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Russian Bibliography Publications Linked to the NPAFC Science Plan in 2018

by

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Russian Bibliography Publications Linked to the Current NPAFC Science Plan in 2018

ABSTRACT

The current bibliography lists original papers published in 2018 by Russian scientists and their collaborators relevant to the 2016–2020 NPAFC Science Plan as well as other salmon studies. The bibliography lists 61 papers, corresponding mainly to the 3 key research components of the NPAFC Science Plan: 1) Status of Pacific Salmon and Steelhead Trout; 2) Pacific Salmon and Steelhead Trout in a Changing North Pacific Ocean; 3) New Technologies. Each publication is listed under one research component, although some of them are relevant to several components. The references are given with abstracts if papers included abstracts in English. Otherwise, they are listed without abstracts.

BIBLIOGRAPHY

Theme 1: Status of Pacific Salmon and Steelhead Trout

Aitukaev K.I., Karpenko V.I., Zikunova O.V. 2018. Growth rate features of chinook salmon in the Kamchatka river. Newsletter of Kamchatka State Technical Univ. 44: 70-75. (In Russian). The article describes length-age composition and growth rate characteristics of Chinook salmon in the Kamchatka river. Similar growth rate of fish was identified with observed and calculated data, except 1.1+ age group. Despite this lack of results, these data can be use for calculating stock and catch.

Akinicheva E.G., Volobuev V.V., Yamborko A.V. 2018. Marked salmon production by the hatcheries of Russia in 2017. NPAFC Doc. 1768: 5. As in the preceding years, the main aim of the hatcheries salmon marking in Russia is to evaluate numbers of hatchery-reared salmon returns. In recent years the basic part of juvenile salmon has been reared and marked at Sakhalin. Two methods were used for hatcheries marking: thermal and “dry”. In 2017, the percentage of marked salmon juveniles in Sakhalin region was 80.3% of the total Russian release of marked juveniles. This is caused by the location of hatcheries, a large number of which (38) are located at Sakhalin and only 19 hatcheries in other regions of the Russian Far East.

Akinicheva E.G., Volobuev V.V., Yamborko A.V., Myakishev M. 2018. Proposed otolith marks for brood year 2018 salmon in Russia. NPAFC Doc. 1769: 4. Otolith marking of salmon of 2018 brood year will be conducted in five regions of the Far East: Kamchatka, Magadan, Sakhalin, Khabarovsk and Kuril regions. Marking will be carried out using two methods: thermal and “dry”. Their application will be determined by the possibilities and specificity of water supply of incubated embryos at hatcheries of the Far East. The dominating method of marking will be a “dry” one–it will be used on the 69% of salmon hatcheries. Salmon will be marked at 28 hatcheries. Totally 34 otolith marks will be used.

Antonov A.L., Zolotukhin S.F., and Skopets M.B. 2018. Distribution of masu salmon *Oncorhynchus masou* (Salmonidae) in Amur River Basin. J. Voprosy Ichthyology 58(1): 25–30. (In Russian).The presented data on the distribution of the masu salmon *Oncorhynchus masou* in the Amur River basin are collected in 1976–2015. In the analyzed region the species' spawning range includes the lower part of the Amur River basin from the rivers flowing into the Amur estuary to the basins of the Anyui and Amgun Rivers in their middle parts. The information on the catch of a masu salmon specimen in the Khor River Basin (approximately 1300 km from the Amur River mouth) in 2015 is presented. It is assumed that the total Amur population does not exceed several thousand of adult anadromous fish.

Bugaev A.V., Shpigalskaya N.Yu., Zikunova O.V., Feldman M.G., Zavarina L.O., Dubynin V.A., Artukhina N.B., Shubkin S.V., Yerokhin V.G., Koval M.V., Kovalenko M.N. Birukov A.M., Fadeev E.S., Nagornov A.A. 2018. Analytic review of the results of salmon fishery season in 2018 (Kamchatka territory). Bulletin of Pacific salmon studies in the Far East 13: 14–40. (In Russian). Analysis of the results of salmon fishery season 2018.

Bugaev V.F. 2018. On effect of the size of sockeye salmon *Oncorhynchus nerka* smolts on time of the scale sclerite forming during implementing of their compensatory growth in the year or migration to the sea from Lake Azabachye (Kamchatka river Basin). **Izv. TINRO 193: 88–98. (In Russian with English abstract).** The Kamchatka River basin is the reproduction area for the secondary large Asian stock of sockeye salmon, one of the most valuable species of pacific salmons. Several major local stocks and groups of minor stocks occupy the basin, the main of them are: i) A—the aboriginal stock in Lake Azabachye (in the lower Kamchatka basin) which juveniles stay two winters in the lake and migrate to sea in the age 2+; ii) E—the transit group of local stocks spawning in the middle and lower tributaries of the Kamchatka which juveniles enter to Lake Azabachye for feeding and wintering and migrate to the sea after the wintering in the age 1+. The latter underyearlings get an additional mark on the scale (less than typical annuli) entering the Lake because of the feeding conditions change. That's why almost all (90–95 %) juveniles have two zones of dense sclerites (ZDS) when leave Lake Azabachye, no matter of their 2+ or 1+ age. By the measurements in 1979–1987 of the smolts with two ZDS (A + E) in the year of their migration from Lake Azabachye to the sea, each sclerite on scale had formed in 6.61 days, on average, while the smolts staying in the lake for freshwater feeding (with one ZDS) formed each sclerite in 12.00 days, on average. Correspondingly, the migrants had wider distance between the sclerites (4–5 mm), as compared with those of non-migrants (2.0–2.5 mm) (with 150 times magnification). The aboriginal migrants dem-onstrate the effect of real compensatory growth in the year of emigration that is reflected in the scale structure as wider intersclerite distances. Negative dependence between the size of smolts and rate of their sclerites forming is observed on the data of 1987–2016 for the aboriginal stock A: the bigger the smolts at age 2+, the lower the rate, the longer the time of new sclerite forming, and the narrower the distance between sclerites, and vice versa. This dependence is interpreted as additional environment-dependent adjustment of the growth rate for the smolts with compensatory growth for their better adaptation and survival.

Bugaev V.F. 2018. Relationship between size-weight parameters of sockeye salmon *Oncorhynchus nerka* smolts emigrated from Lake Azabachye (Kamchatka River basin) in 1979-2013 and abundance of mature fish in the sea in 1982–2016. Izv. TINRO 195: 128-139. (In Russian with English abstract). Two groups of juvenile sockeye salmon are feeding in Lake Azabachye. They belong to the 2nd order stock of the lake (stock A) and to other 2nd order stocks of middle and down stream tributaries of the Kamchatka River which underyearlings migrate into the lake for feeding and wintering (group E). The main part of the stock A leaves the lake to the sea at the age 2+ (mainly 2.3) and the youngsters of the group E migrate to the sea at the age 1+ (mainly 1.3). The body length and weight parameters of the stock A smolts at the age 2+ and the group E smolts at the age 1+ could be similar or dissimilar in particular years. The maximal difference between the smolts of these stocks is observed in the years with higher body length and weight for the stock A. Mean for 1979–2016 length and weight of smolts at abovementioned ages are evaluated as 98.42/87.46 mm and 10.40/7.38 g for the A/E stocks. For the stock A, statistically significant positive correlation is noted between size-weight parameters of smolts in the years of emigration and their abundance in the years of mass return. However, the regression has a shift between the periods of emigration/return of 1979–2000/1982–2003 and 2003–2013/2006–2016. The correlation is higher for the first period ($r = 0.820$; $P < 0.001$ for body weight and $r = 0.797$; $P < 0.001$ for body length, $n = 16$) than for the second one with higher abundance ($r = 0.669$; $P < 0.05$ for body weight and $r = 0.711$; $P < 0.05$ for body length, $n = 11$). On opposite, the returns of the group E depend weakly on size-weight parameters of its smolts for the period of emigration/return of 1979–1997/1982–2000 (no data for return in 1999) and the dependence is insignificant for the period of 2000–2013/2003–2016.

