

Results of the Sea of Okhotsk Pollock fishery in 2016: view of KamchatNIRO specialists

This publication has been adopted from the original publication at the KamchatNIRO website of April 15, 2016.

Results of the Sea of Okhotsk pollock fishery have confirmed scientists' opinion that Sea of Okhotsk Pollock stock is in good condition.

During January 1 till March 31 2016, the most extensive fishery in Russia took place in the northern part of the Sea of Okhotsk within Northern Sea of Okhotsk subzone (61.05.1), West-Kamchatka subzone (61.05.2) and Kamchatka-Kuril subzone (61.05.4). This year fishing season ended 9 days earlier than usual.

Specialists from the Far East fishery research institutes, in particular, from KamchatNIRO, traditionally participated in fishery activities monitoring. From the beginning of fishing season scientific observers worked on commercial trawlers harvesting pollock. By joint efforts of all Far East institutes, comprehensive data and information were collected in all areas of Pollock distribution. Great massive of fishery and bio-statistical information is to be processed and carefully analyzed, however, some results of the completed fishing season can be summarized now.

Meteorological conditions in the Northwest Pacific and, in particular, in the Sea of Okhotsk are normally influenced during winter by interaction of two seasonal atmospheric phenomena – Aleutian Depression (AD) and Asian Anticyclone. An eastward shift of AD was observed in the Northwest Pacific during December 2015 – March 2016 (Fig. 1) same as during the preceding winter season. An important feature of meteorological conditions was significantly higher intensity of this seasonal cyclone. Surface pressure in its center was 990–992 GPa or 8-10 GPa lower than a year before and 11-12 GPa lower than multi-year data. In turn, anomalous development of the depression interacting with the Asian Anticyclone, generally developed within its normal limits, resulted in a significant contrast of pressures in its back zone over Kamchatka and the Sea of Okhotsk which generated a large zone of horizontal pressure gradients. During winter, an intensive inflow of cold air to the sea basin from northern and northeastern mainland areas was observed along isobars and contributed to intensive water cooling in the surface layer.

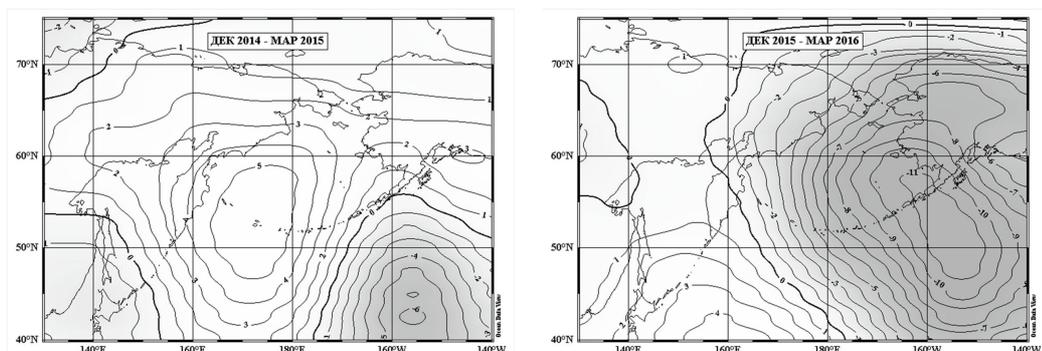


Fig.1 - Field of anomalous surface pressure in 2015 and 2016 averaged over December – March

