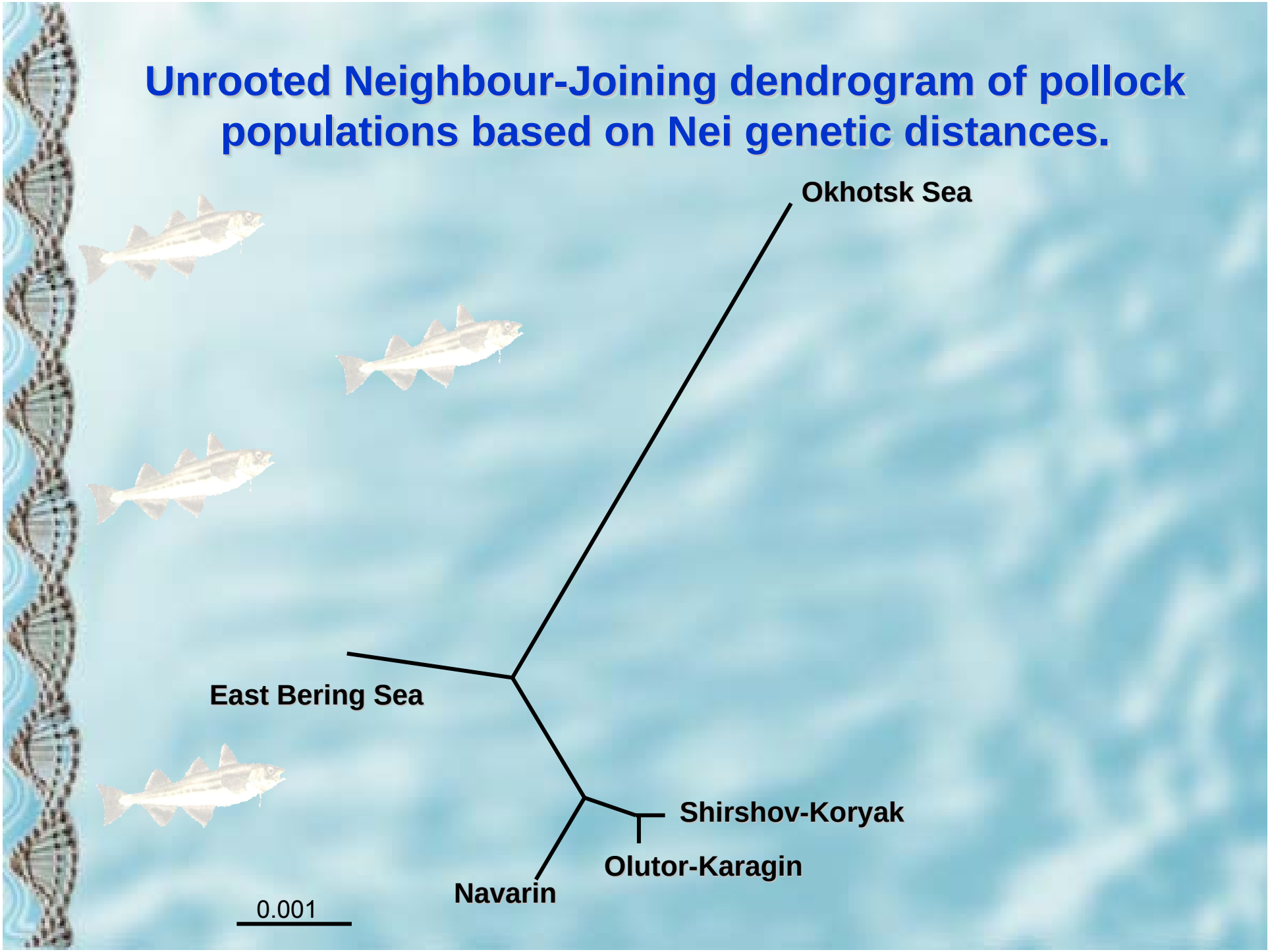


Scatterplot 3D of pollock populations according to Reynolds genetic distances. Multidimensional scaling.



Scatterplot 3D of pollock populations according to Rogers genetic distances. Multidimensional scaling.

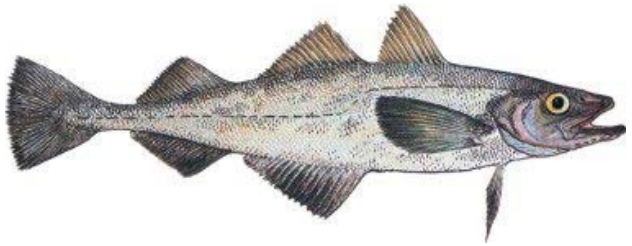
Unrooted Neighbour-Joining dendrogram of pollock populations based on Nei genetic distances.



Conclusions

1. A conventional genetic analysis showed true interpopulational differences between all pairs of allele diversity samples.
2. Composition of genetic and geographic distances showed that all groupings agreed with model of isolation by distance.
3. Comparison of 3D scatterplots made by the method of multidimensional scaling using Rogers and Reynolds distances indicated a high degree of similarity in the mutual location of populations.
4. Analysis of the Russian genetic research results allows us to identify at least four populations: Okhotsk Sea (Shelikhov Bay samples), West Bering Sea (Karagin-Olutor and Shirshov-Koryak samples), Navarin and East Bering Sea (Pribiloff-Bristol sample).
5. The genetic closeness of the West Bering Sea and Navarin populations allows us to suggest possible existence of a single superpopulation in the western and northern parts of the Bering Sea.
6. The genetic structure of concentrations agrees well with the results of the latest studies of biology of Bering Sea pollock.

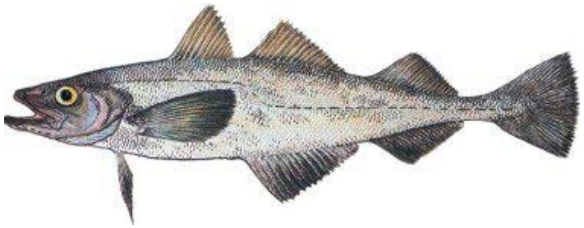

Thank you
for your attention



Eastern Bering Sea Pollock Stock Assessment

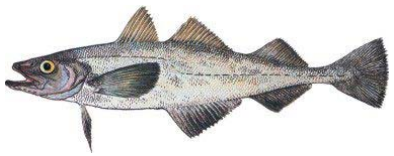
Jim Ianelli, Taina Honkalehto, Neal Williamson, and Steve Barbeaux

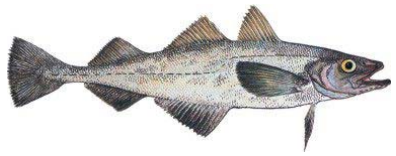
Alaska Fisheries Science Center
NOAA Fisheries



Eastern Bering Sea Catch

- 2006 TAC at 1.49 million t
- 1.41 million t average ABC for 2000-2005
- ABC Projected ↓ to 1.1 million t by 2008

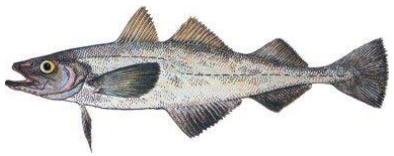


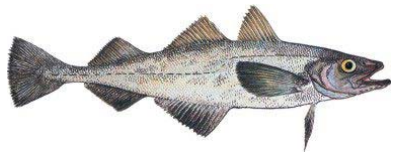


Eastern Bering Sea Survey Results

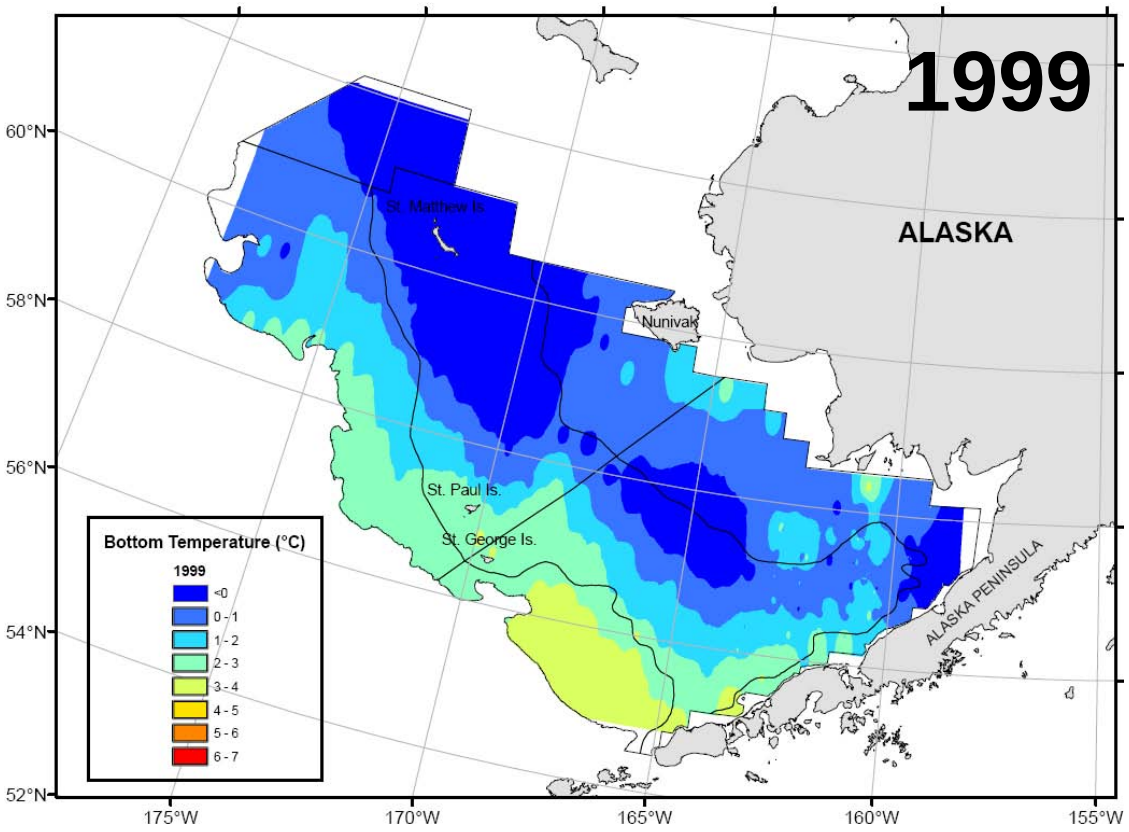
- 2005 BT Survey 5.1 million t
- 2006 BT Survey 2.8 - 3.6 million t

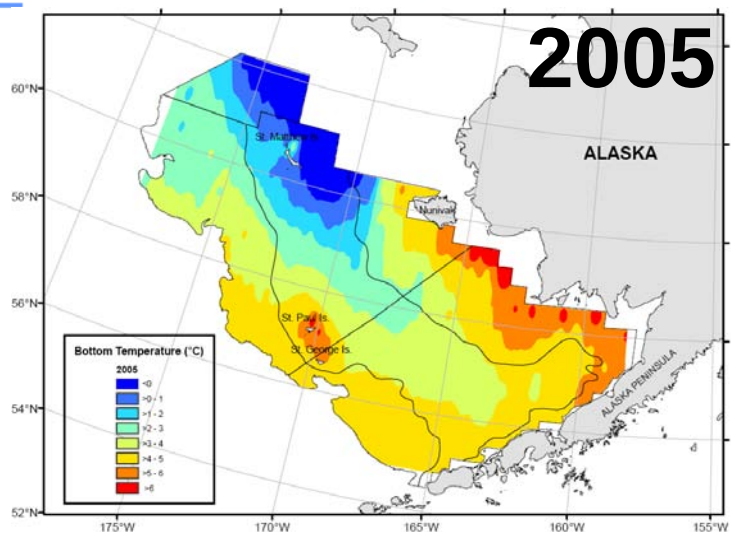
- 2005 EIT Survey 3.3 million t
- 2006 EIT Survey ~1.5 million t

