REPORT

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

September 17-21, 2001
Gdynia, Poland

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Final: 21 September 2001, 12:00

1. Opening of the Conference.

The Chairperson, Dr. Tomasz Linkowski, the director of the Sea Fisheries Institute in Gdynia, welcomed the delegations of the Parties to the Convention on The Conservation and Management of the Pollock Resources in the Central Bering Sea to the Sixth Annual Conference. Chairperson invited the representative of the Polish Government, Secretary of State at the Ministry of Agriculture and Rural Development, Mr. Robert Gmyrek to present his opening Statement.

Just before presentation of his opening statement Secretary of State asked the participants to the Conference to stand up to commemorate by a minute of silence the victims of the unprecedented terrorist attack on the United States of America and to express the solidarity with the American nation.

2. Welcome Address and Statements of the Delegates

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

3. Election

3.A. Chairperson

Dr. Tomasz Linkowski was elected as Chairperson of the Sixth Annual Conference.

3.B. Vice-Chairperson

Dr Boris Kotenev (Russia) was elected as Vice-Chairperson

3.C. Due to the unfortunate absence of the Chairman of Scientific and Technical Committee (Dr. Richard Marasco - USA), Dr. Boris Kotenev - Russia was elected the Chairmen the present meeting of S&T.

3.D. Rapporteur

Mr. Dariusz Fey (Poland) was appointed as rapporteur

4. Adoption of the Agenda

The Agenda was adopted (Appendix 3) as modified

5. Report of the Scientific and Technical Committee

Dr. Boris Kotenev (Russia) Chair of the Scientific and Technical (S&T) Committee reported on the S&T Committee Meeting of September 17 – September 19. 2001. The S&T Committee produced the S&T Report, which was distributed separately to the parties. Dr. Boris Kotenev highlighted some of the items discussed during the S&T Meeting, which are fully discribed in the Report of the S&T Meeting. Dr. Boris Kotenev summarized the S&T Committee's AHL discussion as follows:

The Parties conducted great research of pollock stocks in the EEZ's USA and Russia and also a trial fishing operation in Convention area. The S&T Committee concluded that despite the extensive research efforts of the Parties in 2001, there were insufficient data to directly estimate the Aleutian Basin pollock (ABP) biomass. The S&T Committee Parties agreed to use the indirect method to estimate the ABP as prescribed by the Convention. According to the Convention Annex part I c, the BI biomass represents 60% of the ABP biomass. Therefore, the BI biomass of 208,000 mt determined by the R/V Miller Freeman is the most recent estimate that should be used to indirectly estimate the ABP biomass. Using this data, the S&T Committee agreed that the ABP biomass would be indirectly estimated as 346,667 mt as determined by the results of the R/V Miller Freeman survey.

The Parties conducted overall discussion of the effects of the moratorium and its continuation. Meeting of the S&T Committee summarized discussion of the problem of the effects of Moratorium and noted that Russia and United States confirm a specific status of the ABP. The moratorium has positive effect for conservation of its stocks. The ABP stock is closely related with Bogoslof area stock and stock of Convention area. Different opinions on the effect of the moratorium on the pollock stock recovery were presented. During the discussion of this question, Russia reported that the data, collected by observers in 2000-2001 on board U.S. commersial vessels, clearly showed that a significant part of mature prespawning pollock (1995 year-class) demonstrated large-scaled migration from shelf area downward to continental slope. This fraction of pollock stock during second half of March inhabited midwater layers at the depths of about 450-550 meters. It's present status seems to be good enough for ABP stock recovery. The Russian delegation believes that this is a positive sign of ABP stock recovery.

Meeting of S&T Committee summarized discussion concerning methodologies to detemine Allowable Harvest Level (AHL) and noted that Japanese, Polish and Korean delegations have proposed specific approach to determination of

AHL in spite of ABP stock being at an extremely low level. The 2001 trial fishing found very few pollock in the Convention area. The S&T Committee did not reach consensus regarding the methodologies to detemine (AHL).

Meeting of S&T Committee discussed questions concerning the process of preparing historical data-base of pollock fishery in the Donut Hole area. Cooperative Research plan for 2002 was adopted.

The S&T Committee agreed to recommend to the Annual Conference the trial fishing terms and conditions for pollock fishing for 2001 be applied to the 2002 trial fishing operations. Concerning others components of a management system the Parties agreed with respective statements fixed in the report of the 5th Conference in Shanghai.

The Conference agreed to adopt the Report of the Scientific and Technical Committee

6. Action Items

6.A. The Review of Scientific Data and Conservation Measures of the Coastal States Related to Pollock Fishing in the Bering Sea

The Conference agreed that this item has been discussed thoroughly during S&T Committee and no further discussion was necessary.

6.B. The Establishment of a Plan of Work for the Scientific and Technical Committee

6.B.1. The United States stated that the Working Group established during the 5th Annual Conference in Shanghai should continue its work. This opinion was supported by other Parties. It was also agreed that this work could be done, to some extend, by establishing Internet and e-mail contacts between Parties.

6.C. The Establishing of the Terms and Conditions for Trial Fishing in 2002

6.C.1 China underlined that fishing is a scientific activity and the number of vessels allowed to conduct trial fishing should be increased. There should be no limits regarding the fishing quotas.

6.C.2 Japan stated that although trial fishing is providing some scientific data, the fact is that the trial fishing is a commercial activity. Government of Parties to the Convention are not in the position of telling the commercial company where they should conduct the fishing activity. In fact it is against the idea of trial fishing.

6.C.3. Korea stated that trial fishing should satisfy the benefits of both stakeholders that are involved in the trial fishing, fishing industry and policy-makers. As a technical approach, it proposed to allow transferring of trial fishing rights to Parties that do intend to conduct trial fishing. It also emphasized that the proposal does not change the total number of trial fishing vessels, 12 vessels, at one time. In addition, Korea also proposed to willingly impose a catch limitation scheme, once transfers of trial fishing rights are available. It concluded that this proposal could be more conservative than the current trial fishing conditions.

6.C.4. Russia stated that it is against increasing the number of trial fishing vessels and the conditions approved last year (2001) should be maintained.

6.C.5. USA supported the statement made by Russia and the agreement made this year by the Scientific and Technical Committee.

6.C.6. China suggested that more member states be encouraged to participate in the trial fishing in order to collect more catch information for the stock research in the Convention Area.

6.C.7. Poland stated that we should be very careful about changing the rules and conditions concerning the trial fishing. We should remember that the vessel conducting trial fishing is supposed to follow a given cruise schedule, not to concentrate on fish concentrations found.

6.C.8. The Chairman summarized that the proposal made by China to increase the maximum number of vessels from a given Party allowed to conduct the trial fishing at the same time, was not supported by Russia and USA. At the same time, Poland and Japan expressed limited support for the proposal, stating, however, their preference to maintain present conditions and regulations.

6.C.9 Korea underlined that is not trying to increase the total number of trial fishing vessels, which should be 12, as it was established in previous years, instead Korea proposed to establish possibility of transferring trial fishing rights between Parties.

6.C.10. Finally the Parties agreed to apply in year 2002 the rules and conditions established in 2001.

6.D. The Establishing of the Allowable Harvest Level

6.D.1. Korea stated that as the nine-year moratorium has no positive effect on the stock recovery, this Conference now needs to allow a political and/or symbolic AHL to achieve the goal of fisheries management. It understands that fisheries management should consider social, political and economic aspects to sustain the fisheries base as well as the biological aspect to sustain fish resources. It stressed that the Conference requires flexibility in its decision by incorporating industry's contribution since scientific surveys could not cover all information for the management of pollock resources in the Central Bering Sea. It expected that Parties to this Convention would consider seriously the necessity of reopening fishery by allowing a strategic minimum AHL next year.

6.D.2. According to the request of Korea, the Chairperson allowed Mr. Moo-Sung Park, the Managing Director of Korea Deep Sea Fisheries Association, to make an address regarding the industries' opinions toward this Conference (Appendix 5).

6.D.3. China expressed opinion that it is important to give hope to the fishermen and the fishing industry and it could be done by establishing even minimal AHL.

6.D.4. USA stated that in the present situation, when there are basically no pollock in the CBS, establishing AHL seems to not be the correct decision. USA is against establishing the AHL.

6.D.5. Russia expressed the same opinion and supported it with an example of herring stock in Bering Sea. The stock has been restored within the last 15 years as a result of an appropriate restoration policy. Russia suggested to move to the next point of agenda as we can not reach the consensus.

6.D.6. Poland underlined that there has been a common position of four Parties (China, Japan, Korea and Poland) to open the fishing grounds for fishery and establishing the AHL even at very low level. This opinion has been continuously ignored by other two Parties. Such a situation seems to be very dangerous when considering the Convention spirit and existence.

6.D.7. Japan proposed to establish an ABC what is possible even though the resources are very low. Japan fully supports setting the AHL.

6.D.8. Russia stated that the goal we would like to achieve is 1.67 mmt of the biomass, which can be impossible if we do not support the recovery process. If we just want to give the hope it can be done by the press release for example, without establishing the AHL.

6.D.9. Japan stressed that the ABC methodology they proposed is the same as that used in the USA. We should remember that the Convention is not only about the conservation but also the management of the pollock resources. Parties of the Convention should continue efforts to verify and confirm effectiveness of moratorium as means to resources management as well.

6.D.10. The USA cannot support any decision other than establishing the AHL at a level of zero. The USA reminds the Japanese delegation, and the rest of the Conference, that the scientists that designed the ABC method are the same scientists that believe that the pollock biomass in the Convention area is too small to allow anything other than a zero AHL.

6.D.11. The Chairman noted that despite the Fishing Parties suggested establishing the AHL at a very low level, even insignificant level, it seems to be very difficult to reach a consensus.

6.D.12. Because the Parties were not able to reach a consensus, it was decided that according to Annex 1, the AHL level should be zero. It should be at the same time stressed, that before the next year's meeting, the Parties should discuss the possibility of establishing an AHL.

6.D.13. Poland stated that the AHL could be established if only there would be such will of the Parties. Also, the existence of the Convention can be questioned if we are not able to establish an AHL. This is why we should be very serious about considering the AHL establishment.

6.E. The Establishment of the Individual National Quotas

Since the AHL for 2002 was set at a zero level, no individual national quotas (INQ) were established.

6.F. The Adoption of Appropriate Conservation and Management Measures Based upon the Advice of the Scientific and Technical Committee

Since the Chairman for S&T Committee stated that no new recommendations were forwarded by the S&T Committee, all the decisions regarding regulations and measures which were made last year at the 5th Conference, were adopted.

6.G. Trial Fishing Plans

6.G.1. Poland submitted the plan of trial fishing and informed on the intention to conduct the trial fishing in 2002 (Appendix 6).

6.G.2 Japan does not exclude a possibility to conduct trial fishing activity. At this point, however, there are no concrete plans. If such a plan assumes a concrete shape, remaining Parties to the Convention shall be notified according to the procedures on the shortest possible notice.

6.G.3. Korea, Russia and China informed that also have no plans concerning the trial fishing, however in case such a plans were established all the remaining Parties will be informed.

6.G.3. The United States announced it had no plans to conduct trial fishing and it expressed their appreciation to China for providing their data obtained during 2001 trial fishing.

6.H. Reception of Reports Relating to Measures Taken to Investigate and Penalize Violation of the Convention

In the framework of the application of measures concerning the State control in the sphere of protection of the marine biological resources and the implementation of international Agreements of the Russian Federation, the actions are undertaken in order to respect the items of the Convention, to prevent and stop eventual violations. These steps are particularly important for the gradual restoration of the pollock stock of the central part of the Bering Sea.

In 2001, Russia patrolled on a regular basis, the Area in the Northern and Western parts of the sea using the vessels of the Marine Guard of the Federal Boarder Guard Service of Russia. At the same time, the control of the Area was assisted by the use of aviation and satellites. During such control operations in 2001, no violations of the Convention were observed. In order to ensure the control of the activity of Russian vessels, the formation of a system of technical monitoring was completed in Russia. It permits the control of vessels in real-time position-fixing.

As far as the joint measures related to the application of the clauses of the Convention is concerned, an Agreement between the Federal Boarder Guard Service of Russia and the Coast Guard of the USA was signed in 2000. The Agreement lays out the joint actions regarding the protection of the marine biological resources in the Bering sea. Such plans and actions are already elaborated and successfully realized.

At the present time Russia uses the forces of the Marine Guard of the Federal Border Guard service of Russia to blockade the Area on its Western and Northern sides in order to prevent illegal fishing and to be able to react to the situation. Special Coordinating Centers were created in the Federal Border Guard service of Russia and in the Coast Guard of the USA. There is a regular exchange of information between them.

All the other Parties reported that they observed no violation in the Convention Area for the preceding year.

6.I. The Consideration of Matters Related to the Conservation and Management of Living Marine Resources other than Pollock in the Convention Area

No comments

6.J. Meeting Observers

The Parties agreed to the same observers rules for 2001 that were used in 1998, 1999 and 2000 (See Report of the Second Annual Conference 1997 Part 6.J.10).

7. Seventh Annual Conference

7.A. Time and Location

Russia offered to host the Seventh Annual Conference in mid-September

2002, in Moscow, Russia.

7.B. Election of Chairperson and Vice-Chairperson

7.B.1. Dr Yuriy Moskaltsov was named as Chairperson for the next Annual Conference.

7.B.2. United States offered to host the Eight Annual Conference in 2003. In keeping with past practice, USA will identify a Vice-Chairperson for the Eight Annual Conference at a later date.

8. **Other Business**

8.1. Japan has scheduled for the next year extended research activity in the area of the US EEZ and would appreciate help and some cooperation from the side of Coastal Parties.

8.2. The Annual Conference agreed on join press release (Appendix 7).

9. Closing Statements

The closing statements of the Parties are provided in Appendix 8.

Appendices:

1. Opening Statements
2. Delegation Lists
3. Plenary Agenda
4. Trial Fishing Terms and Conditions for 2002
5. Statement of the Korean Fisheries Industry
6. Polish 2002 Trial Fishing Plan
7. Press Release
8. Closing Statement

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

REPORT OF THE MEETING OF THE SCIENTIFIC AND TECHNICAL COMMITTEE

September 17-19, 2001
Gdynia, Poland

Final corrected: 19 September 2001, 20:30

Delegations from the People's Republic of China (China), Japan, the Republic of Korea (Korea), the Republic of Poland (Poland), the Russian Federation (Russia), and the United States (USA) participated in a meeting of the Scientific and Technical (S&T) Committee in Gdynia, Poland.

1. Opening remarks

Dr. Boris Kotenev (Russia), Chair of the Scientific and Technical Committee, opened the meeting at 14:15, 17 September 2001. The meeting agenda and a list of the participants are provided in Attachments 1 and 2.

2. Appointment of Rapporteur.

Mr. Dariusz Fey (Poland) was appointed as rapporteur.

3. Adoption of Agenda

3.1. It was discussed whether the point 4.8. of the Agenda should be changed from Comprehensive Research Plan into Cooperative Research Plan as this point of the Agenda is related at the present time, as it was noted by Poland, only to Japan, and United States' cruises.

3.2. The Agenda was adopted (Attachment 1).

4. Discussion of Scientific Issues

4.1. Update Catch and Effort Statistics.

4.1.1 Russia presented the catch per unit effort data for last several years for Russian waters, Navarin area and Western Bering Sea (WBS). The presented data demonstrated that during last several years all the portions of the pollock population were decreasing, especially the numerous 1992 year class. Also, it should be noted that in the WBS and Navarin area young year-classes (1995, 1996, 1997) are the predominate ones.

4.1.2. In fulfilling the recommendation of the 5th Annual Conference, Poland provided a document prepared by the Sea Fisheries Institute, which presents the historical data of Polish pollock fishery in the Donut Hole Area of the Bering Sea during the period 1984-1991 (Attachment 3).

4.1.3. Korea stated that it is currently in the process of preparing a similar data-base during the period 1984-1991.

4.1.4. Japan asked the objective of the data-base and how such a data-base could be accessed by all the other Parties to the Convention. Korea suggested that it could be done by preparing an appropriate web-page. Japan stated that in case of setting up such a system, Japan would be able to submit appropriate data.

4.1.5. China stated that it would be a good idea to set up a common statistic form. If the data were not reported in a different way by different countries, it would have been much easier to compare them.

4.2. Year 2001 Results of Trial Fishing

4.2.1 China reported the results of trial fishing operation conducted in June-July 2001 in the Central Bering Sea. During 38 days, very few pollock (16 individuals) were caught (Attachment 4).

4.2.2. Korea did not conduct any trial fishing in 2001. In addition, it should be noted that the fishing companies measure their financial trade-off for trial fishing. Thus, the Conference should reconsider the current terms and conditions of trial fishing to accommodate industry's voluntary contribution for the better management of pollock resources in the Central Bering Sea.

4.2.3. Poland stated that because of technical problems, the planned cruise did not take place in 2001. It should be, however, noted that Poland has been conducting the trial fishing in previous years regularly. It was also stated that the trial fishing should be done exclusively under supervision of scientific observer and according to regulations and already introduced rules.

4.3. Review Results of 2000/2001 Research Cruises

4.3.1. Russia reported that the 2001 survey in the Western Bering Sea (WBS) has not been completed, but provided preliminary data to the S&T Committee. Five vessels were employed the R/V Professor Kaganovskiy, Russian trawlers N. Chepik, Khaiduk, R/V Bagration and Japanese trawler Kayo-Maru 28. The final WBS stock biomass will be determined after the survey vessels have returned. (Attachment 5).

4.3.2. The United States reported on the EIMWT survey cruise with the R/V Miller Freeman in the Bogoslof I. Area (BI) in winter 2001. In the BI, there was 232,000 mt and in the specific area 208,000 mt of pollock. Since 1988, the BI biomass has decreased from 2.4 mmt to 0.232 mmt in 2001. The United States reported on the preliminary results of the EBS bottom-trawl survey (BT) by two charted commercial fishing vessels in June-July 2001. Pollock were found in the Unimak I. area all the way up to the US-Russia maritime boundary. The BT survey estimate was a preliminary 4.1 mmt in 2001. The total EBS pollock biomass is not available because of no EIMWT survey in 2001. (Attachment 6).

4.3.3. Russia presented a pollock stock assessment document concerning the results of research in the Navarin area and in the WBS (Attachment 7). Bottom trawl surveys, ichthyoplankton surveys and echo integration surveys were conducted.

4.3.4. Japan asked about the possible reasons for pollock stock decline, other than those related to over-fishing. Russian delegation explained that there can be a connection of different factors, for example related to the climate situation - a very cold period in the WBS is observed at present. But first of all, the fishing effort must be reduced to minimum.

4.4. <u>Review the Status of Aleutian Basin Pollock Stocks.</u>

4.4.1. Russia presented the state of Aleutian Basin pollock stock (Attachment 8). The Pollock biomass and abundance in the middle of 1990s after the historical peak in 1980s has declined to 6.0-7.0 mt in the EBS and to 0.4-0.5 in the WBS. These facts are very important, in regard to the peculiarity of Aleutian basin pollock distribution in the EBS shelf, in the Bogoslof Island area and scale of extinction of post spawning pollock in the Aleutian Basin. It was concluded that, as a result of the status of the EBS and especially WBS stocks, large-scale migration of big, mature pollock in post spawning time into the Aleutian Basin and CBS cannot be expected at least up to the middle of period 2002-2005.

4.4.2 Japan presented a document concerning genetic studies of the Bering Sea pollock (Attachment 12).

4.4.3. In answering the question asked by Japan, Russia informed that the bottom trawl survey of pollock biomass in the EBS in 2001, as indicated by preliminary data from Alaska Science Center (US EEZ), is 4.1 mmt, which is about 1.0 mmt less than year before. The EIMWT survey was not conducted in the EBS in 2001.

4.4.4. The S&T Committee concluded that despite the extensive research efforts of the Parties in 2001, there were insufficient data to directly estimate the Aleutian Basin pollock (ABP) biomass. The S&T Committee Parties agreed to use the indirect method to estimate the ABC biomass as prescribed by the Convention. According to the Convention Annex Part Ic, the BI biomass represents 60% of the ABP biomass. Therefore, the BI biomass of 208,000 mt determined by the R/V Miller Freeman is the most recent estimate that should be used to indirectly estimate the ABP biomass.

4.4.5. Using these data, the S&T Committee agreed that the ABP biomass would be indirectly estimated as 346,667 mt as determined by the results of the R/V Miller Freeman survey.

4.5. Factors Affecting Recovery of the Stock

4.5.1. Russia noted that this topic was already discussed last year in Seattle. However, it should be underlined that in addition to the climatic changes and fishing pressures, appearance of very strong year-classes of herring since 1993 year, when huge reduction of spawning stock and catches of pollock occurred, should be taken into account as well.

4.5.2. Japan pointed out the importance of understanding the processes and factors effecting recruitment of young pollock.

4.5.3. Japan addressed a question to the United States' delegation about information on the fishery management. and conditions occurring in the shelf area, in regard to the recruitment problems.Thus, oceanographic conditions, predation and also fishery related processes should be taken into account.

4.5.4. Korea reviewed the factors affecting the delay of pollock stock recovery including overfishing in the CBS and neighboring areas, natural population declines, environmental changes, ecological changes, and predation, and it noted that the integrated function of these factors might be the most reasonable explanation.

4.6. The Effects of the Moratorium and its Continuation

4.6.1 Russia stated that pollock fishing was stopped in 1992 in the Bogoslof Island area, in 1994 in CBS and in 1999 in the Aleutian Islands; additionally, since 1995, fishing effort in the Russian Economic Zone in WBS was reduced to the minimum level. The period of spawning should be considered as very important as far as the conservation of the stock is concerned. As a result of these steps we can observe now some indication of pollock stock recovery in the EBS.

4.6.2 Poland noted that the moratorium did not have a positive effect on the recovery of pollock stock biomass in the CBS. Thus, we should look at other possible reasons for the unfavorable situation. For example, coastal catches, feeding and temperature conditions affecting the recruitment, and as a consequence, stock biomass should be considered.

4.6.3 China stated that in the view of no positive effect of moratorium on the pollock stock recovery in the CBS, we should try to estimate a new AHL. We should also think about establishing a new area for scientific research, instead of the „Specific area".

4.6.4 The Chairman commented on the suggestion of establishing a new AHL by recalling that a very low number of fish was caught during Chinese trial fishing.

4.6.5 Russia stated that the fishery in the CBS would have a negative effect on the Bogoslof Island spawning stock - a very important recruitment source.

4.6.6 Korea also pointed out that the moratorium itself did not have a significant effect on the pollock recovery, and it also noted the necessity of establishing a small AHL that does not substantially affect the recovery of pollock to promote cooperative research between fishermen and scientists.

4.6.7 Poland supported this suggestion, because the positive effect of the moratorium on the CBS stock is not visible, and first of all there is no scientific proof of such an effect.

4.6.8 The United States responded that even if the moratorium did not cause stock restoration, it probably stopped the stock from extinction.

4.6.9. The Chairman referring to the pattern of age distribution of pollock in SE BSA and Bogoslof I. (Attachment 6) concluded that observed differences indicate a positive effect of moratorium.

4.6.10 Korea doubted this statement and pointed out that in fact we do not really know much about the Bering Sea pollock stock structure and interactions among fish stocks occurring in different areas of the Bering Sea. In view of an absence of a positive moratorium effect on the pollock stock recovery, we should consider the existence of other factors than over-fishing that affects the current stock situation, the recent continuous decline of the Bogoslof stock size even under the long implementation of moratorium.

4.6.11 Japan stated that moratorium's positive effects may be visible in the basin pollock older than 7 years when considering age composition of the basin pollock. Since there are few young pollock in this area, the moratorium did not affect positively the recruitment. Other measures are needed to stimulate the recruitment process.

4.6.12 Poland supported the statement presented by Japan.

4.6.13 Russia informed that the data, collected by observers in 2000-2001 on board U.S. commercial vessels clearly showed that a significant part of mature pre-spawning pollock (1995 year-class) demonstrated large-scaled migration from shelf area downward to continental slope. This fraction of pollock stock during second half of March inhabited midwater layers at the depths of about 450-550 meters. It's present status seems to be good enough for Aleutian Basin pollock stock recovery. The Russian delegation believes that this is a positive sign of Aleutian Basin pollock stock recovery.

4.6.14 The Chairman of Scientific and Technical Committee summarized discussion of the problem of the effects of Moratorium and noted that Russian and United States confirm a specific status of Aleutian Basin pollock and that the Moratorium has positive effects for it's stocks. The Aleutian Basin pollock stock is closely related with Bogoslof area stock and stocks of Convention area. Different opinions on the effect of the moratorium on the pollock stock recovery were presented.

4.7. Methodologies to Determine Allowable Harvest Level (AHL)

4.7.1. Japan suggested setting an ABC for the Convention Area for 2002 at the level of 2918 mt (Attachment 9).

4.7.2. Poland presented the method of AHL calculation on the basis of actual (2001) pollock spawning stock biomass and rate of exploitation on the level of 20% (Attachment 10).

4.7.3. In relation with this agenda item Korea wishes to point out, in advance, the necessity of establishing AHL. In fisheries management, both fish resources and fishermen should be considered together. A scientist-industry joint research survey, as was proposed in the Shanghai meeting, seems appropriate and the data from that joint survey will be appreciated for the future management of the Central Bering Sea pollock stocks. One technical approach could be the establishing of an AHL with some scientifically designed fishing activity.

4.7.4 Japan proposed to establish the AHL even though known resources are low.

4.7.5. Russia expressed the feeling that setting the AHL could pass the message to fisherman that the stock in the CBS is recovering, which is not happening at this moment.

4.7.6. Poland suggested that an AHL could be established. If there are no fish we should not expect fishing vessels to operate in this area despite the AHL designated at a level above zero. Such a decision however, would pass hope to the fishermen. This statement was supported by China.

4.7.7. The Chairman of Scientific and Technical Committee summarized discussion concerned Methodologies to Determine Allowable Harvest Level (AHL) and noted that Japanese, Polish, and Korean delegations have proposed specific approach to determination of AHL in spite of Aleutian Basin stock being at a low level. The 2001 Trial Fishing found very few pollock in the Convention area. The Scientific and Technical Committee did not reach consensus regarding the methodology of determining of Allowable Harvest Level (AHL).

4.8. Cooperative Research Plan

4.8.1. Japan stated that talking about a Comprehensive Research Plan is misleading because of a limited number of vessels cooperating. In 2002, there will only be two research cruises: Japan-USA during the winter and Russia-USA on the continental shelf during the summer. Cooperative Research Plan would be a more appropriate designation.

4.8.2. Russia presented a cooperative research plan for 2002 (Attachment 11) including US Miller Freeman and Japan Kaiyo Maru cruise plans.

4.8.3. Japan presented a cooperative research cruise plan (USA and Japan) in 2002 and they invited the Parties to participate in the cruise. Contact should be made by the end of October - contact person is Dr. Akira Nishimura.

4.8.4. Korea explained its background information on the ceasing of continuous scientific surveys in the Bogoslof I. Area. It fully understands the significance of identifying the reality of the population structure in the Bering Sea, migration route, geographic distribution, spawning grounds, etc. Unfortunately, however, it is unable to continue scientific surveys in the Bogoslof Island Area that have been conducted annually since 1994. Because of the sustenance of moratorium expected in the future, the government questioned the efficiency of utilization of the restricted government budget. Without a special event in this Conference, it appears hard to resume the survey in the region, and subsequently there is no survey schedule in the Bogoslof Area in 2002. However, Korea is willing to send one scientist to join either one of the US survey or Japanese survey in 2002.

4.8.5. The USA is deeply concerned and disappointed that Korea has decided to no longer send research ships into the Bering Sea. The scientific problems facing this Conference are very complex and it requires the combined effort of all Parties to overcome them.

4.8.6. USA acknowledged a large interest in organizing comprehensive surveys and invited all Parties to take part in that plans.

5. Discussion of Enforcement and Management Issues

5.1. Trial Fishing Terms and Conditions for 2002.

5.1.1. China stated that the number of trial vessels allowed to fish at the same time should be 5 to 6 vessels per Party.

5.1.2. Korea reviewed the purpose of trial fishing as a collection of fisheries data and limited scientific data, and detecting the feasibility of commercial fishing. However, Korea proposed to consider the purpose in a Stakeholder's perspective. It stated that trial fishing is related to both the fishing industry and fisheries managers. The goal of fisheries managers is to obtain supplemental data for the management, whereas the substantial goal of the fishing industry can be considered as obtaining some profits, if possible. Accordingly, the practical and fair implementation of trial fishing lies in the satisfaction of both stakeholders' goals. Korea has already requested several times the transfer of other member's trial fishing opportunity under the current agreement of a total of 12 vessels at a time. Additionally, Korea proposes to impose voluntarily a catch limitation schedule once transfers of trial fishing rights are available. It also noted that the scientific research surveys are funded by the institution or the relevant government, not the scientists themselves, whereas trial fishing is conducted at the industry's private expense. Therefore, it is reasonable to secure some compensation or merit for the cost or expense that the industry is expected to incur.

5.1.3. Japan stated that trial fishing operations are nothing more than feasibility studies of commercial fishing and from the point of resource management are conducted in accordance with a previously set limit of a maximum of two vessels operating at the same time.

5.1.4. Poland stated that although we should be open to discuss on this subject, the current terms and conditions seem to be sufficient. First of all the number of vessels should not be decreased.

5.1.5. The Chairman suggested that we should be very careful about increasing the number of vessels since we are talking about area where pollock is basically not occurring.

5.1.6. The Chairman proposed to keep the current regulations as we can expect that the young fish from the continental slope will probably move to the CBS area for feeding.

5.1.7. China stated that they are not interested in increasing the number of trial vessels just because of commercial reasons, but to increase the amount of available research data and information.

5.1.8. The Scientific and Technical Committee agreed to recommend to the Annual Conference that trial fishing terms and conditions for pollock fishing for 2001 be applied to the 2002 trial fishing operations.

5.2. Number and priority Placement of Observers Required by Article XI

The Delegations agreed with the respective statements fixed in the Report of the 5th Conference in Shanghai.

5.3. Methods to Determine Catch Weight

The Delegations agreed with the respective statements fixed in the Report of the 5th Conference in Shanghai.

5.4. Components of a Management System

The Delegations agreed with the respective statements fixed in the Report of the 5th Conference in Shanghai.

6. Other Matters and Recommendations

6.1. Japan stated that the objectives of using the data should be clarified and free access to the data by Parties to the Convention secured.

6.2. Korea asked about the possibility of establishing a web-page describing the activities of the Annual Conference. Historical data, such as those presented earlier by Poland, could be presented on such a web-page.

6.3. It was decided that rules and a common form for reporting fishing statistics should be introduced, as it was already proposed by China. It will be done by circulating the proposed forms and by discussion by e-mail.

6.4 List of Attachments

1. S&T Agenda
2. List of S&T participants
3. Polish catches of pollock in Donut hole area of the Bering Sea during 1985-1991
4. Report of China trial fishing in 2001
5. Russia trawl survey in Navarin region in 2000
6. U.S. Bogoslof pollock abundance report for March 2001
7. Russian pollock stock assessment document
8. Russia Aleutian Basin state of pollock stock
9. Japan setting of ABC for 2002
10. Poland calculation of AHL for 2002
11. Cooperative research plan for 2002
12. The status of pollock stock study by Japan

OPENING STATEMENT
PEOPLE'S REPUBLIC OF CHINA
By Mr. Liu Qianfei
Head of Chinese Delegation

Thank you, Mr.Chairman,
Mr.Chairman, distinguished delegates, Ladies and Gentlemen:

It is a great honor for us to participate in the 6th Annual Meeting. On behalf of the Chinese delegation, I would like to express my appreciation for Poland Government to excellent arrangement for 6th Annual Meeting.

At this occasion, I would also like to pay our respect to experts who have made a great deal scientific research work to collect Pollock stock data in the Convention Area.

It is sixth annual conference that can provide a good opportunity for all member states to discuss the issues in relation to assessment of status of Pollock resources and management in the Central Bering Sea. According to the results of trial fishing, we shall discuss whether the fishing operation could be resumed in the Convention area next year. In fact, what we have done in these years is making preparations when the fishing is re-stared.

As we are aware, the Central Bering Sea plays the significant role in various state's fishing operations, therefore, I believe that the fishmem of all member states are expecting not only the operation to resume but also consensus agreement to be made on law enforcement and scientific data collection of Pollock resources.

In these recent years, the regulations of management have been improved under the close cooperation between all member states for the purpose of conservation and management of Pollock stocks. China will continue make positive contributions in this aspect. We are very pleased to see that progress have been made on some issues under the joint effort of all parties although some such as INQ and AHL are still remained. To resolve these differences should depend on the principles of effective cooperation and scientific evidence rather than other ones. It is our hope that more cooperation and progress be made during the next few days to establish a sound management system for the rational utilization of Pollock resources.

Finally, Mr.Chairman, I highly expect fruitful outcomes during the meeting.

Thank you.

6th Annual Conference of the Parties to the Convention on the Conservation and Management of Pollock Resources in the Central Bearing Sea

Opening Statement of Japan

My name is Oi and I represent the Japanese delegation.
Due to the changes in the Fisheries Agency of Japan I replace Mr. Kanto who was heading this delegation for the past few years.

This agreement on Conservation and Management of Pollock in the International Waters of Bering Sea went into effect in 1995. Our country, coming from the position of honoring this agreement, believes that if we take the position of wanting to adhere to the agreement, and if there are enough stocks to justify reasonable use of that stock, we should set allowable harvest levels (AHL) even if these should be minimal.

In spite of the most stringent measures of conservation of pollock stock – the moratorium – we are still faced with low abundance of pollock which is a very serious problem. We would like to urge all participating nations at this 6th Annual Conference of the Parties to the Convention on the Conservation and Management of Pollock to use every means at their disposal to rebuild pollock stocks in the Alleutians.

I would like to introduce the Japanese delegation

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Hajime ONISHI		National Federation of Medium Trawlers

Finally I would like to take this opportunity and express our appreciation to the government of Poland for organizing and preparing this conference.

Opening Statement of the Republic of Korea

by

Republic of Korea

Good morning.

Mr. Chairman, distinguished delegates, observers, and ladies and gentlemen, on behalf of my delegation, I am greatly honored to be here in Gdynia for the Sixth Central Bering Sea Pollock Conference. We extend our special appreciation to the Government of Poland for providing this excellent facility to hold our conference.

In addition, on behalf of the Korean people, I want to express our deep consolation to the tragedy that the U.S. had suffered lately. Korean people want to share the deep sorrow with Americans.

Over the past several years, we have discussed pollock in the Central Bering Sea in many aspects since we have voluntarily agreed and established a moratorium in 1993. It has been one major agenda for all of us to identify the reasons for failing to see signs of pollock recovery in the Central Bering Sea. It is for this very reason that we had a pollock workshop in Seattle last year in order to intensively discuss about the origin of pollock stock in the Central Bering Sea. Aside from the proposed hypotheses, we need to continuously exchange information and develop reasonable explanations for the better understanding concerning the delay of Pollock stock recovery in the Central Bering Sea. We should increase our focus on the whole Bering Sea pollock structure and keep revaluating the Central Bering Sea pollock stocks in relation with the surrounding stocks.

Mr. Chairman, we fully understand the economic and social disadvantages incurred to some members' fishing industry. I hope this meeting results in fruitful outcomes so that we can provide reasonable explanation to the fishermen and remain patient for the future reopening of the fishery.

Thank you.

OPENING STATEMENT
POLAND

Before I start my official speech I would like to ask all of you to standup to commemorate by a minute of silence the victims of the unprecedented terrorist attack on the United States of America and to express our solidarity with the American nation. (...) Thank you very much.

Mr. Chairman, Distinguished Delegates, Ladies and Gentlemen, on behalf of the Polish Government, I would like to welcome the delegations from the parties to the Convention on the Conservation and Management of Pollock Resources in the Central Bering Sea.

This is the sixth time all the parties to the convention have convened to discuss measures related to the pollock resources since the convention came into force in 1995.

Although we have made progress in developing principles for the management of pollock resources in the convention area, we have still not achieved our main goal – the recovery of the Aleutian Basin pollock stock.

What is more, to date we have not been able to implement the relevant regulations of the convention to manage the stock because there is no commercial fishing in this area.

Pollock fishing in the central Bering Sea was suspended on a voluntary basis from 1993 to 1995, and since 1996, it has been disallowed by the convention. In practice, this means that there has been no commercial pollock fishing for ten years.

The suspension of pollock fishing in the Aleutian Basin has not resulted in the stock's recovery. On the contrary, studies have indicated that the biomass of the pollock stock is decreasing annually.

The scientific effort to determine the state of the Aleutian Basin pollock stock that has been made by all the parties to the convention is highly valuable.

Please allow me now to outline briefly the importance of pollock fishery for the economics of the Polish deep-sea fleet and the expectations of the fishermen in connection with the convention.

The international waters of the Bering Sea were the principal fishing grounds for the Polish deep-sea fleet from 1985 to 1991, and the lack of pollock caused economic and social hardships for Polish fisheries.

Each year, the financial state of Polish deep-sea companies is growing worse. Last year alone, one out of three of these companies went bankrupt.

Polish fishermen blame their own government for the state of the fishing companies.

The Polish fishing community is observing the dialogue and the decisions of the convention with keen interest.

Polish fisherman expect progress in the recovery of the pollock stock, and progress means opening the convention area to commercial fishery even on a small scale

I would like to express my hope that fruitful conclusions will have been reached by the end of this conference.

It is also my wish that the expectations of all of you are fulfilled at this meeting, and that in addition to analyzing and evaluating Pollock resources, you also are able to find the time to experience the unique atmosphere the city of Gdynia offers to its visitors.

Thank you for your attention.

Sixth Annual Conference of the Parties to the Convention on the Conservation and Management of Pollock Resources in the Central Bering Sea

SEPTEMBER 17-21, 2001
GDYNIA,POLAND

Russian Federation Opening Statement

Dear Mr. Chairman, delegates, ladies and gentlemen, it's a great honor for the Russian Delegation to participate at the Central Bering sea Pollock Convention Sixth Annual Conference. We'd like to express our gratitude to the Government of Poland for hosting the Conference, providing excellent accommodations, and for the warm hospitality, shown to us in Gdynia.

Allow me to express deep condolence for American people from Russian delegation connected with big tradegy of last days. We really sorry that American delegation havn't possibility take part in VI Convention Conference.

It is for the sixth time that we have gathered for the Annual Conference to explore some regular features in the formation of pollock concentrations in the central Bering Sea. Considerable volumes of data on the dynamics of the principal stocks of pollock in the Bering Sea have been accumulated since the time of signing of the Convention nine years ago. Unfortunately, most evidence shows that main Bering sea pollock stocks remains at low level and abundance of some stocks even continue decrease. There is necessity for reduce TAC or even prohibit fishing operations in some areas. For example, Russia has prohibited commersial pollock fishing in the Karaginsky subarea and reduced TAC twice for WBS area.

Russia is hopeful that the information collected will make it possible in the future to find out the main factors which govern the recovery of fishing concentrations of pollock in the Bering Sea. It will certainly be facilitated by the materials that the member nations will contribute to the Sixth Conference.

Now I would like to introduce our delegation.

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

SEPTEMBER 17-21, 2001
GDYNIA, POLAND

United States Opening Statement

The US Government would like to apologize, but its entire US delegation will not be able to travel to the CBSPC in Gdynia. The US is represented by myself, David Citron, an officer in the US Embassy in Warsaw. I would like to personally thank the Deputy Minister and the other delegates for offering their sympathies to the victims of the terrible tragedy in New York last week. Though I am neither a scientist nor a fishing expert, I will do my best to represent the interests of my country. Please know that almost any question you might have of the United States will require me to consult with Washington and the answer will not be available until the next day.

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

SEPTEMBER 17-21, 2001
GDYNIA, POLAND

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

SEPTEMBER 17-21, 2001
GDYNIA, POLAND

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

SEPTEMBER 17-21, 2001
GDYNIA, POLAND

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

SEPTEMBER 17-21, 2001
GDYNIA, POLAND

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

SEPTEMBER 17-21, 2001
GDYNIA, POLAND

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

SEPTEMBER 17-21, 2001
GDYNIA, POLAND

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

SEPTEMBER 17-21, 2001
GDYNIA, POLAND

AGENDA OF THE ANNUAL CONFERENCE

1. Opening of the Conference
2. Welcome Address and Statements of Delegates
3. Election
    A. Chairperson
    B. Vice-Chairperson
    C. Rapporteur
    D. Chairman of the Scientific and Technical Committee
4. Adoption of the Agenda
5. Report of the Scientific and Technical Committee
6. Action Items
    A. The Review of Scientific Data and Conservation Measures of the Coastal States Related to Pollock Fishing in the Bering Sea
    B. The Establishment of a Plan of Work for the Scientific and Technical Committee
    C. The Establishment of the Terms and Conditions for Trial Fishing in 2002
    D. The Establishment of the Allowable Harvest Level
    E. The Establishment of the Individual National Quotas
    F. The Adoption of Appropriate Conservation and Management Measures Based upon the Advice of the Scientific and Technical Committee
    G. Trial Fishing Plan
    H. Reception of Reports Relating to Measures Taken to Investigate and Penalize Violation of the Convention
    I. The Consideration of Matters Related to the Conservation and Management of Living Marine Resources other than Pollock in the Convention Area
    J. Meeting Observers
7. Seventh Annual Conference
    A. Time and Location
    B. Election of Chairperson and Vice-Chairperson
8. Other Business
9. Closing Statement

MEASURES ADOPTED PURSUANT TO THE CONVENTION ON THE CONSERVATION AND MANAGEMENT OF POLLOCK RESOURCES IN THE CENTRAL BERING SEA

TRIAL FISHING FOR POLLOCK IN 2002

20 September 2002

1. Taking into account the report of the Scientific and Technical Committee on the status of pollock resources in the Aleutian Basin, the Third Annual Conference decided, as follows:

1.1. To establish the 2001 Allowable Harvest Level (AHL) at zero; and

1.2. To authorize trial fishing in the Convention Area.

2. The Annual Conference establishes for 2001 the following terms and conditions for such operations:

No more than two vessels from each Party to the Convention at any time may conduct trial fishing for pollock in the Convention Area. Information on the vessels that will engage in the trial fishing will be provided to all Parties at least two weeks prior to commencement of trial fishing. Such information will include vessel name, vessel type, vessel's international radio call sign (IRCS), vessel's satellite transmitter number, and the area and time of the trial fishing. Parties conducting trial fishing will notify the other Parties regarding the schedule of such trial fishing with sufficient notice to facilitate the embarkation and disembarkation of observers. Vessels engaged in trial fishing will have Scientific Observers of the flag-State on board and will accept at least one Scientific Observer of other Parties to the Convention, with the cost being paid by the requesting Party in accordance with arrangements to be made between the flag-State of the vessel and the other Parties. All provisions of the Convention and all measures adopted by the Annual Conference regarding boardings and inspections, vessel monitoring systems, entry and transshipment notifications, safe boarding ladder standards, and shipboard logs and records will govern such trial fishing. Prior to the Sixth Annual Conference, Parties conducting trial fishing in 2001 will submit to the other Parties a report of the trial fishing which provides the type of catch and distribution data as specified in the Central Bering Sea Observer Program Manual.

The Sixth Annual Conference of the Convention on the Conservation and Management of Pollock Resources in the Central Bering Sea

Thank you, Mr. Chairman.

My name is Moo-Sung PARK. I am the managing director of the International Cooperative Department at the Korea Deep Sea Fisheries Association, an association which, I am proud to say, has 160 member companies.

I wholeheartedly thank the Polish government and all the officials concerned for their efforts in hosting this conference, as well as those experts who have contributed greatly with their scientific research to assess the status of Pollock resources in the Central Bering Sea.

I am very honored to talk about the difficulties that our fishing industries have been facing since the moratorium of 1993 and, in particular, the importance of the establishment of AHL and INQ again.

As you may recall, originally, a two year temporary moratorium was recommended by many scientists according to the signs that Pollock stocks in the Bering Sea had declined to considerably low levels. We, the fishing states took decisive actions and accepted this moratorium, under the spirit of international cooperation for the conservation and management of the resources, despite various financial difficulties, which simply resulted in hardships for our fishing communities.

Unfortunately, 9 years later, there is still no clear evidence that pollock resources in the Central Bering Sea will gradually recover and this Conference seems unable to provide any clear vision on the prospects for resuming our fishing operations. Year after year, our fishing communities are getting perturbed with the consistent results of this Conference. Specifically, "Failure to resume fishing operation in this area, due to indecision of the establishment of AHL this year, too." Some feel that having more patience for restarting fishing operations is meaningless and foolish because they find that their hope for resuming fishing quickly turns to despair after receiving the same disappointing results every year.

With a moratorium that remains intact, our fishing industries that once operated in the Central Bering Sea are only further falling down the path of financial crisis and management difficulties, many of them on the brink of bankruptcy and ruin. Additionally, the number of the bankrupted fishing companies increased in geometrical progression. Considering this situation, all the parties, I firmly believe, should not overlook the hopes of our fishermen to earn a living any longer.

Since I am here to share the fishing nation's view with all the parties, let me explain and urge to you, hoping that all of you are here, as we already have mentioned in this meeting every year, to please extend kind consideration to the socio-economic dimension.

First of all, I would like to request the coastal states to allocate quota to the fishing nations such as China, Japan, Poland and Korea in the sense that the coastal states allow the fishing nations' rights to fish and survive. Some coastal states, as all of you are well aware of, increased TAC for their fishermen in their EEZs, while keeping foreign vessels away from operating at the same period. For example, in the year 2000, the TAC of the U.S. increased by 138,000 metric tons, 15% increase compared with that of 1999. Furthermore, in 2001, the TAC of the U.S. increased by 262,000 metric tons, about 23% increase compared with that of 2000. Under this situation, we find it very difficult to understand why the Conference continuously maintains a one-sided, unilateral moratorium.

Secondly, I would like to suggest here that the parties consider increasing the number of experimental fishing vessels to more than 10 vessels so that scientists can research more efficiently as well as providing our fishermen to calculate the status of Pollock resources in the area on their own. Moreover, the survey area for biomass estimation, currently limited only to the area 518, should be extended to retrieve sufficient and practical information.

As we have already and strongly stressed at the 5th meeting, if these kinds of our earnest proposals to keep the rights to survive and fish are overlooked at this session again, we can not find any rational reason to participate in this meeting any more, since our efforts and endurance has failed to provide suitable compensation but suffering only.

I, therefore, strongly believe that it is time for us to review pollock resources not only as a subject of the conservation of marine living resources but also as a concept of the foundation of the fishing nations' important industries, and after taking into account these factors, the decision making should begin.

Finally, I hope that the coastal states allocate the fishing nations at least the minimum level of quota and that my proposal today is accepted unanimously with positive consideration of all the parties on an open-minded and warm-hearted basis.

Thank You.

Appendix 6

POLAND

CRUISE PLAN FOR TRIAL FISHING IN THE BERING SEA CONVENTION AREA IN 2002

1. Institution
Polish Deep Sea Fishing Companies - to be decided later

2. Polish Vessels

Name: to be decided later
Type:
Length:
Tonnage:
Radio call sign:
Immarsat no.

Detailed information will be provided to all Parties at least one month prior to commencement of trial fishing.

3. Research area
International waters of the Bering Sea. The detailed hydroacoustic trackline will depend on the availability of the vessels and will be determined before the cruise.

4. Time of trial fishing operation
To be decided later

5. Purpose
The purpose of trial fishing operation is:

a/ to determine the geographical distribution of pollock in the international waters of the Bering Sea;

b/ to estimate total catch weight for as many hauls as possible;

c/ to calculate the CPUE data;

d/ to determine species composition of catches;

e/ to collect biological data on pollock (length, sex, body weight, maturity);

f/ to complete forms as recommended in "Observer Manual for Sampling of Central Bering Sea Pollock Fisheries" March 1997 that is:

- Haul Summary Form,
- Species Composition Form,
- Length Frequency Form,
- Biological Samples Form.

6. Scientific observers

Observers will be trained and certified in the Sea Fisheries Institute, Gdynia in accordance with the procedures established by Poland and consistent with relevant aspects of the training for observers.

7. Results

The reports and data collected during the cruises will be available to all Parties concerned.

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

September 17-21, 2001 Gdynia, Poland
JOINT PRESS RELEASE
Final, 21 September 2001

Representatives from the six Parties to the Convention on the Conservation and Management of Pollock Resources in the Central Bering Sea met in Gdynia, Poland, and continued their cooperative efforts to conserve and manage pollock stocks in the Convention Area.

The Sixth Annual Conference held under terms of the Convention tool place 17-21 September 2001. The Conference was chaired by Dr. Tomasz Linkowski of Poland. The Parties to the Convention, Poland, the People's Republic of China, Japan, the Republic of Korea, the Russian Federation, and the United States of America, agreed on conservation and management measures and reviewed scientific information on the status of pollock stocks. The Scientific and Technical Committee agreed on a plan of work for 2002.

Based on the report of the Scientific and Technical Committee, the Parties agreed that data was insufficient to directly determine the biomass of the pollock stocks in the entire Aleutian Basin. Several of the Parties proposed the establishment of an Allowable Harvest Level (AHL) for 2002, because of the need to obtain further scientific information from fishing operations and the need to sustain existing fishing industries. They emphasized the function of the Annual Conference is to include conservation and management of both fish resources and the fishery sector. Other Parties feel that the moratorium and other related conservation measures have had a positive effect on pollock stocks. Following a thorough discussion, the Parties noted that nine years of moratorium has not achieved pollock stock recovery in the Central Bering Sea. However, Parties to the Convention will continue efforts to verify and confirm the effectiveness of the moratorium as a means to resource management as well as the rationality for maintaining such a harsh measure. The Annual Conference could not reach consensus to set an AHL for a commercial fishery for pollock in the Central Bering Sea during 2002. In such a situation, under the procedure set out in Article VII-2 and Annex Part 1 of this Convention, the AHL for 2002 was set at zero.

Trial fishing by vessels of the Parties to the Convention will be permitted in 2002, under the terms and conditions established by the Annual Conference.

In 2002, member States plan to conduct a coordinated research effort in the Central Bering Sea and the Aleutian Basin. This provides a unique opportunity to study pollock distribution and migration patterns in the Bering Sea. Comprehensive scientific information such as this will allow the Parties to make better informed decisions on the conservation and management of pollock resource.

The Russian Federation invited the Parties to convene the Seventh Annual Conference in mid September 2002 in Moscow.

Sixth Annual Conference of the Parties to the Convention on the Conservation and Management of Pollock Resources in the Central Bering Sea

September 17-21, 2001
Gdynia, Poland

Japan Delegation Closing Statement

As the 6th Annual Conference of the Parties to the Convention on the Conservation and Management of the Pollock stock in the Central Bering See is drawing to a close I would like to say a few words on behalf of the Japan delegation.

First I would like to express our deep appreciation to the Polish government and the technical staff who spared no effort to convene and conduct this conference in spite of difficulties triggered by the outrageous terror attack against the United States.

The objective of this conference has been restoration and management of Pollock resources in the Central Bering Sea. We are confronted with an unusual situation where in spite of nine years of continued moratorium resources keep decreasing.

Question of resources should be addressed with utmost care. We have already applied the strictest possible management measure, the moratorium on fishing. However, the present outcome does show that effects of moratorium as a measure to resources management and rationality of maintaining moratorium need further and thorough scrutiny.

We also believe that we must continue working on finding other reasons behind the lack of recovery of the Pollock stock in the Convention Area.

Since AHL is based on scientific basis it is possible to establish its level regardless of stock volume and we are deeply convinced that establishing Allowable Harvest Level would be a signal of future hope to the fishing industry in this area. We expect flexibility from coastal states in this respect at the upcoming conference.

Finally, again we would like again to express our appreciation to the Polish Delegation for organizing this conference.

Sixth Annual Conference of the Parties to the Convention on the Conservation and Management of the Pollock Resources in the Central Bering Sea

September 17-21, Gdynia, Poland

Closing Statement
by
Republic of Korea

Mr. Chairman and distinguished delegates!

On behalf of the Korean delegation, I'd like to extend our special appreciation to the Sea Fisheries Institute and the government of Poland for their excellent organization and warm hospitality. Special thanks also go to the chairpersons of the Annual Conference and the Scientific and Technical Committee for their successful conduct to complete this Session.

During the last six years, the Central Bering Sea Pollock Conference has collected data for management, analyzed the status of pollock stocks, and planned scientific research surveys and trial fishing. These plans and activities are important to identify the stock structure, migration routes, and geographical distribution of the pollock resources in the Bering Sea. With all our efforts including the harshest measure of a nine-year moratorium, however, the Aleutian Basin stocks showed no taint of recovery. This Conference now needs to focus on discussing and analyzing the causes of this slow recovery. In addition, this Conference needs to avoid repeated discussions that are unproductive. Several members now think that this Conference needs some flexibility to accommodate new ideas and innovative activities for the health of this Conference itself. The existence of this Conference can be sustained by the support of fishermen as well as the maintenance of pollock stocks.

Thank you again for all the contributions to finish this Conference in time, and especially I thank to the only U.S. delegate for his contribution including editing reports. I hope to see you in Moscow next year!

Thank you.

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

SEPTEMBER 17 – 21, 2001
GDYNIA, REPUBLIC OF POLAND

Republic of Poland
Closing Statement

Mr. Chairman and distinguished Delegates,

First of all, on behalf of Mr. Robert Gmyrek - the Secretary of State at the Ministry of Agriculture and on behalf of the Polish delegation, I would like to thank you all for cooperation and active participation in the Conference.

Having in mind the genesis of the Convention and the performance of Annual Conferences so far, this year's meeting was different from previous ones due to the unfortunate absence of many of our friends from the US, caused by the tragedy which took place in the United States last week.
The important element of the Conference is the meeting of the Scientific and Technical Committee and here the absence of American scientists have been noted with regret.
Happily, Mr. David L. Citron – the Third Secretary of the US Embassy was nominated as the representative.
Thank you Mr. David Citron for your attendance and your attitude during discussions.

Establishing of the Annual Harvest Level (AHL) and the effects of the Moratorium were crucial points of the Conference.
Decisions regarding the AHL should be based on scientific principles, however in case of insufficient data explaining the situation in the Central Bering Sea, the Parties to the Convention should consider social and economic aspects as well. Polish fishermen await for some good news after 9-year period of suspension of fishing.

The Parties were not able to reach consensus on establishing the AHL.
Poland is afraid that if the observed lack of consensus concerning the AHL issue is continued, we will face the danger that the formula of the Convention can be exhausted in near future.

Mr. Chairman, we thank you for your leadership of this Conference.
Fellow delegates, we wish you safe journey home and satisfaction from your work you have been doing.
On behalf of the Polish government and the Polish delegation thank you for coming to Poland and your active participation.

Sixth Annual Conference of the Parties to the Convention on the Conservation and Management of Pollock Resources in the Central Bering Sea

SEPTEMBER 17-21, 2001
GDYNIA, POLAND

Russian Federation Closing Statement

The Russian Delegation would like to express its sincere gratitude to the government of Poland for its warm hospitality in arranging and hosting the Sixth Annual Conference. We are also grateful to the Secretariat which provided first-class service for our work.

Words of special gratitude are sent to the Chairman of the Conference, Dr. Tomasz Linkowski, and the rapporteur, Mr. Dariusz Fey, whose responsible approach to work, high professional level and good knowledge of problems under consideration gave us the opportunity to fulfill with successthe Sixth Conference tasks.

Unfortunately we havn't possibility to send positive message to fishermen of the Parties about renewing of pollock fishing in the Convention Area.

At the same time new data have been obtained by the observers on the US fishing vessels in the Eastern Bering sea have showed the beginning of big scale migration of young mature pollock from shelf into continental slope. It gives hopeness for the future pollock stock recovery in the Aleutian basin. Therefore Russian side supports any initiatives for strengthening of the cooperative research of the Bering sea pollock.

Our gratitude goes to the Chairman and to all the participants of the Conference for the joint work. It will be a great honour for us to welcome you in Russia next year, and we shall undertake all measures in order to provide the high level of hosting and working conditions.

Closing Statement of the United States to the 6th Annual Conference of the Parties to the Convention on the Conservation and Management of Pollock Resources in the Central Bering Sea

The United States again extends its regrets for not being able to send a full delegation to the 6th Annual Conference due to circumstances beyond its control. We acknowledge the work of the other Parties and look forward to the time when we will collectively meet next year. We especially give our gratitude to the Government of Poland for organizing this conference.

It is our hope that the high degree of cooperation demonstrated the past several years in this forum will continue. We wish all Parties a safe journey home and thank you for your understanding and support during this time of crisis in the United States. Thank you.

