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

Papers submitted

by

the Russian Federation

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Contents

Cruise aboard R/V "Professor Kaganovskyi" to the Northwestern Bering Sea in August - September 2009

A trawl - acoustic survey was made in the West Bering Sea zone from R/V "Professor Kaganovskyi" between August 30 and September 9, 2009 (Figure 1).

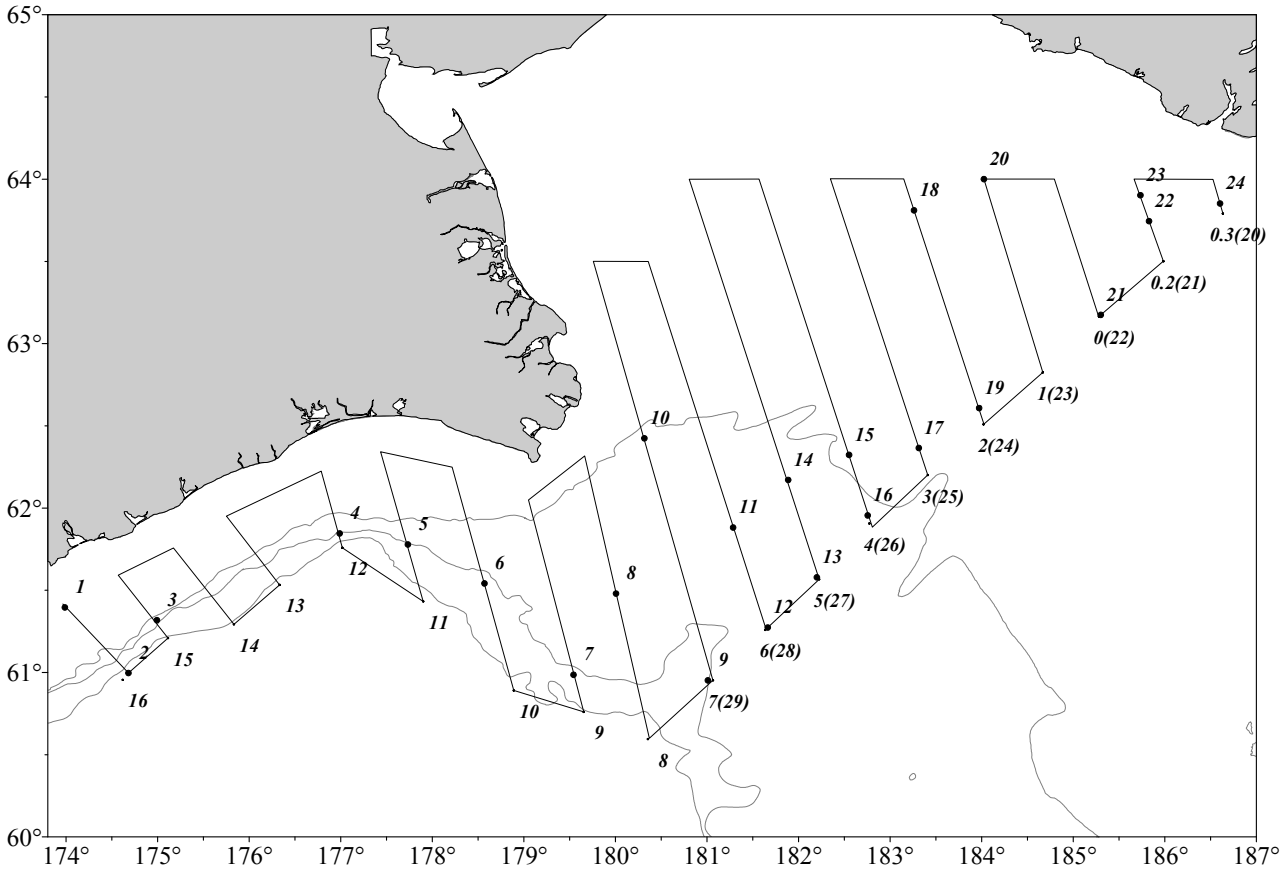

Figure 1. Grid of acoustic tacks and position of trawling checkpoints by R/V "Professor Kaganovskyi" in the Northwest Bering Sea in August - September 2009 (tack numbers of the similar survey being done by AFSC – USA in the east part of the sea are shown in brackets).

Based on the survey, the abundance and biomass of pollock were assessed; the pattern of interannual and seasonal variability of its spatial differentiation was studied; biological and oceanological data were analyzed.

The seasonal processes in the Bering Sea in the spring-summer time of 2009 followed the course close to the average multiannual conditions. The water

warming intensity in the surface layer in July slowed down because gale conditions occurred very frequently.

The frontal temperature zone in Navarin region was between 61º40' and 61º50' N. Negative water temperature of 0.5 – 1.0º C in the near-bottom layer of Navarin region in late July was recorded on the shallow shelf and in the rim of Anadyr Bay.

Zooplankton biomass of large fraction on the northwest Bering Sea shelf in 2009 was significant, as in 2007 – 2008.

The data gathered by R/V "Professor Kaganovskyi" from a northwest Bering Sea area limited by 174º E. and 175º W. contain weak echorecordings of pollock which indicated that its concentration density in Russian waters was very low. The major concentrations were in close vicinity to the delimitation line between the Russian and U. S. zones, in the upper part of the continental slope and lower part of the shelf between 178º E. and 177º W. (over 30000 ind./mile², to compare with over 300000 ind./mile² in 2008). In other words, pollock was distributed in waters along the frontal zone of cold water masses avoiding negative temperature regions. As is known, pollock of any age group enter low temperature waters during the feeding period in very small numbers.

No echorecordings of pollock were received along the Koryak coast west of 178º E. Therefore, in view of its intra – specific fractional characteristics in the Russian waters of the Bering Sea one might assume that in late summer and early autumn of 2009 the West Bering Sea pollock did not make significant migrations towards the north part of the sea.

The distribution of individual size groups most of which were found close to the separation line, with numbers of fish, is shown in Figure 2.

The overall size composition of pollock in the North Bering Sea was polymodal and included 5 – 72 cm fish where small – and mid – sized classes prevailed. The dominant groups included pollock of 17 – 21, 26 – 27 and 31 – 37 cm (Figure 3). The first two groups made up 12.2% in total; the latter constituted 42.5% of the total number. The right part of the series had a rather pronounced

group of 50 – 60 cm (9.9% of the total number). The by-catch of the fish of the year (up to 15 cm) was not great and did not exceed 2%. Hence, the fish under the minimum fishing size of 37 cm AC amounted to over 78.9%.

The 2006 year - class led in terms of numbers among the ages of pollock in August – September 2009; its average length was 32.1 cm; it made up 42.3% (Figure 3). The relative number of 2008 and 2007 year – classes was about equal (10.7 and 13.4% respectively). The 2009 age composition featured the 2000 year – class still notable among the other older age groups which used to be exploited heavily in the Russian and U. S. waters in previous years; this year – class is estimated as the most abundant in the East Bering Sea population since 1993. The survey shows that its relative abundance in Navarin region was nearly 5.5% (Figure 3). Consequently, the results of the survey reconfirmed a high abundance (above the average level) of the 2006 generation.

By far most pollock in the sample were immature during the survey: 58.0% males and 47.2% females were at the second stage of maturity. As for the II – III stage, 22.2% males and 11.4% females were recorded; at stage VI – II the respective figures were 13.3% and 33.1% (Figure 4). There were individual cases of occurrence of pre – spawning pollock. The sex ratio in the immature part of catches was about equal, with an insignificant prevalence of males (50.7%); the mature part was notably dominated by females (73.6%).

On the whole, the spatial distribution of concentrations of small – and mid – sized fish and the list of their food items correlated with the distribution and species composition of zooplankton. Some spots with a great biomass of zooplankton (up to 1000 mg/m^3, including biomass of large fraction of over 600 mg/m^3) were observed around the outer part of the shelf and on the slope, between Navarin Cape and the delimitation line. Therefore, the abundance of food zooplankton during the period of study, most probably, was not among the factors which limit the extension of pollock range into the North Bering Sea from the other parts of the range.

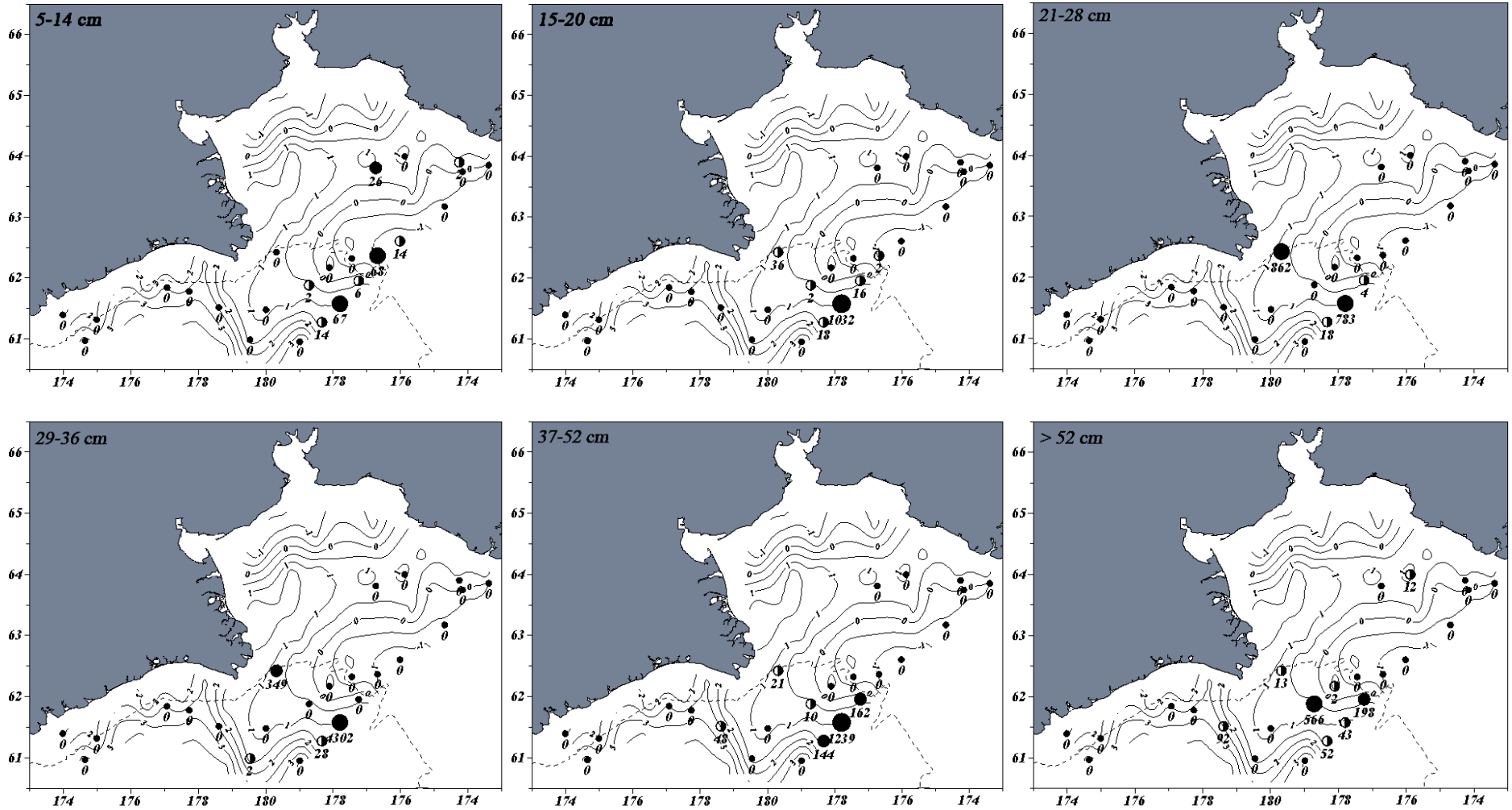

Figure 2. Distribution of various size groups of pollock in catches (ind./one hour trawling) from Navarin region, 30 August – 9 September 2009.