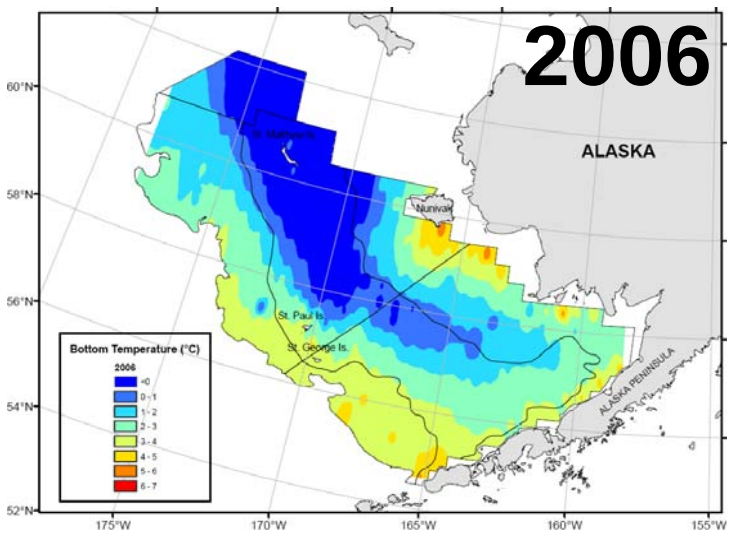


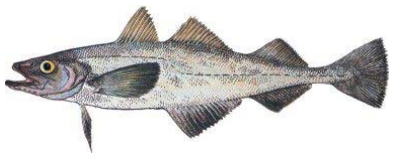


Bottom Temperatures

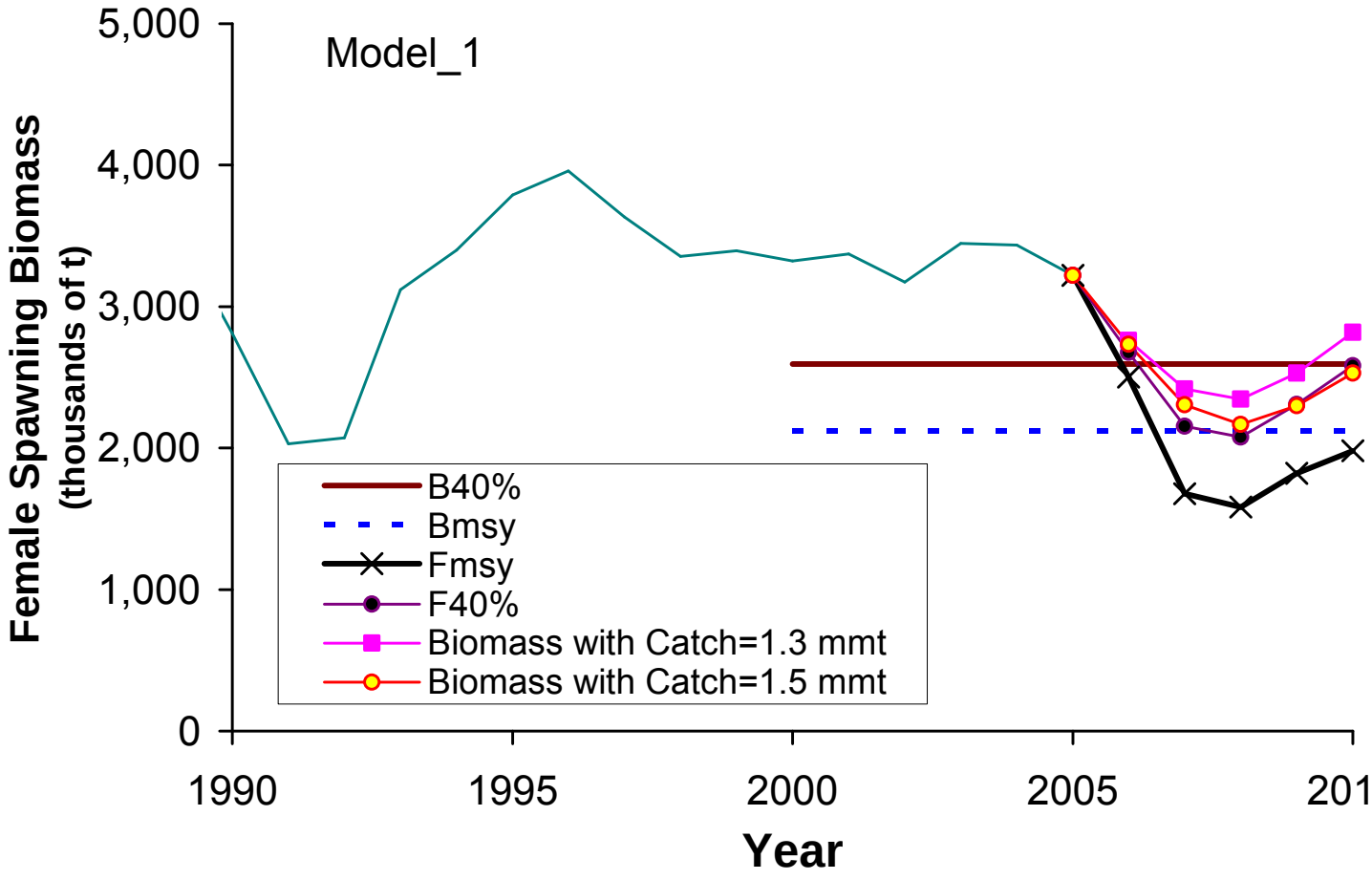


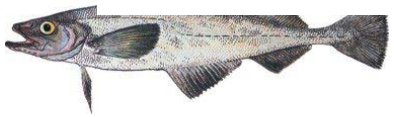


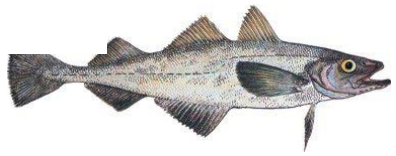




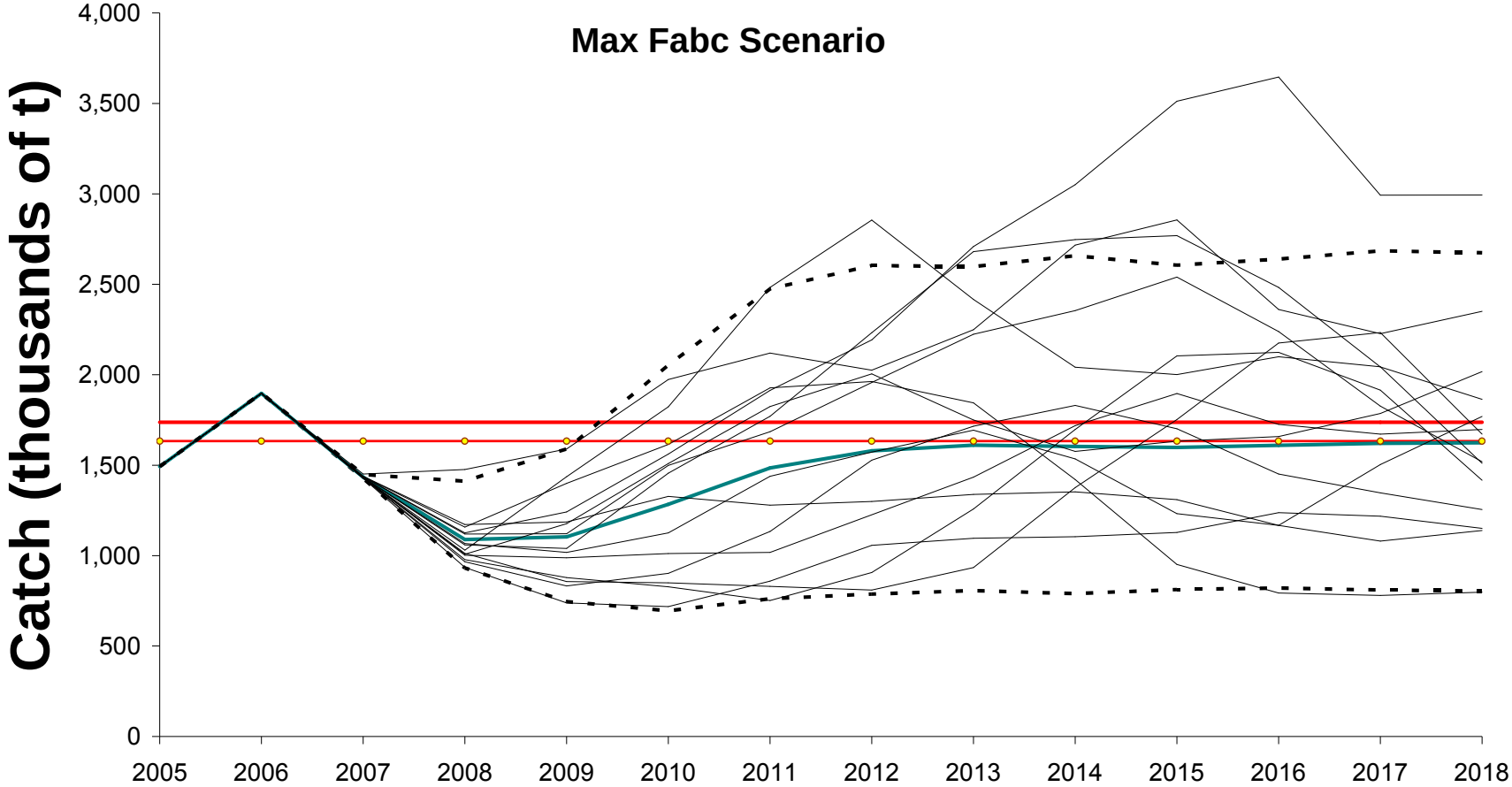
Eastern Bering Sea Pollock Biomass Trends



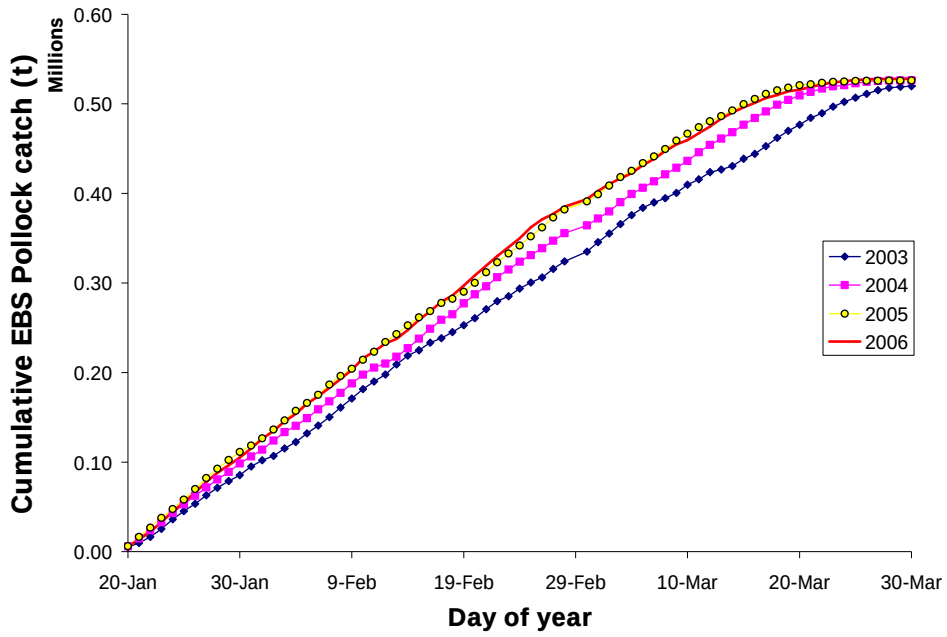




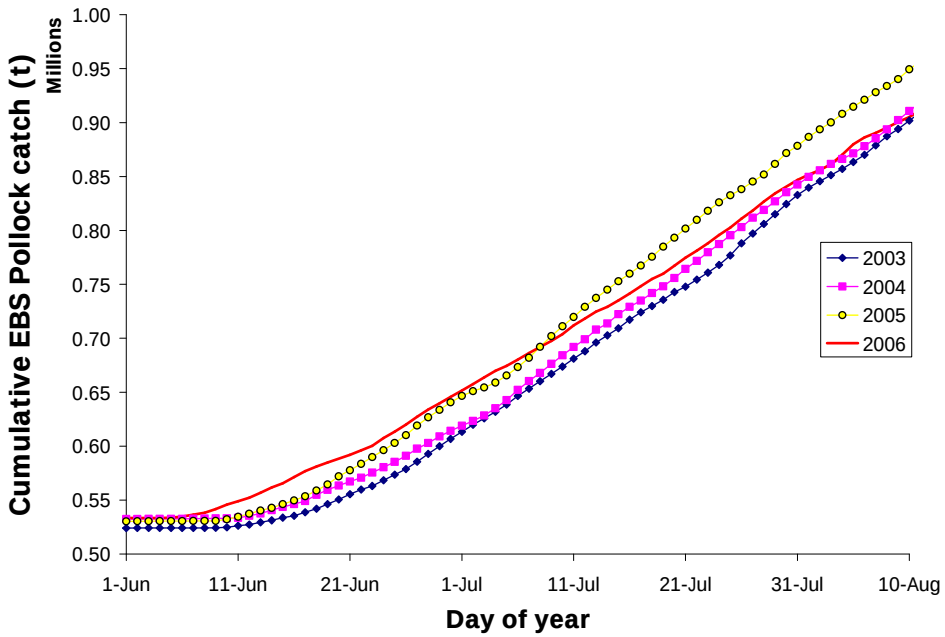
Projected Yield



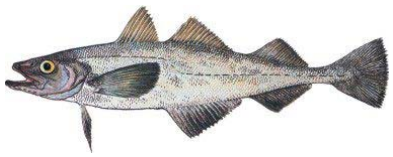
Cumulative Catch Levels

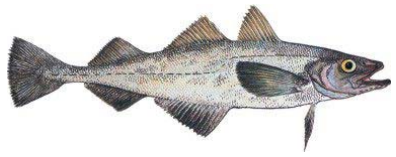


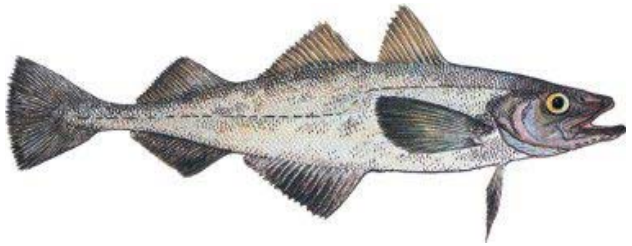
January - March



June - August







Aleutian Islands Pollock Stock Assessment

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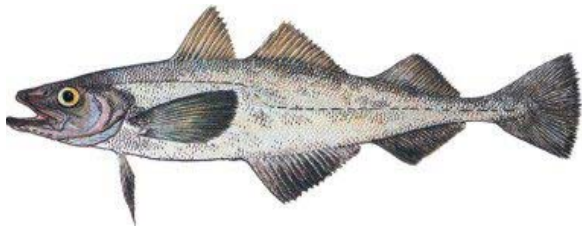
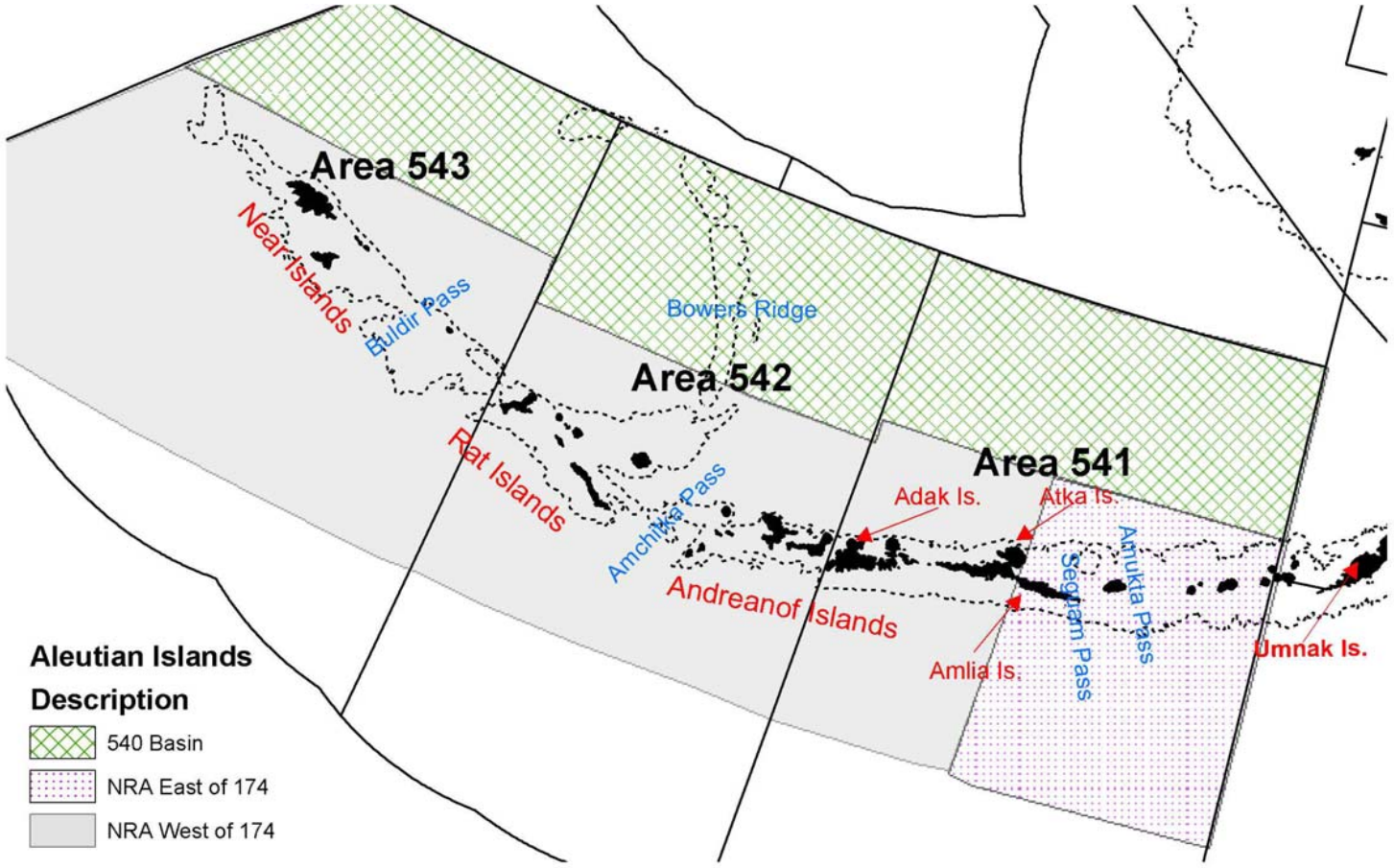
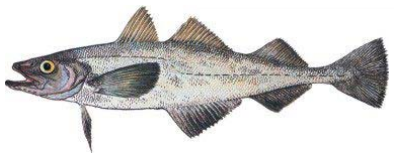
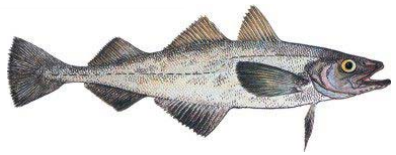