Attachment 1

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

SEPTEMBER 17-21, 2001
GDYNIA, POLAND

AGENDA OF THE SCIENTIFIC AND TECHNICAL COMMITTEE

1. Opening Remarks
2. Appointment of Rapporteur
3. Adoption of the Agenda
4. Discussion of Science Issues
    - 4.1 Update Catch and Effort Statistics
    - 4.2 Year 2001 Results of Trial Fishing
    - 4.3 Review Results of 2000/2001 Research Cruises
    - 4.4 Review the Status of Aleutian Basin Pollock Stocks
    - 4.5 Factors Affecting Recovery of the Stock
    - 4.6 The Effects of the Moratorium and its Continuation
    - 4.7 Methodologies to Determine Allowable Harvest Level (AHL)
    - 4.8 Cooperative Research Plan
5. Discussion of Enforcement and Management Issues
    - 5.1 Trial Fishing Terms and Conditions for 2002
    - 5.2 Number and priority Placement of Observers Required by Article XI
    - 5.3 Methods to Determine Catch Weight
    - 5.4 Components of a Management System
6. Other Matters and Recommendations
7. Report to the Annual Conference
8. Closing Remarks

PARTICIPANTS OF THE SCIENTIFIC AND TECHNICAL COMMITTEE
SEPTEMBER 17-21, 2001
GDYNIA, POLAND

USA

David L. CITRON

RUSSIA

Boris KOTENEV

Vyacheslav BOCHKAREV

Yury PISKAREV

Aleksandre GLOUBOKOV

Mikhail STEPANENKO

Oleg ZOLOTOV

Vadim MININ

KOREA

Hak-Haing CHO

Tai-Gi KIM

SungKwon SOH

Moo-Sung PARK

Hyun-Su JO

JAPAN

Mitsunori OI

Keiichi MITO

Nobuya KANEKO

Akira NISHIMURA

Hajime ONISHI

Janusz KUPCZYK

Sławomir SZULC

CHINA

Qianfei LIU

Zixin LIN

Jinfa ZHANG

POLAND

Jan GOŹDZIKOWSKI

Jerzy JANUSZ

Jan HORBOWY

Dariusz FEY

Ireneusz WÓJCIK

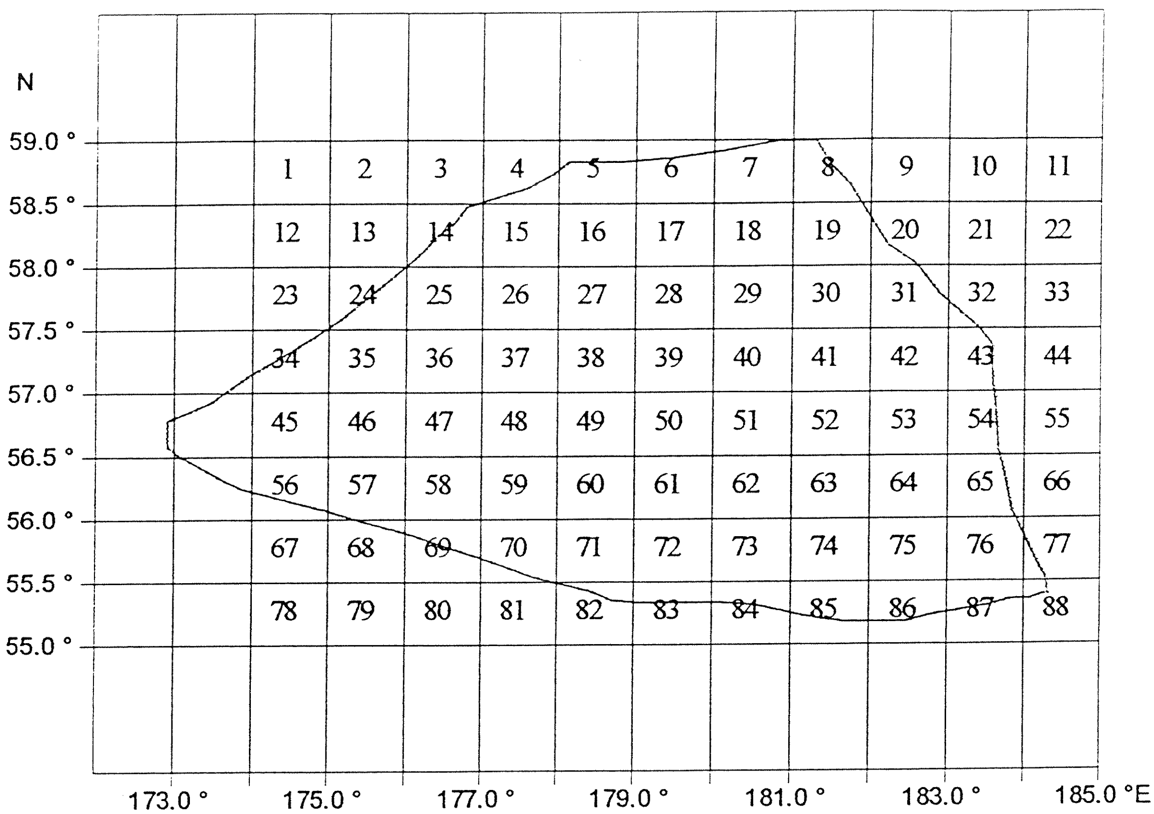
Sea Fisheries Institute
Gdynia, Poland

POLISH CATCHES OF POLLOCK IN DONUT HOLE AREA OF THE BERING SEA DURING 1985 – 1991

Submitted by Poland at VI Annual Conference of the Parties to the Convention on the Conservation and Management of Pollock Resources in the Central Bering Sea
September 17 – 21, 2001

Prepared by Jerzy Janusz

Gdynia, September 2001



Map of the central Bering Sea showing big statistical blocks (0.5^0 latitude by 1^0 longitude)

Geographical positions (lower left corner of the block; 30' latitude by 1° longitude) of big statistical blocks used for Polish pollock catch data from the central Bering S

Block no	Latitude	Longitude
1	58° 30' N	174° 00' E
2	58° 30' N	175° 00' E
3	58° 30' N	176° 00' E
4	58° 30' N	177° 00' E
5	58° 30' N	178° 00' E
6	58° 30' N	179° 00' E
7	58° 30' N	180° 00' E
8	58° 30' N	179° 00' W
9	58° 30' N	178° 00' W
10	58° 30' N	177° 00' W
11	58° 30' N	176° 00' W
12	58° 00' N	174° 00' E
13	58° 00' N	175° 00' E
14	58° 00' N	176° 00' E
15	58° 00' N	177° 00' E
16	58° 00' N	178° 00' E
17	58° 00' N	179° 00' E
18	58° 00' N	180° 00' E
19	58° 00' N	179° 00' W
20	58° 00' N	178° 00' W
21	58° 00' N	177° 00' W
22	58° 00' N	176° 00' W
23	57° 30' N	174° 00' E
24	57° 30' N	175° 00' E
25	57° 30' N	176° 00' E
26	57° 30' N	177° 00' E
27	57° 30' N	178° 00' E
28	57° 30' N	179° 00' E
29	57° 30' N	180° 00' E
30	57° 30' N	179° 00' W
31	57° 30' N	178° 00' W
32	57° 30' N	177° 00' W
33	57° 30' N	176° 00' W
34	57° 00' N	174° 00' E
35	57° 00' N	175° 00' E
36	57° 00' N	176° 00' E
37	57° 00' N	177° 00' E
38	57° 00' N	178° 00' E
39	57° 00' N	179° 00' E
40	57° 00' N	180° 00' E
41	57° 00' N	179° 00' W
42	57° 00' N	178° 00' W
43	57° 00' N	177° 00' W
44	57° 00' N	176° 00' W
45	56° 30' N	174° 00' E
46	56° 30' N	175° 00' E
47	56° 30' N	176° 00' E
48	56° 30' N	177° 00' E
49	56° 30' N	178° 00' E
50	56° 30' N	179° 00' E
51	56° 30' N	180° 00' E
52	56° 30' N	179° 00' W
53	56° 30' N	178° 00' W
54	56° 30' N	177° 00' W
55	56° 30' N	176° 00' W
56	56° 00' N	174° 00' E
57	56° 00' N	175° 00' E
58	56° 00' N	176° 00' E
59	56° 00' N	177° 00' E
60	56° 00' N	178° 00' E
61	56° 00' N	179° 00' E
62	56° 00' N	180° 00' E
63	56° 00' N	179° 00' W
64	56° 00' N	178° 00' W
65	56° 00' N	177° 00' W
66	56° 00' N	176° 00' W
67	55° 30' N	174° 00' E
68	55° 30' N	175° 00' E
69	55° 30' N	176° 00' E
70	55° 30' N	177° 00' E
71	55° 30' N	178° 00' E
72	55° 30' N	179° 00' E
73	55° 30' N	180° 00' E
74	55° 30' N	179° 00' W
75	55° 30' N	178° 00' W
76	55° 30' N	177° 00' W
77	55° 30' N	176° 00' W
78	55° 00' N	174° 00' E
79	55° 00' N	175° 00' E
80	55° 00' N	176° 00' E
81	55° 00' N	177° 00' E
82	55° 00' N	178° 00' E
83	55° 00' N	179° 00' E
84	55° 00' N	180° 00' E
85	55° 00' N	179° 00' W
86	55° 00' N	178° 00' W
87	55° 00' N	177° 00' W
88	55° 00' N	176° 00' W

Contents

Table 1. Polish catches of pollock (in metric tons), effort and CPUE data in Donut Hole area of the central Bering Sea during 1985 - 1991

Year	Total	MONTH											
		Jan.	Feb.	March	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1985													
Effort (days)	**2125**	70	305	237	359	483	362	2	-	-	-	3	304
Effort (hours)	**15688**	611	2534	1730	2602	3525	2848	14	-	-	-	8	1816
Catch (tons)	**115874**	3407	16954	10031	18456	30855	18161	94	-	-	-	-	17916
CPUE (t/d)	**54,5**	48,7	35,6	42,3	51,4	63,9	50,2	47	-	-	-	-	58,9
CPUE (t/h)	**7,4**	5,6	6,7	5,8	7,1	8,8	6,4	6,7	-	-	-	-	9,9
1986													
Effort (days)	**3422**	546	465	458	424	385	185	16	1	6	49	328	559
Effort (hours)	**23197**	3805	3351	2818	3418	2826	516	92	6	14	137	2444	3770
Catch (tons)	**163249**	32290	21169	18937	26644	17852	4939	339	6	-	2201	13514	25358
CPUE (t/d)	**47,7**	59,1	45,5	41,4	62,8	46,4	26,7	21,2	6	-	44,9	41,2	45,4
CPUE (t/h)	**7,0**	8,5	6,3	6,7	7,8	6,3	9,6	3,7	1	-	16,1	5,5	6,7
1987													
Effort (days)	**4905**	760	729	511	545	608	535	236	-	-	-	279	702
Effort (hours)	**40824**	4831	5072	2885	3635	5744	5874	2702	-	-	-	3252	6829
Catch (tons)	**230318**	41107	32146	13715	31292	30338	24512	16157	-	-	-	13342	27709
CPUE (t/d)	**47,0**	54,1	44,1	26,8	57,4	49,9	45,8	68,5	-	-	-	47,8	39,5
CPUE (t/h)	**5,6**	6,3	6,3	4,8	8,6	5,3	4,2	6	-	-	-	4,1	4,1
1988													
Effort (days)	**6822**	973	788	642	738	499	589	463	375	137	136	484	998
Effort (hours)	**68174**	10682	5516	4278	7058	4329	6563	5921	3855	1258	1668	5547	11499
Catch (tons)	**298714**	40944	8676	9309	49678	15177	37791	28836	19431	5839	7414	29342	46277
CPUE (t/d)	**43,8**	42,1	11	14,5	67,3	30,4	64,2	62,3	51,8	42,6	54,5	60,6	46,4
CPUE (t/h)	**4,4**	3,8	1,6	2,2	7	3,5	5,8	4,9	5	4,6	4,4	5,3	4
1989													
Effort (days)	**6258**	812	368	318	557	630	600	583	303	234	513	603	737
Effort (hours)	**59510**	7304	2706	1965	4413	6348	6385	5855	3562	3097	4923	6060	6892
Catch (tons)	**268570**	29392	4167	7488	32677	39955	32849	23428	12464	8768	16418	26113	34851
CPUE (t/d)	**42,9**	36,2	11,3	23,5	58,7	63,4	54,7	40,2	41,1	37,5	32	43,3	47,3
CPUE (t/h)	**4,5**	4	1,5	3,8	7,4	6,3	5,1	4	3,5	2	3,3	4,3	5,1
1990													
Effort (days)	**7566**	565	172	204	935	845	754	519	651	621	816	703	781
Effort (hours)	**77754**	5032	1398	1891	10563	8643	9772	6147	8891	6224	8168	6133	4892
Catch (tons)	**223454**	13144	1251	2936	42035	21030	39111	13741	25052	17183	24977	15882	7112
CPUE (t/d)	**29,5**	23,3	7,3	14,4	45	24,9	51,9	26,5	38,5	27,7	30,6	22,6	9,1
CPUE (t/h)	**2,9**	2,6	0,9	1,6	4	2,4	4	2,2	2,8	2,8	3,1	2,6	1,5
1991													
Effort (days)	**3051**	208	24	35	591	662	695	589	221	14	-	12	-
Effort (hours)	**31627**	1705	54	332	6362	6815	7212	6143	2684	228	-	92	-
Catch (tons)	**54866**	1530	26	158	18059	9756	10257	11251	3716	106	-	7	-
CPUE (t/d)	**18,0**	7,4	1,1	4,5	30,6	14,7	14,6	19,1	16,8	7,6	-	0,6	-
CPUE (t/h)	**1,7**	0,9	0,5	0,5	3,0	1,4	1,4	1,8	1,4	16,3	-	0,1	-

Table 2. Polish catches (in metric tons) of pollock in Donut Hole area of the cental Bering Sea by big statistical blocks (0.5° latitude x 1° longitude) by months in 1985

Month	Block no	Catch
January 85	52	24
	61	85
	63	76
	73	247
	74	1836
	75	676
	76	88
	85	283
	86	92
Total		3407

Month	Block no	Catch
February 85	52	77
	73	1053
	74	3773
	75	7561
	76	3829
	84	307
	85	77
	86	277
Total		16954

Month	Block no	Catch
March 85	7	70
	32	58
	64	268
	75	2660
	76	4742
	77	24
	86	1350
	87	859
Total		10031

Month	Block no	Catch
April 85	18	1267
	19	283
	29	2268
	30	2495
	40	1535
	41	679
	43	60
	51	305
	52	771
	53	1226
	64	1325
	65	876
	75	643
	76	3695
	85	129
	86	486
	87	280
	88	133
Total		18456

Month	Block no	Catch
May 85	5	712
	8	3203
	16	3296
	20	849
	26	4557
	27	6485
	29	2260
	30	1798
	31	453
	40	5091
	41	2151
Total		30855

Month	Block no	Catch
June 85	6	196
	26	592
	27	337
	37	2045
	47	2282
	48	902
	49	327
	50	171
	51	743
	53	347
	54	18
	58	339
	59	4423
	60	1748
	61	892
	62	1921
	73	878
Total		18161

Month	Block no	Catch
July 85	59	94
Total		94

Month	Block no	Catch
August 85		
Total		0

Month	Block no	Catch
September85		
Total		0

Month	Block no	Catch
October 85		
Total		0

Month	Block no	Catch
November85		
Total		0

Month	Block no	Catch
December85	52	1487
	54	357
	61	154
	62	51
	63	2937
	64	6876
	71	48
	73	514
	74	359
	75	4407
	76	384
	86	342
Total		17916

Table 3. Polish catches (in metric tons) of pollock in Donut Hole area of the cental Bering Sea by big statistical blocks (0.5° latitude x 1° longitude) by months in 1986

Month	Block no	Catch	Month	Block no	Catch	Month	Block no	Catch	Month	Block no	Catch	Month	Block no	Catch	Month	Block no	Catch
January 86	51	191	**February 86**	65	251	**March 86**	41	1145	**April 86**	14	779	**May 86**	14	4612	**June 86**	34	105
	52	5527		73	5333		42	323		15	277		15	5437		37	501
	62	1847		74	3201		43	654		24	1718		16	68		45	619
	63	574		75	4410		52	653		25	1707		24	1087		47	653
	72	2739		76	6539		53	2607		26	8350		25	1972		48	308
	73	14431		84	180		54	8370		27	402		26	48		49	492
	74	4489		85	1010		64	·1130		37	933		35	3177		57	987
	84	2492		86	245		65	1130		40	1917		36	148		59	33
							76	2109		49	482		37	72		60	597
							77	760		50	1191		39	30		70	67
							87	56		51	6233		45	188		71	134
										52	2655		63	2		74	161
													71	469		75	10
													72	143		83	23
													74	66		84	183
													82	154		85	66
													83	179			
Total		32290	Total		21169	Total		18937	Total		26644	Total		17852	Total		4939

Month	Block no	Catch	Month	Block no	Catch	Month	Block no	Catch	Month	Block no	Catch	Month	Block no	Catch	Month	Block no	Catch
July 86	48	44	**August 86**	60	6	**September86**			**October 86**	37	185	**November86**	30	1342	**December86**	39	424
	49	28								47	240		38	835		49	1698
	59	120								48	348		41	71		50	3138
	60	112								49	738		48	773		51	785
	70	35								50	232		49	1760		59	1497
										59	87		50	880		60	4733
										60	371		51	307		61	1962
													52	2785		70	46
													53	113		71	5221
													59	854		72	2688
													60	894		73	928
													61	43		74	105
													71	1264		82	328
													72	1593		83	1349
																84	268
																85	188
Total		339	Total		6	Total		0	Total		2201	Total		13514	Total		25358

Table 4. Polish catches (in metric tons) of pollock in Donut Hole area of the cental Bering Sea by big statistical blocks (0.5° latitude x 1° longitude) by months in 1987

Month	Square	Catch
January 87	59	265
	60	14810
	61	3279
	71	20483
	72	984
	82	838
	83	377
	86	34
	87	37
Total		41107

Month	Block no	Catch
February 87	60	6176
	61	3513
	63	21
	71	14275
	72	6539
	73	145
	74	70
	82	1267
	83	140
Total		32146

Month	Block no	Catch
March 87	42	208
	43	138
	52	17
	53	891
	54	1122
	60	103
	64	857
	65	1915
	71	2618
	72	348
	75	3959
	76	1426
	82	113
Total		13715

Month	Block no	Catch
April 87	60	128
	61	483
	70	1318
	71	3656
	72	1222
	73	2627
	74	1765
	75	832
	82	2025
	83	10484
	84	5207
	85	1416
	86	129
Total		31292

Month	Block no	Catch
May 87	35	57
	36	120
	38	717
	45	431
	46	3426
	47	2213
	48	817
	49	232
	50	3567
	51	438
	57	4127
	58	2642
	59	443
	60	1633
	61	1284
	62	1377
	72	2442
	73	793
	74	72
	83	2999
	84	508
Total		30338

Month	Block no	Catch
June 87	46	180
	47	1083
	48	2157
	49	4890
	58	880
	59	7874
	60	5124
	61	193
	70	131
	71	2000
Total		24512

Month	Block no	Catch
July 87	46	102
	47	416
	48	832
	49	1539
	59	2672
	60	2203
	61	45
	69	3858
	70	1377
	71	3113
Total		16157

Month	Block no	Catch
August 87		
Total		0

Month	Block no	Catch
September87		
Total		0

Month	Block no	Catch
October 87		
Total		0

Month	Block no	Catch
November 87	37	3114
	47	116
	48	492
	49	217
	58	226
	59	1812
	60	1474
	69	983
	70	4908
Total		13342

Month	Block no	Catch
December87	35	1709
	36	284
	37	689
	38	52
	39	2455
	40	1823
	46	311
	47	168
	48	1765
	49	1504
	50	2084
	57	1022
	58	34
	59	1496
	60	570
	61	1470
	62	226
	65	47
	68	360
	69	4835
	70	47
	71	1131
	72	435
	73	156
	74	2079
	77	222
	83	735
Total		27709

Table 5. Polish catches (in metric tons) of pollock in Donut Hole area of the cental Bering Sea by big statistical blocks (0.5° latitude x 1° longitude) by months in 1988

Month	Block no	Catch	Month	Block no	Catch	Month	Block no	Catch	Month	Block no	Catch	Month	Block no	Catch	Month	Block no	Catch
January 88	42	339	**February 88**	18	36	**March 88**	7	2	**April 88**	30	1831	**May 88**	4	467	**June 88**	7	11737
	51	521		19	12		17	67		41	6341		15	278		8	4859
	52	4142		29	12		18	54		42	2849		16	507		18	1015
	53	4254		30	216		19	18		52	1806		18	268		19	9867
	57	1114		31	21		28	1		53	667		19	247		28	13
	58	78		41	281		29	112		54	973		26	79		29	193
	61	307		42	44		30	96		64	614		27	393		30	379
	62	3755		52	36		40	30		74	1021		30	128		31	1551
	63	625		63	3204		41	17		75	6771		38	468		41	2333
	64	81		64	369		54	18		76	16533		40	613		42	4471
	65	2400		65	65		64	843		85	1610		41	49		50	37
	68	118		72	2		65	5286		86	7839		48	90		53	620
	69	20		73	1373		76	2751		87	823		49	425		54	488
	70	534		74	1496		84	14					50	43		59	39
	71	51		75	180								51	1922		61	36
	72	5862		76	340								52	3115		70	37
	73	1725		82	6								54	129		84	46
	74	3812		83	12								58	94		86	70
	76	2185		85	755								61	1462			
	84	4292		86	216								62	3620			
	85	2623											63	110			
	87	2106											64	389			
													71	177			
													73	33			
													76	71			
Total		40944	Total		8676	Total		9309	Total		49678	Total		15177	Total		37791

Month	Block no	Catch	Month	Block no	Catch	Month	Block no	Catch	Month	Block no	Catch	Month	Block no	Catch	Month	Block no	Catch
July 88	40	293	**August 88**	6	247	**September88**	35	209	**October 88**	48	1594	**November88**	24	2470	**December88**	25	3801
	41	468		46	190		46	153		49	916		25	106		26	623
	42	2378		47	227		47	121		50	82		34	3445		31	470
	50	15		50	415		48	564		51	1813		35	9307		36	16213
	53	2476		51	65		49	126		52	59		38	1239		37	5139
	54	1719		57	829		52	1103		58	953		40	111		43	490
	57	1090		58	1845		53	261		59	387		46	1382		45	445
	61	44		59	620		57	472		60	108		48	2289		47	1071
	62	578		60	195		58	98		61	1012		49	905		48	635
	65	2451		61	195		60	153		62	67		50	589		53	994
	70	595		62	2720		61	101		72	423		51	349		57	712
	72	343		63	120		63	515					57	102		60	5524
	74	122		65	1168		64	205					58	114		61	2398
	75	3304		68	140		69	267					59	1892		63	2411
	76	6675		69	2968		70	733					60	1160		65	1102
	85	4016		70	940		74	555					61	716		70	819
	86	932		71	992		75	203					62	112		71	1691
	87	1337		72	2373								69	400		72	940
				73	2128								70	1295		82	799
				74	617								71	1135			
				76	177								72	224			
				82	260												
Total		28836	Total		19431	Total		5839	Total		7414	Total		29342	Total		46277

Table 6. Polish catches (in metric tons) of pollock in Donut Hole area of the cental Bering Sea by big statistical blocks (0.5° latitude x 1° longitude) by months in 1989

Month	Block no	Catch	Month	Block no	Catch	Month	Block no	Catch	Month	Block no	Catch	Month	Block no	Catch	Month	Block no	Catch
January 89	46	364	February 89	51	101	March 89	65	567	April 89	6	151	May 89	18	991	June 89	19	165
	57	1244		63	2		75	1279		7	1740		19	572		30	2097
	59	1055		65	1946		76	609		8	1657		30	666		31	18310
	60	5309		75	2		77	117		18	1342		31	17688		41	864
	61	342		76	1829		86	3938		19	1038		41	6793		42	4749
	63	1413		87	287		87	978		28	774		42	4718		43	844
	64	2546								29	4080		43	2835		52	1273
	65	166								30	550		53	4141		53	1635
	70	6842								31	1012		54	1551		54	102
	71	4131								40	460					64	557
	72	974								41	1628					65	157
	73	265								42	1523					73	872
	74	1072								43	1900					74	995
	75	178								53	54					75	229
	76	94								54	6375						
	77	26								65	595						
	84	3120								75	2428						
	85	162								76	479						
	86	89								85	188						
										86	4599						
										87	104						
Total		29392	Total		4167	Total		7488	Total		32677	Total		39955	Total		32849

Month	Block no	Catch	Month	Block no	Catch	Month	Block no	Catch	Month	Block no	Catch	Month	Block no	Catch	Month	Block no	Catch
July 89	8	3874	August 89	31	438	September89	4	434	October 89	4	922	November89	5	54	December89	18	9
	19	3632		40	372		8	323		8	332		13	3206		38	3281
	51	159		41	281		15	92		14	2214		14	1521		39	1451
	52	154		50	675		16	52		15	1311		24	476		45	1137
	53	1148		51	1788		19	243		20	641		25	1901		46	434
	54	1397		52	1149		25	186		24	1438		35	683		48	1522
	63	73		53	800		26	320		25	1098		37	266		49	19089
	64	2616		54	1032		27	564		26	2675		45	3660		50	1280
	65	5698		62	433		28	387		27	18		46	76		51	3100
	72	505		63	76		30	155		35	1026		47	393		56	1257
	73	113		64	413		36	207		36	483		48	1508		58	555
	76	2837		65	478		37	525		37	3064		49	1560		59	210
	77	301		73	612		38	96		38	169		52	105		60	1215
	83	86		74	1590		39	591		48	96		53	379		61	311
	84	637		75	231		40	140		49	285		56	283			
	87	198		76	2096		48	564		58	489		57	1414			
							49	847		61	27		58	4355			
							50	888		65	130		59	3295			
							52	141					64	368			
							58	106					65	313			
							59	36					69	297			
							60	529									
							61	1034									
							63	267									
							71	41									
Total		23428	Total		12464	Total		8768	Total		16418	Total		26113	Total		34851

Table 7. Polish catches (in metric tons) of pollock in Donut Hole area of the cental Bering Sea by big statistical blocks (0.5° latitude x 1° longitude) by months in 1990

Month	Block no	Catch	Month	Block no	Catch	Month	Block no	Catch	Month	Block no	Catch	Month	Block no	Catch	Month	Block no	Catch
January 90	43	34	**February 90**	29	1	**March 90**	52	2	**April 90**	42	964	**May 90**	6	155	**June 90**	29	54
	48	1230		52	120		64	37		43	12648		7	1921		39	1570
	49	8414		53	681		65	721		54	8511		8	424		40	5609
	50	328		63	20		76	1981		63	174		17	247		41	648
	51	19		64	388		77	195		64	26		18	107		42	6230
	53	130		65	1					65	1095		19	393		43	10297
	54	148		75	15					73	431		20	58		50	94
	59	293		76	25					74	4225		27	48		51	1791
	60	620								75	1987		28	351		52	2013
	62	2								76	6933		29	713		53	3209
	63	407								85	3187		30	136		54	6353
	64	628								86	574		31	13		62	350
	65	172								87	772		37	102		63	45
	73	35								88	508		39	844		64	636
	74	430											40	273		65	67
	75	162											43	3648		74	145
	76	92											48	479			
													49	24			
													51	19			
													59	9			
													60	10			
													62	9			
													63	29			
													65	55			
													70	14			
													73	10			
													74	919			
													75	351			
													83	8			
													84	387			
													85	9219			
													87	55			
Total		13144	Total		1251	Total		2936	Total		42035	Total		21030	Total		39111

Table 7 cont.

Month	Block no	Catch	Month	Block no	Catch	Month	Block no	Catch	Month	Block no	Catch	Month	Block no	Catch	Month	Block no	Catch
July 90	42	1758	**August 90**	40	202	**Septembe 90**	5	3622	**October 90**	5	2451	**November90**	4	1230	**December90**	5	215
	43	1154		42	191		6	5902		8	1561		5	431		6	1434
	49	891		43	2567		7	109		14	3376		15	933		7	3703
	50	36		50	1747		8	157		16	2872		16	611		8	1211
	51	245		51	535		16	897		17	600		17	102		17	266
	52	191		54	2541		17	932		24	803		18	156		18	193
	53	1722		59	531		26	119		25	957		27	1200		28	5
	54	145		61	5355		28	2302		27	1040		28	851		61	85
	61	577		62	2222		39	115		28	822		35	16			
	62	121		63	2198		40	196		31	407		37	56			
	63	745		64	189		50	235		35	1645		38	932			
	64	113		65	198		61	1463		36	637		39	2404			
	71	221		70	783		62	473		38	1659		43	288			
	72	3058		71	299		74	661		39	1032		48	401			
	73	1366		72	876					43	387		49	718			
	74	190		73	885					45	235		50	152			
	75	219		74	3285					46	1320		51	32			
	76	989		75	448					47	312		53	930			
										54	2740		56	1972			
										72	121		58	180			
													59	31			
													61	156			
													65	9			
													72	753			
													73	967			
													77	371			
Total		13741	Total		25052	Total		17183	Total		24977	Total		15882	Total		7112

Table 8. Polish catches (in metric tons) of pollock in Donut Hole area of the cental Bering Sea by big statistical blocks (0.5° latitude x 1° longitude) by months in 1991

Month	Block no	Catch
January 91	5	22
	6	19
	7	924
	8	85
	20	439
	48	5
	74	4
	75	32
Total		1530

Month	Block no	Catch
February 91	30	26
Total		26

Month	Block no	Catch
March 91	31	7
	75	30
	76	121
Total		158

Month	Block no	Catch
April 91	32	683
	43	5172
	54	4669
	65	3695
	73	166
	76	3295
	77	379
Total		18059

Month	Block no	Catch
May 91	7	1074
	8	2345
	18	386
	30	727
	43	3090
	53	453
	54	230
	65	357
	70	242
	75	515
	76	337
Total		9756

Month	Block no	Catch
June 91	8	270
	19	587
	20	392
	28	1519
	30	311
	31	600
	32	187
	37	57
	38	373
	39	435
	42	1457
	43	1201
	47	659
	52	169
	53	464
	54	456
	58	893
	74	227
Total		10257

Month	Block no	Catch
July 91	19	217
	20	455
	31	1205
	41	530
	42	1221
	43	174
	52	378
	64	368
	75	4645
	76	2058
Total		11251

Month	Block no	Catch
August 91	19	146
	20	90
	31	2620
	32	285
	40	18
	53	557
Total		3716

Month	Block no	Catch
September 9	15	100
	38	6
Total		106

Month	Block no	Catch
October 91		
Total		0

Month	Block no	Catch
November91	41	7
Total		7

Month	Block no	Catch
December91		
Total		0

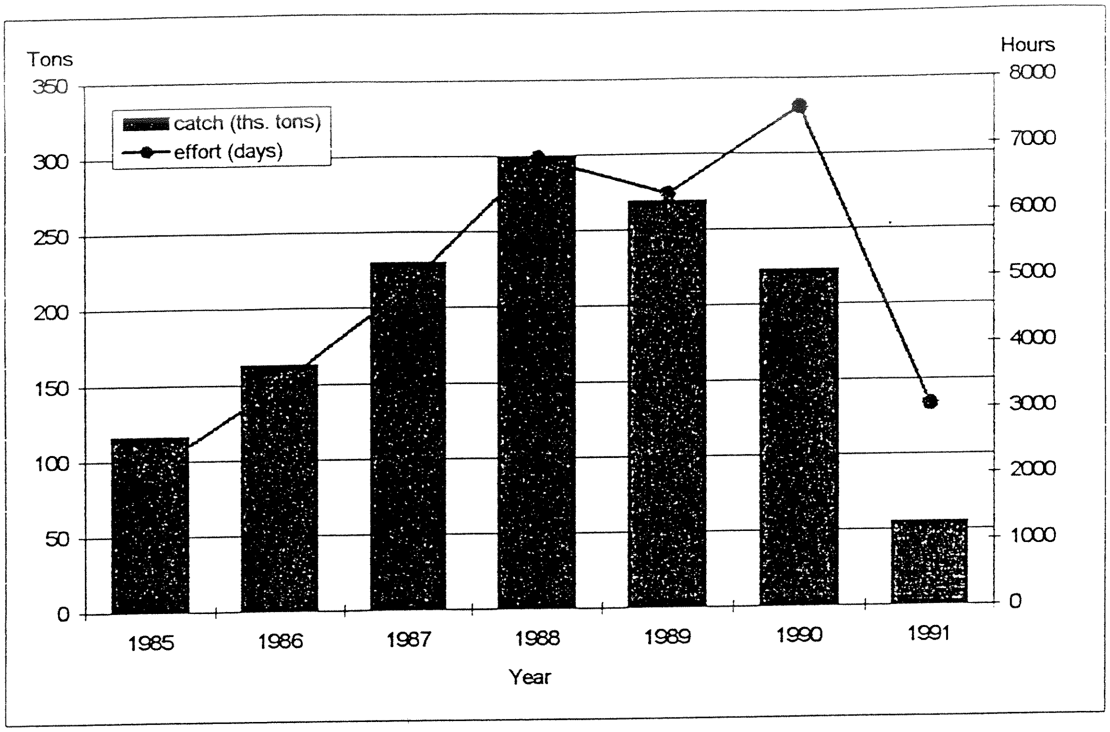


Figure 1. Polish catches of pollock (in thousand tons) and effort (in fishing days) in Donut hole area of the central Bering Sea for years 1985 through 1991

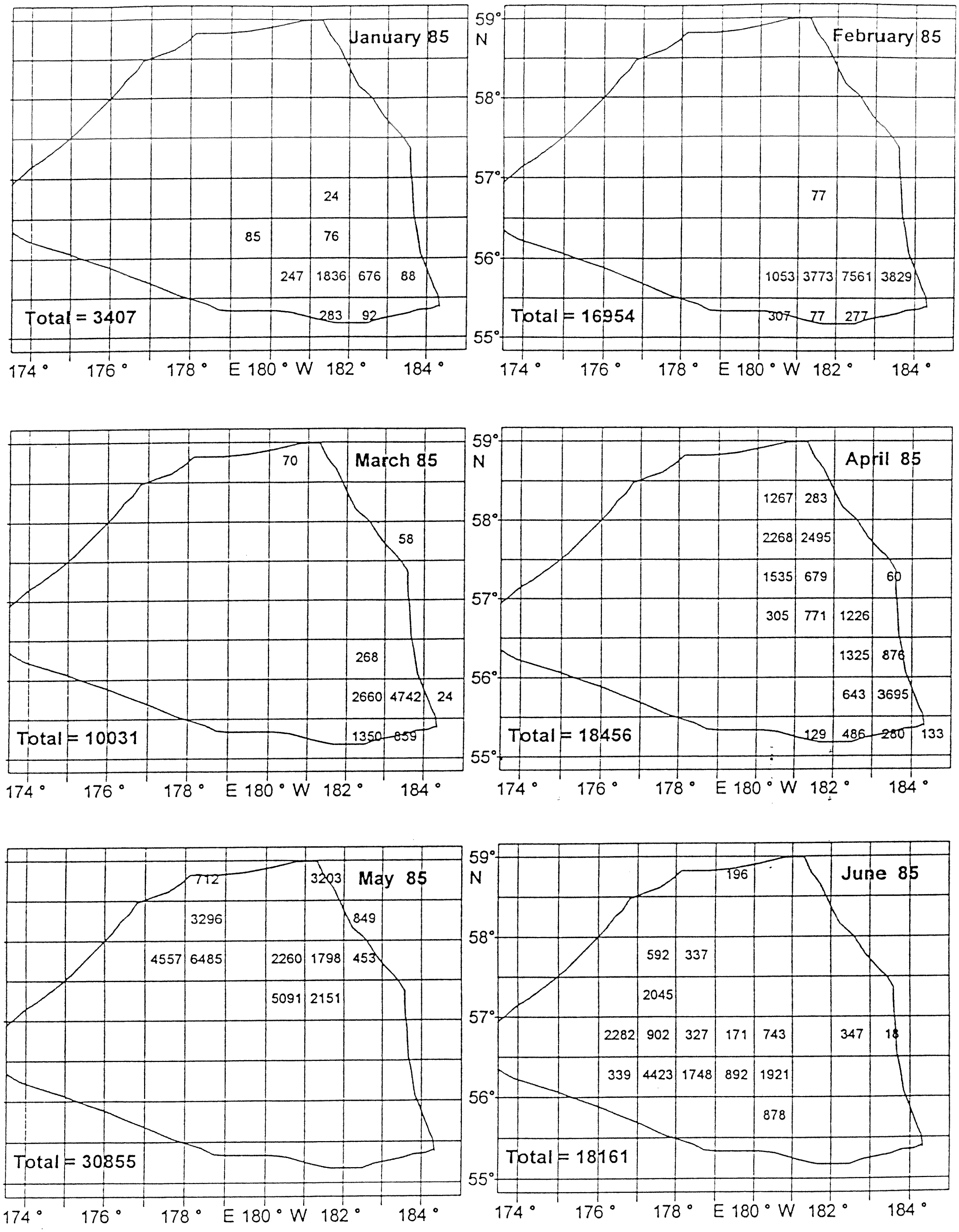


Fig. 2. Polish catches (in metric tons) of pollock in Donut Hole area of the Bering Sea by big statistical blocks (1° longitude x 0.5° latitude) by months in 1985

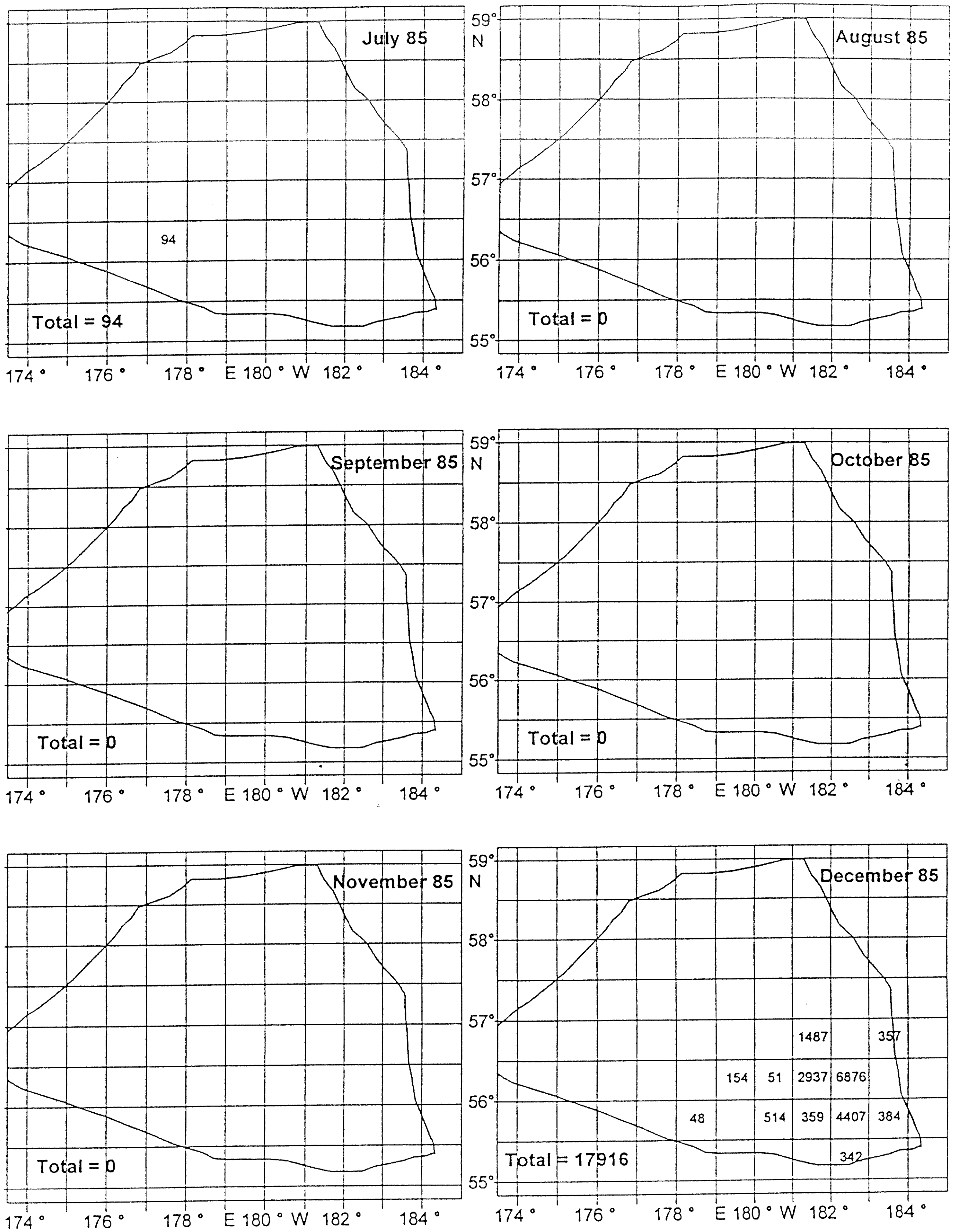


Fig. 2 cont. Polish catches (in metric tons) of pollock in Donut Hole area of the Bering Sea by big statistical blocks (1° longitude x 0.5° latitude) by months in 1985

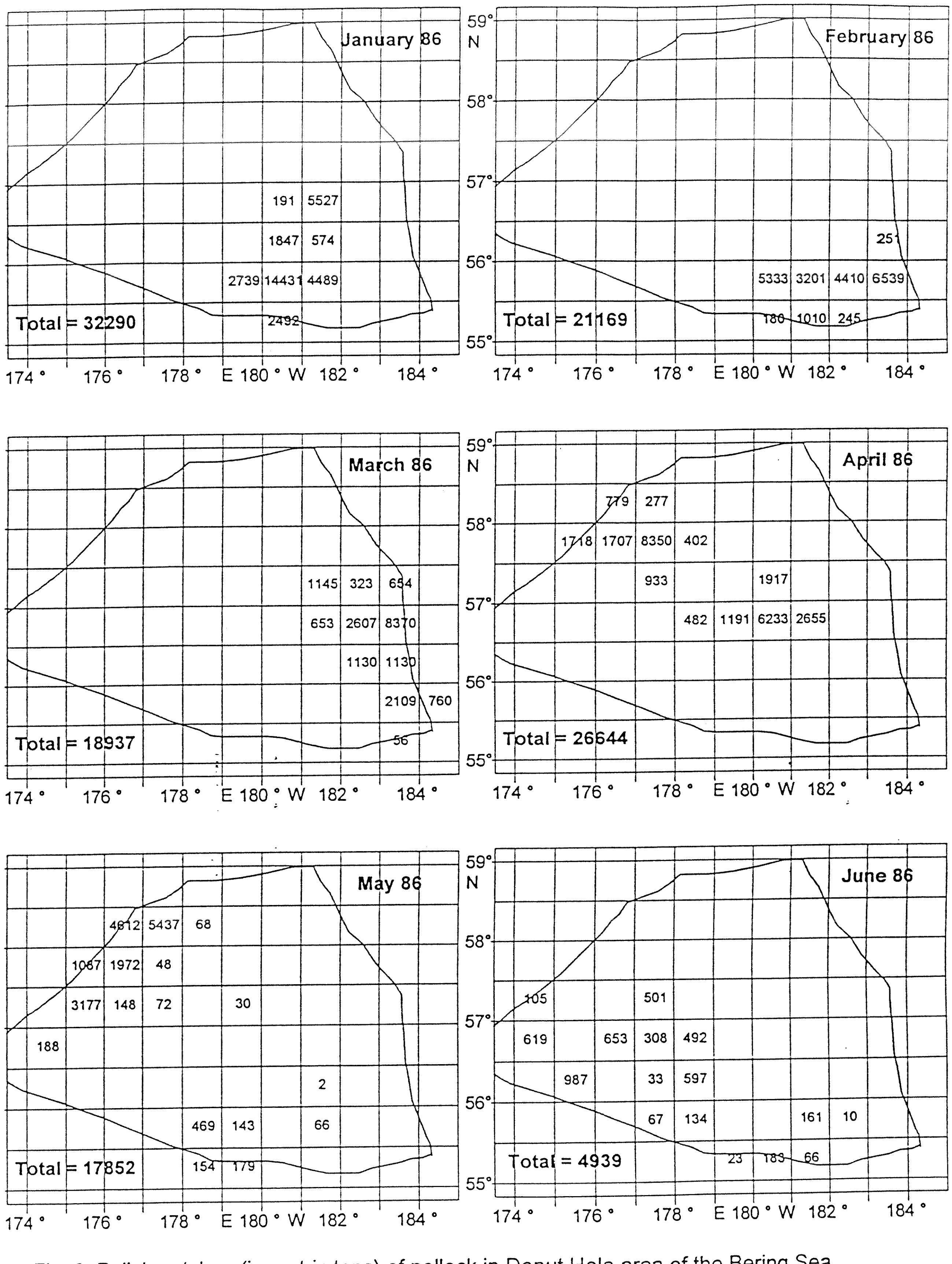


Fig. 3. Polish catches (in metric tons) of pollock in Donut Hole area of the Bering Sea by big statistical blocks (1° longitude x 0.5° latitude) by months in 1986

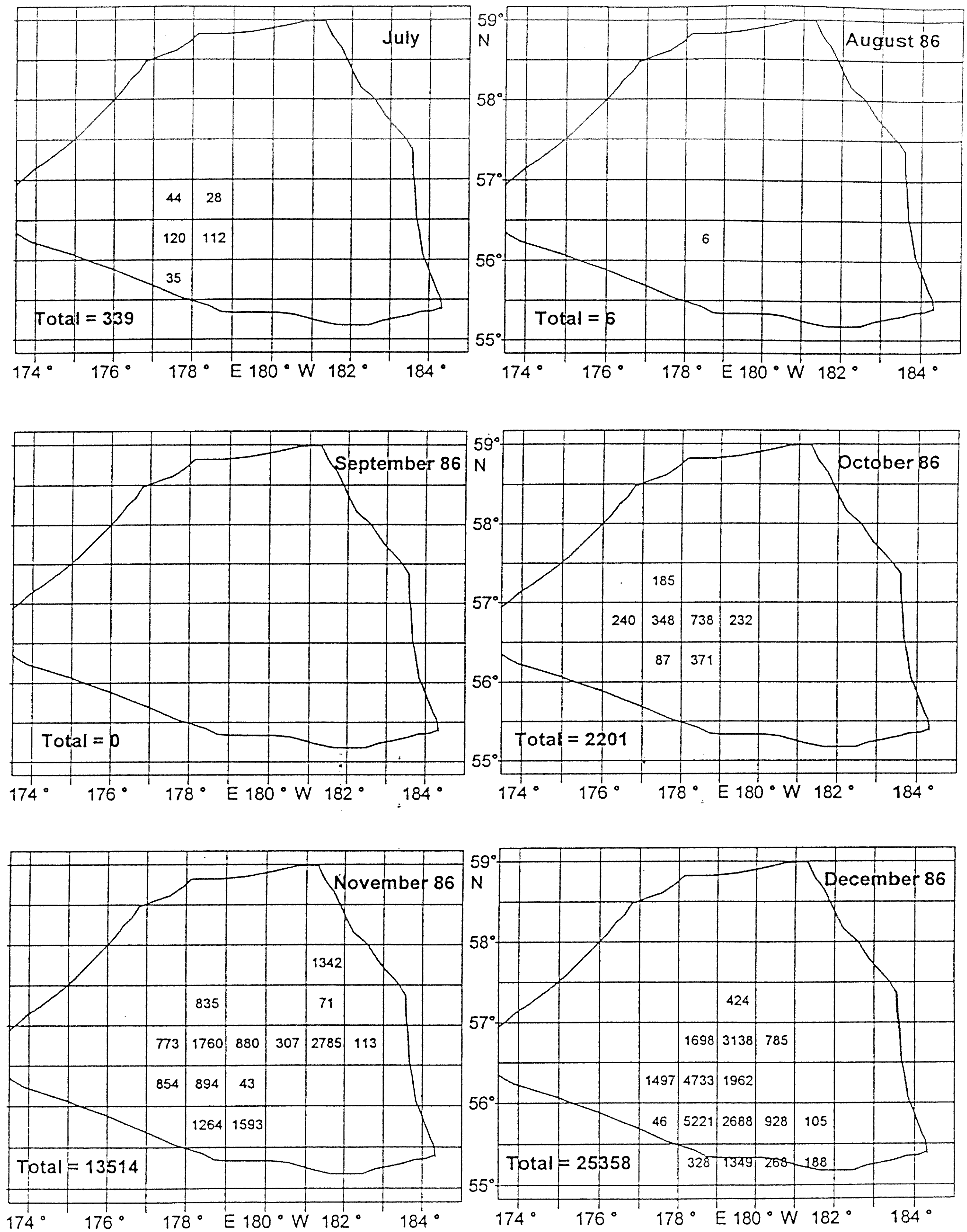


Fig. 3 cont. Polish catches (in metric tons) of pollock in Donut Hole area of the Bering Sea by big statistical blocks (1° longitude x 0.5° latitude) by months in 1986

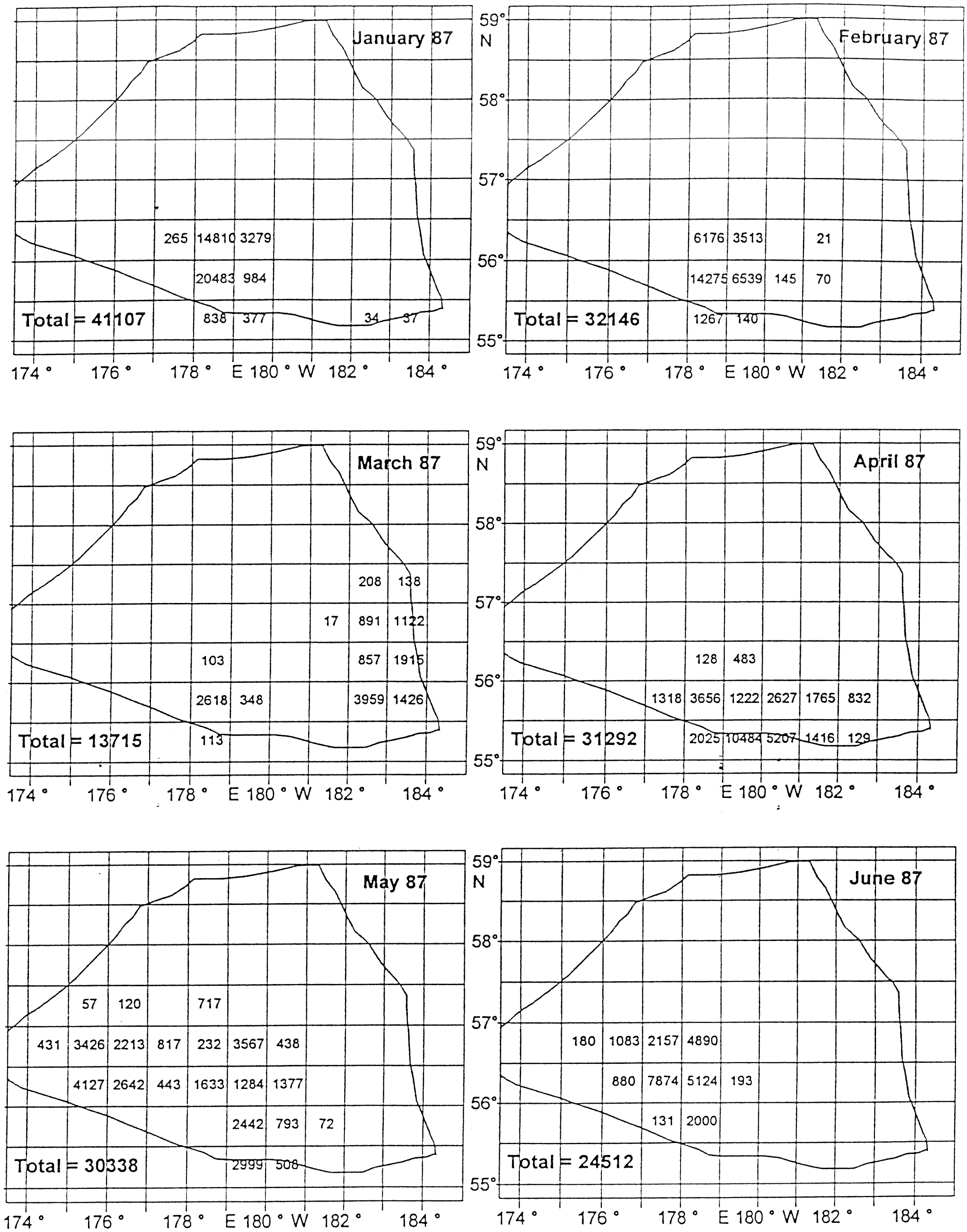


Fig. 4. Polish catches (in metric tons) of pollock in Donut Hole area of the Bering Sea by big statistical blocks (1° longitude x 0.5° latitude) by months in 1987

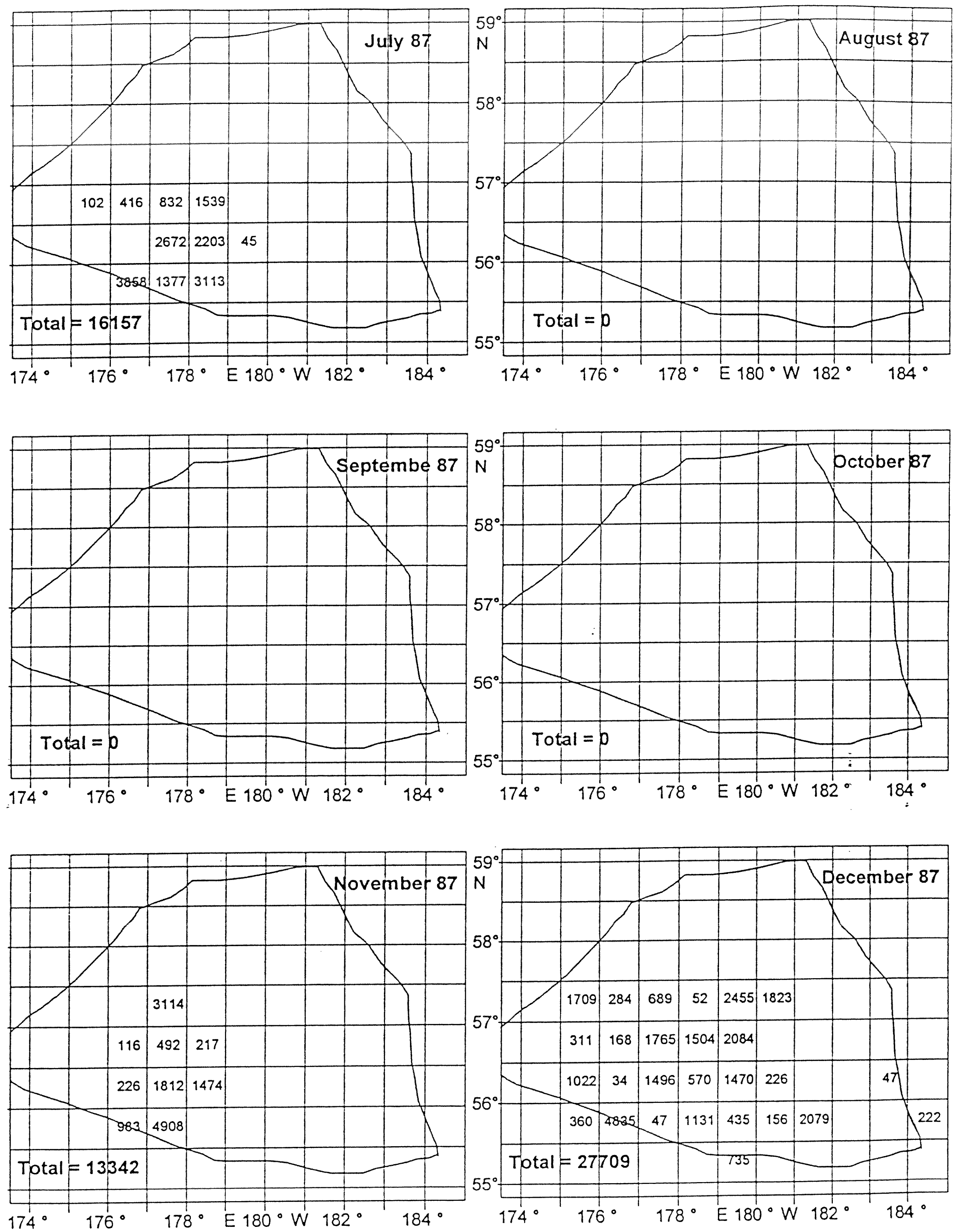


Fig. 4 cont. Polish catches (in metric tons) of pollock in Donut Hole area of the Bering Sea by big statistical blocks (1° longitude x 0.5° latitude) by months in 1987

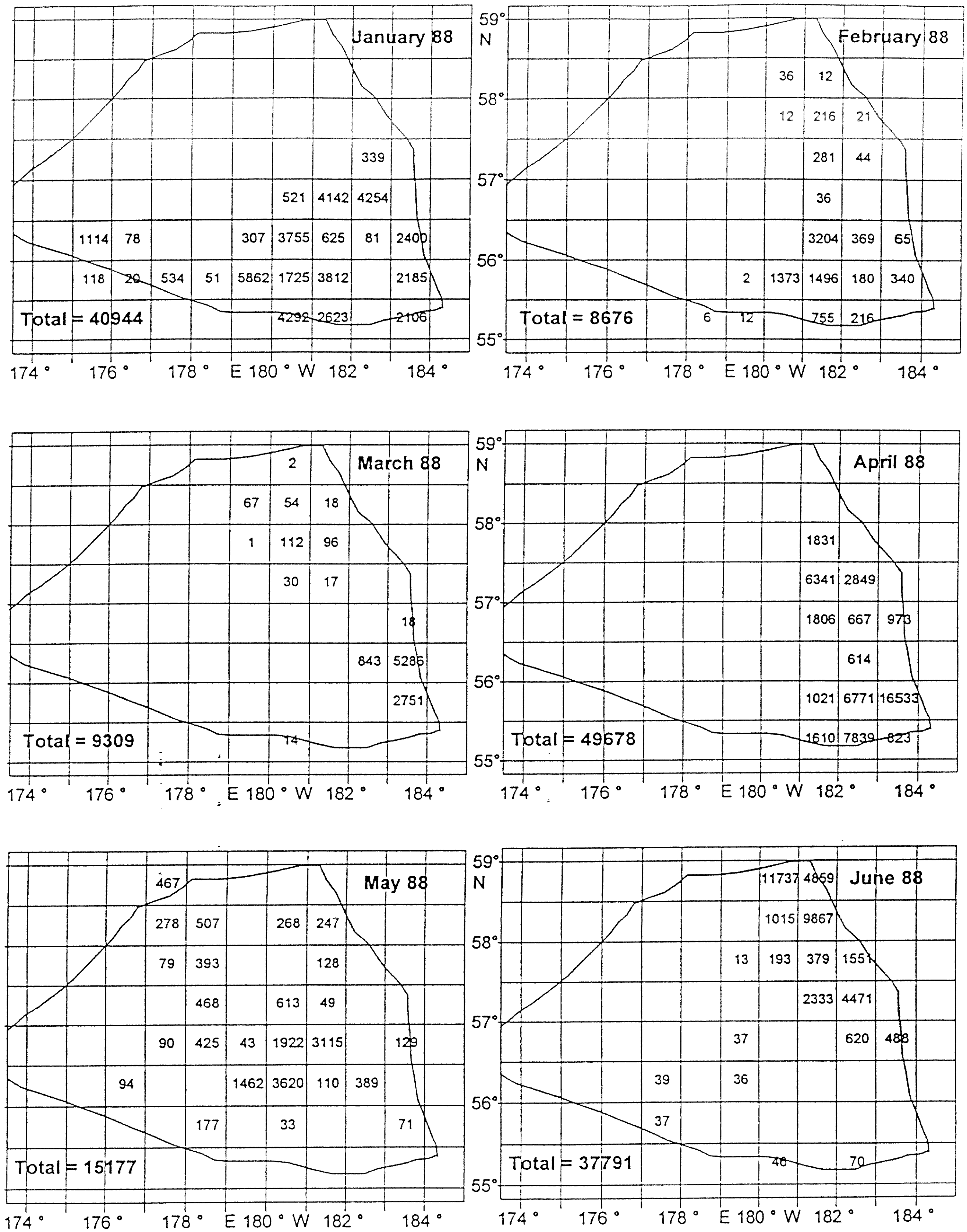


Fig. 5. Polish catches (in metric tons) of pollock in Donut Hole area of the Bering Sea by big statistical blocks (1° longitude x 0.5° latitude) by months in 1988

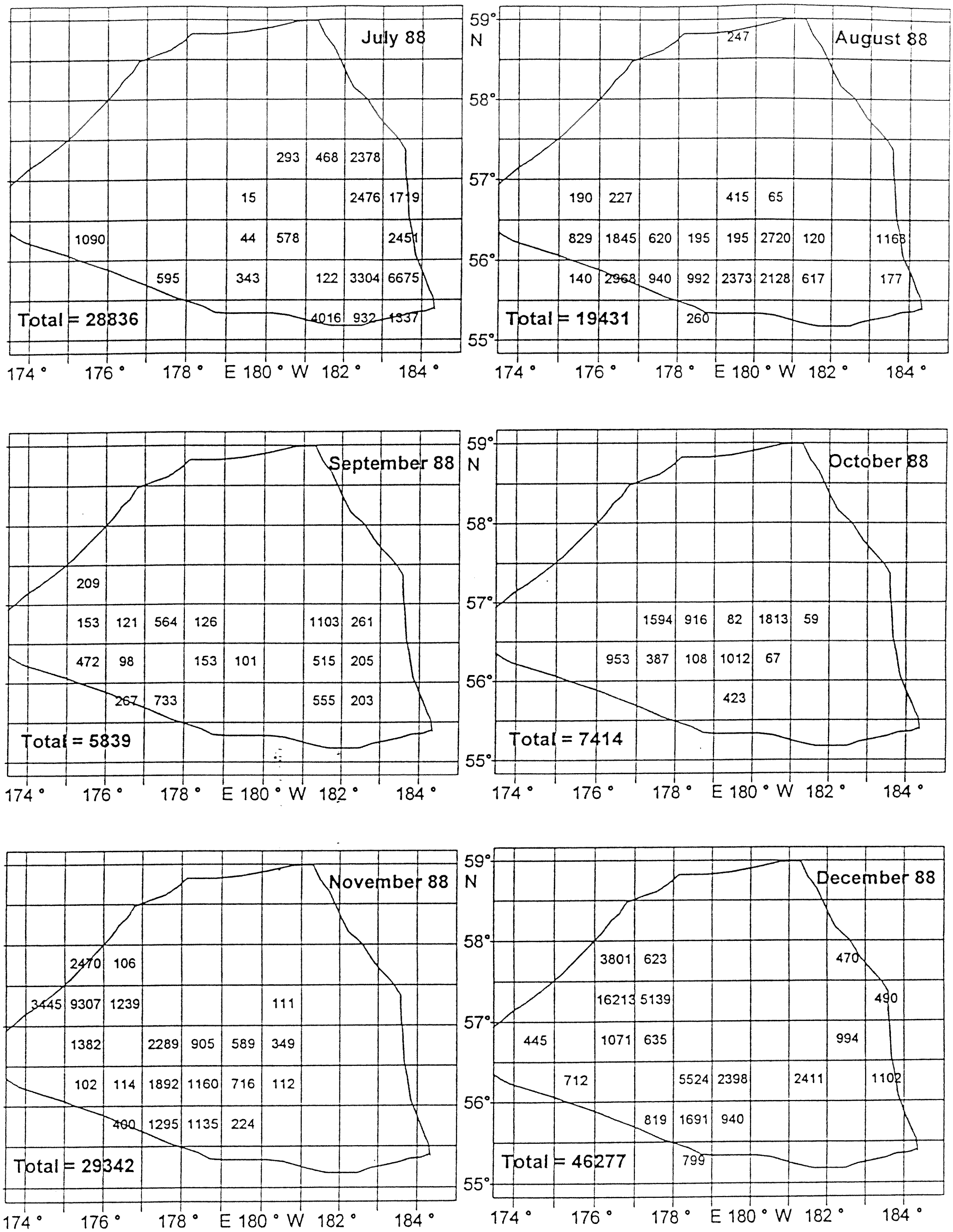


Fig. 5 cont. Polish catches (in metric tons) of pollock in Donut Hole area of the Bering Sea by big statistical blocks (1° longitude x 0.5° latitude) by months in 1988

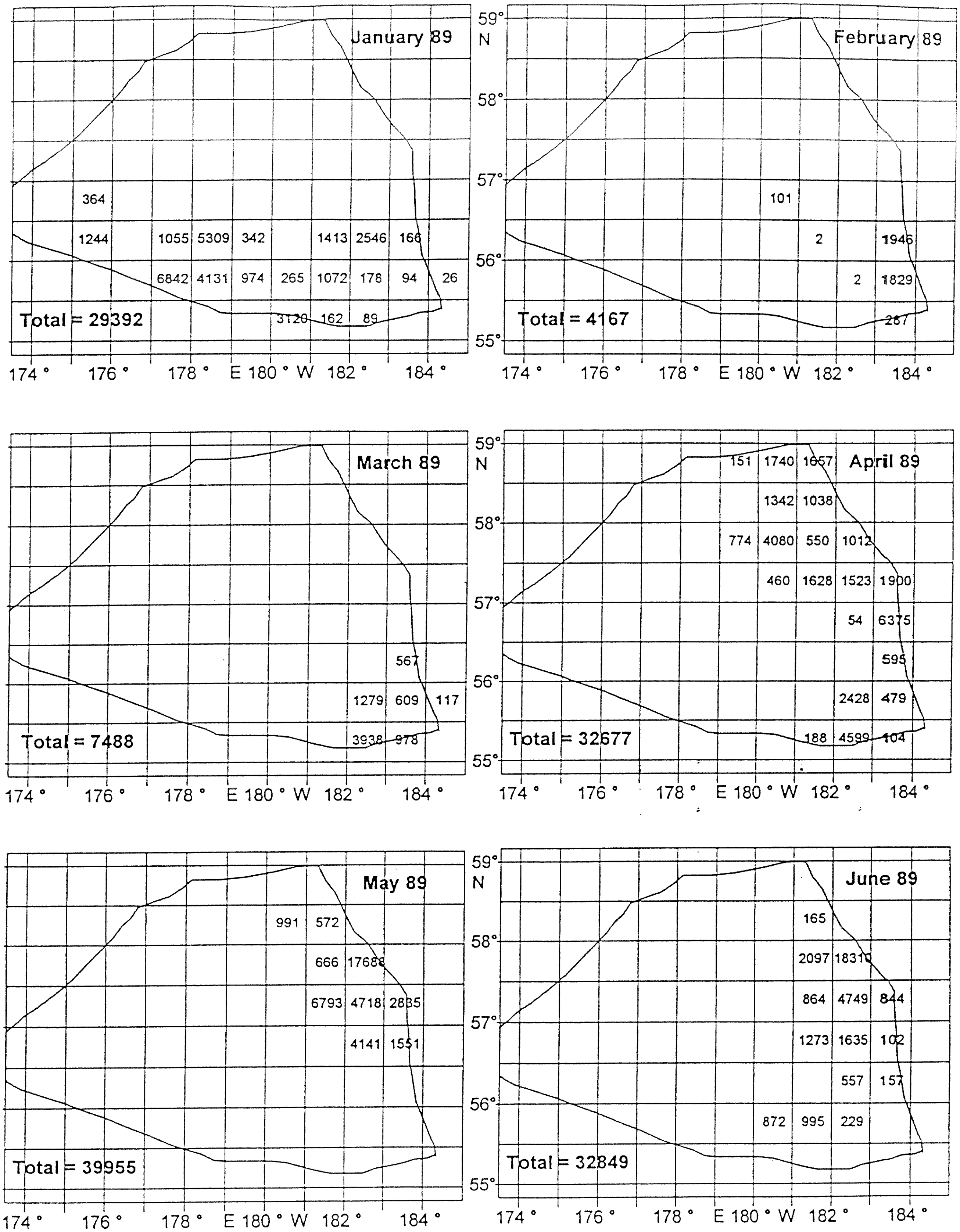


Fig. 6. Polish catches (in metric tons) of pollock in Donut Hole area of the Bering Sea by big statistical blocks (1° longitude x 0.5° latitude) by months in 1989

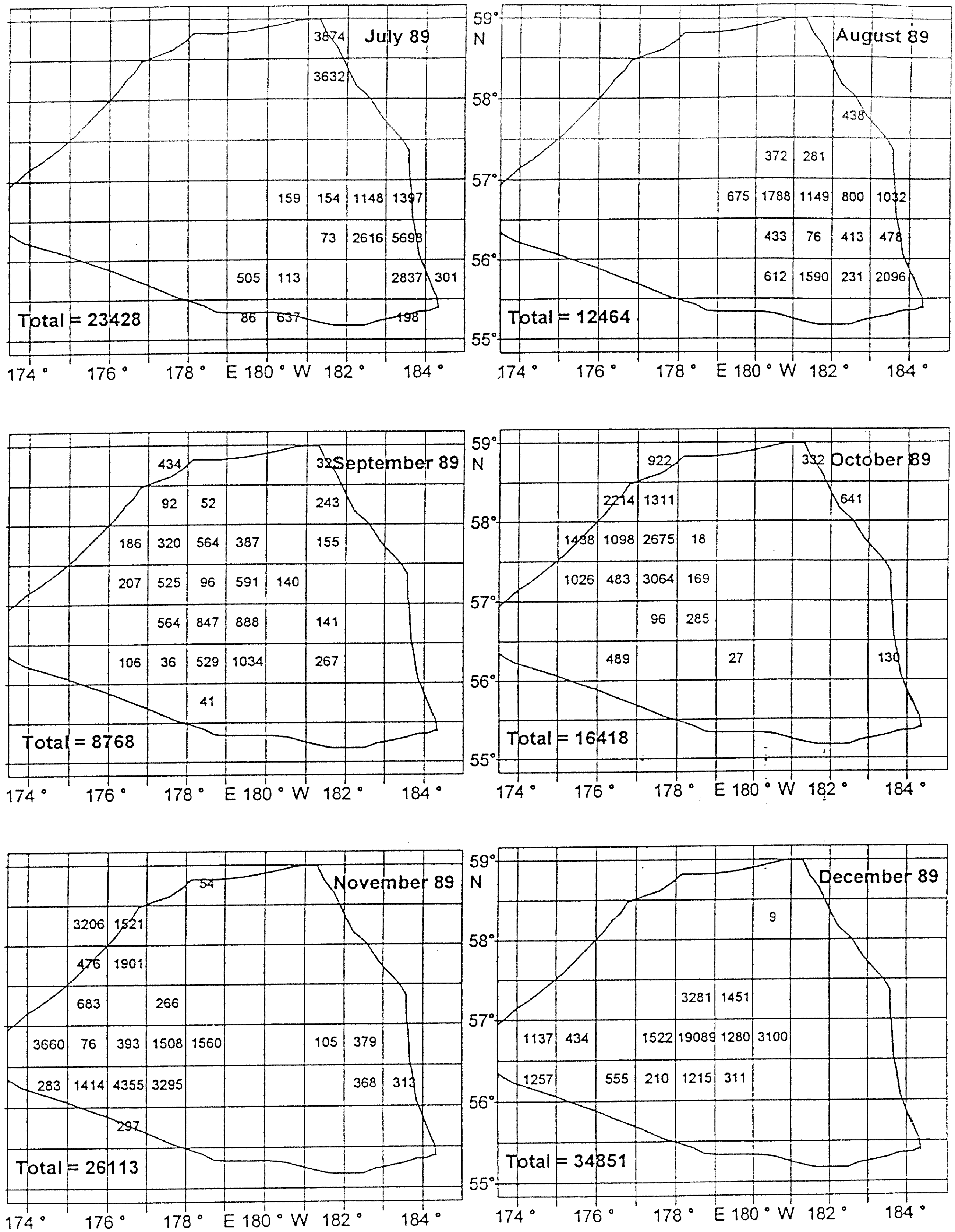


Fig. 6 cont. Polish catches (in metric tons) of pollock in Donut Hole area of the Bering Sea by big statistical blocks (1° longitude x 0.5° latitude) by months in 1989

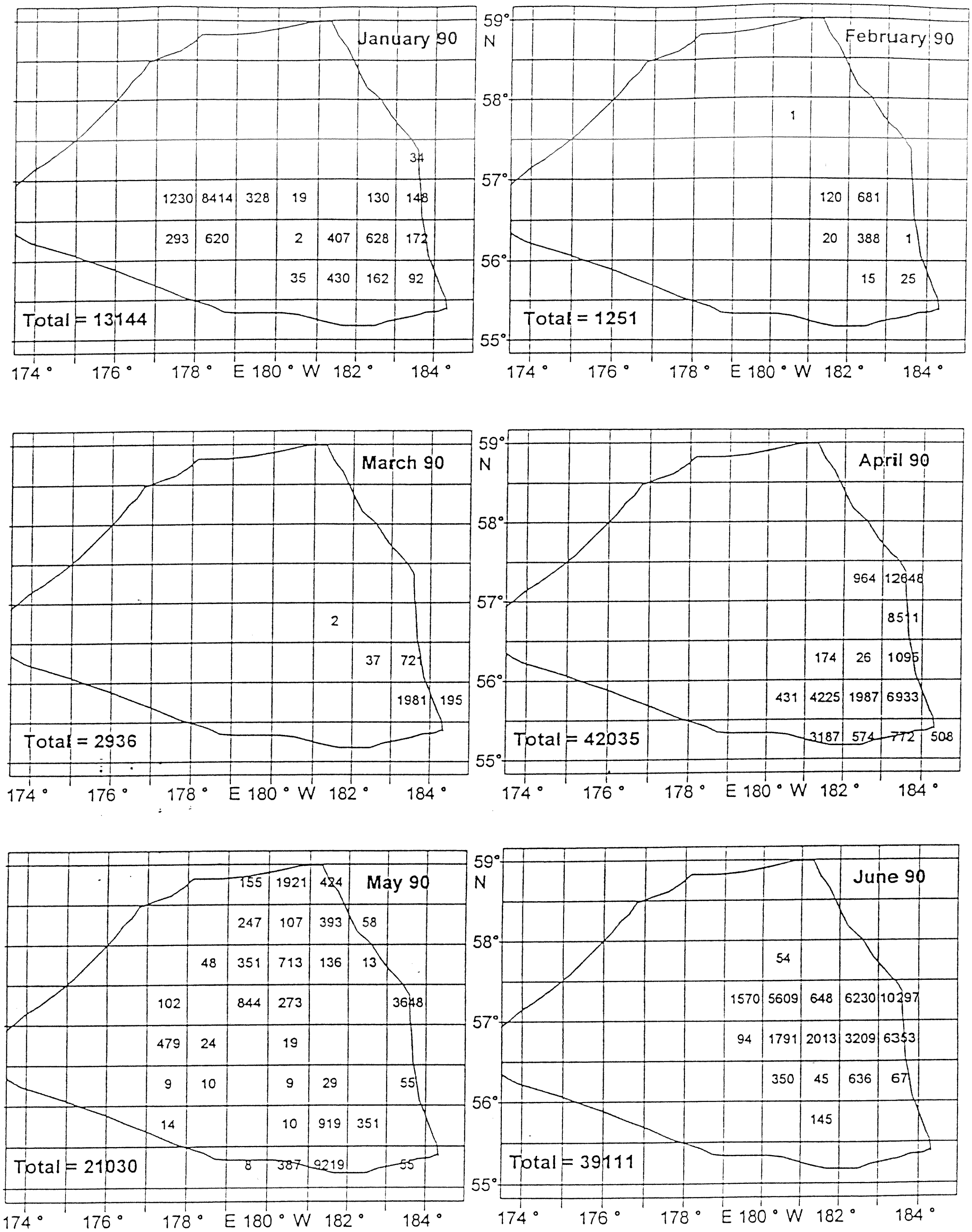


Fig. 7. Polish catches (in metric tons) of pollock in Donut Hole area of the Bering Sea by big statistical blocks (1° longitude x 0.5° latitude) by months in 1990