Bugaev V.F., Tiller I.V. 2018. On biology of sockeye salmon Oncorhynchgus nerka from the Zhupanova river (East Kamchatka). Izv. TINRO 193: 78–87. (In Russian with English abstract). Runs and escapements of sockeye salmon to the Zhupanova River have increased since 1985. The increasing was reasoned by change of the pink salmon odd year-classes domination in West Kamchatka to domination of even year-classes after the extremely high escapement in 1983. In 2005–2006, the sockeye salmon stock in the Zhupanova River became even more higher that continues till nowadays. This growth corresponds with general increasing of the pacific salmon abundance in the Russian Far East as the result of favorable environmental and feeding conditions in the North Pacific. General biological indices (age, body length and weight, maturity, fecundity) of mature sockeye salmon originated from the Zhupanova River are presented on the data of commercial catches in the sea in 1999–2017. The sockeye salmon population from this river has 11 age groups. The age group 1.3 is the most abundant and associated with the age groups 1.2 and 1.4. Majority of sockeye in the catches from the Zhupanova has the age 1.3 (on average 66.2 % in 1999–2017). Besides, returns of underyearlings with age 0.2, 0.3, and 0.4, and the fish with age 2.2, 2.3, 2.4, 3.2, and 3.3 are detected. The body length and weight are similar for all age groups of sockeye salmon: for males/females the mean length is 57.56/57.70 cm, mean weight is 2.69/2.62 kg. The mean males:females ratio is 44.7: 55.3. The mean absolute fecundity is 4121 eggs. In op-posite of sockeye salmon in some rivers of East Kamchatka, the population of the Zhupanova has no negative year-to-year trend of the body length or weight.

Chebanova V.V., Frenkel S.E., Zelenikhina G.S. 2018. Relation of Feeding in Juvenile Chum Salmon (*Oncorhynchus keta*) and Pink Salmon (*O. gorbuscha*) to Abundance of Zooplankton in Coastal Waters of the Prostor Bay (Iturup Island). J. Ichthyol. 58: 741–749. (In English). The paper characterizes feeding of juvenile chum salmon (*Oncorhynchus keta*) and pink salmon (*O. gorbuscha*) during the fattening period in July 2013-2015 within the coastal zone of 0.5-1.5 km from the shores. The study revealed that both species exhibited diverse feeding in the pelagial, but older Neocalanus spp. and Pseudocalanus spp. copepodites were the main food items determining adequate covering of the fish demands for food. These invertebrates formed 78% of the total zooplankton biomass in the upper water layer (0–10 m). In 2013 and 2014, all juvenile fish specimens were feeding and were fed satisfactory. In 2015, feeding intensity of the juvenile fish was weaker and more than 1/3 of the fish were starving by the end of July. On average for three observation years, chum and pink salmons were feeding at the narrow shallows almost twofold better than over the wide shallows. Specific features of the fish feeding revealed in the present study are in agreement with the interannual and local fluctuations of the zooplankton abundance.

Dulenin A.A., Kozlova T.V. 2018. Resources of Pacific Salmon of mainland part of Tatarsky strait within Khabarovsk area. Bulletin of Pacific salmon studies in the Far East 13: 106–113. (In Russian). Studies conducted in the 1960–1980 revealed the unequal contribution of pink salmon resources among the rivers of the Northern and southern parts of the Primorye area. On average, the most powerful pink salmon run were observed in the Northern river basins (largest is the Tumnin River: up to 60% or more of the total stock of Primorye area rivers). To the South, small coastal basins of the mainland coast of the Tatar Strait, has smaller number of pink salmon: Koppi River 15–20%; Botchi River 10–15% of the total stock. In recent years, rivers research to the North of the Tumnin River was being conducted sporadically. The small part of total catch that has the Ulchi area, regardless of the transport accessibility of its rivers, suggests that the pink salmon run here are weak due to natural reasons related to the conditions of reproduction and population dynamics. Probably, the catastrophic condition of pink salmon in the Tumnin River, which occupies an intermediate position between the "North" and "South" is due to both reasons, since in the last decade there has been a natural decrease in the role of the Northern rivers and a multiple increase in poaching pressure. Fishing by set nets in the coast is largely catch the transit pink salmon. So, fishing near Botchi River and Tumnin River, has no linkages with pink salmon run in those river. To correctly assess the pink and chum salmon as a whole for Primorye area status, we need to organize some regular observations on several large rivers; it is necessary to perform aero accounting work on most large watersheds of the area, as well as in the sea. Without these conditions, any accurate assessment of the pink salmon stock of the Northern part of the Primorye's rivers will be impossible.

Farley E.V., Beacham T.D., Bugaev A.V. 2018. Ocean ecology of sockeye salmon / Ed. R.J. Beamish. The ocean ecology of pacific salmon and trout. American Fisheries Society, Bethesda, Maryland. P. 319–389.

Gavruseva T.V., Bochkova E.V., Sergeenk N.V., Ustimenko E.A. 2018. Current state of the health of pacific salmon (Oncorhynchus) in the aquaculture of Kamchatka. The researches of the aquatic biological resources of Kamchatka and of the north-west part of the Pacific Ocean 48: 19–30. (In Russian). Results of complex virological, bacteriological, parasitological and histological examination of juvenile and mature Pacific salmon from hatcheries of Kamchatka in 2015–2017 are demonstrated. The most dangerous pathogens for salmon included the Infectious Hematopoietic Necrosis Virus (IHNV) and bacteria *Aeromonas salmonicida* subsp. *salmonicida*, the causative agent of furunculosis. An asymptomatic carriage of IHNV was revealed in mature sockeye salmon (*O. nerka*) from two hatcheries and chum salmon (*O. keta*) in one hatchery. An outbreak of the IHN was recorded among juvenile sockeye salmon at one of hatcheries in 2017. For the research period *A. salmonicida* was found at four hatcheries in sockeye salmon, coho salmon (*O. kisutch*) and chum salmon used for reproduction. Histopathological changes typical as chronic form of alimentary toxicosis were the most frequent in liver, kidneys and gastrointestinal tract of juvenile individuals. Serious structural changes of the organs and tissues as a result of water or alimentary toxicosis were revealed in coho salmon underyearlings in 2017.

Golub E.V., Golub A.P. 2018. The research and harvest of the Pacific salmon in Chukotka in 2018. Bulletin of Pacific salmon studies in the Far East 13: 119–125. (In Russian). The results represent the research of the large salmon stocks in Chukotka such as chum salmon stock in Anadyr estuary, sockeye and pink salmon stocks in Meynypilgynskaya lake-river system. Number of Anadyr chum salmon returns was 4.04 million ind., number of sockeye salmon returns and pink salmon returns in Meynypilgynskaya lake-river system were 480 and 200 thousand ind. respectively in 2018. The quantity of Anadyr chum salmon stock was more than a third higher as well as the quantity for Meynypilgynskaya sockeye salmon stock was more over double than average interannual level accordingly. The total number of pink salmon stock in Koryak coast waters was more and in Anadyr estuary was fewer than in 2016 respectively. Weight and fatness of pink salmon spawners were minimum in Meynypilgynskaya lake-river system for the entire observation period.