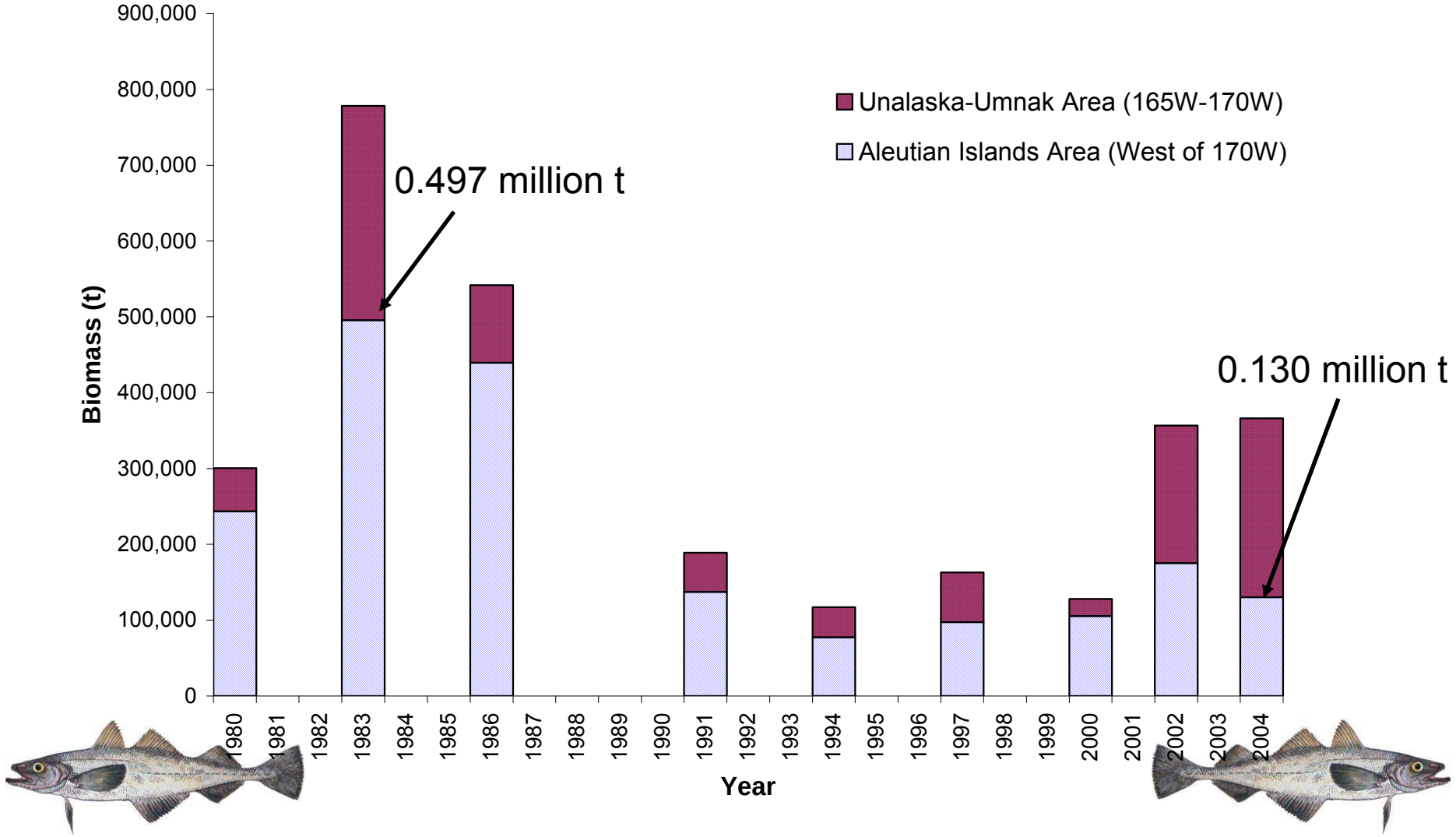
Aleutian Islands Management Areas





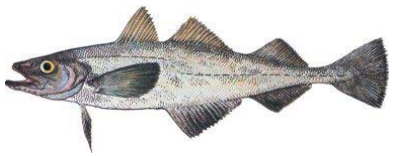


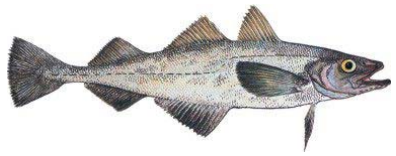
Aleutian Islands Bottom Trawl Surveys



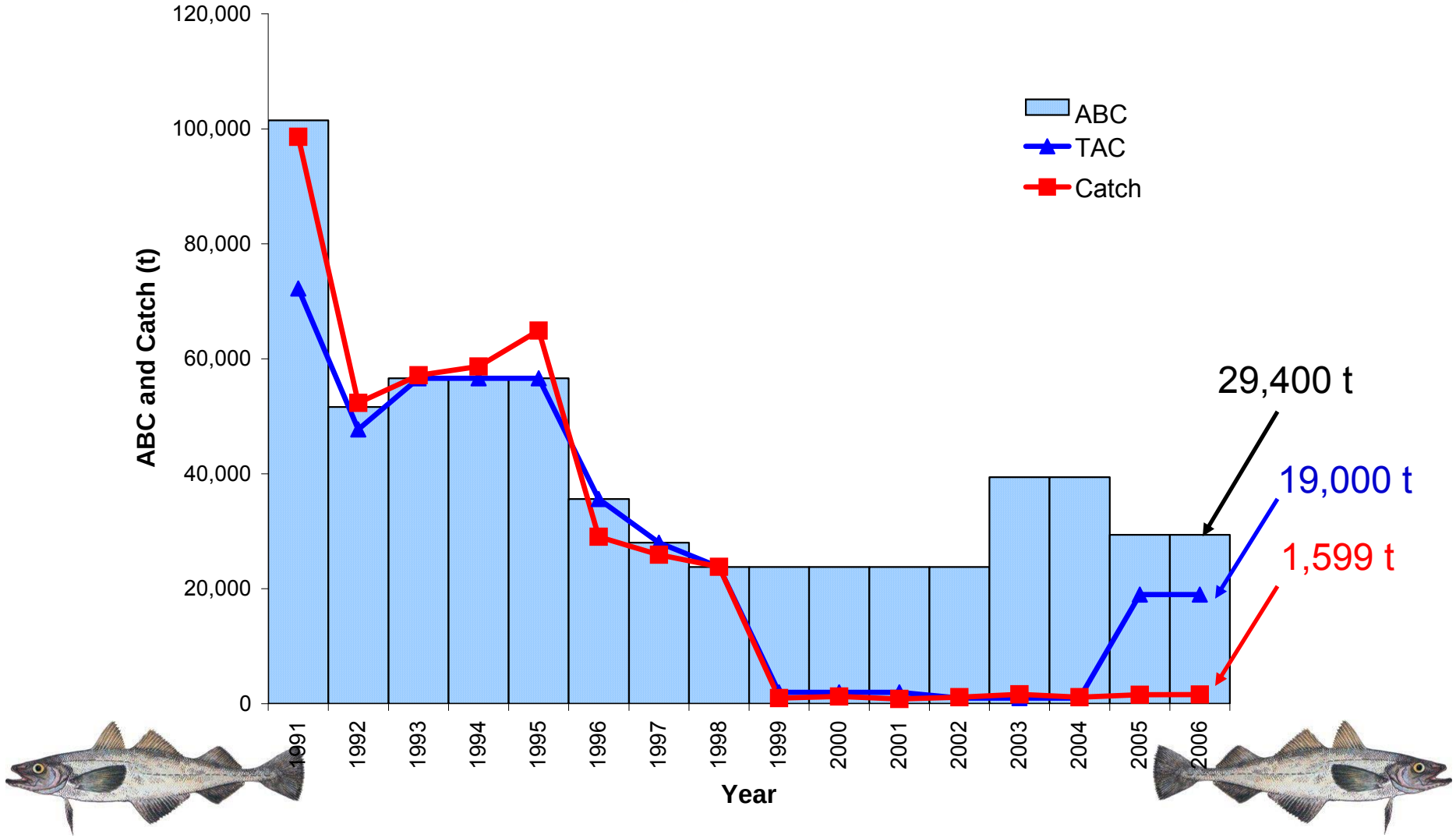
Aleutian Islands Area
ABC and TAC

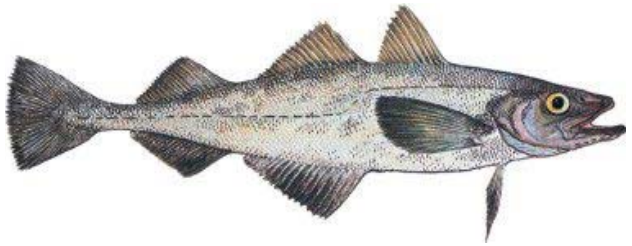
- Tier 5: ABC harvest rate set at a fraction of natural mortality (F_{ABC} = 0.75M, M = 0.3)
- Most recent bottom trawl survey used as biomass estimate (2004 BT Survey at 130,451 t)
- ABC_{2006} = 0.75M × B_{2004}= 29,400 t
- Since 2005 by rule the TAC is set at the lower of 19,000 t or ABC





Aleutian Islands Pollock Catch

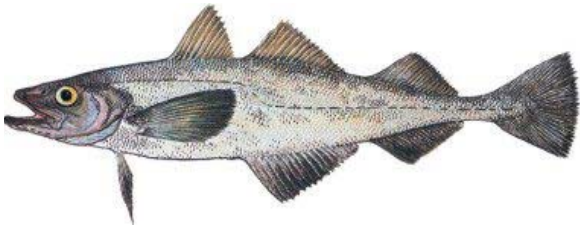




2006 Aleutian Islands Cooperative Acoustic Survey Study (AICASS)

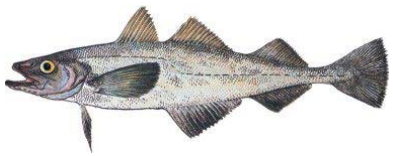
Steve Barbeaux

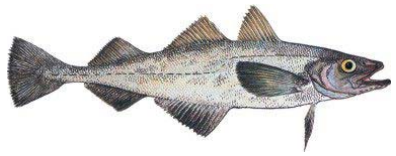
Alaska Fisheries Science Center
NOAA Fisheries



2006 AICASS Goal

- The purpose of this study was to test the feasibility of using commercial fishing vessels to conduct acoustic surveys for pollock in the Aleutian Islands

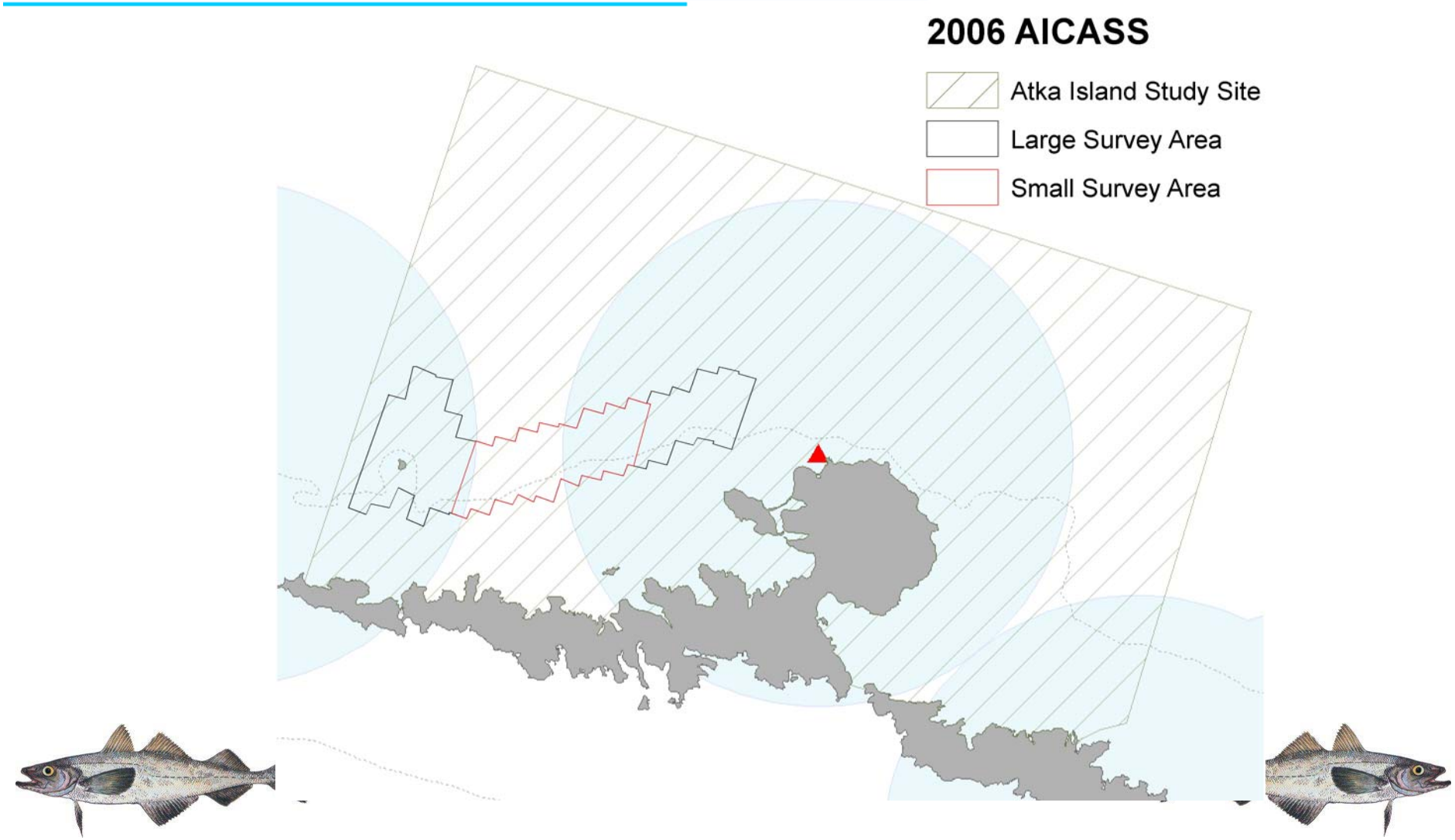




F/V Muir Milach

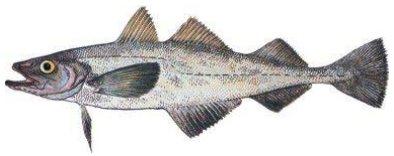
- 32 meter stern trawler
- ES 60 echosounder with a 38kHz transducer

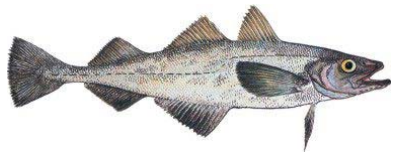
2006 AICASS Proposed Study Sites



2006 AICASS Cruise Plan

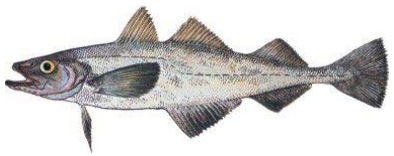
- Three Phases:
  - **Phase 1:** Evaluate the commercial fishing vessel's appropriateness as an acoustic sampling platform
  - **Phase 2:** Opportunistically collect acoustic data of fish distribution in the two proposed study sites
  - **Phase 3:** Conduct acoustic and biological data sampling and commercial fishing at one of the two study sites

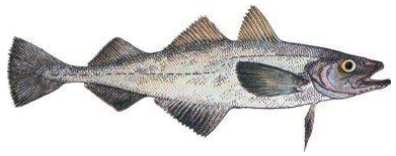




Acoustic Surveys

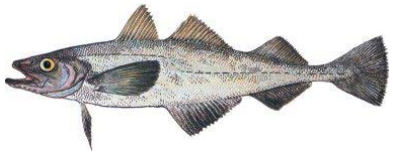
- 8 surveys in total
  - 3 large surveys (180 nm^2)
  - 3 usable small surveys (9-72 nm^2)
  - 2 quantitatively unusable surveys
    - Survey 1, exploratory on east side of Atka Island.
    - Survey 3, zig-zag survey resulting in significant wasted effort.



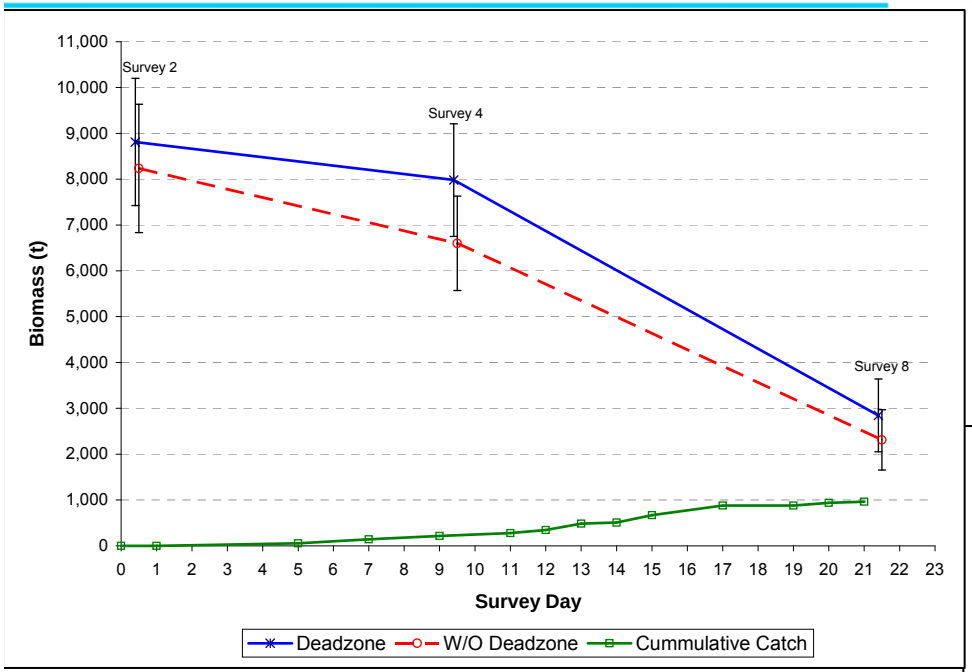


Verification and Commercial Fishing

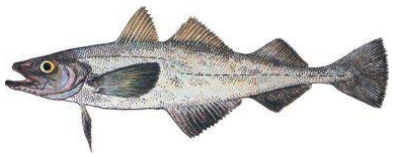
- 965 t of groundfish harvested
- 30 hauls
  - 7 verification tows
  - 23 commercial tows



Pollock Abundance



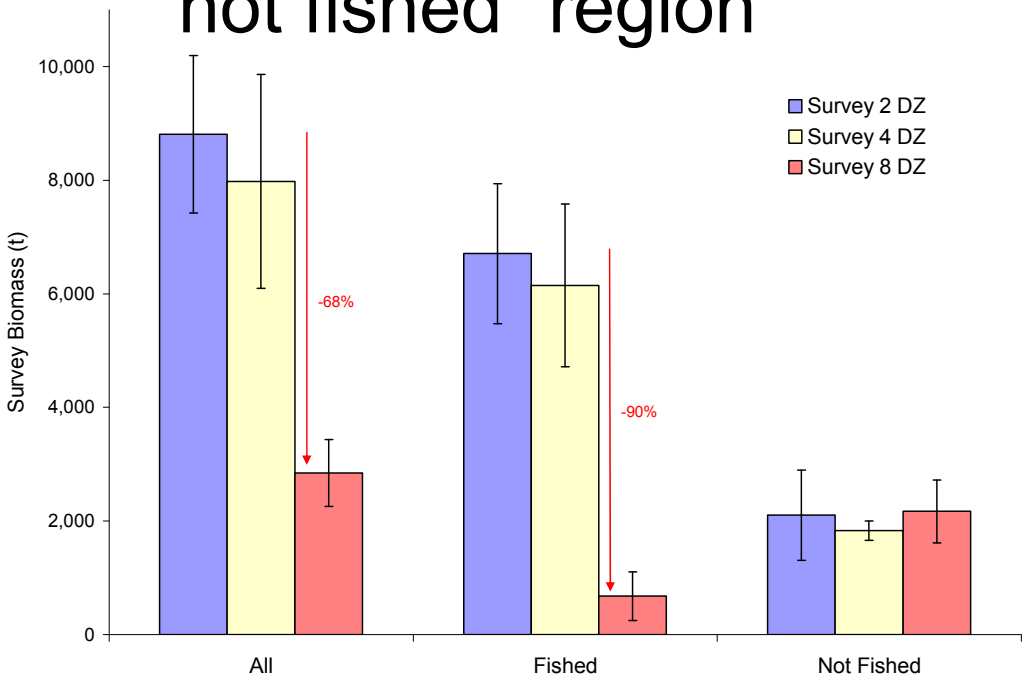
Large Survey Area (180 nm^2)

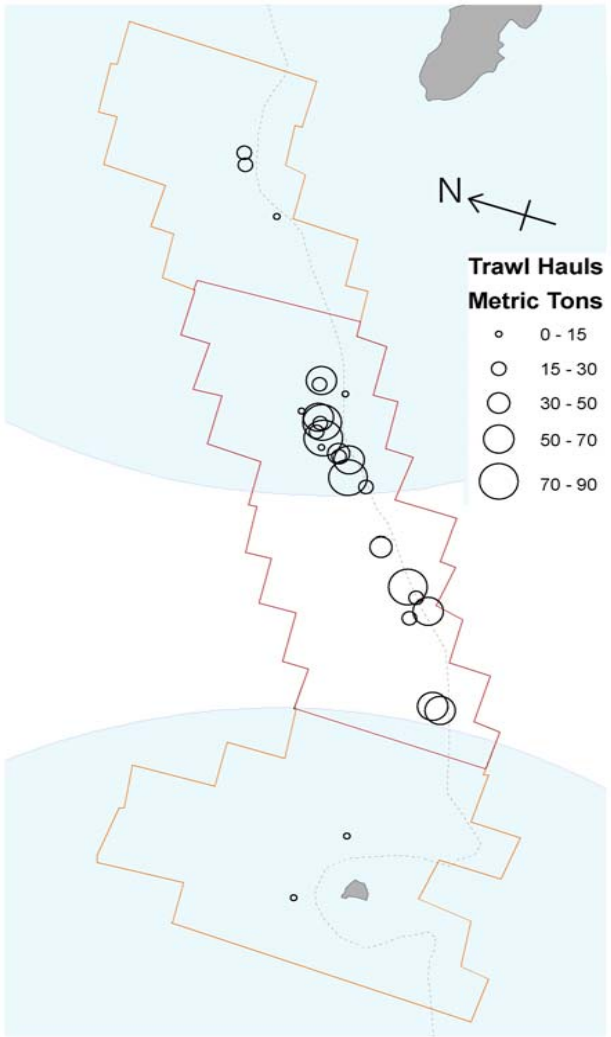


Survey	Area (nm^2)	Deadzone (Y/N)	Biomass (t)	Relative Precision (E_i)	Density (t / nm^2)
2	180	N	8233.8	8.67%	45.7
2	180	Y	8809.9	8.04%	48.9
2	72	N	6484.5	12.29%	90.1
2	72	Y	6706.6	14.32%	93.1
4	180	N	6600.4	7.96%	36.7
4	180	Y	7980.2	7.87%	44.3
4	72	N	5246.4	12.31%	72.9
4	72	Y	6149.8	11.89%	85.4
5	9	N	890.8	5.29%	99.0
5	9	Y	1036.6	4.75%	115.2
6	72	N	3015.0	6.64%	41.9
6	72	Y	3458.5	6.44%	48.0
7	72	N	1159.0	6.83%	16.1
7	72	Y	2179.7	5.05%	30.3
8	180	N	2313.6	14.51%	12.9
8	180	Y	2845.2	14.24%	15.8
8	72	N	559.2	14.32%	7.8
8	72	Y	677.0	12.96%	9.4