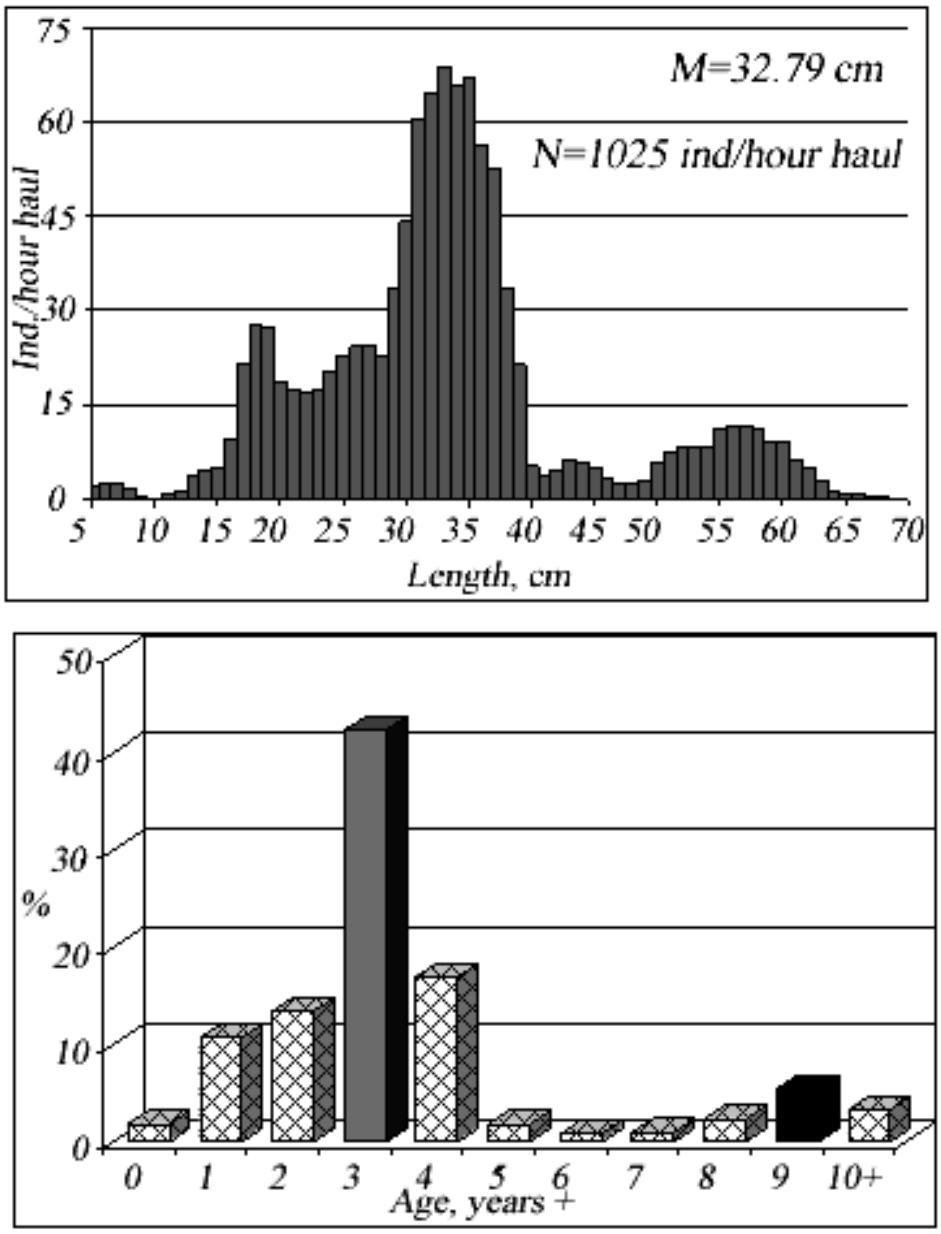

Figure 3. Size – age composition of pollock in Navarin region in August – September, 2009.

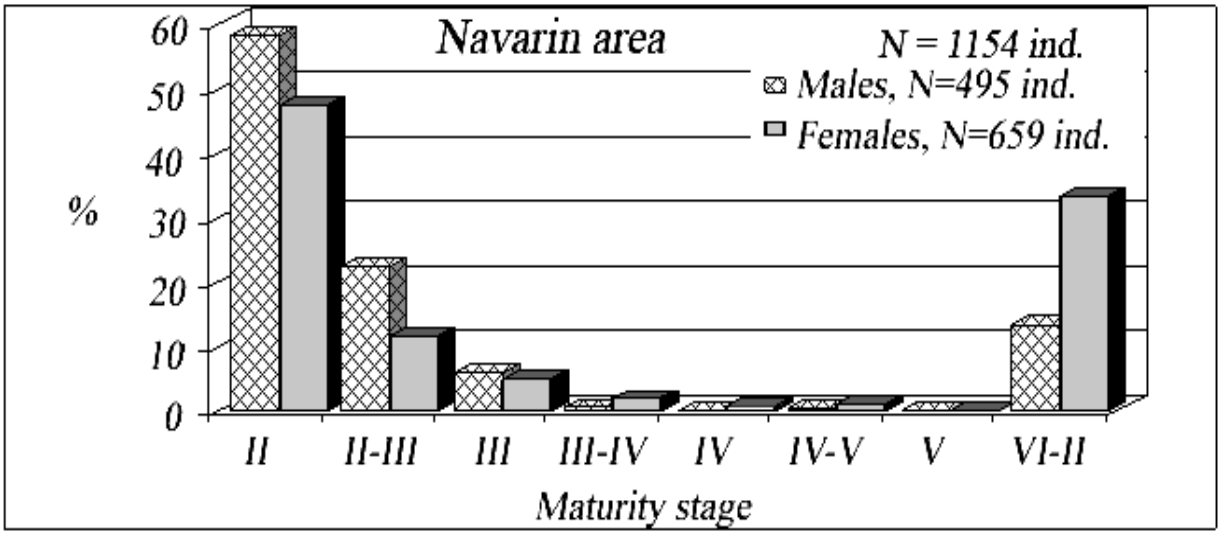

Figure 4. Sex ratio of pollock at various stages of maturity of gonads in Navarin area in August – September, 2009.

In the area east of 177º W., i.e. the east part of Anadyr Bay and the adjacent waters the fish sighted on the inner part of the shelf down to 100 m included only the fish – of – the – year, their average size range in catches being 5.9 to 9.3 cm and diminishing northwards; and the large and older – aged pollock of 64.9 cm on the average. All size groups were found over the depths of 100 – 150 m (except fish – of – the – year). There the size range of 30 – 38 cm was by far predominant (up to 55% of the total number, mostly the 2006 year – class). The mean size of pollock in catches varied from 32.5 to 53.3 cm on the outer shelf (100 – 200 m) and the slope.

The present abundance of pollock in the Russian zone will not allow it to extend into the enclave.

Cruise aboard SRTM “Arctic Leader” to the Northwestern Bering Sea and Petropavlovsk-Komandorsk subzone in September - December 2009

During the cruise which was made onboard of the fishing vessel SRTM "Arctic Leader" in September-December 2009, the work with the purpose to study biology and space-bathymetric distribution of the main trawling objects (pollock, cod and other demersal and benthic fish) was carried out.

The main objects of the cruise were:

- to collect the biostatistical information about size-age and sex structure of pollock's populations and about main objects of the fishery;
- to monitor the distribution of these species;
- to collect the materials about the structure of catches.

The middle freezing trawler (SRTM) "Arctic Leader" refers to a class of medium-tonnage vessels with unlimited navigation area. The main characteristics of the vessel are as follows: maximum length – 61.5 m, maximum width – 12.8 m, freeboard – 7.69 m, deep displacement – 2574.1 tons, cargo capacity – 573 tons, the maximum power of main engine – 3420 hp (2460 kW), speed – 12 knots, crew size – 48 people, the portability of navigation – 30 days.

Navigation and fishing equipment were presented with: echo-sounder SIMRAD ES-60, control device of the trawl SIMRAD FS-1920, GPS SPR-1400 and the radar FURUNO FR-2125.

Fishing were conducted with a mid-water trawls type RT / TM 99/624 with mesh size in codend 60 x 60 mm and bottom trawl DT 77/63 with a codend mesh size 60 x 60 mm.

The volume of collected material is presented in Table 1.

The working areas of the SRTM "Arctic Leader" are presented in Figure 5.

Table 1. The volume of collected material.

Subzone		The Northwestern Bering Sea	Petropavlovsk-Komandorsk subzone
Theragra chalcogramma	FBA	510	40
	M	7244	1191
Gadus macrocephalus	FBA	107	36
	M	251	127
Reinhardtius hippodlossoides	FBA	140	-
	M	530	-
Clupea pallasi	FBA	50	100
	M	263	716
Hippoglossoides elassodon	FBA	126	7
Hippoglossoides robustus	FBA	64	18
	M	-	49

Note: FBA – full biological analysis, M – length measures.

Pollock

The Northwestern Bering Sea

SRTM "Arctic Leader" worked in the West Bering Sea in two areas: at the "separation" line in the square with coordinates 60°49'-61°29' N. and 178°11'-177°33' W. (the first area) and in the area 173°-174° E. (the second area where the vessel spent for most part of the fishing time).

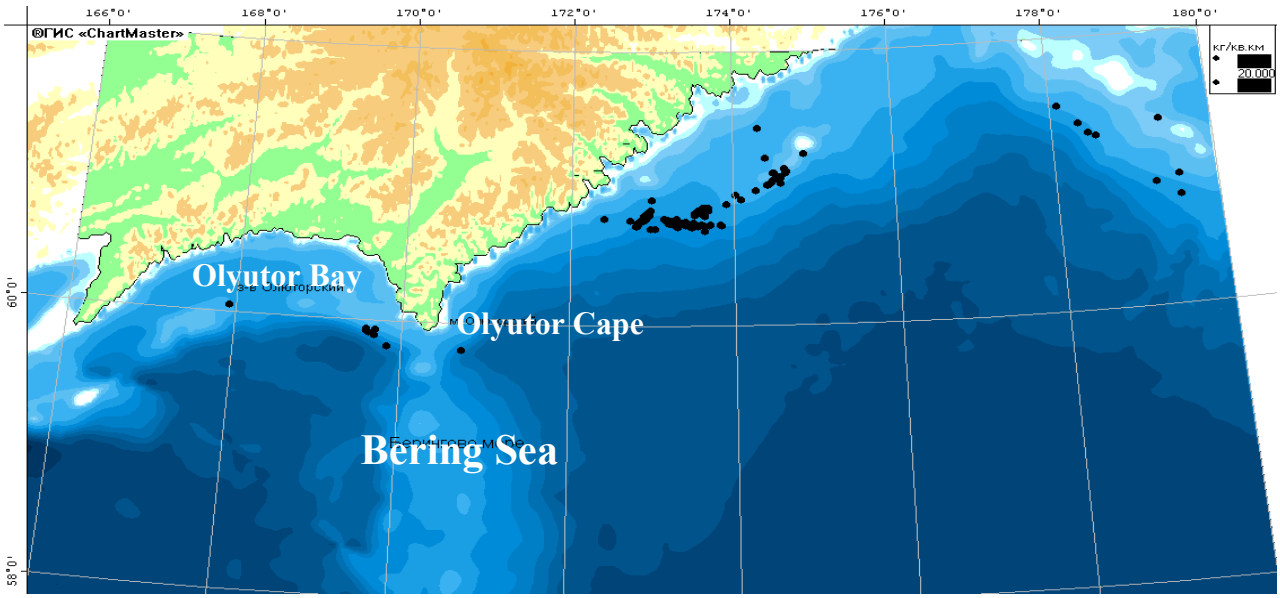

Figure 5. The working areas of SRTM "Arctic Leader" in the Bering Sea in autumn 2009

In the first area the trawlings were conducted at the depth of 105-185 m. Catches of pollock were weak and not stable and varied from 0.8 to 1.9 t/h. haul (average – 1.3).

The length of the pollock varied from 30 to 70 cm. The individuals from the size groups of 32-38 cm dominated in catches (56.38%) (Figure 6). Average length of pollock was 38.4 cm at an average weight of 0.485 kg.

Males several predominated over females (52.6%). The share of the pollock with the length below fishery size on average was 53%.

Among males and females predominated pollock with gonads at maturity stage III.

The pollock was caught at depths varied from 50 to 450 m. in the area of 174° E in September. The catches of this species in that period varied from a few kilograms to 34 t/h. haul (average – 5.1) and were not stable.

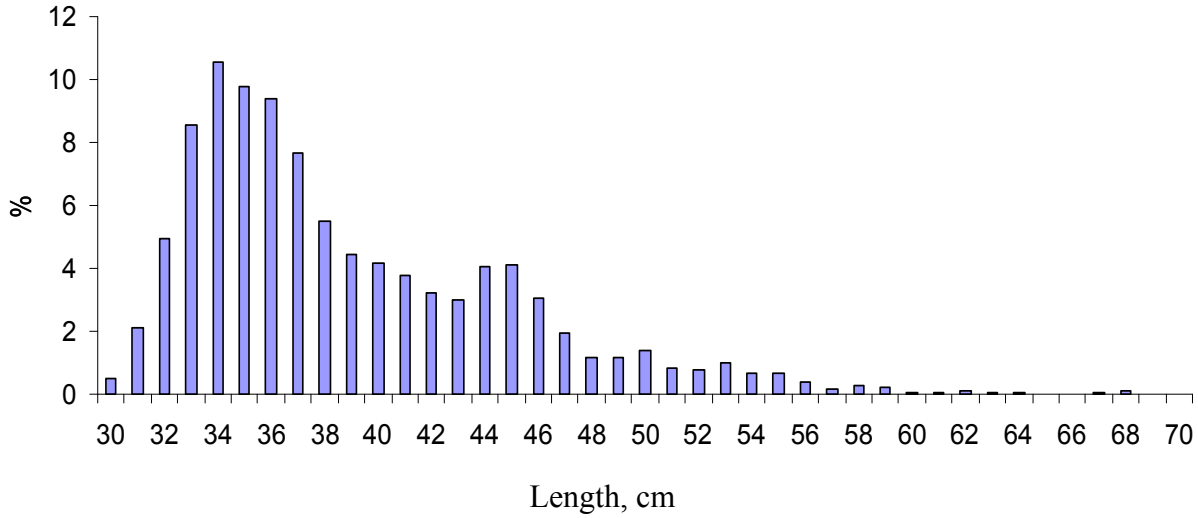

Figure 6. Length composition of pollock in the Western Bering Sea in the area of the separation line in September 2009.

The length of pollock in the catch varied from 30 to 70 cm, with a predominance of individuals from the size groups of 33 - 37 cm (25.1%) and 43 - 46 cm (23.7%) (Figure 7). The average length was 44.0 cm with an average weight of 0.678 kg. Ratio of males/females was near 1:1 (49.8% / 50.2%, accordingly). Proportion of fish with the length below fishery size was 28.3%.

Among males and females dominated fish with gonads at maturity stage III (54.4% and 66.3% accordingly).