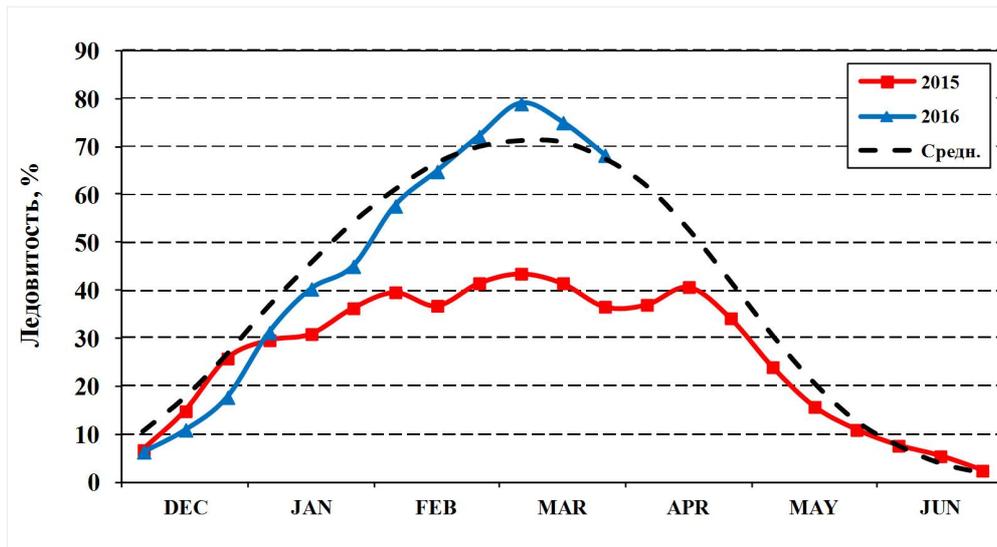


Fig. 2 - Overall ice cover variation in the whole Sea of Okhotsk during winter seasons of 2014–2015 and 2015–2016 and average variation during 1972–2014

Ice conditions. Seasonal temporal variation of such hydrological parameter as ice cover rather well reflects particular features of synoptic and meteorological processes and its mean values over a certain period of time can be used as a criterion of winter severity. According to our data, while an absolute ice cover minimum for the whole Sea of Okhotsk over the entire row of observations beginning from 1972 occurred in the winter season of 2014-2015, ice cover onset processes in the winter of 2015-2016 were similar to the multi-year scenario (Fig. 2). However, in the eastern part of the sea this parameter was at a noticeably higher level in comparison with the multi-year seasonal pattern of ice cover dynamics, particularly in late February – early March when the relative square area of ice cover exceeded the typical value by 14-15% and was similar to that of icy winters of early 2000s (2000 and 2002). Figure 3 shows data on ice conditions in the Sea of Okhotsk as of the middle of March 2016.

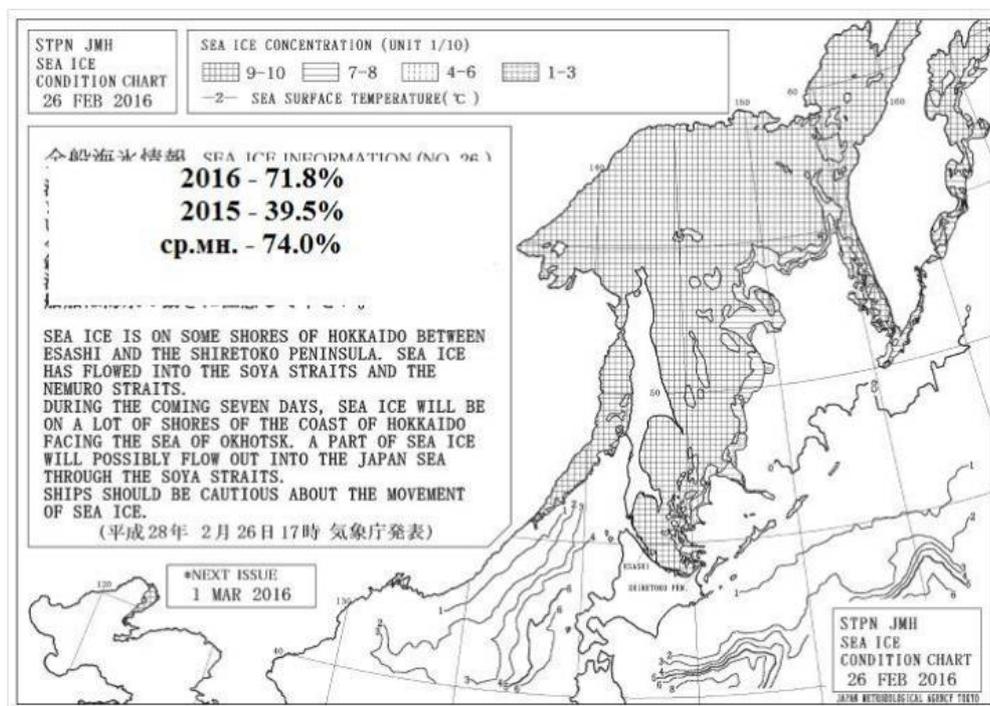


Fig. 3 - Ice conditions in the Sea of Okhotsk and comparative overview of ice cover square area as of late February

Therefore, the meteorological conditions existing in the Northwest Pacific including the Sea of Okhotsk virtually during the entire winter season of 2015-2016 were largely contributing to intensive water cooling in the surface layer. The ice cover square area in the Sea of Okhotsk was remaining within its normal limits during the greater portion of the winter and noticeably exceeded these limits only at the end of the reporting period. In late February – early March, ice cover data for the eastern part of the sea were higher than their multi-year mean by 14-15% which can certainly be considered as one of adverse factors affecting this year’s fishing conditions. The winter season of 2015-2016 in North Sea of Okhotsk can be classified as “cold” in sea surface temperature terms.