Gordeev I.I., Starovoytov A.N., Ponomarev S.S., Shevlyakov V.A., Milovankin P.A. 2018. Trawl survey R/V "Professor Kaganovsky" on assessment of Pacific salmon in the northwestern part of the Pacific Ocean (May–July 2018) . Trudy VNIRO 171: 208–213. (In Russian with English abstract). Trawl survey was performed in the Pacific waters of the Kuril Islands and in open waters of the Pacific Ocean during the summer of 2018. The abundance and biomass of Pacific salmons in the period of their pre-anadromous migrations to the rivers of the Okhotsk Sea basin were surveyed in the upper epipelagic zone, and the main concentrations of the pink salmon producers were outlined. Data on spatial distribution, density, biological state of other mass fish species in the northwestern Pacific were obtained. Estimates of the abundance and biomass of migrating pink salmon on an area of more than 1 million km 2 showed record results of 1 .1 billion individuals and 913 thousand tons, respectively.

Gorodovskaya S.B., Sushkevich A.S. 2018.The rate of the gonad development of juvenile Pacific salmon in early marine period of life in the Okhotsk Sea waters adjacent Kamchatka. Bulletin of Pacific salmon studies in the Far East. 13: 170–178. Histological analysis of the gonads of juvenile salmon in early marine period in 2017 revealed differences between different Pacific salmon species in the rate of maturation. Increased temperature of water caused impressively accelerated maturation of gonad cells of pink and chum salmon. One of determinants of the enormously high runs of pink salmon in 2018 on Western Kamchatka was the physiological condition of the generation at juvenile stages. The rate of the gametogenesis in juvenile sockeye salmon generally depended on freshwater environment conditions. In 2017 juvenile salmon demonstrated gonad cells with amitotic abnormalities. These morphological deviations can lead to decreasing salmon spawning efficiency.

Kaev A.M. 2018. Results of pink salmon fishery season on the Sakhalin and southern Kuril islands in 2018. Bulletin of Pacific salmon studies in the Far East 13: 72–79. (In Russian). The expected and factual pink salmon catches are compared for all of their basic fishery areas in Sakhalin-Kuril region. Some likely reasons for the substantially great runs of pink salmon in the northeastern Sakhalin coast and, in contrast, low runs in the southeastern coast relatively to the predictions are shown.

Kaev A.M., Avdeyev D.V., Dzen G.N., Zakharov A.V., Romasenko L.V., Sereda V.V., Sukhonos P.S. 2018. Numbers of downstream migrating fry pink salmon counted in rivers of the Sakhalin and Iturup islands in 2018. Bulletin of Pacific salmon studies in the Far East 13: 80–87. (In Russian). Fry pink salmon migrated downstream from the spawning grounds have been counted for the rivers Krasnoyarka (western Sakhalin), Kura, Voznesenka, Lazovaya, Orlovka, Khoi, Rybatskaya (SakhNIRO), and Pugachevka (SF Glavrybvod). The data obtained and the results of accounting of fry migrants in five other rivers (SF Glavrybvod) were used to calculate a fry harvest in 2018 for the basic territorial pink salmon groupings in Sakhalin-Kuril region.

Klovach N.V., Leman V.N., Elnikov A.N., Varaksin I.A. 2018. Reproduction and fishery of Iturup chum salmon (southern Kuril Islands). Past. Present. Future. Fish industry. J. Rybnoe khozyajstvo 6: 42–47. (In Russian with English abstract). The article presents data of our own research and the analysis of literature data on the reproduction and fishing of the Iturup chum salmon *Oncorhynchus keta*. It is shown that the dynamics of stocks and catches of Iturup chum salmon is generally the same as in other areas of the Far East and depends mainly on the climatic conditions in the sea and oceanic periods of life. Artificial reproduction of Iturup chum salmon, which began in the 1990s. coincided with the onset of favorable conditions in the ocean, which led to the rapid growth of its reserves. The conditions of feeding in the early period after the stingray into the sea and in the first summer in the Sea of Okhotsk in recent years have led to a varying number of returns of the generations of Iturup chum salmon. Nevertheless, it can be stated that feeding conditions for chum salmon near Iturup in the first summer of the marine period of life is generally favorable, and the ecological capacity limit for Iturup chum salmon has not yet reached. The feasibility of further increasing the number of young fry chum produced by the Iturup hatcheries.

Klovach N.V., Temnykh O.S, Shevlyakov., V.A., Shevlyakov E. A., Bugaev A. F., Ostrovskiy V.I., Kaev A.M., Volobuev V.V. 2018. Current Stock Assessment of Pacific Salmon in the Far East of Russia. NPAFC Tech. Rep. 11: 12–16. (Available at https://npafc.org). The anomalous surface warming started in autumn 2013 which had spread into the western Bering Sea by spring 2014, and in 2015/2016 it reached the North Kuril area and northern Okhotsk Sea. This was accompanied by northward shift of reproduction areas of pink salmon. As a result of increased marine survival of the northern pink salmon stocks (West and East Kamchatka and Continental Coast of Okhotsk), their approaches to the coast and catches increased. At the same time, the Sakhalin and South Kuril pink salmon stocks decreased. In 2017, all chum salmon stocks were at a high level but somewhat lower than during two previous years. All chum salmon stocks except for the South Kuril and Sakhalin stocks, were maintained by means of natural reproduction. The South Kuril and Sakhalin stocks were maintained by artificial reproduction, approximately 90% of the stocks are hatchery fish. Coho and sockeye stocks, originated mainly from Kamchatka, are in a good state now. Further research is needed to explain the reasons of sharp increase in Amur and Primor'e pink salmon stocks in even years, as well as the reasons of degradation and changes in biological features of Kamchatka Chinook salmon.

Klovach N.V., Temnykh O.S., Shevlyakov V.A., Lysenko A.V., Golub E.V., Burlak O.V., Shevlyakov E.A., Kaev A.M., Golovanov I.S.. 2018. Biostatistical information on salmon catch, escapement and enhancement production in Russia in 2017. NPAFC Doc. 1749: 4 pp. (Available at https://npafc.org). Biostatistical Information on Salmon Catch, Escapement and Enhancement Production in Russia in 2017 is given.