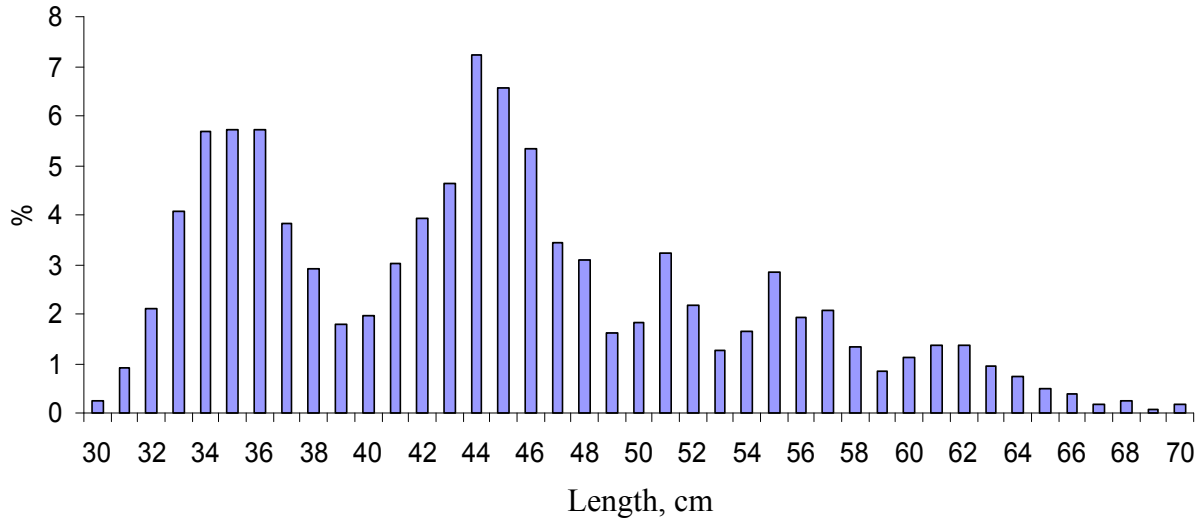

Figure 7. Length composition of pollock in the Western Bering Sea in September 2009.

The work in the area of 174 degrees was continued in October. Trawlings were conducted at depths of 125 - 465 m. The values of catches in that month declined slightly, and the fishing situation in this region has remained consistently lower than average. The catch per hour haul reached 12 tons (average – 3.8).

The length of pollock in the catches varied from 31 to 70 cm; in the catches dominated fish from the size group of 41 - 48 cm (66.5%) (Figure 8). The average length was 45.5 cm with an average weight of 0.691 kg. The sex ratio remained the same, but with a slight predominance of males (50.2% / 49.8% accordingly). Proportion of fish with the length below fishery size was 3.4%.

Among males and females in October dominated fish with gonads at maturity stage III (64% and 793.9% accordingly).

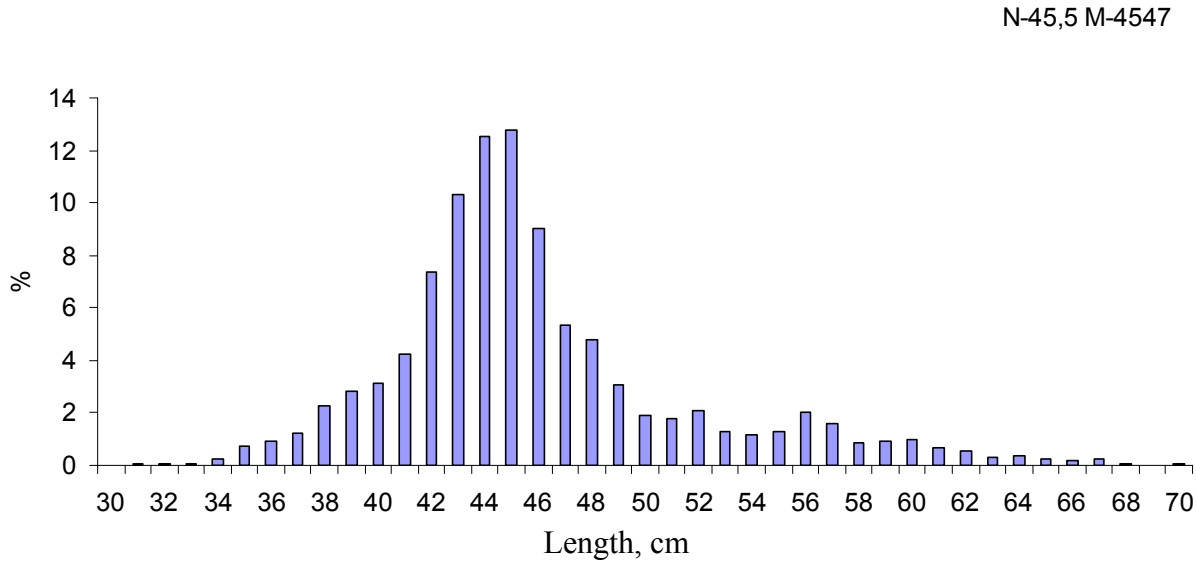

Figure 8. Length composition of pollock in the Western Bering Sea in October2009.

Karagin subzone

The work in the Karagin subzone was conducted in October. The trawlings were carried out in the eastern part of Olyutor Bay at depths of 125 - 280 m. Catches of pollock varied from 4.5 to 13 t/h. haul (average – 8.6).

The length of pollock in the catches varied from 31 to 60 cm, in the catches dominated fish from the size groups of 39-46 and 48 cm (61.7%) (Figure 9). The average length was 43.4 cm with an average weight of 0.668 kg. Proportion of fish with the length below fishery size was 13.9%.

In the catches of pollock predominated males (61.7%); most of them had gonads at III and III-IV stages of maturity (43.9% and 31.3% accordingly). Most of females had gonads at III stage of maturity.

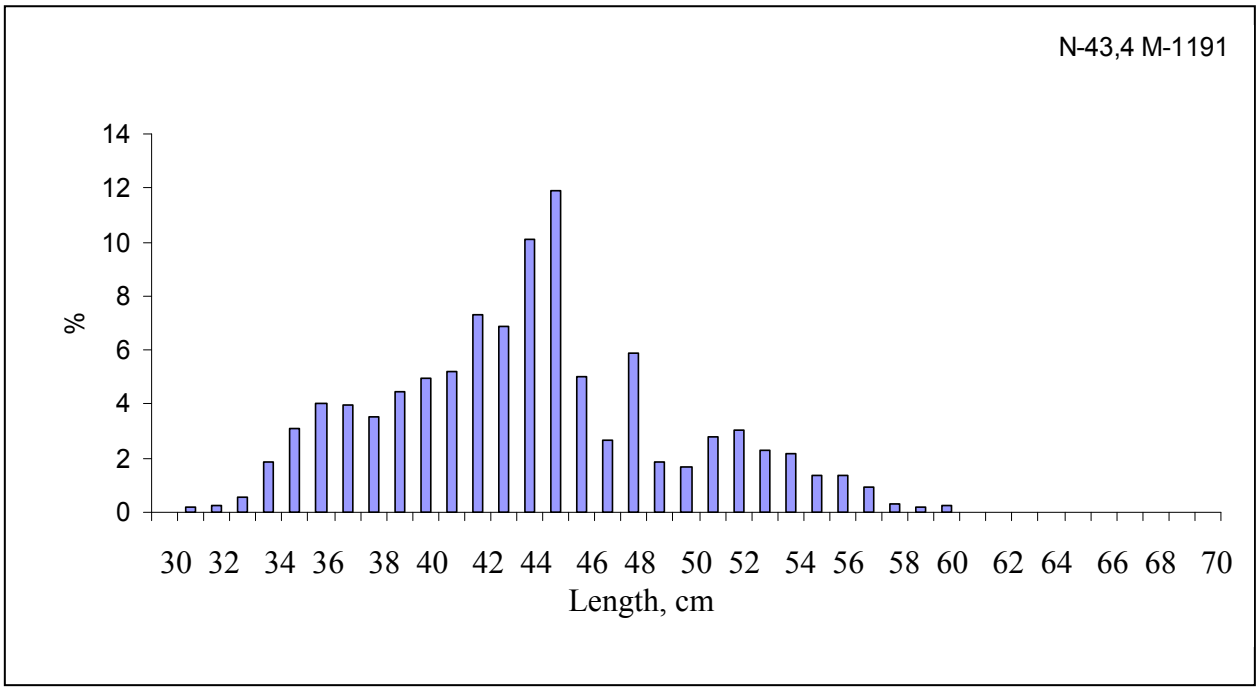

Figure 9. Length composition of pollock in the Karagin subzone in autumn 2009.

Petropavlovsk-Komandorsk subzone

Only one trawling was made in Petropavlovsk-Komandorsk subzone at the depth of 275 m and coordinates 51°18' N. and 158°09' E. The catch amounted to 4.2 t/h. haul.

The length of pollock in the catches varied from 34 to 61 cm, in the catches dominated fish from the size groups of 40-46 and 48-49 cm (79%). The average length was 44.6 cm with an average weight of 0.672 kg. Proportion of fish with the length below fishery size did not exceed 2.5%.

In the catches of pollock predominated males (65.6%); most of them had gonads at III-IV stage of maturity (55.9%). Most of females had gonads at III and III-IV stages of maturity.

Herring

This species was met once in the catch in the Western Bering Sea at the depth of 215 m and coordinates 60°53' N. and 173°50' E. The catch was 18.9 kg/h. haul with a predominance of young fish. The length of fish varied from 20 to 34 with average length 22.6 cm and average weight of 0.12 kg. In the catch

dominated fish from the size groups of 20-23 cm (71.1%) (Figure 10). Proportion of females in the catch was 43.7%.

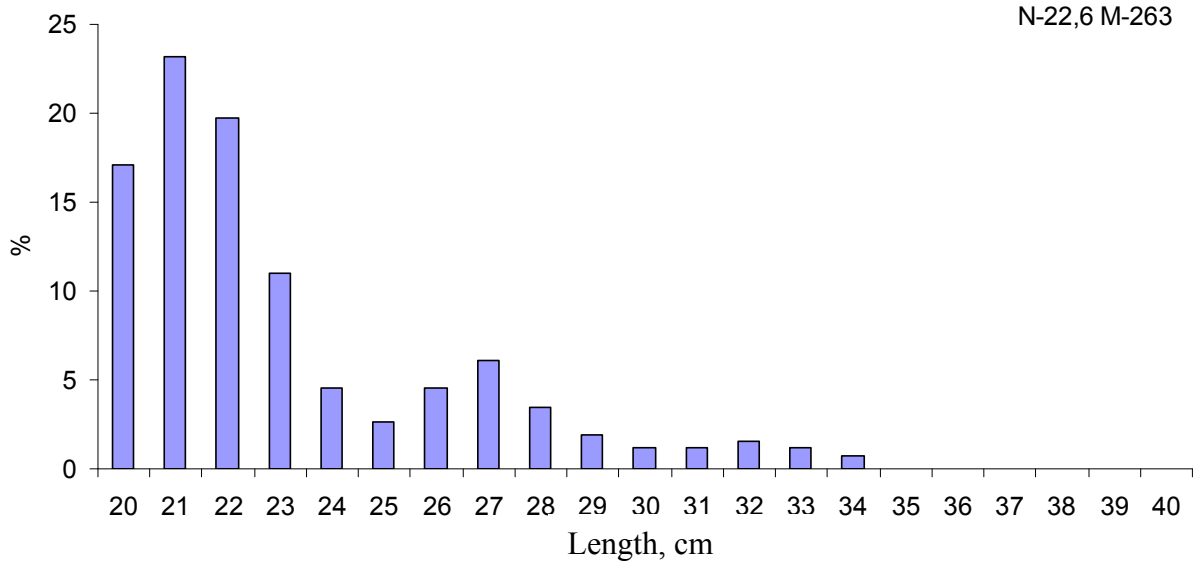

Figure 10. Length composition of herring from the catches of SRTM "Arctic Leader" in the Western Bering Sea.

More than 82% of both males and females had gonads at maturity stage II. Fat content varied from 0 to 3 points (average – 2).

In Karagin subzone the herring was observed in two trawlings at the depth of 160-280 m and coordinates 59°48'-54' N. and 169°37'-53' E. Catches in terms of hour haul varied from 28.4 to 692 kg (average – 360).