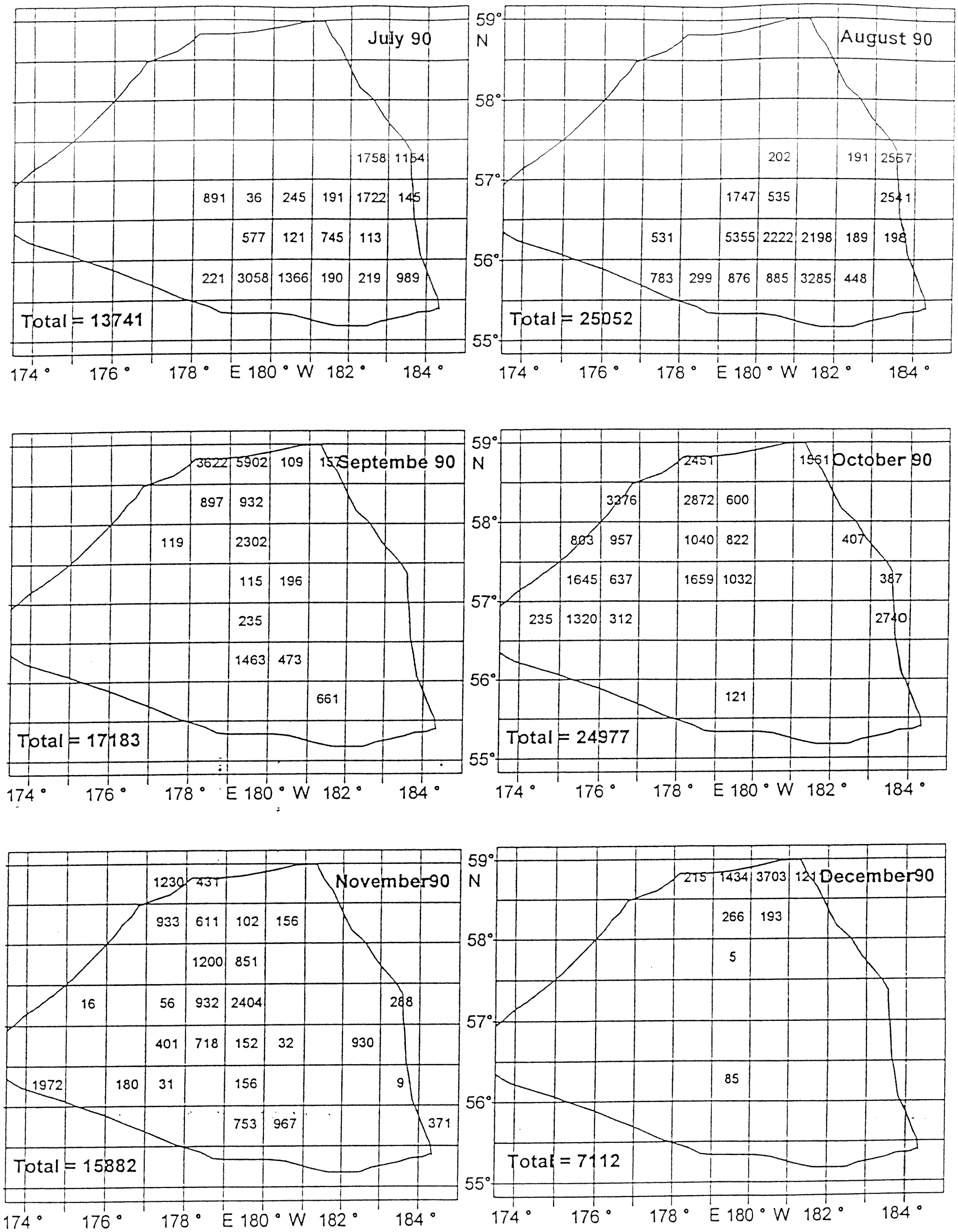


Fig. 7 cont. Polish catches (in metric tons) of pollock in Donut Hole area of the Bering Sea by big statistical blocks (1° longitude x 0.5° latitude) by months in 1990

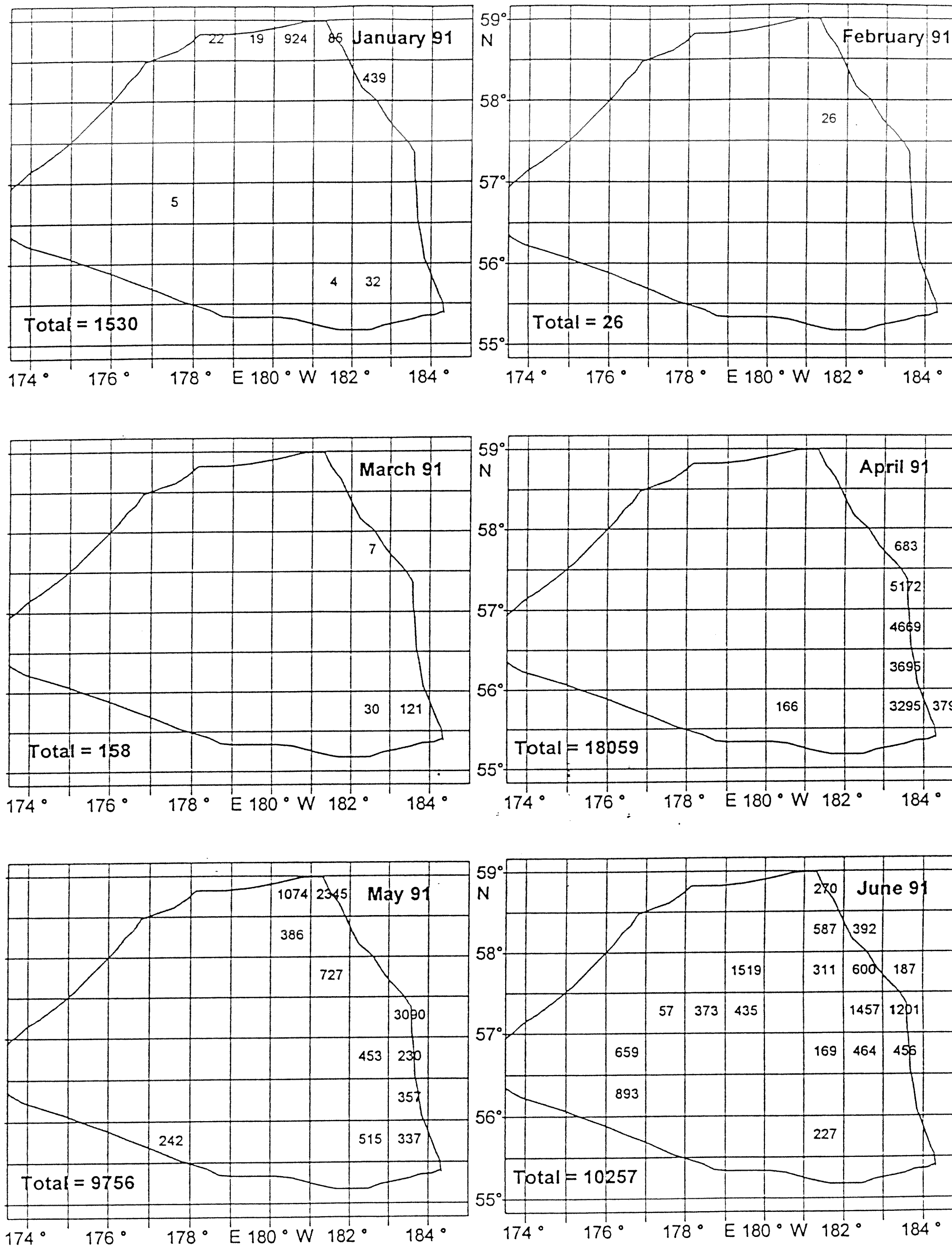


Fig. 8. Polish catches (in metric tons) of pollock in Donut Hole area of the Bering Sea by big statistical blocks (1° longitude x 0.5° latitude) by months in 1991

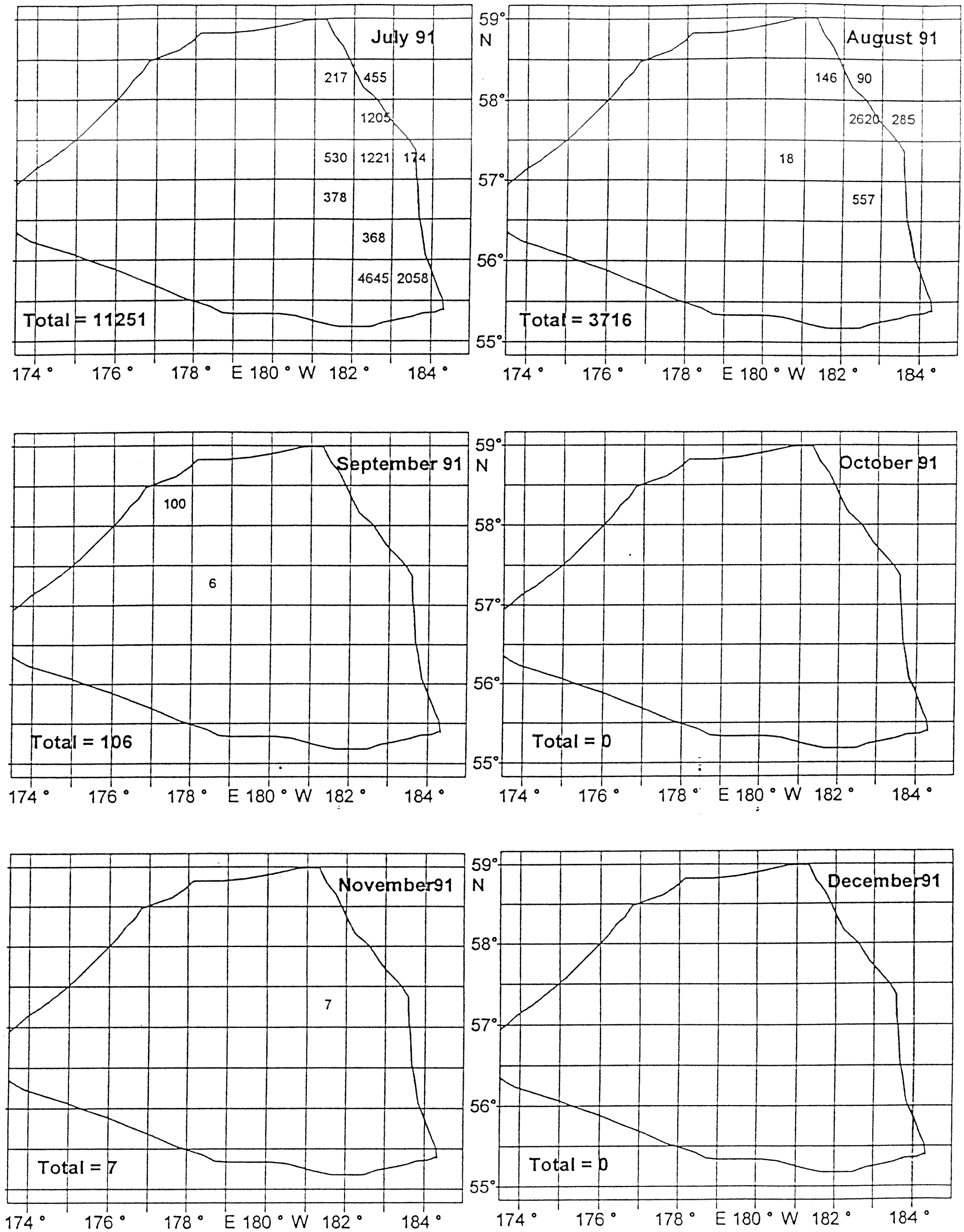


Fig. 8 cont. Polish catches (in metric tons) of pollock in Donut Hole area of the Bering Sea by big statistical blocks (1° longitude x 0.5° latitude) by months in 1991

August, 2001

CRUISE REPORT OF THE TRAWLER "KAI TUO" IN THE INTERNATIONAL WATERS OF THE BERRING SEA, 2001

Shanghai Deep Sea Fisheries Company, China

According to the spirit of the Fifth Annual Conference of the Parties to the Convention on the Conversation and Management of Pollock Resources in the Central Berring Sea, the trawler "Kai Tuo" was dispatched to conduct survey in the international waters of the Berring Sea. "Kai Tuo" arrived on June 7, 2001 and was retreated on July 14,2001, totally operating 38 days. Herein we report the result as follows:

June 7~14, surveying along 2 nautical miles west of USA 200 nm EEZ to and fro from south to north. There were no fish shoals reflected by the fish detector.

June 15, putting down the net at 59°00'N179°10'W, gradually adjusting the net depth from 50 meters to 180 meters, drawing the net at 58°05'N177°50'W, total net-drawing time 12 hours, with a harvest of 4 pollock, weighing 750 grams.

Beginning from June 16, Z-shape survey was carried out east of the international date-line. It lasted three days until the morning of June 20, no fish shoals was detected either.

In the morning of June 20, putting down net westward at 55°44'N175°53'W, drawing at 55°25'N177°30'W, empty net without any harvest. Survey was continued after drawing net.

In the morning of June 21, putting down net at 57°00'N176°35'W, drawing at 55°56'N176°10'W, with a harvest of 3 pollock.

From June 22, S-shape survey northward from 55°37'N175°50'W, drawing net at 59°05'N179°10'W on June 26, no findings.

On June 26, putting down net at 59°03'N179°10'W, drawing at 58°56'N179°55'W, with a harvest of 2 pollock, weighing 750 grams. No other fish species were detected.

June 27~30, surveying along 2 nautical miles west of USA 200 nm EEZ to and fro from south to north again. Still no fish shoals were detected.

On July 1, putting down net at 56°30'N176°30'W, drawing at 57°07'N176°38'W, with a harvest of one salmon, weighing 2 kgs, and 2 pollock.

July 2~4, surveying from 59°00'N179°10'W to 58°00'N177°E, and then turning southeastward to 55°40'N176°W, lasting two days and two nights, no fish shoals were detected.

On July 5, putting down net at 57°10'N176°37'W, drawing at 58°20'N178°25'W, with a harvest of one salmon and 2 pollock.

On July 6, starting from 58°30'N178°45'W, westward S-shape survey between 58°N and 59°N, no fish shoals was detected.

On July 7, surveying north of 57°00'N, west of the international date-line. On July 9, changing to survey along 59°00'N from west to east to 59°05'N179°10'W. No fish shoals was detected.

On July 9, putting down net at 58°00'N177°45'W, drawing at 59°03'N179°11'W, with a harvest of 3 pollock.

From the evening of July 9 to the morning of July 14, surveying the northeast corner of the Berring sea international waters, no findings.

July 14, retreated from Berring international waters.

During the above surveying period, seven hauls were put down, net depth was adjusted accordingly from 50 meters to 250 meters. Total harvest amouted to 16 Pollock and 2 salmons. The result is far beyond expectation. Analyze on basis of the above information, it is possible that, from June to the beginning of August, there will be no fish shoals for fishing production in the mentioned area.

Attechment 1.

Echo integration trawl survey of walleye pollock (*Theragra chalcogramma)*
on the Navarin region in September, 2000

By Sergey B. Popov

The surveys were conducted simultaneously in the same area of the west part of Bering Sea near cape Navarin from 08 September to 12 September 2000.

Acoustic data were collected in the whole water column using EY500 Simrad echosounder on the board of Japanese trawler «KAYE-MARU №28».

The trackline consisted of 468 nautical miles *(Fig.1)*.

The following a specialized complex of the equipment and the software was used for the echo survey:

- echo sounder EY500 Simrad (38 kHz) with single beam antenna in the towed body;
- PC, used as the block of management and monitor of echo sounder;
- GPS receiver of firm Trimble Navigation (USA), connected to the computer of the echo sounder and automatically determining coordinates of a vessel, which are registered together with acoustic data;
- magneto-optical drive Fujitsu FMO-1300WS2 for recording echo signals from the computer, which was used as the store of the information;
- echo processing system EP500 Simrad for reproducing and processing of the recorded echo signals.
- colour printer DeskJet HP850C (Hewlett Packard).

Complex allows to automate completely the collection of data during echo survey, providing record of primary data *(as echo signal from an output of echo sounder)* for their subsequent storage and processing. Other important peculiarity of a complex is an automatic determination of coordinates of a vessel with rather high precision of GPS system, registration of echo signals and coordinates simultaneously. It allows to calculate plots of distribution of measured parameters, to locate significant interesting records.

Nowadays advanced direction in hydroacoustics are methods and equipment of a quantitative estimation of fish schoolings. Created methods *(Manual of hydroacoustic surveying //VNIRO, Moscow, pp.124, 1984)* are well fulfilled and are widely used for biomass estimation of fish schooling and its distribution at realization echo survey in process of fishery researches with the use of echo sounders and echo integrators.

The method of realization of hydroacoustic surveys includes the following standard stages:

- installation of the equipment on a vessel and checking its functioning;
- calibration of the equipment with the use of standard copper sphere;
- choice of transects and parameters of echo survey (speed of a vessel, length of transect lines, place of control trawling, elementary sampling distance unit

(ESDU) and etc.);

- choice of working parameters of the equipment during survey;
- directly registration and record of echo sign;
- data processing of survey, plotting of the echo integration results, estimation of the biomass with a confidence intervals.

The antenna of echo sounders was towed from the left board on a course of a vessel on depth about 2m, in order to exclude influence of reflections of a echo sounder signals from the frame of a vessel and superficial of sound-scattering layers (air bubbles). Proceeding from the methodical recommendations of operation of the echo sounders and design peculiarities of a vessel, the speed of a movement was chosen 5.5 - 6 knots.

The choice of a transects was determined in view of results of the previous surveys, and also with necessity of more detailed surveying of chosen region. Transects of hydroacoustic survey crossed depths about 200 meters. The preliminary tests of echo sounder EY500 have show that the level of a signal-to-noise-ratio at duration of a pulse 1 msec *(Medium)* on such depthes has appeared unsufficient. Therefore duration of a pulse 3 msec *(Long)* with a narrow band was chosen. The record of echo signals was conducted during the day-and-night time with breaks, necessary for conduction control trawls.

Control trawls were carried out in places with high density of fish schooling and at change of character of their registration, where it was possible.

Biomass calculation *W* was computed according to a «Manual of hydroacoustic surveying» *(VNIRO)* and instruction for use of echo processing system EP-500. The technology of processing of acoustic data based on a principle of detailed stratification of region with the account length category of pollock stocks and another species. In a basis of such approach lay the following parcels:

- the acoustic image of a schooling rather adequately displays spatial distribution and behaviour of objects on a certain part of a way in a certain interval of time of days;
- the change of a kind of the acoustic image serves the indicator of change of behaviour and, probably, age-length characteristics of a fish and is subject to check control trawling;
- in case there is record of object in various depth horizons, control trawlings are carried out for separate identification of each type of schooling.
- in accordance with receipt acoustic datas during survey the empirical analysis of echo signals, taking into account character of behaviour of object, type of distribution of target strength *(TS, dB)*, results control trawling, experience of previous work in the certain region came true. In result of the

conducted analysis of an acoustic situation parts of a way on transects of acoustic survey, schoolings appropriate to the characteristic acoustic description with certain length category, confirmed by results control trawlings on certain schooling. Were allocated, in the subsequent such part of a way and length-frequent line appropriate to a schooling were used for biomass calculation of an identified schooling on the given piece of acoustic transect.

Calculating of signals is made on echo processing system EP500 Simrad by a echo-integration method. The values received as a result of surface back scattering strength *Sa* $(m^2/mile^2)$ were converted in area density values of fishes one-size group ρ_i $(ton/mile^2)$ using the following general formula:

$$\rho_i = S_a \cdot \frac{f_i}{\sum_1^n f_i \cdot \sigma_i} \cdot \omega_i \cdot 10^{-6};$$

where: ω_i - mean weight of *i -size* group of fish *(g)*,

σ_i - mean value of acoustic back-scattering cross section of *i-size* group of fish (m^2).

f_i - share of *i-size* group of fishes in control trawl,

$$\sum_1^n f_i = 1$$

n - amount of size groups by results of trawling.

Surface density values of fishes all size groups was computed as:

$$\rho = \sum_1^n \rho_i$$

In turn the acoustic back-scattering cross section was determined through target strength *(TSi, dB)* under the formula:

$$\sigma_i = 4\pi \cdot 10^{TS_i/10};$$

For recalculation *li (cm)* - length of pollock *(biological characteristic)* in the appropriate to it target strength of fish *(the acoustic characteristic of reflective ability a fish)* was used the equation *(Traynor, 1996):*

$$TS_i = 20 \cdot Log_{10}[l_i] - 66;$$

During biomass estimation a method of selective processing of acoustic data was used. It is caused by that at the system, regular collection of acoustic data in a course echo sounding take place large variations of echo-intensity. The essence of a method is, that all echo-intensity *(density)*, survey received in region, are distributed on "*n*" of numerical intervals *(j=1,2,3,..., n - gradation)*. Let, the area of region is equal "*S*", total of elementary sampling distance unit *(ESDU)* in region is equal "*N*", the amount of *ESDU* with echo-intensity in a numerical interval "*j*" is equal "*Nj*". It's suggested, that the area, occupied by echo-intensities in the interval "*j*", is equal:

$$S_j = \frac{N_j}{N} \cdot S$$

In this case dispersion and error at processing become less significant in comparison with classical ways of processing, also spatial influence of autocorrelation between acoustic measures decreases, as datas in each numerical interval "*j*" can get echo-intensities from different places of region.

The essential difficulties of detection and quantitative estimation arise during the work with semi-demersal of concentration in habit. By virtue of the various reasons they only are partially registered by echo sounders. To estimate such concentration can be possible only by a echo integration-trawl way *(K.I. Yudanov, 1992.)*. Taking into account, that vertical opening of bottom trawl was 4m, it was made a decision to carry out echo-integration by two channels: pelagic and bottom *(4-0.5 m to the bottom)*. During result processing of area back scattering coefficient *Sa* $(m^2/mile^2)$ in the second channel was multiplied on appropriate factor of fish masking. This factor was computed as the relation of density, received by results of trawlings, to density under the indications of echo-intergators in the same layer.

To interpolate fish surface density values, the geostatistical gridding method of "Kriging", as recommended *FAO* a method of fields construction of biomass distribution by results of EIT surveys was used.

Biomass of fish aggregations is calculated as:

$$W = \sum_{1}^{n} W_j = \sum_{j}^{n} \rho_j \cdot S_j;$$

where: W_j – biomass in each gradation or on each part of region, (tons);

n – number of gradation or parts of region.

Dispersion of density values *([tons/mile^2]^2)* in each gradation:

$$D_j^2 = \frac{\sum_1^{m_j} [\rho_j - \rho_i]^2}{m_j - 1};$$

where: p_j - mean value of density, appropriate *"j"-th* gradation,

$$\rho_j = \frac{\sum_1^{m_j} \rho_i}{m_j};$$

where: p_i - current value of density in *"j"-th* gradation, *(tons/mile^2);*

m_j - number of datas, appropriate *"j"-th* gradation.

Error of biomass estimation of fishes on all region was calculated under the formula:

$$\varepsilon_W = \pm t(m) \cdot \sqrt{\sum_1^n \frac{D_j^2 \cdot S_j^2}{m_j}};$$

$$m = \sum_1^n m_j;$$

where: *t(m)* - value of Student *t*-distribution.

Software used at calculations *(Excel, Surfer)*, and also the developed programs of thematic data processing provide calculation of errors of biomass estimations of fishes as on each gradation, and on the whole region. However it is necessary to mean, that the getting errors were calculated by the account only variations of integrals *(density)* of fish aggregations inside gradations and on region of surveying, i.e. are not complete errors, the calculation of which is impossible practically at the moment.

Acoustic data were collected using a Simrad EY500 echo-sounding system operating at 38 kHz. Specifications of the acoustic system during the present servey were following:

- pulse duration - 3.0 ms (Long);
- band width - narrow (0.38 kHz);
- absorption loss coefficient - 10 dB/km;
- TVG function - 20LogR;
- TS threshold = -60 dB;
- Sv threshold = -70 dB;
- sound velocity - 1490 m/s.

The echo sounder was calibrated using a 60 mm copper standard sphere with a TS of –33.6 dB using the technique described by Foote *et al.* (1987). It was carried out in day time on drift of a vessel in a point with coordinates 60°58,573N and 179 °26,607W. Sphere was suspended on fishing line and sank to 32 meters. The depth to the bottom results according to the echo measurements was 206 meters.

The measurement of a noise level was carried out at various speeds of a movement of a vessel according to the methodical work instructions with echo sounder EY500. Thus mean value of noise power on the antenna of echo sounder, recalculating to 1W, at speed of a movement of 6 knots was -138.6 db.
During carry out of echo survey ESDU was choose 2.5 miles.

In places of the greatest concentration of fishes was carried out five control trawls, duration on 30 minutes each, on depthes from 98 meters up to 155 meters *(Fig. 1)*.

Walleye pollock was the dominant species (up to 80%) captured in trawls. Average length of a pollock was 44.2 cm. It the most significant aggregation were observed during conducting of transect №7 in coordinates 62°12.920N; 179°42.060E *(trawl № 5)*. The value of *Sa* on this part of transect was 1364 $m^2/mile^2$, extent of a shooling was 4 miles.

Echo-integration of the other parts of transects has shown significant decrease of density of registered shoolings – Sa values occasionally exceeded values in 400 $m^2/mile^2$, at mean: 82,12 $m^2/mile^2$ *(st.dev = 188,2* $m^2/mile^2$*)*.

For biomass calculation the dependence of pollock weight versus length was computed from measurements of 528 fish with length from 18 cm to 78 cm *(Table 1)*, with correlation coefficient 0,98:

$$w = 12.32 \cdot 10^{-3} \cdot l^{2.89}$$

,where: w – weight of pollock *(g)*;
l – length of pollock in cm.

The dependence of weight on length, received by results of measurements of 528 fish is introduced on *Fig. 2*.

At plotting of area density distributions of pollock, for interpolation of area density values, display of a field of biomass distribution, its a quantitative estimation and calculation of each gradation area was used the Serfer software *(Golden Software, USA)*.

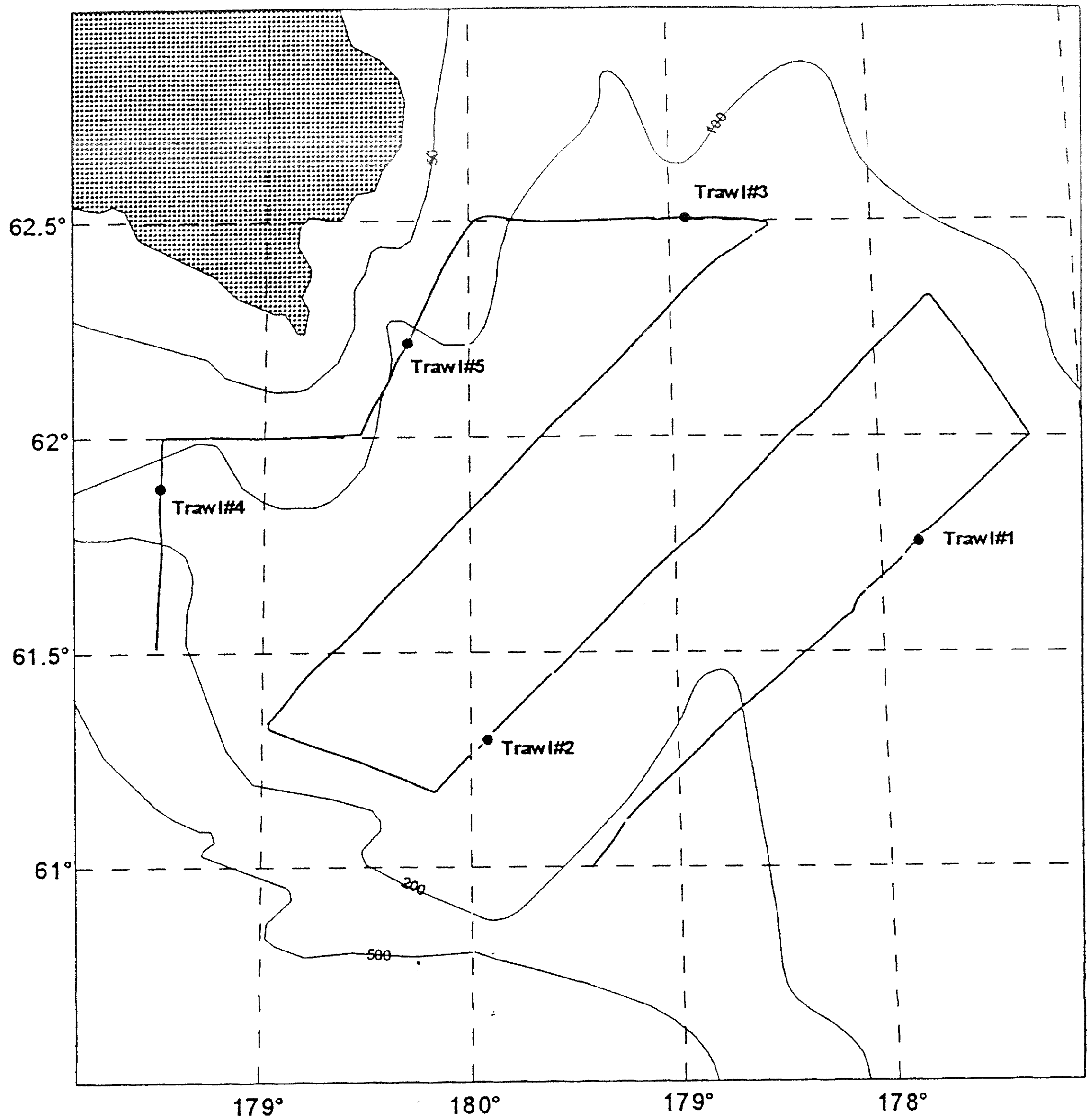


Fig. 1. Plot of hydroacoustic surveys and control trawls, carried out by a vessel "Kaye-Maru № 28 " from September 08 to September 12, 2000

Table 1

Average and standard deviation of length and weight of Walleye pollock by results of cath data.

	Mean	St. deviation	Minimum	Maximum
Length(cm)	48,4	10,0	18,00	78,0
Weight(g)	1015,2	650,8	60,00	3750,0

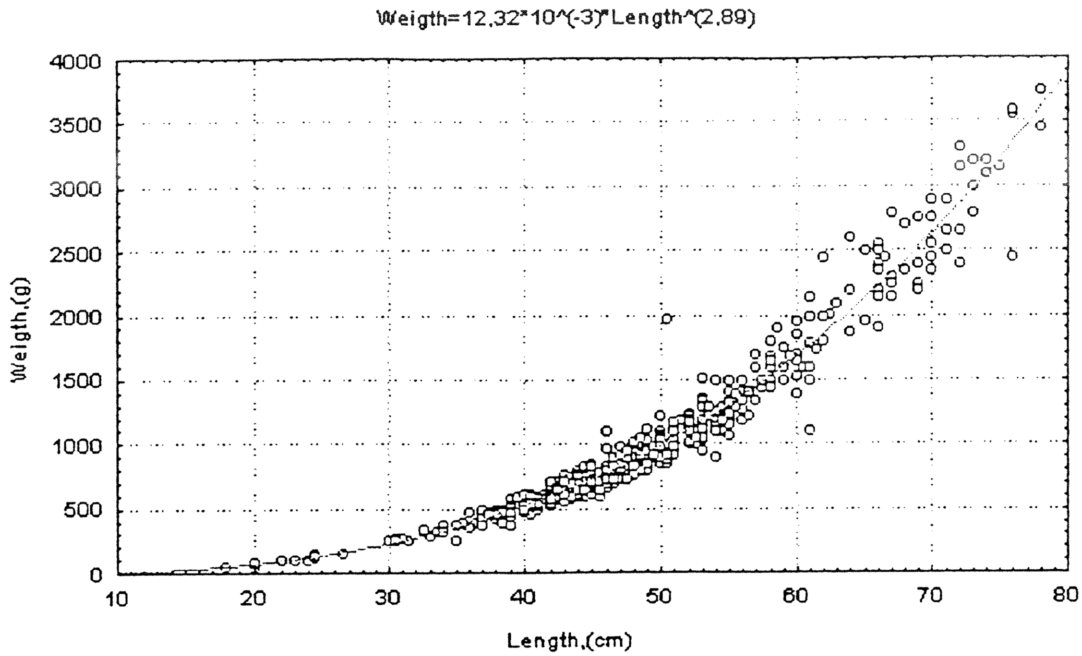


Fig. 2. Dependence of weight from length of Walleye pollock.

To study the spatial structure of pollock distribution, experimental omnidirectional standardised variograms were calculated on the respective estimated fish density. Variograms were fitted by visual inspection to logarithmic model. Software allows the user to monitor the goodness of fit resulting from the adoption of different choices for the parameters of the model, in order to find the best possible fit. The parameters of the logarithmic fit to the experimental variogram so obtained were then applied to implement Kriging interpolation method for biomass estimation and mapping purposes.

The parameters for calculating of density values in points of a regular grid were following:

- method of interpolation - Kriging;
- model of variogram (see Fig. 3) - Logarithmic
  (Scale = 126.4; length = 1.002; anisotropy = 2, 73.84)
- scale of regular grid - 1 mile X 1 mile.

Echo integration-trawl survey of walleye pollock (*Theragra chalcogramma*) on the southeastern Bering Sea shelf and in the Aleutian Basin near Bogoslof Island in February and March, 2001

by Taina Honkalehto, Paul Walline, Denise McKelvey, and Neal Williamson

ABSTRACT

An echo integration-trawl (EIT) survey of walleye pollock (*Theragra chalcogramma*) was conducted on the southeastern Bering Sea shelf and in the Bogoslof Island area during the winter of 2001. The first leg of the survey took place February 19 to March 3 and covered an area of the southeastern Bering Sea shelf north of Cold Bay, AK, to northeast of Umnak Island. The second leg took place March 5 to 11 and covered the southeastern Aleutian Basin adjacent to the Aleutian Islands north of Unalaska Island to west of the Islands of Four Mountains. On the Bering Sea shelf, pollock were most concentrated northeast of Unimak Island. They were also concentrated near the 200 m isobath. In the Bogoslof area (west of 166° W and south and west of the 500 m isobath) pollock were limited to a few regions and were most concentrated in the Samalga Pass area.

The population estimate from this EIT survey for pollock between 14 m from the surface and 0.5 m off bottom was 1.595 billion pollock and 1.057 million tons for the entire area surveyed. Of that, the estimate for pollock inside the SCA, was 1.467 billion pollock and 0.968 million tons. From a biological standpoint, we distinguished the southeastern shelf population from the Bogoslof pre-spawning population. Estimated pollock abundance for the shelf region was 1.424 billion fish and 0.825 million tons. For Bogoslof, we estimated 171 million fish and 0.232 million tons. Of the Bogoslof estimate, the abundance of pollock estimated to be inside U.S. management area 518/CBS specific area was 150 million fish and 0.208 million tons. Pollock abundance, distribution and biological composition was compared and contrasted between the shelf and Bogoslof and between years.

INTRODUCTION

Scientists from the Midwater Assessment and Conservation Engineering (MACE) Program of the Alaska Fisheries Science Center conduct research surveys of Bering Sea walleye pollock (*Theragra chalcogramma*) on an annual or biennial basis to estimate pollock distribution and abundance. Results presented here are from the echo integration-trawl (EIT) survey carried out from February 19 to March 3, 2001 on the southeastern Bering Sea shelf, and from March 5 to 11, 2001, in the Bogoslof Island area between central Unalaska Island and the Islands of Four Mountains, Alaska. The primary cruise objective for the Bering Sea shelf section was to assess abundance and distribution of pollock inhabiting the eastern portion of the sea lion conservation area (SCA) east of 168° W. The primary objective of the Bogoslof portion was to assess the abundance of pre-spawning pollock in the southeastern Aleutian Basin. The biomass estimate for pollock inside U.S. management area 518 (also known as the Central Bering Sea (CBS) specific area) obtained during this survey provides an index of Aleutian Basin pollock abundance which is discussed at each year's CBS Convention meeting. Secondary cruise objectives were to obtain biological information for other research projects as noted in the appendix.

METHODS

Acoustic Equipment

Acoustic data were collected with a Simrad EK 500[1] quantitative echo-sounding system (Bodholt et al. 1989, Bodholt and Solli 1992) on the NOAA ship *Miller Freeman*, a 66-m stern trawler equipped for fisheries and oceanographic research. Two split-beam transducers (38 kHz and 120 kHz) were mounted on the bottom of the vessel's centerboard extending 9 m below the water surface. System electronics were housed inside the vessel in a permanent laboratory space dedicated to acoustics. Data from the echo sounder were processed using Simrad BI500 echo

[1] *Reference to trade names or commercial firms does not constitute U.S. Government* endorsement.

integration and target strength analysis software (Foote et al. 1991, Simrad 1993) on a SUN workstation. Results presented here are based on the 38 kHz data.

Trawl Gear and Oceanographic Equipment

One of two trawl nets was used to sample observed echosign. Midwater and near-bottom echosign was sampled using an Aleutian Wing 30/26 Trawl (AWT), a full-mesh wing trawl constructed of nylon except for polyethylene 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 3.2-cm (1.25-in) codend liner. A 1.27 cm (0.5-in) codend liner was used on two occasions on the Bering Sea shelf. The AWT was fished with 82.3 m (270 ft) of 1.9-cm (0.75-in) diameter 8x19 (wire) non-rotational dandylines, and 226.8-kg (500-lb, leg 1) or 340.2-kg (750-lb, leg 2) tom weights on each side. On or near bottom echosign was sampled with an 83-112 bottom trawl without roller gear. Net mesh sizes ranged from 10.2 cm (4 in) forward and 8.9 cm (3.5 in) in the codend to 3.2 cm (1.25 in) in the codend liner. Headrope and footrope lengths were 25.6 m and 34.1 m (83.9 ft and 111.9 ft), respectively, and the breastlines measured 3.4 m and 3.2 m (11.3 ft and 10.5 ft). Vertical and horizontal net opening and depth were monitored with a WESMAR third wire netsounder system attached to the headrope on most hauls. On some occasions a Furuno netsounder system was used. Both nets were fished with 5 m^2 Fishbuster trawl doors (1,250 kg).

On one occasion, a Methot trawl was used to target scattering in the upper water column. Its mouth was a square frame measuring 2.27 m (89.5 in) on each side. Mesh size was 2 mm x 3 mm (0.08 in x 0.12 in) in the main part of the net, and 1 mm (0.04 in) in the codend. A 1.83-m (6-ft) dihedral depressor was used to generate additional downward force. A calibrated General Oceanics flow meter was attached to the mouth of the Methot trawl to determine the volume of water filtered during trawling. The Methot trawl was attached to a single cable that was fed through a stern-mounted A-frame.

Physical oceanographic data collected throughout the cruise included temperature/depth profile data obtained with a micro bathythermograph (MBT) attached to the trawl headrope and conductivity-temperature-depth (CTD) data collected with a Sea-Bird CTD system at calibration sites and other selected locations. Sea surface temperature, salinity, and other environmental data were collected using the *R/V Miller Freeman's* Scientific Collection System (SCS). Ocean current profile data were obtained using the vessel's centerboard-mounted acoustic Doppler current profiler system operating continuously in water-profiling mode.

Survey Design

Survey design differed slightly between the two areas covered during this EIT cruise. The first leg began on February 19, 2001 on the Bering Sea shelf north of Cold Bay, AK, and extended across the shelf to north of the east end of Umnak Island, ending on March 3. The 22 north-south parallel transects spaced 8 nmi apart covered a 14,200 nmi^2 area. The second leg began on March 5, 2001 north of the center of Unalaska Island at about 167° 18′ W, and proceeded westward to the western part of the Islands of Four Mountains near 170° 15' W, concluding on March 11, 2001 (Fig. 1). The 22 north-south transects spaced 5 nmi apart covered a 3000 nmi^2 area. This year's survey area for Bogoslof was reduced compared with previous years' survey areas. Results from recent surveys have shown that the area occupied by pre-spawning Bogoslof pollock has grown smaller, and that the population could be adequately and more efficiently estimated by focusing effort on the regions adjacent to the Aleutian Island chain and north of Samalga Pass. We reduced the northern extent of tracklines west of 168° W, and thus eliminated an area where very few or no pollock had been observed in recent years. This eliminated area accounted for an average of less than 1% of the biomass estimated from the last four *Miller Freeman* surveys (1996, 1997, 1998 and 2000). It reduced the total Bogoslof survey area by about 1/3. Southern transect endpoints were at bottom depths of approximately 100 m on the Aleutian shelf but varied depending on bottom depth and fish echo sign.

Echo integration and trawl data were collected 24 hours a day at an average vessel speed of 10.9 kts on the shelf, and 11.5 kts in the basin. Acoustic system settings used during the collection were based on results from standard sphere calibrations and on experience from prior surveys. Trawl hauls were made to identify echosign and to provide biological samples. Average trawling speed was about 3 knots. For AWT hauls 1 to 24, all of which were fished with 227 kg (500 lb) tom weights, the average vertical net opening was 22 m and it ranged from 18 m to 30 m. For AWT hauls 25 to 36, which were fished with 340 kg (750 lb) tom weights, the average vertical net opening was 27 m and ranged from 21 m to 35 m. Vertical net opening averaged 3 m for the 83/112. Standard catch sorting and biological sampling procedures were used to provide weight and number by species for each haul. Pollock were sampled to determine sex, fork length, body weight, age, maturity, and ovary weight of selected females. An electronic motion-compensating scale was used to determine all weights taken from individual pollock specimens. Fork lengths were measured to the nearest cm (e.g, a fish measuring between 49.5 cm and 50.5 cm was recorded as 50 cm) and recorded with a Polycorder measuring device (a combination of bar code reader and hand-held computer), then downloaded into a desktop computer. Maturity was determined by visual inspection and categorized as immature, developing, pre-spawning, spawning, or post-spawning. Age-1 pollock samples, adult pollock tissue samples, and fish for the seabird and sea lion prey study were frozen.

Collections of target strength data were made when conditions were suitable (e.g., low fish density, single species aggregations, unimodal size distribution, and calm seas). Repeated passes were made over aggregations of pollock at speeds of less than 4 kts. Biological data were obtained from trawl hauls made in conjunction with the acoustic data collection.

Calibrations using standard sphere techniques were made to monitor acoustic system performance. During calibrations, the *Miller Freeman* was anchored at bow and stern. Copper spheres with known backscattering characteristics were suspended below the transducers and acoustic returns were measured, following the procedure outlined by Foote et al. (1987). Sphere diameters were 60 and 23 mm for the 38-kHz and 120-kHz transducers, respectively. Split-beam target strength and echo-integration data from the copper spheres were collected to describe acoustic gain parameters and transducer beam pattern characteristics.

Data Analysis

Acoustic data collected between 14 m from the surface and 0.5 m off the bottom or to 1000 m, depending on bottom depth, were examined for pollock and stored in a relational database. Where possible, these data were also partitioned into non-pollock fish, myctophid scattering layer, and other categories. Pollock length data from 35 hauls were aggregated into 6 analytical strata based on echosign type, geographic proximity of hauls, and similarity in size composition data. Estimates of pollock backscattering strength in the area represented by each stratum were calculated. These echo integration values were then summed and scaled using a previously derived relationship between target strength and fish length ($TS = 20 \text{ Log } FL - 66$; Traynor 1996) and the length composition data, resulting in an estimate of numbers of pollock by size. Two length-weight relationships were determined from the trawl data, one for pollock on the eastern shelf and one for the Bogoslof area. These relationships were used to estimate pollock biomass for each length category. Pollock exhibit sexual dimorphism with females reaching larger sizes than males at the same age, particularly at older ages. In the Bogoslof region, pre-spawning pollock aggregations are tightly packed and are vertically and/or horizontally stratified by sex. Because of both the high densities and stratification by sex, it is difficult to obtain a random sample of lengths from these aggregations to estimate population size composition. Although we caught more females than males in Bogoslof, we assumed a 50:50 sex ratio and derived a population size composition using this assumption. As there was about a year lag time between a survey and completion of age-reading from that survey, age data were not available for winter 2001. However, age data from the winter 2000 EIT survey were available, and age-specific numbers and biomass were estimated for that year using age-length keys developed from the trawl data.

Numbers and biomass at length were estimated for pollock between 14 m from the surface to within 0.5 m from the bottom for the entire area surveyed. This area was divided into two regions, the eastern shelf (11,600 nmi^2), and the Bogoslof area (5600 nmi^2). For consistency with the Bogoslof time series, a portion of the shelf survey (part of the 8 nmi spaced transects during leg 1) in waters typically included in the Bogoslof Island area survey was removed from the "shelf" and added to the "Bogoslof" survey area for population estimates and biological results on pollock. The area covered in the first leg of the survey but considered to be part of Bogoslof was west of 166° W, and south and west of the Bering Sea shelf break in basin waters beginning at about the 500 m isobath and deeper. Estimates were also made for the CBS specific area, and the SCA.

Error bounds on the acoustic data were derived using a 1-dimensional (1D) geostatistical method as described in Petitgas (1993), Williamson and Traynor (1996), and Rivoirard et al. (2000). We chose geostatistical methods for computation of error (± 2 relative estimation error) because the approach accounts for the spatial structure observed and thus provides a more realistic estimate of error than one derived from the random sample variance. The 1D method uses variation between the total abundance observed on transects to calculate an estimation variance, and has been the method of choice in most previous surveys. The method was applied separately to the shelf and Bogoslof areas because transect spacing differed (8 and 5 nmi, respectively). Since part of the Bogoslof area was sampled with 8 nmi transect spacing, the two sections of the Bogoslof area were analyzed separately. The estimation variance for the combined total biomass was calculated by adding the estimation variances for the two sections. Sampling error bounds on the acoustic data can be used to provide error bounds on the point estimate of biomass. These error bounds quantify only acoustic data sampling variability; other sources of error (e.g., target strength, trawl sampling, error associated with ageing error) are not included. These sampling error estimates should be treated as preliminary. Methods employed will be reviewed and revised (if necessary) in future reports.

RESULTS

Calibration

Four acoustic system calibrations were conducted; one during gear trials in Port Susan, WA, two in Captains Bay, AK, during the Bering Sea surveys, and one at the end of the winter field season in the Gulf of Alaska (Table 1). No significant differences in gain parameters or transducer beam pattern characteristics were observed for the 38 kHz collection system. The 120 kHz system is known to be somewhat temperature sensitive, but no significant differences in parameters were observed for the 120 kHz system during the Alaska field season.

Target Strength

One target strength collection was made on age 1 pollock. Results are still being analyzed and will be reported elsewhere.

Oceanographic

Oceanographic data were collected from 36 trawl-mounted MBTs (Table 2), 5 CTDs (Fig. 1), and continuous surface thermosalinograph readings. Temperature profiles showed well mixed water columns both in the shelf area and in the basin (Fig. 2). Average temperature by 50 m depth intervals between the surface and 250 m was similar across the whole area, ranging from 3.8° to 4.2° C on the Bering Sea shelf and from 4.0° to 4.2° C in the basin, although observed basin temperatures were more variable than those on the shelf. Below 250 m, average basin temperatures declined steadily from about 3.9° to 2.4° C at 1300 m.

Surface temperatures (Fig. 3) ranged from 2.7° to 4.8° C. Most surface waters were between 3.6° and 4.2° C. Adjacent pockets of warmer and cooler water were observed in the Aleutian basin. Coldest surface temperatures (less than about 3.0° C) were observed on transects 100 and 101 near the Alaskan Peninsula, and in basin waters north of Umnak Island and Samalga Pass between transects 215 and 220.. Warmest waters (greater than about 4.2° C) occurred near the Aleutian chain in basin waters west of about 167° W. Surface salinity ranged from 30.9 to 33.3 ppt (Fig. 4). Salinities were lowest (less than about 31.3 ppt) in the east along the Alaskan peninsula and Umnak Island, and increased from east to west becoming highest (greater than 33 ppt) in the basin near Unimak Island and west.

Biological composition

Biological data and specimens were collected from 36 trawl hauls; 32 AWT, three 83/112, and one Methot trawl haul (Tables 2 &3, Fig. 1). Biological samples for several additional research projects, including prey studies and genetics, were also collected (Table 4). On the Bering Sea shelf, walleye pollock comprised 93% and 56% by weight of midwater and bottom trawl catches, respectively (Tables 5&6). Rock sole (*Lepidopsetta sp.*) comprised about 20% by weight of the bottom trawl catches. In the Bogoslof area, pollock comprised 99% by weight of the (midwater) catches (Table 7). Although the next most abundant species group in the Bogoslof area, myctophidae, comprised only 0.3% by weight, it represented 25% of the midwater catches by number.

Bering Sea Shelf

Length compositions of pollock from the 23 shelf survey trawl hauls were grouped into four analytical strata (Fig. 5 a-d), three shelf strata and one shelf/Bogoslof transition stratum for the region traditionally part of the Bogoslof survey. Fork lengths ranged from 9 to 65 cm among pollock sampled in shelf area trawl hauls. Size-based population estimates for shelf pollock indicated two dominant size modes, pollock of about 46 cm, and juveniles, likely to be age one pollock, at about 12 cm (Fig. 6). The juvenile aggregations were centered on the shelf north of the 200 m isobath, between transects 116 and 121. For fish greater than 29 cm long from hauls where more than 50 fish were sampled, catch sex ratios ranged from 23 to 65% male (Fig. 7). Most female (50%) and male (57%) pollock greater than 29 cm long (approximately ages 3+) were pre-spawning (Fig. 8a), although quite a high proportion, 35% of females and 22% of males, were developing. One percent of females and about 5% of males were actively spawning. Among pollock sampled that were smaller than 29 cm long, 96% were immature. Females were estimated to be 50% mature at 43 cm (Fig. 8c). Among female pollock greater than 38 cm long sampled in trawl hauls, the proportion mature varied by region (Fig. 9). Those in trawl hauls east of about 165° W had a higher proportion mature than those to the west. Average gonadosomatic index (GSI) for pre-spawning females on the shelf was 0.10 (Fig. 10a). As was observed with proportion mature, the average GSI was higher between 163° and 165° W, and lower west of 165° W (Fig. 10c). The regression equation of total body weight to length used in population analysis was $W = 0.00357 * FL^{3.1915}$, where W is weight, and FL is fork length for males and females combined (Fig. 11a).

Distribution of pollock was continuous across the first 11 transects on the shelf (Fig. 12). Transect 104 had the highest densities of pollock of all shelf transects and represented 18% of the estimated biomass. West of transect 110, pollock were more concentrated near the 200 m isobath. At transect 116, pollock abundance increased between the 200 m isobath and the northern transect endpoints at 55° 30' N. Echosign appearance differed between day, when pollock were densely aggregated either on or off bottom, and night, when pollock were more evenly distributed and loosely aggregated from the bottom into midwater. Juvenile pollock in the northwest survey area sampled by hauls 17 to 24 (see Fig. 1) looked slightly different during day than adult pollock, as they did not form as dense on-bottom aggregations. Instead, they tended to form medium-density scattering layers or schools about 5 to 50 m off bottom. Sometimes these juvenile pollock schools appeared in the upper water column.

Abundance estimates for pollock in the Bering Sea shelf survey area between 14 m below the surface and 0.5 m off-bottom were 1.423 billion fish and 0.825 million tons (Fig. 13a). The 1D analysis produced an estimate of 16.2% for the sampling error (twice the relative estimation error) in estimated biomass on the shelf. The 95% confidence interval around the biomass estimate was 0.691-0.959 million tons. A very high biomass observed at a single point, resulting from a single, dense, near-bottom school, had great influence on the overall variance observed on the shelf. When this point was excluded from the analysis and replaced by the overall mean, the sampling error estimate was reduced to 11.5%.

Although age data were not available from otoliths collected in winter 2001, age composition data were available from the winter 2000 eastern Bering Sea (EBS) shelf survey. In 2000 average length at age was fairly similar between males and females on the shelf (Fig. 14). Population estimates by age for EBS shelf pollock showed that in 2000, the 1992 and 1996 year classes each made up about 25% of the population by numbers. The 1995 year class was next most numerous, at about 20% of the population (Fig. 15a).

Bogoslof Area

Pollock encountered west of 166° W, and south and west of the 500 m isobath were considered to be part of the Bogoslof pre-spawning population. Length compositions from hauls 25 to 36 were grouped into two analytical strata (Fig. 5e,f). Two hauls from the shelf section of the survey comprised a shelf/Bogoslof transition stratum for the region traditionally part of the Bogoslof survey (Fig. 5d). Among pollock sampled in trawl hauls, fork lengths ranged from 38 to 70 cm. Size-based population estimates for Bogoslof pollock indicated that their average length was 55 cm. Catch sex ratios ranged from 7 to 85% male among pollock greater than 29 cm from hauls where more than 50 fish were sampled (Fig. 7). Most female (96%) and male (68%) pollock were in pre-spawning condition (Fig. 8b). One percent of females and about 26% of males were in spawning condition. The average gonadosomatic index (GSI) for pre-spawning females was 0.17 (Fig. 10b), the same as in Bogoslof in winter 2000, indicating that survey timing was similar in relation to peak spawning. The average Bogoslof GSI was much higher than the average shelf GSI, suggesting that spawning was more spread out in time and/or occurred later on the Bering Sea shelf. A marked increase in average GSI appeared at about 167° 30' W, in the shelf/Bogoslof transition area, and continued westward (Fig. 10c). The regression equation of total body weight to length used in population analysis for Bogoslof was $W= 0.0103 * FL^{2.934}$, where W is weight, and FL is fork length of males and females combined, assuming a 50:50 population sex ratio (Fig. 11b).

In the Bogoslof area, defined as west of 166° W and south and west of the 500 m isobath, most pollock echosign was observed along the Aleutian Islands (Figs.1 and 12). Low-density scattering layers occurred between the 500 m isobath and the Aleutian chain along transects 114 to 119. More pollock were encountered in a small submarine canyon the northeast corner of Umnak Island (between and including transects 203 and 204) where bottom depths were between about 500 and 1000 m, and, as in previous years, most pollock were observed in a submarine basin area north of Samalga Pass and east of the Islands of Four Mountains. Aggregations were centered between 400 and 500 m in depth. In the Samalga area, pollock aggregations were about 300 m thick, and were typically observed to extend horizontally for about 5-10 nmi.

The abundance estimate for pollock in the Bogoslof area between 14 m below the surface and 1000 m (or to within 0.5 m off-bottom) was 171 million fish, and 0.231 million tons (Table 8, Fig.13b). The 1D analysis produced an estimate of 20.0% for the error (twice the relative estimation error) in estimated biomass in Bogoslof. The 95% confidence interval around the biomass estimate was 0.185-0.278 million tons. The abundance of pollock estimated for the subset of Bogoslof pollock inside U.S. management area 518/CBS specific area (see Fig.1) was 150 million fish and 0.208 million tons, about 90% of the estimated population for the whole area (Table 8).

The population estimate for the SCA, obtained by adding together estimates from the shelf area excluding transects 100 and half of 101, and Bogoslof excluding transects 221, 222, and half of 220, was 1.467 billion pollock and 0.968 million tons. The population estimate for the entire area surveyed was 1.595 billion pollock and 1.057 million tons.

Biomass estimates from the EIT survey for pollock on the winter southeastern shelf and in the southeastern Aleutian Basin area, between 14 m below the surface and 1000 m (or to within 0.5 m from bottom) in 2001 are summarized as follows:

Area	Million metric tons	
SCA	0.968	SCA includes Area 518/CBS specific area (0.208)
east of SCA	0.089	
west of SCA	0.000	
Total survey	1.057	

Pollock otoliths collected during this cruise were not yet analyzed and thus estimates of age composition for 2001 were not available. Age data from winter 2000 were analyzed. In winter 2000, average length at age was higher for Bogoslof area females than for Bogoslof males at most ages (Fig. 14). Population estimates by age showed that the 1989 year class was still dominant in the Bogoslof area (Fig. 15b). The 1992 year class was next most abundant, followed by the 1990 year class. In winter 2000, a small number of pollock from older year classes (1984,1982 and 1978) which represented most of the biomass in the Bogoslof population prior to 1993 were still present.

DISCUSSION

The first part of the winter 2001 survey on the southeastern Bering Sea shelf differed from the winter 2000 shelf survey in that it took place during 2 weeks rather than 4 days, had transects oriented north-south rather than east-west, and covered a much larger portion of the SCA. The same survey design had originally been planned for winter 2000, but poor weather and sea ice conditions limited that survey to 4 days, altered the transect design and spacing, and reduced the area covered. Water temperatures were warmer in winter 2001 than in 2000, probably due to a less severe winter and reduced sea ice cover on the shelf in 2001. Comparing and contrasting the biological results from 2001 and 2000 showed some similarities between years. Modal lengths of the adult pollock increased from about 42 cm in 2000 to about 46 cm in 2001. Aggregations of age-1 pollock were observed near the 200 m contour in 2001 in an area not surveyed in 2000. Among adults, maturity was similar for both sexes between years, and the length at 50% maturity for females was 43 cm for both years. Estimated pollock abundance on the eastern shelf in 2001 (0.825 million t) was about the same as in 2000 (0.816 million t). However, abundance results are not strictly comparable due to the difference in shelf areas surveyed between 2000 (5000 nmi^2) and 2001 (11,600 nmi^2, not including the area included in Bogoslof).

In the second part of the winter 2001 survey, we monitored pollock in the Bogoslof Island area for the 12th time in 13 years (including a Fisheries Agency of Japan survey in 1999 in which the

U.S. participated). Pre-spawning pollock aggregate in this area in February and March each year (Honkalehto and Williamson 1995, 1996), and spawn between the end of February and mid-March. During the earliest survey years (1989-1992), Bogoslof pre-spawning pollock occupied a large area of the southeast Aleutian basin extending from east of Bogoslof Island westward to the Islands of Four Mountains and Samalga Pass, with highest concentrations surrounding Bogoslof Island. At that time they were subject to a large commercial fishing effort which was halted in 1992 due to pollock population decline there and in international waters of the Aleutian Basin also know as the donut hole.

In 2001, as in recent years (1998 and 2000), pollock were highly concentrated in Samalga Pass (76% of biomass in 2001, 73% in 1998 and 72% in 2000), and were sparsely distributed elsewhere. There was no significant change in population between 2000 and 2001 (95% confidence intervals overlap, Table 8). However, Bogoslof population estimates from EIT surveys showed a trend of decreased biomass with time (Fig. 16). No significant recruitment from younger year classes has occurred since the 1989 year class began recruiting in about 1994 (Tables 9-12, Fig.17). Tracing numbers by age of dominant Bogoslof year classes (Figs. 18 and 19) showed that the 1989 year class became the main component of the population at age 5, replacing the 16-year-old 1978 year class in 1994. The 1992 year class peaked in estimated numbers at age 7 in 1999, and thus seemed unlikely to boost the population size in the future.

Bogoslof pre-spawning pollock appeared distinct from those pre-spawning pollock inhabiting the Bering Sea shelf in winter. In 2000, the 11-year-old 1989 year class dominated the Bogoslof population followed by the 1992 year class and there were many older fish, while the 1996 year class dominated the shelf population (Fig. 15). Average length at age was higher for both sexes in Bogoslof than on the shelf (Fig. 14). A much higher proportion of females were in pre-spawning condition and the average GSI was much higher in Bogoslof (Fig. 8). Although its contribution to the overall Bering Sea pollock gene pool is not known, the Bogoslof population is unusual in that its deep-water spawning aggregations are composed of larger, relatively older fish with higher average GSI than pollock found on the shelf.

SCIENTIFIC PERSONNEL

Leg 1 (February 19-March 3)

Name	Sex/Nationality	Position	Organization
Neal Williamson	M/USA	Chief Scientist	MACE
Kevin Landgraf	M/USA	Fish. Biologist	MACE
Paul Walline	M/USA	Fish. Biologist	MACE
John Horne	M/USA	Fish. Biologist	MACE
Denise McKelvey	F/USA	Fish. Biologist	MACE
Phil Porter	M/USA	Computer Specialist	MACE
Sarah Stienessen	F/USA	Fish. Biologist	MACE
Steve de Blois	M/USA	Fish. Biologist	MACE
Hyun-Su Jo	M/Korea	Fish. Biologist	NFRDI

Leg 2 (March 5-11)

Name	Nationality	Position	Organization
Taina Honkalehto	F/USA	Chief Scientist	MACE
Steve de Blois	M/USA	Fish. Biologist	MACE
Kevin Landgraf	M/USA	Fish. Biologist	MACE
Paul Walline	M/USA	Fish. Biologist	MACE
Mike Brown	M/USA	Computer Specialist	MACE
Steve Porter	M/USA	Fish. Biologist	FOCI
William Floering	M/USA	Fish. Biologist	MACE
Hyun-Su Jo	M/Korea	Fish. Biologist	NFRDI

MACE - Midwater Assessment and Conservation Engineering Program,
Alaska Fisheries Science Center, Seattle, WA

FOCI - Fisheries Oceanographic Coordinated Investigations, AFSC, Seattle, WA

NFRDI – National Fisheries Research and Development Institute, Pusan, Republic of

Korea

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A/S, Strandpromenenaden 50, Box 111, N-3191 Horten, Norway.

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Williamson, N and J. Traynor. 1996. Application of a one-dimensional geostatistical procedure to fisheries acoustic surveys of Alaskan pollock. ICES Journal of Marine Science, 53: 423-428.

Appendix– Other Research Projects–List of Contacts

Legs 1 and 2 (EBS shelf and Bogoslof)

Research Objective	Contact	Organization/Email address
Fecundity collection	Bern Megrey	AFSC/ Bern.Megrey@noaa.gov
Fecundity collection	Hyun-Su Jo	NFRDI/
Whole fish collection and sea lion and seabird prey study	Alan M. Springer	U. of AK/ ams@ims.uaf.edu
Stomach collection from non-spawning pollock	Pat Livingston,	AFSC/Pat.Livingston@noaa.gov
Pollock fin clips	Mike Canino,	AFSC/ Mike.Canino@noaa.gov

Leg 2 (Bogoslof)

Research Objective	Contact	Organization/Email Address
Spawn pollock	Steve Porter,	AFSC/steve.porter@noaa.gov

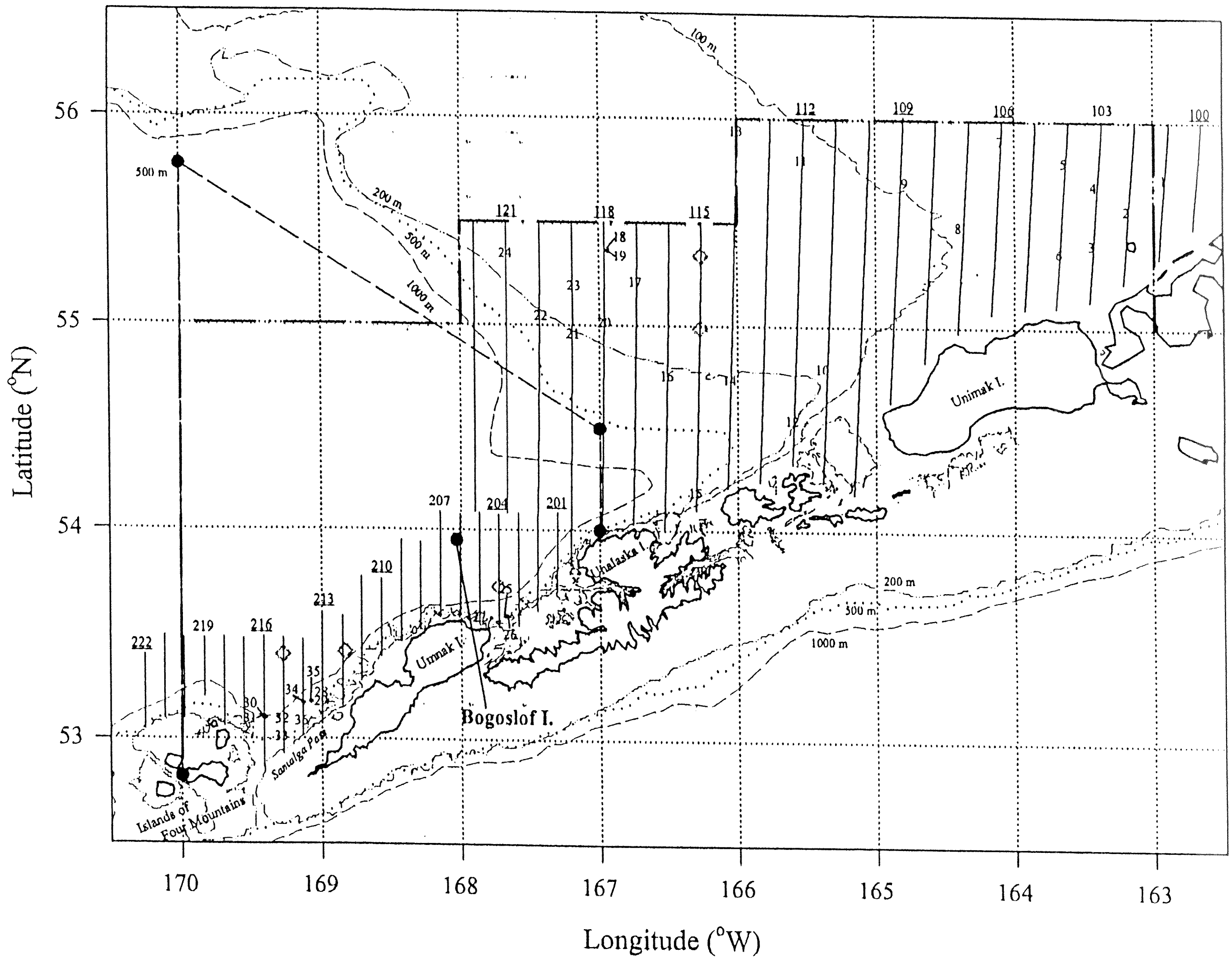

Figure 1. Trackline and haul locations from the winter 2001 echo integration-trawl survey of the southeast Bering Sea shelf and Bogoslof Island areas. Transect numbers are underlined. Conductivity-temperature-depth (CTD) sample locations are indicated by diamond symbols. Dash-dotted line indicates boundary of the sea lion Conservation Area (SCA), and dashed line outlines U.S. management area 518/Central Bering Sea specific area.