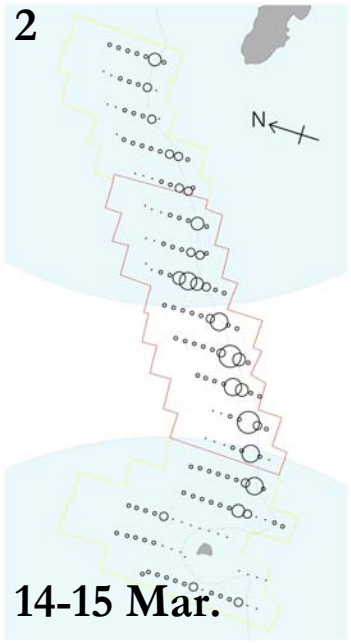
Pollock Abundance

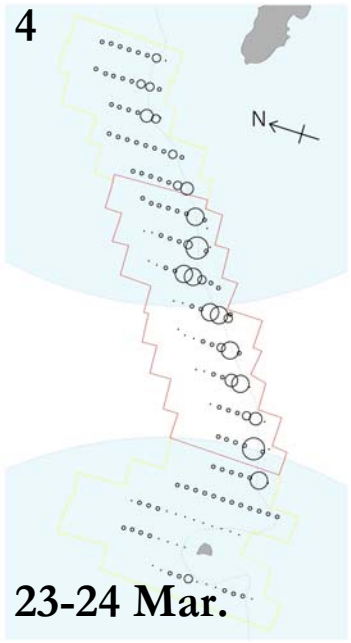
- 68% overall decline
- 90% decline in “fished” region
- No measurable change in “not fished” region

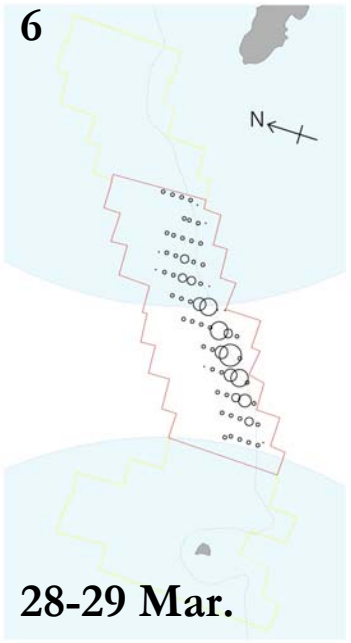


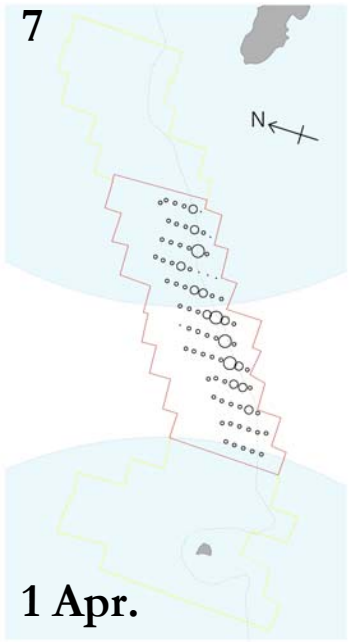


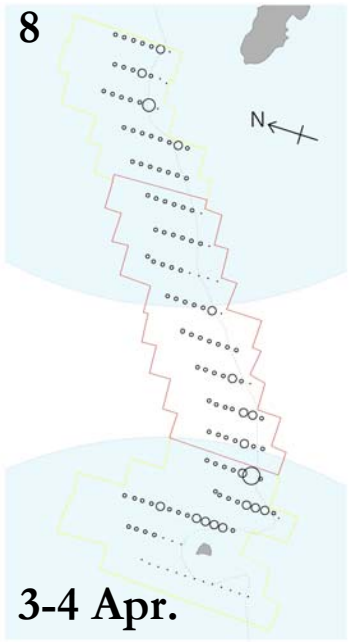
Pollock Distribution

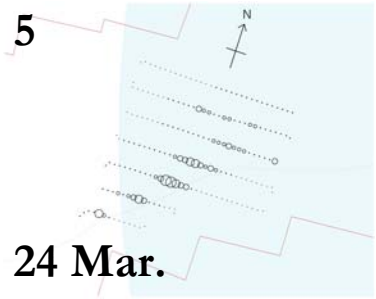


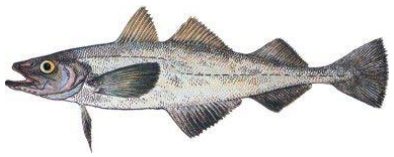


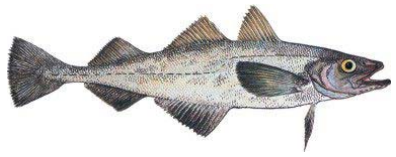






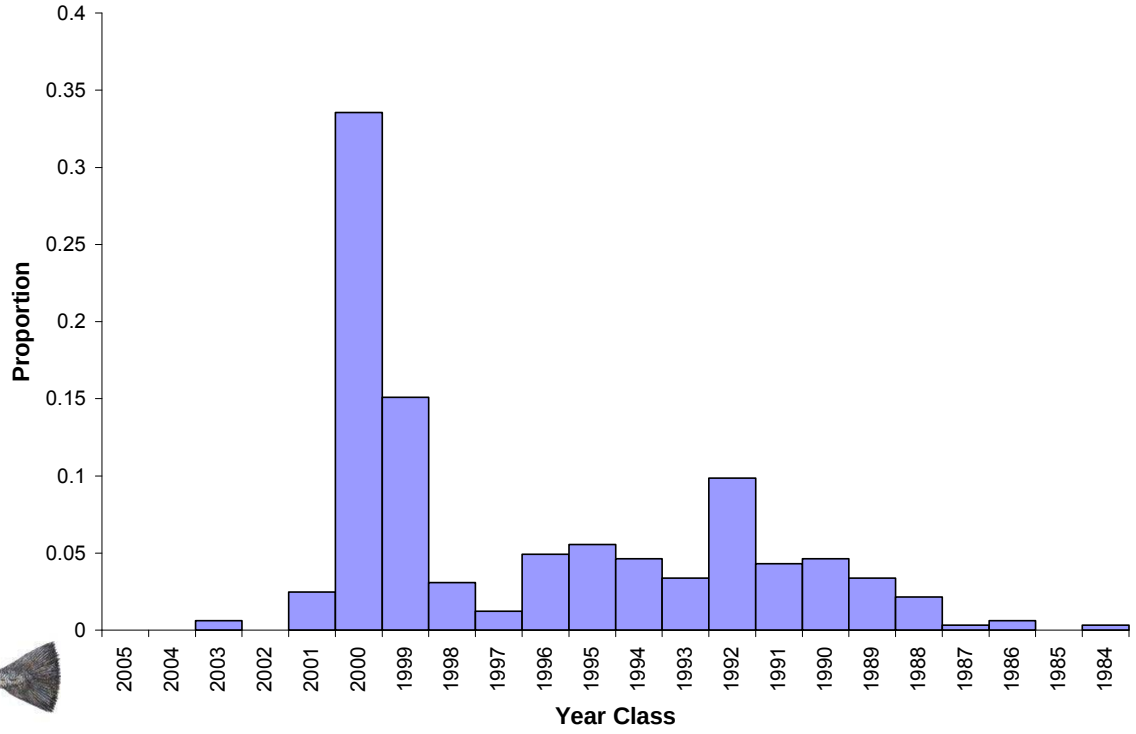


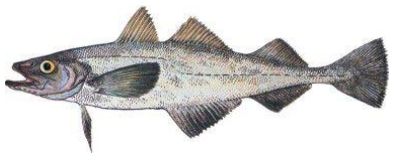


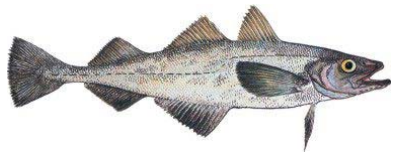


Biological Data: Age

- Age structure similar to Eastern Bering Sea
- Age 5 and 6 (99 and 00 YC) largest

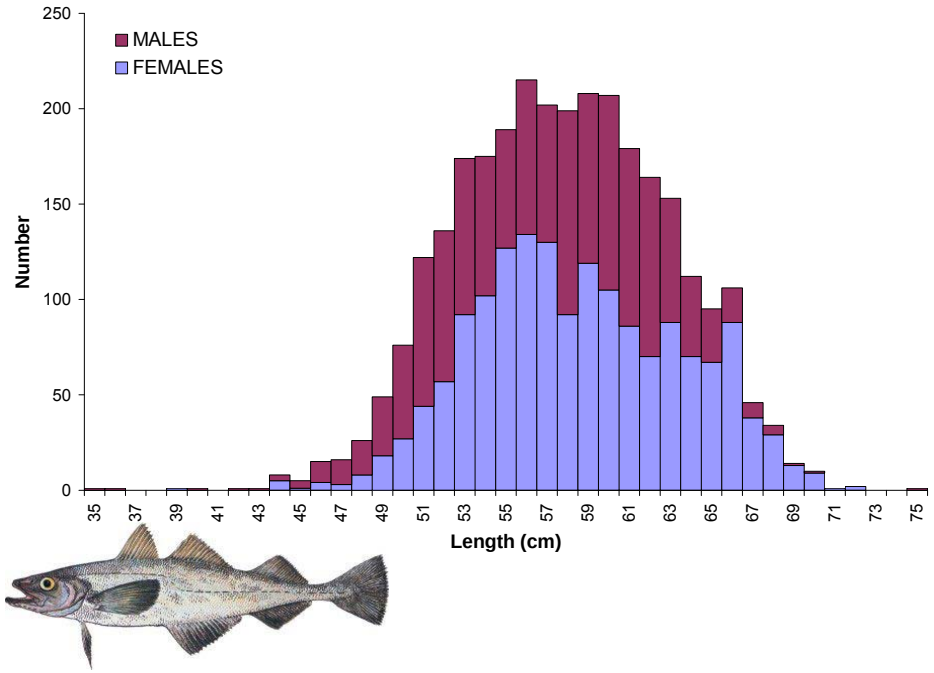


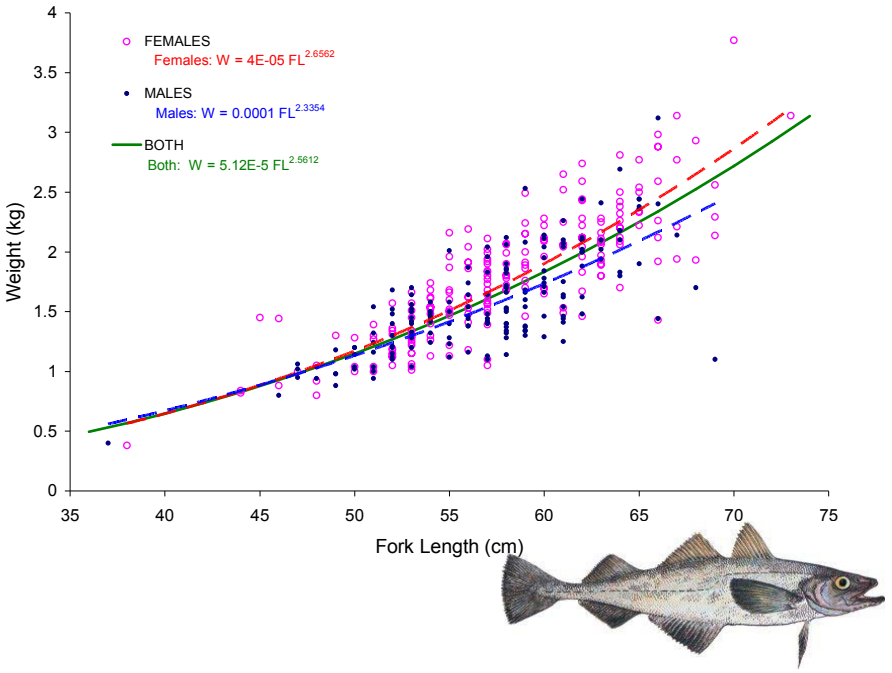




Biological Data: Length and Weight

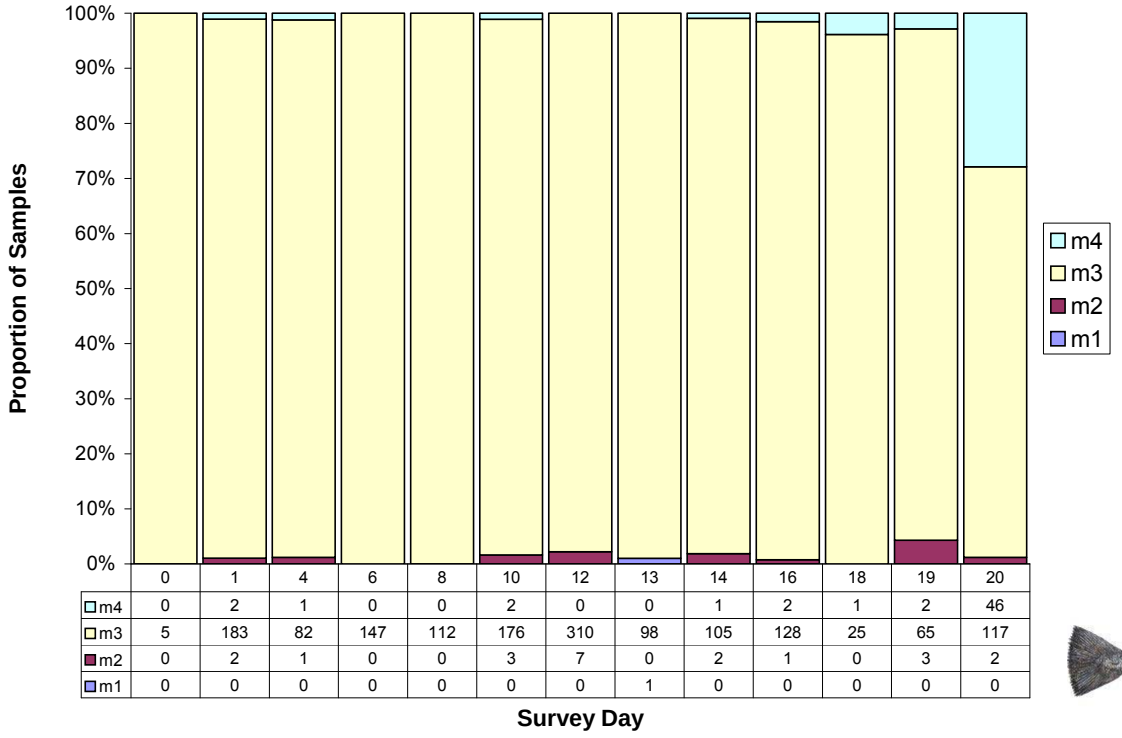
- Sex Ratio: 55% female
- Mean length and weight:
  - Males 56.9 cm and 1.58 kg
  - Females 58.5 cm and 1.80 kg





Biological Data: Maturity

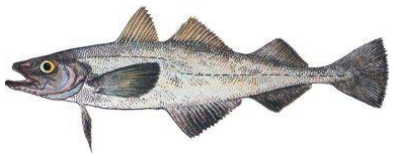
- Female maturity:
  - 98.6% of females pre-spawning or spawning
  - 0% post-spawning

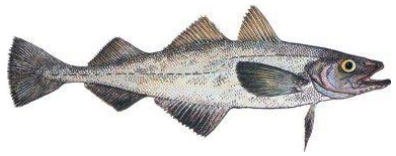


	0	1	4	6	8	10	12	13	14	16	18	19	20
m4	0	2	1	0	0	2	0	0	1	2	1	2	46
m3	5	183	82	147	112	176	310	98	105	128	25	65	117
m2	0	2	1	0	0	3	7	0	2	1	0	3	2
m1	0	0	0	0	0	0	0	1	0	0	0	0	0

Conclusions

- It is possible to collect high quality acoustic data on pollock abundance and distribution from a small commercial fishing vessel during winter in the Aleutian Islands.
- Data are of sufficient quality for management purposes such as abundance estimation.
- Pollock abundance/distribution may remain stable for periods of time, but can change rapidly.