Kolpakov N.V., Kotsyuk D.V. 2018. Having failed predictions of pink salmon returns to the Amur River and Primorye area in 2018: probable cause. Bulletin of Pacific salmon studies in the Far East 13: 94–105. (In Russian). With a record value of the total catch of pink salmon in the basin of 511.2 thousand tons, to Kamchatka, to the mainland coast of the sea of Okhotsk, to the Northern part of Eastern Sakhalin and to the Southern Kuriles of pink salmon came significantly more than in the adjacent even 2016. On the contrary, it was extremely unpleasant to see large pink salmon in a number of southern areas. First of all, this applies to the Amur (development of quotas – 6%), the Primorye subzone within the Khabarovsk territory (12 %) and, to a lesser extent, the southern part of the Primorye subzone (59 %) and South-Western Sakhalin (58%). the intensity of the Amur pink salmon fishing is taken to be 50 %, then the biomass of parents in the current year (roughly) is equal to the annual catch. However, according to the fisheries Committee of the Ministry of natural resources of the Khabarovsk territory, from 2015 to 2018 the number of fishing sites for commercial fishing in the Amur River increased by 28% (from 137 to 175). It is clear that this has led to no less intensification of fishing. Accordingly, the error in the estimation of the number of parents has increased. In light of written above, and taking into account the possible decline in the number of Pacific salmon of the North-Western Pacifica in the coming years, it is obvious that at present, in-depth studies of the biology of these fish, their distribution in the river basin, the state of the spawning area, etc. are of particular relevance. Maximum efforts of fishery science should have been aimed at expanding the scope of salmon monitoring (as far as possible in the current conditions), namely: to intensify work on the direct accounting of juvenales and spawners on spawning grounds (including the use of quadrocopters).

Koval M.V., Gorin S.L., Vasilenko A.V., Dubynin V.A. and Klimov A.V. 2018. Biology of juvenile sockeye salmon *Oncorhynchus nerka* (the Ozernaya River, Basin of the Kurilskoe Lake) during downstream migration and early marine period of life. NPAFC Tech. Rep. 11: 29–38. Results of a complex research of the juvenile sockeye salmon biology in Kurilskoye Lake, Ozernaya River (the main stream and the estuary) and coastal waters of the Sea of Okhotsk in June-August of 2017are demonstrated. It is revealed, that in the life history of sockeye salmon of this river the period of the downstream migration and the early marine period of the life history are not critical stages. This specific biological trait of the population is suggested allowing to support the high accuracy of forecasting adult returns of Ozernaya River sockeye salmon in recent decade, when one of basic components of the forecast was evaluation of the abundance of juvenile sockeye salmon, emigrated from Kurilskoye Lake (the averaged accuracy of the forecast of run for recent decade is 103.6%).

Koval M.V., Tepnin O.B., Gorin S.L. 2018. About the hydrological regime of the northern part of Kamchtsky Gulf and possible effects of trap tens in escapement of sockeye salmon for spawning in Kamchatka river during the campaign 2018. Bulletin of Pacific salmon studies in the Far East 13: 222–228. Results of hydrological observations in the northern part of Kamchatsky Bay in the coastal waters (adjacent the mouth of Kamchatka River) in August 2018 are demonstrated. The purpose of the research was to figure out characteristics of the zone of the effects of the water from Kamchatka River on the waters of Kamchatsky Bay and to evaluate specifics of the distribution of the trap nets within the zone. Results make it possible to suggest, that the hydrological and commercial situation in the northern part of Kamchatsky Bay during the fishery campaign 2018 could affect the escapement of sockeye salmon in Kamchatka River.

Lepskaya E.V., Bugaev A.V., Koval M.V., Sogrina A.V., Tepnin O.B. 2018. The state of the population of kokanee in the Tolmachevskoye water reservoir and in the area of the Tolmachev HPS cascade in 2018. Bulletin of Pacific salmon studies in the Far East 13: 179–195. (In Russian). Results of the works carried out in the Tolmachevskoye water reservoir in August of 2018 confirmed again the conclusion, that the decrease of kokanee population observed for the period since exploiting the Tolmachev's Hydro Power Stations has begun is insignificant, and, judging by biological principles, there is no harm for the population. Moreover, in the absence of the other factors regulating the stock abundance (predators, parasites and fisheries) the effect provides function of melioration, because allows at least partly to reduce general abundance of fish in the reservoir. Taking into account everything said above, we just do note that the population of kokanee in the Tolmachevskoye water reservoir stays balanced in recent years in the length-weight characteristics, age structure and sex ratio, what confirms the conclusion about the absence of a negative effect from industrial activities of the Tolmachev's HPS cascade, and can result of the effects of natural factors, regulating general abundance of local fish. The factor number one is the absence of regular predators and fisheries. Potential of restoration of the population of Tolmachev's kokanee to commercial level still exists.

Makarov D.V., Ostrinsky M.O., Yamborko A.V. 2018. Dynamics of the anadromous migration and some population indicators of coho salmon of the Ola River (Taui Bay of the Okhotsk Sea) in 2018. Bulletin of Pacific salmon studies in the Far East 13: 140–144. (in Russian). Information about the dynamics of anadromous migration of adult coho salmon and the variability of sex, age, size-weight structure, fertility during the spawning run in the Ola river are provides.

Markovtzev V.G. Some results of the private fish hatcheries work in Primorskiy region 2018. Bulletin of Pacific salmon studies in the Far East 13: 168–169. There are two state fish hatcheries and two private fish hatchery in Primorye. Another private fish hatchery should be built in the end of 2018. To calculate percent of spawners returns, fish farmers have detected the spawners which passed into the river for spawning. Then, based on the known number of salmon juveniles released from the hatchery the difference between those two figures was calculated. As result, for the past two years there were 20113 ind. of salmon which have been let into rivers belong to fish hatcheries and their calculated coefficients of returns have made up 1.3–1.9 %.

Nazarov V.A., Lysenko A.V. 2018. The results of 2018 salmon fishing season for Primorsky Territory (Russia). Bulletin of Pacific salmon studies in the Far East 13: 240–254. (In Russian). The results of fishing season for pink salmon, chum salmon and cherry salmon were considered. For the first time in recent years the data regarding chum's stocks from Samarga River of Primorsky Territory's northern part was published. Also was indicated the terms of anadromous migration, given the estimations of catch volumes, characterized the places of capture, and number of spawned-out fishes for each species. The salmon biological characteristics are following body fork length, standard length, body weight, males and females ratio, gonad maturation stage, absolute individual fertility, and age were presented.

Ostrovsky V.I. 2018. Regularities of reproduction for pink salmon *Oncorhynchus gorbuscha* from the Iska River. Izv. TINRO 194: 54–67. (In Russian with English abstract). Reasons for rapid rise of pink salmon landings in the Sakhalin Bay (Okhotsk Sea) in the early 21 century are analyzed. Dependence of its juveniles and adults numbers on the number of their parents is well described with Ricker equation, and the recruitment depends linearly on the number of juveniles in the river. Several factors of the pink salmon reproduction are compared between the early 21 century and previous period. There is found that recent increase of the catches could not be reasoned by favorable changes of environments, decreasing of juveniles' mortality either in the river or in the sea, extending of spawning grounds, and growth of spawning stock or number of juveniles. The only possible reason for significant rise of the landings could be increasing by-catch of transitory stocks.

Ostrovsky V.I., Kotsyuk D.V., Kolpakov N.V. 2018. The results of pacific salmon commercial fishing season in the Khabarovsk area in 2018. Bulletin of Pacific salmon studies in the Far East 13: 88–93. (In Russian). The article describes Pacific salmon commercial fishing in the Khabarovsk area. It should be noted that during the fishing season in the Amur River, due to the shift in timing of the salmon run, the permitted fishing periods were also shifted. If necessary, an earlier ban was made for Amur River fall chum fishing. During the fishing season, the regime of passing days was revised. The predicted total quota of Amur River summer chum salmon was mastered by 66,0 %, catch was 4809,9 tons. We note that it was the lowest catches of summer chum since 2009. The main part of total catch was taken in the Nikolaevsk city area near Amur River mouth (more than 90,0 %). The most strongly different from the forecast has the Amur river pink salmon (15.7 %), which is probably due to its low survival rate in the feeding areas and wintering in the marine coast and the open sea. The forecast of salmon fishing within the Khabarovsk territory for 2018 can be considered satisfactory – the forecast was mastered by 61.8 % only. Adjustment of volumes of the predicted total catch only worsened these indicators to 46,9 %. As in previous years, additional justifications for the volume of projected catch increasing in the Amur River were necessary to eliminate the inevitable errors in the quotas distribution associated with their strict assignment to users and fishing areas. It is necessary to continue work on the development of Amur River Pacific salmon fishing regulations, as well as to reduce the number of fishing sites and fishing gear.