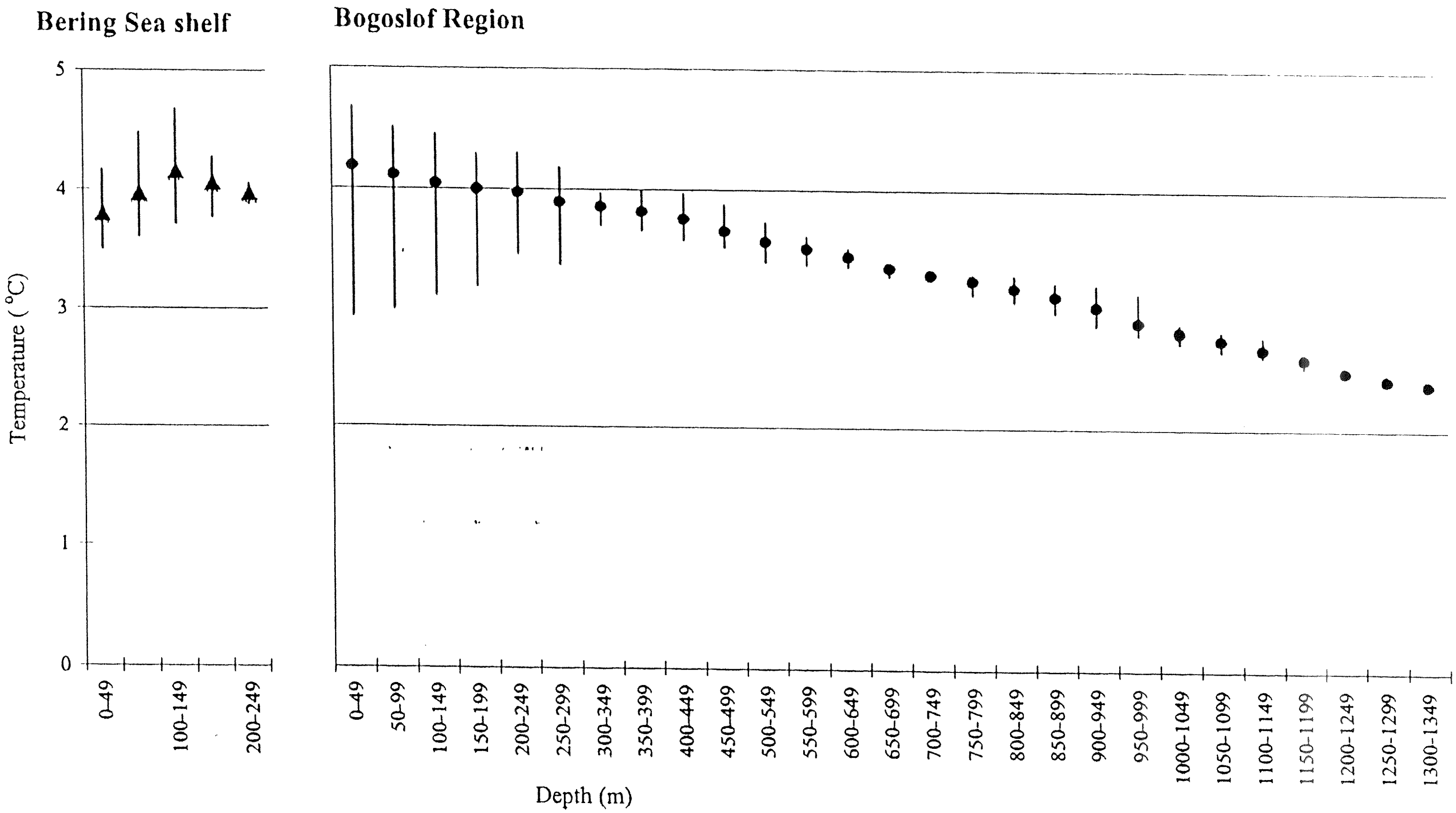

Figure 2. Average temperature (°C) (symbols) and range (vertical bars) by 50-m depth intervals observed during the southeastern Bering Sea shelf and Bogoslof region.

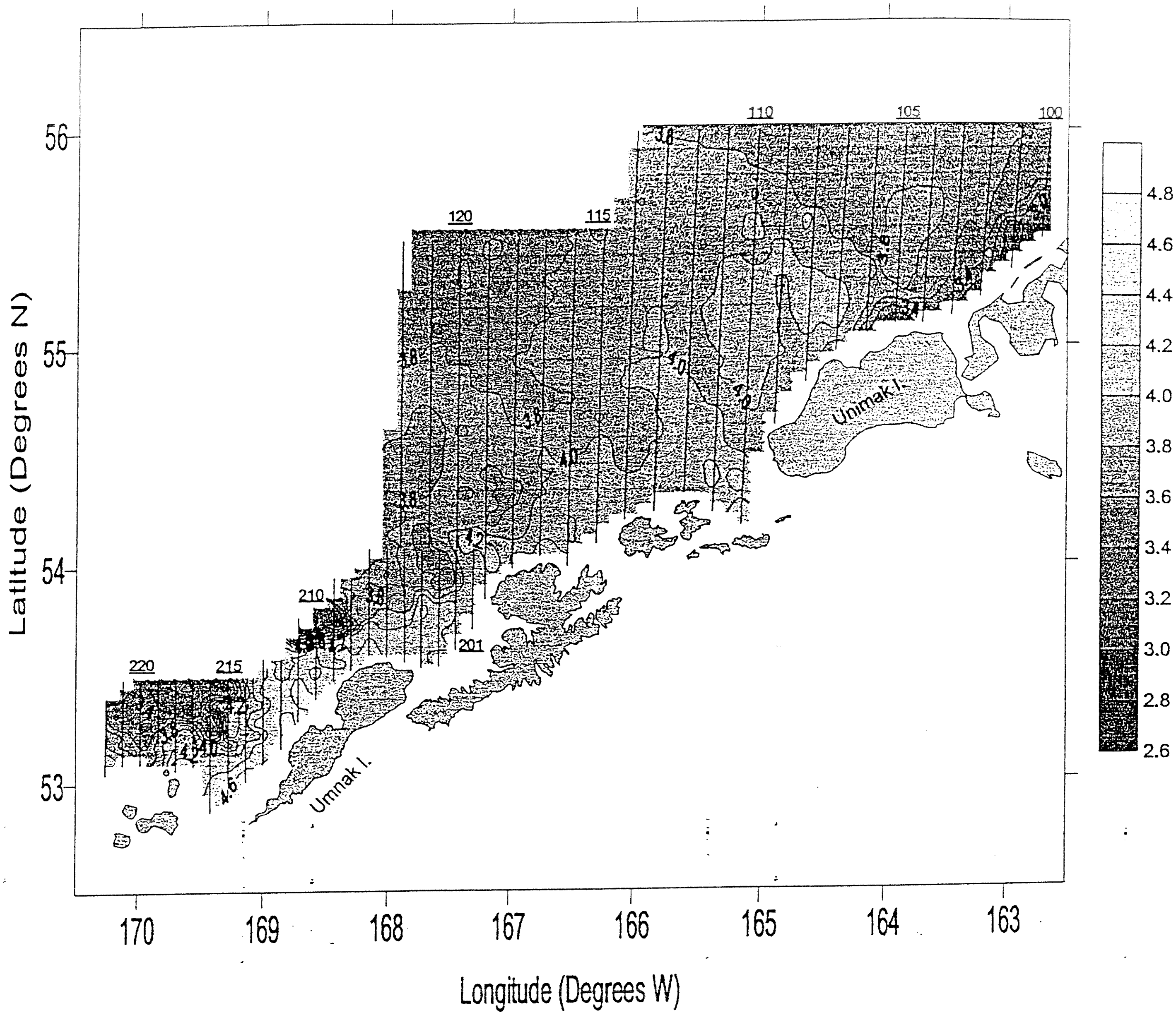

Figure 3. Transect lines with surface temperature contours (in degrees C) during the winter 2001 echo integration-trawl survey of the southeast Bering Sea shelf and Bogoslof Island areas. Transect numbers are underlined.

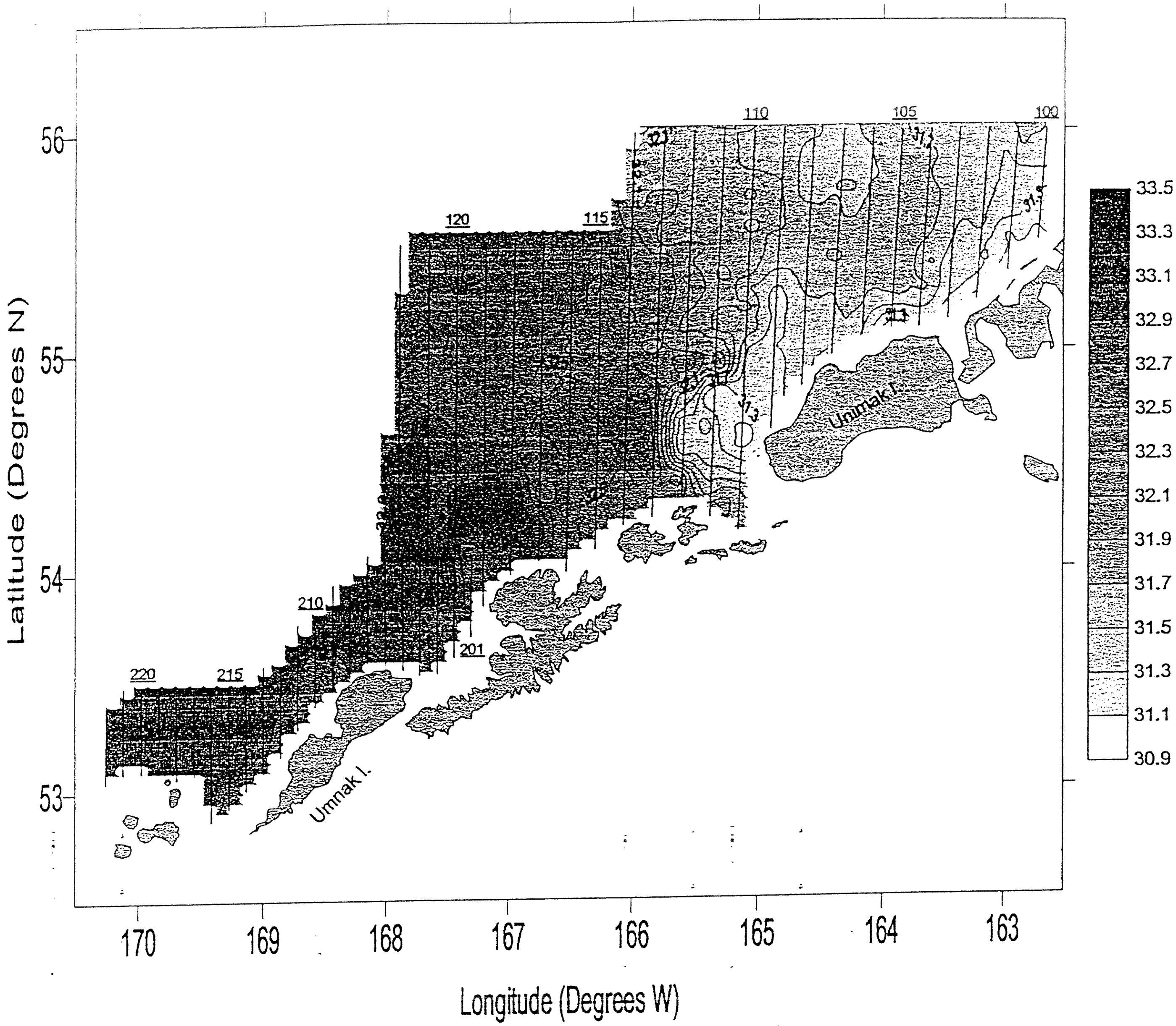

Figure 4. Transect lines with surface salinity contours (in ppt) during the winter 2001 echo integration-trawl survey of the southeast Bering Sea shelf and Bogoslof Island areas. Transect numbers are underlined.

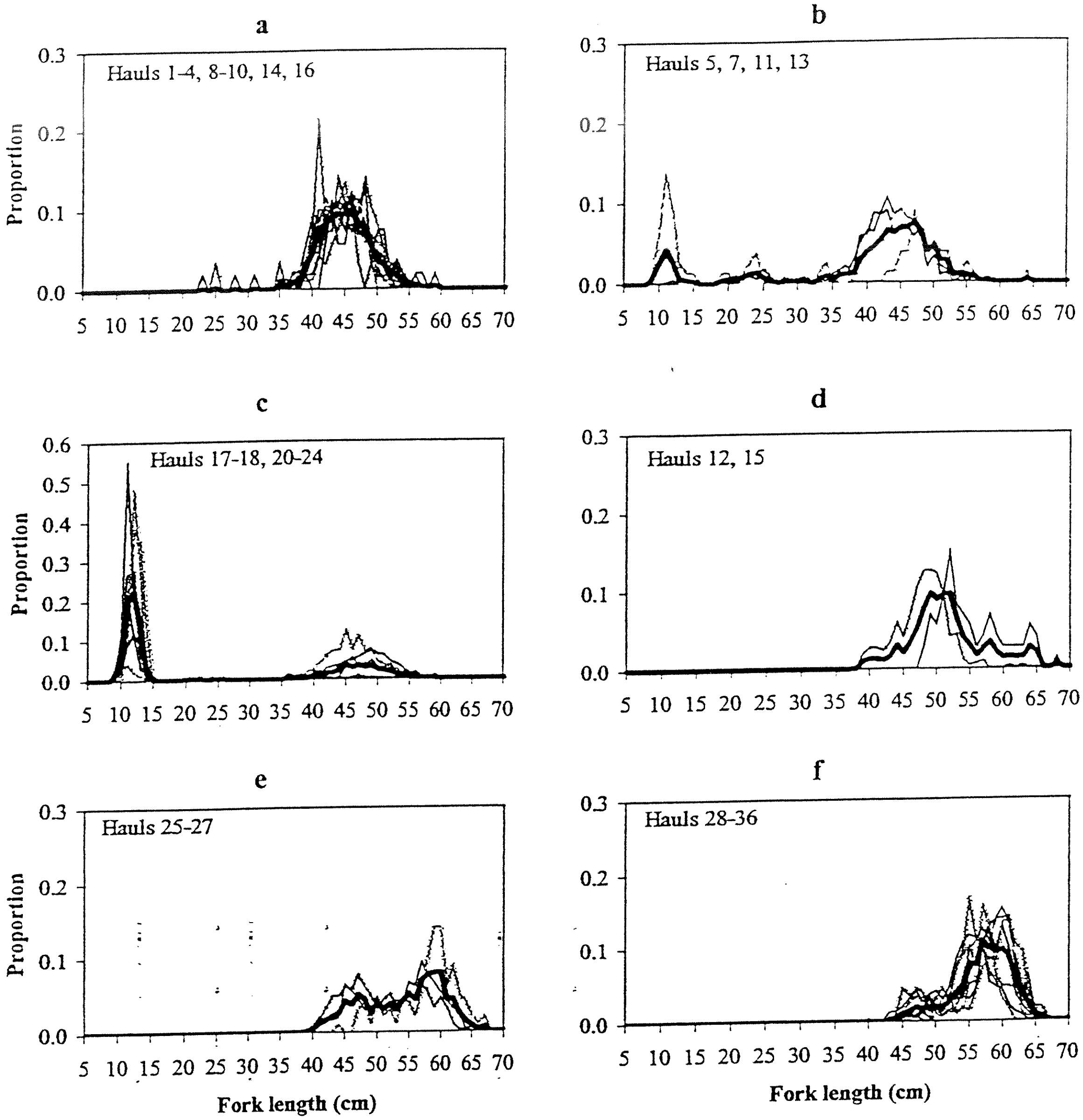

Figure 5. Pollock proportions by length from raw haul data, and haul data averaged (heavy line) by length stratum for the southeastern Bering Sea shelf (a-c), shelf/Bogoslof transition zone (d), and the Bogoslof area (e-f).

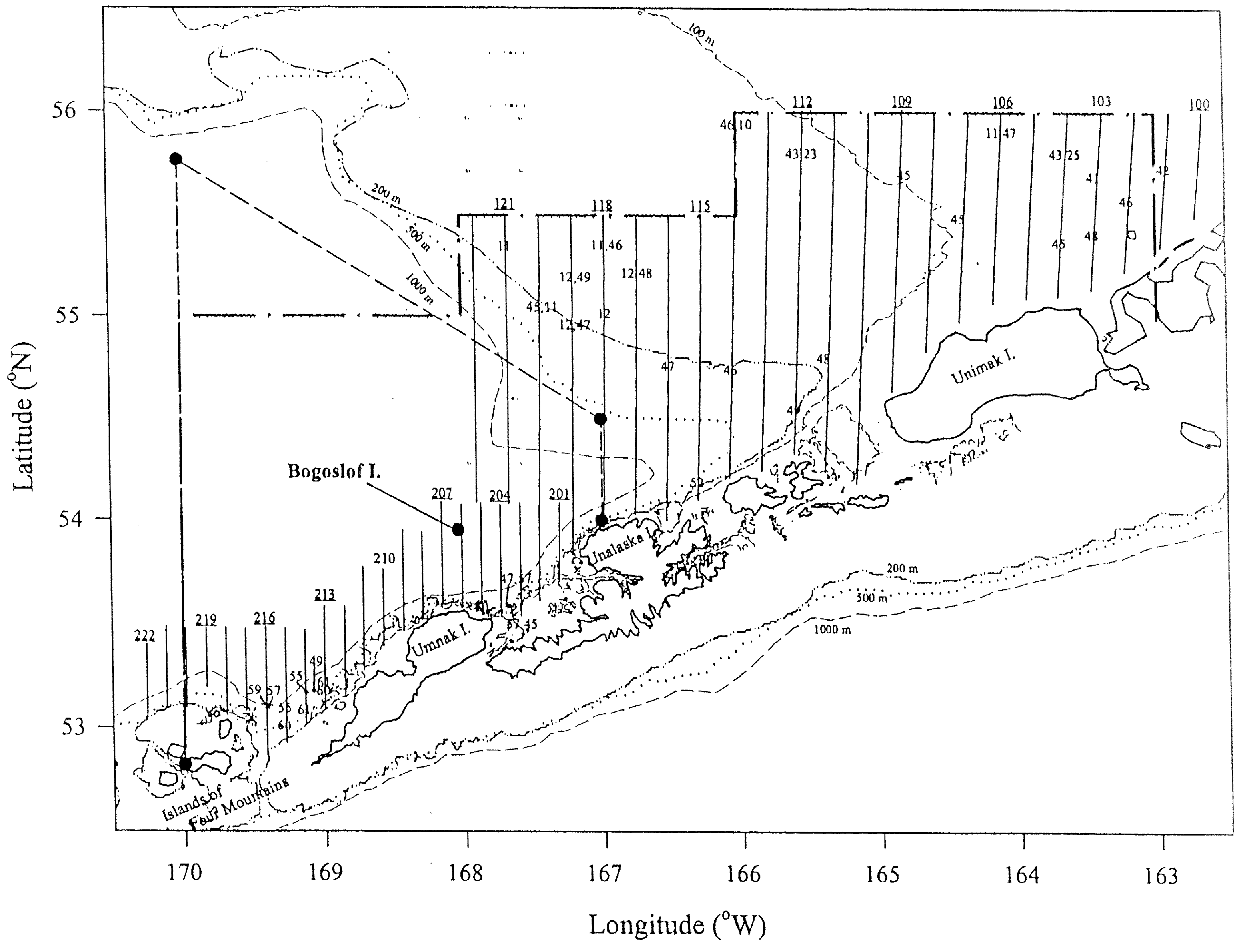

Figure 6. Trackline and haul locations with pollock modal and bimodal lengths (cm) from the winter 2001 echo integration-trawl survey of the southeast Bering Sea shelf and Bogoslof Island areas. Transect numbers are underlined. Dash-dotted line indicates boundary of the sea lion Conservation Area (SCA), and the dashed line outlines U.S. management area 518/Central Bering Sea specific area.

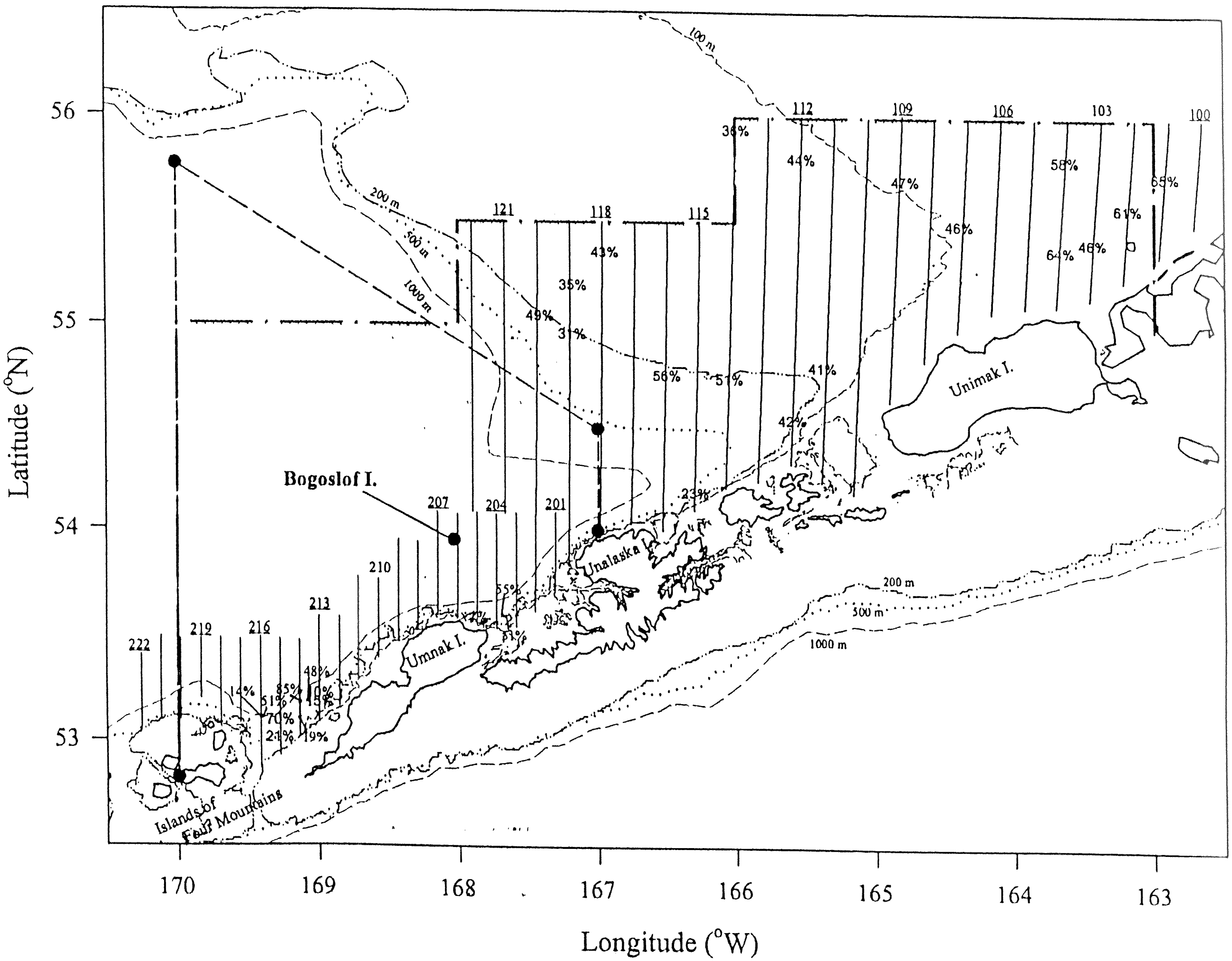

Figure 7. Trackline and haul locations with percent male pollock > 29 cm (N > 50) from the winter 2001 echo integration-trawl survey of the southeast Bering Sea shelf and Bogoslof Island areas. Transect numbers are underlined. Dash-dotted line indicates boundary of the sea lion Conservation Area (SCA), and the dashed line outlines U.S. management area 518/Central Bering Sea specific area.

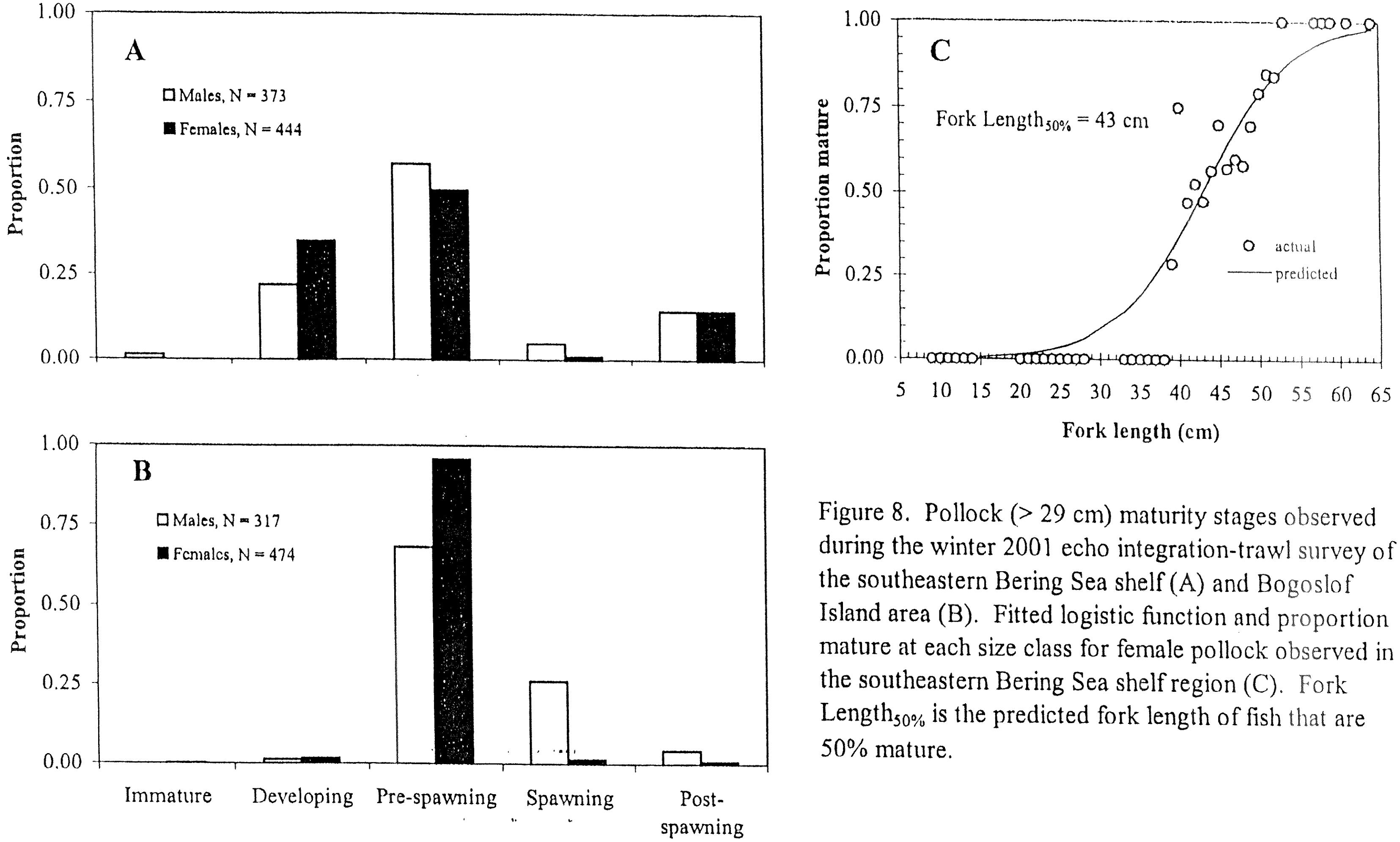

Figure 8. Pollock (> 29 cm) maturity stages observed during the winter 2001 echo integration-trawl survey of the southeastern Bering Sea shelf (A) and Bogoslof Island area (B). Fitted logistic function and proportion mature at each size class for female pollock observed in the southeastern Bering Sea shelf region (C). Fork $Length_{50\%}$ is the predicted fork length of fish that are 50% mature.

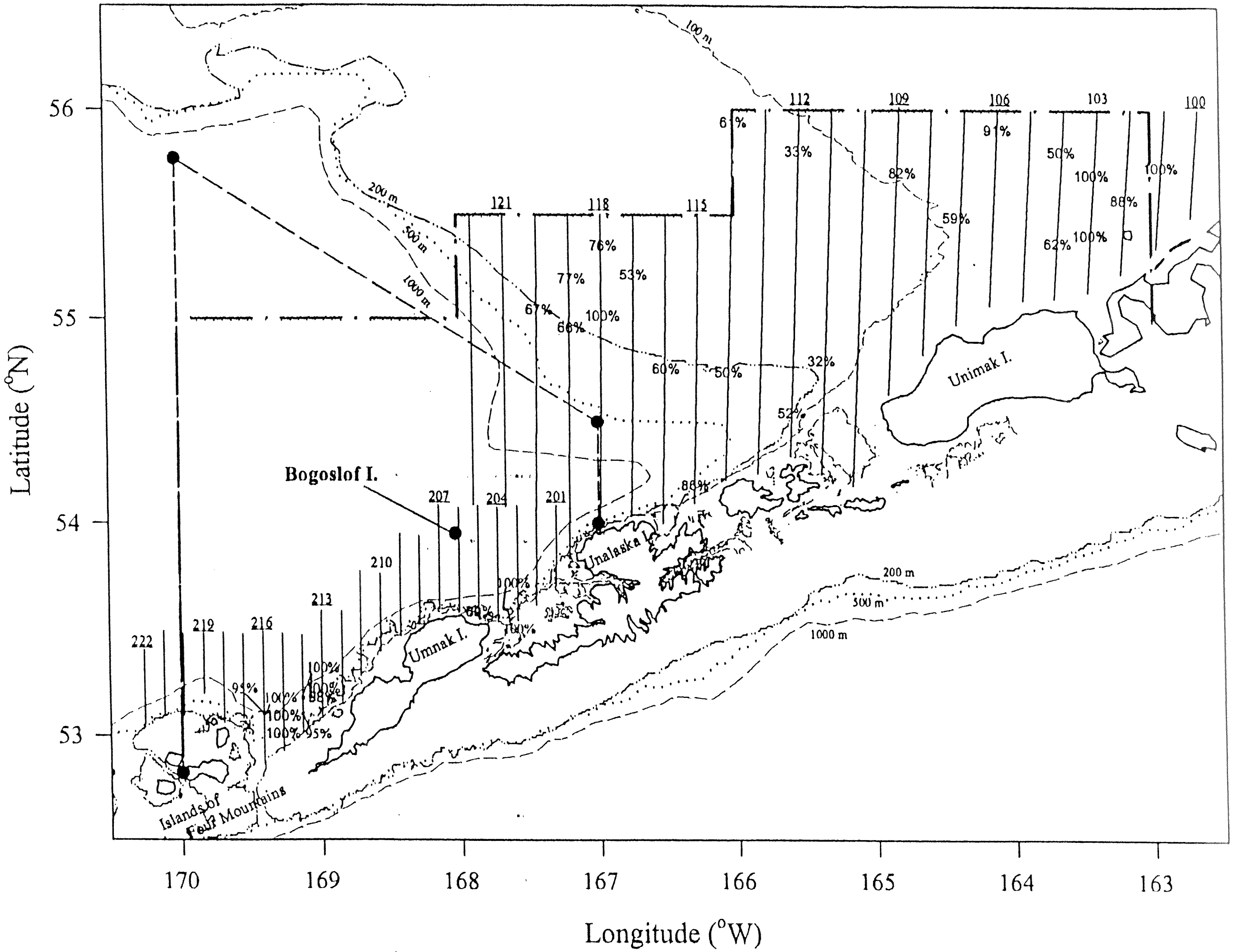

Figure 9. Trackline and haul locations with percent mature female pollock > 38 cm from the winter 2001 echo integration-trawl survey of the southeast Bering Sea shelf and Bogoslof Island areas. Transect numbers are underlined. Dash-dotted line indicates boundary of the sea lion Conservation Area (SCA), and the dashed line outlines U.S. management area 518/Central Bering Sea specific area.

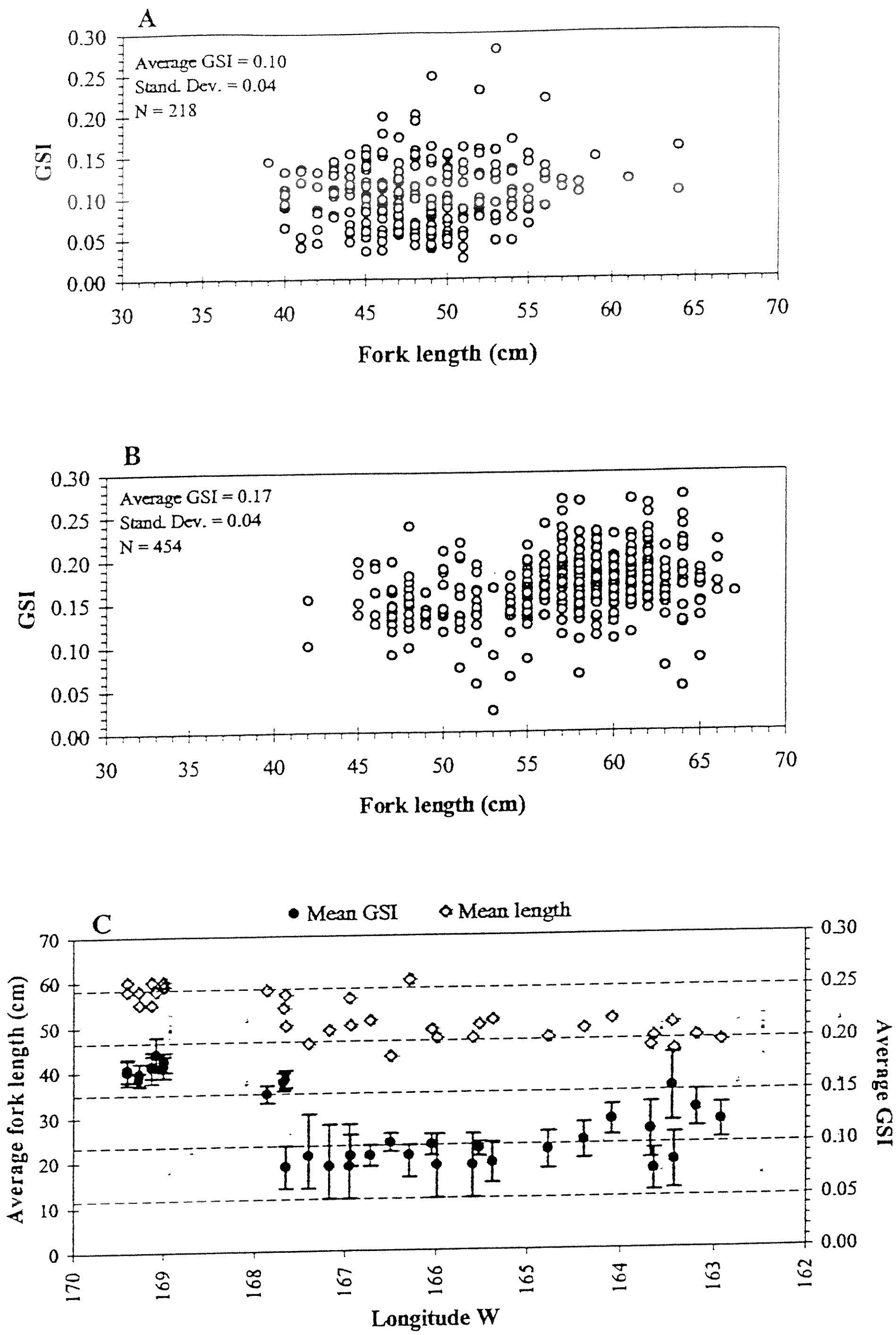

Figure 10. Pollock gonado-somatic indices (GSI) for mature females as a function of length from the winter 2001 echo integration-trawl survey of the southeastern Bering Sea shelf (A) and Bogoslof Island area (B). Average GSI with 95 % confidence intervals, and fork length averages as a function of longitude are depicted in C.

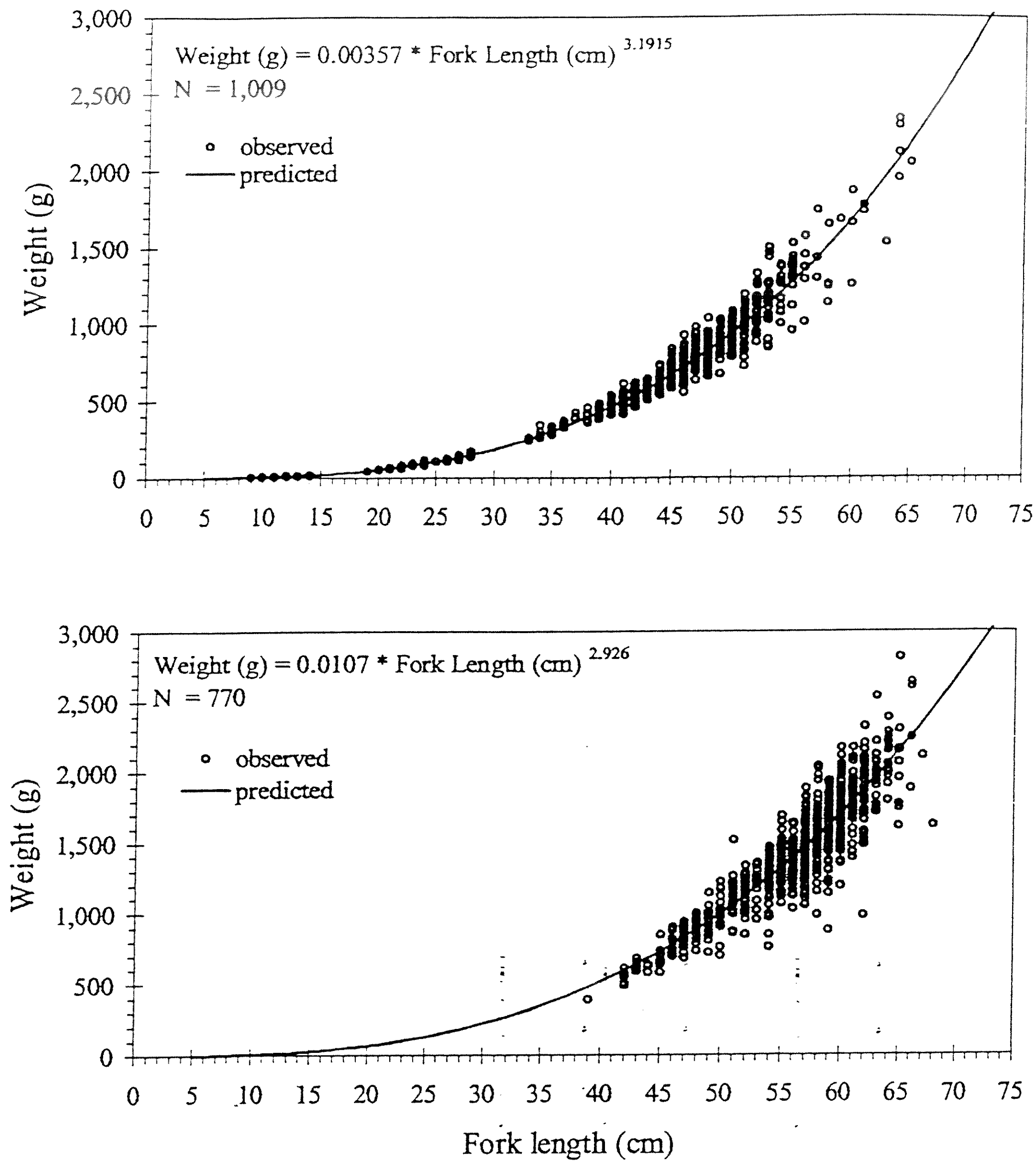

Figure 11. Pollock length-weight relationships observed during the winter 2001 echo integration-trawl survey of the southeastern Bering Sea shelf (upper), and Bogoslof Island region (lower).

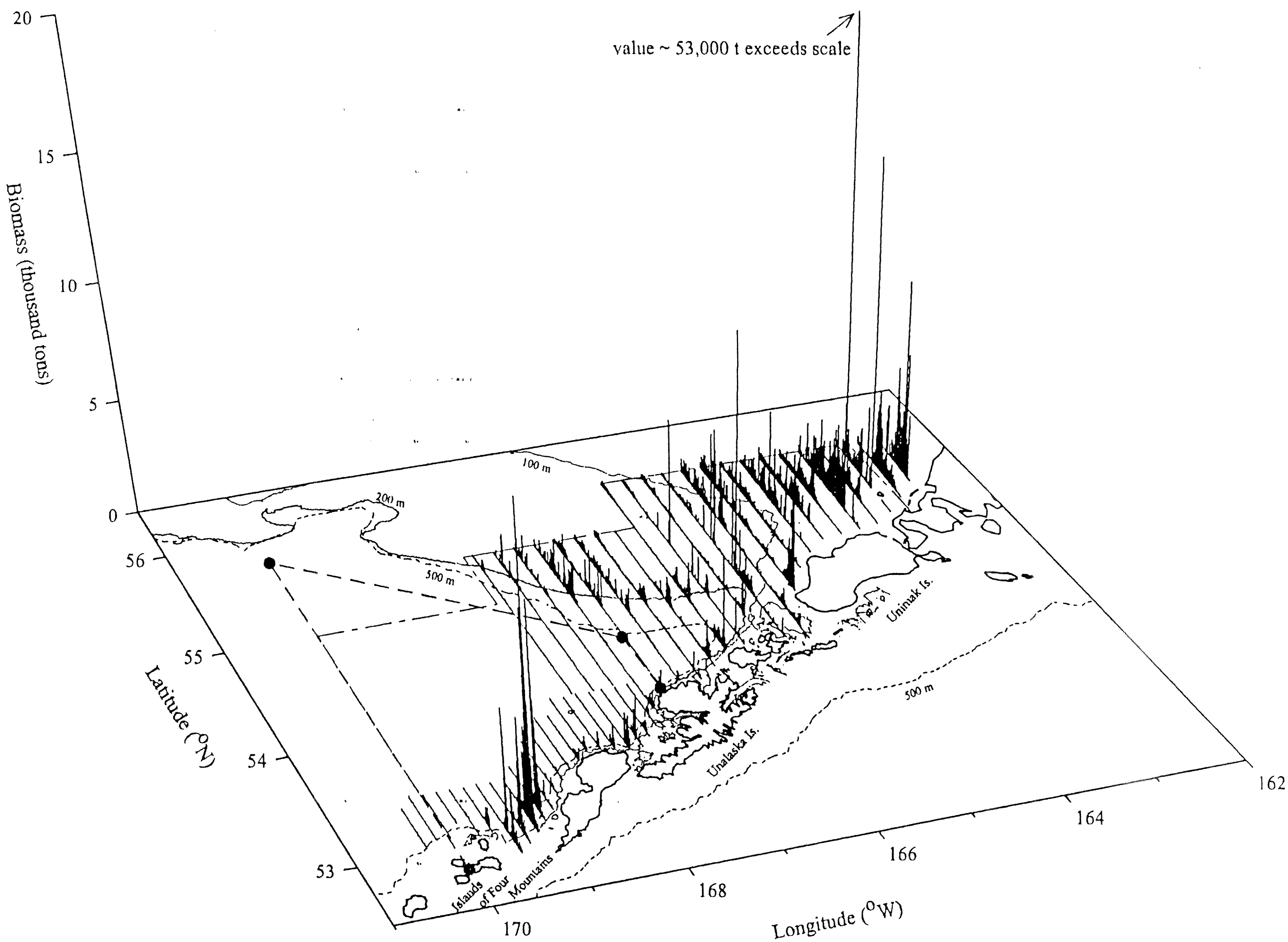

Figure 12. Pollock biomass (t) along tracklines from the winter 2001 echo integration-trawl survey of the southeast Bering Sea shelf and Bogoslof Island areas. Dash-dotted line indicates boundary of the sea lion Conservation Area (SCA), and long dashed line outlines U.S. management area 518/Central Bering Sea specific area.

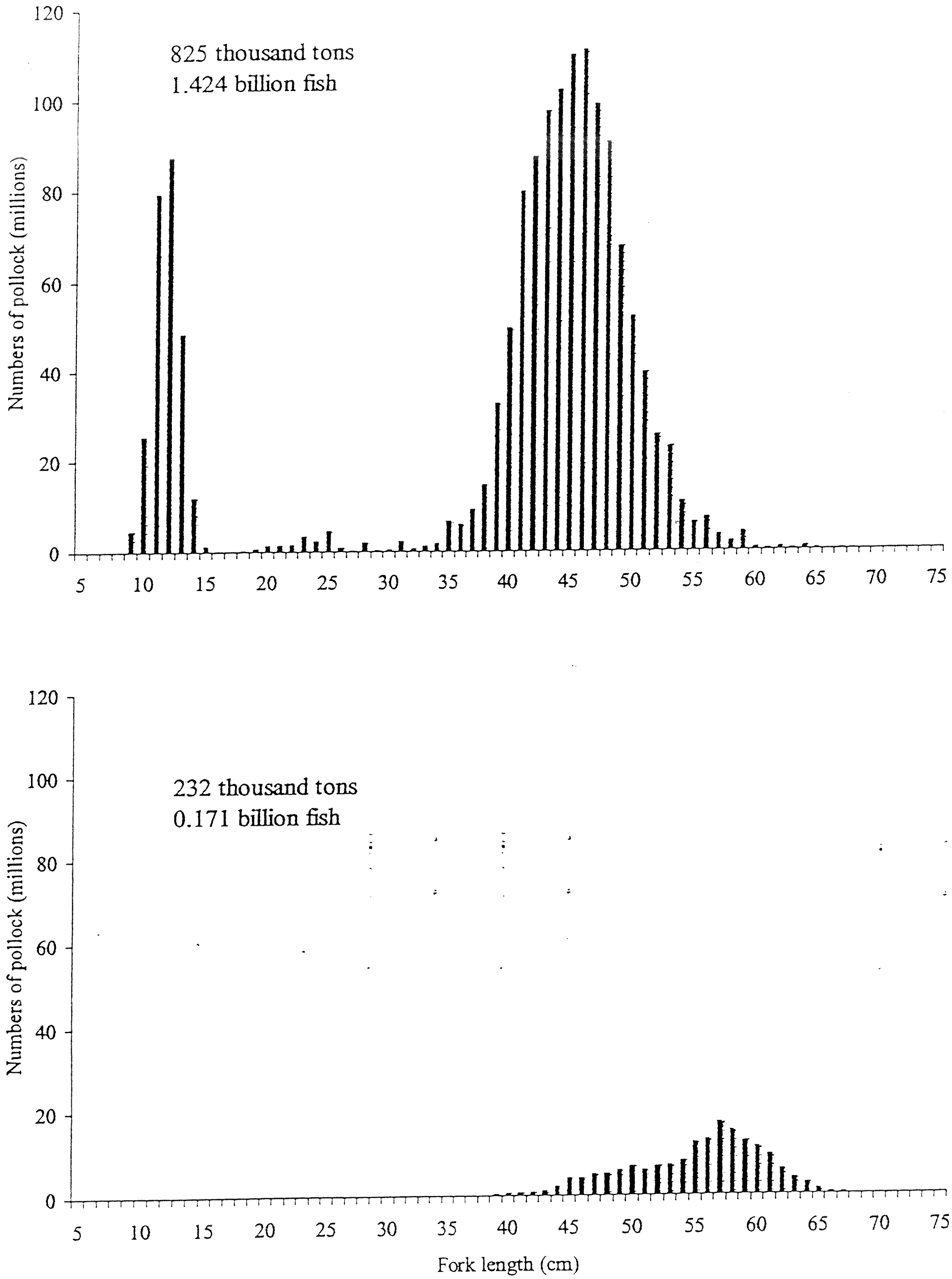

Figure 13. Estimated pollock numbers at length from the winter 2001 echo integration-trawl survey of the southeastern Bering Sea shelf (upper) and Bogoslof Island region (lower).

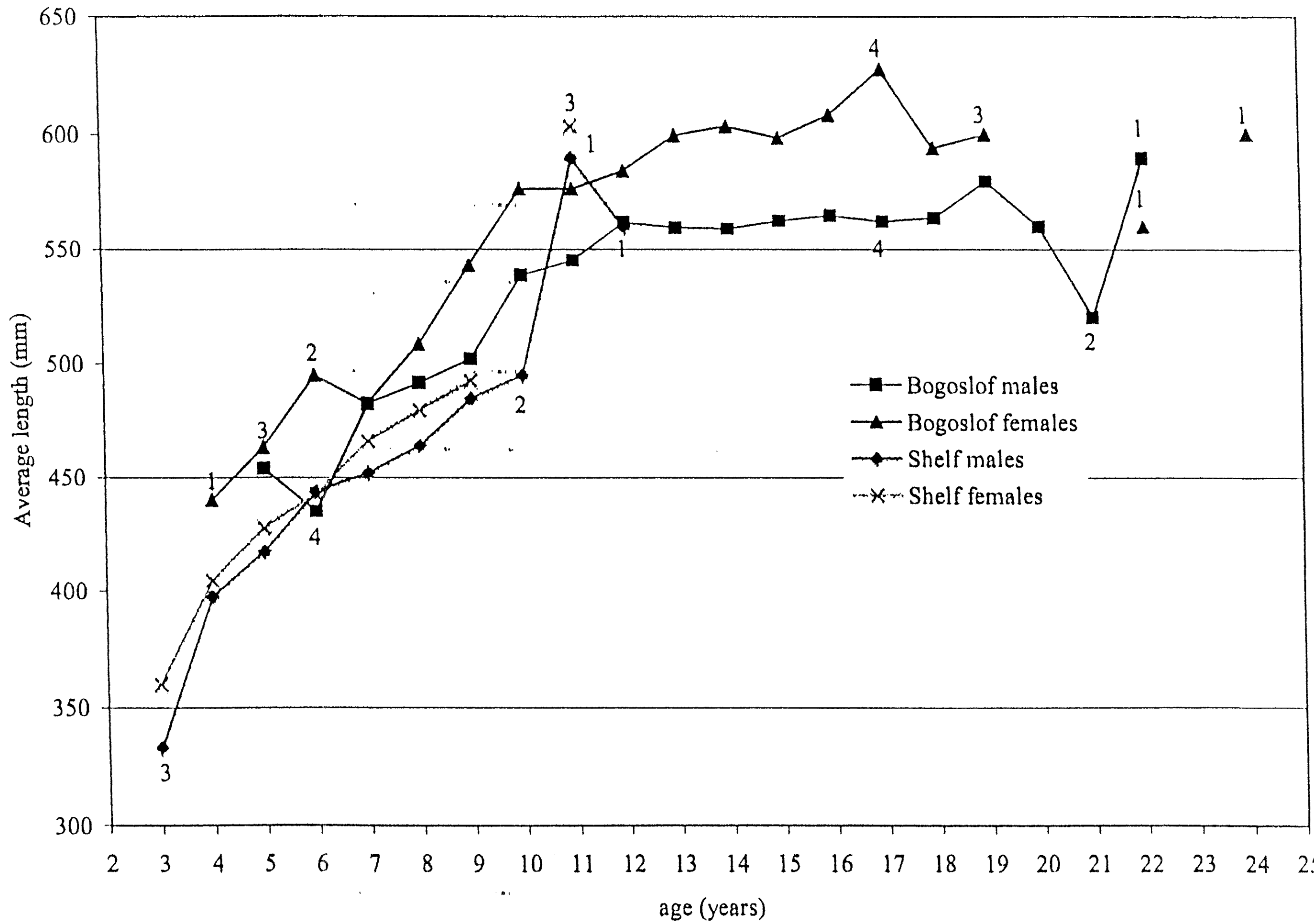

Figure 14. Average lengths at age for pollock from the winter 2000 echo integration-trawl survey of the Bering Sea shelf and Bogoslof Island area. Samples based on fewer than 5 individual pollock are indicated with sample numbers.

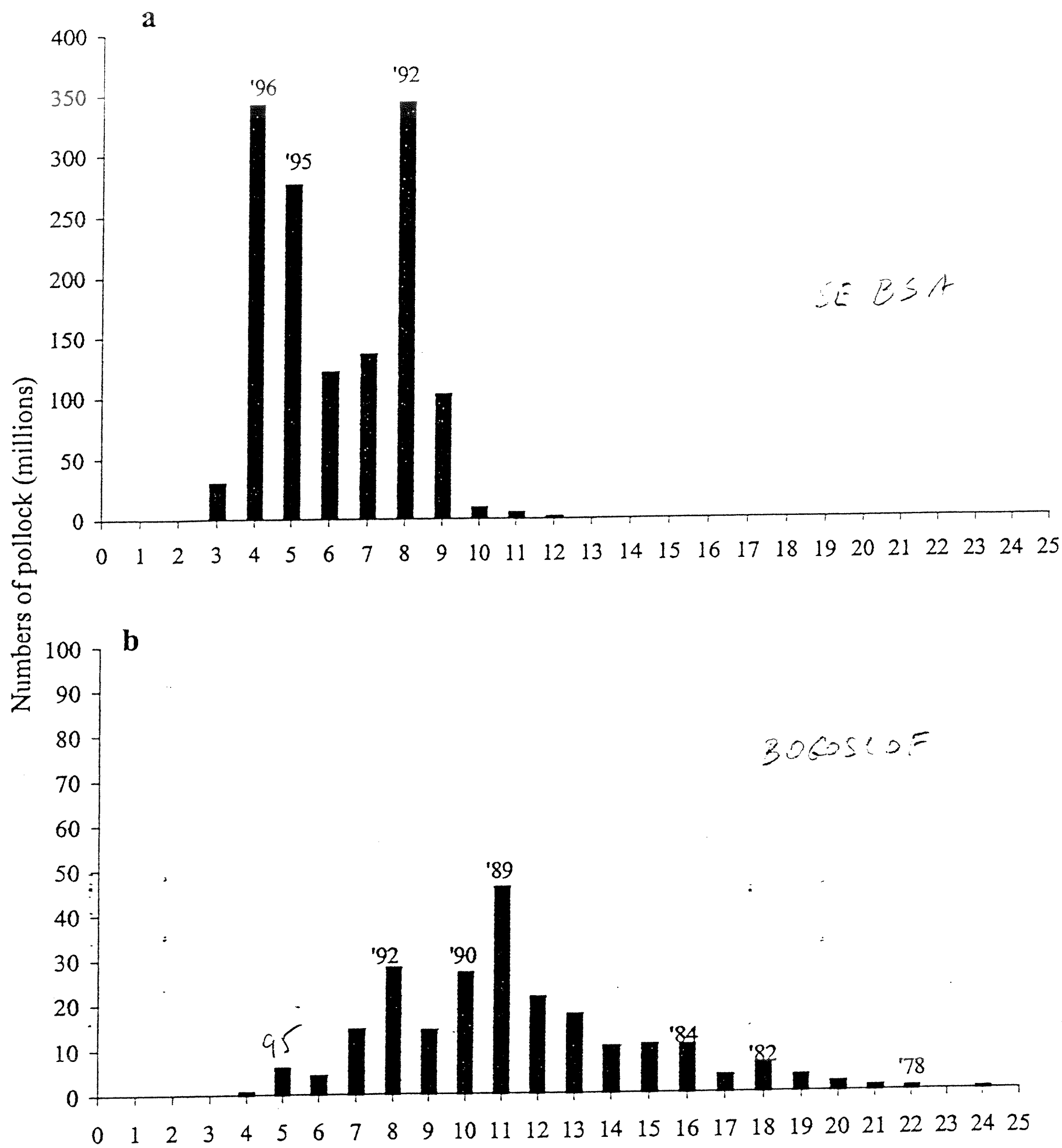

Figure 15. Estimated numbers of walleye pollock by age from the winter 2000 echo integration-trawl survey of the southeastern Bering Sea shelf (a) and Bogoslof Island area (b). Major year classes are indicated. Note Y-axis scales differ.

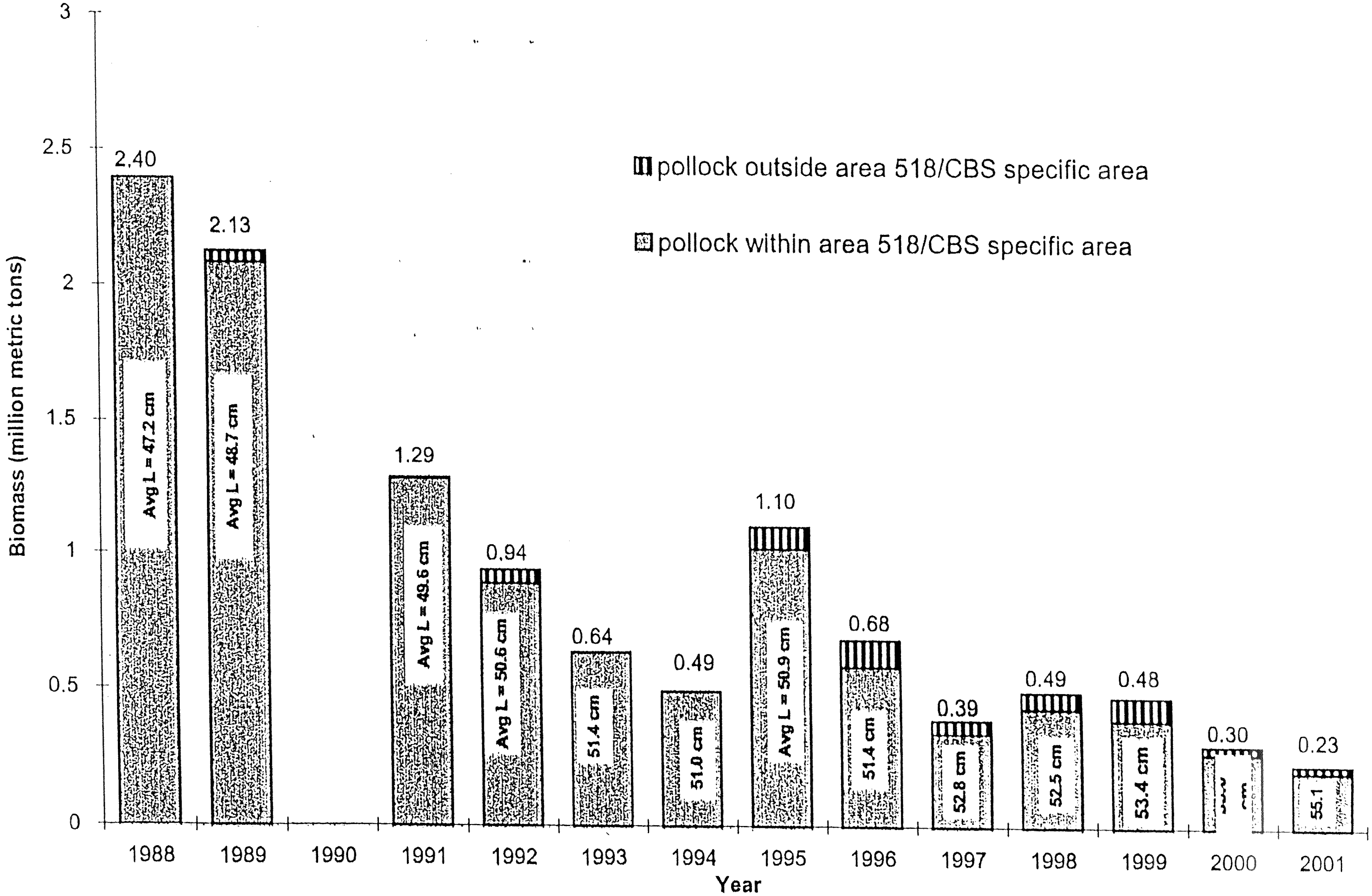

Figure 16. Biomass estimates and average fork lengths obtained during winter echo integration-trawl surveys for pre-spawning walleye pollock near Bogoslof Island, 1988-2001. The U.S. conducted all but the 1999 survey, which was conducted by Japan. There was no survey In 1990. Total pollock biomass for each survey year is indicated on top of each bar.

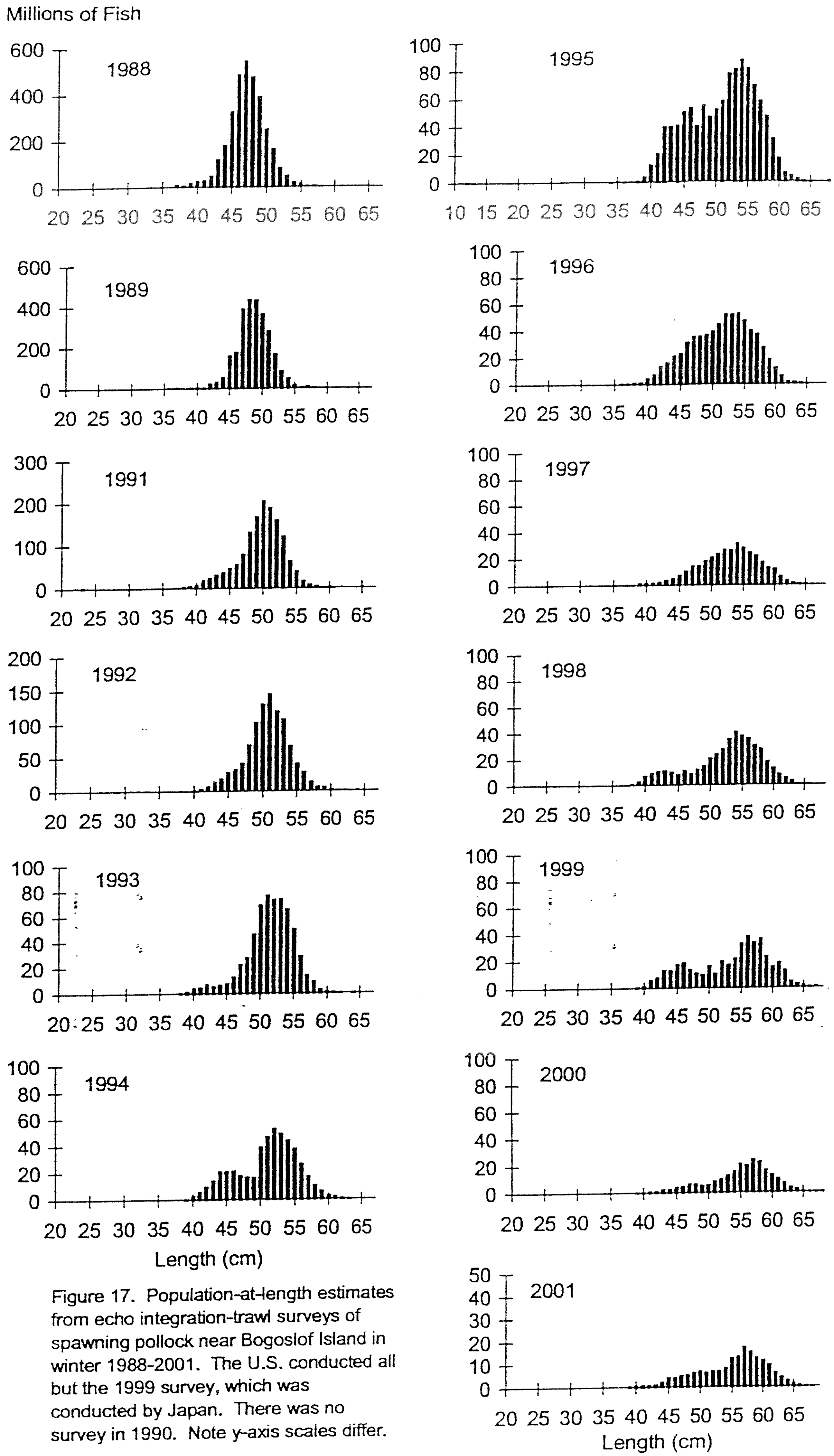

Figure 17. Population-at-length estimates from echo integration-trawl surveys of spawning pollock near Bogoslof Island in winter 1988-2001. The U.S. conducted all but the 1999 survey, which was conducted by Japan. There was no survey in 1990. Note y-axis scales differ.