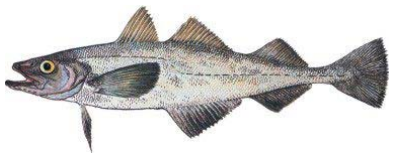


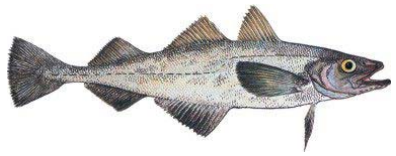


Future Plans

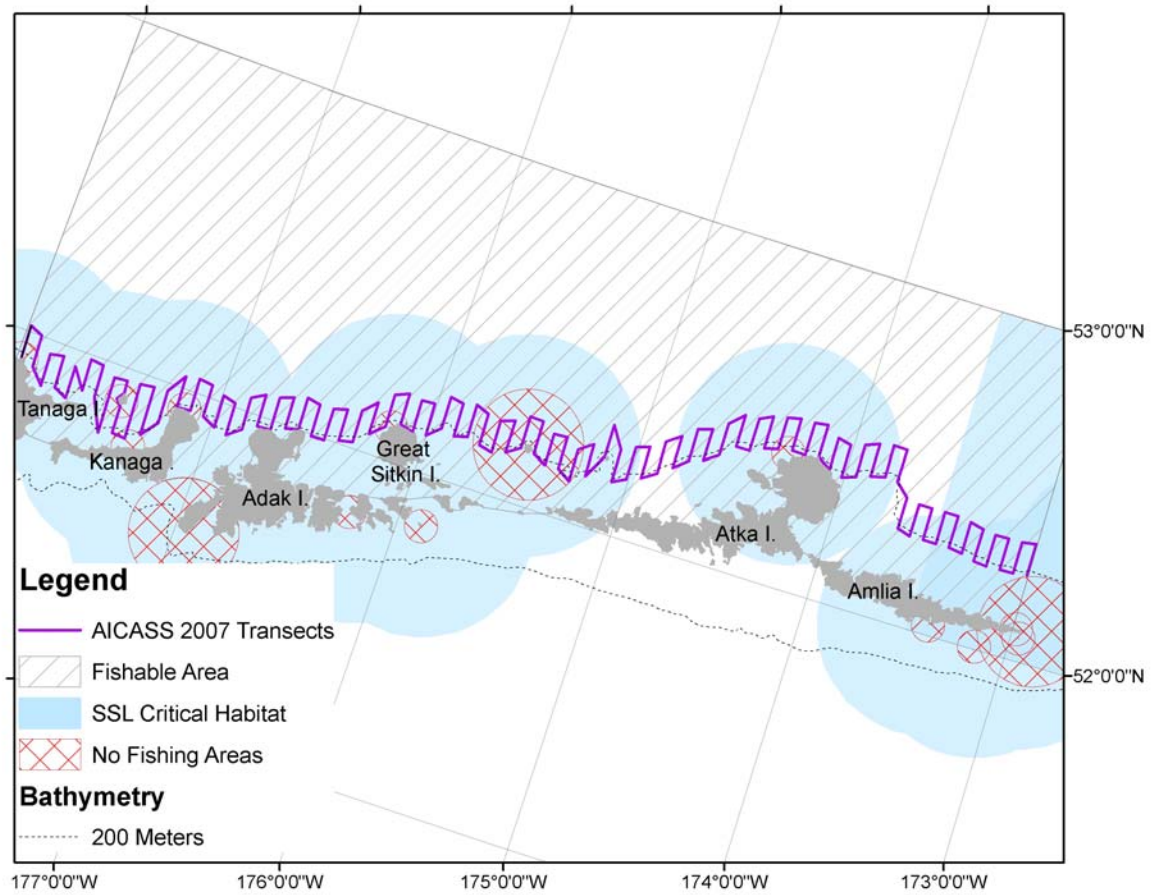
- Finish analyzing data from 2006 AICASS
  - Age data analysis
  - Subarea and temporal differences in pollock biometrics

- 2007 AICASS
  - Acoustic Survey
    - Seguam Island to Tanaga Island (5 degrees longitude)
    - 2.5 nm spacing, ~1163 nm^2
    - Two surveys: one pre-fishing and one post-fishing
    - ~142 vessel hours or 6 days each
  - Commercial fishing
    - 450 t per 1 degree longitude inside critical habitat (2,250 t)
    - 100% observer coverage





2007 AICASS

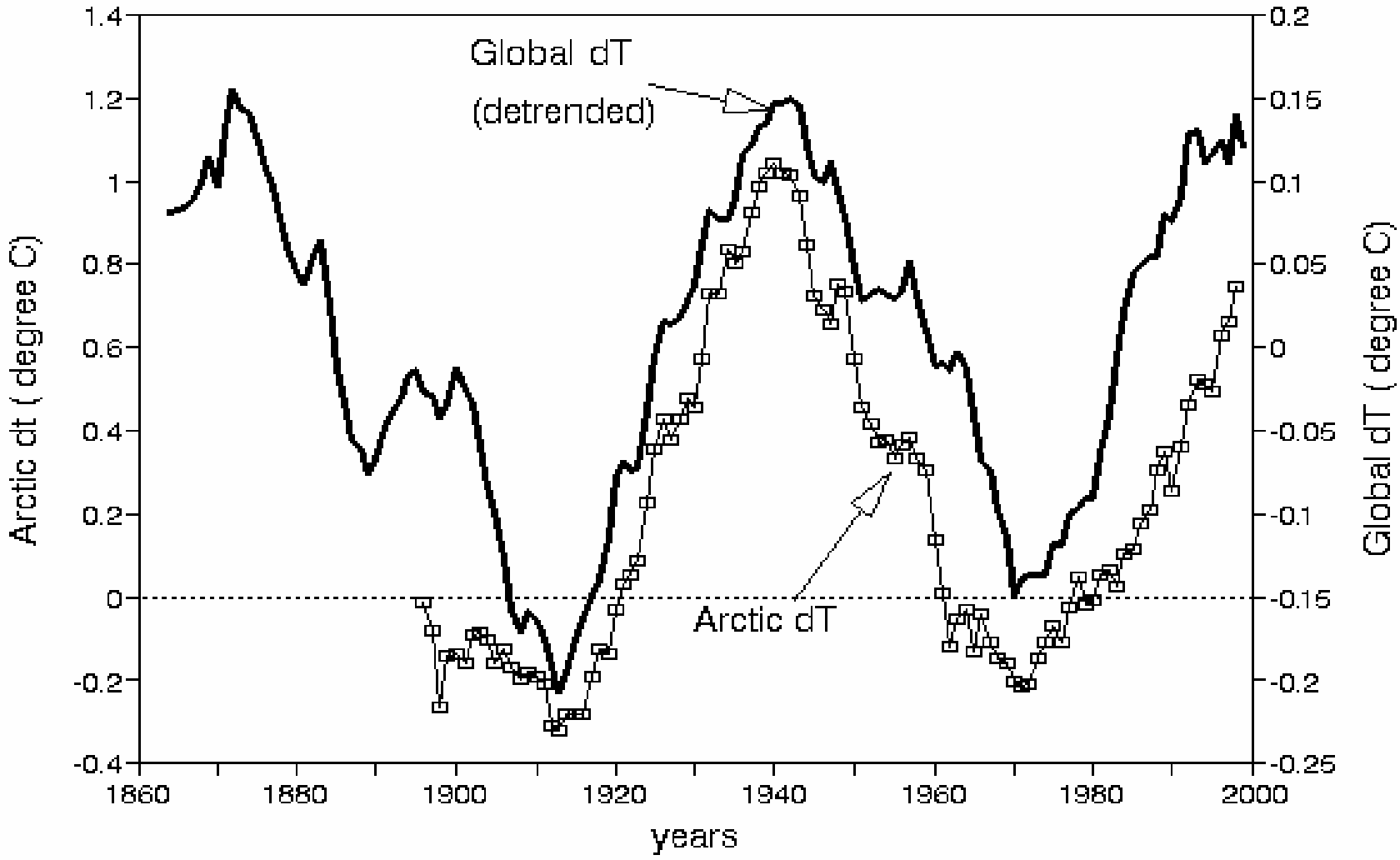

Tanaga I.
Kanaga I.
Great Sitkin I.
Adak I.
Atka I.
Amlia I.
53°0'0"N
52°0'0"N
177°0'0"W
176°0'0"W
175°0'0"W
174°0'0"W
173°0'0"W
Legend
AICASS 2007 Transects
Fishable Area
SSL Critical Habitat
No Fishing Areas
Bathymetry
200 Meters

Climate change and walleye pollock biomass in the Aleutian Basin

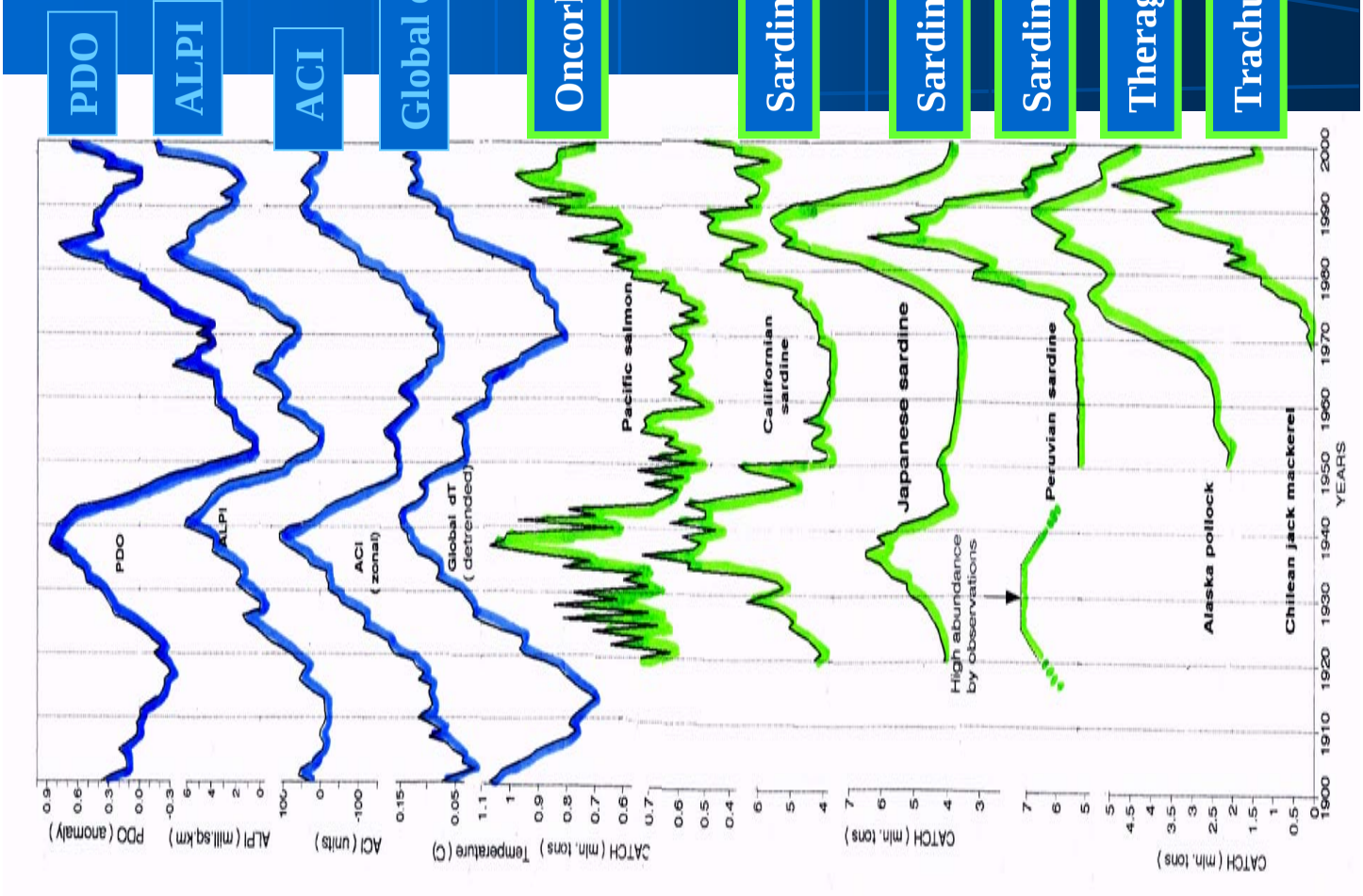
A.Glubokov,* L.Klyashtorin*, A. Lyubushin**

*VNIRO, **Institute Physics of the Earth, Russian Academy of Science
Moscow, Russia

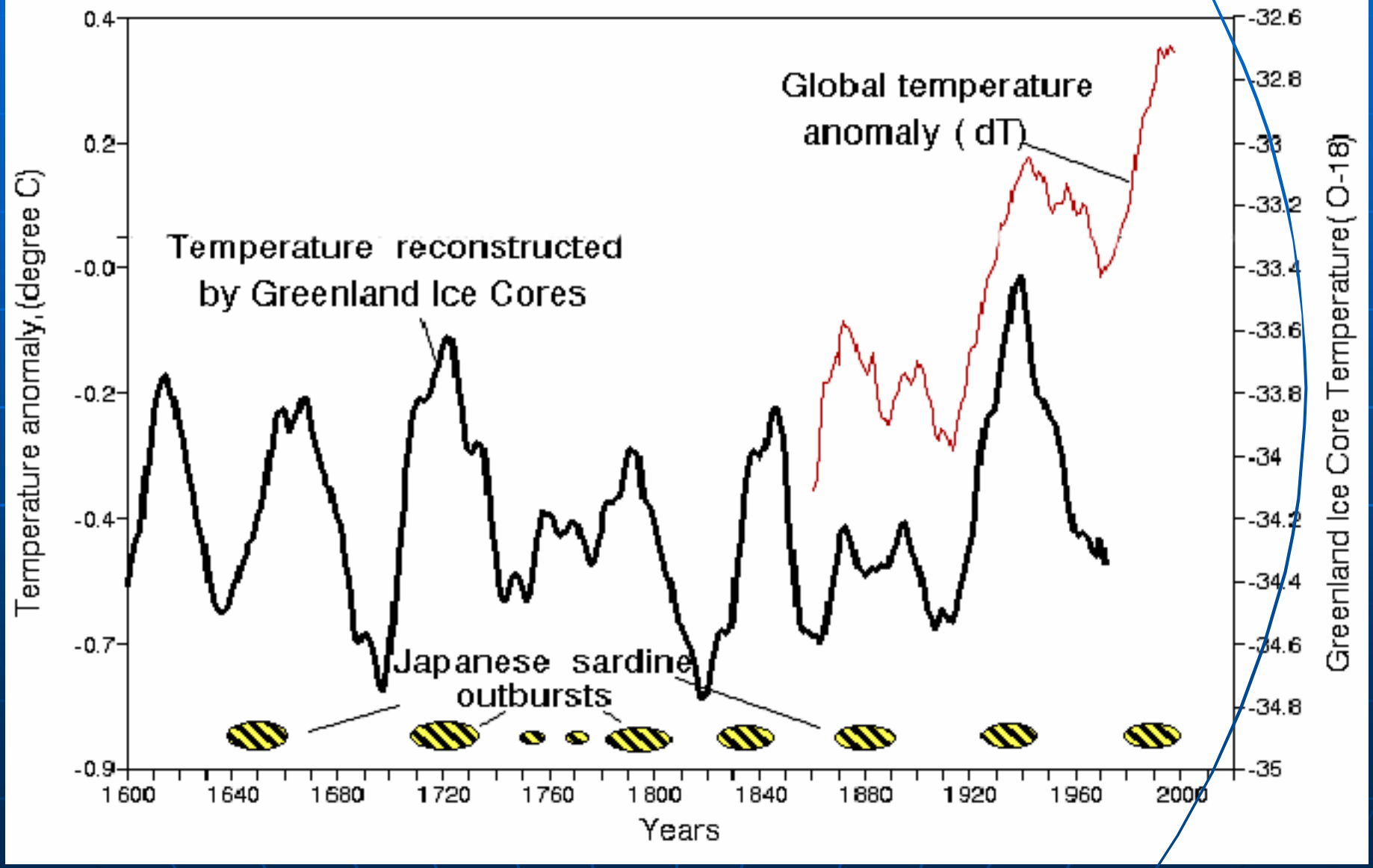
Comparative dynamics of Global dT (detrended) and temperature anomaly of Arctic circumpolar zone 60-85o N (Arctic dT)



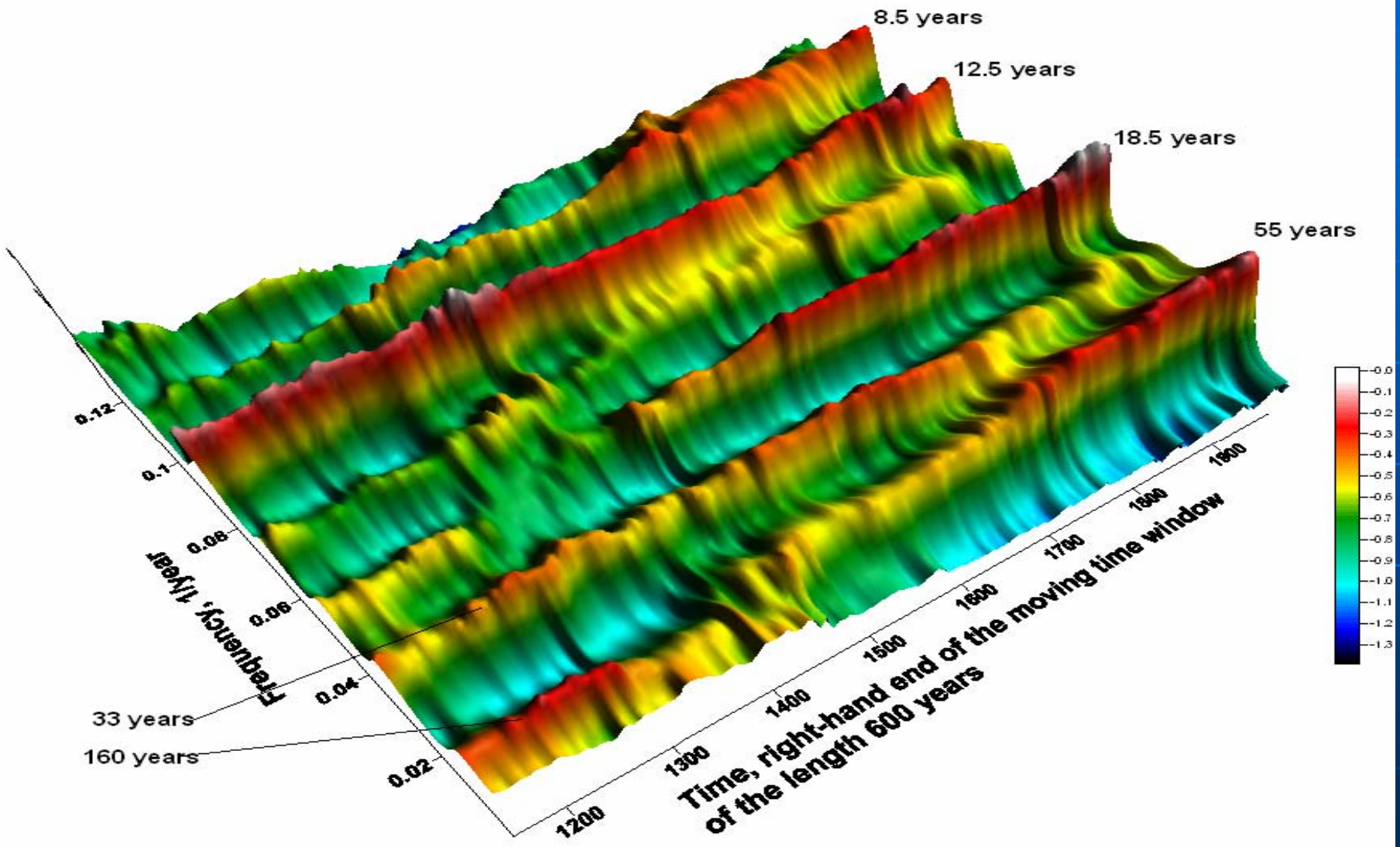
Fluctuations of main climatic indices and catches of commercial species 1900-2000