Brief characteristic of pollock fisheries in the Sea of Okhotsk. According to the current understanding, the North Sea of Okhotsk is populated by a single pollock grouping within North Sea of Okhotsk (61.05.1), West Kamchatka (61.05.2), Kamchatka–Kuril (61.05.4) subzones and in the high seas (61.52) which has a complicated intra-population structure.

Historical record catch of pollock fishery in the Sea of Okhotsk fishery was 1,925 thsd tons in 1997. Due to reducing stocks, TAC and catch had dropped more than 5 times by 2004. Catch began rising after 2005 as stocks increased, and 1.01 million tons was recommended for harvesting in 2010. Due to reducing pollock stocks in the Sea of Okhotsk in 2011-2014, cumulative TAC and, accordingly, catch was decreasing. TAC has been again growing since 2015 due to high productive generation of 2011. At the moment, Sea of Okhotsk pollock stock is at the upper average level with a growing trend for next 1-2 years.

In 2016 TAC in 61.05.1 subzone has been set at 348.0 thsd tons, 61.05.2 – 348.0 thsd tons, 61.05.4 – 270.7 thsd tons, which in total exceeded level of 2015 by 62.7 thsd tons. Same as in 2010-2015, quotas in subzones 61.05.2 and 61.05.4 were based in 2016 on the total TAC of 618.7 thsd tons allocated for both subzones collectively.

According to data from the Fishery Monitoring System, 172 vessels of various types (164 in 2015) operated by 76 Far East-based companies participated in the pollock target trawl fishery during the fishing season of 2016 (Table 1). Primorsky region’s flotilla was traditionally the largest one and followed by fleet from Kamchatka and Sakhalin. Total catch by far East regions reflects this sequence of fleet numbers.

Table 1 - Performance results of Far Eastern regions in the pollock fishery in the Sea of Okhotsk in January – March 2016

Region	Target mid-water trawl fishery			Total catch, tons	
	Number of companies	Number of vessels	Number of ship-days	Mid-water trawl	All fishing gear types
Primorsky region	22	69	3155	274090	274145
Sakhalin region	16	35	1408	145065	147159
Kamchatka region	22	39	2067	233758	265826
Magadan region	2	3	199	13583	13583
Khabarovsk region	14	26	1067	100309	102152
Total	76	172	7896	766805	802865

Total pollock catch by mid-water trawls in a commercial fishery mode in the Russian EEZ (target fishery) amounted to approx. 766.8 thsd tons by the end of March 2016 which is larger than a year before (717.9 thsd tons) (Table 2). 36.1 thsd tons of pollock were taken by other fisheries (38.4 thsd tons in 2015), mostly on the Danish seine fishery off West Kamchatka. Total pollock catch in the season A amounted to 802.7 thsd tons; and TAC was taken by 83.1%. For reference, absolute catch in the same period of last year was lower (756.3 thsd tons), however, in TAC share use, it was higher (83.7%) due to smaller TAC in last year.

Table 2 - TAC and catches by fishing areas in the Sea of Okhotsk in January – March 2016

Subzone	TAC, thsd tons	Number of ship-days in trawl fishery	Total catch, tons		% of TAC taken by all fishing gear
			Pelagic trawls	All fishing gear types	
61.05.1	348,0	2903	289828	291671	83.8
61.05.2	348,1	1682	130345	154699	82.6
61.05.4	270,7	3360	346633	356495	
Total	966.7	7945	766806	802865	83.1

Total catch off West Kamchatka was 511.1 thsd tons in January – March which is roughly equal to the last year's catch (518.4 thsd tons). In contrast with last three years, the bulk of this year's pollock catch off West Kamchatka was harvested in Kamchatka-Kuril subzone (69.7%) as the case was in 2009-2012.

One of reasons why catch in the season A in 2016 surpassed catch in the similar period of 2015 by 48.9 thsd tons is, first of all, a larger number of catchers and, accordingly, larger number of fishing operations (7945 and 7043 ship-days respectively) despite the fact that average catch per unit effort for trawlers was lower than in the last year (96.5 and 101.9 tons/ship-day respectively).