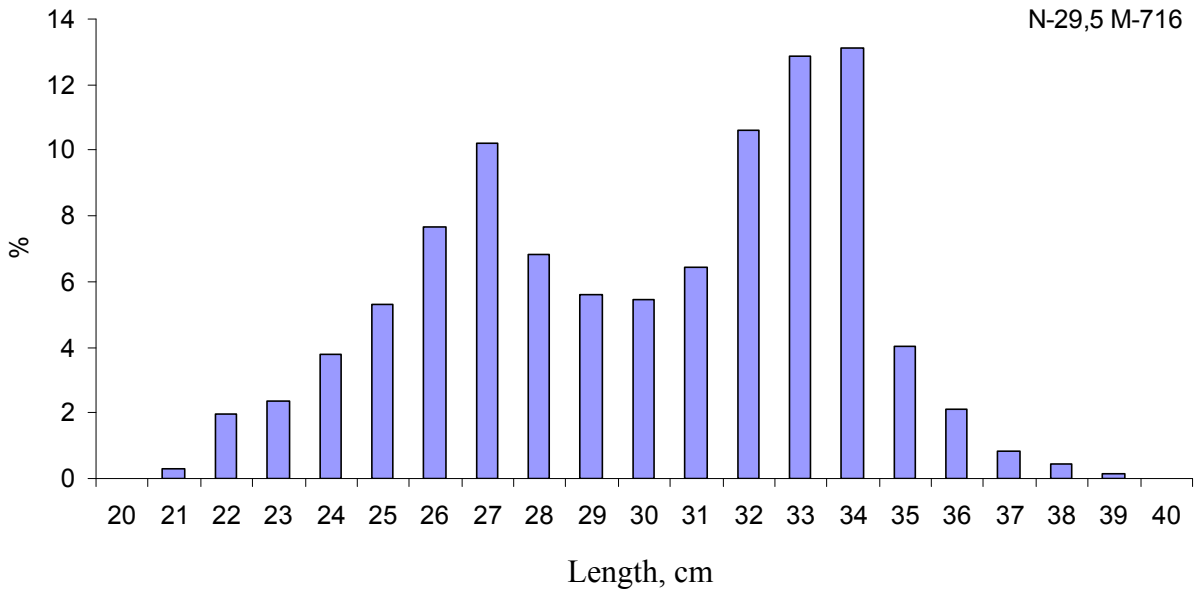

Figure 11. Length composition of herring from the catches of SRTM "Arctic Leader" in the Karagin subzone.

The length of herring varied from 21 to 39 cm with average length 29.5 cm and average weight of 0.298 kg. The basis of catches was presented with the individuals with length of 25-34 cm (Figure 11). Proportion of females in the catches was 45.1%.

More than 82% of both males and females had gonads at maturity stage II. Fat content varied from 0 to 3 points (average – 2).

Most males had gonads at III-IV and IV stages of maturity (22% and 57% accordingly). The proportion of the females with gonads from II to III-IV stage of maturity was approximately the same. Fat content varied from 0 to 4 points (average – 1.54%).

Cod

The maximum catch of cod was registered in the coordinates 61°28' N. and 174°13' E. at a depth of 50 m. It came to 19 tons per trawling. In terms of hour haul catches varied from 1.5 to 3800 kg (average – 500).

The fish length varied from 30 to 79 cm. The average length was 52.6 cm and average weight was 2.5 kg. The basis of catches was presented with the

individuals with length of 25-34 cm (Figure 12). Proportion of females in the catches was on average 51.6%.

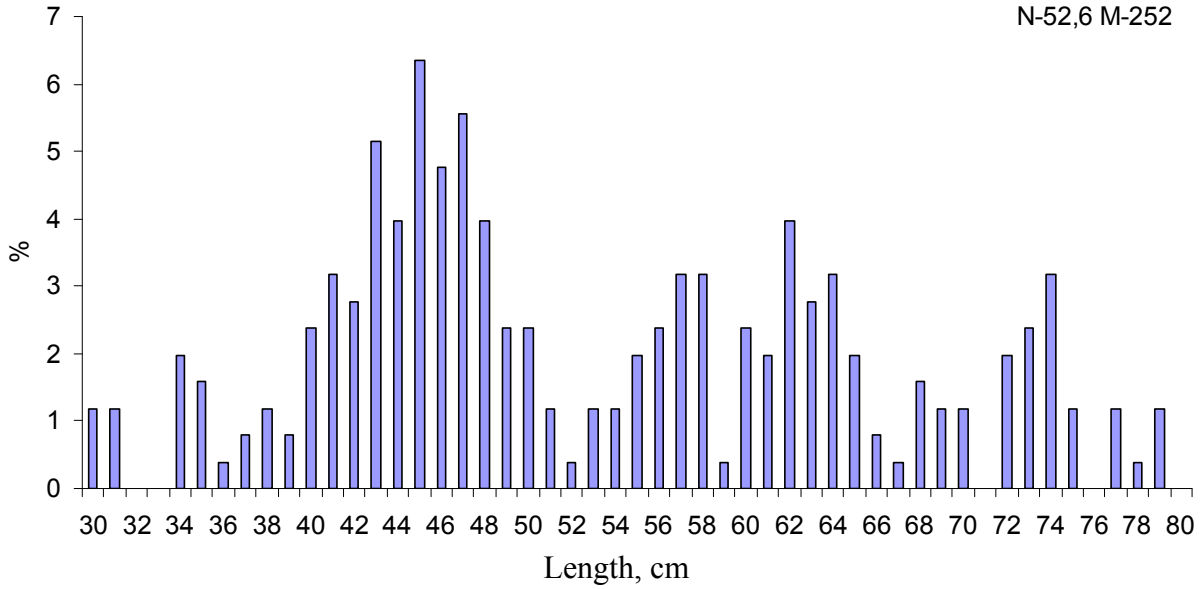

Figure 12. Length composition of cod from the catches of SRTM "Arctic Leader" in the Western Bering Sea.

More than 82% of both males and females had gonads at maturity stage II. Fat content varied from 0 to 3 points (average – 2).

Most males and females had gonads at II and II-III stages of maturity.

In Karagin subzone cod catches varied from 27 to 100 kg/h. haul (average – 60.6). The length of cod varied from 34 to 71 cm; in the catches dominated individuals with length of 44-51 cm (46%) (Figure 13). The average length of cod was 49.2 cm with an average weight of 1.9 kg. The share of females was 42.2%.

Most of the fish had the gonads at II-III and III stage of maturity.

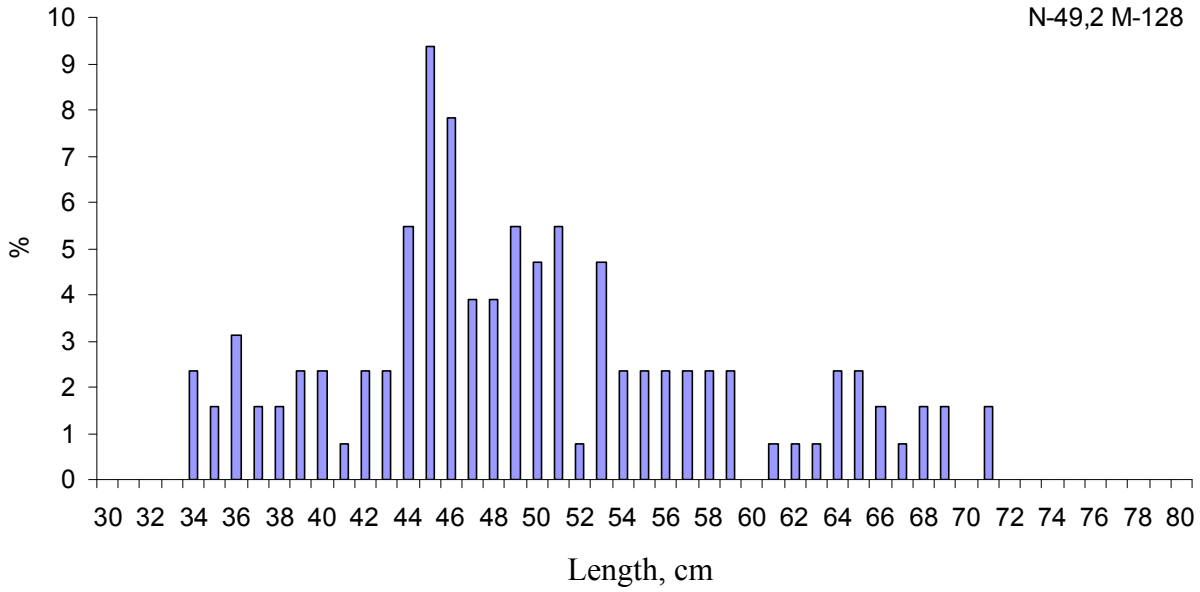

Figure 13. Length composition of cod from the catches of SRTM "Arctic Leader" in the Karagin subzone.

Greenland halibut

The highest frequency of occurrence of greenland halibut in the Western Bering Sea fell on September. This species was caught in the area of 173-174 meridians at a depth of 230-435 m. In the later periods greenland halibut was observed in the catches very rarely, in all probability, at that period the migration to spawning areas at great depths began. Greenland halibut catches varied from 1.9 to 57.2 kg/h. haul (average – 22.9).

The specimens' length varied from 38 to 70 cm, with an average length of 55.3 cm and weight of 1.7 kg. The fish with length of 56-62 cm dominated in catches (47.1%) (Figure 14). The proportion of females averaged 28.6%.

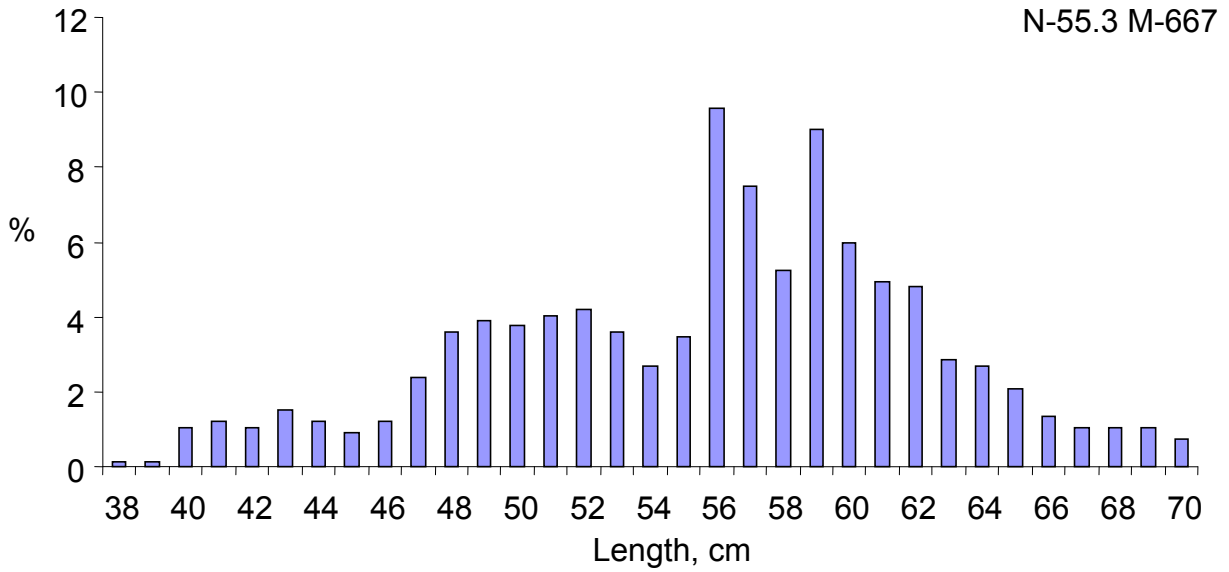

Figure 14. Length composition of Greenland halibut from the catches of SRTM "Arctic Leader" in the Western Bering Sea.

Most males and females had gonads at III stage of maturity.

Flathead sole (*Hippoglossus elassodon*)

This species occurred only in the Bering Sea, where it catches varied from 0.52 to 27 kg/h. haul (average – 6.3).

The length of individuals varied from 27 to 52 cm, with an average length of 36.2 cm and weight of 0.632 kg. The fish with body length of 29-30 cm (11.3%) and 33-39 cm (48.9%) dominated in catches (Figure 15). Proportion of females was significantly higher than males – 63.9%.

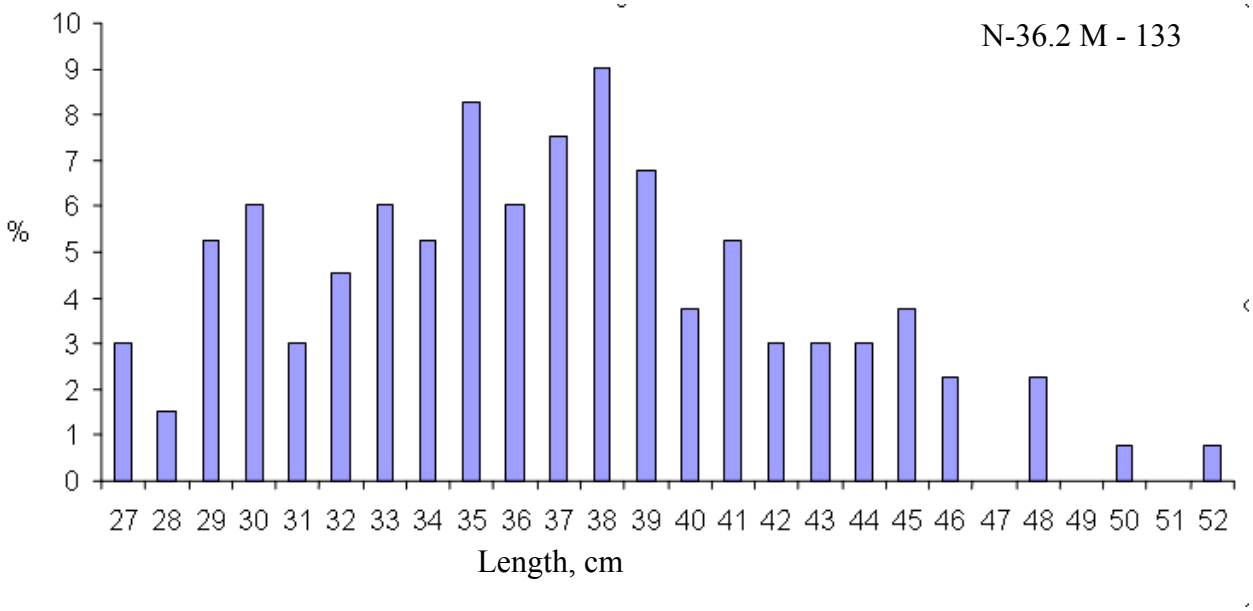

Figure 15. Length composition of flathead sole from the catches of SRTM "Arctic Leader" in the Bering Sea.