Ovchinnikov V.V., Smirnov A.A., Volobuev V.V, Golovanov I.S. et al. 2018. Region commercial fishes: biology, ecology, stocks, catches. Magadan:MagadanNIRO. 156 p. (in Russian). Analytical review of biology, ecology, dynamic stocks and catches of a main species of commercial fish in the area of responsibility of the FSBSI "MagadanNIRO" (Magadan region) is submitted. Historical information and modern monitoring data on the state of the reserves of the main fishery objects in the region are examined. A predictive assessment of their catches in the future is given.

Vladimir I. Radchenko, Richard J. Beamish, William R. Heard, and Olga S. Temnykh. 2018. Ocean Ecology of Pink Salmon / Ed. R.J. Beamish. The ocean ecology of pacific salmon and trout. American Fisheries Society, Bethesda, Maryland. P. 15–160.

Riddell B.R., Brodeur R.D., Bugaev A.V., Moran P., Murphy J.M., Orsi J.A., Trudel M., Weitkamp L.A., Wells B.K., Wertheimer A.C. 2018. Ocean ecology of chinook salmon / Ed. R.J. Beamish. The ocean ecology of pacific salmon and trout. American Fisheries Society, Bethesda, Maryland. P. 555–696.

Ryabukha E.A., Ignatov N.N., Artyukhin A.V. 2018. The results of the growing of coho salmon juveniles in the natural pond conditions of Arman River hatchery (Magadan Region). Bulletin of Pacific salmon studies in the Far East 13: 196–201. (In Russian). The analysis of the results of growing juveniles salmon in the conditions of the natural pond of Arman River hatchery in 2015–2017 showed that with favorable average temperatures of the environment (from 4.2 to 14.5 ° C) and with regular feeding of the juveniles, the potential for growth of the juveniles to weight in 0.6–1.2 g occurs in 43–85 days. By the end of the rearing, the size-weight and morphophysiological indicators of pond juveniles significantly exceeded those of hatchery juveniles.

Sato S., Akinicheva E., Bugaev A., Campbell L., Guyon J., Holmes J., Jeon C.H., Kim J.K., Koval M., Neville C., Oxman D., Tojima T., Urawa S., Volobuev V., Seitz A.C. 2018. Recoveries of High Seas Tags and Tag Releases from High Seas Research Vessel Surveys in 2017. NPAFC Doc. 1758: 5 p. In late July and early August 2017, tagging operations were conducted by the Japanese *R/V Hokko-maru*, and 48 chum salmon and six sockeye salmon were released with tags in the Bering Sea. Among them, seven chum salmon were equipped with DST magnetic tag. Other tagging experiments were conducted by US scientists, in which 40 Chinook salmon were tagged with PSATs and released in Kachemak Bay near the Kenai Peninsula (n=20), Alaska in March 2017 and Unalaska Bay in the Aleutian Islands (n=20) in October-November 2017. Although no recovery of disc and DST magnetic tags released in the summer Bering Sea was reported in 2017, archived tag data were retrieved via the Argos satellite system from 19 PSATs that were attached to Chinook salmon in Kachemak Bay. The remaining 20 PSATs deployed in Unalaska Bay are still attached to free swimming Chinook salmon.

Shevlyakov E.A., Feldman M.G., Yerokhin V.G., Shubkin S.V. 2018. Summary of pink salmon fishing on Western Kamchatka in 2018, prospects of future state of the stock and the fishery. Bulletin of Pacific salmon studies in the Far East 13: 41–51. (In Russian). Situation with spawning escapement in the rivers of West Kamchatka in 2018 was similar to that happened 35 years ago (the escapement of more than 100 mln individuals of pink salmon for spawning). It may be cause of strengeth of the risks foreward for the stock abundance of pink salmon of even and odd generations and fishery in visible perspective of the nearest period.

Shevlyakov E.A., Zikunova O.V., Fadeev E.S., Feldman M.G. 2018. Sockeye salmon fishery in Kamchatka river in 2018: stock monitoring, management targets, operational regulation and results. Bulletin of Pacific salmon studies in the Far East 13: 52–71. (In Russian). Sockeye salmon fishery in Kamchatsky gulf and Kamchatka river system in 2018 was analyzed. Possible causes of differences between in-fact and forecasted sockeye salmon runs were suggested. Instruments for evaluation of Pacific salmon escapement to spawning grounds are described, including the methods of the direct counting and of math simulation, based on the data of control catches at particular fishing plot.

Shuntov V.P. Is that real to make breakthrough in development and functioning of Russian fishery in the nearest future? Bulletin of Pacific salmon studies in the Far East 13: 255–264. (In Russian). There are some critical notes relating to the current reorganisation initiated by VNIRO have been described in the paper. In addition, as a conclusion, the author's point of view and his prediction about probable consequences associated with that uncertain situation which has mentioned in the issue are presented.

Shuntov V.P., Temnykh O.S. The results of the salmon fishing season 2018 in the Far East of Russia – Absolute record provided by the Kamchatka pink salmon catch. Bulletin of Pacific salmon studies in the Far East 13: 3–13. (In Russian). The salmon fishing season results divided into certain commercial species have been described in the article. This year became a maximum level of pink salmon catch (511 thousand tones) in the Far East of Russia due to the enormous catch of pink salmon in West Kamchatsky region (301 th. tones) and Karaginsko-olyutorsky region (107 th. tones). Also, the results about pink salmon research during their sea and ocean life stages are presented. As summarize the certain predictions for future salmon fishing season in the coming year are given by authors in the current paper. The one of the main conclusions made up by authors was that it is very unlikely that dramatically decrease of salmon stock to a low biomass level of 1940–1960 could happen in the nearest future.

Somov A.A. The estimates of pink salmon in Kuril island waters of Okhotsk sea and at the East coast of Sakhalin island during their spawning migrations in July 2018. Bulletin of Pacific salmon studies in the Far East 13: 202–209. (In Russian). The results of trawl research survey which conducted by scientific research ship named "Dmitriy Peskov" in July 2018 have been described. One of the main purposes of the research was also detecting the sea mammals by visual observations. The research area of pink salmon migrations was observed partially, therefore only around a quarter of the total abundance of pink salmon was accounted. The main migratory routes of pink salmon were observed throughout the Bussol Strait and the Fourth Kuril Strait. Based on biological data and distribution of pink salmon in comparison with trawl survey conducted in the Western North Pacific lead us to the conclusion that the observed fish aggregations belonged to population of Kamchatka pink salmon stock.