The bulk of catch by large-tonnage vessels in the target trawl pollock trawl fishery in the Sea of Okhotsk is produced by vessels of BATM type (BMRT of "Pulkovsky Meridian" type) and by mid-tonnage vessels – STR-503 ("Alpinist" type, project 503) (Table 3). The bulk of catches in Danish seine fishery is produced by vessels of RS-300 type (RS-300, project 388M) and STR-420 ("Nadezhny" type, project 420) (Table 3).

Average catches per ship-day of BATM vessels in the period under consideration were continuously growing and reached a maximum in 2010, after which they were slightly declining and 2013-2015 going up again (Table 3). In 2016, after a record high in 2015, CPUE declined back to the level of 2013. Average catch per haul for this trawler type was growing from the beginning to end of the period, reached its maximum in 2015 and declined in 2016. An upward trend for catch per unit effort during 2006-2014 was observed for STR-503 vessels as well; then it abruptly dropped in 2015 by 1.8 times from a record high in 2014 and in 2016 slightly grew again – to the level of 2013.

Such varying picture of the year-to-year CPUE dynamic for vessels of different types shows that, in addition to stock condition, fishing efficiency in particular areas and in specific fishing periods is significantly, and in some cases decisively, influenced by numerous other factors, e.g. oceanologic and synoptic (number and force of storms, ice coverage growth rate and square area, drifting ice fields), because they directly affect safety of navigation and fishing time losses. Other important

factors include experience of navigation officers, type of product generated by vessel, capacity of its plant, etc. Be that as it may, overall analysis shows that fishing conditions in the past fishing run season were rather favorable.

Table 3 - Year-to-year dynamic of the number of efforts and catches per unit effort by vessels and fishing gear of main types in the target pollock trawl fishery (January–April) in North Sea of Okhotsk and Danish seine fishery (January–March) off West Kamchatka

Year	Catch, tons	Number of ship-days	Average catch per ship-day, t	Average catch per fishing operation, t
Trawl fishery				
BATM (mid-water trawl 154/1120 m project 342 EKB)				
2013	71250	768	92.8	37.7
2014	73995	670	110.4	41.3
2015	108994	870	125.3	49.2
2016	118050	905	130.4	47.0
STR-503 (mid-water trawl 100/460 m project 222 KEB KRP)				
2013	4598	108	42.6	30.9
2014	4034	63	64.0	40.3
2015	5606	158	35.5	23.0
2016	6575	136	48.3	27.4
Danish seine fishery				
RS-300 project 388M (Danish seine 40.3/39.3 m)				
2013	5600	214	26.2	13.2
2014	2417	74	32.7	12.0
2015	1062	39	27.2	14.8
2016	1253	58	21.6	11.9
STR-420 (Danish seine 40.3/39.3 m)				
2013	2181	66	33.0	11.3
2014	6253	176	35.5	13.3
2015	1955	47	41.6	15.0
2016	1494	26	57.5	15.7

Daily pollock catch in the North of the Sea of Okhotsk during the 2016 fishing season was gradually rising from 1,426 thsd tons in early January to 10,444 thsd tons in late January (see Fig. 4) as the number of catchers and of their efforts was increasing. After that, daily catch varied in the range of 7,937 to 13,102 thsd tons till the last 5-day period of March averaging at 10,039 thsd tons. Maximum catch was registered on the last day of the fishing run period and amounted to 16,899 thsd tons. Such picture is quite typical of the pollock fishery in the Sea of Okhotsk and is explained by the fact that, firstly, in March pollock forms its densest aggregations of spawners migrating to future spawning areas and, secondly, fishing is most profitable in this time due to high roe output. That's why fishing companies try to use their quotas exactly in May. Mean daily catch for the whole fishing run period was 8,822 thsd tons which is higher than a year before (8,160 thsd tons).

Fleet allocation in fishing season 2016 was different from the 2015 season as well as from multi-years average. Traditionally fishery started in area of the Lebed Bank and in area of the Ozernovskiy seabed drop-off. As for West Kamchatka subzone, fishing in January was rather successful in some years in area of the Lebed Trough and in February–March – north of 58°00' N and in the mouth of the Shelikhov Bay. Fishing conditions in North Sea of Okhotsk subzone in January–February are normally worse than in other areas. In some years, fishing was rather

successful on the Lebed Rise, Pritauisky area and Kashevarov Bank but the focus was traditionally placed on March–April.