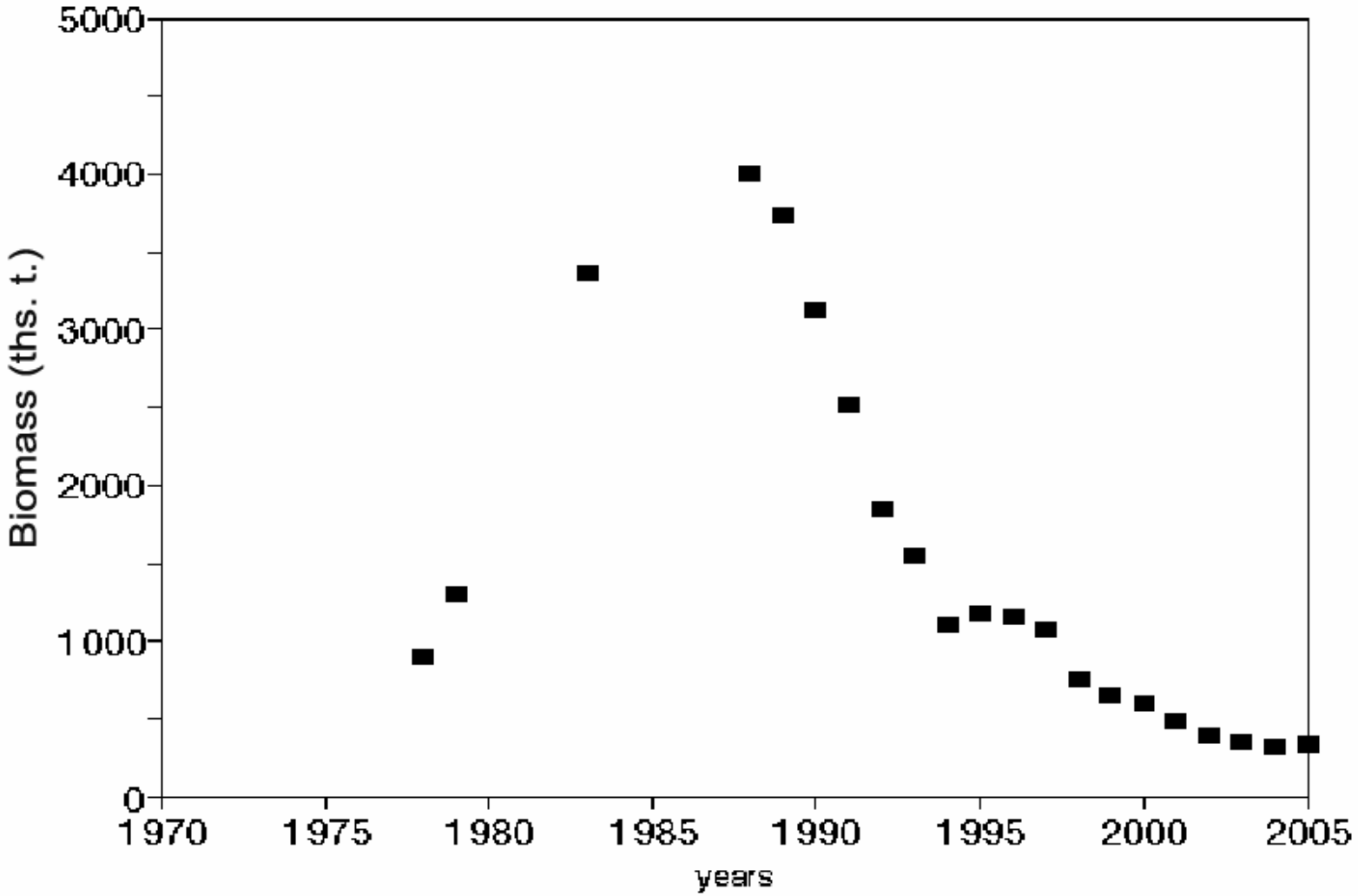
A comparison of cyclic temperature fluctuations reconstructed by Ice Cores and Sardinops melanosticus outbursts for the last 400 years by Japanese historic chronicles (1600-1880) and fisheries statistics (1900 –2000)



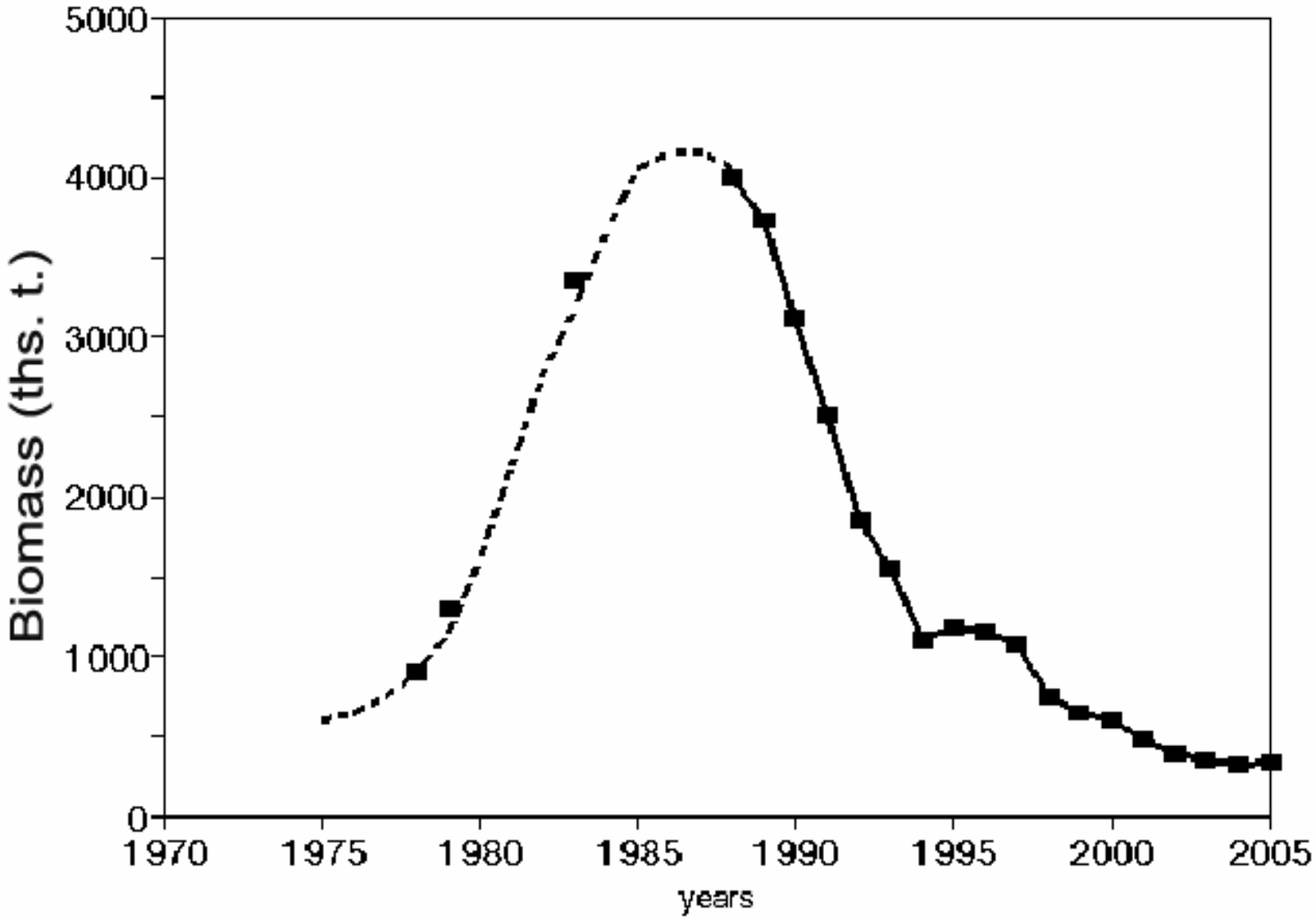
Dominating periodicity of air surface temperature by analysis of Greenland ice cores for the last 1500 years



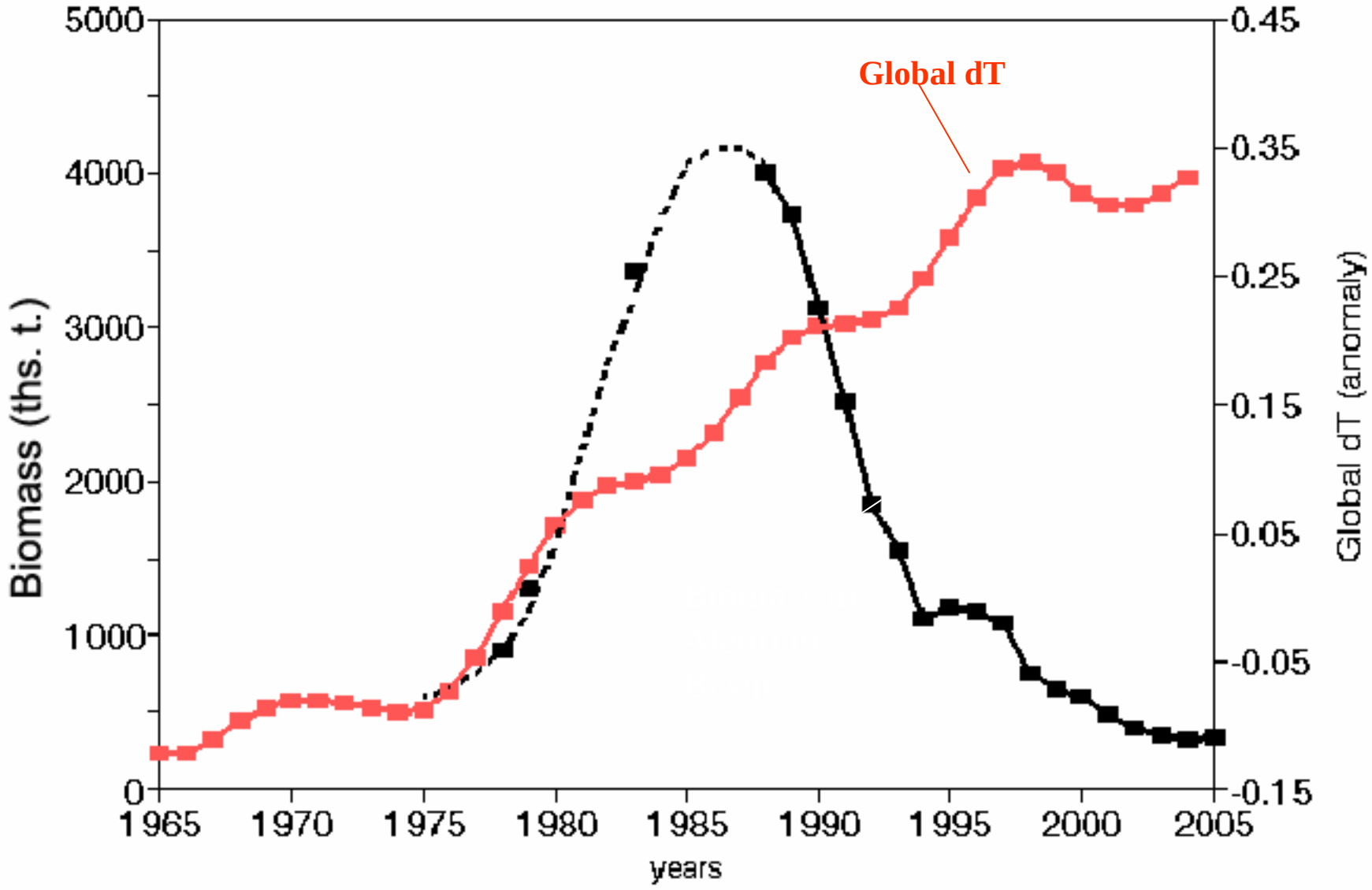
Walleye pollock biomass estimates from Aleutian Basin (Att.8 from 10th Conference)



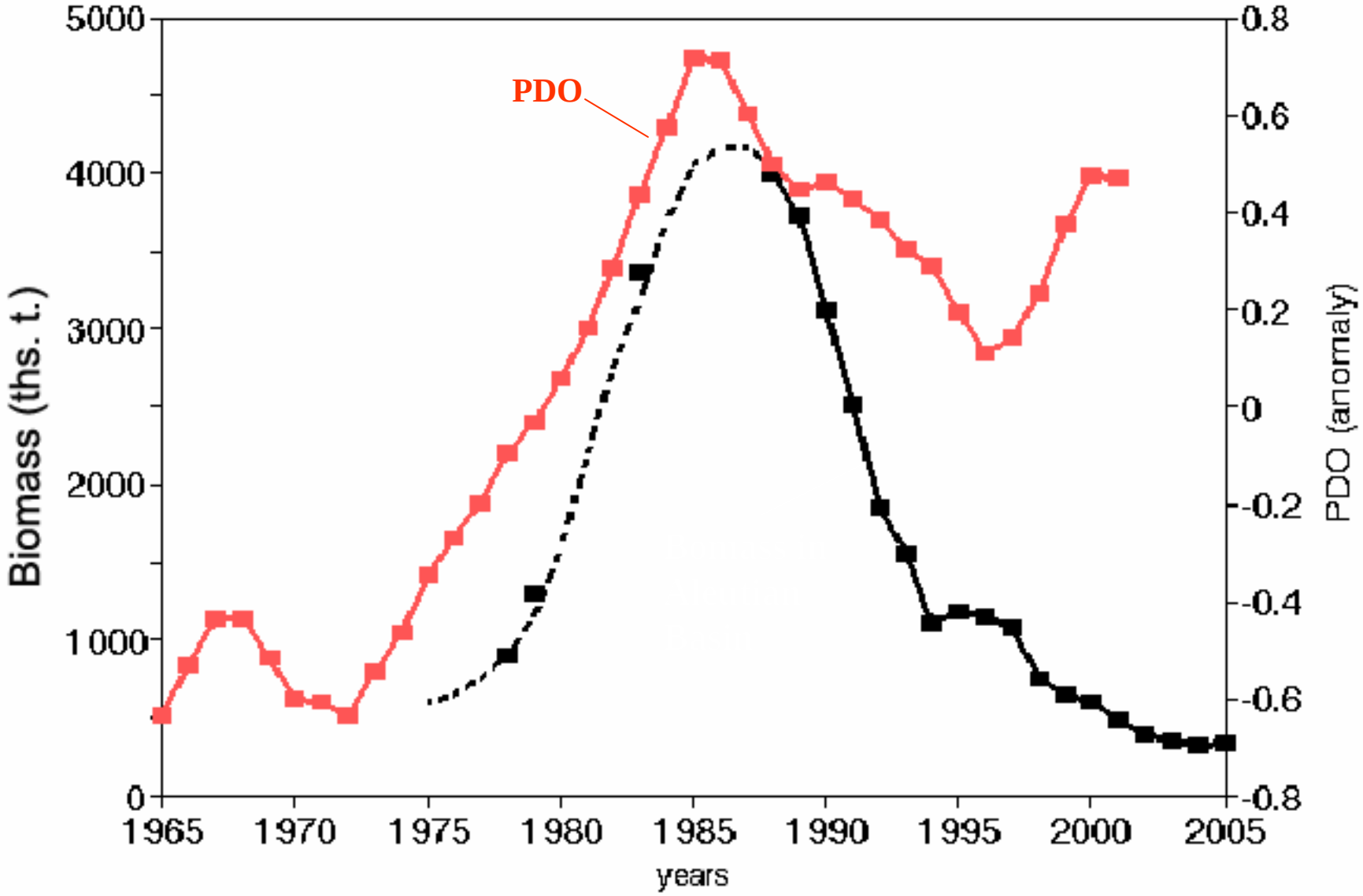
Probable trend of Walleye pollock biomass in the Aleutian basin



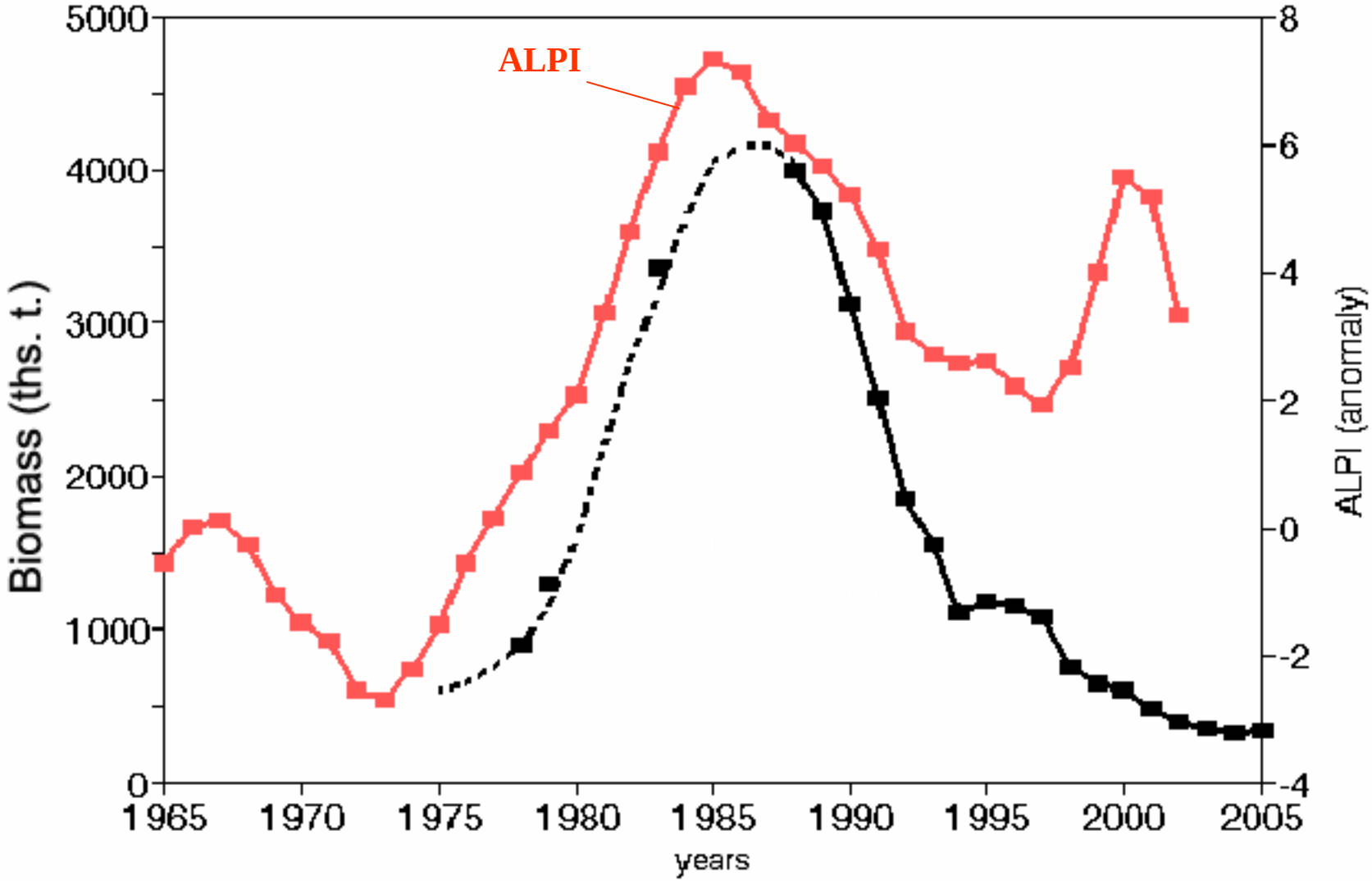
Comparative dynamics of Global dT and Walleye pollock biomass in Aleutian Basin