Starovoytov A. N., Shevlyakov V. A., Milovankin P. G. The newest data about the compound of nekton and macroplankton communities and trawl survey results of pink salmon estimates in the Western North Pacific in May–July 2018. Bulletin of Pacific salmon

studies in the Far East 13: 153–162. (In Russian). The results of trawl research survey, which conducted by vessel "Professor Kaganovskiy" in the Western North Pacific in May–July 2018, have been described. During the expedition the number of 88 trawl stations in upper epipelagic layer was made. The primary goal was detection and assessment (quantity and biomass) of Pacific salmon stocks, especially Okhotsk populations during their early spawning and feeding migrations, also other nekton and macroplankton species were identified, measured and counted in the marine research expedition. It is remarkable that the abundant aggregations of chub mackerel and Japanese sardine were observed and counted again as in previous surveys of the same period. Sampled data of pink salmon during the survey revealed that ratio of spawners was 65 % of early spawning stock and 35 % of late spawning stock.

Starovoytov A.N., Somov A.A., Emelin P.O., Kanzeparova A.N., Khleborodov A.S. The compound of nekton and macroplankton communities and trawl survey results of pink salmon estimates in the Bering Sea and in the Sea of Okhotsk during autumn 2018. Bulletin of Pacific salmon studies in the Far East 13: 163–167. (In Russian). Total quantity and abundance of nekton and macroplankton in the Western Bering sea in September-October 2018 were estimated as 138 billion ind. and 1.3 million tons respectively. The most numerous and abundant species was northern lampfish (*Stenobrachius leucopsarus*) which was estimated of 115 billion ind. and 165.6 thousand tones. The analyzed data of postcatadromous pink salmon juveniles evidenced a high level of the spawners returns to rivers of the Western Bering sea what respectively indicates the favorable forecast for fishing in the coming year. Total quantity and abundance of nekton and macroplankton in the Sea of Okhotsk in October-November 2018 were estimated as 94.8 billion ind. and 1.8 million tons respectively. The most numerous species was northern smoothtongue (*Leuroglossus schmidti*) which was estimated of 73 billion ind., whereas the most abundant group was jellyfish species with total biomass of 1.2 million tones. Based on sampled data of pink salmon juveniles estimates it is notable to state that number of pink salmon migrating to the ocean waters was at the same as average level for even generations. However, according to the biological indicators the mortality extent of pink salmon probably should be lower than multi- year average level.

Temnykh O.S, Kanzeparova A.N. 2018. Interannual dynamics of pink and chum salmon juveniles abundance and their average body sizes in the Sea of Okhotsk and western part of the Bering sea during 1998–2017. NPAFC Tech. Rep. 11: 46–50. The dynamic of abundance and average sizes of pink salmon and chum salmon juveniles have been analyzed according to the annual complex trawl surveys data, conducted in the autumn of 1998-2017 in the Sea of Okhotsk and in the western Bering Sea. Abundance of pink salmon juveniles in the Sea of Okhotsk in 1998–2017 varied within the range of 442–1833 million individuals in the line of odd generations, and 569–2752 million individuals - in the line of even generations. Pink salmon has absolutely dominated the abundance among juveniles, ranging from 53 to 89% of its total abundance. Chum salmon juveniles abundance during the study period varied from 164 to 926 million individuals, an average of 32% from the total of these two salmon species.The results of the correlation analysis performed using the data on pink salmon and chum salmon juveniles trawl survey within each of trawl catch conducted during their 1998-2016 early marine period indicate a statistically significant correlation between the pink salmon and chum salmon juveniles abundance in the autumn period (Spearman correlation coefficient +0.77, $p < 0.05$). Dynamics of average body size for pink and chum salmon juveniles during study period is also synchronous (Spearman correlation coefficient +0.54, $p < 0.05$).The changes in abundance and average body size of pink and chum salmon juveniles in the western Bering Sea are similar. Statistically significant Spearman correlation coefficients between pink and chum juveniles salmon abundance are very high - + 0.85, between average body weight sizes of these species - + 0.79.

These results confirm the conclusion about the complementarity of these species in both Sea of Okhotsk and Bering Sea.The influence of fodder supply for pink salmon from Sea of Okhotsk and Bering Sea stocks on the growth of juveniles, their abundance and possible mortality in the period of marine and ocean migrations is discussed.

Tepnin O.B., Lepskaya E.V., Bonk T.V., Pohodina M.A. 2018. Environment conditions for kokanee (*Oncorhynchus nerka* Kenerley) in the Tolmachevskoye water reservoir in 2018. Bulletin of Pacific salmon studies in the Far East. 13: 210–221. (in Russian). Hydrological, hydrochemical and hydrobiological conditions are analyzed for local kokanee population (*Oncorhynchus nerka* Kenerley) on the data of field observations, carried out in August of 2018 in the Tolmachevskoye water reservoir. It was demonstrated, that temperatures in the lake were lower than observed in similar period in 2017 and in July of 2016. Intense water stratification was noted and steep decrease of the level of oxygen saturation the more depth the lower was observed during the field work. In the other measured environmental factors, the hydrological conditions were in fact totally identic to observed one year before. The concentration of the mineral phosphorous and silicon otherwise were normal, and the amount of the mineral nitrogen and total dissolved iron strongly lower than normal. The number and the biomass of phytoplankton decreased two times comparing to the norm. The dominant complex of the plankton microalgae during the observation was formed in the number and in the biomass by diatom microalgae, contributing about 98% into the phytoplankton abundance and biomass. The taxon number one in the dominant complex was *Asterionella formosa*. There was a minimum of rotifers similar to that in 2002, and the averaged values for crustaceans were at the level of 2003 and 2010. The trend of the dominance of the plankton Cladocera is noted as a stable.

Volobuev V.V., Golovanov I.S., Korshukova A.M., Yamborko A.V., Grushinets V.A., Ostrinsky M.O. 2018. Results of 2018 salmon fishing in the Magadan Region. Bulletin of Pacific salmon studies in the Far East 13: 114–118. (in Russian). Salmon season in the Magadan region in 2018 from June 21 to September 16 is lasted. The catch of salmon was carried out in five areas: industrial, sports and licensing catch, for the needs of the aborigines, for fish farming and science research catch. Commercial salmon fishing was carried out at 50 fishing grounds to 25 fishing organizations. In 2018, 9367 tons of salmon for catch were recommended. In the course of scientific support, the institute prepared 2 additional adjustments to increase the recommended catch.

Vvedenskaya T.L., Ulatov A.V. 2018. Anthropogenic impact of salmon watercourse during the construction and operation of the main gas pipeline (Kamchatka). Newsletter of Kamchatka State Technical Univ. 46: 53–65. (In Russian). Impact on salmon watercourses during the construction and operation of the gas pipeline occurs in the form of fine suspension inflow from the shores and along the route into the riverbeds. Deposited on the bottom, it changes the granule metric composition of the soil and, thus, the habitat of benthic animals. Changes in the composition and structure of macrozoobenthos on parts of the river located in the gas pipeline zone compared to the areas without anthropogenic influence were found in most of the studied watercourses. They are expressed in the oligochetes index increase, Margalef's specific species richness index decrease, ERT species composition depletion, ERT index decrease and the invertebrates total number and biomass changes. Such changes lead to the deterioration of the young salmon and other fish species forage base.