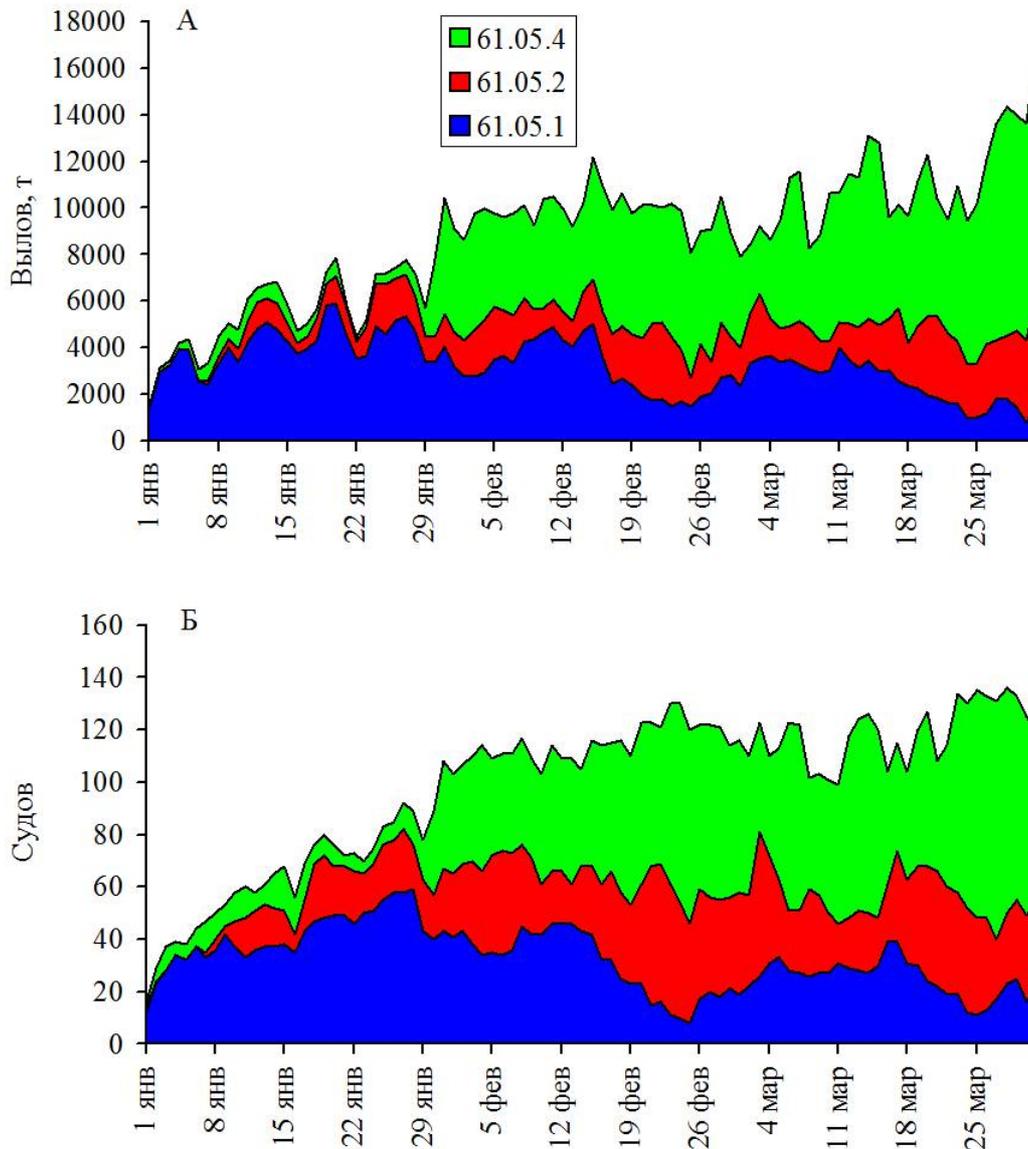


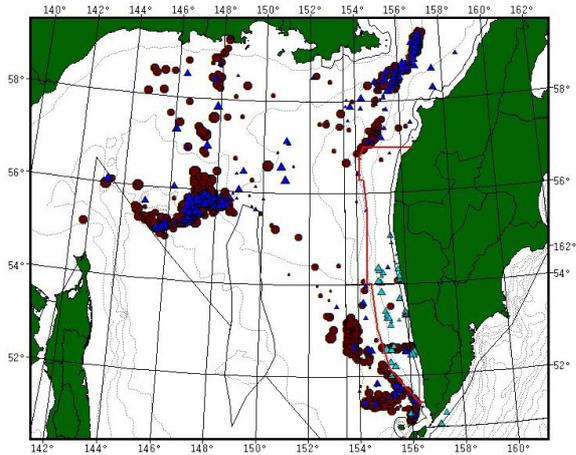
Fig. 4 - Dynamics of daily catch (A) and number of vessels (B) in the Sea of Okhotsk fishery in January–March 2016

Same as in 2015, pollock fisheries were concentrated in January 2016 in North Sea of Okhotsk subzone. Total monthly catch in this area was about 125.2 thsd tons which is more than the last year's record high of 114.9 thsd tons. For reference, as little as 7.5 thsd tons of pollock was harvested in subzone 61.05.1 in January 2014. On some days, the number of vessels in this area reached 59 and maximum daily catch amounted to 4.0 thsd tons.