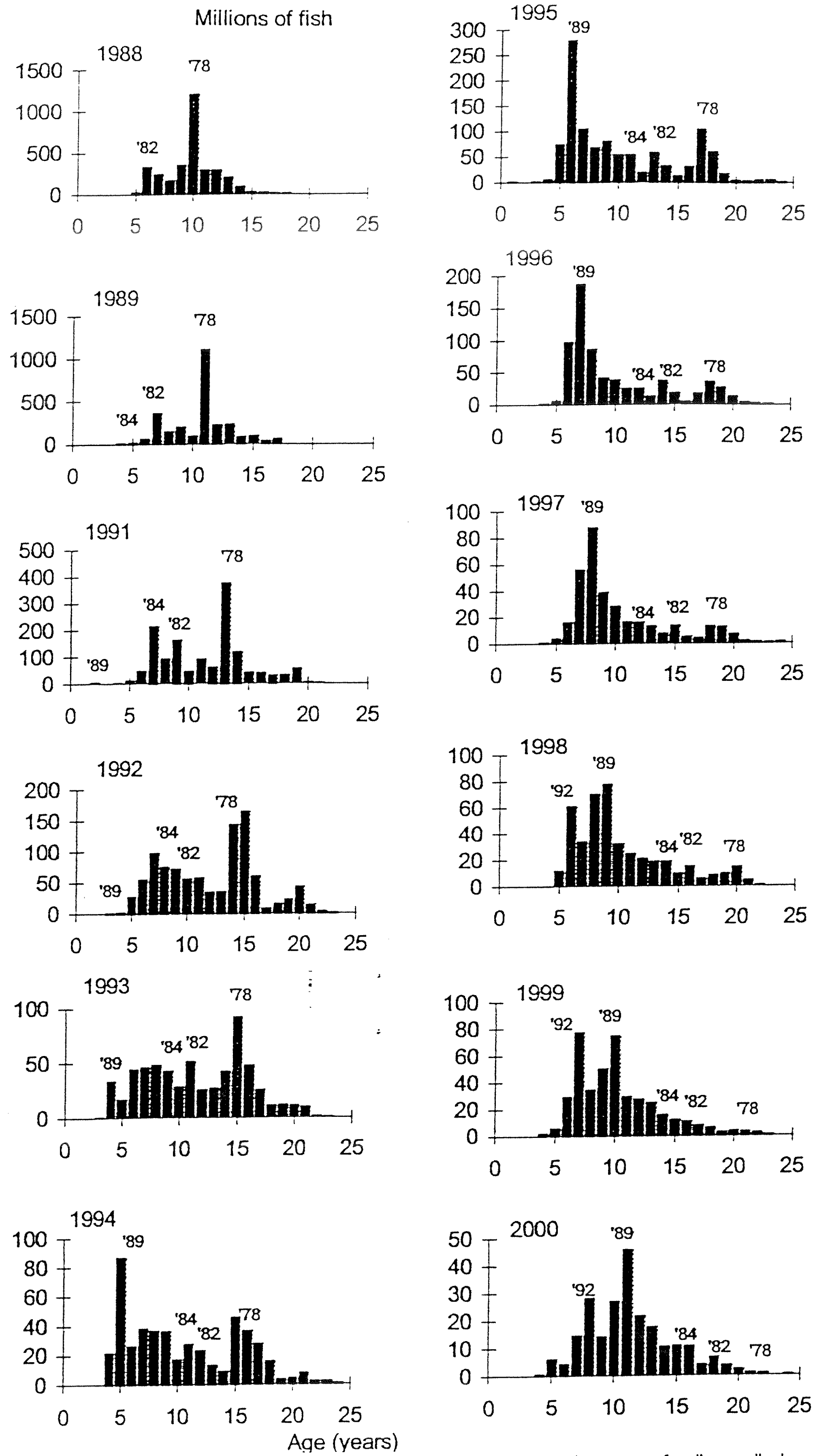

Figure 18. Population-at-age estimates obtained during echo integration-trawl surveys of walleye pollock near Bogoslof Island in winter 1988-2001. Major year classes are indicated. The U.S. conducted all but the 1999 survey, which was conducted by Japan. No survey was conducted in 1990. Ages are not yet available for 2001. Note y-axis scales differ.

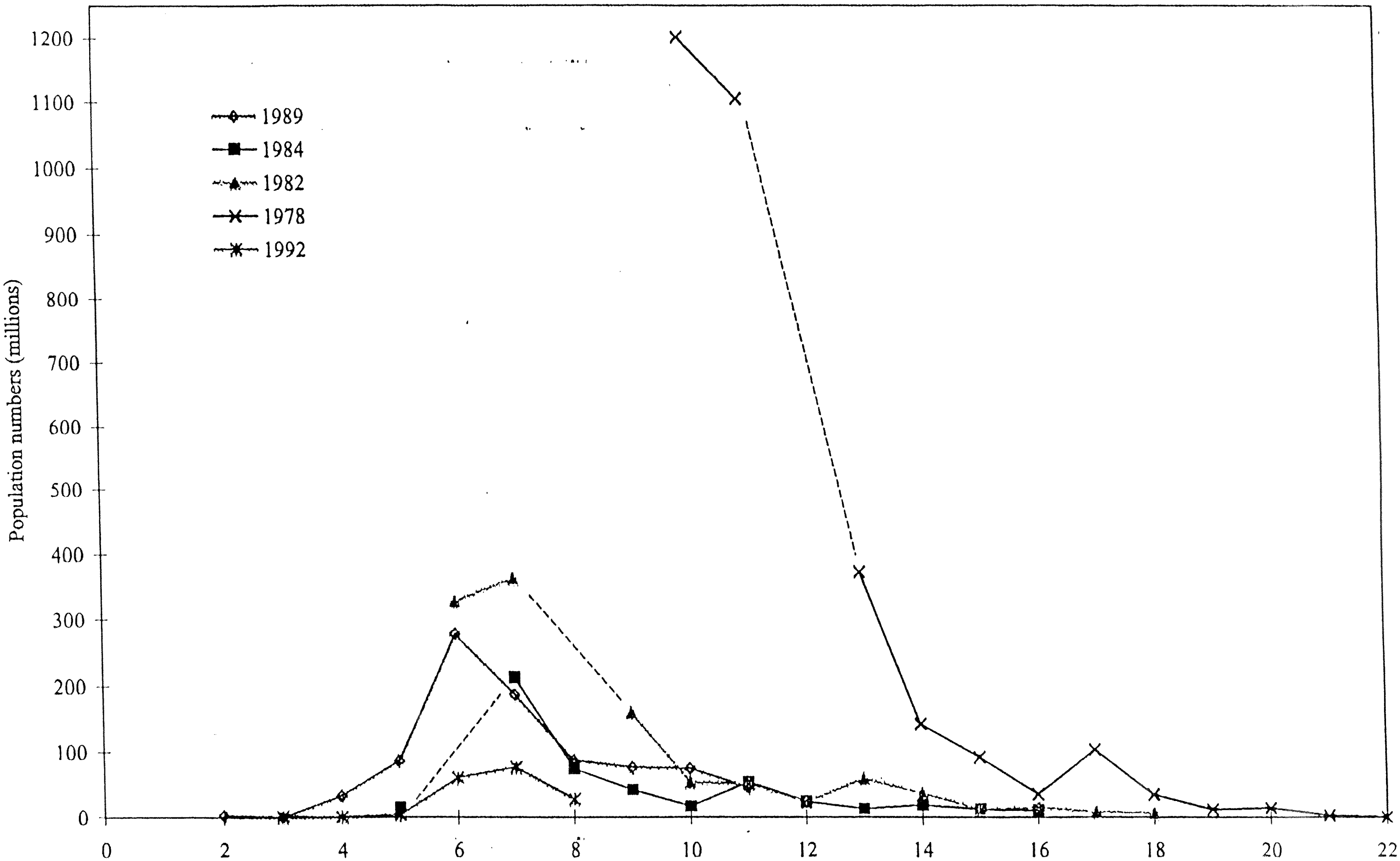

Figure 19. Population numbers at age for dominant year classes observed in winter echo integration-trawl surveys of Bogoslof area spawning pollock. Data are from surveys conducted in 1988-2000. The U.S. conducted all but the 1999 survey, which was conducted by Japan. No survey was conducted in 1990 (dashed lines).

Table 1. Summary of results of sphere calibrations conducted before, during, and after the winter 2001 pollock echo integration-trawl survey in the Bering Sea.

Date	Location	Frequency (kHz)	Water Temp (°C) at Transducer[1]	Water Temp (°C) at Sphere	Sphere Range from Transducer (m)	TS Gain (dB)	SV Gain (dB)	Along 3 dB Beam Width (deg)	Angle Offset Along	Angle Offset Athwart
22-Jan	Port Susan, WA	38	9.6	10.0	22.1	25.8	25.5	6.83	-0.11	0.02
		120	9.6	9.6	16.7	25.5	25.6	-	-	-
12-Feb	Captains Bay, AK	38	4.2	4.2	25.6	25.9	25.7	6.88	-0.08	0.00
		120	4.2	4.2	20.1	25.0	25.1	7.41	-0.24	0.34
5-Mar	Captains Bay, AK	38	3.8	4.0	25.0	25.9	25.7	6.86	-0.07	0.00
		120	3.8	4.0	19.6	24.9	24.9	7.28	-0.17	0.26
27-Mar	Malina Bay, AK	38	5.1	5.2	29.4	25.8	25.6	-	-	-
		120	5.1	5.2	23.9	25.0	25.1	-	-	-
Feb-Mar	System settings during surveys	38	-	-	-	25.8	25.5	6.90	-0.08	0.03
		120	-	-	-	25.3	25.4	7.10	-0.12	-0.21

SV threshold used for post-processing = -69 dB

[1]The transducer was located approximately 9 m below the water surface.

Note: Gain and beam pattern terms are defined in the "Operator Manual for Simrad EK500 Scientific Echo Sounder (1993)" available from Simrad Subsea A/S , Strandpromenaden 50, P.O. Box 111, N-3191 Horten, Norway.

Table 2. Trawl station and catch data summary from the winter 2001 echo integration-trawl survey of walleye pollock in the southeastern Bering Sea shelf and Bogoslof Island region.

Haul No.	Gear Type[1]	Date	Time (GMT)	Duration (minutes)	Start Position Latitude (N)	Start Position Longitude (W)	Depth (m) Gear	Depth (m) Bottom	Temp. (deg. C) Gear[2]	Temp. (deg. C) Surface	Profiler No.[3]	Pollock Catch (kg)	Pollock Catch number	Other Catch (kg)
1	317	20 Feb	15:43	15	55 43.78	162 55.30	62	66	3.6	3.5	301	1,370.1	2,048	41.7
2	30	21 Feb	5:04	17	55 34.57	163 11.14	60	60	3.7	3.9	302	1,747.8	2,240	44.2
3	317	21 Feb	11:38	18	55 24.59	163 26.19	55	59	3.6	3.8	303	43.9	54	9.6
4	317	21 Feb	15:28	12	55 41.60	163 25.16	63	85	3.7	3.7	304	15.8	28	0.3
5	317	21 Feb	21:37	19	55 48.15	163 38.04	81	93	3.8	3.7	305	683.1	1,159	01.2
6	317	22 Feb	7:26	12	55 22.15	163 40.22	59	66	3.6	3.8	306	2,526.4	3,852	55.6
7	30	22 Feb	14:07	30	55 54.28	164 5.41	93	93	4.2	3.6	307	38.6	79	11.4
8	317	23 Feb	0:14	30	55 29.38	164 23.67	91	100	4.2	3.8	308	1,882.8	2,724	21.2
9	317	23 Feb	21:40	50	55 42.10	164 46.70	92	99	3.9	3.9	309	210.5	299	47.3
10	317	24 Feb	19:24	28	54 47.89	165 22.60	153	165	4.2	4	310	529.1	587	2.6
11	317	25 Feb	9:58	22	55 48.23	165 31.37	106	113	3.9	4	311	820.1	1,310	6.9
12	317	25 Feb	18:59	19	54 32.74	165 35.73	223	238	4	4.1	312	1,639.9	1,900	0.0
13	317	26 Feb	8:31	26	55 56.37	165 59.42	111	119	3.9	4	313	396.1	587	8.0
14	317	26 Feb	17:40	22	54 44.61	166 2.87	194	241	4.1	3.9	314	429.1	607	8.7
15	317	27 Feb	0:45	9	54 11.21	166 17.89	211	270	4.1	4.2	315	100.0	73	5.0
16	317	27 Feb	16:55	20	54 45.54	166 30.05	208	243	4.1	3.8	317	870.6	1,390	0.0
17	317	28 Feb	7:57	20	55 12.92	166 43.72	129	142	4.3	3.8	318	29.9	130	0.5
18	317	28 Feb	14:46	25	55 21.29	166 56.54	126	139	4.3	3.7	319	205.1	447	7.8
19	626	28 Feb	17:43	6	55 21.42	166 56.74	70	140	3.9	3.8	320	0.0	0	0.0
20	317	28 Feb	21:40	21	55 0.87	166 57.25	148	156	4.3	3.7	321	22.9	1,619	0.2
21	317	1 Mar	20:02	15	54 57.48	167 10.86	208	219	3.9	3.8	322	56.1	1,240	8.0
22	317	2 Mar	4:32	40	55 2.69	167 24.66	231	247	4	3.9	323	346.5	521	68.5
23	30	2 Mar	21:19	18	55 11.72	167 10.32	150	150	4.1	3.7	324	2,006.4	3,383	53.6
24	317	3 Mar	1:43	19	55 21.08	167 39.67	147	151	3.8	3.8	325	234.4	26,430	0.0
25	317	6 Mar	20:24	5	53 34.46	167 41.28	444	716	3.8	4.2	326	2,796.5	2,413	3.5

Haul No.	Gear Type[1]	Date	Time (GMT)	Duration (minutes)	Start Position Latitude (N)		Start Position Longitude (W)		Depth (m) Gear	Depth (m) Bottom	Temp. (deg. C) Gear[2]	Temp. (deg. C) Surface	Profiler No.[3]	Pollock Catch (kg)	Pollock Catch number	Other Catch (kg)
26	317	6 Mar	22:18	4	53	34.23	167	39.81	463	614	3.7	4.2	327	4,938.5	3,825	1.5
27	317	7 Mar	6:45	36	53	34.63	167	51.82	412	659	3.9	4.7	328	165.9	101	20.6
28	317	8 Mar	8:41	2	53	12.92	168	59.79	464	779	3.8	4.7	329	1,663.6	1,126	2.4
29	317	8 Mar	11:03	4	53	10.50	169	0.05	435	703	3.7	4.7	330	475.0	282	3.4
30	317	9 Mar	4:14	7	53	5.18	169	24.80	458	930	3.8	4.6	331	1,351.3	827	1.2
31	317	9 Mar	8:08	9	53	5.43	169	24.78	511	901	3.6	4.3	332	316.8	217	9.1
32	317	9 Mar	10:54	18	53	5.47	169	16.74	490	1053	3.6	4.4	333	1,602.7	1,230	25.3
33	317	9 Mar	13:44	9	53	0.55	169	17.09	472	779	3.6	4.2	334	1,315.2	824	4.8
34	317	9 Mar	18:36	26	53	9.49	169	8.24	585	1082	3.5	4.4	335	359.6	294	18.8
35	317	10 Mar	2:47	15	53	9.80	169	5.04	428	953	3.8	4.5	336	949.0	645	5.3
36	317	10 Mar	5:12	11	53	5.00	169	8.36	437	590	3.8	4.7	337	377.2	225	3.1

[1] Gear type: 317 = Aleutian wing trawl, 30 = 83/112 bottom trawl, 626 = Methot trawl
[2] Gear temperature was measured at the trawl headrope depth.
[3] Three-hundred series = SeaBird SBE39

Table 3. Inventory (numbers of fish) of pollock biological samples and measurements collected during the winter 2001 echo integration-trawl survey in the southeastern Bering Sea shelf and Bogoslof region.

Haul	Length	Maturity	Otoliths	Fish Weight	Ovary Weight
1	322	51	51	51	19
2	399	55	55	55	17
3	54	26	26	26	13
4	28	28	28	28	11
5	373	68	68	68	7
6	455	53	53	53	11
7	79	61	61	61	16
8	353	40	40	40	12
9	299	34	34	34	13
10	324	43	43	43	6
11	426	40	40	40	5
12	296	41	41	41	6
13	347	51	51	51	12
14	311	35	35	35	6
15	73	21	21	21	10
16	378	38	38	38	6
17	120	47	47	47	6
18	294	60	60	60	17
20	68	6	6	6	2
21	106	56	36	56	12
22	337	57	57	57	7
23	345	38	38	38	15
24	99	11	11	11	0
25	376	87	87	87	47
26	365	78	78	78	42
27	101	19	19	19	16
28	341	49	49	49	49
29	282	60	60	60	51
30	299	73	73	73	39
31	217	76	76	76	30
32	423	73	73	73	24
33	336	69	69	69	55
34	265	66	66	66	17
35	394	78	78	78	37
36	225	42	42	42	34
Totals	9,510	1,730	1,710	1,730	670

Table 4. Inventory (numbers) of biological samples collected for other research projects during the winter 2001 pollock echo integration-trawl survey of the southeastern Bering Sea shelf and Bogoslof Island region.

	Pollock						Sea lion and seabird prey collection
	Ovary collection[1]					Genetics	
Haul	# 1	# 2	Stomachs	Spawning	Age 1[2]	Fin clip	
1	-	8	7	-	-	-	X[3]
2	-	8	15	-	-	-	-
3	-	1	15	-	-	-	-
4	-	6	1	-	-	-	-
5	23	2	6	-	-	-	X
6	-	1	15	-	-	-	X
7	-	5	-	-	-	-	-
8	21	1	4	-	-	-	X
9	12	2	-	-	-	-	X
10	5	-	3	-	-	100	X
11	-	1	1	-	-	-	X
12	7	-	-	-	-	100	-
13	-	1	17	-	-	100	X
14	3	-	-	-	-	-	X
15	11	1	10	-	-	-	X
16	1	3	-	-	-	-	-
17	-	-	15	-	-	-	X
18	-	2	5	-	-	-	X
20	-	-	15	-	X	-	X
21	-	-	15	-	-	-	X
22	-	-	15	-	-	-	X
23	-	-	-	-	-	-	-
24	-	-	15	-	X	-	X
25	17	22	-	-	-	-	X
26	12	6	-	-	-	78	-
27	-	2	-	-	-	101	X
28	-	-	-	-	-	-	-
29	-	-	-	-	-	-	X
30	14	-	-	-	-	73	-
31	-	2	-	X	-	100	X
32	-	-	-	-	-	-	X
33	-	-	-	-	-	-	X
34	-	-	-	-	-	-	X
35	30	-	-	X	-	-	X
36	-	-	-	-	-	-	X
Total	156	74	174	2 sites	2 sites	652	25 sites

[1] Pollock ovaries were collected for

1: DNA stock structure and fecundity studies by Korean scientists,

2: fecundity study by NMFS scientists

[2] Pollock age 1 were collected for M. Wilson and K. Bailey, NMFS scientists

[3] "X" indicates a collection was made, but numbers were not specified.

Table 5. Catch by species from 19 Aleutian Wing trawl hauls conducted during the winter 2001 walleye pollock echo integration-trawl survey of the southeastern Bering Sea shelf.

Species Name	Scientific Name	Weight (kg)	Percent	Numbers
walleye pollock	*Theragra chalcogramma*	12,312.5	92.6	46,932
chrysaora jellyfish	*Chrysaora sp.*	693.8	5.2	4
jellyfish unident.	*Scyphozoa (class)*	150.9	1.1	19
Pacific sleeper shark	*Somniosus pacificus*	62.0	0.5	1
chinook salmon	*Oncorhynchus tshawytscha*	25.6	0.2	14
smooth lumpsucker	*Aptocyclus ventricosus*	16.8	0.1	7
Pacific cod	*Gadus macrocephalus*	15.4	0.1	4
rock sole sp.	*Lepidopsetta sp.*	11.9	0.1	36
flathead sole	*Hippoglossoides elassodon*	4.0	0.0	18
eulachon	*Thaleichthys pacificus*	2.6	0.0	82
arrowtooth flounder	*Atheresthes stomias*	2.2	0.0	2
yellowfin sole	*Limanda aspera*	1.5	0.0	7
sturgeon poacher	*Podothecus acipenserinus*	0.9	0.0	11
squid unident.		0.5	0.0	130
crescent-tail sculpin	*Triglops metopias*	0.2	0.0	1
shrimp unident.		0.0	0.0	3
capelin	*Mallotus villosus*	0.0	0.0	1
Totals		13,300.8		47,272

Table 6. Catch by species from 3 bottom trawl hauls conducted during the winter 2001 walleye pollock echo integration-trawl survey of the southeastern Bering Sea shelf.

Species Name	Scientific Name	Weight (kg)	Percent	Numbers
walleye pollock	*Theragra chalcogramma*	3,792.8	55.8	5,702
rock sole sp.	*Lepidopsetta sp.*	1,361.7	20.0	5,065
invertebrate unident.		716.8	10.5	98
arrowtooth flounder	*Atheresthes stomias*	240.5	3.5	524
Pacific cod	*Gadus macrocephalus*	147.8	2.2	161
yellowfin sole	*Limanda aspera*	126.0	1.9	539
Pacific halibut	*Hippoglossus stenolepis*	85.6	1.3	43
flathead sole	*Hippoglossoides elassodon*	75.7	1.1	342
starfish unident.	*Asteroidea unident.*	61.0	0.9	490
Alaska skate	*Bathyraja parmifera*	53.6	0.8	11
hermit crab unident.	*Paguridae*	30.3	0.4	342
Tanner crab	*Chionoecetes bairdi*	22.6	0.3	168
jellyfish unident.	*Scyphozoa (class)*	14.5	0.2	
rex sole	*Glyptocephalus zachirus*	13.4	0.2	95
snow crab	*Chionoecetes opilio*	12.6	0.2	44
	Neptunea sp.	12.1	0.2	96
red king crab	*Paralithodes camtschaticus*	8.2	0.1	3
unsorted shab		6.4	0.1	
Oregon triton	*Fusitriton oregonensis*	5.0	0.1	69
flatfish unident.	*Pleuronectiformes*	3.3	0.0	10
sturgeon poacher	*Podothecus acipenserinus*	3.0	0.0	28
Alaska plaice	*Pleuronectes quadrituberculatus*	2.4	0.0	6
sponge unident.	*Porifera*	2.4	0.0	
sablefish	*Anoplopoma fimbria*	1.8	0.0	8
eulachon	*Thaleichthys pacificus*	1.1	0.0	28
sea anemone unident.	*Actiniaria (order)*	0.6	0.0	53
	Buccinum sp.	0.5	0.0	9
	Hyas sp.	0.1	0.0	3
Oregon rock crab	*Cancer oregonensis*	0.0	0.0	8
shrimp unident.		0.0	0.0	5
Totals		6,802.0		13,950

Table 7. Catch by species from 13 Aleutian Wing trawl hauls conducted during the winter 2001 walleye pollock echo integration-trawl survey in the Bogoslof region.

Species Name	Scientific Name	Weight (kg)	Percent	Numbers
walleye pollock	*Theragra chalcogramma*	12,312.5	92.6	46,932
chrysaora jellyfish	*Chrysaora sp.*	693.8	5.2	4
jellyfish unident.	*Scyphozoa (class)*	150.9	1.1	19
Pacific sleeper shark	*Somniosus pacificus*	62.0	0.5	1
chinook salmon	*Oncorhynchus tshawytscha*	25.6	0.2	14
smooth lumpsucker	*Aptocyclus ventricosus*	16.8	0.1	7
Pacific cod	*Gadus macrocephalus*	15.4	0.1	4
rock sole sp.	*Lepidopsetta sp.*	11.9	0.1	36
flathead sole	*Hippoglossoides elassodon*	4.0	0.0	18
eulachon	*Thaleichthys pacificus*	2.6	0.0	82
arrowtooth flounder	*Atheresthes stomias*	2.2	0.0	2
yellowfin sole	*Limanda aspera*	1.5	0.0	7
sturgeon poacher	*Podothecus acipenserinus*	0.9	0.0	11
squid unident.		0.5	0.0	130
crescent-tail sculpin	*Triglops metopias*	0.2	0.0	1
shrimp unident.		0.0	0.0	3
capelin	*Mallotus villosus*	0.0	0.0	1
Totals		13,300.8		47,272

Table 8. Estimates of pollock biomass in the entire Bogoslof Island region and inside the Central Bering Sea specific area[1] (U.S. fisheries management area 518) from echo integration-trawl surveys between 1988-2001. No survey was conducted in 1990.

	Entire Bogoslof Survey Area			Biomass estimate		CBS specific area/ U.S. area 518			
	Biomass*	Acoustic	95% CI's	bounds (million t)		Biomass	Biomass	Proportion	Proportion
Year	(million t)	Return (Sm)	(+-%)	lower	upper	inside	outside	inside	outside
1988	2.396	--	--	--	--	2.396	0.000	1.00	0.00
1989	2.126	--	--	--	--	2.084	0.042	0.98	0.02
1990	--	--	--	--	--	--	--	--	--
1991	1.289	11063	23.3	0.989	1.589	1.283	0.006	1.00	0.00
1992	0.940	7914	40.8	0.557	1.324	0.888	0.052	0.94	0.06
1993	0.635	5134	18.4	0.518	0.752	0.631	0.005	0.99	0.01
1994	0.490	3020	23.2	0.376	0.604	0.490	0.000	1.00	0.00
1995	1.104	8236	21.4	0.868	1.340	1.020	0.084	0.92	0.08
1996	0.682	5604	39.2	0.415	0.950	0.582	0.100	0.85	0.15
1997	0.392	2985	28.0	0.283	0.502	0.342	0.051	0.87	0.13
1998	0.492	3829	38.0	0.305	0.680	0.432	0.060	0.88	0.12
1999	0.475	--	--	--	--	0.393	0.083	0.83	0.17
2000	0.301	2200	28.5	0.215	0.387	0.270	0.032	0.90	0.10
2001	0.232	1654	20.0	0.185	0.278	0.208	0.024	0.90	0.10

* The 1999 survey was conducted by Japan Fisheries Agency

$Sm = \sum_{1}^{n} Sa * A_n / 1000$, where n is the number of 0.5 nmi intervals along the transect, Sa is meters^2 of pollock backscattering per nmi^2 and $A_n = 0.5 * w$, where w is the width assigned to the interval and varies depending on transect spacing.

[1]The "specific area" is defined in the Annex to the Convention on the Conservation and Management of Pollock Resources in the Central Bering Sea as "the area south of a straight line between a point at 55° 46' N lat. and 170° W long. and a point at 54° 30' N lat., 167° W long. and between the meridian 167° W long. and the meridian 170° W long. and the north of the Aleutian Islands and straight lines between the islands connecting the following coordinates in the order listed:
52° 49.2 N 169° 40.4 W, 52° 49.8 N 169° 06.3 W, 53° 23.8 N 167° 50.1 W, 53° 18.7 N 167° 51.4 W.

Table 9. Estimates of population at length (millions of fish) from February-March echo integration-trawl surveys* of pre-spawning pollock in the Bogoslof Island area. No survey was conducted in 1990.

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

Table 9. continued.

Length	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001

53	48	85	–	122	106	73	49	81	52	26	35	17	13	7
54	19	50	–	63	67	66	43	88	53	31	41	21	16	8
55	12	13	–	40	41	50	37	81	48	28	38	33	21	12
56	4	5	–	17	27	29	26	69	40	24	35	38	20	13
57	3	8	–	8	13	14	17	58	37	22	30	33	24	17
58	1	1	–	4	6	9	10	47	28	17	27	36	23	15
59	0	0	–	1	5	3	6	31	19	13	18	23	16	13
60	0	0	–	1	1	1	3	17	12	12	13	15	13	11
61	2	0	–	1	<1	1	2	7	6	6	8	18	10	9
62	0	0	–	<1	<1	<1	1	4	2	3	5	13	7	6
63	0	0	–	0	0	0	<1	2	1	1	3	4	4	4
64	0	0	–	0	1	<1	0	1	<1	1	1	3	2	3
65	0	0	–	<1	0	0	0	<1	<1	<1	1	1	1	1
66	0	0	–	0	0	0	0	<1	0	<1	1	<1	<1	1
67	0	0	–	0	0	0	0	0	0	0	0	1	<1	<1
68	0	0	–	0	0	0	0	1	0	0	<1	0	<1	<1
69														<1
70														<1
Totals	3236	2687	–	1419	975	613	478	1081	666	337	435	416	229	171

* Echo integration-trawl surveys were conducted in 1988-1998, 2000-2001 by the Alaska Fisheries Science Center, Seattle, USA. The 1999 survey was conducted by Japan Fisheries Agency.

Table 10. Estimates of biomass at length (metric tons) from February-March echo integration-trawl surveys* of pre-spawning pollock in the Bogoslof Island area. No survey was conducted in 1990.

Length	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
10	0	0	--	0	0	0	0	<1	0	0	0	0	0	0
11	0	0	--	0	0	0	0	2	0	0	0	0	0	0
12	0	0	--	0	0	0	0	5	0	0	0	0	0	0
13	0	0	--	0	0	0	0	2	0	0	0	0	0	0
14	0	0	--	0	0	0	0	1	0	0	0	0	0	0
15	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
17	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
19	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
21	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
23	0	0	--	70	0	0	0	0	0	0	0	0	0	0
24	0	0	--	61	0	0	0	0	0	0	0	0	0	0
25	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
27	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
29	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
31	0	0	--	0	37	0	0	0	0	0	0	0	0	0
32	0	0	--	0	42	0	0	0	0	0	0	0	0	0
33	0	0	--	0	48	0	0	0	0	0	0	0	0	0
34	0	0	--	0	0	0	0	53	35	0	29	0	0	0
35	0	0	--	0	0	0	0	93	0	29	0	0	0	0
36	0	0	--	0	68	0	0	42	96	18	32	0	0	0
37	3199	846	--	115	0	0	0	113	109	84	92	0	0	0
38	2304	0	--	768	84	260	0	435	465	173	395	0	0	19
39	6365	1461	--	1843	0	634	202	1697	562	507	1250	258	168	149
40	10573	1116	--	2801	451	1776	1190	5510	1857	634	3208	1242	195	315
41	12697	1532	--	7940	1235	2276	2855	9777	3637	851	4484	5598	575	403

Table 10. continued

Length	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
42	24360	10704	--	10812	3316	3571	4990	20730	7012	1387	5652	7223	674	464
43	64253	16516	--	15540	6760	3089	8021	22332	9190	2158	6407	12079	1511	770
44	104733	29588	--	20103	9877	4006	12963	24863	12735	3018	6048	11877	1622	1562
45	206586	93899	--	28059	16329	4818	13823	32817	14927	4824	5592	16278	2848	2966
46	328735	113092	--	36235	20645	8835	15081	37303	21637	7399	7774	17678	3289	3218
47	394741	268496	--	56880	29146	16669	13565	30184	26425	10786	6653	13933	5002	4095
48	367368	323170	--	101488	51983	22214	13658	44572	28658	12233	9528	11280	5191	4548
49	320630	345632	--	141399	84329	39811	14414	40477	31599	15951	12766	10698	4659	5654
50	217890	314778	--	187006	115614	63571	36256	47785	35907	19593	18837	18373	5466	6794
51	152084	258067	--	186358	140004	75524	46297	57291	43272	23896	23203	12204	8364	6361
52	79654	166322	--	170855	124034	77721	55851	81793	53696	28549	29109	23427	10816	7605
53	50739	89721	--	139671	120309	83189	55151	90342	57294	29783	39234	20486	14509	8203
54	21211	56681	--	77905	82110	79461	52329	104021	61504	38168	48567	25270	19059	10064
55	14191	16270	--	52506	53286	64342	47770	102318	59033	35853	47461	39463	27179	16246
56	5580	6059	--	23541	38564	39556	35451	91962	52765	33144	47627	46764	27212	17977
57	3886	10681	--	12470	19710	20781	24453	81885	52000	31736	42594	40641	34562	24987
58	1395	1220	--	6603	9188	14391	15826	70522	40581	26309	41160	44788	34255	23153
59	0	0	--	1284	7872	4376	9546	48878	28918	21031	28241	28362	26252	20390
60	0	0	--	2743	2631	1989	4716	28240	19749	20509	21604	18174	22075	19263
61	2561	0	--	2195	562	1756	3644	11855	10762	11428	14301	22618	18519	16883
62	0	0	--	780	600	372	1826	7951	3578	6439	9748	15120	12972	11334
63	0	0	--	0	0	0	200	3978	2835	2999	6344	5181	7033	7722
64	0	0	--	0	1363	415	0	1074	863	1489	1777	3198	4277	5489
65	0	0	--	938	0	0	0	495	578	1096	1156	1833	1660	2730
66	0	0	--	0	0	0	0	163	0	329	1251	403	534	1132
67	0	0	--	0	0	0	0	0	0	0	0	863	520	715
68	0	0	--	0	0	0	0	2570	0	0	276	0	403	426
69	0	0	--	0	0	0	0	0	0	0	0	0	0	55
70	0	0	--	0	0	0	0	0	0	0	0	0	0	100
Totals	2395735	2125851	--	1289008	940197	635403	490078	1104118	682279	392403	492398	475311	310402	231795

* Echo integration-trawl surveys in 1988-1998 and 2000-01 were conducted by the Alaska Fisheries Science Center, Seattle, USA. The 1999 survey was conducted by Japan Fisheries Agency.

Table 11. Estimates of population at age (millions of fish) from February-March echo integration-trawl surveys* of pre-spawning pollock near Bogoslof Island. No survey was conducted in 1990.

Age	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
0	0	0	–	0	0	0	0	0	0	0	0	0	0
1	0	0	–	0	0	0	0	1	0	0	0	0	0
2	0	0	–	4	0	0	0	0	0	0	0	0	0
3	0	0	–	0	1	1	0	2	0	0	0	0	0
4	0	6	–	2	2	33	21	6	<1	<1	<1	2	1
5	28	15	–	12	27	17	86	75	6	4	11	5	6
6	327	58	–	46	54	44	26	278	96	16	61	29	4
7	247	363	–	213	97	46	38	105	187	55	34	77	14
8	164	147	–	93	74	48	36	68	85	88	70	34	28
9	350	194	–	160	71	42	36	80	40	38	77	50	14
10	1201	91	–	44	55	28	17	53	37	28	32	75	27
11	288	1105	–	92	57	51	27	54	24	16	25	29	46
12	287	222	–	60	33	25	23	19	24	16	21	27	21
13	202	223	–	373	34	27	13	59	12	13	19	25	17
14	89	82	–	119	142	42	9	32	36	7	18	16	10
15	27	90	–	41	164	92	45	12	18	13	9	12	11
16	17	30	–	38	59	47	36	31	4	5	15	10	11
17	7	60	–	29	8	25	28	103	16	4	5	8	4
18	3	0	–	32	15	11	16	60	35	12	8	6	6
19	0	0	–	56	22	11	4	18	26	12	10	3	4
20	0	0	–	4	42	11	4	5	12	7	15	4	2
21	0	0	–	2	13	10	8	5	3	2	4	3	1
22	0	0	–	0	3	1	2	6	2	1	1	2	1
23	0	0	–	0	1	1	2	6	1	<1	0	<1	0
24	0	0	–	0	0	0	1	2	0	1	0	0	<1
25	0	0	–	0	0	0	0	0	0	0	0	0	0
Totals	3236	2687	–	1419	975	613	478	1081	666	336	435	416	229

* Echo integration-trawl surveys in 1988-1998, and 2000 were conducted by the Alaska Fisheries Science Center, Seattle, USA. The 1999 survey was conducted by Japan Fisheries Agency.

Table 12. Estimates of biomass at age (metric tons) from February-March echo integration-trawl trawl surveys* of pre-spawning pollock near Bogoslof Island. No survey was conducted in 1990.

Age	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
0	0	0	–	0	0	0	0	0	0	0	0	0	0
1	0	0	–	0	0	0	0	10	0	0	0	0	0
2	0	0	–	170	0	0	0	0	0	0	0	0	0
3	0	0	–	0	162	284	0	681	0	0	0	0	0
4	0	2184	–	715	782	18809	13028	3411	322	87	78	1809	405
5	14997	7275	–	6067	21455	11939	59938	48690	3668	2083	6771	5688	4177
6	192324	41140	–	24911	38081	39100	21530	208409	69106	10598	37697	28096	2580
7	155569	241301	–	143024	67027	43049	39768	82680	165354	49598	29637	77751	12377
8	114725	111156	–	74575	59445	46874	39107	72294	75658	94580	73714	37210	27748
9	251417	149143	–	149035	67358	43976	39539	96260	45732	44076	94394	59688	15696
10	910016	68495	–	43519	56969	30688	20520	64202	45360	37822	40417	90284	37613
11	226380	894895	–	94020	61394	59294	31589	70646	31116	22942	35706	35240	64846
12	232810	187280	–	59273	36293	27008	27506	26482	33262	22497	29180	32724	32681
13	167054	193548	–	377521	37218	29947	17038	77225	16950	18074	26690	29864	26732
14	81596	71920	–	116171	150237	46997	10896	42417	48990	10713	26304	18915	16328
15	22969	81447	–	38750	168966	107062	52899	16595	24443	19768	13230	14207	15651
16	16336	24342	–	37870	63304	54401	42771	37907	5538	6659	21631	12723	16990
17	6681	51725	–	30696	9342	27577	32128	131396	20782	5470	8218	9635	6281
18	2863	0	–	32392	15467	10736	17911	74010	43092	16894	10212	7020	9763
19	0	0	–	55116	23380	13607	4768	22292	31760	17174	13047	3357	5768
20	0	0	–	3840	43605	11963	5081	5902	14486	9228	19016	4343	2897
21	0	0	–	1341	15240	10167	8866	5433	4023	1885	5376	3574	1061
22	0	0	–	0	3186	1329	2011	7728	1974	947	1078	2668	1177
23	0	0	–	0	1287	598	2323	6696	661	419	0	514	0
24	0	0	–	0	0	0	860	2758	0	888	0	0	631
25	0	0	–	0	0	0	0	0	0	0	0	0	0
Totals	2395737	2125851	–	1289006	940198	635405	490077	1104124	682277	392402	492396	475311	310402

* Echo integration-trawl surveys in 1988-1998, and 2000 were conducted by the Alaska Fisheries Science Center, Seattle, USA. The 1999 survey was conducted by Japan Fisheries Agency.

Sixth Annual Conference of the Parties to the Convention on the Conservation and Management of Pollock Resources in the Central Bering Sea

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Russian Pollock Stock Assesment Document

The present review is based on the data of previous years and the materials of expeditions of the second half of the year 2000, spring-summer of 2001 on the research vessel "TINRO", freezer supertrawler "N. Chepik", single freezer supertrawler "Khaiduk" and Japanese trawler "Kaye Maru 28".

Numerous scientific and fishing data, particularly collected during the recent 10 years, shows that there are two fishing pollock resources available in the Bering Sea within the Russian Exclusive Economic Zone. The stock of the western part of the Bering Sea comprises of pollock, dwelling in the Karaginskiy and Ol'utorskiy bays and a small part of pollock, which can be met in the area of the Shirshov underwater ridge, and along the western part of Koryak coast to the east till 174-179^{O} eastern longitude.

North-western or Navarin stock, connected with Navarin stream, dwells in Anadyr bay and the along eastern part of Koryak coast. South-eastern boundary of distribution of the Navarin pollock may shift depending on oceanologic conditions either approaching the Ol'utorskiy cape or moving away from it. Pollock of the north-western stock makes distinctive annual migrations. From the second half of nineties and up to the present time fattened agglomerations began to form around the Navarin cape between 61^{O}30 and 62^{O}00 northern latitude. During the development of the zooplankton, the pollock agglomerations have dispersed to a more shallow and productive areas of the Anadyr shelf. In the end of August-September the water cools down and the pollock fodder organisms stop developing. Afterwards the pollock withdraws from the shallow areas of the sea. Meanwhile the fattened agglomerations of one-year-old and two-year-old species remain there for a longer period than species of senior age. In October-December pollock wintering agglomerations, which do not change their position until the spawning period, are being formed at the exterior side of the shelf and on the slope. When the spawning period is over, pollock starts to move in the opposite direction towards the shelf for feeding (Fig. 1). Feeding migration good along two canyons, which cut the Anadyr shelf (Fig. 2).

Retrospective review of the stock and fishing status.

The status and mastery of said two stocks varied in seventies-nineties. Between 1970-1976 the biomass of fishing component of Western Bering Sea pollock stayed at a low level (Fig. 3). The biomass varied within 0.3 to 0.8 million tones. The catch was also small – 22-176 thousand tones. During the period from 1977 to 1989 the fishing biomass of the WBS stock stayed at a high level – 1.1 – 2.2 million tones. The catch of said period varied within 261 and 419 thousand tones. In 1990 the size of the stock began to decline smoothly and said decline further intensified due to catching the pelagic group of the stock in the enclave. During the period from 1993 to 1995 the stock biomass declined by 4.5 times. In the second half of the nineties as a result of a decline in fishing biomass to a historical minimum – 73 thousand tones, the reduction of this population area occurred. At present the main part of the stock do not leave Karaginskiy and Ol'utorskiy bays. Reduction of the quantity of pollock was accompanied by a growth of the resources of Korfo-Karagin herring, which showed a change of the dominated species in pelagic ichthyocene of the Western part of the Bering Sea.

The Navarin stock partially spreads behind the limits convention line dividing Exclusive Economic Zones of Russia and the USA. (Fig. 1). Besides, during the feeding period the exchange of species between said stock and that of the Eastern part of the Bering Sea takes place. Some scientists assess the degree of this exchange as insignificant and the other assess it as considerable. However bearing in mind the fast growth of biomass of the Eastern Bering Sea pollock (10.8 million tones in 2000) and reduction of the pollock biomass in Navarin area (Fig. 4, table 1), the degree of said exchange does not allow to consider the north-western stock as a part of the stock of the Eastern part of the Bering Sea. The population and genetic research of protein polymorphism, structure of mitochondrial and genomic DNA, including microsatellite sequences, conducted during the last 5 years, confirms the opinion of independence of the Navarin stock of pollock. During the period from 1977 to 1981 the catch of Navarin pollock had been increasing until it reached the maximum of 900 thousand tones. Within further decade up to 1989 the catches remained stable. The amount of said catches did not go below 463 thousand tones. In 1990 due to social and economic reasons the amount of catches significantly dropped and remained at a low level up to 1995. In contradistinction to the stock of the Western part of the Bering

Sea, there were strong year classes (1989, 1992, 1995 and 1996) in this stock in the nineties. After the species of said generations joined the fishing stock in the nineties, the catch increased up to 753 thousand tones in 1996. Further generations amount of this stock were average. As a result in the second half of the nineties the catch was consistently going down.

Oceanologic conditions.

Oceanologic conditions, to be more correct, interannual variability, are the most important element, which determines behaviour of pollock and formation of fishing agglomerations in the North-Western part of the Bering Sea. Extremely big differences in behaviour and season pollock distribution was mentioned while forming oceanologic conditions according to the type of unusually cold years, occurred in the late nineties in the Bering Sea.

During cold years the ice covers North-Western shelf and adjacent sea areas already in December and is destroyed in June, and the beginning of season hydrological and hydrobiological processes development takes place 1.5-2.0 months later than in the average (taking into account data of a number of previous years). On the contrary during warm years the ice appears only in January-February, does not spread over the external side of the shelf and is already destroyed in the middle of April. In the moderate year conditions the existence period of the ice cover is close to the conditions of a warm year, while the ice covers practically full shelf zone.

According to numerous evidence, obtained recently, the inter-annual variability of oceanologic conditions, which may be observed both in the Bering Sea, and in the whole Northern part of the Pacific Ocean, is related to shifting of the climate to a regular 20-years cold period. Therefore, cooling in the Bering Sea, which showed itself distinctively in the end of 1997 and in the beginning of 1998, shall be probably of a consistent long-term nature. 1999 was an unusually cold year. This year the water of the whole northern shelf (to the north of 60^{O} of the northern latitude) all over the thickness had a negative temperature ($-0.5^{O}C$ – 1.8 ^{O}C) until the middle of summer. Under said conditions in the first part of summer biomass of food zooplankton was twice as less (700-800 mg/m^3), than that under the conditions close to moderate (1500-1700 mg/m^3).

The oceanologic conditions of the year of 2000 may be referred to the conditions of a cold year, particularly in the North-Western part of the

Bering Sea. In the Northern and North-Western parts of the Sea, considerable amount of the water of residual winter cooling remained until the second half of the summer, while the type of circulation of the Central Bering Sea Stream, which is close to latitudinal, contributed to the fact.

Regulatory Fishing Measures.

The conditions, under which fishery vessels are allowed to fish hydrobionts within the Russian part of the Bering Sea, are regulated in accordance with the acting Rules for Fishery in the basins of the Far East (1989). In accordance with changing of climatic and oceanologic conditions and structure of basic fishery stocks, every year the Russian Federation State Committee for Fishery issues orders, which make amendments and additions to the Rules for Fishery. Sharp reduction of the biomass of both Russian pollock stocks of the Bering Sea in the second half of the nineties made it necessary to significantly correct the Rules for Conducting Fishing Operations. From the end of nineties the minimum allowed size of a mesh in the cod end of trawls was increased up to 100 mm. Beginning with fishery season of the year of 2000, in order to reduce additional catch of fry (which portion increased considerably in the total amount of pollock stocks in the second half of nineties), it became necessary for a trawl gear to be equipped with a selective extension piece between the belly and the bag. In the Western-Bering Sea zone and in the Karagin sub-zone of the Eastern Kamchatka zone specialized fishery of pollock was prohibited for the period of spawning (from March 1 to April 20). Under the Order of the Russian Federation State Committee for Fishery of December, 2000, the fishery size of pollock was increased with 5 cm, specialized fishery of pollock was prohibited in the Karagin sub-zone of the Eastern Kamchatka zone all the year round. Due to cold spell and increased period of spawning, the prohibition period for fishery of pollock in the Western-Bering Sea zone was extended up to May 15.

Current Status of the Stocks.

Research of the Western-Bering Sea pollock, conducted in 1999-2000, showed growth of the share of the fish generations of 1995-1997. The share of senior age generations in the year of 2000 did not exceed 4 % (Fig. 5). The amount of the spawning stock had reduced (Fig. 3). In accordance with the maturation curve (Fig. 6) and size and age composition the species of the generation of 1996-1997 will make the bulk of spawning and fishery stocks in the near future. The said species makes the bulk of pollock catches (as an bycatch when fishing other kinds of hydrobionts) in 2001. According to the results of bottom trawl and echo-integration survey the biomass of the Western-Bering Sea pollock reduced by two times for the period from 1997 to 1999. The reduction of amount of spawners resulted in reduction of the spawning grounds by 2.23 times as compared with the year of 1996. At the spawning areas of the Western-Bering Sea stock, they took stock of 6.7 x 10^{12} pieces of developing spawn of pollock in 1996 and 3 x 10^{12} pieces in 1999. In 2000 the amount of spawning and fishery stocks, assessed by ISVPA method, made 23.7 and 73.4 thousand tones respectively (Fig. 3).

Review of the composition of catches of Navarin pollock, conducted on the basis of size and age keys, showed the predominance of pollock generations 1996-1997 in the catches of 2000-2001. Space distribution of pollock in 2001 was typical for the second half on the nineties. In cold years pollock migration from wintering and spawning grounds to feeding waters takes place in the end of June – beginning of July. The main direction of migration paths: North and East. It moves along the two canyons in the area of 180° and 178°30 of western longitude and from the Eastern part of the Koryak slope (Fig. 2). The remaining part of the wintering and spawning agglomeration may be clearly seen on the picture in the Southern part of the test range of the survey, conducted within 26.06-01.07.2001. Species of 1999-2000 generations were widely spread along the external side of the shelf in the end of June (Fig. 7, 8). At this period they observed the beginning of fry migration to feeding waters of the areas of quasi-stationary water eddies. The data of biological and physiological research of the pollock of the Western part of the Bering Sea are presented in tables (2, 3). In 2000-2001 maturation of 50 % of female and male species of the Navarin pollock occurred when their length reached 42-43 cm (Fig. 9). According to population laws of regulating the amount, maturation of significant part of pollock when reaching the length of 29-36 cm may occur only in case of depression status of a population. The fact of maturation of male species at an early age (Fig. 9) confirms independence of said stock from the Eastern Bering Sea stock, which amount is going up now.

Results of direct registration by means of bottom trawl survey showed consistent reduction of the biomass of the North-Western stock of pollock during the period from 1996 to 2000. According to registration bottom trawl survey, conducted in the end of June 2001, the biomass of pollock for the first time in a six year period went up with 74 % as compared to the year before. Data of the survey, conducted in August 2001, will be presented after their processing. Echo-integration survey was conducted in the Navarin area annually beginning from 1996, with exception of 1999. The survey results also showed significant reduction of biomass of pelagic and bottom pollock during the recent 6 years. Only in 2000 the biomass of pelagic pollock reduced with 52.4 % as compared to 1998. The results of the recent echo-integration survey of 2000 are shown with more details in the Appendix 1. A regular survey in the Navarin area shall be conducted in October-November 2001.

During the 3 recent years a fry survey has been conducted twice a year in the North-Western part of the Bering Sea. The results of the survey showed that generations of 1997-2000 are of average abundance. Among said generations, the generation of the year of 2000 (survey of the end of June 2001) has got maximum amount. During recent years ichtyoplankton survey was conducted twice: from May 6 to May 14, 2000 and from April 14 to May 5, 2001. In the year of 2000 the amount of developing eggs of pollock in waters with area of 4866 sq. miles made 4.546×10^{12} pieces. Said amount is 1,5 times as much as the total amount of spawn, registered in 1999 in Karaginskiy and Ol'utorskiy bays, which are the main centers of reproduction of the Western-Bering Sea population. Trawl survey of recent years showed that spawn agglomerations of North-Western stock of pollock have spread over the Eastern part of the Koryak shelf. The results of ichtyoplankton survey, as a part of other types of research, showed essential role of Northern (Navarin) spawning grounds of pollock in the Bering Sea in the end of the nineties of the last century and in the first decade of this century. Survival of Navarin pollock during the first life year, obtained on the basis of comparison of data of ichtyoplankton and fry surveys, makes 0.0678 %. Relatively small design value of survival indirectly confirms that all one-year-old species, registered in June 2001, belong to Navarin stock.

Analytic approach of the status of North-Western stock was made using ISVPA method for modification with controlling catches, ensuring non-displacement of the simulation evaluation of logarithmic catches and efficiency function – a median of distribution of the square of the remainder of logarithms of catches number (MDN). In accordance with said model the biomass of the North-Western stock has been going down till the year of 2000. In the year of 2001 further reduction of the amount of fishery stock B(3+) took place: it has reduce with 27.2 %. However the total biomass B(2+) has increased with 3.2 % (table 1). It must be mentioned that due to increase of a mesh size in the cod end of a trawl and installing a selective extension piece on a trawl, the size and age composition of commercial catches has changed. The above mentioned data is used in a simulation process. Due to this fact evaluation of biomass has also changed during recent 2 years.

Current Status of Fishery.

In the Navarin area fishery of pollock in warm years may be conducted all year round. However too much ice in the North-Western part of the Bering Sea, which has been observed within recent 3 years, made the fishing operations of the fleet during the winter-spring period very difficult and all fishing was carried out within the period from June to November. Abnormality of background conditions in the end of the nineties resulted in a reduction of efficiency of the fleet operation.

Reduction of pollock population abundance resulted in narrowing their natural habitates, basically at the expense of deep waters. Now fishery agglomerations of pollock in the Bering Sea are formed mainly on the shelf. Accordingly pollock fishery is conducted here at the depths below 400 meters.

Increase of a mesh size of trawls resulted in reduction of fishing mortality of pollock of junior age classes. At the expense of average productivity generations of recent years and reduction of their fishing mortality the share of fry in the total amount of the stock has increased. Therefore temporary expenses for searching agglomerations of the fish of commercial size has gone up. The search period became even longer after the introduction of a new commercial size in 2001. Catches per efforts have dropped. Accordingly pollock fishery became unprofitable for some vessels owners and they changed the object of fishing. This resulted in reduction of fishery fleet, majoring in pollock fishing in the Bering Sea.

Summing up the fishery data, data of direct registration surveys and analytic approach, the current status of the stocks of Alaska polack in the Russian part of the Bering Sea may be described in the following way. Currently status of the Western-Bering Sea stock is in depression, the biomass of the stock is close to its historical minimum. Biomass of the North-Western stock has been decreasing within recent years. At the same time introduction of additional measures for fishery regulation, aimed at reduction of fry additional catch, reduction of fishery load and spawning efficiency increase, actually resulted in stabilizing the stock status in 2000. In 2001 there was a tendency for a certain growth of biomass. While a growth of the Western-Bering Sea stock occurred generally due to a growth of its spawning part, a growth of the North-Western stock increased at the expense of the recruits' biomass.

According to forecasts within the coming years the growth of biomass of both stocks will proceed. However to keep up said growth may be possible only by strict observance of principles of precautionary approach, according to which reduction of the total allowed catch in the Karagin sub-zone of the Eastern-Kamchatka zone plan be reduced with 80 % and in the Western-Bering Sea Zone with 49.5 %.

In spite of a significant reduction of fishery load for pollock stocks of the North-Western part of the Bering Sea, the climatic and oceanologic peculiarities of the current epoch in the Northern part of the Pacific Ocean basin do not favour a fast reproduction of the Western-Bering Sea and North-Western stocks. Biomass of pollock in the North-Western part of the Bering Sea will remain at a low level in the near future. Thus species of said population will not migrate to the deep sea part of the Aleutian basin.

Table 1. Navarin pollock. Catch and retrospective of resources estimation.

year	catch (ths.tons)	SSB (ths.tons)	F(5-7)	B(3+) (ths.tons)	R(2) (m.)	R(2)corr* (m.)	B(2+)corr* (ths.tons)
1994	288,9	560,3	0,123	1394,85	2647,29	2647,3	1577,0
1995	427,3	662,7	0,130	1777,53	3710,17	3710,2	2037,2
1996	753,0	749,4	0,264	1949,27	3147,80	3147,8	2147,6
1997	735,0	640,8	0,303	1726,85	3681,74	3681,7	1984,6
1998	719,7	344,3	0,339	1375,64	4402,04	4402,0	1727,8
1999	639,0	280,8	0,505	1123,67	2838,30	2838,3	1296,8
2000	377,0	259,1	0,345	994,14	913,29	3344,3	1224,3
2001	400,0	295,3	0,476	724,10	309,01	7835,3	1263,2

Table 2 a. Biological characteristics of North-Western Bering Sea pollock, 2001 г.

Area		Navarin		Olyutor bay	E Koryak
Period of observation		early June	late June	early July	late May-early June
Average length, cm		44.61		45.42	45.27
Minimum-maximum length, cm		- 85		26 - 71	31 - 74
Mode length cm		40-42, 70-72		35-36, 60-64	44-46
Minimum-maximum weight, g		- 4459		155 - 3048	163 - 2491
Male portion, %		33.8	39.0	26.9	28.5
Predom. stage gonadogenesis %	female	VI-II, 87.7	VI-II, 82.0	VI-II, 92.6	VI-II, 88.2
	male	VI-II, 83.6	VI-II, 65.2	VI-II, 100.0	VI-II, 82.2
Aver. stomach filling (SF)		0.72	1.94	2.46	0.98
Predom. food objects (%)		prawn, 71 euphaus, 12	prawn, 60 euphaus, 47	prawn, 59 copepods, 41	capelin, 49 prawn, 34
Morpho-physiological characteristics matured specimen					
Cubic condition ind. (CCI)		0.561±0.004	0.569±0.004	0.578±0.005	0.568±0.003
Gonadosomatic index, %	female	2.83±0.16	3.74±0.22	3.11±0.41	2.26±0.19
	male	1.97±0.21	2.11±0.15	1.39±0.17	2.22±0.24
Hepatosomatic index, %	female	7.17±0.18	7.51±0.16	8.53±0.25	6.42±0.24
	male	4.29±0.24	4.59±0.16	8.46±0.69	3.99±0.24
Heart index, %	female	0.257±0.003	0.266±0.004	0.253±0.005	0.251±0.004
	male	0.235±0.005	0.251±0.005	0.260±0.007	0.239±0.007
Spleen index, %	female	0.158±0.004	0.177±0.005	0.196±0.012	0.167±0.006
	male	0.181±0.010	0.195±0.008	0.186±0.019	0.154±0.010

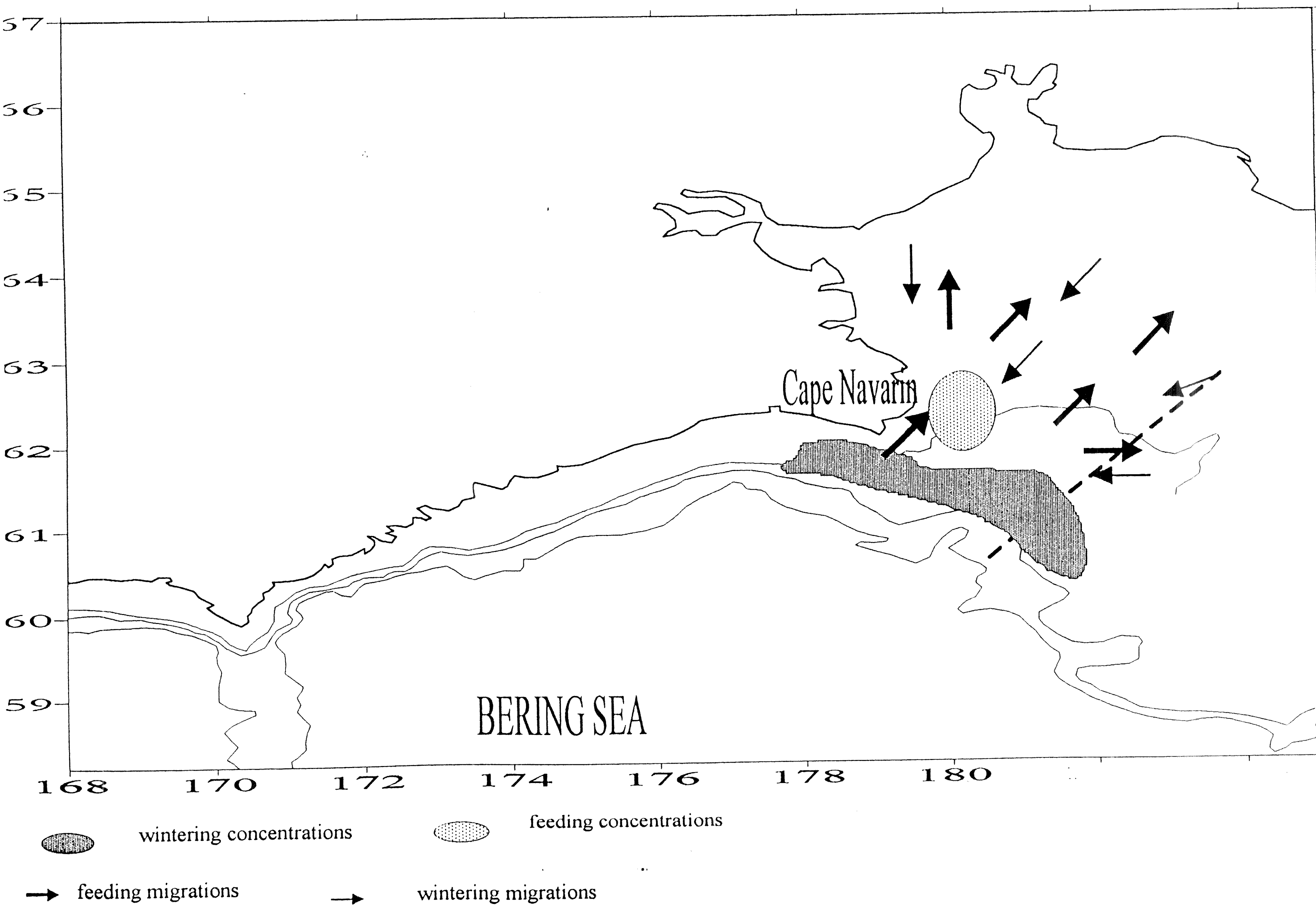
Table 3. Biological characteristic of Navarin Bering sea fry pollock, june 2001.

Generation		1998		1999		2000	
Period of observation		early june	late june	early june	late june	early june	late june
Average length, cm		31.51		22.44		13.46	
Minimum-maximum length, cm		29-34		18-28		9-17	
Mode length, cm		32		23-25		13-14	
Average weight, g		201.38		72.58		14.13	
Male portion, %		50.0		56.3		51.0	
Predom. stage genesis,%	female	II, 67.2		II, 57.3		I-II, 100.0	
	male	II, 56.1		I-II, 56.4		I-II, 100.0	
Aver. Stomach filling (SF)		2.50		2.28		2.00	
Predom. food object, %		prawn, 56; euphaus, 50		prawn, 52; euphaus, 48		euphaus, 100	
Cubic condition index (CCI),%		0.545±0.006	0.546±0.010	0.532±0.009	0.544±0.005	0.499±0.008	
Gonadosomatic index, %	female	0.66±0.10	0.85±0.14	0.45±0.03	0.46±0.04	-	-
	male	0.97±0.22	0.59±0.21	0.48±0.21	0.36±0.16	-	-
Hepatosomatic index, %	female	4.18±0.48	4.64±0.74	3.18±0.35	4.99±0.54	1.99±0.17	-
	male	2.71±0.31	4.72±0.48	2.72±0.28	4.24±0.32	1.91±0.17	4.78±0.11
Heart index, %	female	0.241±0.007	0.284±0.019	0.247±0.008	0.262±0.018	-	-
	male	0.254±0.009	0.279±0.014	0.286±0.024	0.220±0.019	-	-
Spleen index, %	female	0.141±0.009	0.206±0.026	0.149±0.010	0.176±0.014	-	-
	male	0.165±0.014	0.164±0.013	0.176±0.025	0.156±0.018	-	-

Table 2 b. Biological characteristics of North-Western Bering Sea pollock, 2001 г.

Area		Underwater mountain Shirshov ridge		C Koryak	
Period of observation		late May	middle July	late May	middle July
Average length, cm		41.90		44.56	
Minimum-maximum length, cm		32 - 65		22 – 78	
Mode length, cm		38-40, 42-43, 46		40-44	
Minimum-maximum weight, g		253 - 1940		70 – 3370	
Male portion, %		50.0	41.1	40.1	38.6
Predom. stage gonadogenesis %	female	VI-II, 96.0	VI-II, 97.1	VI-II, 84.8	VI-II, 91.5
	male	VI-II, 68.8	VI-II, 100.0	VI-II, 72.1	VI-II, 97.9
Aver. stomach filling (SF)		0.92	1.40	0.86	1.72
Pedom. food object (%)		copepods, 93	copepods, 60 euphaus, 31	prawn, 36 euphaus, 25	prawn, 35 euphaus, 57
Morpho-physiological characteristics matured specimen					
Cubic condition index (CCI)		0.570±0.006	0.595±0.006	0.580±0.003	0.620±0.004
Gonadosomatic index, %	female	1.16±0.10	1.70±0.18	3.00±0.84	2.03±0.22
	male	1.10±0.24	1.22±0.20	2.50±0.20	1.74±0.19
Hepatosomatic index, %	female	6.43±0.46	9.18±0.43	5.99±0.44	8.60±0.20
	male	6.72±0.63	8.43±0.65	4.35±0.15	8.41±0.34
Heart index, %	female	0.257±0.009	0.242±0.006	0.249±0.008	0.233±0.010
	male	0.252±0.010	0.243±0.005	0.241±0.004	0.229±0.005
Spleen index, %	female	0.123±0.008	0.163±0.015	0.152±0.007	0.137±0.006
	male	0.162±0.018	0.163±0.018	0.156±0.005	0.128±0.004

Fig. 1. Migrations of Navarin pollock.