Zaporozhets O.M., Zaporozhets G.V. 2018. The status of the pacific salmon stocks in the rivers Nalychevo, Ostrovnaya and Vakhil (South-East Kamchatka) in 1980–2017. The researches of the aquatic biological resources of Kamchatka and of the north-west part of the Pacific Ocean. 50: 5–26. (In Russian). Stock abundance dynamics of sockeye salmon, pink salmon, chum salmon and coho salmon for the last 37 years was analyzed in the rivers Nalycheva, Ostrovnaya and Vakhil. Biological characteristics of spawners (including Chinook salmon) were analyzed in Nalycheva River, and a comparison to Ostrovnaya River was made for the first time (on the data about Nalycheva for 2017). Temporal groups were revealed for all salmon species (in exception of Chinook salmon) in the Nalycheva, and biological differences are demonstrated in case of occurrence. Spatial and temporal diversity of Pacific salmon in each of the rivers mentioned was evaluated, and it is concluded, that urgent measures are required to protect salmon stocks in the rivers Nalycheva and Ostrovnaya were made.

Zolotukhin S.F., Kanzeparova A.N. 2018. What formed the Pacific salmon biomass in Amur River basin in 2000–2010s? NPAFC Tech. Rep. 11: 22–23. It is most likely that abundance of Amur River Pacific salmon generations is regulated within estuaries and in early marine periods, when the juvenile mortality rate is increased by the ice presence and ice movement into the coastal zone. Dynamics of Sea of Okhotsk ice cover is similar to the dynamics of solar cycles (Wolf's numbers), but their impact on the Amur salmon juveniles number is mediated by complex of environmental and climatic factors. The result of many factors activity is the survival rate of Amur River Pacific salmon during ocean migration, which has the highest weight among other factors. Most good Pearson`s correlation for some climate indexes and total commercial chum salmon catch in Amur River during 1990-2017 were: North Pacific Circulation PCI 0, 6471, and Global Air Temperature GLB.Ts+dSST -0,4952. Other indexes had small power: AFI (-0,0478), ALPI (-0,1709), NP (0,1382), N. HEMI (-0,2759), PDO (0,0358), LOD (0,2074), Wolf`s numbers (-0,2402).

Theme 2: Pacific Salmon and Steelhead Trout in a Changing North Pacific Ocean

Bugaev A.V., Tepnin O.B., Radchenko V.I. 2018. Climate variability and pacific salmon productivity in Russian Far East. The researches of the aquatic biological resources of Kamchatka and of the north-west part of the Pacific Ocean. 49: 5–50. (In Russian). An assessment of the effects of climate changes on Pacific salmon productivity in Russian Far East was made based on long-term data (1971–2015), including commercial fishery statistics and monitoring rows on 17 indices of teleconnection patterns. The assessment was made for three mass species – pink, chum and sockeye salmon. The values were obtained for three basin groups of stocks: PBS – the Pacific-Bering Sea group (East Kamchatka and Chukotka; SOS – the Southern Okhotsk Sea group (Sakhalin, Kuriles, the Amur River basin, Primorye); NOS – the Northern Okhotsk Sea group (West Kamchatka, continental coast of the Sea of Okhotsk). The assessment of the interrelation and the selection of the indices of teleconnection patterns were carried using correlation and the principal component analysis. The results obtained allowed to figure out 10 indexes with the maximal time series (45 years), including ALPI, PNA, WP, PDO, NP, AO, N.HEMI+dSST, Ap, Sun Spot, LOD. Method of moving average was used in the calculations for making the rows of the average annual climate indexes. Averaging for particular species was carried out depending on duration of feeding at sea. In this connection the values of the moving average took into account the ranges of the variable values of indices from the year of juvenile migration to seawater and leaving the coast for the ocean waters (the age n.0) to the year of mass maturation (in the age 0.1 for pink salmon (averaging for two years – the ages 0.0 and 0.1), in the age n.3 for chum and sockeye salmon (averaging for 4 years – the ages n.0, n.1, n.2 and n.3)). In this way, the values obtained could demonstrate the effects of the climate factors on the Pacific salmon catches (production) taking into account the effects on salmon environment for the entire period at sea. Step-by-step multivariate regression analysis was provided based on the indexes-indicators figured out and made figuring out the climate factors, which are the most affecting salmon production in the basin groups of stocks of Pacific salmon in Russian Far East. All results obtained demonstrated authentic interrelations (p < 0.05-0.001) where the coefficients of the multiple regression from moderate (R = 0.36-0.74) to strong (R = 0.75–0.93). The highest level of the correlation "Pacific salmon production - the indices of teleconnection patterns" was revealed for chum and sockeye salmon, the species with a long period of feeding at sea. The indexes for pink salmon were visibly lower in the PBS and NOS groups. For the SOS group the coefficient of the multiple correlation was high. The results of the analysis made it possible to figure out the major active climate components as the N.HEMI+dSST (the index of the global temperature anomaly in the Earth Northern hemosphere), the PDO (the Pacific Decade Oscillation), the Ap (the index of the geomagnetic activities). The analysis of the zonal effects of the water temperature anomalies (aOST) in the areas of fall and winter feeding of Pacific salmon in the 1-st year of ocean life in the seas of Far East and Subarctic zone of Pacific Ocean has it indicated, that for the Okhotsk Sea groups (SOS and NOS) the maximal correlation the "aOST-catches" was in the fall in the central and southern Okhotsk Sea and also in the Pacific Ocean waters adjacent Kuriles: r = 0.4-0.7. The maximal correlations for the PBS group was in the west part of the Bering Sea: r = 0.3-0.5. The effects of the temperature factors on salmon productivity were visibly lower during winter feeding.

Bugaev A.V., Tepnin O.B., Radchenko V.I. Climate Change and Pacific Salmon Productivity on the Russian Far East. NPAFC Technical Report 11: 51-55. (Available at https://npafc.org).

Kaev A.M. Activity of extreme environmental factors as a reason for pink salmon abundance decline in the Sakhalin-Kuril Region, Russia. NPAFC Tech. Rep. 11: 17–21. (Available at https://npafc.org). Some changes in pink salmon abundance from 2007–2017 have been studied on Iturup Island and four areas of the eastern Sakhalin coast. An abrupt decline in abundance was observed in broodlines which appeared to be due to the influence of extreme environmental factors. The extreme events were both the floods caused by abnormal high precipitation that destroyed spawning grounds, and the storms on the seacoast during the mass fry downstream migrations to the sea. Estimated run sizes of pink salmon in 2017 in the monitored areas fully agreed with the ascertained dependences for the preceding period. These results show a decisive role of extreme environmental factors in pink salmon abundance formation.

Kaev A.M. 2018. A decrease in the pink salmon (*Oncorhynchus gorbuscha*) abundance in the Sakhalin-Kuril Region under the effect of extreme environmental factors. Russian Journal of Marine Biology 44(7): 540–548. An analysis of variations in the pink salmon abundance on Iturup Island and in four areas of the eastern Sakhalin Island coast in 2007–2016 has shown that year-classes of this species become weaker if they were exposed to the effect of typhoons during their embryonic development in rivers (spawning nests) or juveniles' feeding in coastal waters (soon after their downstream migration from rivers). The size of the pink salmon runs to these waters in 2017 completely fits the relationships identified for the previous year. These results indicate the decisive role of extreme environmental factors in the formation of pink salmon abundance.