Most of the males had gonads at II-III and III stages of maturity, 71.8% of females had III stage of maturity.

Bering flounder (*Hippoglossus robustus)*

This species, like the previous one, was observed only in the Bering Sea. Catches it in terms of hour haul varied from 0.5 to 42.9 kg (average – 4.1).

The length of individuals varied from 20 to 543 cm. Average length of this species was 29.9 cm and average weight was 0.486 kg. The basis of catches was presented with the individuals with length of 27-33 cm (48.7%) and 35-36 cm (16.8%) (Figure 16). The share of females was 74%.

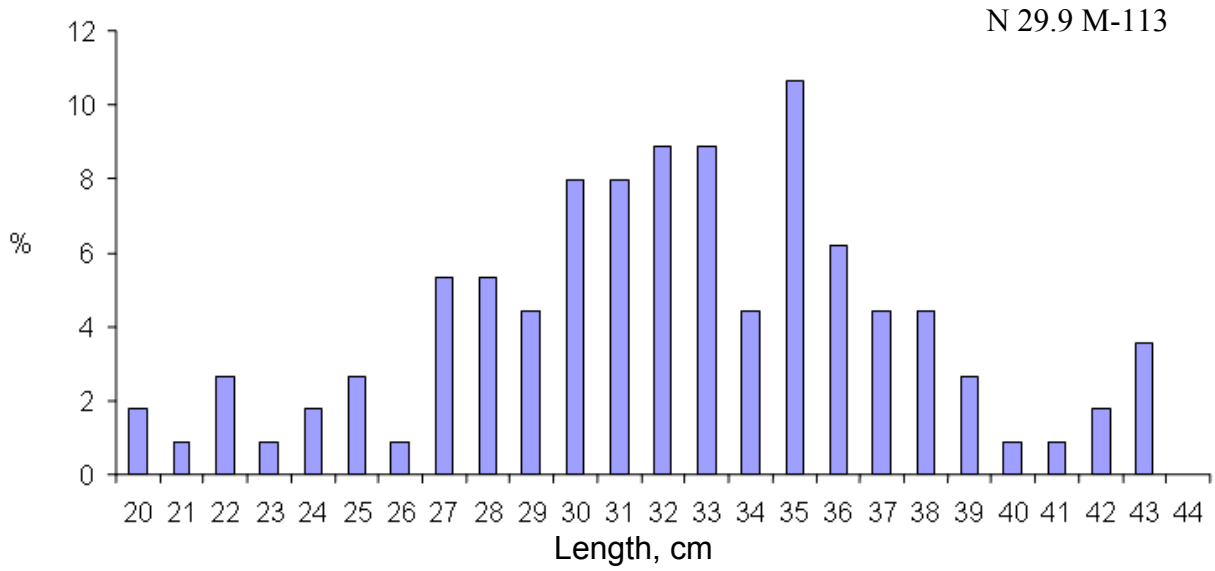

Figure 16. Length composition of Bering flounder from the catches of SRTM "Arctic Leader" in the Bering Sea.

Most males and females had gonads at III and III-IV stages of maturity.

Cruise aboard RS “Sokur” to the Kommandor Islands in April 2010

In the coastal waters of the Commander Islands independently sustainable over time spawning area of pollock is located; the population status of that pollock is still unknown.

The scientific research, which were conducted in that area, were not regular because of the lack of significance of fishing groups living there, as well as formation here the State Nature Biosphere Reserve "Commander" in 1993. In 1988 experts from TINRO-center conducted ichthyoplankton and trawl surveys experts around the Bering and Medniy islands onboard the NPS "Hissar" and in early May 2001 experts from KamchatNIRO conducted egg survey onboard the RTMS "Bagration". The results of the accounting of the developing eggs showed a significant increase in resources of Commander pollock compared with 1980-s. In 2009, after 8 years, the similar survey was conducted and already it was in a planned manner. Its results confirmed earlier information about enough intense spawning of commander pollock.

For many species of fish with pelagic eggs including pollock, ichthyoplankton survey is one of the main methods for studying the reproduction of fish and estimating of the reproductive part of the population. Taking into account the conservation status of 30-mile zone around the archipelago and the inability to organize research using trawling gear, this method is currently only available for the study of this group, because the ichthyoplankton study is carried out practically without interference in the environment and without the removal of resources. According to the number of spawned eggs which were taken into account in the water column it is possible to estimate tentatively the abundance of pollock spawning groups; together with the echoacoustical observations data – to take a picture of the distribution of spawners in the spawning period. In addition, the age of pollock's embryos in the samples can help us to judge about the period of spawning. The hydrological research which are usually accompanied by the catches of ichthyoplankton supply large amount of information.

In 2010 the studies near the Commander Islands were continued. Such studies may also be useful for the environment activity of the Commander reserve because it would allow to reserve more accurate notion of the forage reserve for marine mammals which live on the islands – sea lions, fur seals, seals.

The main objects of the planed expedition were:

- to determine the qualitative and quantitative composition of ichthyo- and zooplankton in the coastal waters of the Bering and Medniy islands;

- to determine the period and area of the spawning of pollock;

- to collect the concomitant hydrological information.

Plankton and hydrographic surveys (52 stations) were held from 17 to 28 April 2010 in the coastal zone of the Bering and Medniy islands (Figure 17).

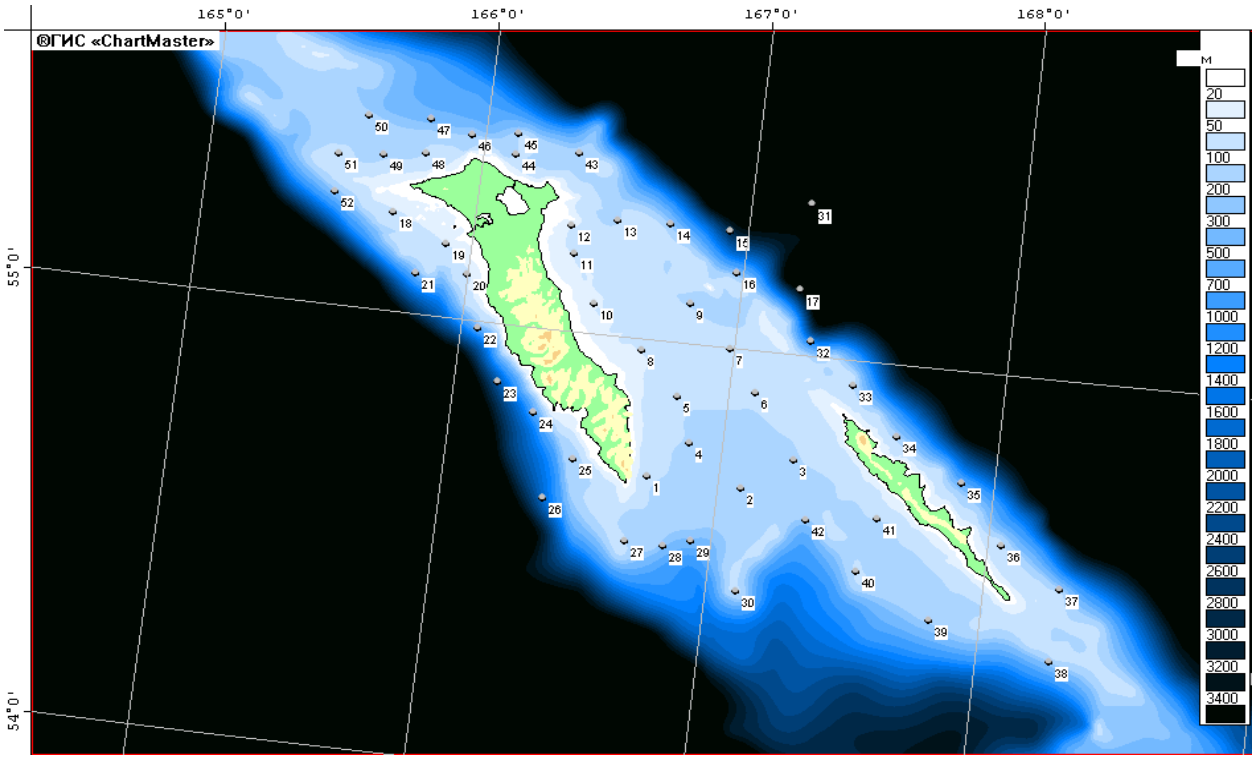

Figure 17. The scheme of the stations of plankton and hydrological surveys in the coastal zone of the Bering and Medniy islands 17-27.04.2010.

The standard ichthyoplankton meshes IKS-80 were used for the catches of ichthyoplankton. At each check point the vessel put its working board lee-wise.

The catches were made in water layer of 200 m and at shallower depth curve – from the bottom to the surface. The meshes went up and down at speed of 0.5-0.6 m/sec. Etched length of rope was determined depending on the depth of space on the echo-sounder and angle rope, which was determined visually. The STD-bore was fixed below the meshes; the actual depth of the dive equipment was determined according to indications of that bore. After lifting gear on board the lower part of the meshes were washed with water and the accumulative glass was separated.

Further, in the same reference point in the upper 50-meter layer the vertical zooplankton catches were carried out with the standard Jedi meshes. The samples were poured out into bottles and fixed with 4-% formalin solution for subsequent office processing.

The hydrological material were collected with the help of STD-bore RBR XR-620 (Richard Brancker Research Ltd., Canada), which was fastened together with the load below the ichthyoplankton meshes.

After the primary hydrological data were transferred from STD-profilograph on a personal computer, that information was processed with the help of MS Excel (Microsoft Corporation). 1949 hydrological stations were made altogether during the survey.

Mapping the distribution of oceanographic parameters was produced by a specialized program Ocean Data View 3.4.1 (Reiner Schlitzer, http://odv.awi.de).

The ichthyoplankton samples were pulled down as follows. The sample was placed in a Petri dish, ichthyoplankton was isolated from the total mass of plankton, its species and quantitative composition was determined. 100 eggs, or whole sample if it contains less than 100 pieces were examined under a binocular to determine the age of embryos pollock on a 4-point scale of Rass. Among the eggs were isolated dead ones to which the unfertilized embryos (without visible signs of fragmentation) and with developmental disabilities were carried.

The attempts to perform the horizontal catches of the surface layer of water wish meshes IKS-80 were made twice at the stations with pollock eggs catches; that stations located in the strait between the Bering and Medniy islands. For this purposes the vessel served as the circulation (full circle) at a rate of about 3 knots, during which the meshes were lowered to a depth of 1-2 m. In view of the design features of boom installed on the vessel, it was impossible to carry out horizontal catch (steep meshes to the desired horizon).

The location and condition of echorecords of pollock's clusters were continuously recorded (photographed) during the survey.

The information about the station, the results of processing of ichthyoplankton, temperature and salinity on standard hydrological horizons, the state of echoacoustical records of pollock was recorded in a special planktonic register and in an electronic database.

The treatment of plankton allowed us to make a quantitative assessment of the recorded eggs and to determine the spawning stock of pollock. First, we calculated the actual number of eggs in stages of development, taking into account the angle of inclination of the cable in terms of m^2 at each station by the formula:

$N_{actual.} = N_{sample} \times H_{actual} L \times 2$, were

$N_{actual.}$ – actual number of eggs,

H_{actual} – actual diving depth of meshes, defined by STD-bore,

L – length of the etched rope.

After that, the total number of eggs accounted for each stage of development was calculated with the help of GIS "ChartMaster 3.1". To compare these results with the results of similar surveys performed in 2009 on the PTR "Moroz" (earlier RTMS "Bagration") the same ground – the strait between the Bering and Medniy Islands – was chosen for the calculations. For the calculation of distribution maps the "2D-spline" method was used.

According to studies from previous years (2001 and 2009), it was found that water masses from the Pacific Ocean and Bering Sea sides of Commander islands vary significantly. Our data confirm this conclusion (Figure 18).