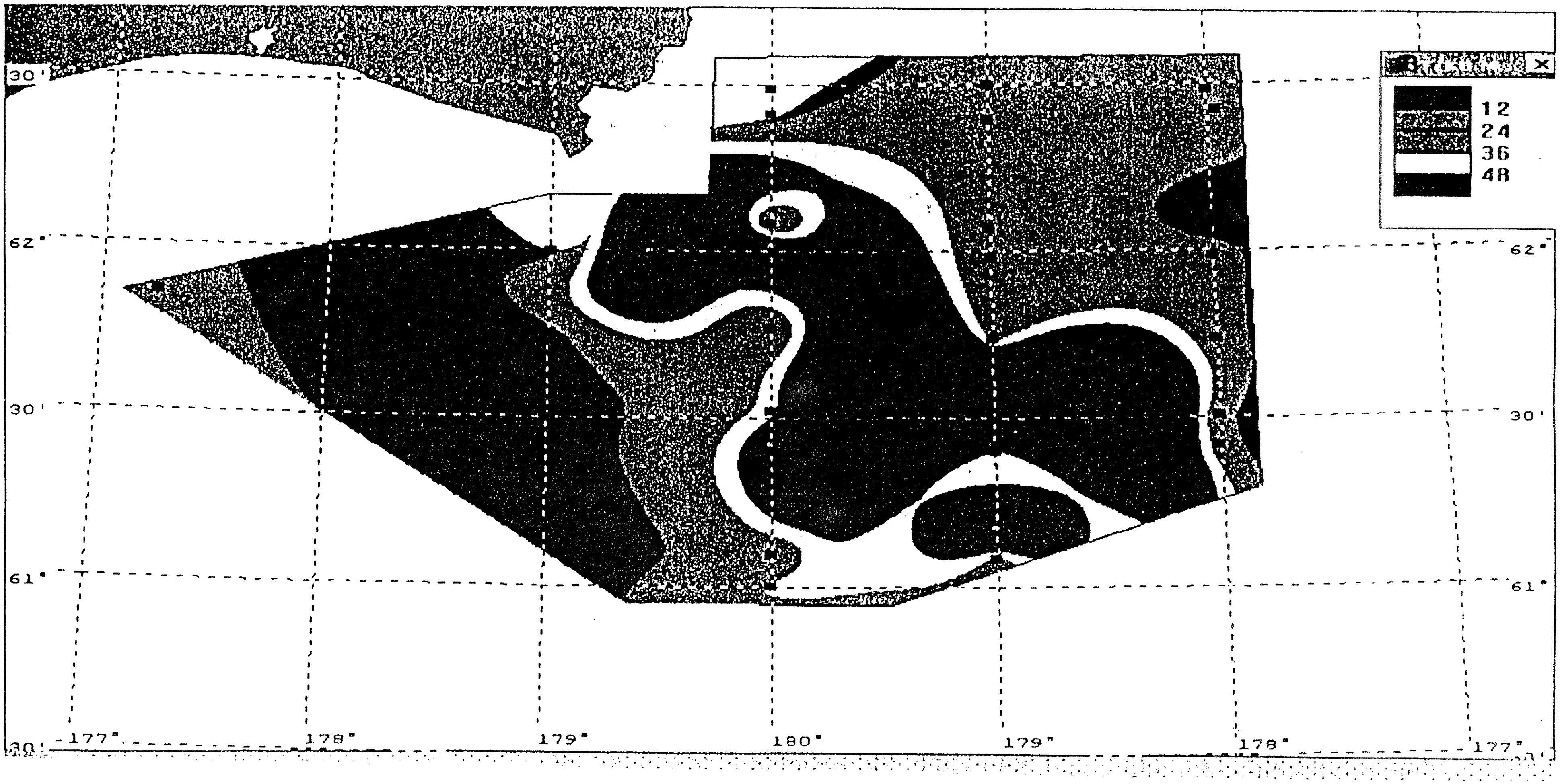


Fig. 2. Distribution of Navarin pollock, bottom trawl survey, June 26 – July 1 2001, tons/sq.miles.

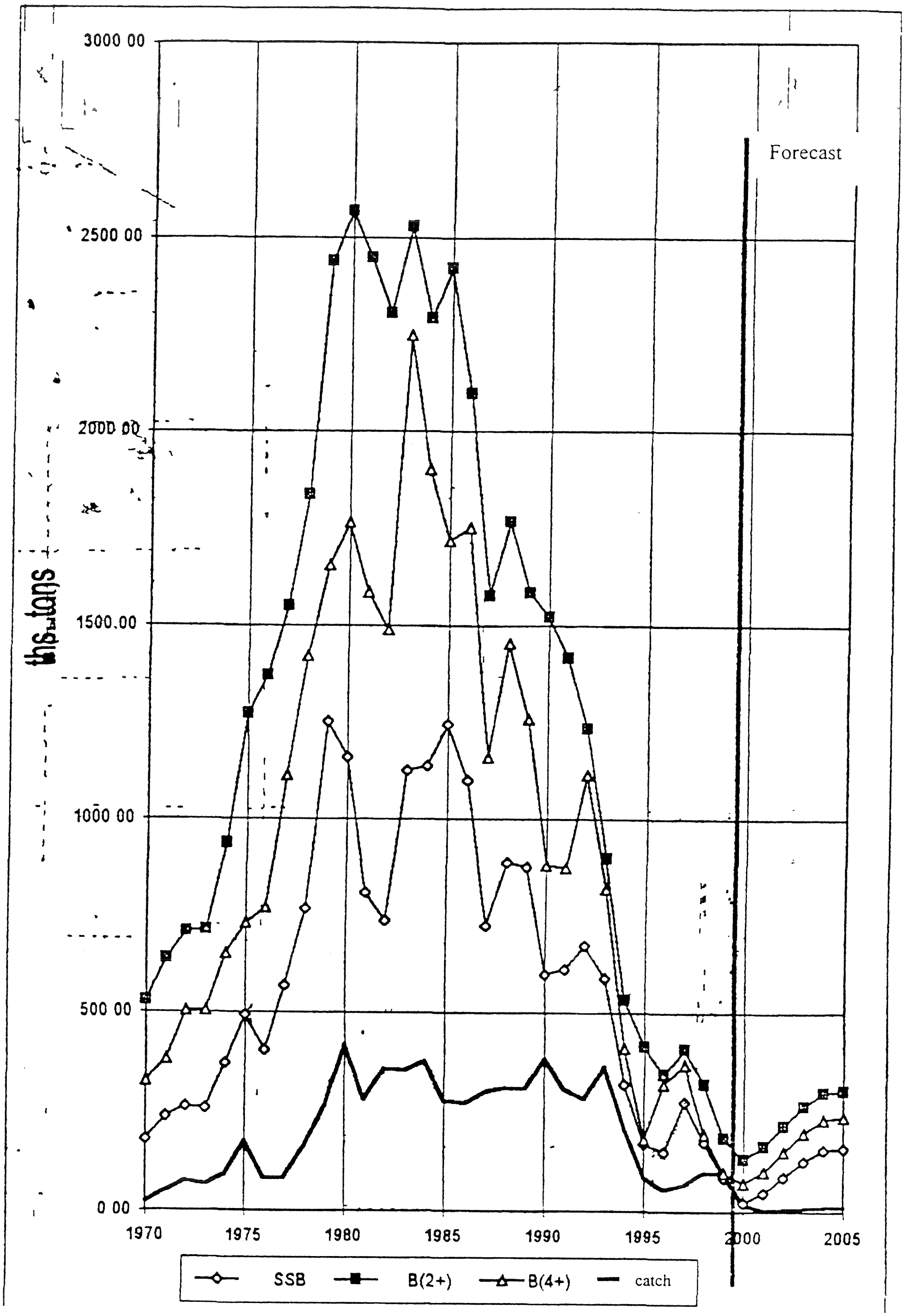
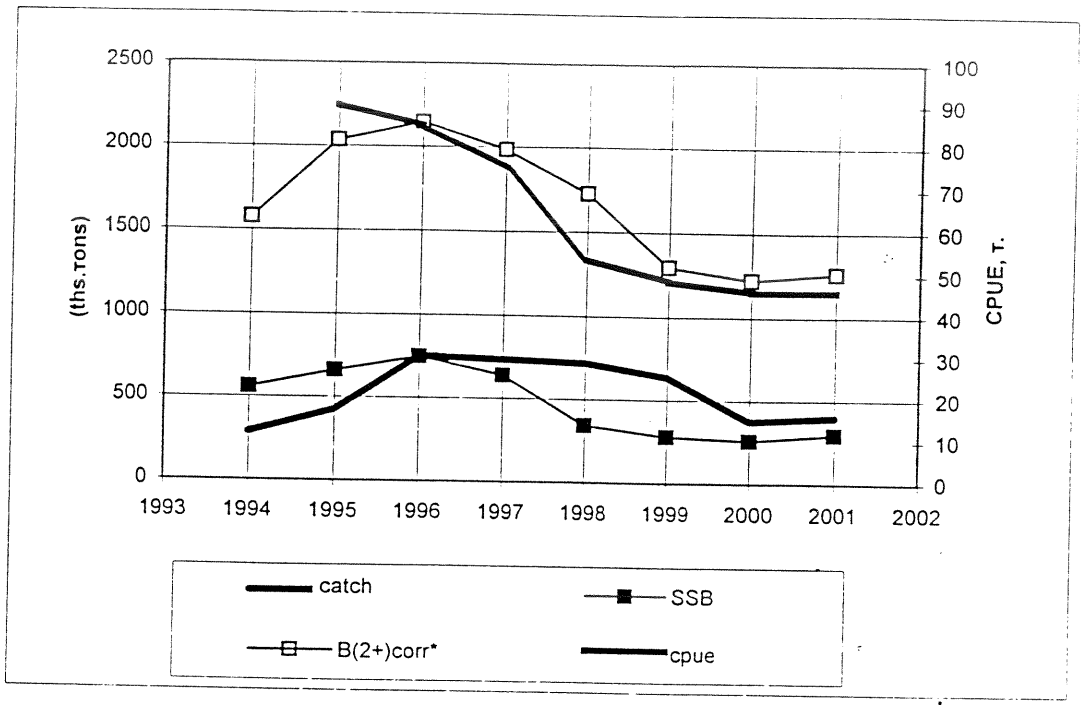


Fig. 3 The biomass estimation of the total (B(2+)), commercial (B(4+)) and spawning (SSB) stock North-Western Bering sea pollock

Fig. 4 Navarin pollock. Catch and retrospective stock estimation.

Catch, biomass



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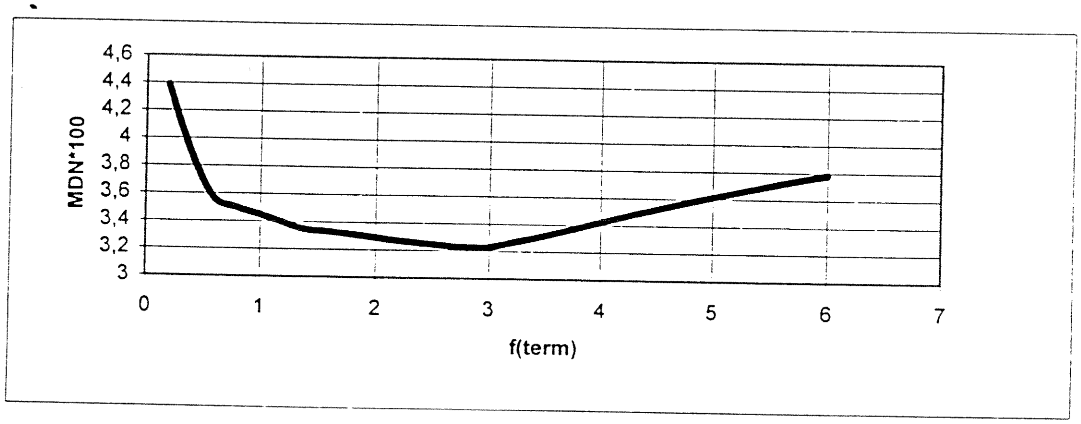


Diagnostic

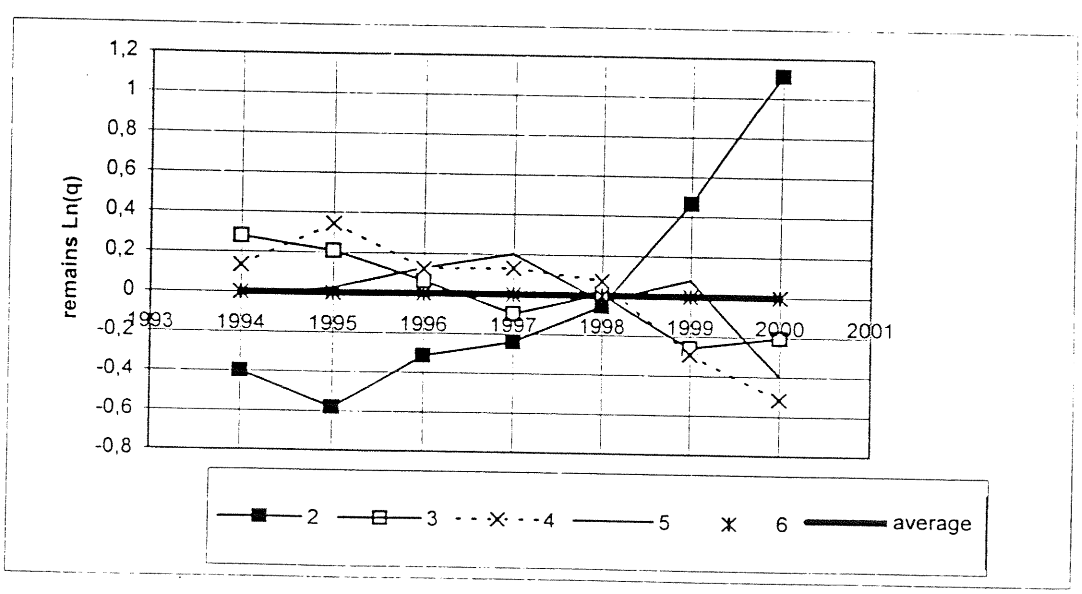
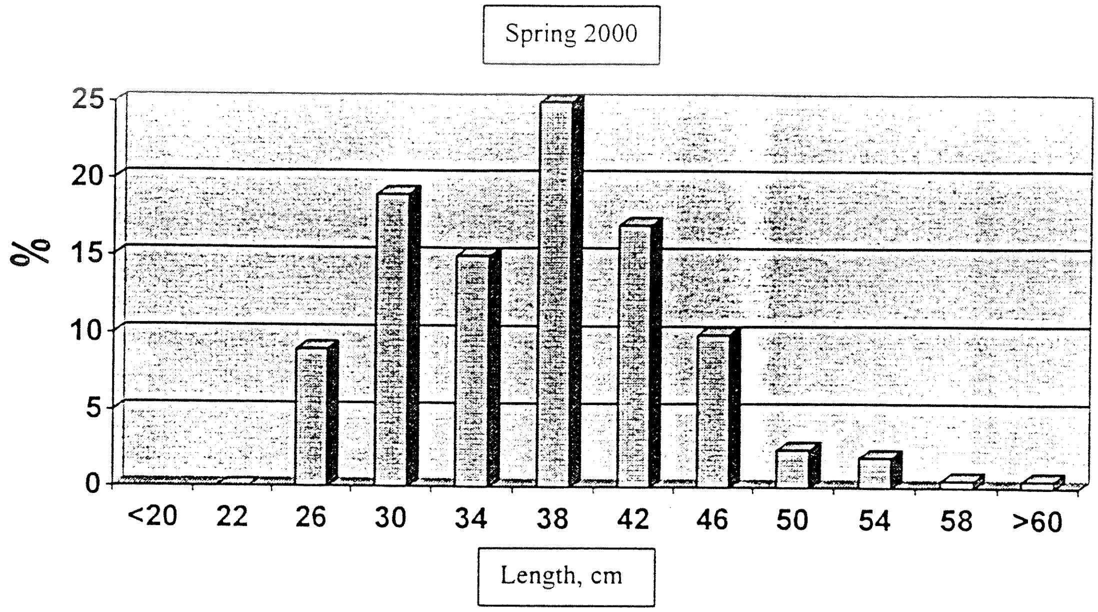


Fig. 5. Length-age composition of Western Bering sea pollock

A



B

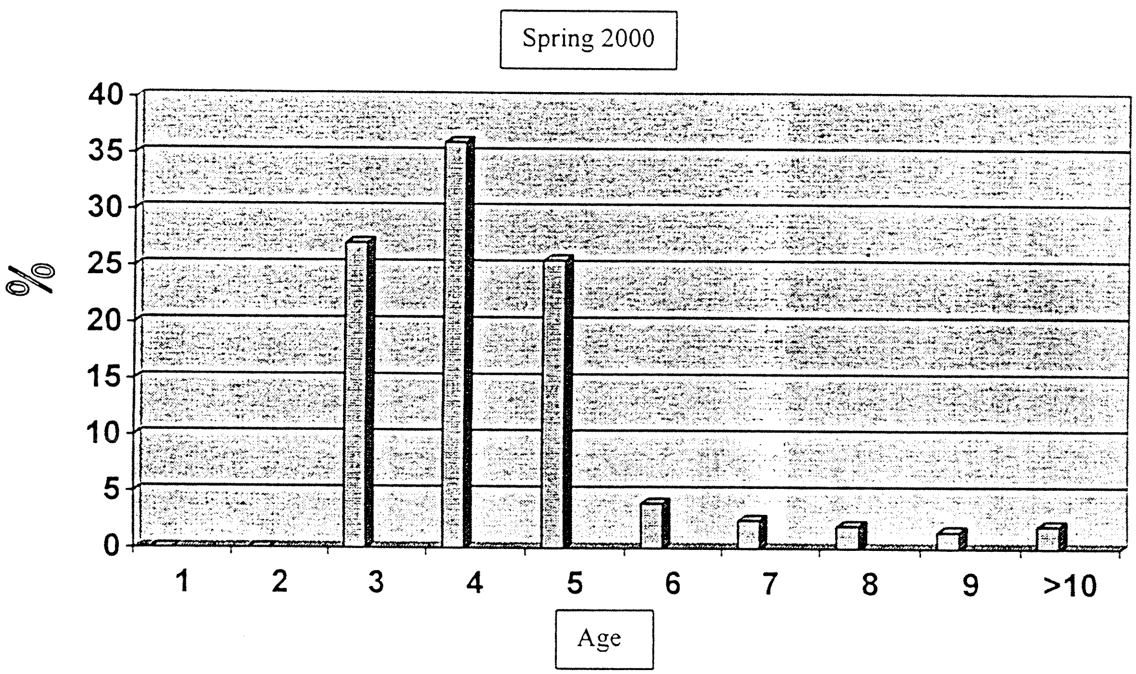
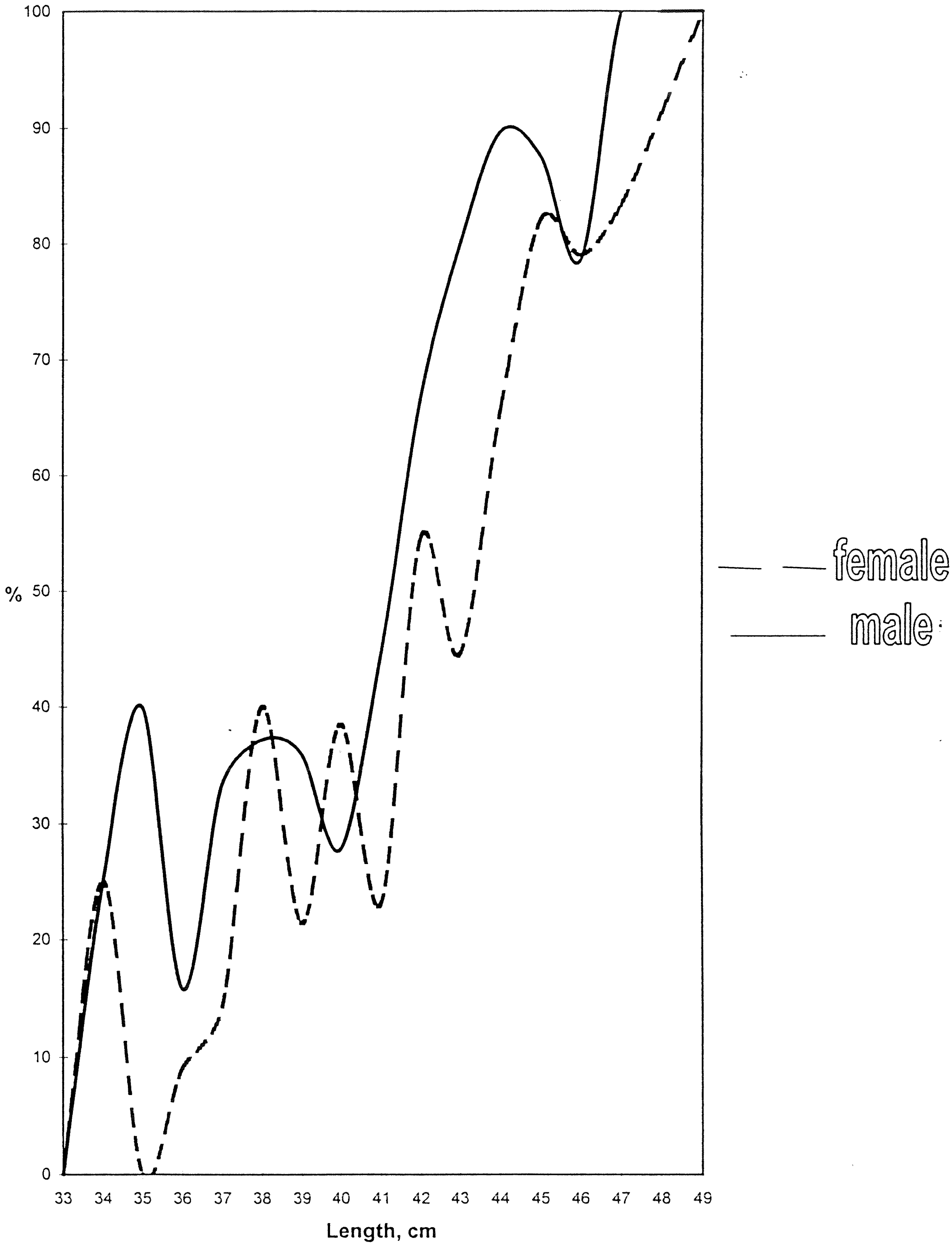


Fig. 6. Maturation curve of Western Bering sea pollock, 2001.



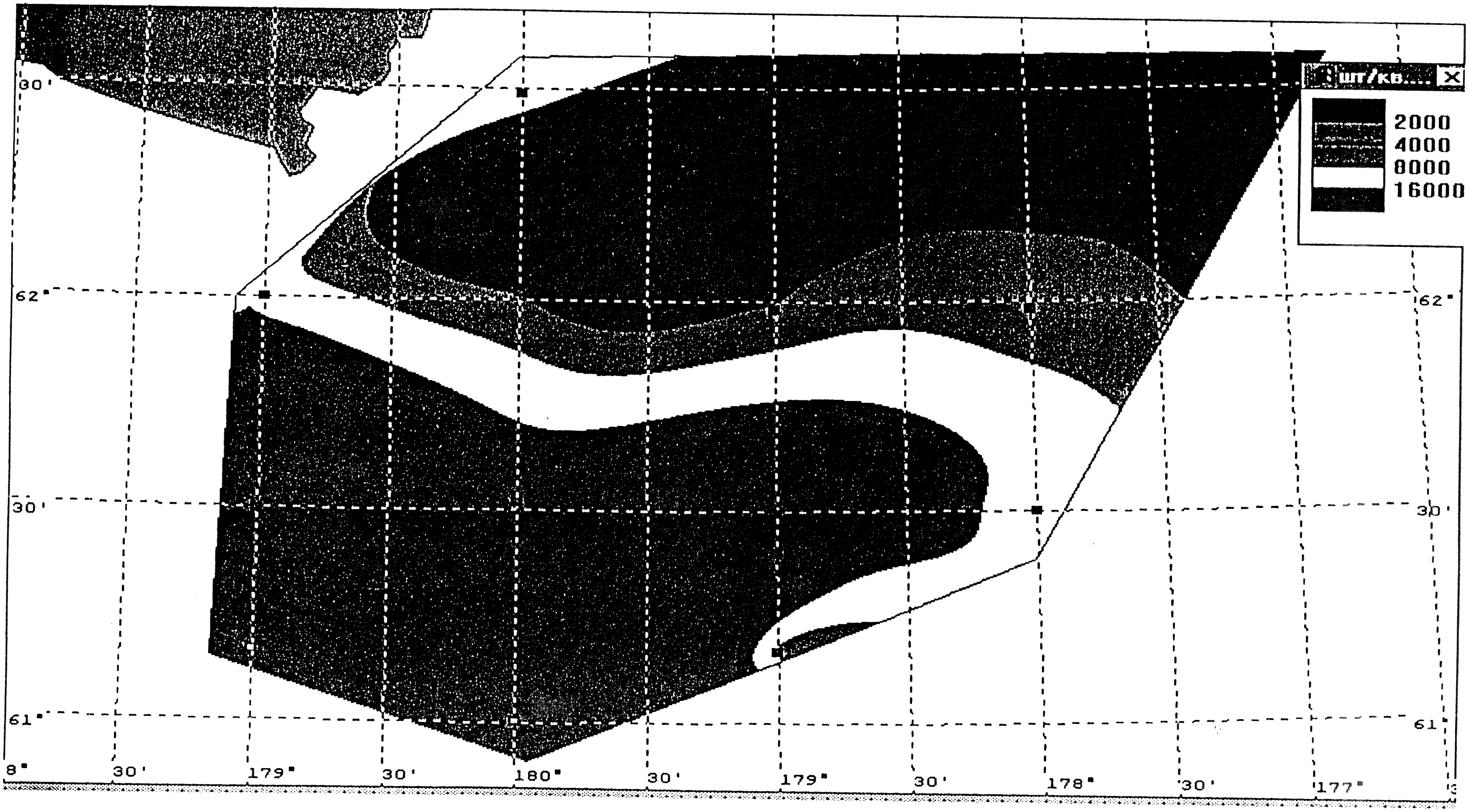


Fig. 7. Distribution of Navarin pollock, generation 1999, fry survey 2001 june 26 – july 01, 1x10 sp/sq.miles.

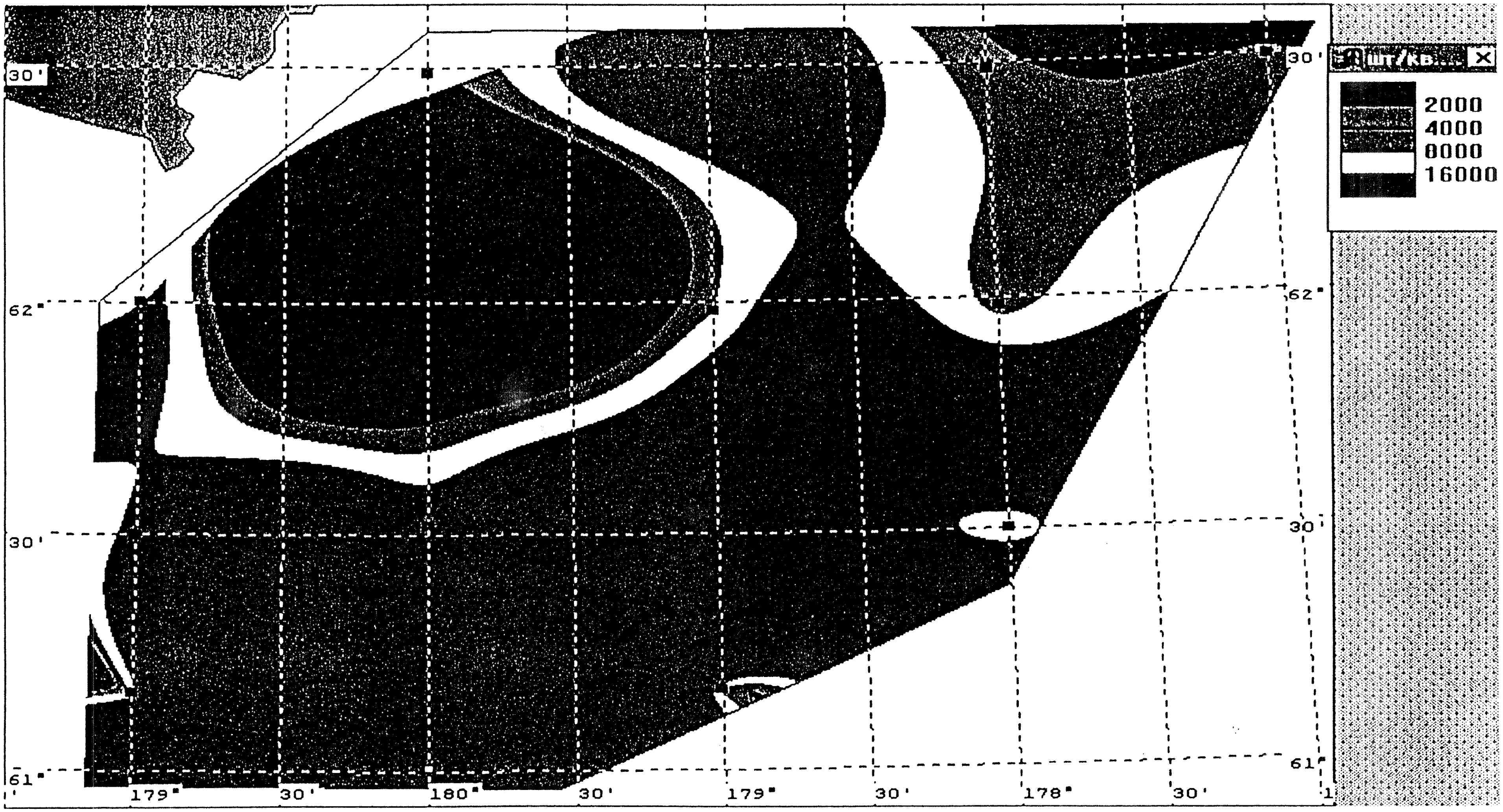
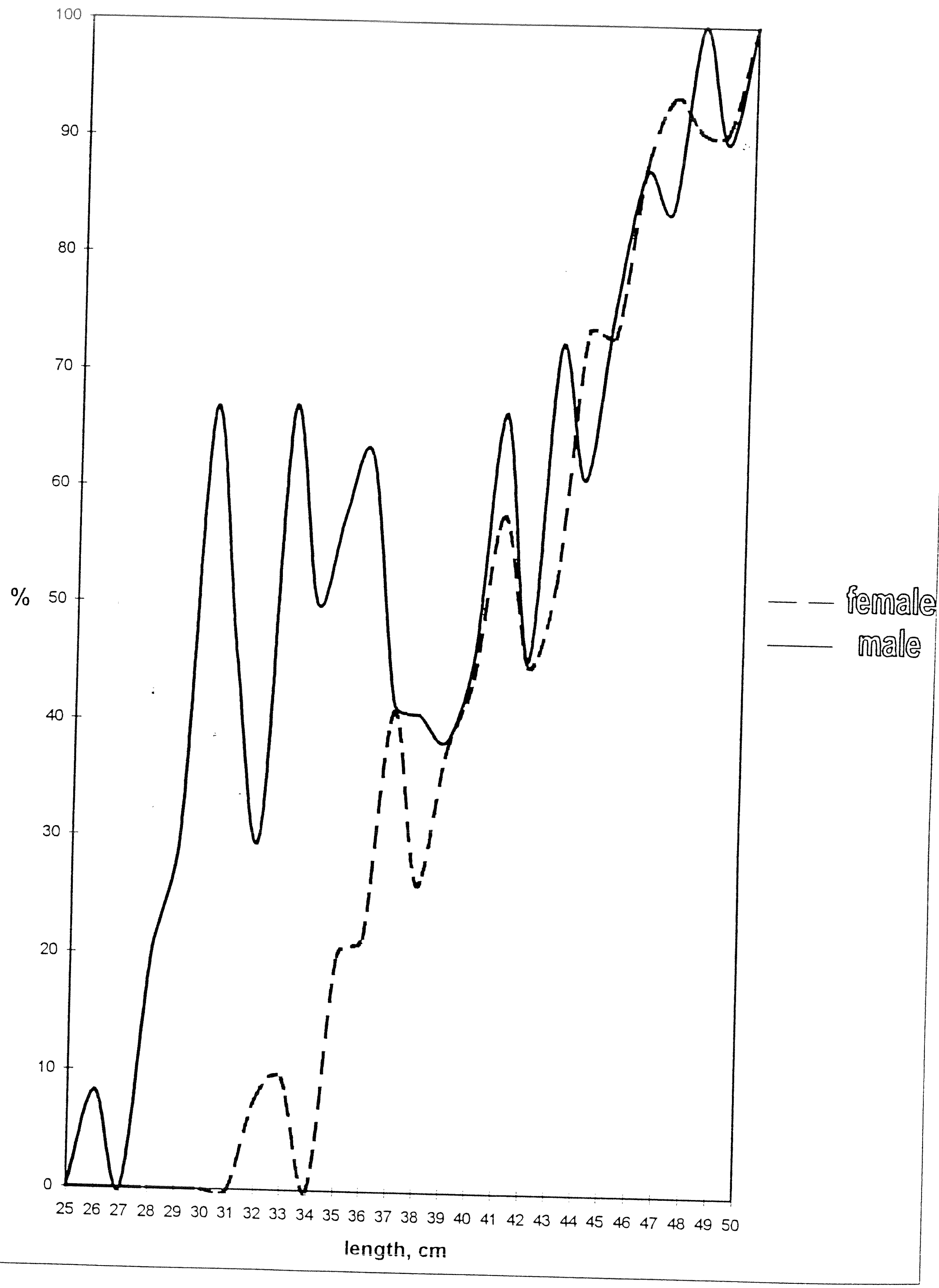


Fig. 8. Distribution of Navarin pollock, generation 2000, fry survey, 2001 june 26 – july 01, 1x10 sp/sq.miles.

Fig. 9 Maturation curve of Navarin pollock, 2001



The Aleutian Basin Pollock Stock in 2001

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There are two numerous, reproductively independent pollock populations in the eastern and western Bering Sea. These populations are isolated geographically from each other during of spawning period but in postspawning time distribution of both ones greatly expands. There is considerable interannual variability of pollock distribution primarily determined by total populations biomass, abundance of year classes and interannual variability of environments.

While being high abundant pollock widely distributes over the shelf and deep Aleutian and Commander Basins, where it is one of the most common fish. Such situation was observed in 1980s when total biomass of the eastern Bering Sea pollock population reached about 14.0-15.0 mln.t and the western population about 2.5-3.0 mln.t (according to another estimation about 20.0 mln.t - EBS and 5.0 mln.t - WBS). An extension of pollock distribution into deep water basins during feeding period is supposed to be caused by food lack at the eastern and western Bering Sea shelves in periods of highly abundant pollock populations. Pollock in the Aleutian and Commander basins uses for food huge resources of zooplankton as well as lanternfish and squids. The pollock of both populations widely intermixes at the Aleutian and Commander basins in periods of high abundance. In the central part of the Bering Sea (donut hole) pollock usually most abundant in summer and early autumn time.

The Bering Sea pollock research surveys had conducted by number of nations in the Bering Sea from early 1950's as well as pollock fisheries history shows quite evidently that appearance of extremely high abundance which has taken place in 1980s is quite infrequent event and it determined by appearing of extremely high abundant year classes comparable with ones of 1978.

The pollock biomass and abundance in the middle of 1990s after the historical peak of 1980s has decreased to 6.0 – 7.0 mln.t in the eastern Bering Sea and to 0.4 - 0.5 mln.t in the western one simultaneously with the reduction of its habitat areas. The spatial distribution of pollock to the deep water Bering Sea basins in postspawning period has sharply reduced, as well spawning activity has noticeably decreased at the Aleutian Isles region.

Undoubtedly, the main reason of interannual variability in the rate of reproduction, recruitment and total pollock abundance in 1980-1990s are basically natural. Nevertheless, fisheries could also negative influence on pollock stock and reproduction potential.

The significant ecosystem changes have taken place in the North Pacific and Bering Sea in late of 1990 initiated by the big-scale variability in the climate and physical environments. There are many evident signs indicating climate shift to the next 20 years cold period. Considerable variability of the pollock reproduction, recruitment and distribution are also registered. It's impossible now to define whether this variability has a stable trend, but quite evidently that necessary to increase research effort for the Bering Sea pollock stocks studies and its ecosystem status and to strengthen measures for conservation pollock resource.

Pollock stock status in the Aleutian basin .

In 1990s pollock abundance and biomass has decreased considerably in the Bering Sea. Pollock of the western Bering Sea population stopped feeding migration to the deep water basins, while the spatial distribution of the eastern Bering Sea pollock population has decreased significantly. The surveys conducted on aboard of Korean and Japanese research vessels in the middle of 1990s (Pusan-851 and Kayo-maru in 1996) in the Aleutian basin showed extremely low pollock abundance during both pre-spawning and post-spawning period. The Korean estimation of postspawning pollock biomass in the central Bering Sea area is just 1.6 th. t in late spring 1996. In February of this year by the r/v Kayo-maru survey did not recorded any prespawning fish in the southeastern part of the Aleutian basin.

Trial pollock fishery conducted by some nations factory trawlers in the central Bering Sea area in 1999-2000 reported extremely low abundance of pollock. The pollock catch decreasing in the Aleutian basin in late 1980s – early 1990s was proceeding the eastern Bering Sea pollock and Bogoslof stock reducing biomass (Tabl. 1, 2). It's quite evident there is relationship between pollock biomass in the eastern Bering Sea shelf and pollock biomass and catch in the Aleutian basin.

As known, pollock which spawns in the Bogoslov I. area migrates basically to the Aleutian basin in postspawning time. So, there is evidence of dependence supposed to be between pollock biomass in the eastern Bering Sea shelf, biomass of the spawning fishes in the Bogoslov I. area and scale of extention postspawning pollock into the Aleutian basin.

High abundance and biomass of the spawning pollock was registered in the Bogoslov I. area in the periods when its biomass at the eastern Bering Sea shelf exceeded 9.0 – 9.5 mln.t (Fig.1). Therefore, large-scale migration of postspawning pollock to the Aleutian basin including central Bering Sea region were also available in period of high pollock biomass in Bogoslov I. area. Such situation was recorded in the second half of 1980s, as pollock biomass in the EBS shelf was about 12.0 – 14.0 mln.t, in Bogoslov I. area – 2.1 – 2.4 mln.t and catch in the central Bering Sea reached 1.3 – 1.4 mln.t. For example, in 1988 pollock biomass of the EBS population was about 12.5 mln.t, biomass of spawning fish in the Bogoslov I. area – 2.4 mln.t and catch in the central Bering Sea – 1.45 mln.t. However, in 1991 Eastern Bering Sea pollock biomass has significantly decreased and estimation in the EBS shelf was just 7.8 mln.t, in Bogoslov area – 1.29 mln.t extention of postspawning pollock into the Aleutian basin sharply decreased and catch in the central Bering Sea reduced to 10 ths. t.

In 1990s the EBS pollock population biomass has stabilized at the level 7.0 – 7.5 mln.t. As result of an absence of abundant year classes, spawning pollock biomass ranged 0.4 – 0.6 mln.t in the Bogoslof I spawning area. In late 1990s the biomass did not exceed 0.5 mln.t and in 2000 biomass was estimated as about 0.30 mln.t.

In late 1990s there was appeared a trend of increasing of the EBS pollock population biomass due to relatively high abundant year classes in 1995-1997. Pollock of these three year classes composed almost half (46.5% in 1999) of the total pollock biomass estimated on the EBS shelf and adjacent continental slope.

The 1996 year class most abundant for 1990-s and in 2000 it abundance composed about 24.1%, abundance of 1995 year class about 18.3 % and abundance of 1997 year class about 13.7% of total abundance.

A stable trend toward increasing of the pollock biomass in the Bering Sea usually occurs as result of recruitment by relatively abundant year classes during 2-3 years. That situation was observed in the first half of 1980s while appeared one extremely numerous year class (1978) and some relatively abundant year classes (1979, 1980 and 1982).

Relatively abundant year classes (1995-1997) also occurred in middle and second half of 1990s, however it total abundance much less comparing of late 1970s – early 1980s year classes. Therefore, growth of the eastern Bering Sea population biomass in 2000-2001 expected not very high (Fig. 2) and 2000 total biomass estimation by bottom trawl and EI MWT surveys data is 8.48 mln.t.

The western Bering Sea pollock population remains very poor condition in second half of 1990s. The stock biomass has gradually decreased to 150.0 ths. t in 1999 (EI MWT and BT survey data) and to about 70-80 ths. t in 2000. The western Bering Sea pollock migrations into the deep-water basin stopped. Furthermore, there are some evidences that the western Bering Sea deep-water region is actively occupies by herring of local Korf-Karaginsky stock during it feeding migration second part of 1990s.

There is not a probability of the large-scale migration of big, mature pollock in postspawning time into the Aleutian basin and central Bering Sea at least up to the middle of period 2000 – 2010 having in view that abundance of the WBS pollock population extremely low and EBS pollock population stabilazed on average level only due to relatively abundant 1995-1997 year-classes.

Table 1

Biomass of the EBS pollock population in 1979-2001 (mln. m. t) in US EEZ (according to AFSC data)

Year	*Surveys data*				*Modeling*	
	bottom, shelf	*Trawl-acoustic, shelf*	*Trawl-acoustic, Bogoslov*	*Total biomass*	*Cohort analysis*	*Synthesis model*
1979	2.00	1.550	-	3.55	4.506	4.07
1980	0.99	-	-	-	6.756	5.05
1981	2.27	-	-	-	10.627	8.59
1982	3.54	4.640	-	8.18	12.029	10.46
1983	4.81	-	-	-	13.165	11.86
1984	3.96	-	-	-	12.868	11.81
1985	4.36	5.450	-	9.82	14.232	13.37
1986	4.31	-	-	-	12.954	13.03
1987	5.03	-	-	-	13.108	13.25
1988	5.94	4.160	2.400	12.50	11.968	12.44
1989	4.78	-	2.100	-	10.020	10.82
1990	7.70	-	-	-	7.960	8.82
1991	5.10	1.400	1.300	7.80	6.660	6.91
1992	4.30	-	0.980	-	8.470	7.84
1993	5.50	-	0.680	-	8.600	7.86
1994	4.98	2.760	0.540	8.28	8.080	7.17
1995	5.41	-	1.020	-	7.570	7.67
1996	3.20	2.239	0.682	6.12	7.100	6.63
1997	3.03	2.590	0.390	6.01	5.710	5.30
1998	2.21	-	0.490	-	5.960	5.13
1999	3.57	3.290	0.480	7.34	7.500	-
2000	5.13	3.05	0.301	8.48	-	10.49
2001	~~NA~~ 7.1	-	0.232	-	-	-

Table 2

Catches of the EBS population pollock in 1984-2000 (thousand tons)

Year	*EBS shelf & slope*	*Bogoslof I*	*Navarinsky region*	*Aleutian basin*	*Aleutian Islands*	*Total*
1984	1092.05	-	503.0	-	81.80	1858.0
1985	1139.67	-	488.0	363.40	58.70	2049.8
1986	1141.99	-	570.0	1039.00	46.60	2797.6
1987	859.41	377.40	463.0	1326.30	28.70	3054.8
1988	1228.72	87.80	852.0	1395.90	30.00	3594.4
1989	1229.60	36.00	684.0	1447.60	15.50	3412.7
1990	1455.19	151.60	232.0	917.40	79.00	2835.2
1991	1217.30	264.70	178.0	293.40	78.60	2037.3
1992	1164.44	0.160	315.0	10.00	48.70	1538.3
1993	1326.60	0.886	389.0	1.95	57.10	1775.4
1994	1363.45	0.566	178.0	-	58.60	1600.6
1995	1262.76	0.264	320.0	-	64.40	1647.4
1996	1192.77	0.387	700.8	-	29.06	1922.2
1997	1124.59	0.168	680.0	-	25.94	1830.6
1998	1101.16	0.136	643.6	-	23.82	1768.7
1999	992.00	0.111	632.7	-	1.00	1625.8
2000	1112.5	0.028	378.0	-	-	1490.5

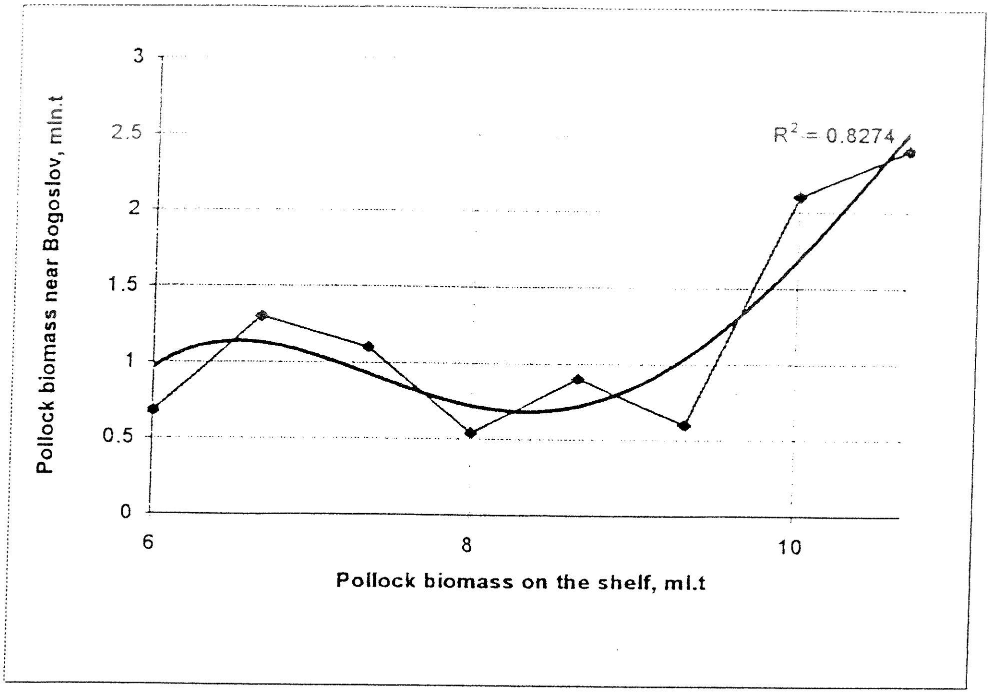
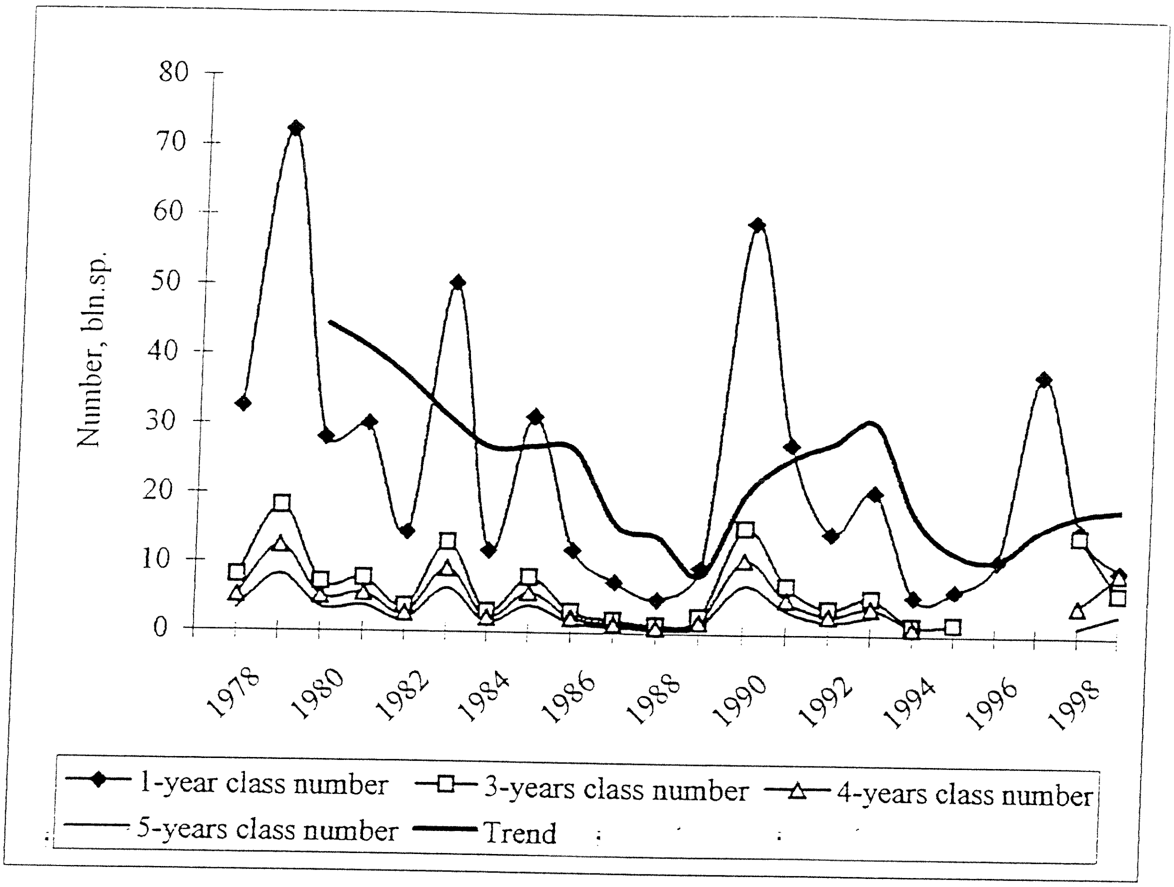


Fig.1 Correlation between pollock biomass on the EBS shelf and in Bogoslof I area in 1980-1990-s

Fig.2 Interannual variability of pollock year-classes abundant and its trend in 1970-1990-s



CBSPC meeting in Shanghai Sep. 2001

Japanese proposal for the ABC of 2002 in the Convention area

Fisheries Agency of Japan

1. Japan tried to calculate the ABC in the Convention area for the year 2002 in case of which the pollock biomass in the Specific Area is less than one million tons.

2. The estimated values of ABC in the Specific area is 1,751 t

3. Base of estimation of ABC

Operational definition: Summary of the Bering Sea and Aleutian Islands Groundfish Fishery Management Plan 1997, published by North Pacific Fishery Management Council.

ABC estimates in the Specific Area were calculated by using Tier 3.

Tier 3

(1) With considering the lowest biomass estimate in 2001, we do not expect the newly recruitment for the year 2002.

(2) Natural mortality rate of M=0.2 gives a projected biomass of B_{2002}=172,000 t.

(3) The values of B40%, and F40% were estimated 2,000,000 t, and 0.27, respectively.

$$F_{ABC}=F_{40\%} \times (B_{2002}/B_{40\%} - 0.05)/(1-0.05) = 0.010$$

(4) ABC for 2002 in the Specific area is

$$ABC_{2002}=B_{2002} \times (1 - e^{0.010}) = 1,751 \text{ t}$$

4. Estimation of ABC in the Convention area

We tried to calculate the ABC in the Convention area taking into consideration the provisions of the Annex part 1(b) of the Convention that the pollock biomass for the Specific Area shall be deemed to represent 60% of the Aleutian Basin biomass.

ABC_{2002} in the Convention area from Tier 3;

$$ABC_{2002} = 1,751 / 0.6 = 2,918 \text{ t}$$

Bering Sea Convention
Sixth Annual Conference
Gdynia, 17-21 September 2001

POLAND

Polish Proposal for Establishing of AHL for Pollock in Central Bering Sea in 2002

According with the Article VII.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:

- Spawning pollock biomass in Specific Area was calculated at the amount of 208 thousand tons during echo integration-trawl survey made by r/v MILLER FREEMAN in March 2001.
- Spawning stock biomass represents 60% of total Aleutian Basin pollock biomass and is equal 347 thousand tons (B)
- Rate of exploitation for pollock in Bering Sea is equal 20% (E).
- The Donut hole represents 17.5% of area of Aleutian Basin (A).

Polish delegation proposes to use this data for calculation of AHL:

AHL = B x E x A

AHL = 347000 x 0.20 x 0.175 = 12145 metric tons

INQ = 12145 : 6 = **2045 metric tons** of pollock for each country.

COOPERATIVE RESEARCH PLAN FOR 2002

submitted to the 6th **Annual Conference of the Parties to the Convention on the Conservation and Management of Pollock Resources in the Central Bering Sea**

Working Group members

Neal Williamson, Alaska Fisheries Science Center, **United States**
Akira Nishimura, Hokkaido National Fisheries Research Institute, **Japan**
Liu Xiaobing, Bureau of Fisheries, Division of International Cooperation, **China**
Young Min Choi, National Fisheries Research and Development Institute, **Korea**
Jerzy Janusz, Sea Fisheries Institute, **Poland**
Mikhail Stepanenko, TINRO Center, **Russia**

I. Background

At the 5th Annual Conference, a Working Group was formed to coordinate survey (research) activities among member nations for the year 2002. Japan and the U.S. plan to conduct scientific surveys in the southeastern Aleutian basin during the winter of 2002 and the U.S. and Russia plan to survey their respective continental shelves in the summer of 2002. These limited vessel resources do not allow for a "comprehensive" research survey. It was the objective of this working group to utilize the available vessel resources as efficiently as possible. And so, we avoid the word "comprehensive" and refer to what follows as a "cooperative" research plan.

The issue of trial fishing and how best to integrate it into the scientific assessment process is a difficult one. Trial fishing is voluntary, occurs at different times of the year (with little advance notice), and, currently, has no mechanism in place for coordination among member nations. With these limitations, the Working Group decided that this issue was beyond the scope of this current task. Effort was focused on coordinating the scientific surveys.

Participants of the Central Bering Sea Pollock Workshop held in Seattle during the summer 2000 identified two principal questions to be addressed in an Aleutian basin research plan –

1) what are the pollock spawning locations in the Aleutian basin ?
2) what are the migration patterns and geographical distribution of pollock stocks ?

With these two questions in mind, the U.S. and Japan proposed the following approach. The U.S. with 7 vessel-days aboard the NOAA Ship Miller Freeman will conduct its annual survey of the Bogoslof area in early March. Japan with 20 vessel days aboard the R/V Kaiyo maru will focus its research on the Aleutian shelf/slope and basin regions west of 170 ° W in an effort to identify spawning locations outside of Bogoslof. To assist the Japanese with their survey design, the U.S. provided a summary of winter pollock catches west of 170 ° W for the years 1991-2000 (Appendix 1). To establish comparability of survey results, an intership calibration of the two vessels will be conducted. This will most likely occur in the Samalga Pass region or the area northeast of Umnak Island. Survey dates for the Miller Freeman are preliminary as are the dates of the intership calibration. Participation in each of these surveys by other member nations is encouraged.

II. Kaiyo maru survey plan for winter 2002 (Appendix 2)

III. Miller Freeman survey plan for winter 2002 (Appendix 3)

IV. U.S. – Russia survey plans for summer 2002

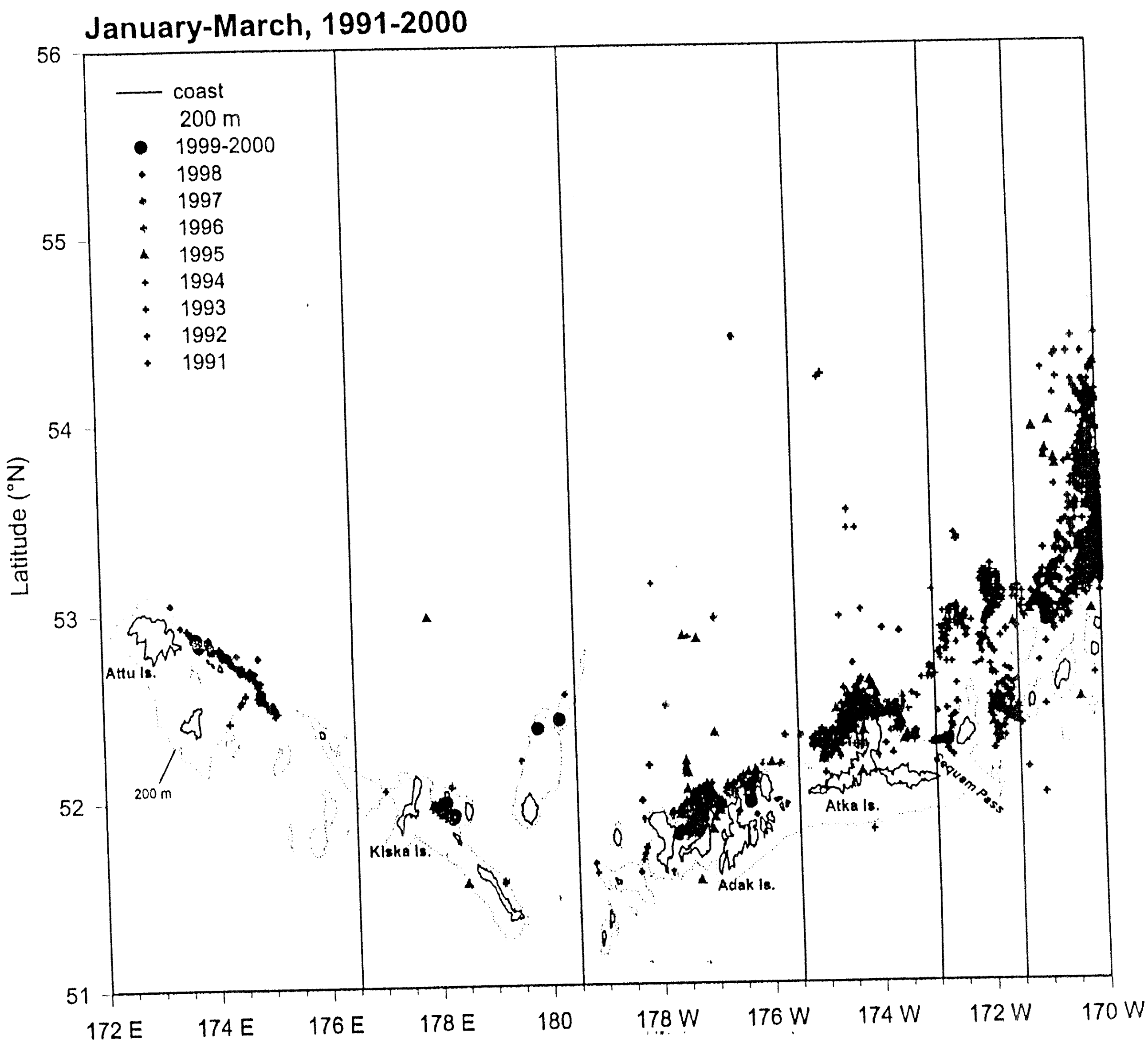
During May-July 2002, the U.S. plans to conduct three surveys in the Bering Sea –

bottom trawl survey of the eastern Bering Sea (EBS) shelf
bottom trawl survey of the Aleutian Islands shelf
acoustic-trawl survey of the EBS shelf and, if permission is granted, the Navarin shelf region.

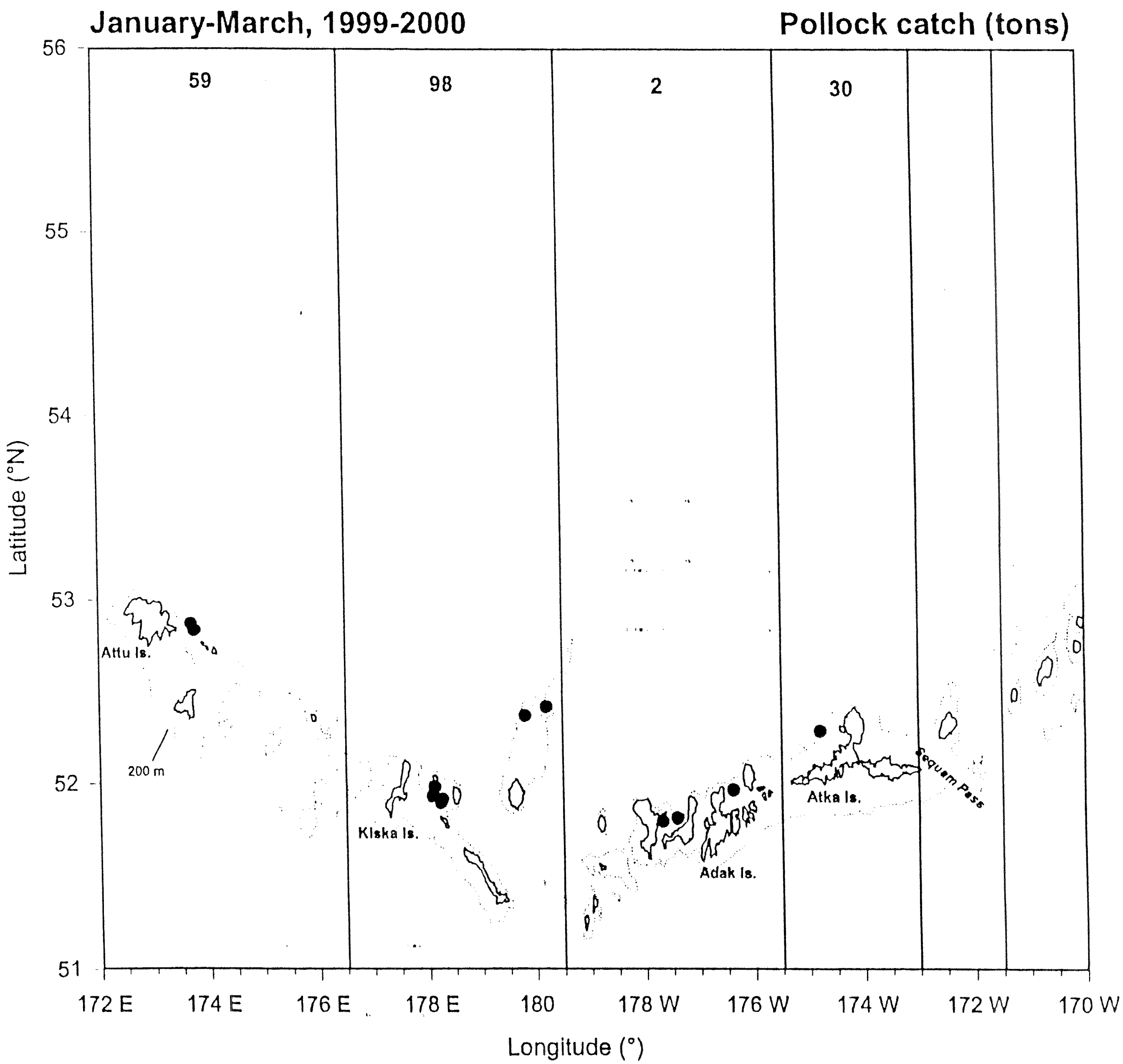
Survey design will be similar to historical summer surveys. The bottom trawl surveys will be conducted by chartered commercial fishing vessels. The acoustic-trawl survey will be conducted aboard the NOAA Ship Miller Freeman. Detailed plans will be available in spring 2002.

RUSSIA PLANS

Every effort will be made to coordinate (in time and space) the U.S. and Russia acoustic-trawl surveys on the eastern and western Bering Sea shelves. An intership calibration is planned – most likely to occur in the northern part of the shelf near the U.S-Russia Convention Line.



Appendix 1. U.S. pollock catch data for Jan.-Mar., 1991-2000 for the Aleutian Islands region west of 170°W. Numbers at the top of the figure represent total tons for the stratum bounded by longitude lines.