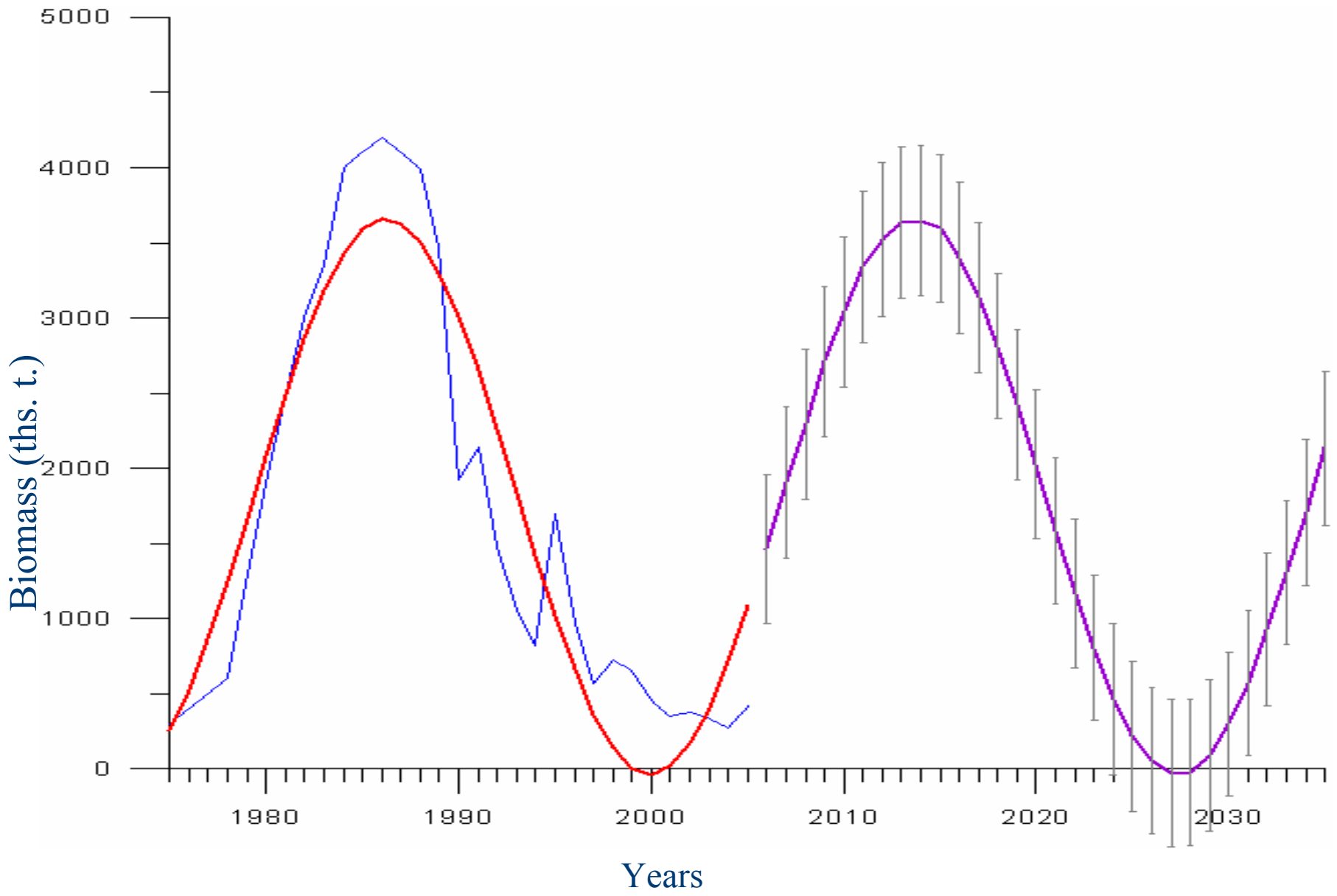
Comparative dynamics of Pacific Decadal Oscillation (PDO) and Walleye pollock biomass in Aleutian Basin

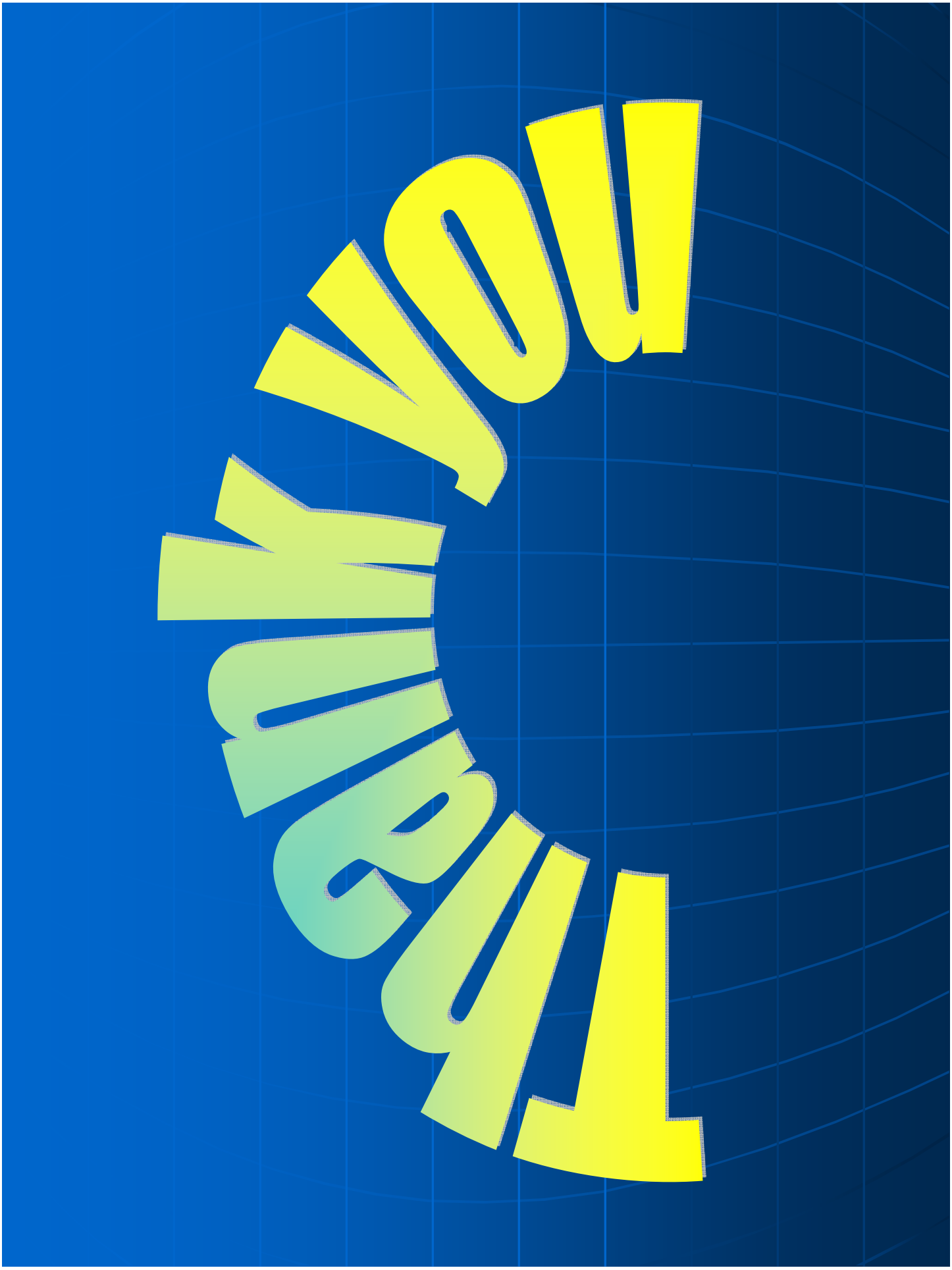


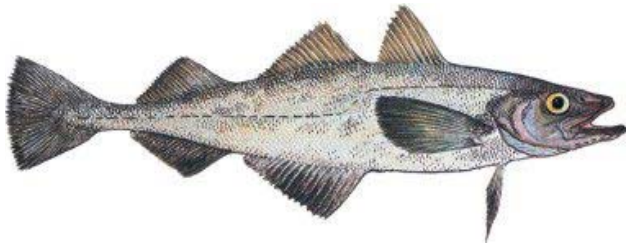
Comparative dynamics of Aleutian Low Pressure Index (ALPI) and Walleye pollock biomass in Aleutian Basin



Biomass of Walleye pollock in Aleutian Basin



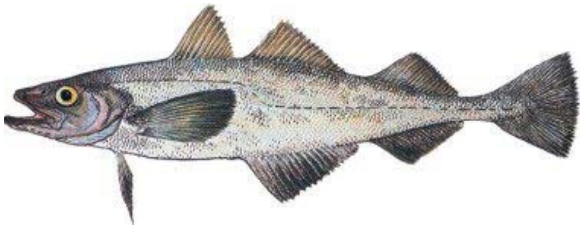

THANK YOU!



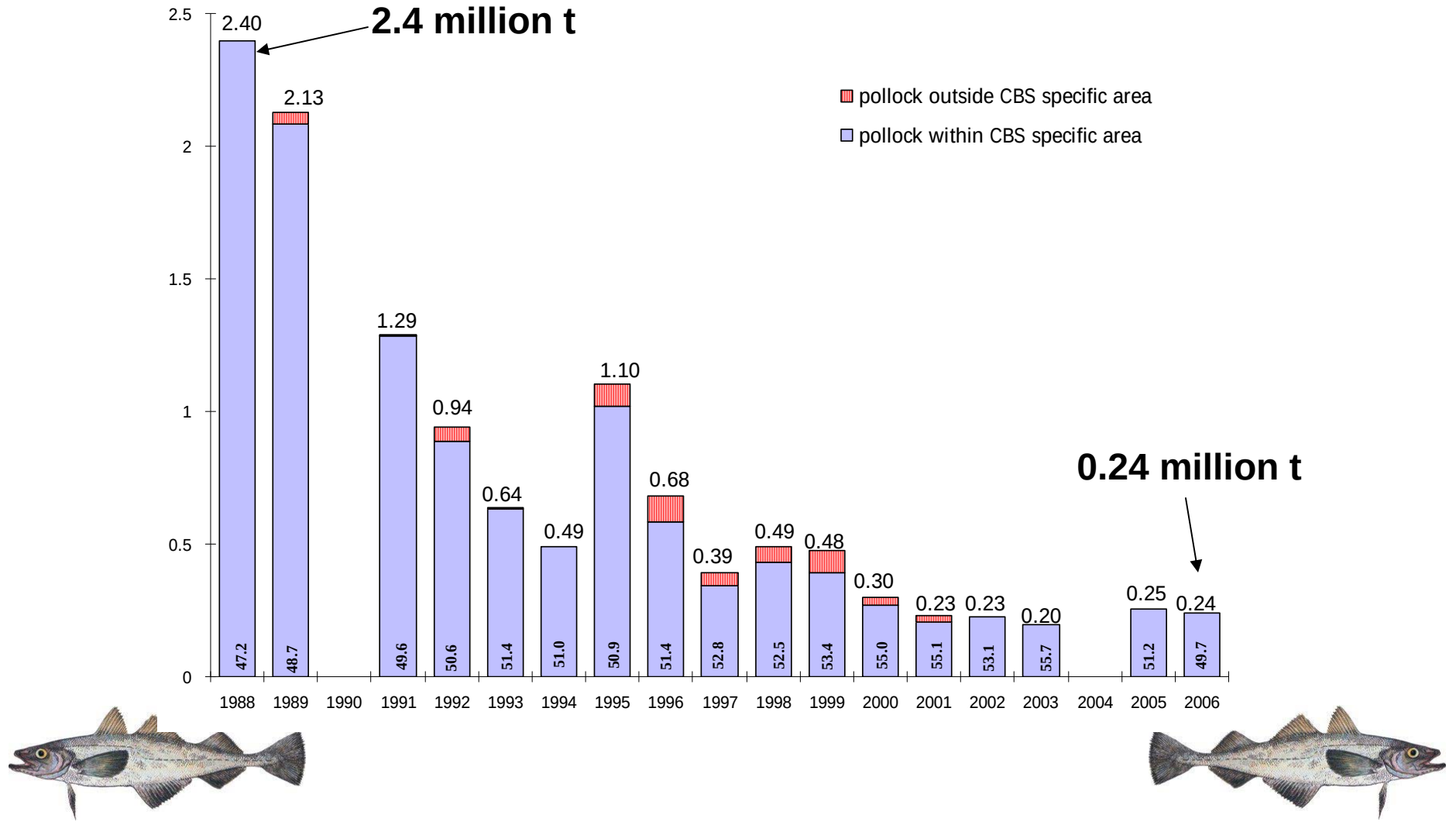
Approaches for setting ABC in the Bogoslof Region under US fishery management practices

Jim Ianelli and Steve Barbeaux

Alaska Fisheries Science Center
NOAA Fisheries

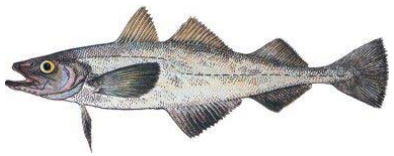


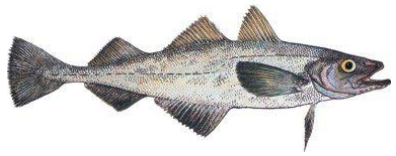
EIT Survey Biomass



US Fisheries Management ABC Determination Methods

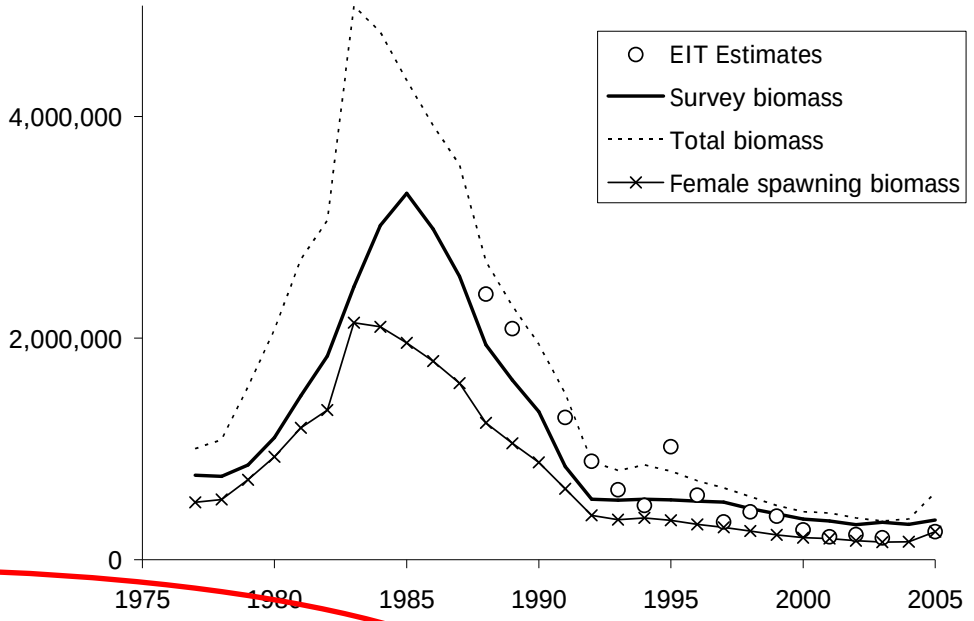
- Simple age-structured model
- Harvest rate as a simple fraction of natural mortality rate (e.g., $F_{ABC} = 0.75M$)
- Biomass-adjusted harvest rate rule (with 2,000,000 ton estimate as a target stock size) with an estimate of a F_{ABC} based on growth, natural mortality, and maturation rate





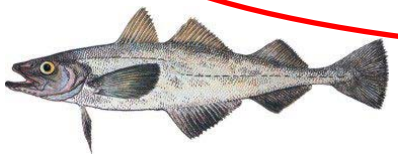
Age-Structured Model

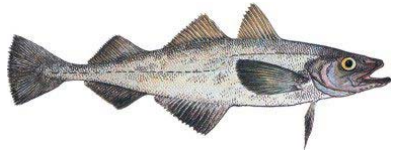
Base model	Results
Age 5+ 2006 begin-year biomass	626,000
2006 Spawning biomass	253,900
$B_{40\%}$	140,400
$B_{35\%}$	122,900
$B_{100\%}$	351,100



- F_{ABC} = 0.498

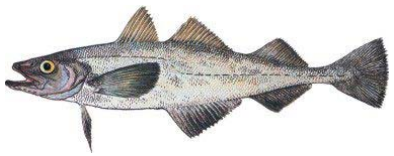
ABC_{2007} = 244,000 t

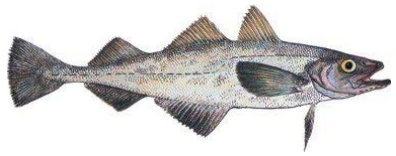




Age-Structured Model

- The NPFMC Science and Statistical Committee considered the age-structured model to be inappropriate
  - The model does not adequately represent the stock
  - The model does not take into account concerns for recovery



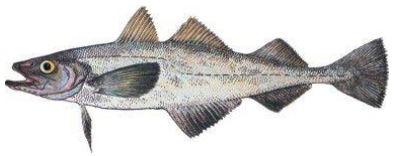


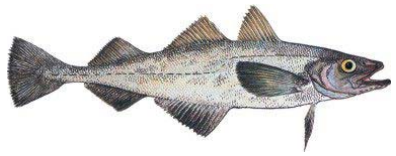
Fraction of Natural Mortality

$$F_{ABC} = 0.75M$$

- $M = 0.2$
- $F_{ABC} = 0.15$
- $B_{2006} = 0.24$ million t

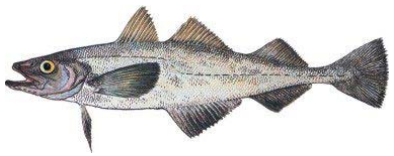
ABC = 36,000 t

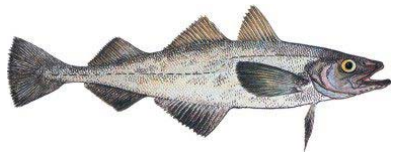




Fraction of Natural Mortality

- The NPFMC Science and Statistical Committee rejected the fraction of natural mortality as a harvest strategy
  - Method does not explicitly take into account stock rebuilding objectives



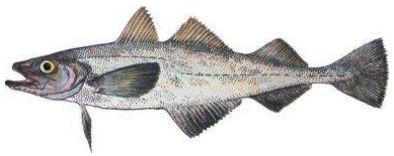


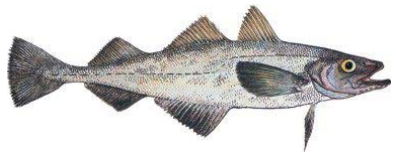
Biomass Adjusted Harvest Rate Rule

$$F_{abc} \le F_{40\%} \bullet \left(\frac{B_{2006}}{B_{Target}} - 0.05 \right) \Big/ (1 - 0.05)$$

- M = 0.2
- $F_{40\%}$ = 0.27
- B_{Target} = 2.0 million t
- B_{2006} = 0.24 million t
- F_{abc} = 0.0199

ABC = 4,447 t



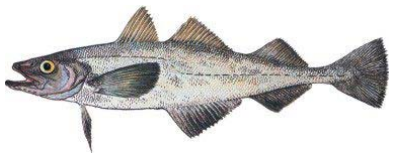


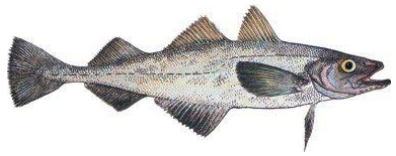
Biomass Adjusted Harvest Rate Rule

- The NPFMC Science and Statistical Committee has set the ABC using the biomass adjusted harvest rate rule since 1997.