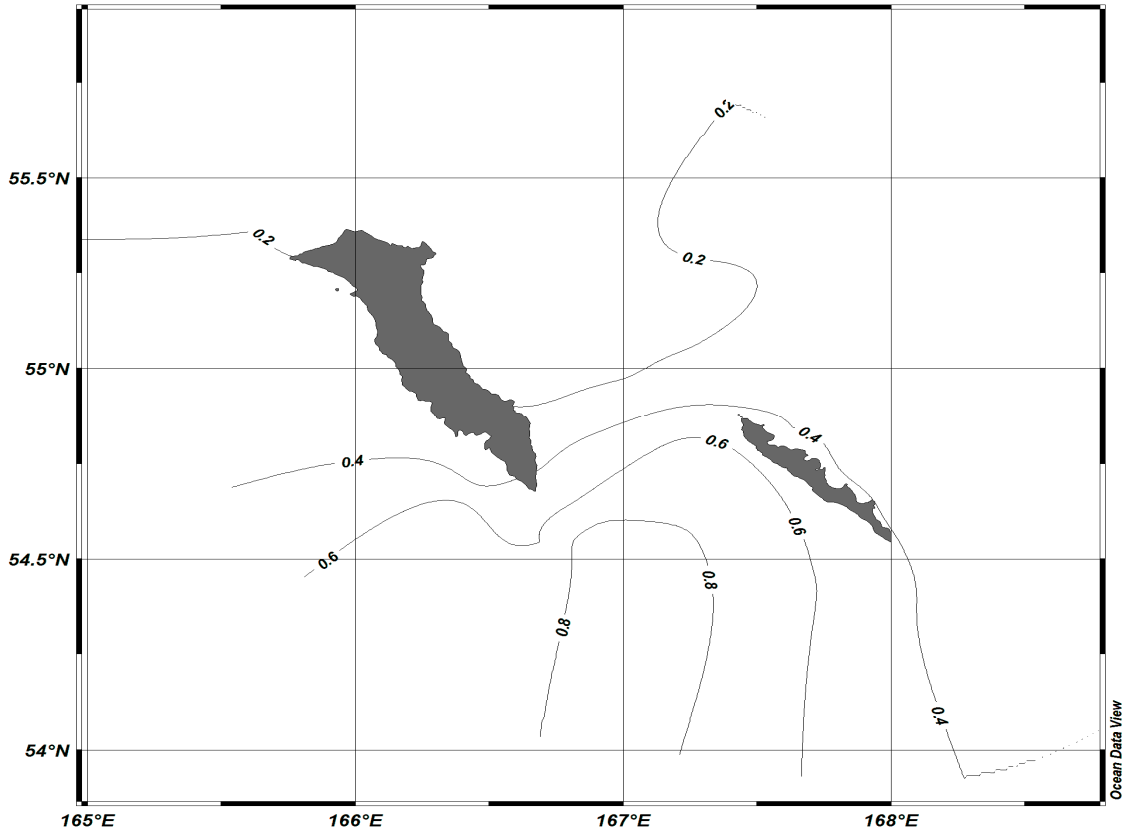

Figure 18. Average water temperature (° C) in the 0-50 m layer based on the results of hidrological survey in the coastal zone of the Commander Islands 17-27.04.2010.

By spawning ecology the "Commander" pollock can be attributed to the "shelf" type, like "Okhotsk Sea" or "East Bering Sea" pollock. Spawning mainly on the shelf and eggs develop in the upper 50-m layer of water which thermal conditions determine the duration of embryonic development. Almost everywhere, from the Pacific side of the Medniy island and in the southern part of the strait the average temperature of the upper 50 m layer was higher than from the Bering Sea side of the island (Figure 18). A similar distribution pattern was noted during observations in 2001 and 2009. The variation of the spatial temperature was characterized by the lowest values (-0,16 – -0,17° C) in the

coast of Bering Island from the Bering Sea side and the largest values (up to 1,3° C) in the southern part of the strait between the islands.

From the vertical profiles of water temperature in most hydrological stations the homogeneity of the upper layer to a depth of 100-150 m is clearly seen this fact indicates a significant convective mixing in the area of survey (Figure 19). Unlike 2009, in some areas of surveyed waters (north of the Bering Island) the negative temperature (up to -0.2° C) was observed.

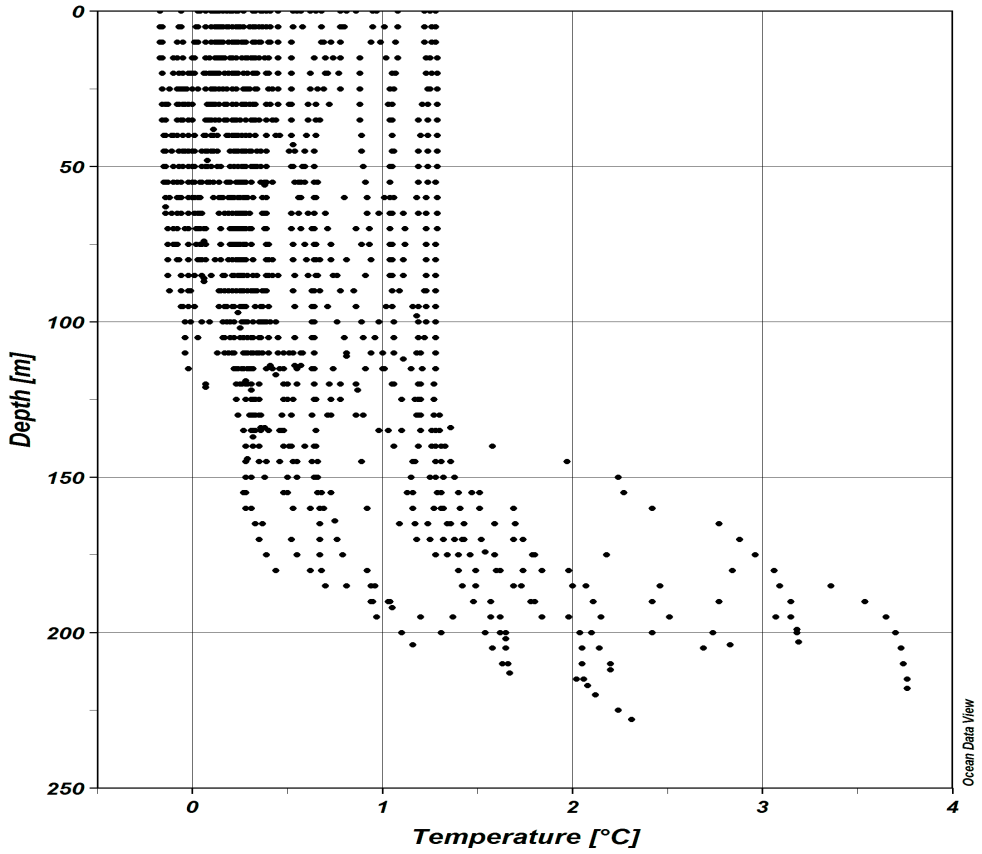

Figure 19. The vertical profiles of temperature according to the survey 17-27.04.2010.

The scheme of the stations of ichthyoplankton survey in 2010 was made taking into account the results of the survey in 2009. Eggs were met at 44 stations of 52 (Figure 20). Unlike last year, large sites without eggs were not observed. Stations with zero catches are scattered throughout the investigated area. Maximum catches recorded in the same areas as in 2009, i.e. in the northern part of the strait in the area of Kitolovnaja shoal. The actual total

number of eggs on the station with the largest catch at a depth of 80 m was about 26.2 thousand individuals/m^2 (Figure 21). The piece catches of eggs were marked, either from with the Bering Sea or from the Pacific sides of the island, mainly on the most seaward stations (Figure 22-25).

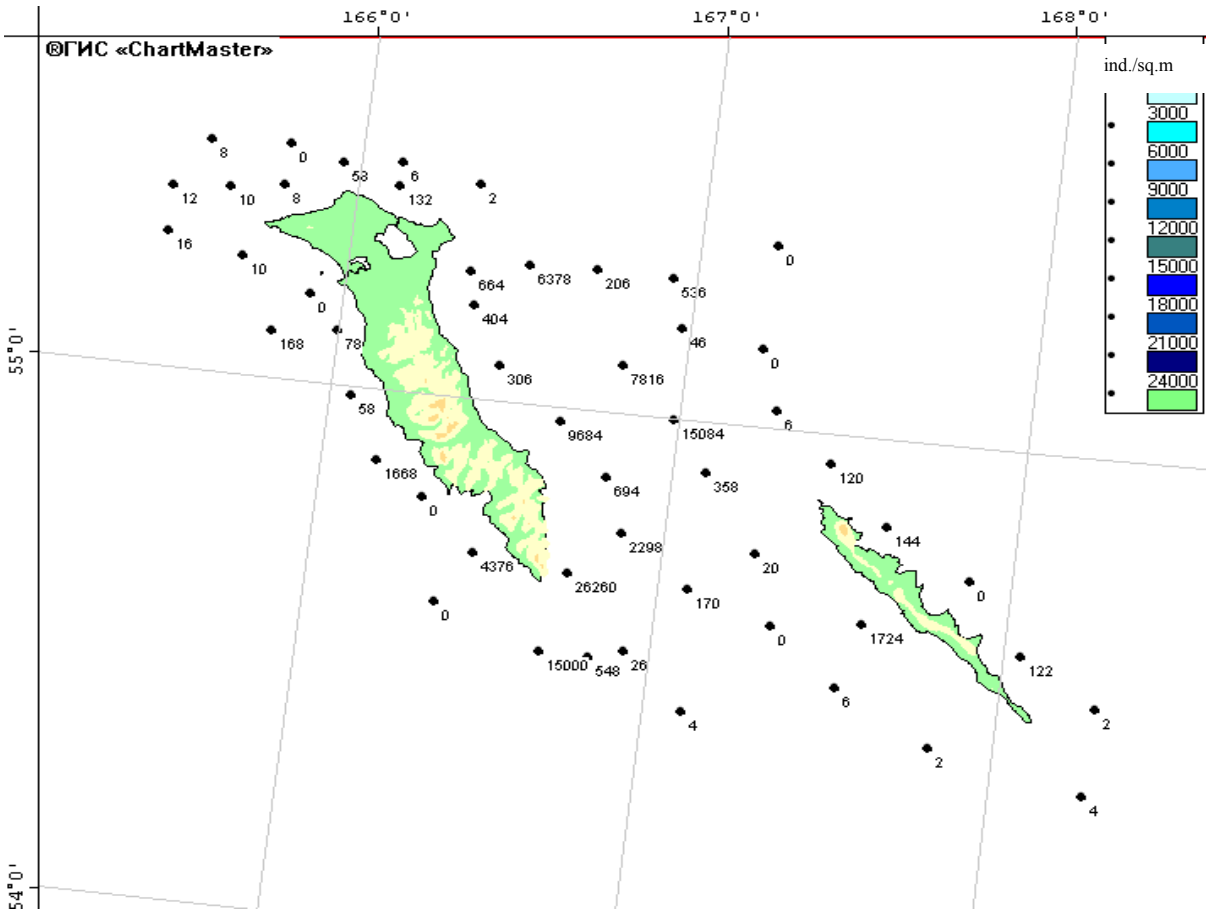

Figure 20. Catches of pollock eggs according to the survey 19-27.04.2010.

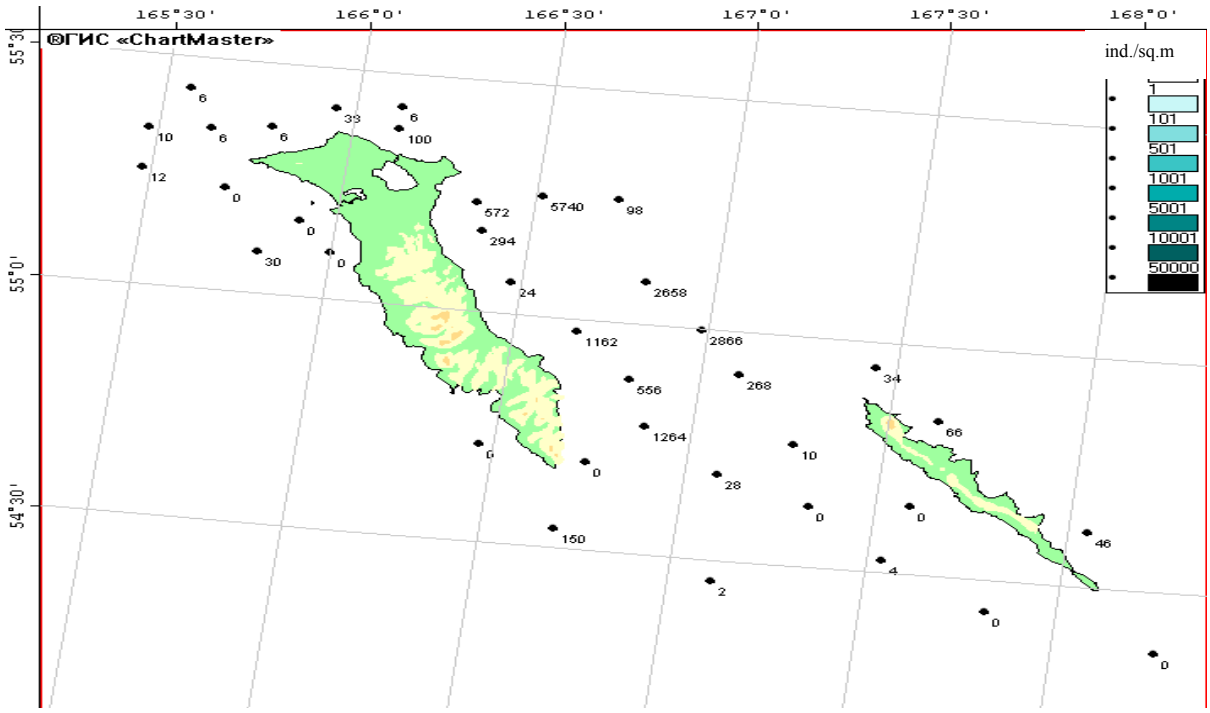

Figure 21. Catches of pollock eggs at stage I of development according to the survey 19-27.04.2010.