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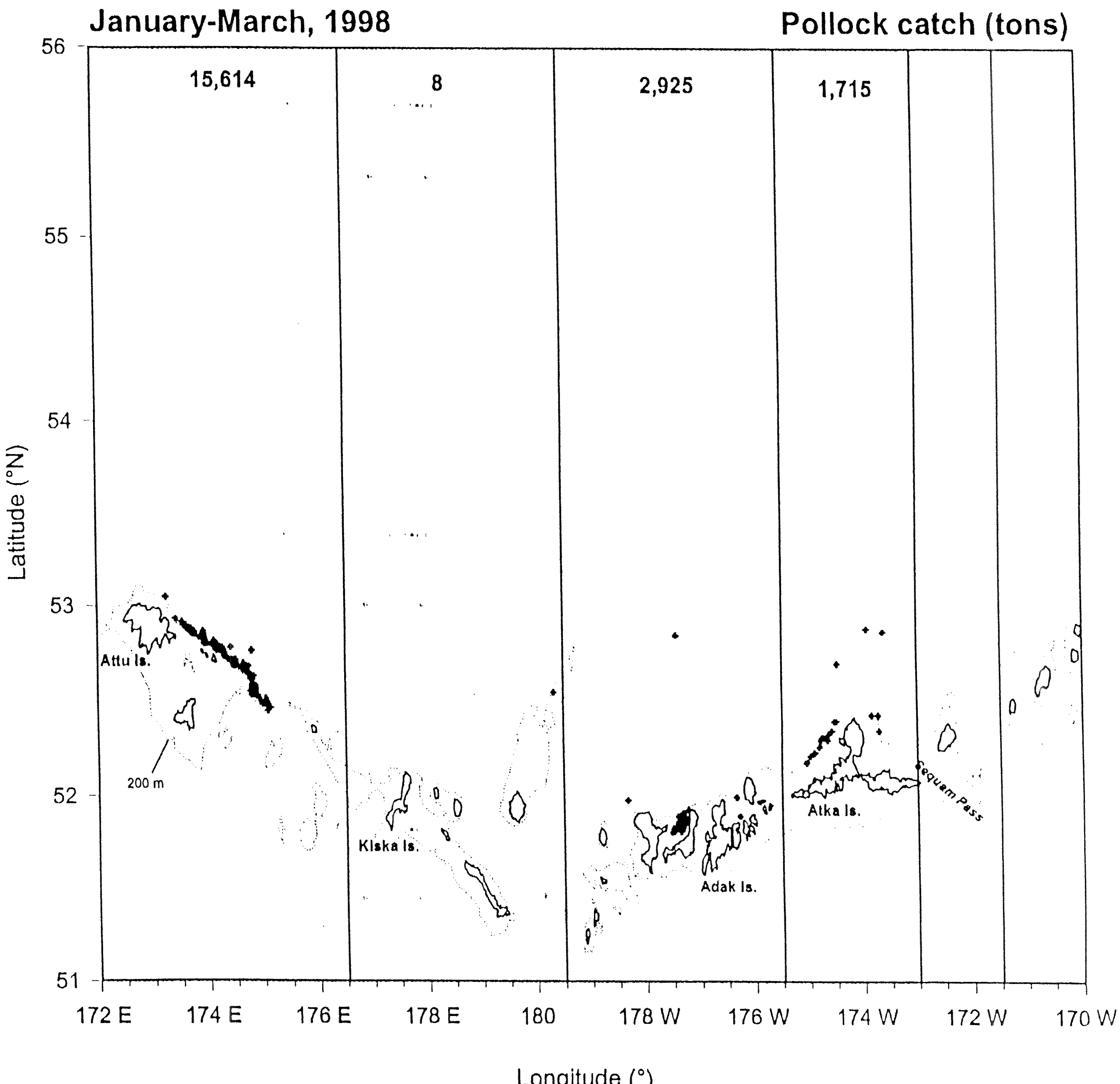

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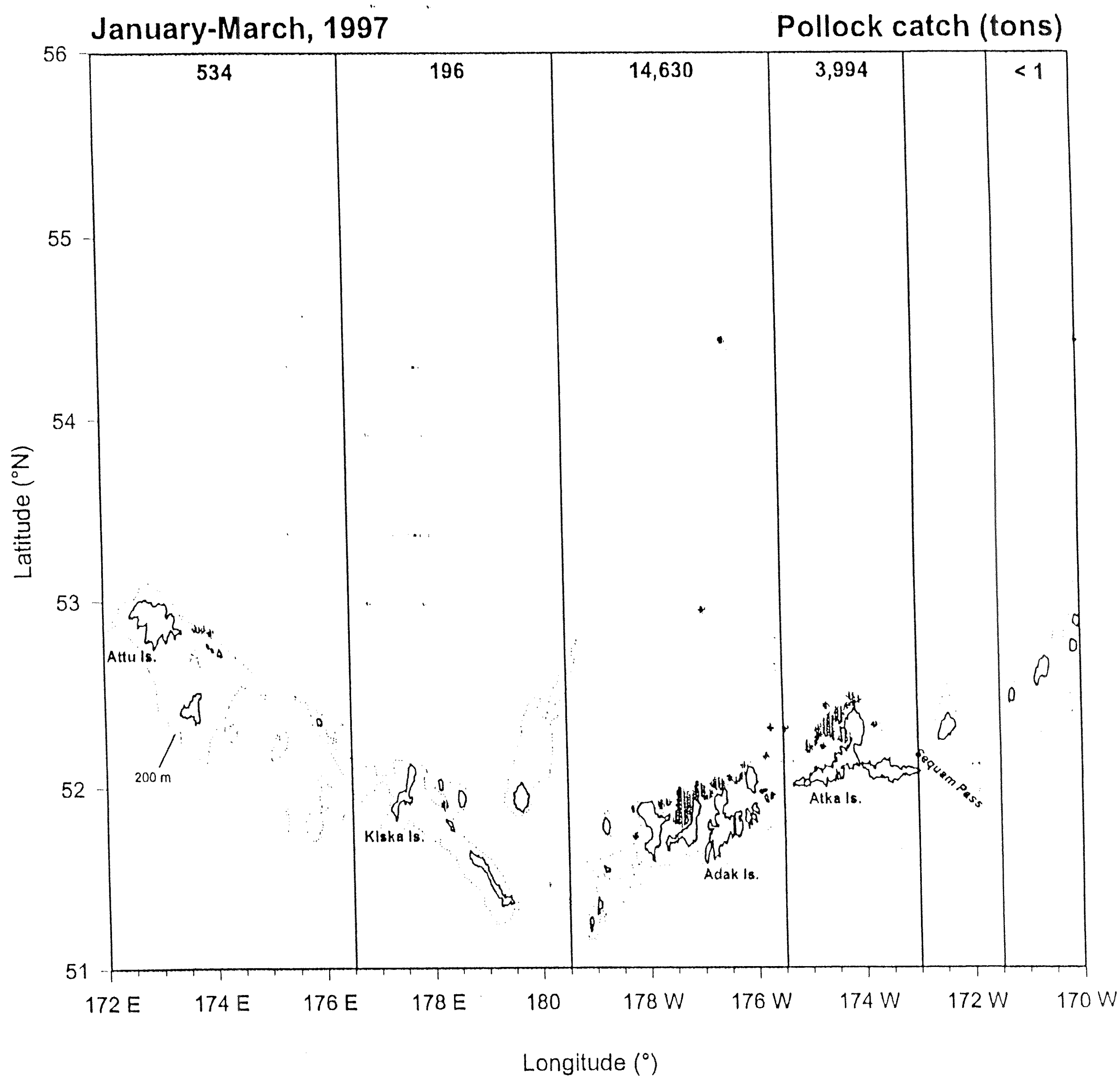

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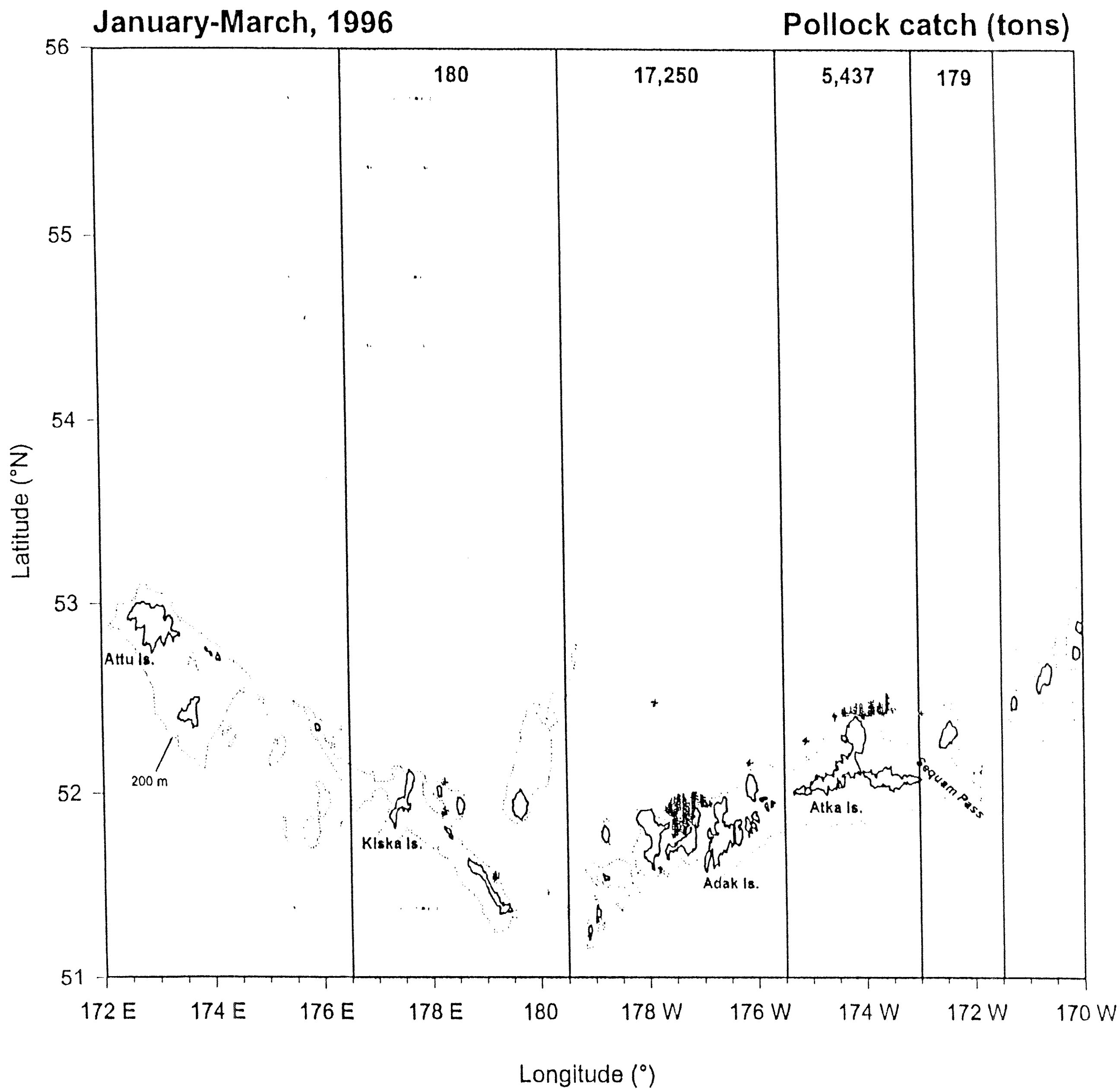

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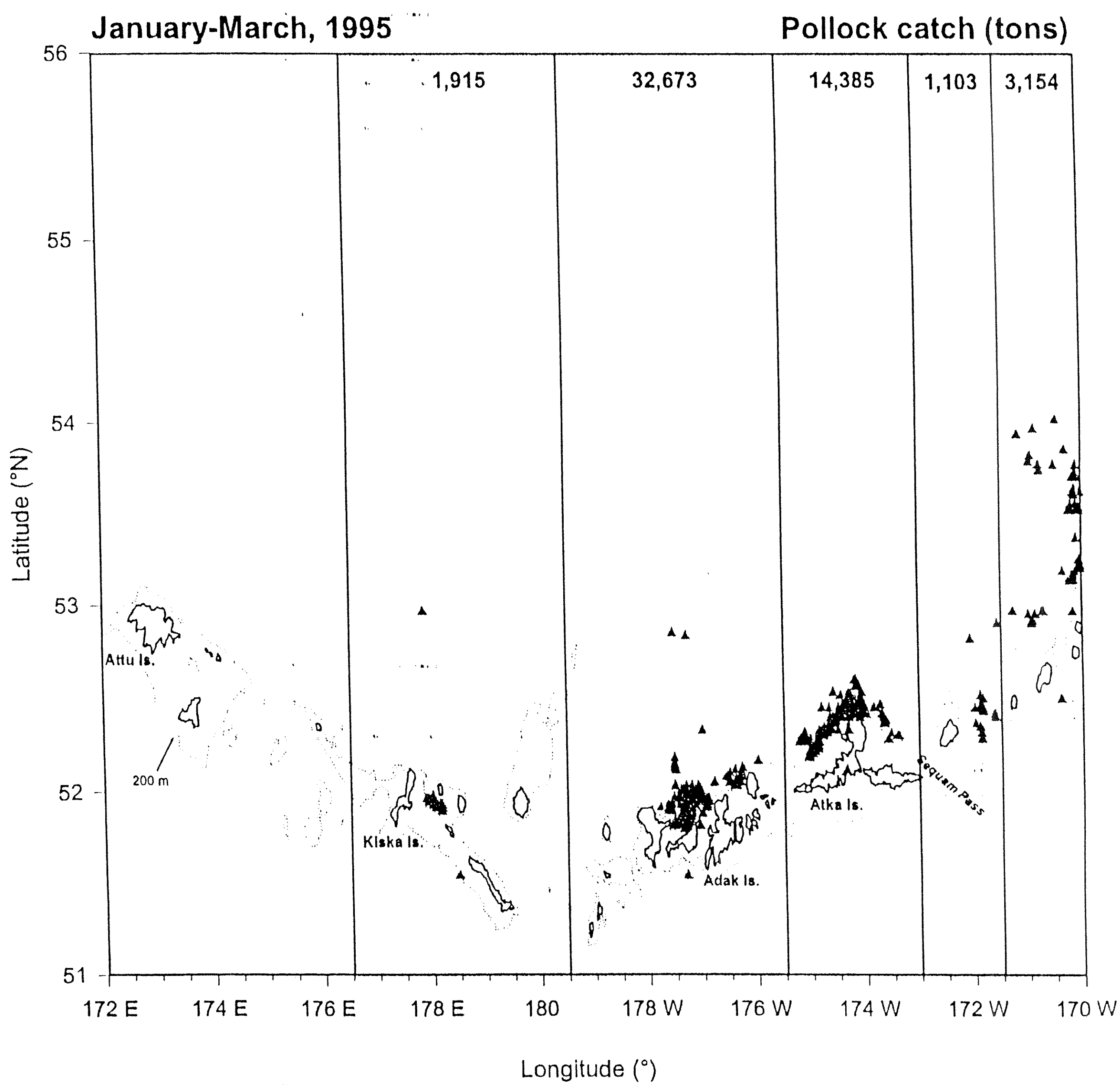

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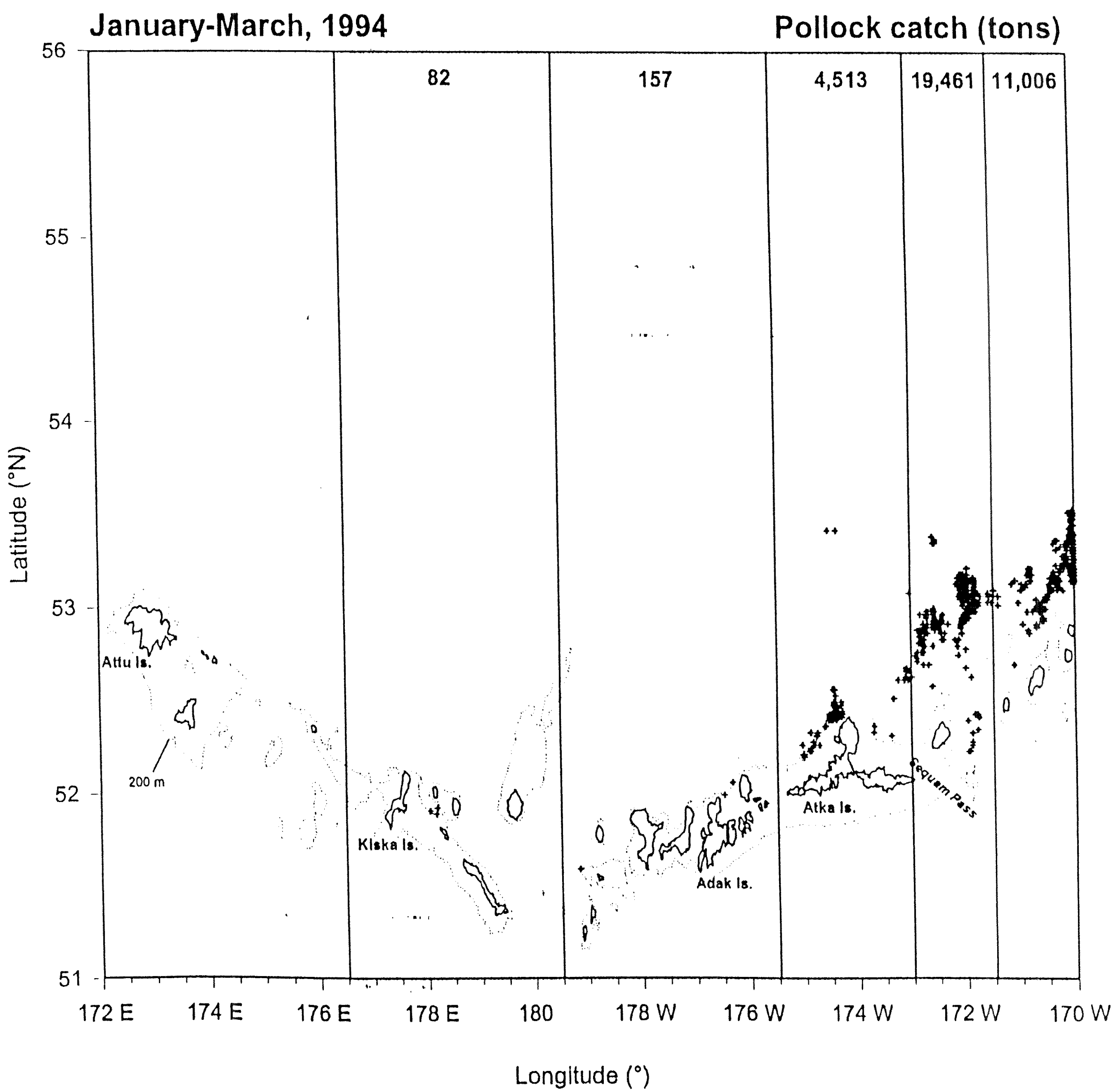

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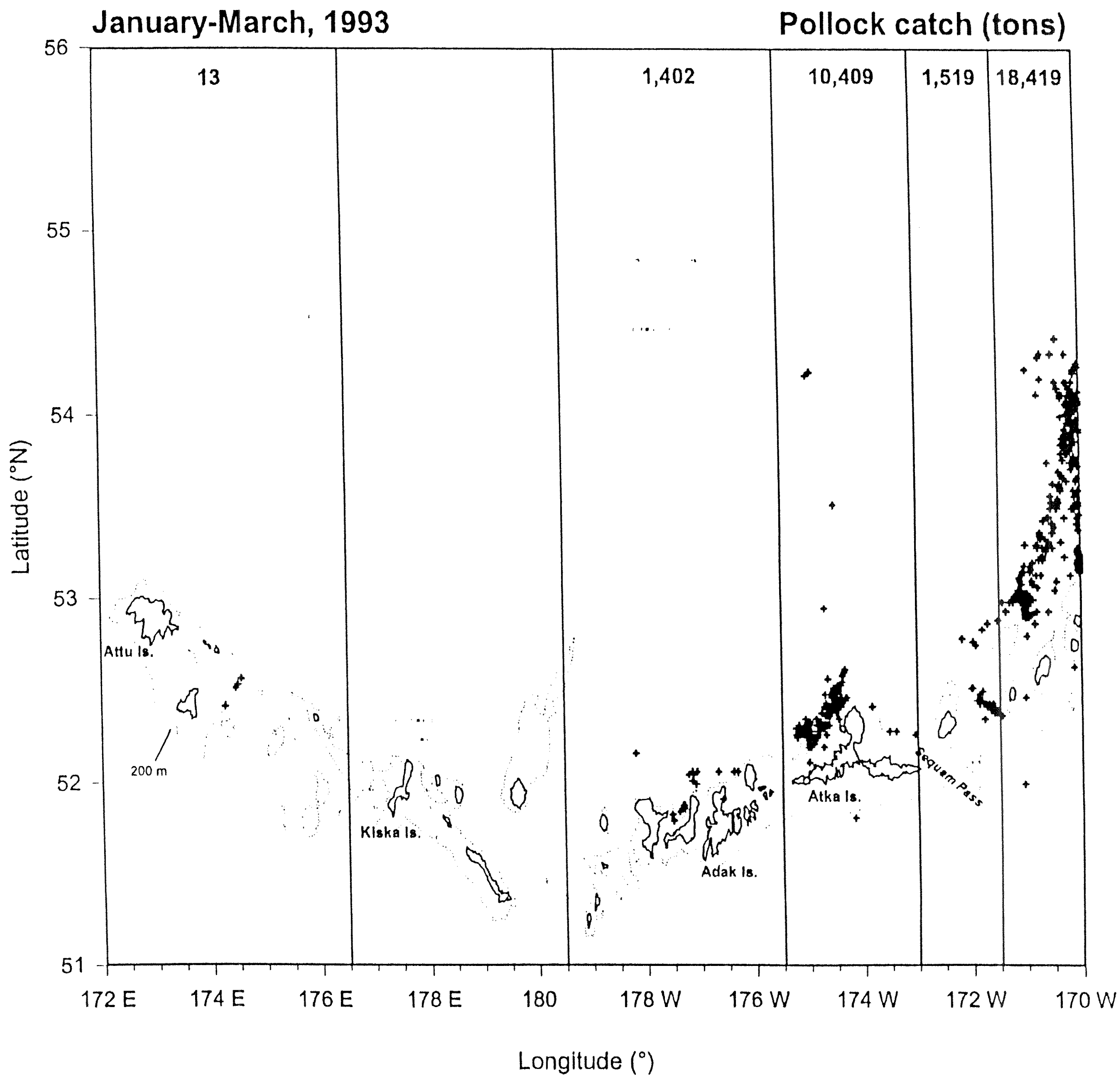

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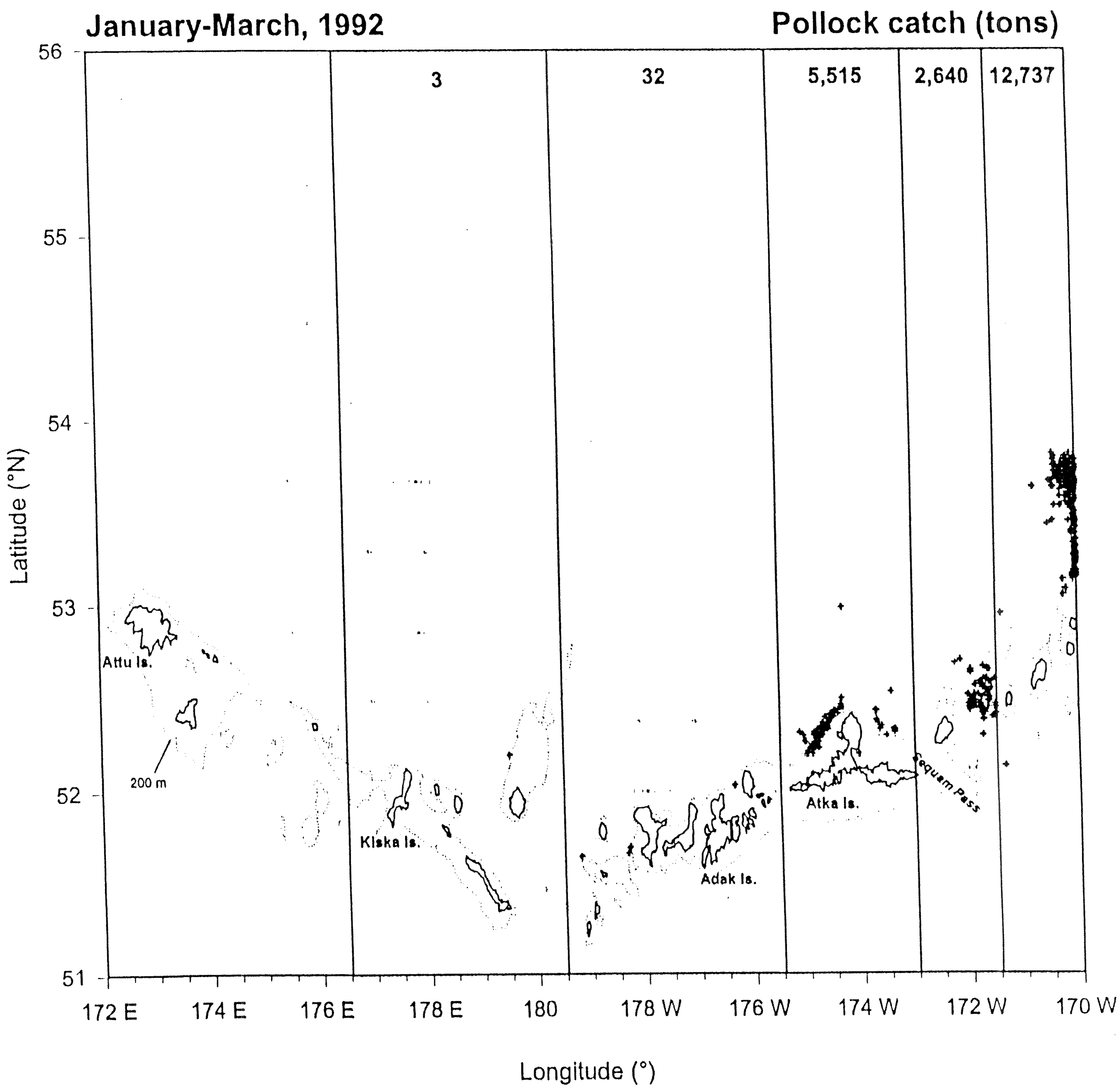

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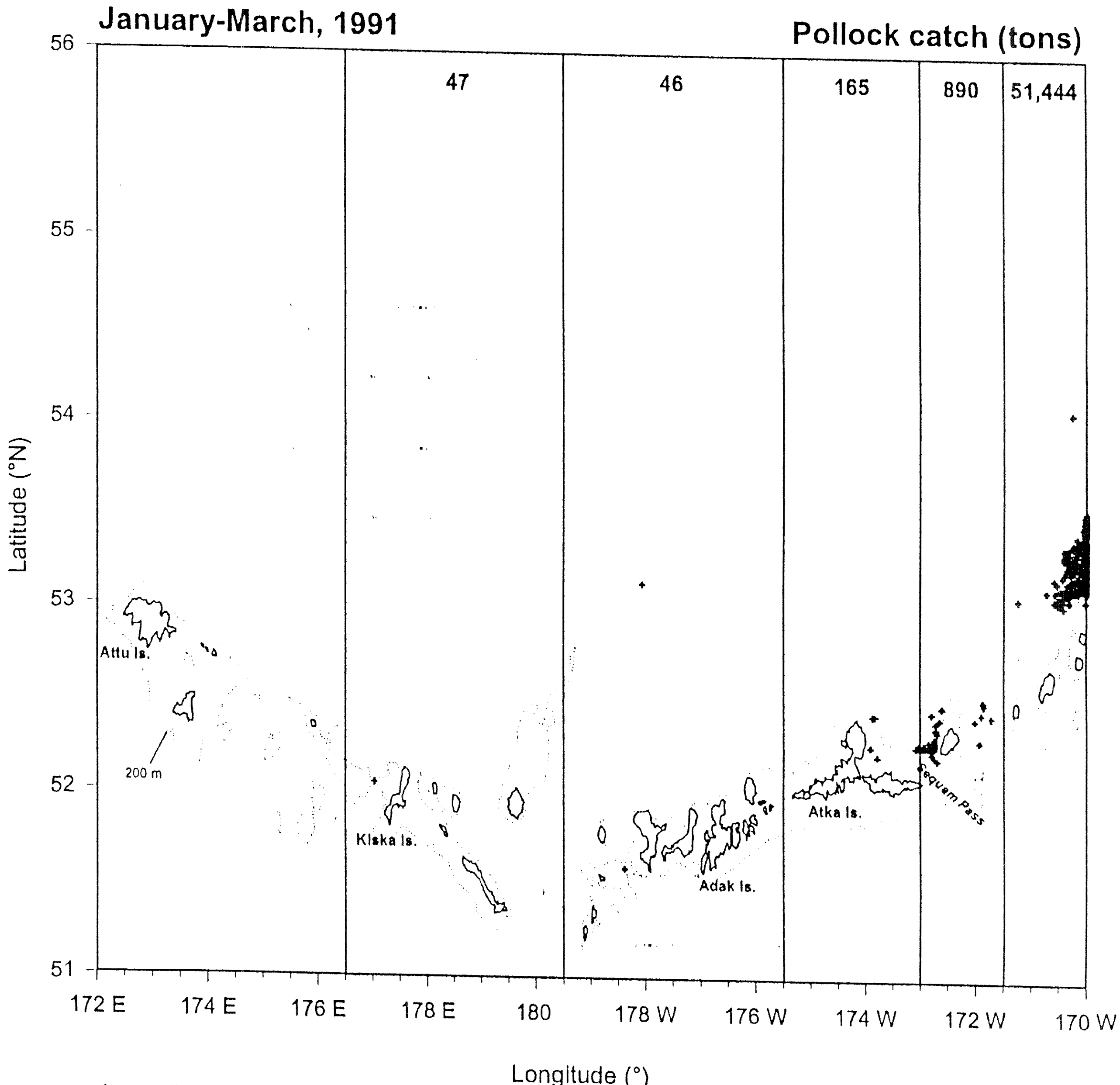


Appendix 1 (cont.).

APPENDIX 2

Cruise Plan of 2002 winter *Kaiyo Maru* survey: Echo Integration and Mid-water Trawl Survey of Pelagic Walleye Pollock in the Southeastern Bering Sea

Fisheries Agency of Japan

Dec. 2001

1. Institution

Hokkaido National Fisheries Research Institute (HNF),
Fisheries Research Agency
116, Katurakoi, Kushiro, Hokkaido, 085-0802, Japan
Tel: 81-154-91-9136
Fax: 81-154-91-9355

National Research Institute of Fisheries Engineering (NRIFE),
Fisheries Research Agency
Ebidai, Hazaki, Kashima, Ibaraki, 314-04, Japan
Tel: 81-479-44-4961
Fax: 81-479-44-1875

Alaska Fisheries Science Center (AFSC)
7600, Sand Point Way NE, Seattle, WA 98115

Pacific Research Fisheries Center (TINRO-centre)
4, Shevchenko Alley, Vladiovostock, 690600, Russia

2. Cruise description and objectives

Hokkaido National Fisheries Research Institute (HNF) and National Research Institute of Fisheries Engineering (NRIFE) will conduct an echo integration mid-water trawl survey of walleye pollock (*Theragra chalcogramma*) in the Aleutian Basin aboard the R/V *Kaiyo Maru* of the Fisheries Agency of Japan. In this area, AFSC had conducted this kind of research by R/V *Miller Freeman* annually since 1989, and also Japan Fisheries Agency had conducted triennial survey since 1980s. In 2002, *Miller Freeman* will conduct a survey in the Specific Area (Bogoslof area) that is defined in the Convention. With considering the importance of the comprehensive survey objectives, *Kaiyo Maru* will go to the neighbor areas in the south Aleutian Basin, north of the Aleutian Chains, and will collect fish distribution and its biological data. These two research cruise will take an important part of the comprehensive research activities that was discussed and authorized at the Convention meeting in 2000 and 2001. The 2002 *Kaiyo Maru* survey is a cooperative work between HNF/NRIFE and AFSC. The main survey would run from early February to mid-March in 2002, and would cover the area north of the Aleutian Chains in the Aleutian Basin. In order to get the accurate assessment of the Area, it is required that the *Kaiyo Maru* is allowed to conduct trawl survey inside 3-mile of the coast. The scientific information obtained from this survey will be very important to manage the Aleutian Basin pelagic walleye pollock stock. Detailed survey plan is being discussed between the institutions and all data and information will be exchanged freely among the different agencies.

The primary objectives of the survey are:

1) To determine the geographical distributions of walleye pollock in the southern Aleutian Basin.
2) To collect echo integration data to determine the biomass of walleye pollock in the area.
3) To collect biological information on walleye pollock in the basin area.
4) To collect information on the oceanographic and biological environments during the winter in the area.

This survey cruise plan was submitted to the Scientific and Technical Committee meeting for the Convention in September, and the importance of this survey cruise was confirmed.

3. Research Vessel

Ship name:	*Kaiyo Maru* (Fisheries Agency of Japan, Tokyo)
Type:	Stern trawler
Length:	93.01 meters
Tonnage:	2,630 tons
Hull color:	White
Draft:	6.0 meters
Radio call sign:	JNZL

4. Crew and researchers on board

1) Crew: Captain Kikuchi and 45 crew

2) Japanese Researchers

<u>Preliminary survey</u>

Akira Nishimura, Hokkaido National Fisheries Research Institute (HNF)
Takashi Yanagimoto, HNF
Yoshimi Takao, National Research Institute of Fisheries Engineering (NRIFE)
Undecided, NRIFE

<u>Main survey</u>

Japanese researchers
Akira Nishimura, HNF, (Chief scientist; biology)
Takashi Yanagimoto, HNF, (Acoustic)
Yoshimi Takao, NRIFE, (Acoustic)

4 assistant researchers: Undecided

Foreign researchers: Undecided

5. Vessel Itinerary (Tentative)

Preliminary survey (in the adjacent waters of Tokyo)

Dec. 7, 2001	leave Tokyo
Dec. 8-10	Acoustic system calibration and noise measurements
Dec. 11	arrive Tokyo

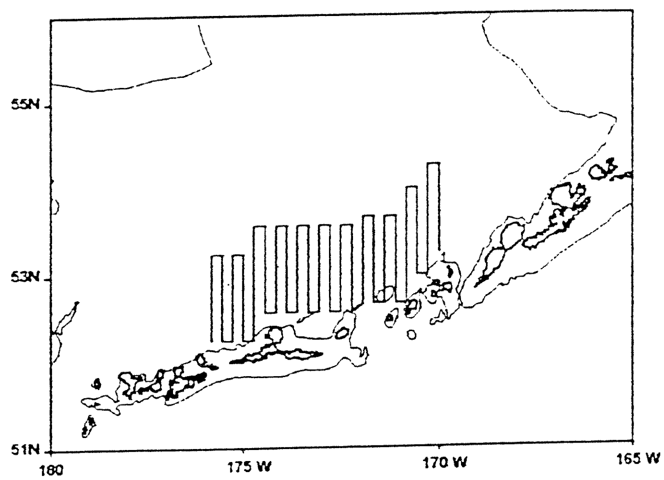
Main survey (in the Bering Sea)

Feb. 2, 2002	leave Tokyo
Feb. 10-11 (U. S. date)	System calibration in the Captain's Bay of Unalaska Is.
Feb. 13-14	Intership calibration with the *Miller Freeman*
Feb. 16	arrive Dutch Harbor
Feb. 19	leave Dutch Harbor

Feb. 20-Mar. 5	Acoustic/trawl survey west of 170W
Mar. 14 (Japanese date)	arrive Kushiro
Mar. 17	leave Kushiro
Mar. 20	arrive Tokyo; end of cruise

Research area

Southern part of the Aleutian Basin, west of the Specific Area (Bogoslof area) that is ied by the Convention on the Conservation and Management of Pollock Resources in the ral Bering Sea. All these ey areas are included in the EEZ. Figure shows a tive transects. Endpoints of transects will be decided 1 the fish sign disappears. It is important to survey inside 3- of coast of the Aleutian ds for the accurate ssment. With considering fish arance, some of the transects be cut short and/or extended. : have extra ship time, we will : new transects west to 178W. Acoustic system calibration pollock sampling by hook and will be carried out in the ain's Bay of Unalaska Island within 3 miles zone. We also plan to conduct our small ect survey in the Specific Area for the intership calibration and sample collection.



Operational plan

The EIMWT survey will be conducted 24 hours per day in each leg. Acoustic data will be cted continuously along a transect with KFC3000 echo integration system (Kaijyo). sect spacing is designed to be 10 nmi. Endpoints of each transects will be decided when ish sign disappears. Ship speed is expected to average 10 knots in favorable weather. l hauls will be conducted when fish echo sign is observed. An average of 1 or 2 trawl ; per day is anticipated. Midwater trawl hauls will be made to identify echo sign and obtain gical data of the fish. Hauling duration will be kept to a minimum extent to which uate biological samples are obtained. Oceanographic observation will be conducted mainly sing XCTD. At some CTD station, water sample will be collected from the selected depths plankton sampling will be conducted by using NORPAC net.

A standard sphere calibration of the acoustic systems will be conducted in the Captain's This requires the vessel to be anchored at bow and stern. During this calibration, live ck will be collected by hook and line, and the pollock will be frozen after one day of ing in a tank. The morphological characteristic of the swim bladder will be studied with elation to the target strength of the fish.

Major scientific equipment

- Acoustic equipment
  - Kaijo KFC3000
  - Simrad EK500
  - ADCP (Acoustic Doppler Current Profilers)

3.5 Conduct an intership calibration of acoustic systems aboard the Miller Freeman and Japanese R/V Kaiyo maru.

Secondary objectives of the cruise will include scientific research requested by investigators from AFSC and other institutes.

4.0 OPERATIONAL PLANS

4.1 Survey operations will be conducted 24 hours per day. Scientists will use the EK500 echo integration system, with two centerboard-mounted transducers at 38 and 120 kHz, to collect acoustic data continuously along a series of parallel transects. Transect spacing will be 8 nmi in the EBS shelf area and 5 nmi in Bogoslof (Fig.1). Ship speed is expected to average 12 knots in favorable weather.

EIT survey operations require that the standard Aleutian wing trawl (AWT) and a 83-112 bottom trawl without roller gear are loaded on to the net reels. Marinovich and Methot trawls may be deployed and should be readily available. Fishbuster doors will be used with AWT, 83-112, and Marinovich trawls; a restrictor will be used when fishing with the Marinovich.

Trawl hauls will be made at any time based on occurrence of echo sign to identify echo sign and provide biological data and pollock samples. An average of 2-3 trawl hauls per 24 hours is anticipated. On occasion we may trawl more frequently. Haul duration will be kept to the minimum necessary to ensure an adequate sample. Biological data collected from each haul will include species composition, sex composition, length frequencies, whole fish and ovary weights, maturities, and otoliths.

4.2 Pollock target strength data collection will occur on an opportunistic basis. These data are used to validate the relationship between pollock length and target strength. Data will be collected when certain conditions (i.e., low fish densities, single species, unimodal size composition, appropriate depth range) are encountered. Collecting target strength data typically involves repeated passes over an aggregation of fish at a vessel speed of less than 3 knots. One or two trawl hauls are made to provide species composition and biological data. When calm seas are encountered along with the above-mentioned conditions, a second approach to target strength data collection may be attempted: with the vessel stopped, a 38-kHz transducer will be lowered to a depth just above the fish sign.

4.3 Standard sphere calibration of the centerboard-mounted acoustic systems will be conducted on March 5 in Captains Bay. This requires the vessel to be anchored at bow and stern, and involves lowering a calibration sphere assembly over the side. A conductivity-temperature-depth (CTD) cast will be taken.

4.4 Temperature/depth data will be collected at trawl locations with a micro bathy-thermograph (MBT or SBE39) attached to the trawl headrope. Temperature/salinity/depth data will be collected at calibration sites with the AFSC Seabird CTD system.

5.0 SCIENTIFIC PERSONNEL

5.1 The co-principal investigators are Neal Williamson (phone, 206-526-6417, email Neal.Williamson@noaa.gov), Paul Walline (phone 206-526-4681, email Paul.Walline@noaa.gov), and Taina Honkalehto, phone (206) 526-4237, email Taina.Honkalehto@noaa.gov, AFSC, Seattle, WA. FAX for all three investigators is 206-526-6723.

5.2 Staffing for this cruise is yet to be determined.

6.0 COMMUNICATIONS

The INMARSAT telephone numbers for contacting the vessel at sea are as follows:

INMARSAT B voice 011-872-330-394-113
INMARSAT B fax 011-872-330-394-114
INMARSAT M voice 011-872-761-267-346 and 347
INMARSAT M fax 011-872-761-267-348

While at sea, email (text only) to scientific personnel should be addressed to mace.miller.freeman@mfnems.pmc.noaa.gov

For further vessel specifications, please visit the *Miller Freeman* website http://www.pmc.noaa.gov/mf

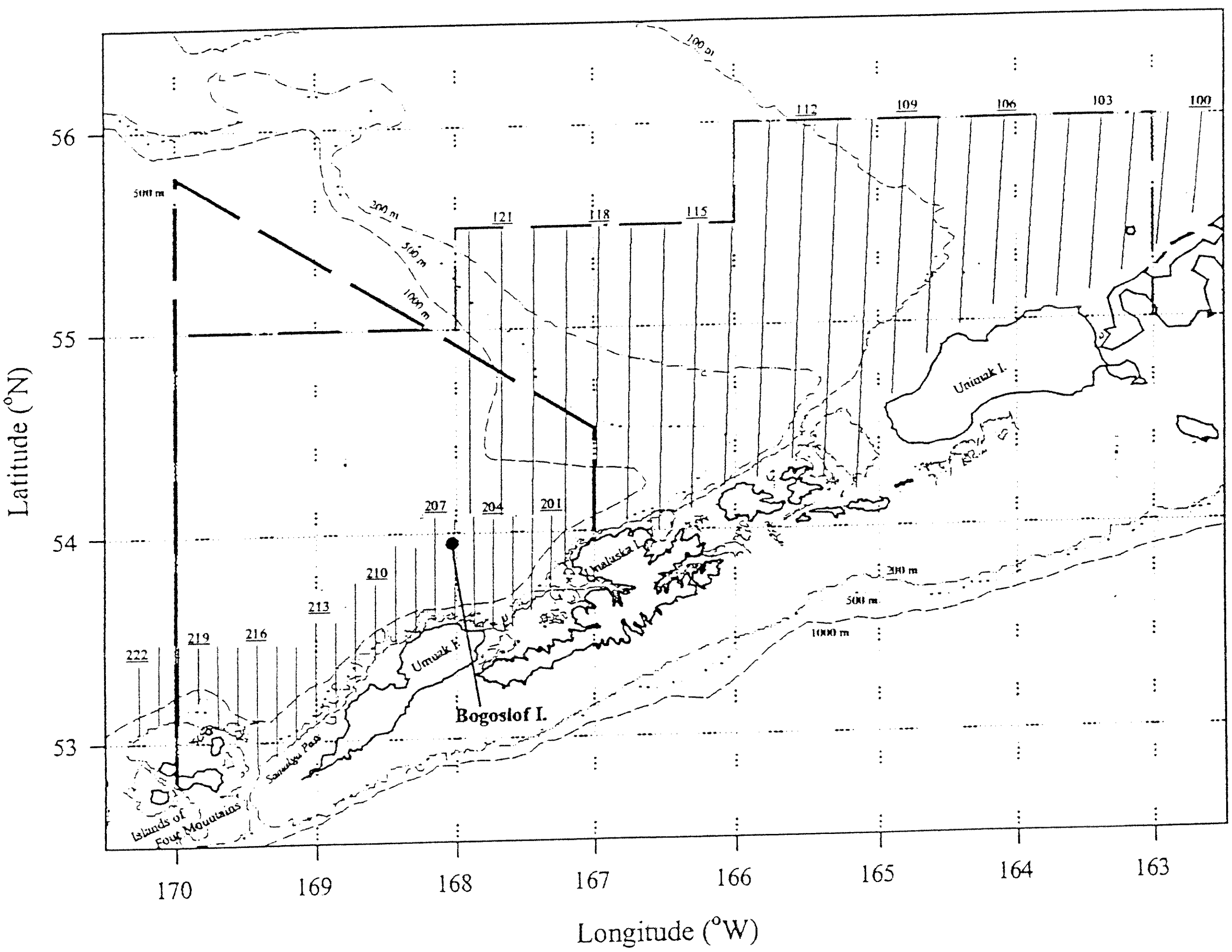


Figure 1. Proposed trackline for the winter 2002 echo integration-trawl survey of the southeast Bering Sea shelf and Bogoslof Island areas. Transect numbers are underlined. Transects 100-122 are spaced 8 nmi apart and transects 201-222 are spaced 5 nmi apart. Dash-dotted line indicates boundary of the sea lion Conservation Area (SCA), and heavy dashed line outlines U.S. management area 518/Central Bering Sea specific area.

CRUISE PLAN FOR POLISH FISHING TRIAL OPERATIONS
ON POLLOCK IN THE BERING SEA CONVENTION AREA
IN WINTER 2002

1. Institution

Deep Sea Fishing Processing and Trading Enterprise
„DALMOR" Joint – Stock Company
81-340 Gdynia
Hryniewickiego 10 Str.
P.O. Box 145 POLAND
Phone: +48 (58) 627 65 64 Fax: +48(58) 620 28 86 Tlx: 54 225

2. Vessels

A/ Name: ACRUX, Side no. GDY 308
Type: Stern trawler
Length:95.0 m.
Tonnage: 3707 GRT
Radio call sign: SQRG
Immarsat A - 1703133
Immarsat C - 426111410

B/ Name: ALPHARD
Type: Stern trawler
Length:95.0 m.
Tonnage: 3709 GRT
Radio call sign: SQRK
Immarsat A – 1703315
Immarsat C - 4261120010

3. Research area

International waters of the Bering Sea. Proposed hydroacoustic trackline at the attached map.

4. Time of trial fishing operation

January 1, 2002 - January 31, 2002

5. Purpose

The purpose of trial fishing operation is:

a/ to determine the geographical distribution of pollock in the international waters of the Bering Sea;

b/ to estimate total catch weight for as many hauls as possible;

c/ to calculate the CPUE data;

d/ to determine species composition of catches;

e/ to collect biological data of pollock (length, sex, body weight, maturity);

f/ to complete forms as recommended in "Observer Program Manual for Sampling of Central Bering Sea Pollock Fisheries" March 1997 that is:

- Haul Summary Form,
- Species Composition Form,
- Lenght Frequency Form,
- Biological Samples Form.

6. Observers

Scientific observers:

Mr. Jan Gierke

Mr. Stanis?aw Flisikowski

have been instructed by the Sea Fisheries Institute, Gdynia in accordance with the procedures established by Poland and consistent with relevant aspects of the training for observer provided by the United States in March 1997.

7. Results

The reports and data collected during the cruises will be available to all Parties concerned.

The statues of walleye pollock stock study by Japan

Hokkaido National Fisheries Research Institute
Takashi Yanagimoto

Sample

Adult pollocks were collected from spawning grouds (Fig. 1). Tissues and fins from these Pollock are stored in frozen and 90% ethanol.

Precious study

1) RFLP analysis (Control Region and NADH 5-6 Region of mtDNA)

RFLPs for Control region and NADH5-6 region were different with eastern and western area. But there were no differences within Bering Sea.

2) CFLP analysis (Control Region of mtDNA)

The differences between the Japan Sea and the Bogosolof area were observed. But there were no differences within the Bering Sea.

3) MS analysis (Tch11, 12, 13, 15, 16, 17, 20, 22, from O'Riley et al. 2000)

For MS analysis using ABI 310, analysis condition was decided. It is possible to conduct large quantity analysis.

4) RAPD PCR analysis (OPA12)

RAPD analysis using ALFexpressII were conducted. Kobayashi(1998) reported that RAPD using OPA 12 labeled Cy'5 could find the differences between open sea and easteren Bering Sea. I tried RAPD analysis using OPA12, however I could not find the differences among sampling sites. We need to examine various genetic markers in the future study.

5) Intron DNA analysis (Calmodulin intron between Exon4 and Exon5)

We were amplified calmodulin intron between Exon4 and Exon5, and sequencing was conducted using ABI310. The lack of two base and base substitutions in this region were found. In the following study, primers that are recognized the lack of two base and base substitutions will be designed and many analyses will be conducted.

6) Sequence analysis of mtDNA

We are conducting sequence analysis of mtDNA from the Japan Sea and the Bogoslof Area. Primers that are recognized base substitutions will be designed and many analysis will be conducted.

Future works

1) DS-PCR (RAPD+TREP)

2) Pimer Extension method for Calmodulin Intron and mtDNA.

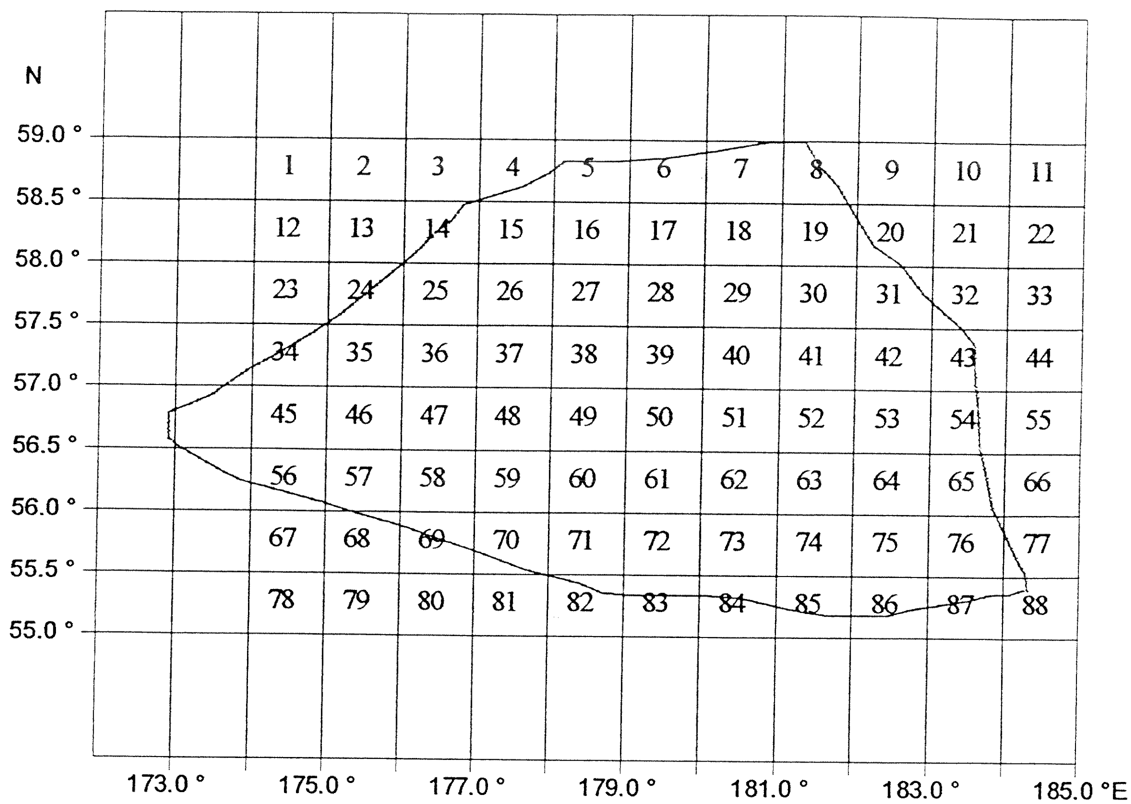
Sea Fisheries Institute
Gdynia, Poland

POLISH CATCHES OF POLLOCK IN DONUT HOLE AREA OF THE BERING SEA DURING 1985 – 1991

Submitted by Poland at VI Annual Conference of the Parties to the Convention on the Conservation and Management of Pollock Resources in the Central Bering Sea September 17 – 21, 2001

Prepared by Jerzy Janusz

Gdynia, September 2001



Map of the central Bering Sea showing big statistical blocks (0.5^0 latitude by 1^0 longitude)

Geographical positions (lower left corner of the block; 30' latitude by 1° longitude) of big statistical blocks used for Polish pollock catch data from the central Bering S

Block no	Latitude	Longitude	Block no	Latitude	Longitude
1	58° 30' N	174° 00' E	45	56° 30' N	174° 00' E
2	58° 30' N	175° 00' E	46	56° 30' N	175° 00' E
3	58° 30' N	176° 00' E	47	56° 30' N	176° 00' E
4	58° 30' N	177° 00' E	48	56° 30' N	177° 00' E
5	58° 30' N	178° 00' E	49	56° 30' N	178° 00' E
6	58° 30' N	179° 00' E	50	56° 30' N	179° 00' E
7	58° 30' N	180° 00' E	51	56° 30' N	180° 00' E
8	58° 30' N	179° 00' W	52	56° 30' N	179° 00' W
9	58° 30' N	178° 00' W	53	56° 30' N	178° 00' W
10	58° 30' N	177° 00' W	54	56° 30' N	177° 00' W
11	58° 30' N	176° 00' W	55	56° 30' N	176° 00' W
12	58° 00' N	174° 00' E	56	56° 00' N	174° 00' E
13	58° 00' N	175° 00' E	57	56° 00' N	175° 00' E
14	58° 00' N	176° 00' E	58	56° 00' N	176° 00' E
15	58° 00' N	177° 00' E	59	56° 00' N	177° 00' E
16	58° 00' N	178° 00' E	60	56° 00' N	178° 00' E
17	58° 00' N	179° 00' E	61	56° 00' N	179° 00' E
18	58° 00' N	180° 00' E	62	56° 00' N	180° 00' E
19	58° 00' N	179° 00' W	63	56° 00' N	179° 00' W
20	58° 00' N	178° 00' W	64	56° 00' N	178° 00' W
21	58° 00' N	177° 00' W	65	56° 00' N	177° 00' W
22	58° 00' N	176° 00' W	66	56° 00' N	176° 00' W
23	57° 30' N	174° 00' E	67	55° 30' N	174° 00' E
24	57° 30' N	175° 00' E	68	55° 30' N	175° 00' E
25	57° 30' N	176° 00' E	69	55° 30' N	176° 00' E
26	57° 30' N	177° 00' E	70	55° 30' N	177° 00' E
27	57° 30' N	178° 00' E	71	55° 30' N	178° 00' E
28	57° 30' N	179° 00' E	72	55° 30' N	179° 00' E
29	57° 30' N	180° 00' E	73	55° 30' N	180° 00' E
30	57° 30' N	179° 00' W	74	55° 30' N	179° 00' W
31	57° 30' N	178° 00' W	75	55° 30' N	178° 00' W
32	57° 30' N	177° 00' W	76	55° 30' N	177° 00' W
33	57° 30' N	176° 00' W	77	55° 30' N	176° 00' W
34	57° 00' N	174° 00' E	78	55° 00' N	174° 00' E
35	57° 00' N	175° 00' E	79	55° 00' N	175° 00' E
36	57° 00' N	176° 00' E	80	55° 00' N	176° 00' E
37	57° 00' N	177° 00' E	81	55° 00' N	177° 00' E
38	57° 00' N	178° 00' E	82	55° 00' N	178° 00' E
39	57° 00' N	179° 00' E	83	55° 00' N	179° 00' E
40	57° 00' N	180° 00' E	84	55° 00' N	180° 00' E
41	57° 00' N	179° 00' W	85	55° 00' N	179° 00' W
42	57° 00' N	178° 00' W	86	55° 00' N	178° 00' W
43	57° 00' N	177° 00' W	87	55° 00' N	177° 00' W
44	57° 00' N	176° 00' W	88	55° 00' N	176° 00' W

Contents

Table 1. Polish catches of pollock (in metric tons), effort and CPUE data in Donut Hole area of the central Bering Sea during 1985 - 1991

Year	Total	MONTH											
		Jan.	Feb.	March	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1985													
Effort (days)	**2125**	70	305	237	359	483	362	2	-	-	-	3	304
Effort (hours)	**15688**	611	2534	1730	2602	3525	2848	14	-	-	-	8	1816
Catch (tons)	**115874**	3407	16954	10031	18456	30855	18161	94	-	-	-	-	17916
CPUE (t/d)	**54,5**	48,7	35,6	42,3	51,4	63,9	50,2	47	-	-	-	-	58,9
CPUE (t/h)	**7,4**	5,6	6,7	5,8	7,1	8,8	6,4	6,7	-	-	-	-	9,9
1986													
Effort (days)	**3422**	546	465	458	424	385	185	16	1	6	49	328	559
Effort (hours)	**23197**	3805	3351	2818	3418	2826	516	92	6	14	137	2444	3770
Catch (tons)	**163249**	32290	21169	18937	26644	17852	4939	339	6	-	2201	13514	25358
CPUE (t/d)	**47,7**	59,1	45,5	41,4	62,8	46,4	26,7	21,2	6	-	44,9	41,2	45,4
CPUE (t/h)	**7,0**	8,5	6,3	6,7	7,8	6,3	9,6	3,7	1	-	16,1	5,5	6,7
1987													
Effort (days)	**4905**	760	729	511	545	608	535	236	-	-	-	279	702
Effort (hours)	**40824**	4831	5072	2885	3635	5744	5874	2702	-	-	-	3252	6829
Catch (tons)	**230318**	41107	32146	13715	31292	30338	24512	16157	-	-	-	13342	27709
CPUE (t/d)	**47,0**	54,1	44,1	26,8	57,4	49,9	45,8	68,5	-	-	-	47,8	39,5
CPUE (t/h)	**5,6**	6,3	6,3	4,8	8,6	5,3	4,2	6	-	-	-	4,1	4,1
1988													
Effort (days)	**6822**	973	788	642	738	499	589	463	375	137	136	484	998
Effort (hours)	**68174**	10682	5516	4278	7058	4329	6563	5921	3855	1258	1668	5547	11499
Catch (tons)	**298714**	40944	8676	9309	49678	15177	37791	28836	19431	5839	7414	29342	46277
CPUE (t/d)	**43,8**	42,1	11	14,5	67,3	30,4	64,2	62,3	51,8	42,6	54,5	60,6	46,4
CPUE (t/h)	**4,4**	3,8	1,6	2,2	7	3,5	5,8	4,9	5	4,6	4,4	5,3	4
1989													
Effort (days)	**6258**	812	368	318	557	630	600	583	303	234	513	603	737
Effort (hours)	**59510**	7304	2706	1965	4413	6348	6385	5855	3562	3097	4923	6060	6892
Catch (tons)	**268570**	29392	4167	7488	32677	39955	32849	23428	12464	8768	16418	26113	34851
CPUE (t/d)	**42,9**	36,2	11,3	23,5	58,7	63,4	54,7	40,2	41,1	37,5	32	43,3	47,3
CPUE (t/h)	**4,5**	4	1,5	3,8	7,4	6,3	5,1	4	3,5	2	3,3	4,3	5,1
1990													
Effort (days)	**7566**	565	172	204	935	845	754	519	651	621	816	703	781
Effort (hours)	**77754**	5032	1398	1891	10563	8643	9772	6147	8891	6224	8168	6133	4892
Catch (tons)	**223454**	13144	1251	2936	42035	21030	39111	13741	25052	17183	24977	15882	7112
CPUE (t/d)	**29,5**	23,3	7,3	14,4	45	24,9	51,9	26,5	38,5	27,7	30,6	22,6	9,1
CPUE (t/h)	**2,9**	2,6	0,9	1,6	4	2,4	4	2,2	2,8	2,8	3,1	2,6	1,5
1991													
Effort (days)	**3051**	208	24	35	591	662	695	589	221	14	-	12	-
Effort (hours)	**31627**	1705	54	332	6362	6815	7212	6143	2684	228	-	92	-
Catch (tons)	**54866**	1530	26	158	18059	9756	10257	11251	3716	106	-	7	-
CPUE (t/d)	**18,0**	7,4	1,1	4,5	30,6	14,7	14,6	19,1	16,8	7,6	-	0,6	-
CPUE (t/h)	**1,7**	0,9	0,5	0,5	3,0	1,4	1,4	1,8	1,4	16,3	-	0,1	-

Table 2. Polish catches (in metric tons) of pollock in Donut Hole area of the cental Bering Sea by big statistical blocks (0.5° latitude x 1° longitude) by months in 1985

Month	Block no	Catch	Month	Block no	Catch	Month	Block no	Catch	Month	Block no	Catch	Month	Block no	Catch	Month	Block no	Catch
January 85	52	24	February 85	52	77	March 85	7	70	April 85	18	1267	May 85	5	712	June 85	6	196
	61	85		73	1053		32	58		19	283		8	3203		26	592
	63	76		74	3773		64	268		29	2268		16	3296		27	337
	73	247		75	7561		75	2660		30	2495		20	849		37	2045
	74	1836		76	3829		76	4742		40	1535		26	4557		47	2282
	75	676		84	307		77	24		41	679		27	6485		48	902
	76	88		85	77		86	1350		43	60		29	2260		49	327
	85	283		86	277		87	859		51	305		30	1798		50	171
	86	92								52	771		31	453		51	743
										53	1226		40	5091		53	347
										64	1325		41	2151		54	18
										65	876					58	339
										75	643					59	4423
										76	3695					60	1748
										85	129					61	892
										86	486					62	1921
										87	280					73	878
										88	133						
Total		3407	Total		16954	Total		10031	Total		18456	Total		30855	Total		18161

Month	Block no	Catch	Month	Block no	Catch	Month	Block no	Catch	Month	Block no	Catch	Month	Block no	Catch	Month	Block no	Catch
July 85	59	94	August 85			September85			October 85			November85			December85	52	1487
																54	357
																61	154
																62	51
																63	2937
																64	6876
																71	48
																73	514
																74	359
																75	4407
																76	384
																86	342
Total		94	Total		0	Total		0	Total		0	Total		0	Total		17916

Table 3. Polish catches (in metric tons) of pollock in Donut Hole area of the cental Bering Sea by big statistical blocks (0.5° latitude x 1° longitude) by months in 1986

Month	Block no	Catch
January 86	51	191
	52	5527
	62	1847
	63	574
	72	2739
	73	14431
	74	4489
	84	2492
Total		32290

Month	Block no	Catch
February 86	65	251
	73	5333
	74	3201
	75	4410
	76	6539
	84	180
	85	1010
	86	245
Total		21169

Month	Block no	Catch
March 86	41	1145
	42	323
	43	654
	52	653
	53	2807
	54	8370
	64	1130
	65	1130
	76	2109
	77	760
	87	56
Total		18937

Month	Block no	Catch
April 86	14	779
	15	277
	24	1718
	25	1707
	26	8350
	27	402
	37	933
	40	1917
	49	482
	50	1191
	51	6233
	52	2655
Total		26644

Month	Block no	Catch
May 86	14	4612
	15	5437
	16	68
	24	1087
	25	1972
	26	48
	35	3177
	36	148
	37	72
	39	30
	45	188
	63	2
	71	469
	72	143
	74	66
	82	154
	83	179
Total		17852

Month	Block no	Catch
June 86	34	105
	37	501
	45	619
	47	653
	48	308
	49	492
	57	987
	59	33
	60	597
	70	67
	71	134
	74	161
	75	10
	83	23
	84	183
	85	66
Total		4939

Month	Block no	Catch
July 86	48	44
	49	28
	59	120
	60	112
	70	35
Total		339

Month	Block no	Catch
August 86	60	6
Total		6

Month	Block no	Catch
September86		
Total		0

Month	Block no	Catch
October 86	37	185
	47	240
	48	348
	49	738
	50	232
	59	87
	60	371
Total		2201

Month	Block no	Catch
November86	30	1342
	38	835
	41	71
	48	773
	49	1760
	50	880
	51	307
	52	2785
	53	113
	59	854
	60	894
	61	43
	71	1264
	72	1593
Total		13514

Month	Block no	Catch
December86	39	424
	49	1698
	50	3138
	51	785
	59	1497
	60	4733
	61	1962
	70	46
	71	5221
	72	2688
	73	928
	74	105
	82	328
	83	1349
	84	268
	85	188
Total		25358

Table 4. Polish catches (in metric tons) of pollock in Donut Hole area of the cental Bering Sea by big statistical blocks (0.5° latitude x 1° longitude) by months in 1987

Month	Square	Catch	Month	Block no	Catch	Month	Block no	Catch	Month	Block no	Catch	Month	Block no	Catch	Month	Block no	Catch
January 87	59	265	**February 87**	60	6176	**March 87**	42	208	**April 87**	60	128	**May 87**	35	57	**June 87**	46	180
	60	14810		61	3513		43	138		61	483		36	120		47	1083
	61	3279		63	21		52	17		70	1318		38	717		48	2157
	71	20483		71	14275		53	891		71	3656		45	431		49	4890
	72	984		72	6539		54	1122		72	1222		46	3426		58	880
	82	838		73	145		60	103		73	2627		47	2213		59	7874
	83	377		74	70		64	857		74	1765		48	817		60	5124
	86	34		82	1267		65	1915		75	832		49	232		61	193
	87	37		83	140		71	2618		82	2025		50	3567		70	131
							72	348		83	10484		51	438		71	2000
							75	3959		84	5207		57	4127			
							76	1426		85	1416		58	2642			
							82	113		86	129		59	443			
													60	1633			
													61	1284			
													62	1377			
													72	2442			
													73	793			
													74	72			
													83	2999			
													84	508			
Total		41107	Total		32146	Total		13715	Total		31292	Total		30338	Total		24512

Month	Block no	Catch	Month	Block no	Catch	Month	Block no	Catch	Month	Block no	Catch	Month	Block no	Catch	Month	Block no	Catch
July 87	46	102	**August 87**			**September87**			**October 87**			**November 87**	37	3114	**December87**	35	1709
	47	416											47	116		36	284
	48	832											48	492		37	689
	49	1539											49	217		38	52
	59	2672											58	226		39	2455
	60	2203											59	1812		40	1823
	61	45											60	1474		46	311
	69	3858											69	983		47	168
	70	1377											70	4908		48	1765
	71	3113														49	1504
																50	2084
																57	1022
																58	34
																59	1496
																60	570
																61	1470
																62	226
																65	47
																68	360
																69	4835
																70	47
																71	1131
																72	435
																73	156
																74	2079
																77	222
																83	735
Total		16157	Total		0	Total		0	Total		0	Total		13342	Total		27709

Table 5. Polish catches (in metric tons) of pollock in Donut Hole area of the cental Bering Sea by big statistical blocks (0.5° latitude x 1° longitude) by months in 1988

Month	Block no	Catch	Month	Block no	Catch	Month	Block no	Catch	Month	Block no	Catch	Month	Block no	Catch	Month	Block no	Catch
January 88	42	339	**February 88**	18	36	**March 88**	7	2	**April 88**	30	1831	**May 88**	4	467	**June 88**	7	11737
	51	521		19	12		17	67		41	6341		15	278		8	4859
	52	4142		29	12		18	54		42	2849		16	507		18	1015
	53	4254		30	216		19	18		52	1806		18	268		19	9867
	57	1114		31	21		28	1		53	667		19	247		28	13
	58	78		41	281		29	112		54	973		26	79		29	193
	61	307		42	44		30	96		64	614		27	393		30	379
	62	3755		52	36		40	30		74	1021		30	128		31	1551
	63	625		63	3204		41	17		75	6771		38	468		41	2333
	64	81		64	369		54	18		76	16533		40	613		42	4471
	65	2400		65	65		64	843		85	1610		41	49		50	37
	68	118		72	2		65	5286		86	7839		48	90		53	620
	69	20		73	1373		76	2751		87	823		49	425		54	488
	70	534		74	1496		84	14					50	43		59	39
	71	51		75	180								51	1922		61	36
	72	5862		76	340								52	3115		70	37
	73	1725		82	6								54	129		84	46
	74	3812		83	12								58	94		86	70
	76	2185		85	755								61	1462			
	84	4292		86	216								62	3620			
	85	2623											63	110			
	87	2106											64	389			
													71	177			
													73	33			
													76	71			
Total		40944	Total		8676	Total		9309	Total		49678	Total		15177	Total		37791

Month	Block no	Catch	Month	Block no	Catch	Month	Block no	Catch	Month	Block no	Catch	Month	Block no	Catch	Month	Block no	Catch
July 88	40	293	**August 88**	6	247	**September88**	35	209	**October 88**	48	1594	**November88**	24	2470	**December88**	25	3801
	41	468		46	190		46	153		49	916		25	106		26	623
	42	2378		47	227		47	121		50	82		34	3445		31	470
	50	15		50	415		48	564		51	1813		35	9307		36	16213
	53	2476		51	65		49	126		52	59		36	1239		37	5139
	54	1719		57	829		52	1103		58	953		40	111		43	490
	57	1090		58	1845		53	261		59	387		46	1382		45	445
	61	44		59	620		57	472		60	108		48	2289		47	1071
	62	578		60	195		58	98		61	1012		49	905		48	635
	65	2451		61	195		60	153		62	67		50	589		53	994
	70	595		62	2720		61	101		72	423		51	349		57	712
	72	343		63	120		63	515					57	102		60	5524
	74	122		65	1168		64	205					58	114		61	2398
	75	3304		68	140		69	267					59	1892		63	2411
	76	6675		69	2968		70	733					60	1160		65	1102
	85	4016		70	940		74	555					61	716		70	819
	86	932		71	992		75	203					62	112		71	1691
	87	1337		72	2373								69	400		72	940
				73	2128								70	1295		82	799
				74	617								71	1135			
				76	177								72	224			
				82	260												
Total		28836	Total		19431	Total		5839	Total		7414	Total		29342	Total		46277

Table 6. Polish catches (in metric tons) of pollock in Donut Hole area of the cental Bering Sea by big statistical blocks (0.5° latitude x 1° longitude) by months in 1989

Month	Block no	Catch	Month	Block no	Catch	Month	Block no	Catch	Month	Block no	Catch	Month	Block no	Catch	Month	Block no	Catch
January 89	46	364	February 89	51	101	March 89	65	567	April 89	6	151	May 89	18	991	June 89	19	165
	57	1244		63	2		75	1279		7	1740		19	572		30	2097
	59	1055		65	1946		76	609		8	1657		30	666		31	18310
	60	5309		75	2		77	117		18	1342		31	17688		41	864
	61	342		76	1829		86	3938		19	1038		41	6793		42	4749
	63	1413		87	287		87	978		28	774		42	4718		43	844
	64	2546								29	4080		43	2835		52	1273
	65	166								30	550		53	4141		53	1635
	70	6842								31	1012		54	1551		54	102
	71	4131								40	460					64	557
	72	974								41	1628					65	157
	73	265								42	1523					73	872
	74	1072								43	1900					74	995
	75	178								53	54					75	229
	76	94								54	6375						
	77	26								65	595						
	84	3120								75	2428						
	85	162								76	479						
	86	89								85	188						
										86	4599						
										87	104						
Total		29392	Total		4167	Total		7488	Total		32677	Total		39955	Total		32849

Month	Block no	Catch	Month	Block no	Catch	Month	Block no	Catch	Month	Block no	Catch	Month	Block no	Catch	Month	Block no	Catch
July 89	8	3874	August 89	31	438	September89	4	434	October 89	4	922	November89	5	54	December89	18	9
	19	3632		40	372		8	323		8	332		13	3206		38	3281
	51	159		41	281		15	92		14	2214		14	1521		39	1451
	52	154		50	675		16	52		15	1311		24	476		45	1137
	53	1148		51	1788		19	243		20	641		25	1901		46	434
	54	1397		52	1149		25	186		24	1438		35	683		48	1522
	63	73		53	800		26	320		25	1098		37	266		49	19089
	64	2616		54	1032		27	564		26	2675		45	3660		50	1280
	65	5698		62	433		28	387		27	18		46	76		51	3100
	72	505		63	76		30	155		35	1026		47	393		56	1257
	73	113		64	413		36	207		36	483		48	1508		58	555
	76	2837		65	478		37	525		37	3064		49	1560		59	210
	77	301		73	612		38	96		38	169		52	105		60	1215
	83	86		74	1590		39	591		48	96		53	379		61	311
	84	637		75	231		40	140		49	285		56	283			
	87	198		76	2096		48	564		58	489		57	1414			
							49	847		61	27		58	4355			
							50	888		65	130		59	3295			
							52	141					64	368			
							58	106					65	313			
							59	36					69	297			
							60	529									
							61	1034									
							63	267									
							71	41									
Total		23428	Total		12464	Total		8768	Total		16418	Total		26113	Total		34851

Table 7. Polish catches (in metric tons) of pollock in Donut Hole area of the cental Bering Sea by big statistical blocks (0.5° latitude x 1° longitude) by months in 1990

Month	Block no	Catch
January 90	43	34
	48	1230
	49	8414
	50	328
	51	19
	53	130
	54	148
	59	293
	60	620
	62	2
	63	407
	64	628
	65	172
	73	35
	74	430
	75	162
	76	92
Total		13144

Month	Block no	Catch
February 90	29	1
	52	120
	53	681
	63	20
	64	388
	65	1
	75	15
	76	25
Total		1251

Month	Block no	Catch
March 90	52	2
	64	37
	65	721
	76	1981
	77	195
Total		2936

Month	Block no	Catch
April 90	42	964
	43	12648
	54	8511
	63	174
	64	26
	65	1095
	73	431
	74	4225
	75	1987
	76	6933
	85	3187
	86	574
	87	772
	88	508
Total		42035

Month	Block no	Catch
May 90	6	155
	7	1921
	8	424
	17	247
	18	107
	19	393
	20	58
	27	48
	28	351
	29	713
	30	136
	31	13
	37	102
	39	844
	40	273
	43	3648
	48	479
	49	24
	51	19
	59	9
	60	10
	62	9
	63	29
	65	55
	70	14
	73	10
	74	919
	75	351
	83	8
	84	387
	85	9219
	87	55
Total		21030

Month	Block no	Catch
June 90	29	54
	39	1570
	40	5609
	41	648
	42	6230
	43	10297
	50	94
	51	1791
	52	2013
	53	3209
	54	6353
	62	350
	63	45
	64	636
	65	67
	74	145
Total		39111

Table 7 cont.