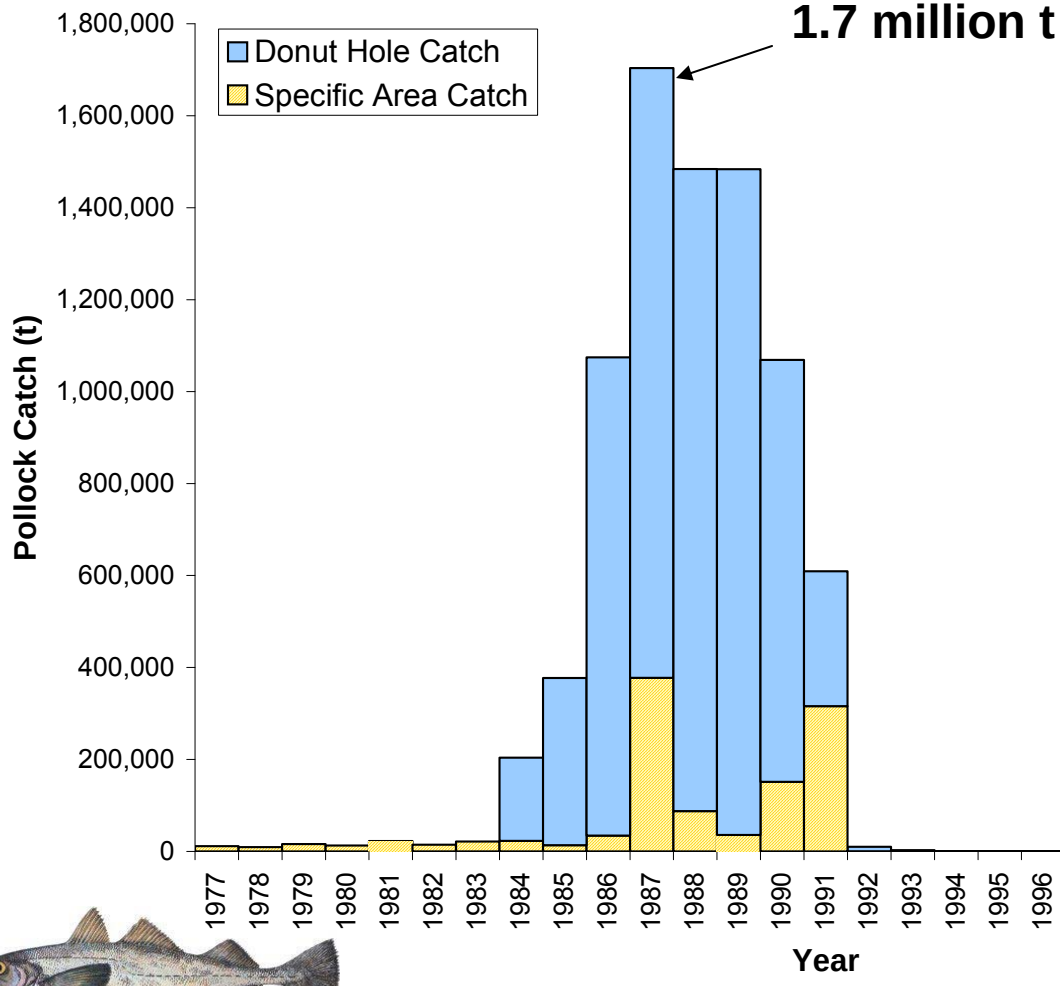
- Directed pollock fishing has been closed in the Bogoslof Region since 1992

- Total Allowable Catch (TAC) set at 1,000 t solely for bycatch in other fisheries

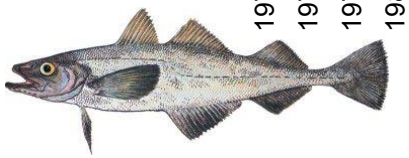


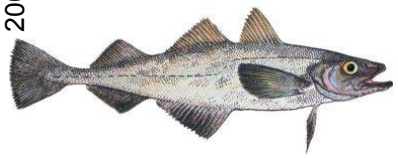


Bogoslof Island Area Pollock Catch



Year	Donut Hole	Bogoslof I.
1993	1,957	886
1994	0	556
1995	0	334
1996	0	499
1997	0	163
1998	0	136
1999	0	29
2000	0	29
2001	0	258
2002	0	1,042
2003	0	24
2004	0	100
2005	0	100





Bering Sea Convention
Eleventh Annual Conference
Warsaw, Poland, 5-8 September, 2006

Joint proposal by China, Japan, Korea, Poland
for the establishing the AHL for Pollock in the Central Bering Sea in 2007

According with the Article V11.1 "The Annual Conference shall establish by consensus the AHL for the succeeding year, based upon an assessment of the Aleutian Basin pollock biomass by the Scientific and Technical Committee."

Taking into account that:

- The spawning pollock biomass in the Specific Area was calculated on the level of 240 thousand tons by r/v MILLER FREEMAN in March 2006 during echo integration-trawl survey
- The spawning biomass represents 60% of the total Aleutian Basin pollock spawning biomass. Thereby the indirect biomass of pollock in the Aleutian Basin Area is equal to 400 000 tons (B)

  The rate of exploitation for pollock in the Bering Sea is equal 20% (E) The Donut hole represents 17.5% of the area of Aleutian Basin (A)

The delegations suggest the following calculation for the AHL for 2007:

AHL=Bx ExA

AHL = 400 000 x 0.20 x 0.175 = 14 000 metric tons

Korea's Trial Fishing Plan for 2007

1. The Purposes of Trial Fishing

- To analyze the geographical distribution of Pollock in the Central Bering Sea.
- To estimate total weight and number of fish of Pollock and other species
- To collect biological data of Pollock and other species (length, sex, body weight, maturity)

2. Fishing Company

Name of Company	Address	Tel/Fax
Nambuk Fisheries Co.,Ltd	654, Nambumin-Dong, Seo-Ku, Busan, Korea	82+51+467+1551 / 82+51+243+4211
HanSung Enterprise Co.,Ltd	71, Daekyo-Dong 1Ga, YoungDo-Ku, Busan, Korea	82+51+410+7100 / 82+2+732+5300

3. Descriptions of Trial Fishing Vessel

3-1. Nambuk Fisheries Co.,Ltd

Name of Vessel	Type	G/T	Call Sign
Nambuk Ho	Stern Trawler	5,549.02	6.M.X.T
Main Dimension			INMARSAT-C No.
Length	Breadth	Depth	
104.30	17.80	11.00	444048214

3-2. Han Sung Enterprise Co.,Ltd

Name of Vessel	Type	G/T	Call Sign
Joon Sung Ho	Stern Trawler	2,866	6.L.S.U
Main Dimension			INMARSAT-C No.
Length	Breadth	Depth	
84.91	15.00	9.55	444095484

4. Time of Trial Fishing Operation

Trial Fishing will occur from 1 August 2007 to 31 August 2007

The schedule of trial fishing in detail will be notified to the Parties two weeks prior to the beginning of trial fishing.

5. Cruise tracklines and survey method

Cruise tracklines will cover the Convention Area (Figure 1). Vessels engaged in trial fishing will observe conservation measures adopted by the Convention.
Vessels will be equipped with fish finders. The two vessels will detect fish schools in parallel, moving along the tracklines at the average speed of 7~8kt and about 5-mile in width. Fishing will be conducted with a large mid-water trawl net when fish schools are detected.

6. Observer

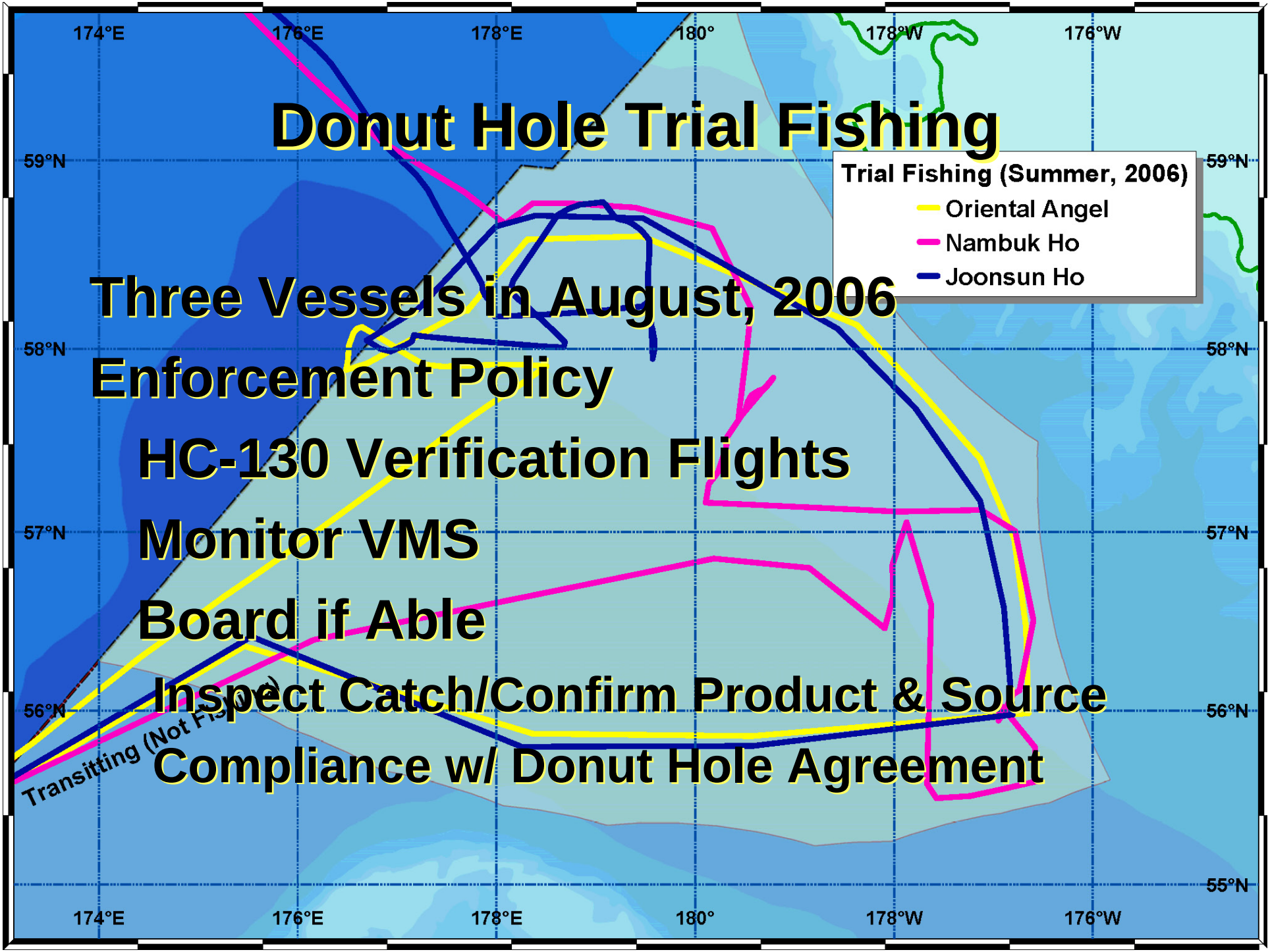
One observer from Korea will be on board each vessel. One observer from other parties will be welcome on board in accordance with the terms and conditions on trial fishing on Pollock in 2007. Cost for observer should be paid by the requesting party.

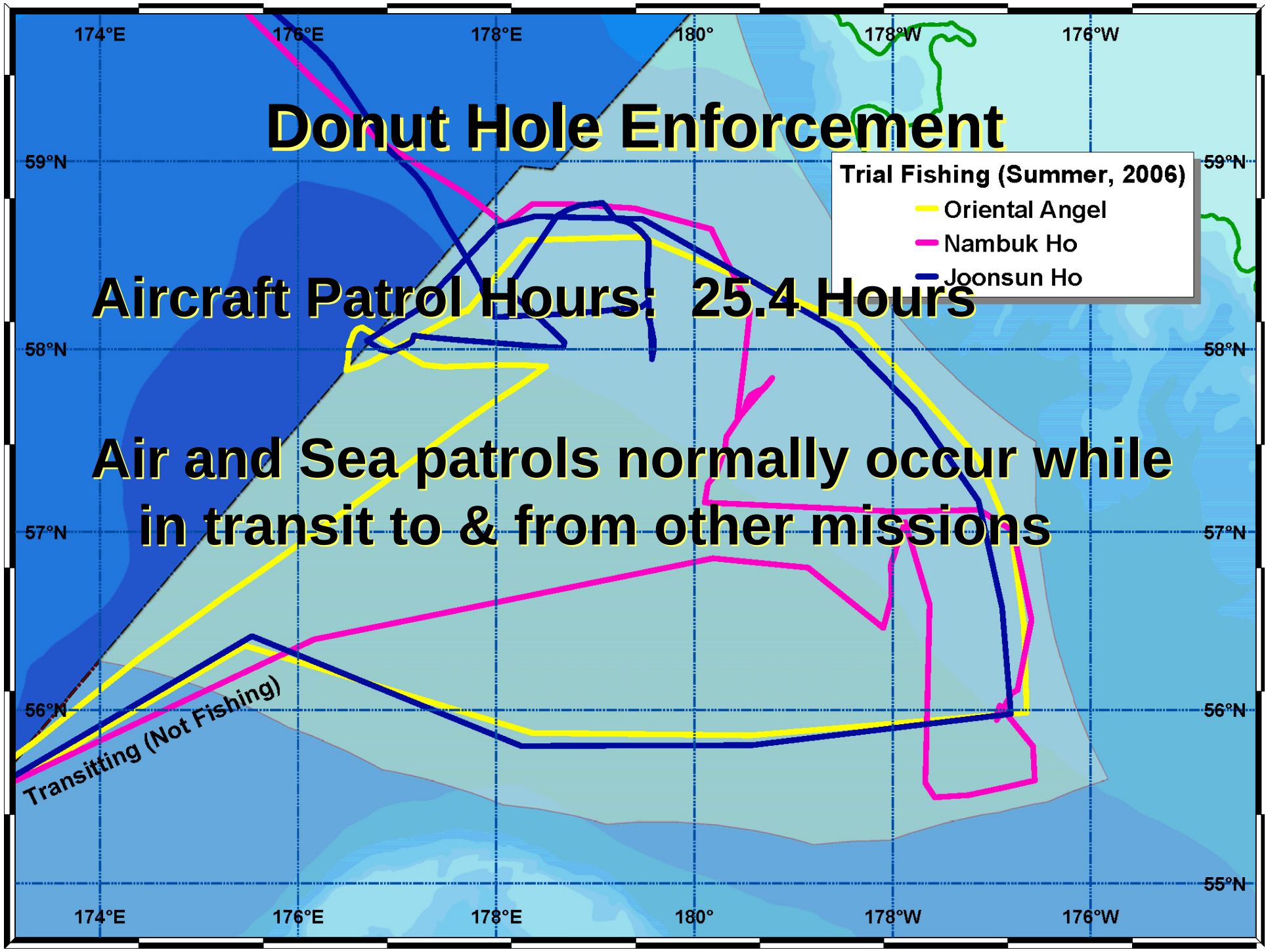
7. Report

The results of trial fishing will be submitted to the next Scientific and Technical Committee, and the Annual Conference, and to the other Parties. This will include the type of catch and distribution data as specified in the Central Bering Sea Observer Program Manual.

11th Annual Convention on the Conservation & Management of Pollock Resources in the Central Bering Sea

Coast Guard Fisheries Law Enforcement


Donut Hole Trial Fishing
Trial Fishing (Summer, 2006)
Oriental Angel
Nambuk Ho
Joonsun Ho
Three Vessels in August, 2006
Enforcement Policy
HC-130 Verification Flights
Monitor VMS
Board if Able
Inspect Catch/Confirm Product & Source
Compliance w/ Donut Hole Agreement
Transitting (Not Fishing)
174°E
176°E
178°E
180°
178°W
176°W
59°N
58°N
57°N
56°N
55°N


Donut Hole Enforcement
Aircraft Patrol Hours: 25.4 Hours
Air and Sea patrols normally occur while in transit to & from other missions
Trial Fishing (Summer, 2006)
Oriental Angel
Nambuk Ho
Joonsun Ho
Transitting (Not Fishing)
174°E
176°E
178°E
180°
178°W
176°W
59°N
58°N
57°N
56°N
55°N

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Coast Guard Fisheries Law Enforcement