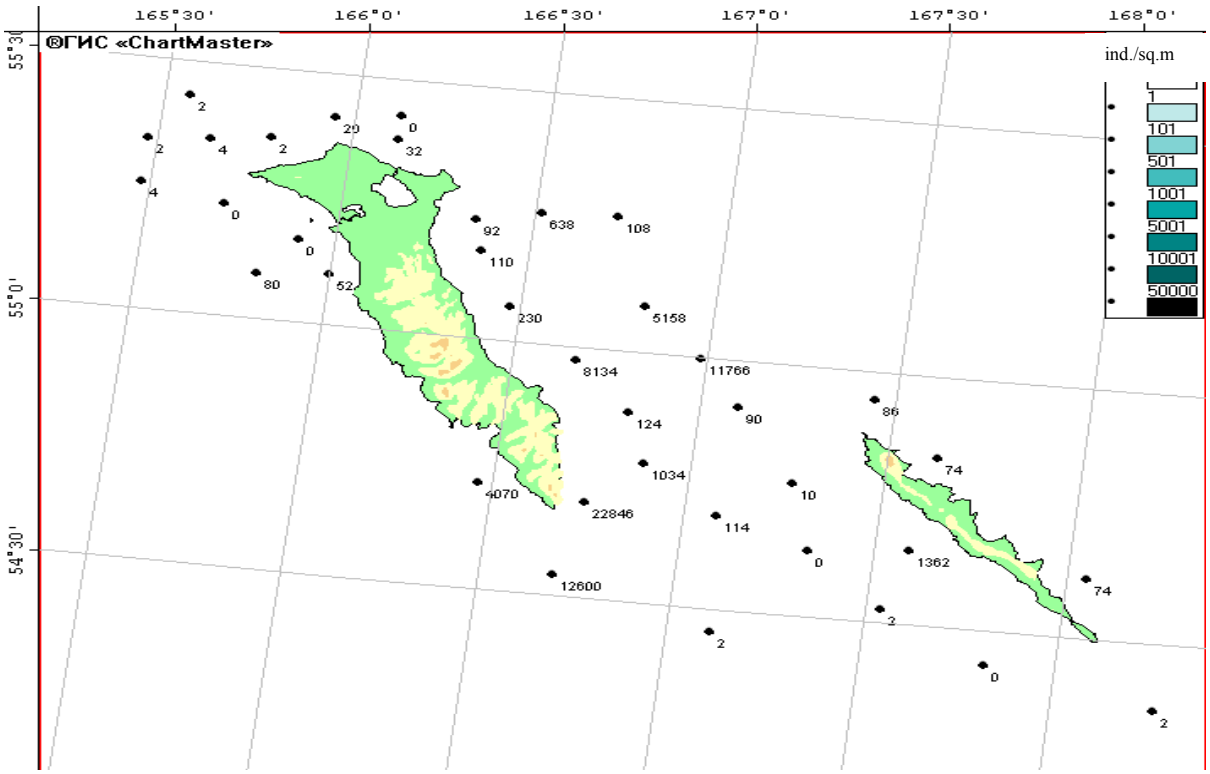

Figure 22. Catches of pollock eggs at stage II of development according to the survey 19-27.04.2010.

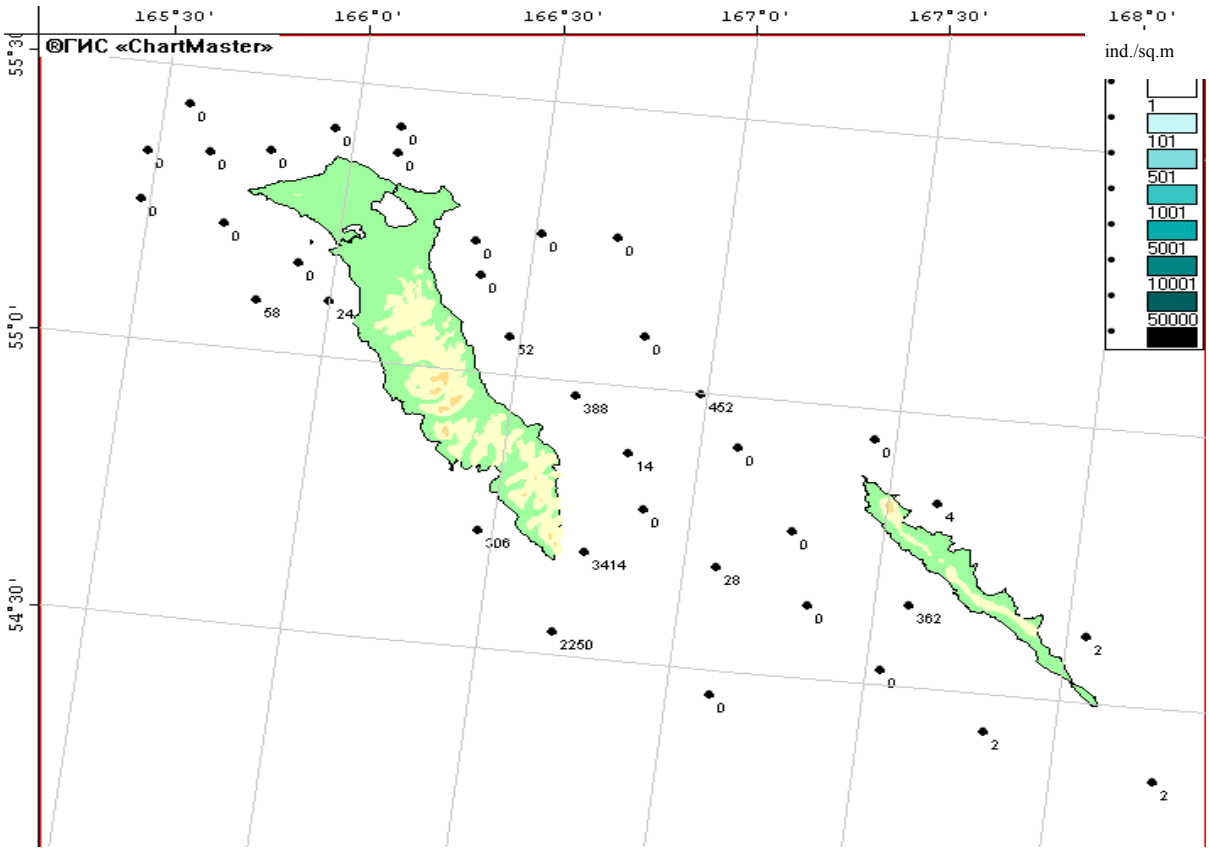

Figure 23. Catches of pollock eggs at stage III of development according to the survey 19-27.04.2010.

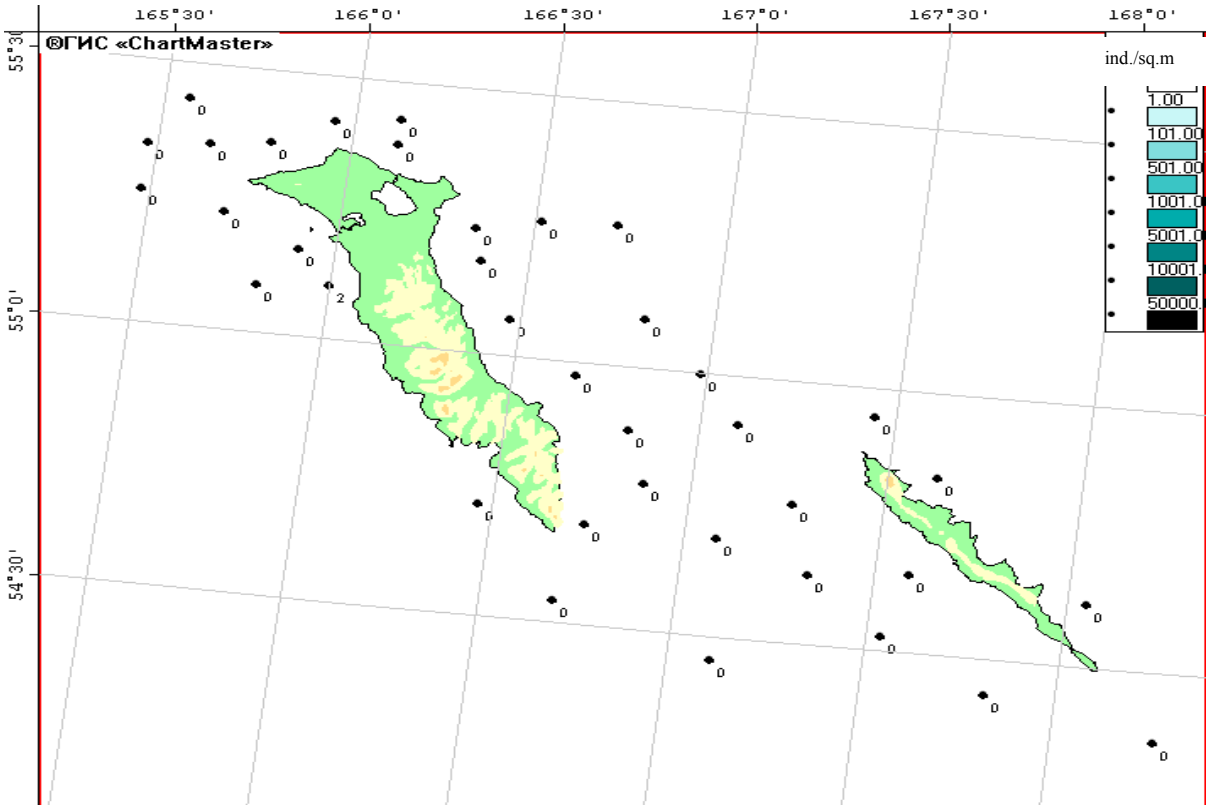

Figure 24. Catches of pollock eggs at stage IV of development according to the survey 19-27.04.2010.

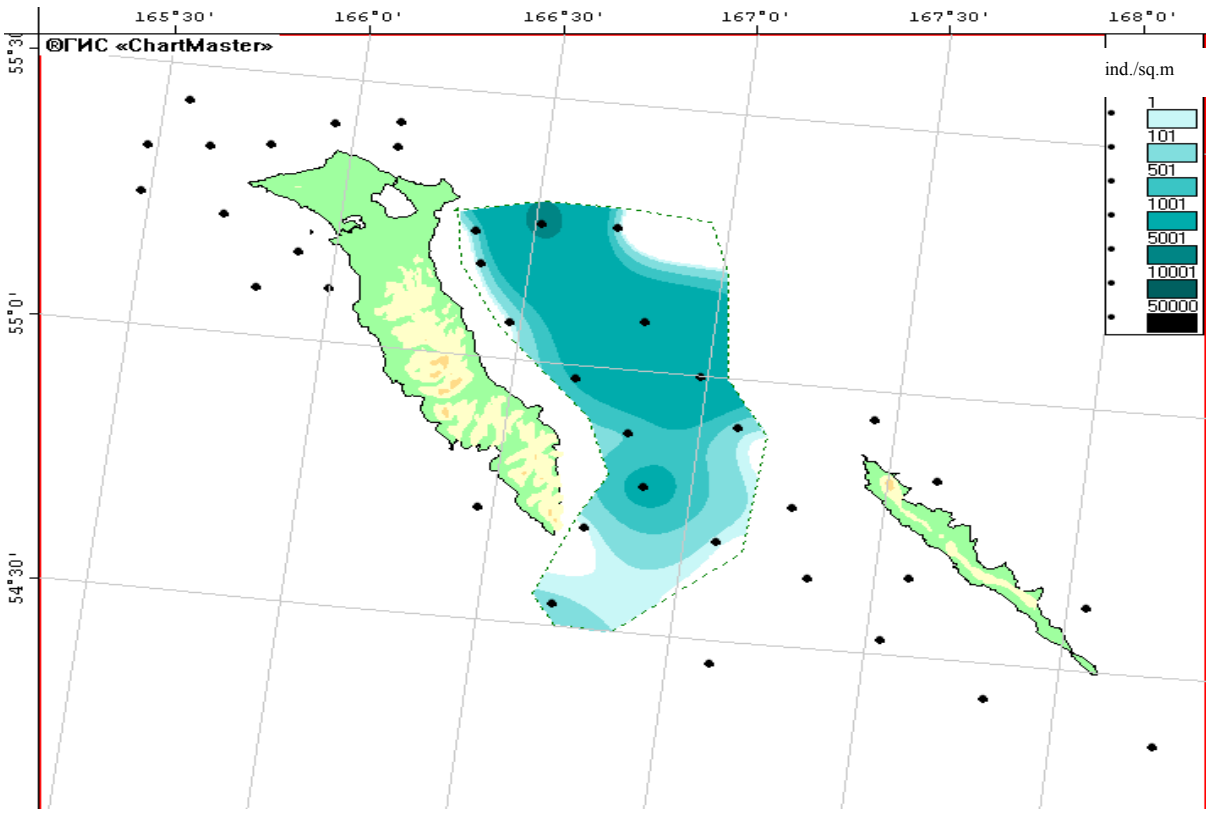

Figure 25. The scheme of distribution of the number of pollock eggs at stage I of development according to the survey 19-27.04.2010.

Between the islands at depths from 80 to 170 m revealed main of the echorecords of pollock. Thus in 2010 as in 2001 and 2009 the main reproduction of Commander pollock proceeded in a strait between the islands (Figure 26-29).