Month	Block no	Catch	Month	Block no	Catch	Month	Block no	Catch	Month	Block no	Catch	Month	Block no	Catch	Month	Block no	Catch
July 90	42	1758	**August 90**	40	202	**Septembe 90**	5	3622	**October 90**	5	2451	**November90**	4	1230	**December90**	5	215
	43	1154		42	191		6	5902		8	1561		5	431		6	1434
	49	891		43	2567		7	109		14	3376		15	933		7	3703
	50	36		50	1747		8	157		16	2872		16	611		8	1211
	51	245		51	535		16	897		17	600		17	102		17	266
	52	191		54	2541		17	932		24	803		18	156		18	193
	53	1722		59	531		26	119		25	957		27	1200		28	5
	54	145		61	5355		28	2302		27	1040		28	851		61	85
	61	577		62	2222		39	115		28	822		35	16			
	62	121		63	2198		40	196		31	407		37	56			
	63	745		64	189		50	235		35	1645		38	932			
	64	113		65	198		61	1463		36	637		39	2404			
	71	221		70	783		62	473		38	1659		43	288			
	72	3058		71	299		74	661		39	1032		48	401			
	73	1366		72	876					43	387		49	718			
	74	190		73	885					45	235		50	152			
	75	219		74	3285					46	1320		51	32			
	76	989		75	448					47	312		53	930			
										54	2740		56	1972			
										72	121		58	180			
													59	31			
													61	156			
													65	9			
													72	753			
													73	967			
													77	371			
Total		13741	Total		25052	Total		17183	Total		24977	Total		15882	Total		7112

Table 8. Polish catches (in metric tons) of pollock in Donut Hole area of the cental Bering Sea by big statistical blocks (0.5° latitude x 1° longitude) by months in 1991

Month	Block no	Catch
January 91	5	22
	6	19
	7	924
	8	85
	20	439
	48	5
	74	4
	75	32
Total		1530

Month	Block no	Catch
February 91	30	26
Total		26

Month	Block no	Catch
March 91	31	7
	75	30
	76	121
Total		158

Month	Block no	Catch
April 91	32	683
	43	5172
	54	4669
	65	3695
	73	166
	76	3295
	77	379
Total		18059

Month	Block no	Catch
May 91	7	1074
	8	2345
	18	386
	30	727
	43	3090
	53	453
	54	230
	65	357
	70	242
	75	515
	76	337
Total		9756

Month	Block no	Catch
June 91	8	270
	19	587
	20	392
	28	1519
	30	311
	31	600
	32	187
	37	57
	38	373
	39	435
	42	1457
	43	1201
	47	659
	52	169
	53	464
	54	456
	58	893
	74	227
Total		10257

Month	Block no	Catch
July 91	19	217
	20	455
	31	1205
	41	530
	42	1221
	43	174
	52	378
	64	368
	75	4645
	76	2058
Total		11251

Month	Block no	Catch
August 91	19	146
	20	90
	31	2620
	32	285
	40	18
	53	557
Total		3716

Month	Block no	Catch
September 9	15	100
	38	6
Total		106

Month	Block no	Catch
October 91		
Total		0

Month	Block no	Catch
November91	41	7
Total		7

Month	Block no	Catch
December91		
Total		0

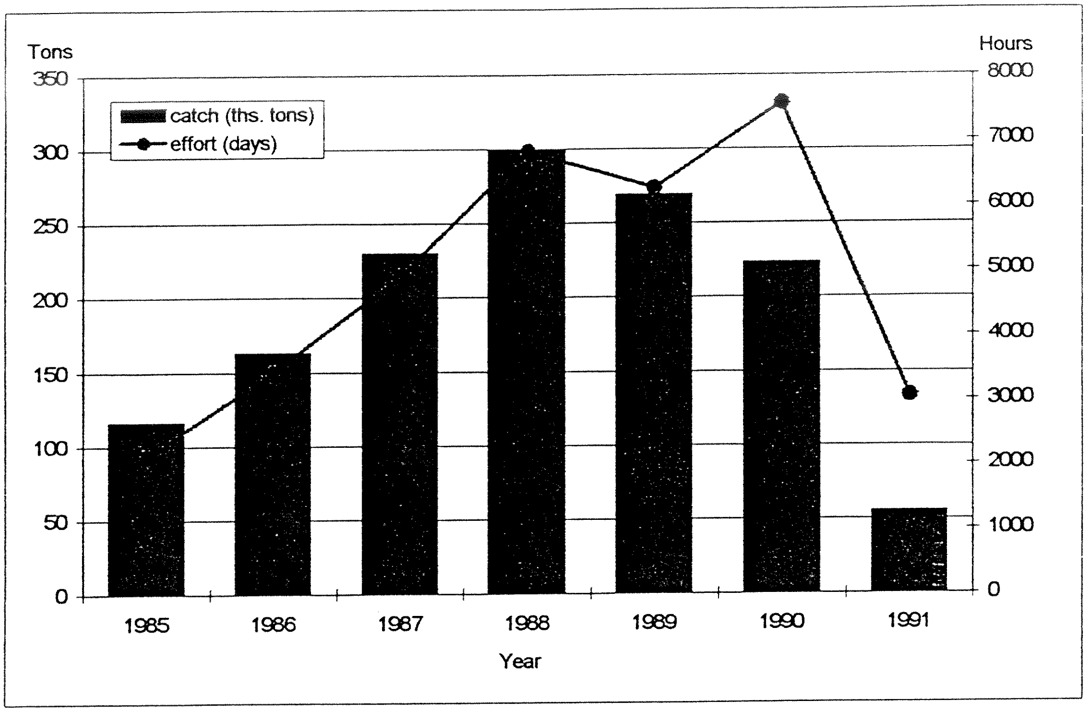


Figure 1. Polish catches of pollock (in thousand tons) and effort (in fishing days) in Donut hole area of the central Bering Sea for years 1985 through 1991

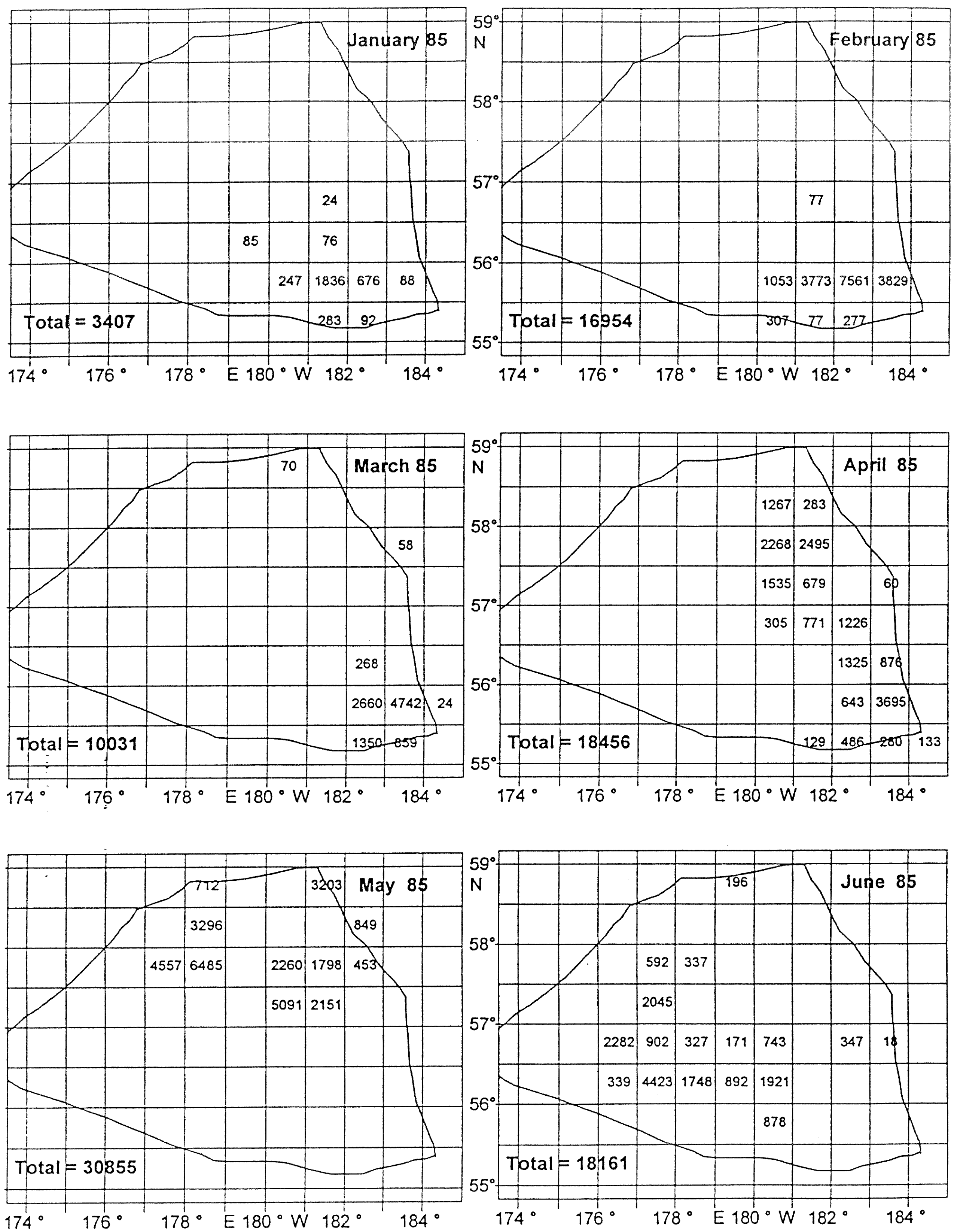


Fig. 2. Polish catches (in metric tons) of pollock in Donut Hole area of the Bering Sea by big statistical blocks (1° longitude x 0.5° latitude) by months in 1985

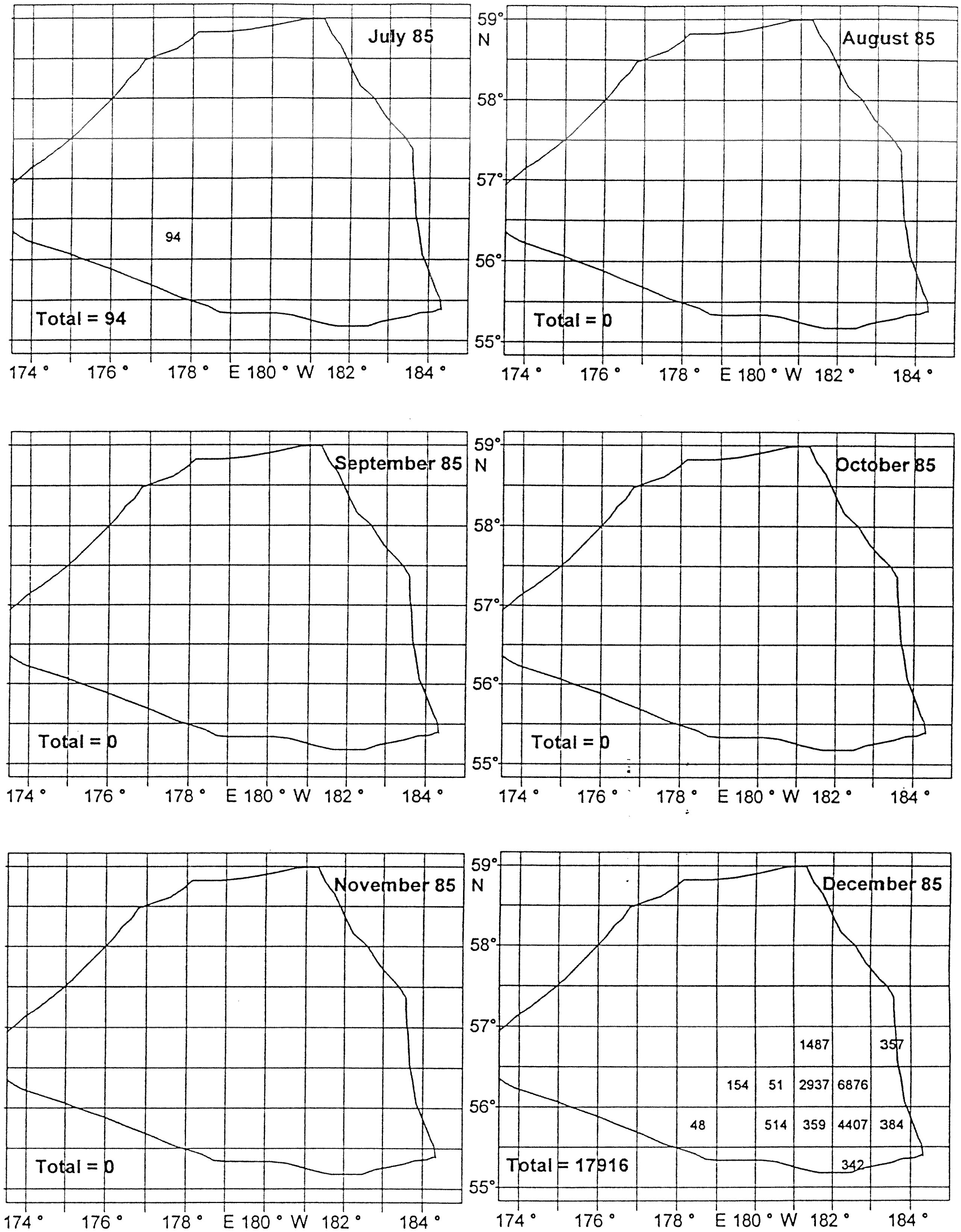


Fig. 2 cont. Polish catches (in metric tons) of pollock in Donut Hole area of the Bering Sea by big statistical blocks (1° longitude x 0.5° latitude) by months in 1985

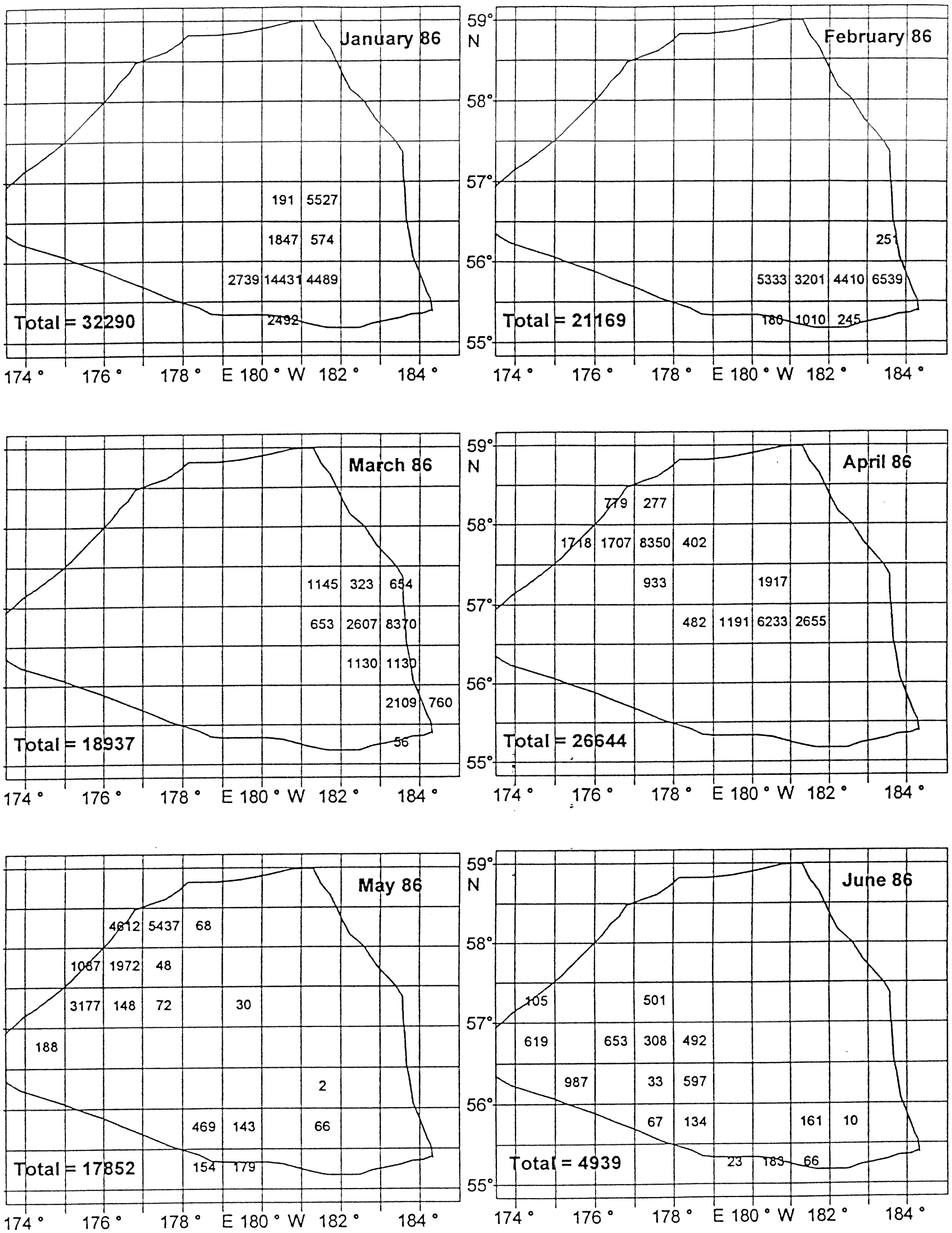


Fig. 3. Polish catches (in metric tons) of pollock in Donut Hole area of the Bering Sea by big statistical blocks (1° longitude x 0.5° latitude) by months in 1986

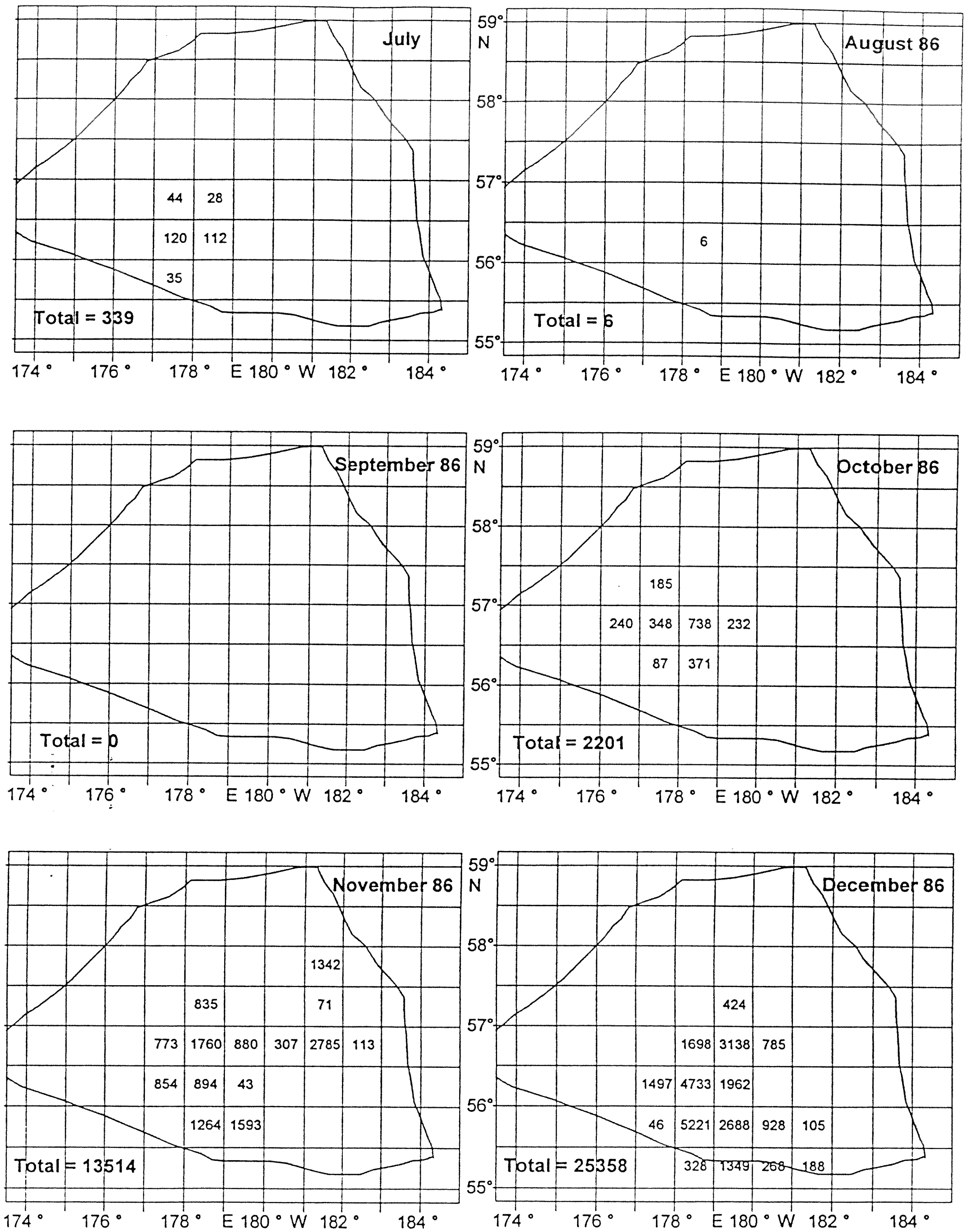


Fig. 3 cont. Polish catches (in metric tons) of pollock in Donut Hole area of the Bering Sea by big statistical blocks (1° longitude x 0.5° latitude) by months in 1986

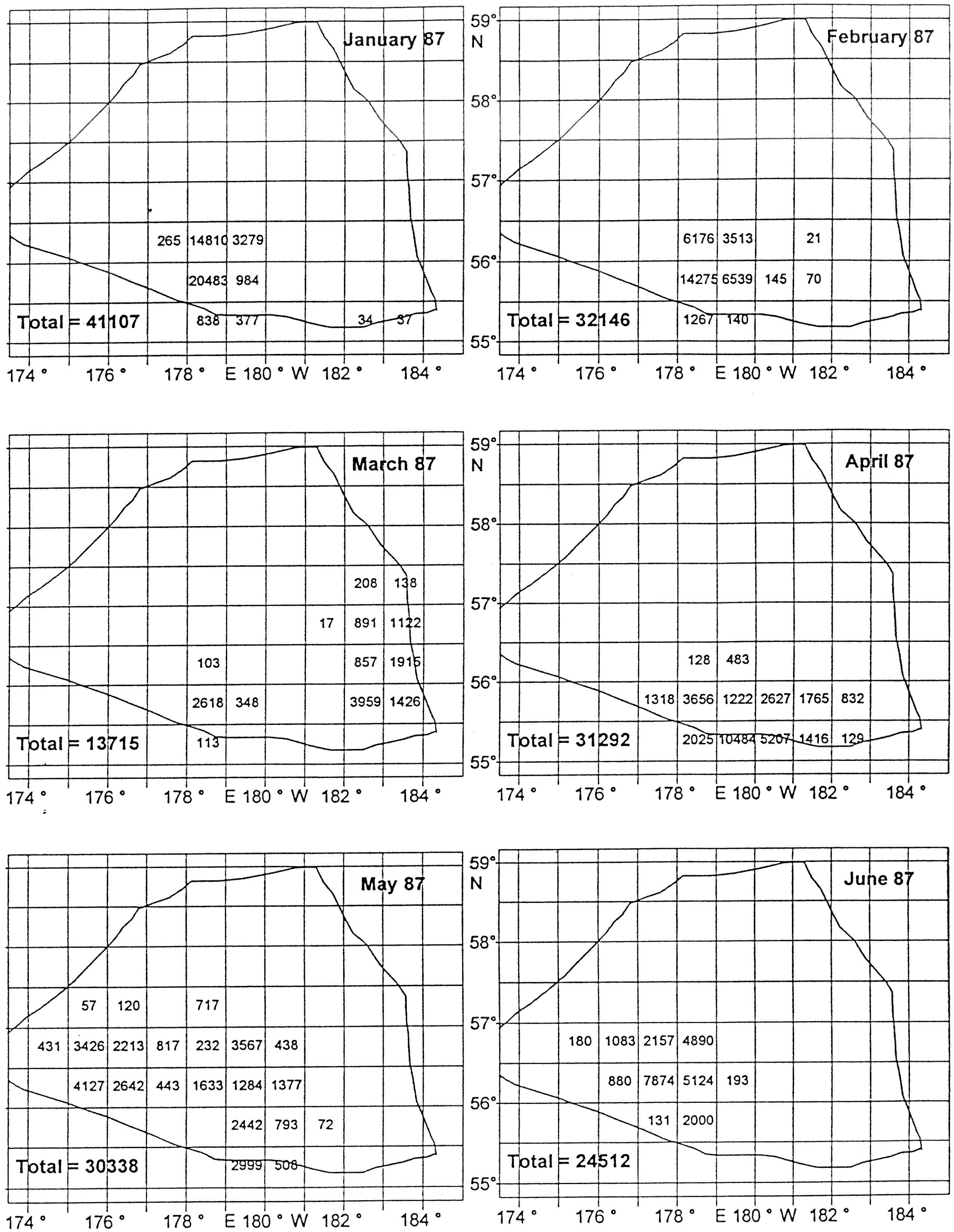


Fig. 4. Polish catches (in metric tons) of pollock in Donut Hole area of the Bering Sea by big statistical blocks (1° longitude x 0.5° latitude) by months in 1987

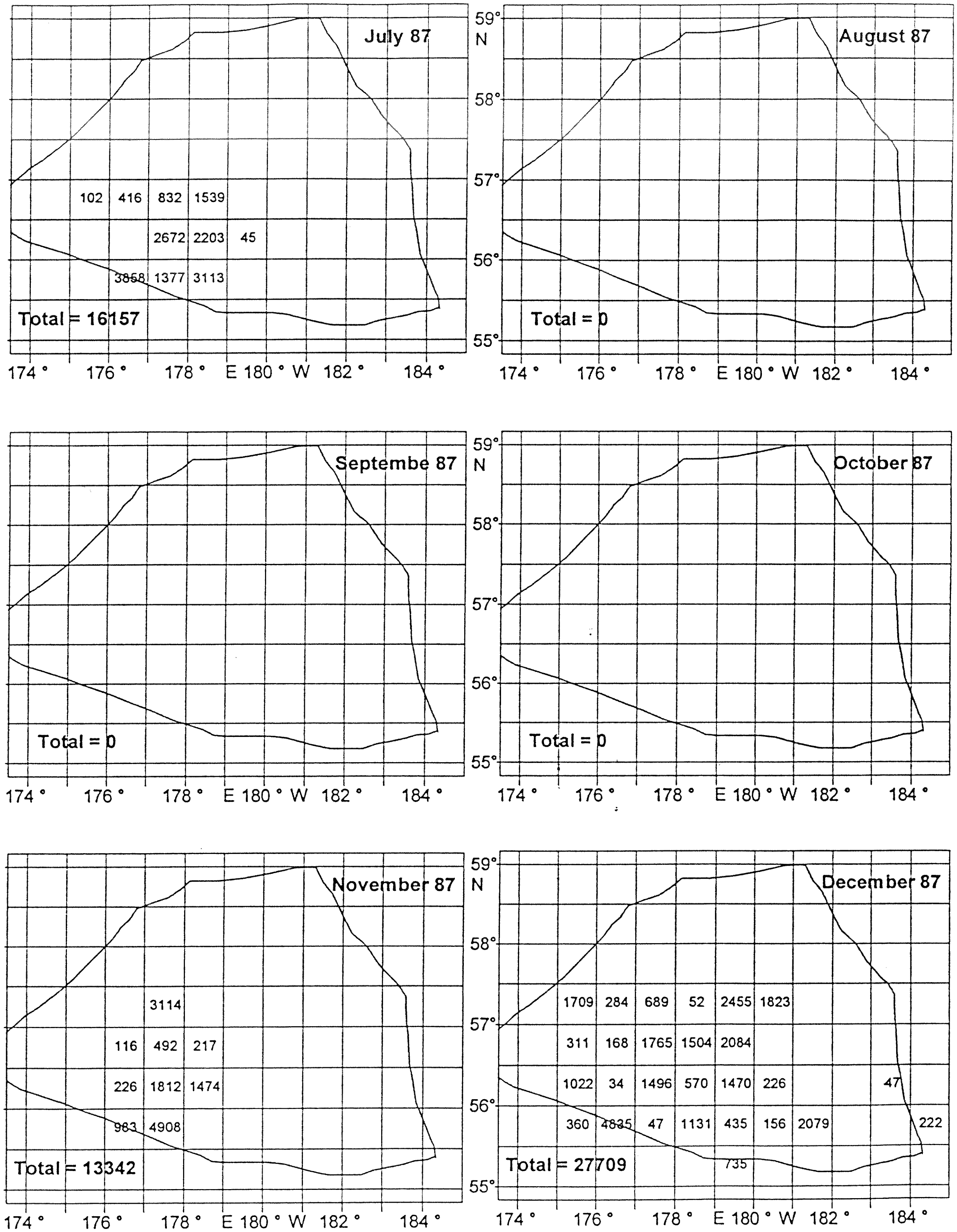


Fig. 4 cont. Polish catches (in metric tons) of pollock in Donut Hole area of the Bering Sea by big statistical blocks (1° longitude x 0.5° latitude) by months in 1987

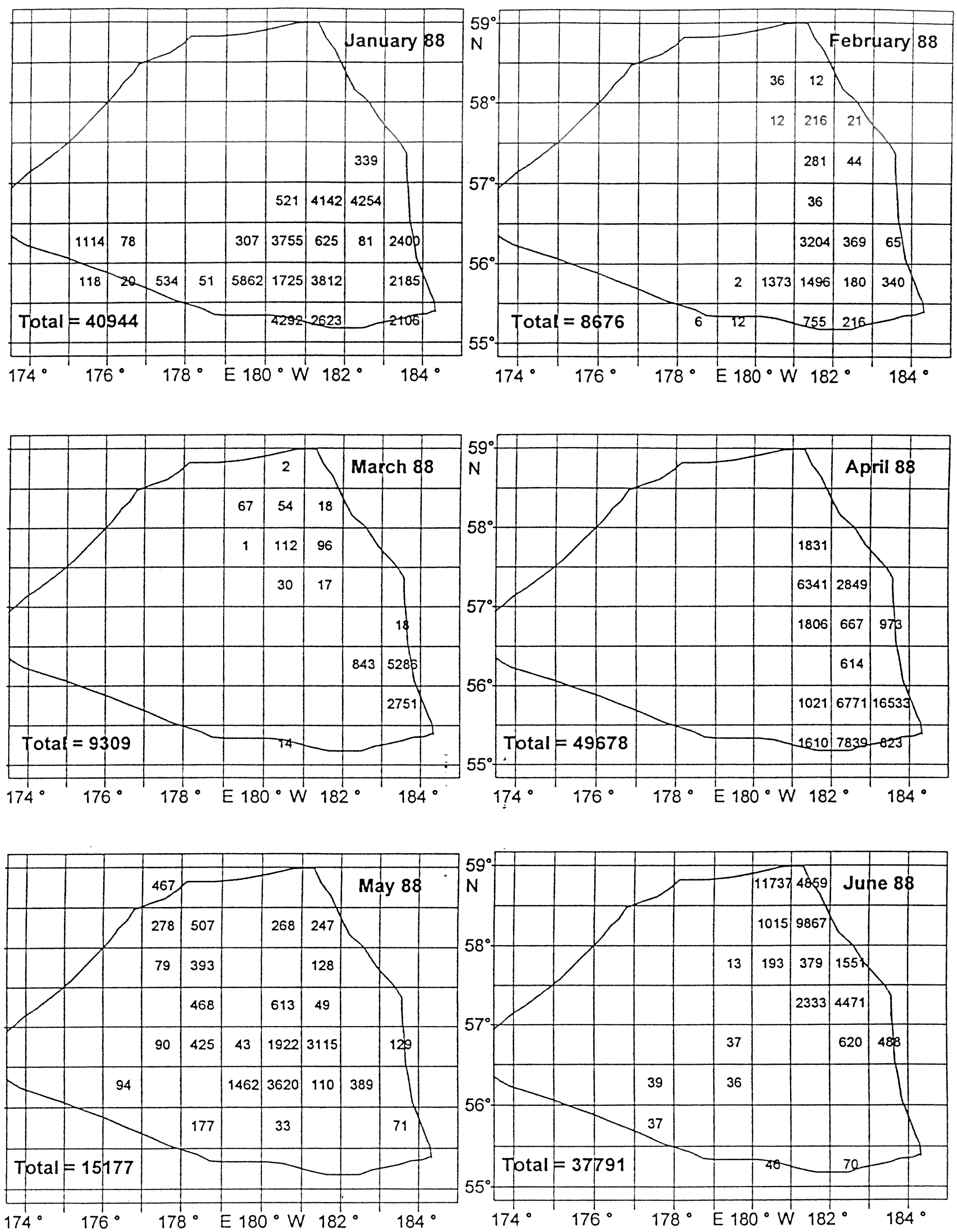


Fig. 5. Polish catches (in metric tons) of pollock in Donut Hole area of the Bering Sea by big statistical blocks (1° longitude x 0.5° latitude) by months in 1988

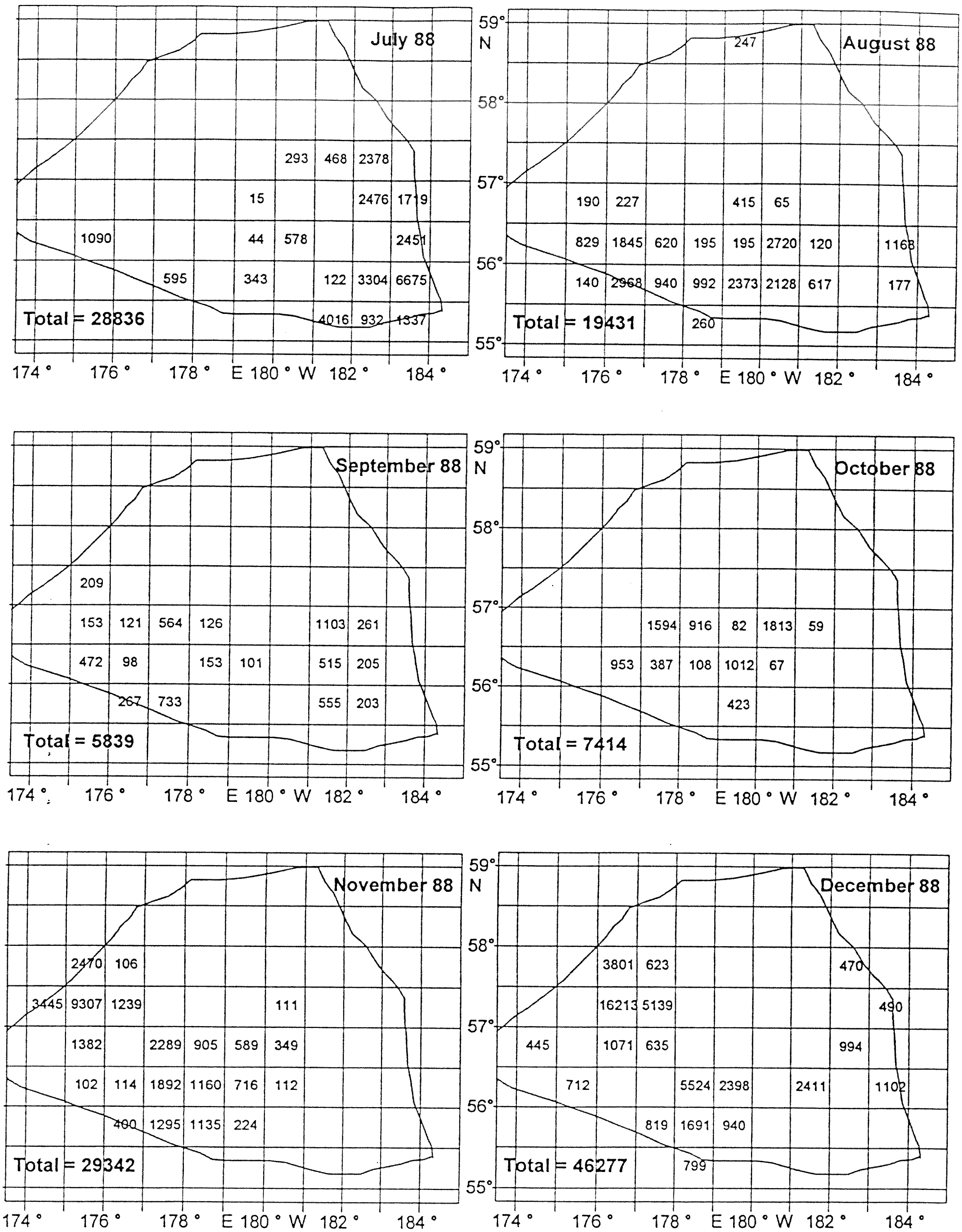


Fig. 5 cont. Polish catches (in metric tons) of pollock in Donut Hole area of the Bering Sea by big statistical blocks (1° longitude x 0.5° latitude) by months in 1988

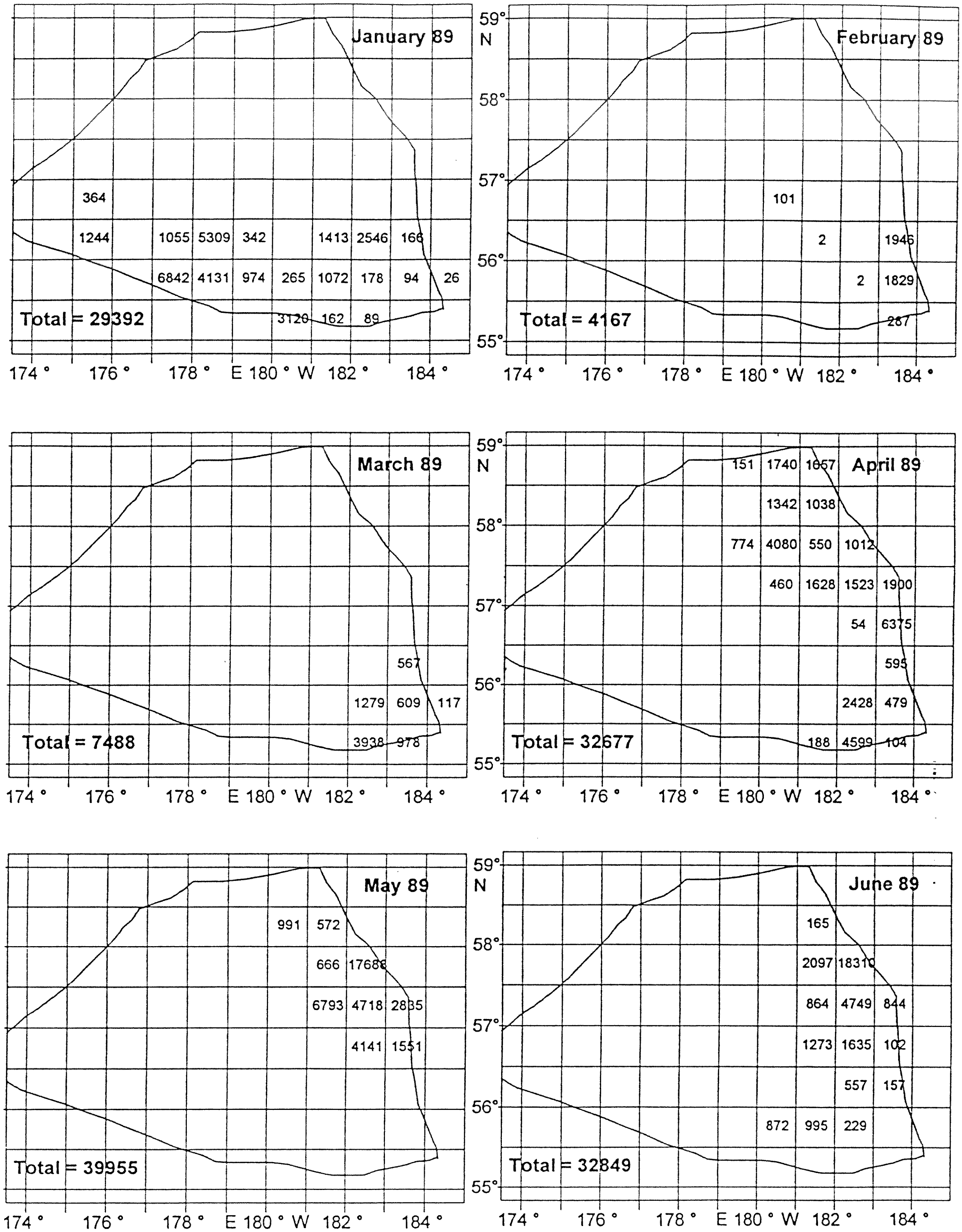


Fig. 6. Polish catches (in metric tons) of pollock in Donut Hole area of the Bering Sea by big statistical blocks (1° longitude x 0.5° latitude) by months in 1989

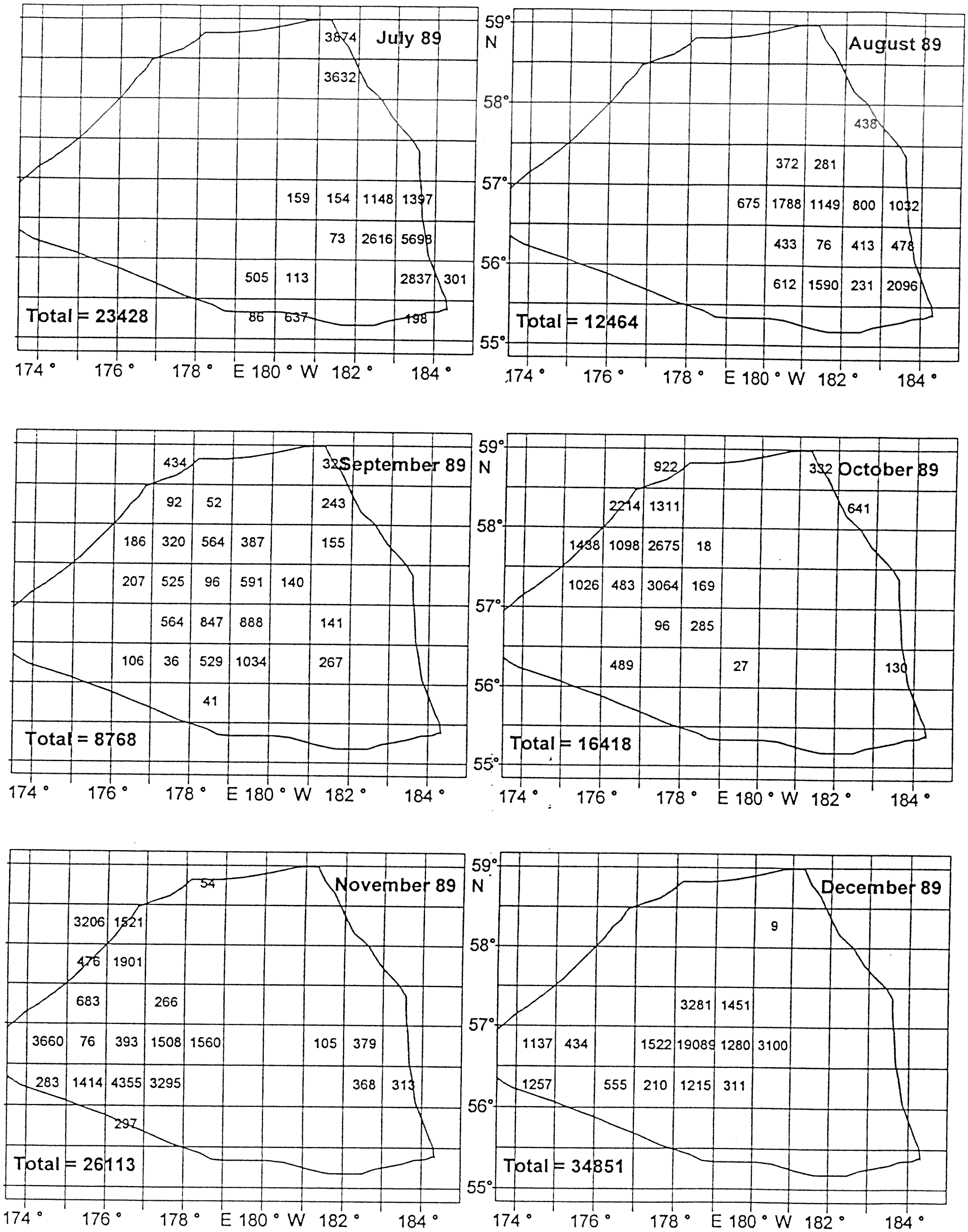


Fig. 6 cont. Polish catches (in metric tons) of pollock in Donut Hole area of the Bering Sea by big statistical blocks (1° longitude x 0.5° latitude) by months in 1989

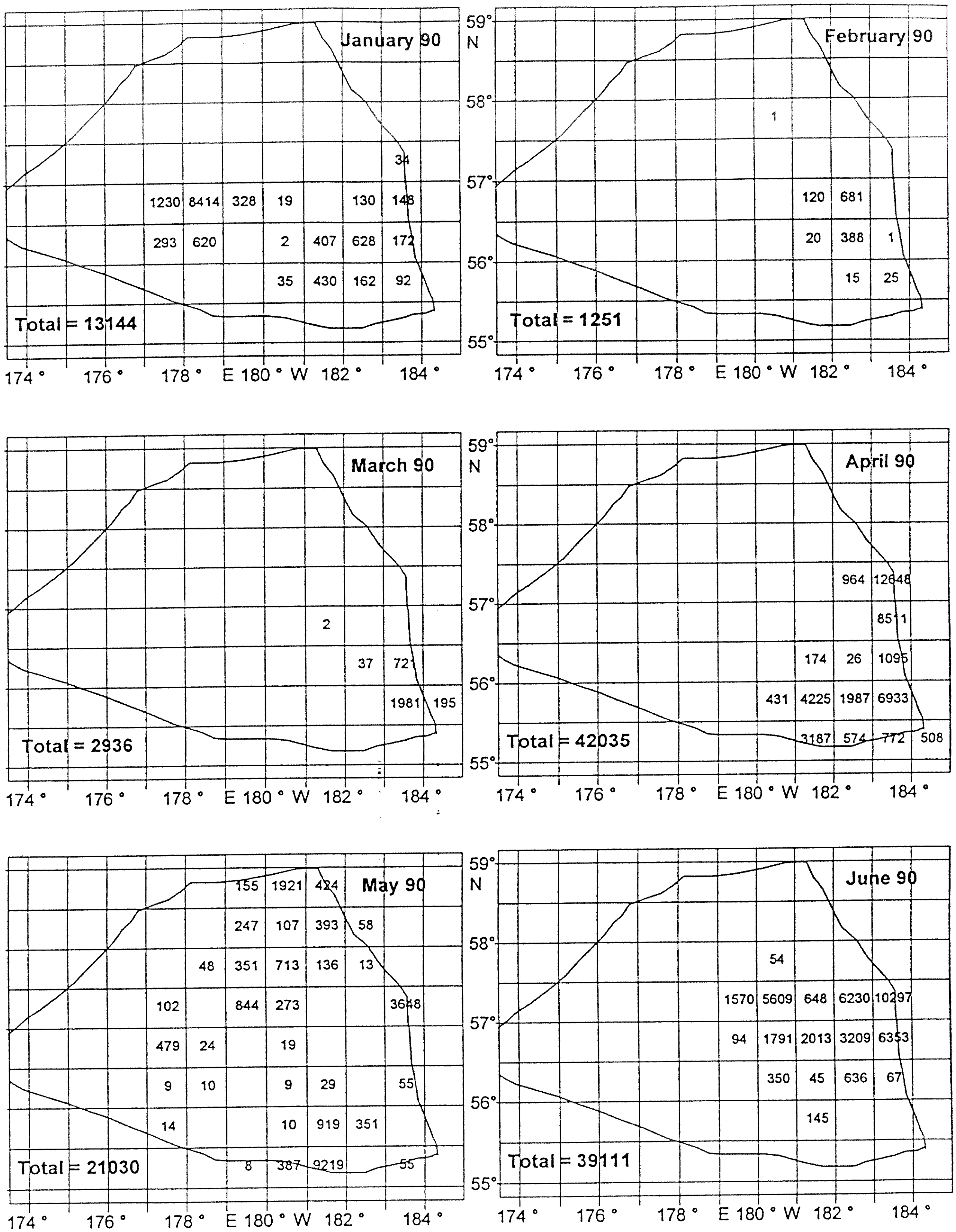


Fig. 7. Polish catches (in metric tons) of pollock in Donut Hole area of the Bering Sea by big statistical blocks (1° longitude x 0.5° latitude) by months in 1990

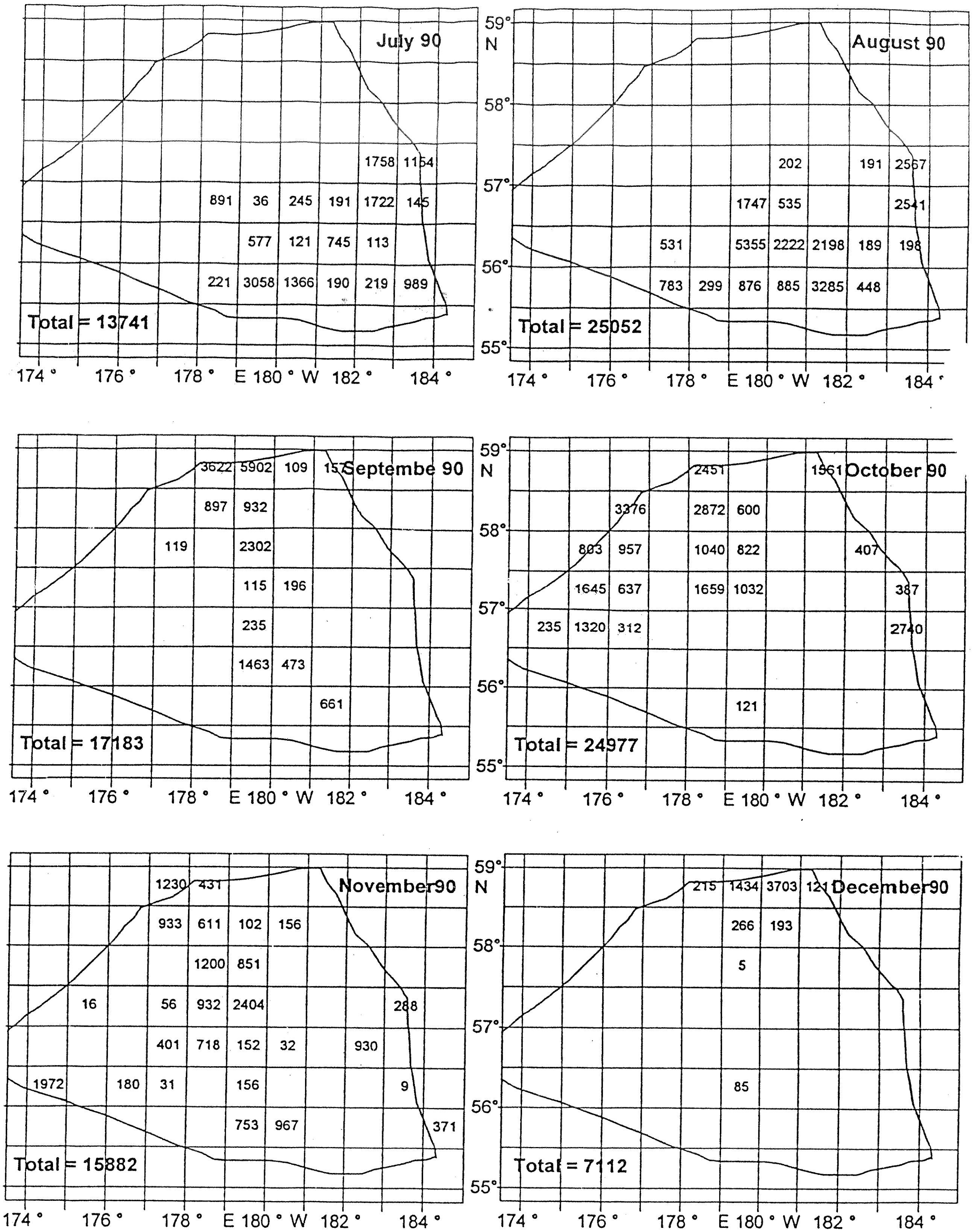


Fig. 7 cont. Polish catches (in metric tons) of pollock in Donut Hole area of the Bering Sea by big statistical blocks (1° longitude x 0.5° latitude) by months in 1990

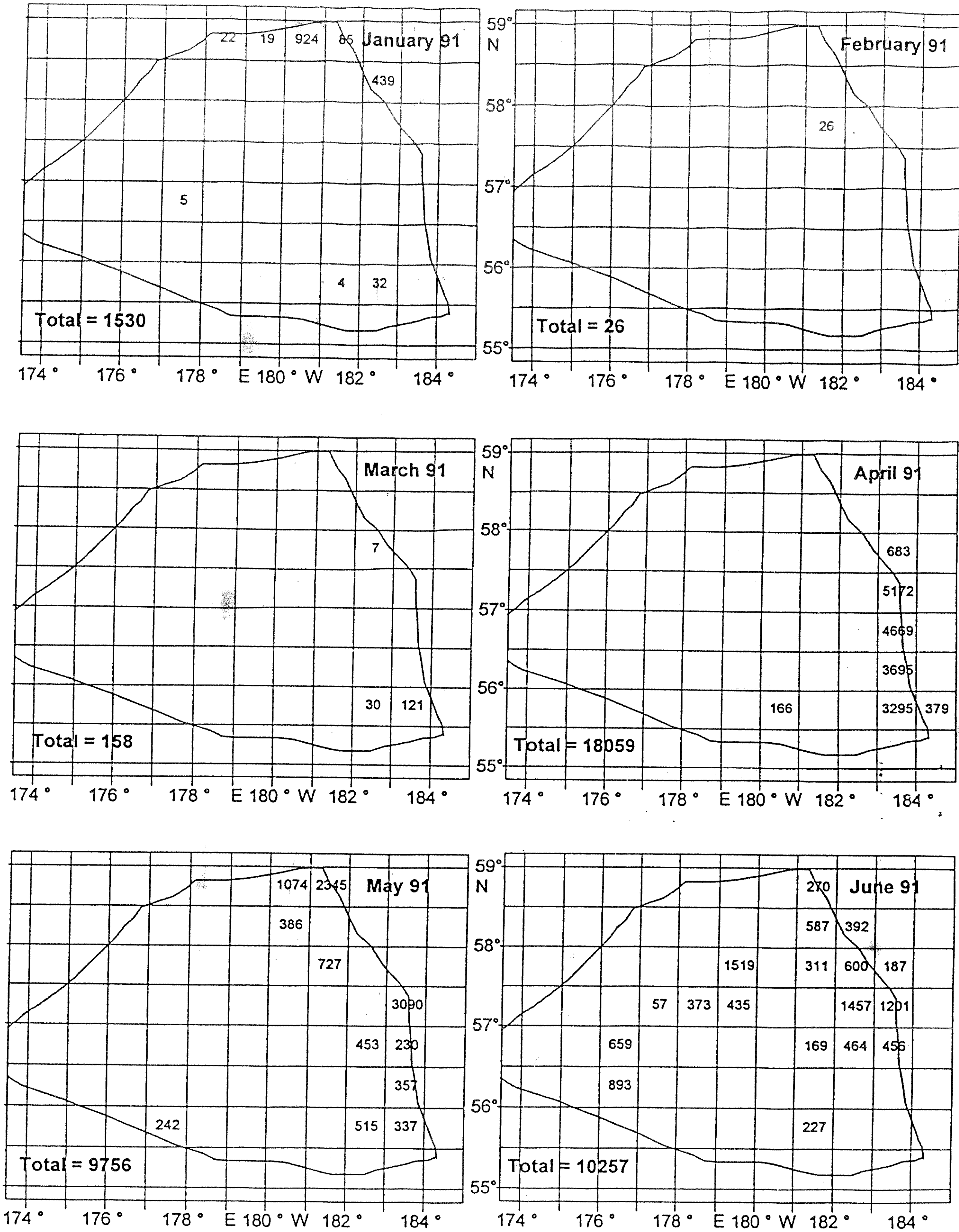


Fig. 8. Polish catches (in metric tons) of pollock in Donut Hole area of the Bering Sea by big statistical blocks (1° longitude x 0.5° latitude) by months in 1991

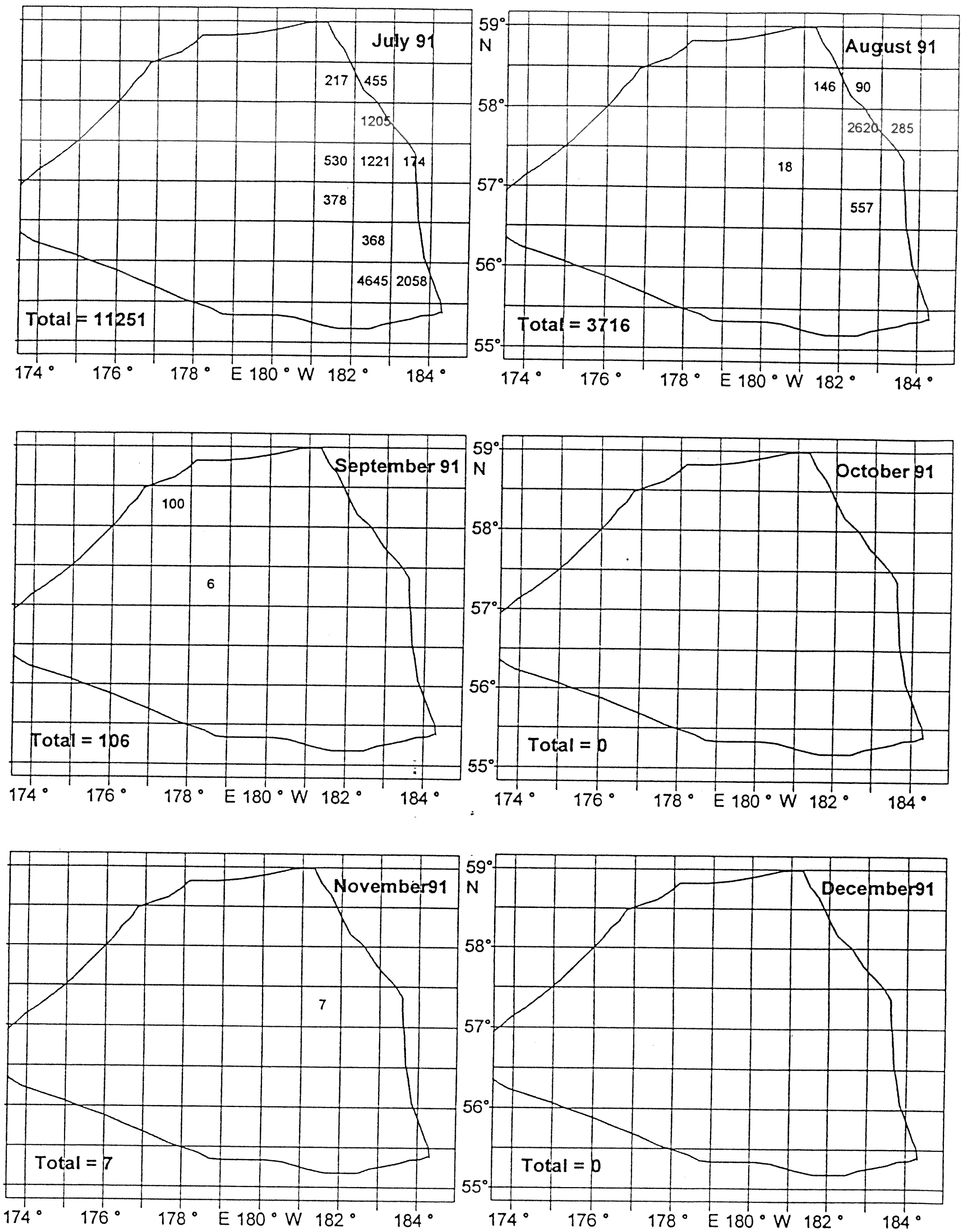


Fig. 8 cont. Polish catches (in metric tons) of pollock in Donut Hole area of the Bering Sea by big statistical blocks (1° longitude x 0.5° latitude) by months in 1991