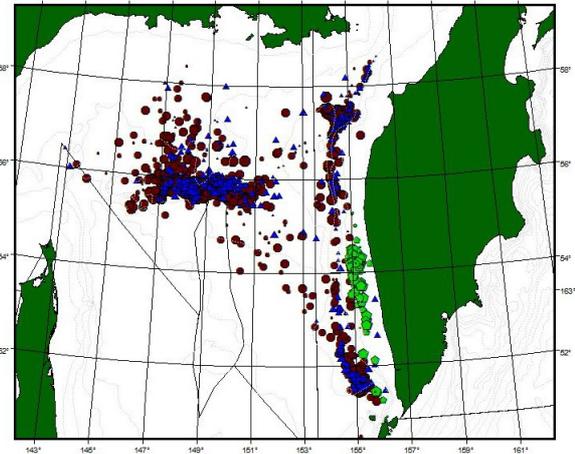
As ice conditions critically aggravated in February, the focus of fishing activities gradually shifted to Kamchatka-Kuril subzone while in the last year, when ice conditions was considerably less severe than in this year, it shifted to West Kamchatka subzone. Up to 76 vessels of different tonnage were operating during that month in subzone 61.05.4, with maximum and mean daily catch being

6.0 and 4.8 thsd tons respectively (Fig. 4). Total catch in this subzone in February was some 140.0 thsd tons. The North Sea of Okhotsk and West Kamchatka subzones ranked second and third with total catches of 89.2 and 44.1 thsd tons respectively.