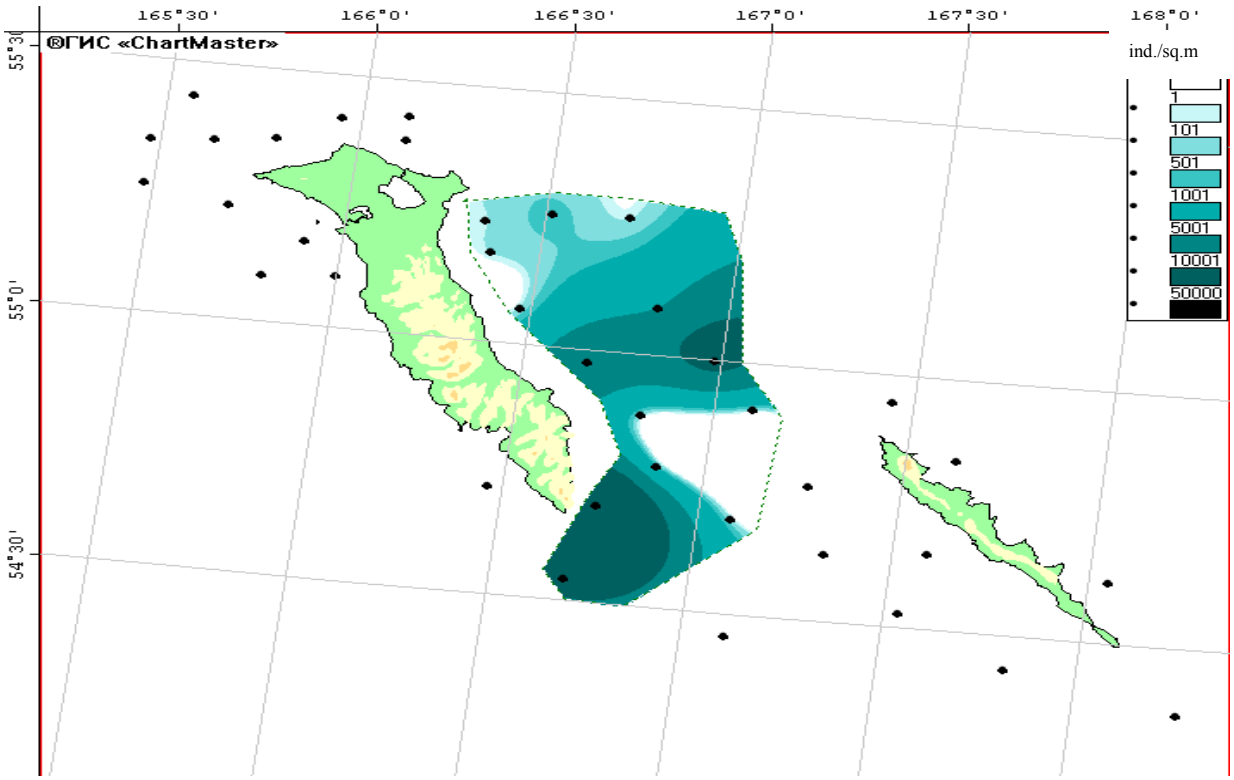

Figure 26. The scheme of distribution of the number of pollock eggs at stage II of development according to the survey 19-27.04.2010.

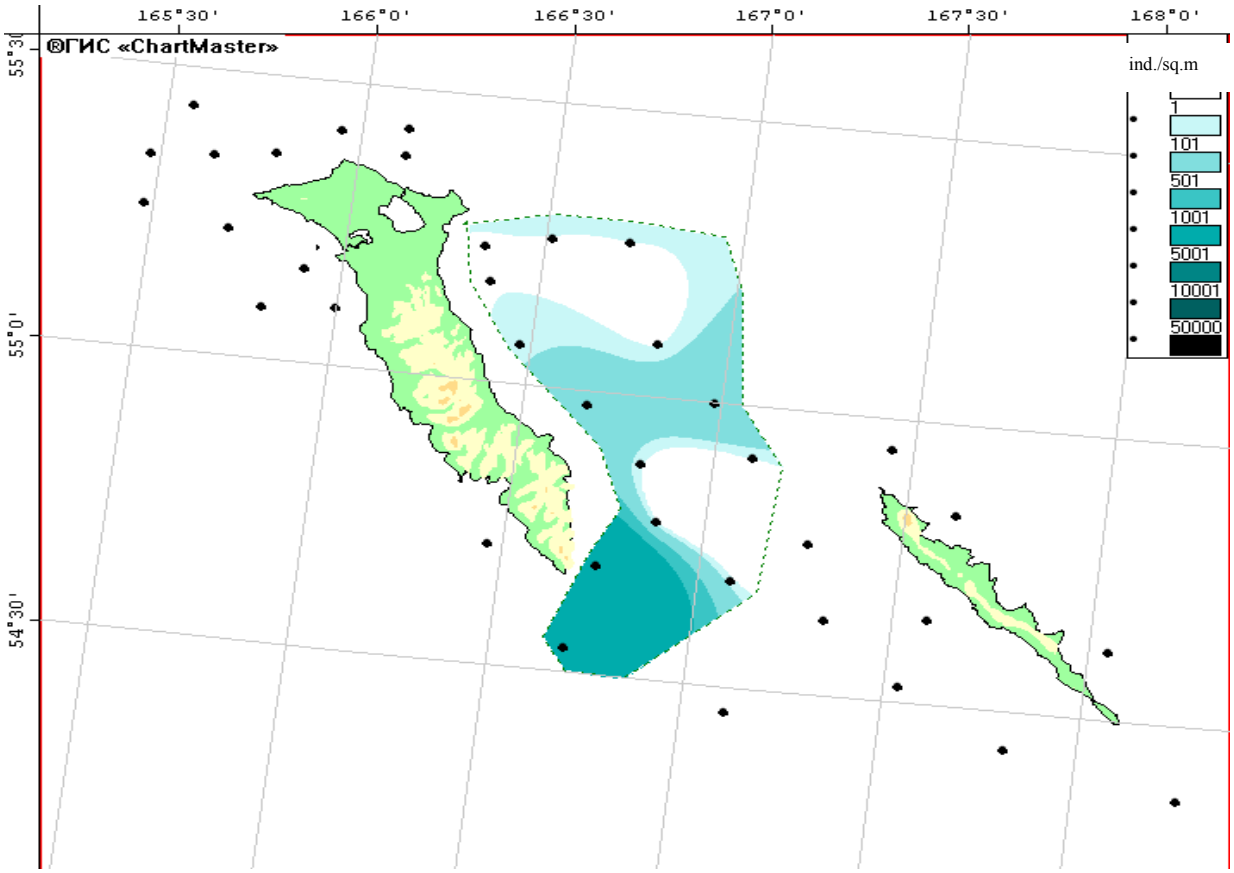

Figure 27. The scheme of distribution of the number of pollock eggs at stage III of development according to the survey 19-27.04.2010.

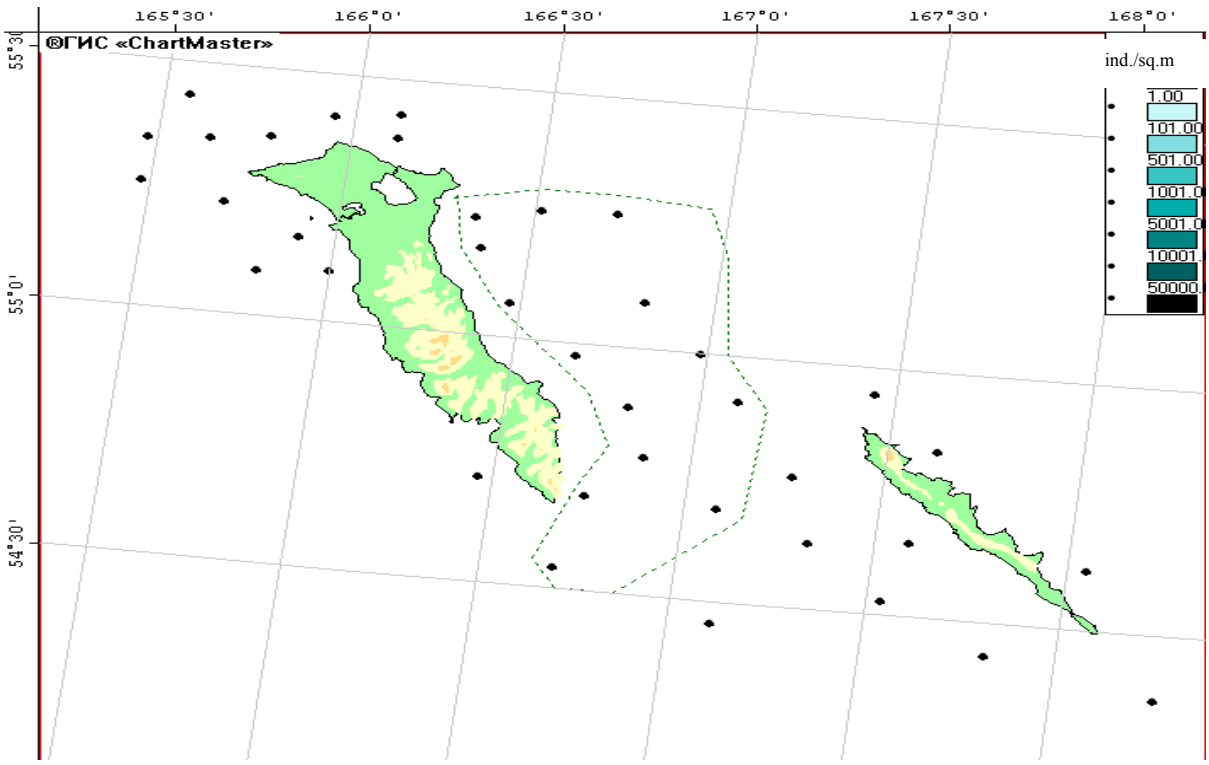

Figure 28. The scheme of distribution of the number of pollock eggs at stage IV of development according to the survey 19-27.04.2010.

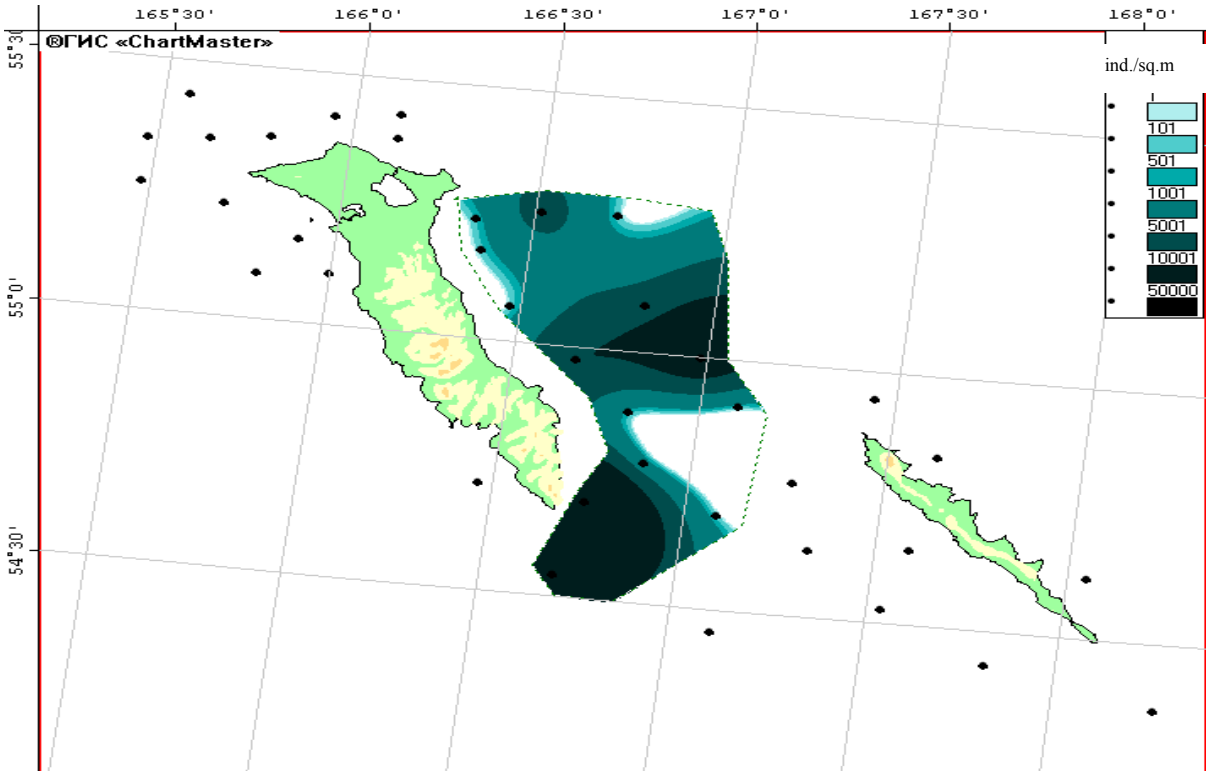

Figure 29. The general scheme of distribution of the number of pollock eggs according to the survey 19-27.04.2010.

Despite the obvious differences in meteorological conditions, the spawning season of 2009 and 2010 (2010 was colder), the results of the study of embryos' age showed us that the peak spawning in 2010 fell almost to the same period (the second decade of April). We decided so, because the eggs at stage II of development dominated in the samples (Table 2). It is assumed that the height of the spawning the number of eggs was even higher.

The average temperature in the upper 50-meter layer of water at the site between islands during the study period varied from – 0.77 to +1.29° C, the weighted average temperature taken into account to number of eggs was equal to 0.09° C. So after comparing this fact with 2009 we can suggest greater duration of embryogenesis in 2010.

Table 2. Value of pollock egg according to stages in the catches from the strait between the Bering and Medniy islands 19-27.04.2010

Stage	Quantity of accounted eggs,$\times 10^{12}$	Average catch, ind./m^2	Relative amount, %
I	3.19416829	1151	21.2
II	10.87174031	3918	72.2
III	0.99084890	357	6.5
IV	0.00000703		0.0004
Total	**14.84375276**	**5349**	**100**

The total number of the accounted eggs among the islands in 2010 was almost equal to the recorded in 2009: 14.8 against 15.2 × 10^{12} eggs and about 3 times more than in 2001 (5.1 × 10^{12} eggs) (Table 2).

By analogy with 2009 we can suggest that the size of the spawning stock of Commander pollock is about 300 thousand tons.

The contemporary abundance of pollock in Russian zone will not allow it to extend into enclave.