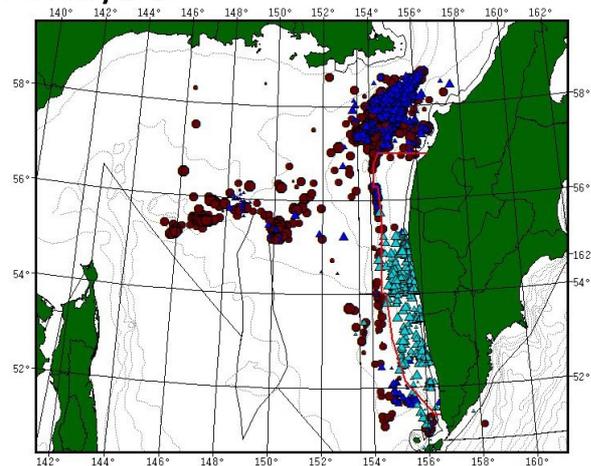
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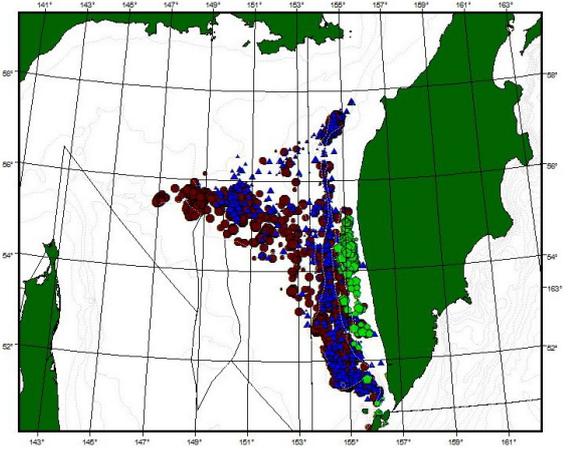
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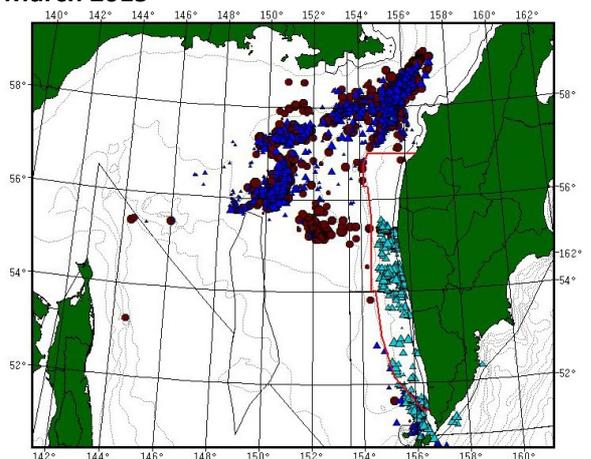
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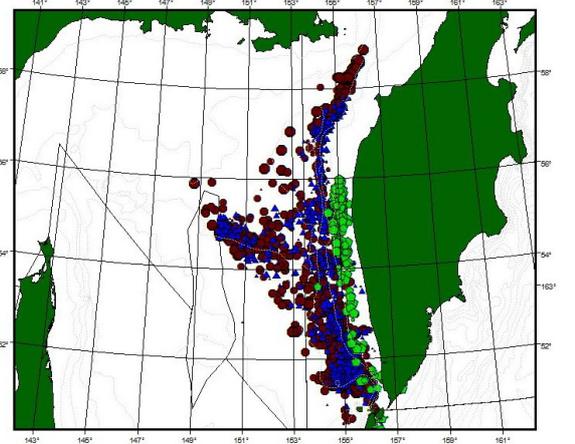


Fig. 5 – Fishing efforts by trawl and Danish seiner fishery during January-March 2015-2016

When ice conditions improved in March 2016, pollock fishing areas somewhat expanded compared with February but Kamchatka-Kuril subzone remained the main fishing area. Total

monthly catch in this area was approx. 186.6 thsd tons of pollock, with a maximum number of vessels at any one time being 91 and maximum and mean daily catch being 10.4 and 6.2 thsd tons. Catch intensity was much lower in subzones 61.05.1 and 61.05.2 where 77.2 and 72.0 thsd tons was caught respectively.

By data of observers from KamchatNIRO collected directly in fishing areas (BATM «Irtushsk», BATM «Mikhail Staritsyn») in the Northern Sea of Okhotsk subzone in January 2016 at the mid-water trawl pollock fishery catches varied from 10,0 to 15,0 t/hour with an average at 13,3 tons per hour of trawling. Fish size was in the range of 20 to 59 cm, with the size group of 42-45 cm dominating (53.2%) and mean size being 42.4 cm (Fig. 6). An average percentage of undersized fish was 5.1% and its average weight was 0.588 kg. Pre-spawning individuals were absolutely dominating among spawners.

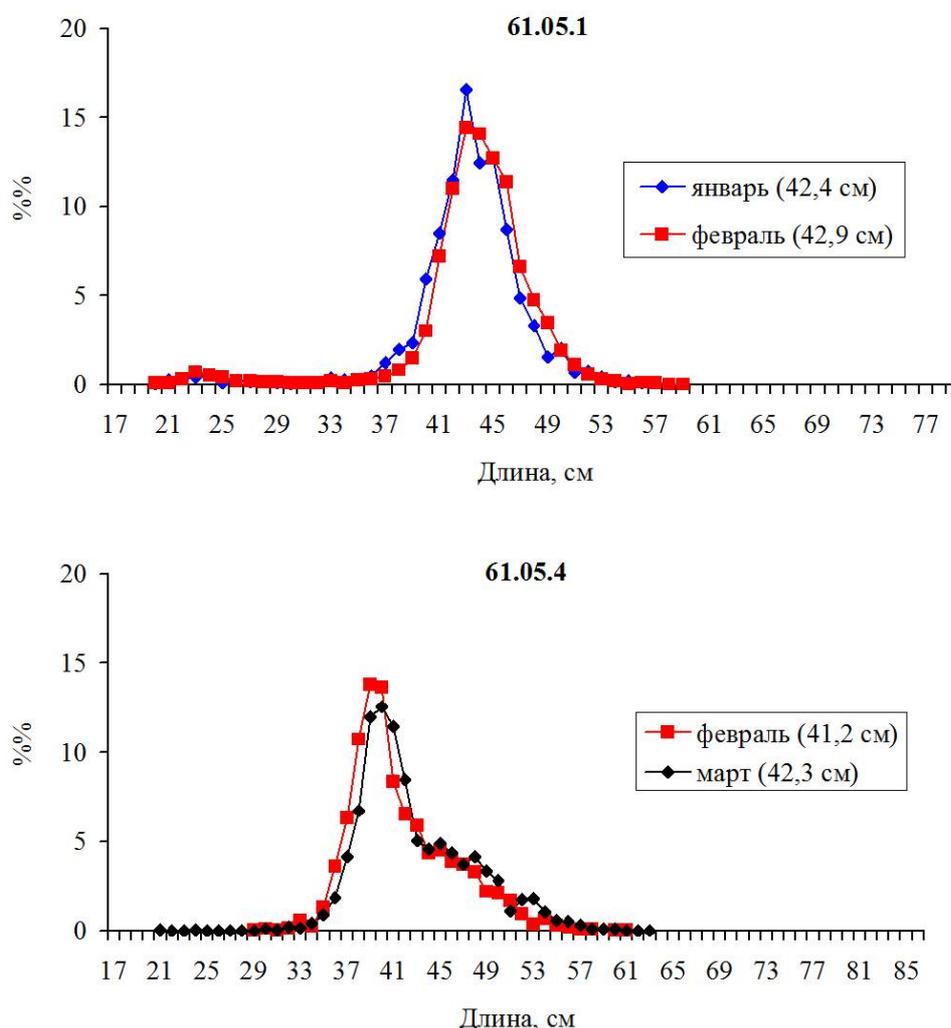


Figure 1.1.1.9. Pollock size distribution in commercial catches in the Sea of Okhotsk in January – March 2016

In February, pollock catches per effort in 61.05.1 subzone increased varying between 11,9 and 43,3 t/hour of trawling with 27,9 t/h in average. Fish size was completely the same as in previous month. Share of fish less then 37 cm in lenth was 5,0%, average mass – 0,585 kg. In comparison to January, in February spawning and post-spawning individuals were registered in few numbers.

In Kamchatka-Kuril subzone in February catches varied from 4,3 to 23,2 t/hour with average at 14,3 t/hour. Fish size was from 29 to 61 cm, with the size group of 38-40 cm dominating (38.1%) and mean size being 41.2 cm (Fig. 6). In comparison with the North Sea of Okhotsk subzone, catches in this area contained more individuals 35-38 cm long belonging to the strong year-class of 2011. The percentage of undersized fish exceeded 20% in some hauls and averaged at 6.1%, with mean weight being 0.514 kg. Same as in North Sea of Okhotsk subzone, pre-spawning individuals were dominating among spawners in February, although occasional

Pollock size distribution in commercial catches did not undergo any considerable change in March – from 7,5 up to 28,0 tons/hour with 14,0 t/h at average. The percentage of fish under 37 cm averaged at 7.4% and its mean weight was 0.519 kg. In comparison with February, the relative number of pre-spawning individuals reduced in March and that of spawning and post-spawning individuals increased.

According to data obtained by an observer from KamchatNIRO, pollock catches on Danish seine fishery reached 27 tons per operation, but in average was about 5,4 tons per effort. Size distribution of pollock essentially differed from trawl catches. Fish length varied from 34 to 74 cm, with individuals 44-46 cm long dominating and mean size being 47.1 cm. The percentage of individuals under 37 cm was 0.3% and their mean weight was 0.752 kg. The bulk of spawners were at various stages of pre-spawning maturity, about 5.5% of males and 10.8% of females were in spawning condition and 0.1% of females were in post-spawning condition.

Summarizing the above, we can state that season A of the 2016 Sea of Okhotsk Pollock fishery in general confirmed scientists' opinion that Sea of Okhotsk Pollock stock is in good condition. It is clearly supported with fishery results. Even in spite of unfavorable ice situation in January-March 2016, catches are by 46 th. tons more than in the same period of 2015.

Original publication in Russian is available at the KamchatNIRO website:

http://www.kamniro.ru/obzory_promysla/promysel/itogi_ohotomorskoj_mintaevoy_putiny_2016_goda_vzglyad_specialistov_kamchatniro