Kaev A.M. 2018. Influence of extreme environmental factors on the dynamics of abundance of the pink salmon *Oncorhynchus gorbuscha.* Journal of Ichthyology 58(2): 204–216. The correlation between the number of returned fish and the spawners of the parent generation recorded in the rivers (the reproduction index) has been analyzed in a series of generations of the five largest stocks of pink salmon *Oncorhynchus gorbuscha* in the Sakhalin-Kuril region. The hypothesis that the appearance of low-yielding generations of pink salmon was mainly due to the impact of typhoons as extreme environmental factors has been confirmed. Low values of the reproduction index of pink salmon generations that have been exposed to typhoons during embryonic development in the rivers (redds) or during the feeding period of juveniles in the coastal region of the sea (the next few days after downstream migration) allow for a conclusion on their significant importance for the formation of the abundance of this species. During some adjacent year groups, the frequency of typhoons attributable to the indicated periods of the pink salmon's life cycle increases, this causes a number of low-yielding generations. At the same time, the strength of the typhoons and the limits of their impact are constantly changing, which explains the lack of synchronism in the sharp changes in the pink salmon population of all the stocks in the region.

Krovnin A.S., Kotenev B.N., and Klovach N. V. 2018. Present State and Future of Far East Salmon Stocks under Changing Climate. NPAFC Technical Report. 11: 51–55. (Available at https://npafc.org)

Theme 3: New Technologies

Chistyakova A.I., Kim O.O., I V.S. 2018. Assessment of regional origin and distribution of hatchery pink and chum salmon on results of otolith marking in the basin of the Sea of Okhotsk in the fall period of 2016. The researches of the aquatic biological resources of Kamchatka and of the north-west part of the Pacific Ocean 48: 62–70. (In Russian). Otolith structures of juvenile pink and chum salmon from trawl catches of complex surveys provided in October-November of 2016 by R/V "Professor Kaganovsky" were examined. The otolith samples for the analysis were collected from 600 pink salmon individuals and 1150 individuals of chum salmon. Obtained results allow to identify hatchery marked fish in mixed catches. In the total there were 15 (2.5%) pink and 50 (4.3%) chum salmon individuals revealed with otolith marks of different salmon hatcheries (SHs) of Russian Far East and Japan. Structure of hatchery juvenile release in the Sea of Okhotsk basin was analyzed. The highest number of juvenile pink and chum salmon was released from the Shs of Sakhalin, and the leader in the release of marked juvenile pink was Sakhalin cluster of the hatcheries, and of chum salmon - the cluster of Japan. It was figured out based on the analysis of the otoliths of juvenile pink salmon from the Sea of Okhotsk, that the percental contribution of fish from different regions into the catches is generally fits structure of the release of marked juvenile pink salmon from the SHs of Russian Far East and Japan. In the ratio between marked Russian and Japan juvenile chum salmon in the Sea of Okhotsk juvenile aggregations the part of Russian hatcheries was first time ever higher than the part of the hatcheries of Japan, what can indirectly evidence in favour of increasing survival of marked fish from Russian SHs and better quality of the marks. It was figured out during analysis of the distribution of marked juvenile pink salmon in the west part of the Sea of Okhotsk, that the sites of the catches of marked pink in most cases coincided with the sites of increased density of pink salmon underyearlings. Analysis of distribution of marked juvenile chum salmon in the waters of the sea has revealed that in 2016 there was rather obvious spatial dissociation between feeding juvenile salmon from Russian and Japan SHs.

Khrustaleva A.M. 2018. Inferring Adaptive Nature of Major Histocompatibility Complex (MHC) Polymorphism from Single Nucleotide Substitutions in Asian Sockeye Salmon Populations: II. Factors Determining Onne-DAB Gene Variability in the Kamchatka River Basin. Russ J Genet. 54: 1314–1322. (In English). Variability of the Onne-

DAB gene is examined using two single nucleotide polymorphisms (SNP) (One_MHC2_190v2 and One_MHC2_251v2) in datasets of early (spring) running sockeye salmon from tributaries and streams of the Kamchatka River basin. Differences in intrapopulation variability indices and interpopulation differentiation estimates in the datasets from different parts of the basin are most likely caused by action of different types of pathogen-induced selection in certain localities of the lake-river system. According to the results of factor analysis, two principal components (PC) are extracted. In sum, they explain 72% of general variability of genetic characteristics in the sockeye salmon datasets. A significant correlation between the second PC (33.4%) values and geographical distances from the corresponding tributary to Azabach'e Creek (Lake Azabach'e was selected as a reference point because it is the nursing lake for young sockeye from several tributaries and is located near the Kamchatka River mouth) is revealed. Moreover, a highly significant correlation between the second PC and prevalence of plerocercoid of Diphyllbothrium sp. in fish from the tributaries is derived.

Khrustaleva A.M., Ponomareva E.V., Ponomareva M.V. et al. 2018. Inferring Adaptive Nature of Major Histocompatibility Complex (MHC) Polymorphism from Single Nucleotide Substitutions in Asian Sockeye Salmon Populations: I. Different Forms of Selection Act in Sockeye Salmon Populations from the Ozernaya and Kamchatka Rivers. Russ J Genet. 54: 1199–1206. (In English). Variability of the Onne-DAB gene, which encodes the β-chain of class II major histocompatibility complex molecule (MHCII), is studied using One_MHC2_109, One_MHC2_190v2, and One_MHC2_251v2 single nucleotide polymorphisms (SNP) in the two largest Asian-Pacific coast populations of sockeye salmon that reproduce in the Ozernaya River and Kamchatka River basins. Differences in the nature of inheritance and degree of polymorphism of One_MHC2_190v2 and One_MHC2_251v2 are observed in samples from both lake-river systems, whereas One_MHC2_109 was uninformative. Samples collected from the lake and river spawning grounds of Lake Kurilskoe are characterized by high estimates of intrapopulation genetic diversity, whereas no intersample differences are revealed in the frequencies of haplotypes and phenotypes of the joint MHC2 locus. This can be interpreted as the result of balancing selection in sequences encoding the MHCII peptide-binding region in this sockeye salmon population. This hypothesis is also confirmed by Ewens-Watterson neutrality tests. On the contrary, low genetic diversity estimates and significant heterogeneity of haplotype and phenotypic frequencies at the MHC2 locus are observed in the samples of early (spring) sockeye salmon from the Kamchatka River basin, apparently owing to the action of directional pathogen-induced selection in the Onne-DAB gene in some localities of the lake-river system.

Mamontova E.A., Lepskaya E.V., Tarasova E.N., Koval M.V., Mamontov A.A. 2018. The chlororganic pesticides and polychlornated bipheniles in tissues of resident sockeye salmon of Tolmachevskoye water reservoir, Kamchatka. Biology of inland waters 2: 76–83. (In Russian). Detected concentrations of chlororganic pesticides (COP) and polychlorinated bipheniles (PCB) in kokanee Pacific sockeye salmon (*Oncorhynchus nerka* kennerlyi) resident morph in Tolmachevskoye water reserve in Kamchatka is similar to levels observed in background freshwater lakes in the world. Spatial distribution of COP and PCB in kokanee in spawning grounds and in the pelagic zone of the reservoir and distribution in organs of the fish indicates of atmosphere origin of the toxicants and of permanent technogenous effects, appeared on constructing and due to operation of Tolmachevskoye water reservoir. The toxicants, arriving from these sources into the water, are getting built into the food chains of the water body. The allowed annual consumption is 10–26 kg of kokanee filet from Tolmachevskoye water reservoir and 1.2 kg of sockeye salmon caviar from Kurilskoye Lake.

Nagornov A.A., Kovalenko M.N., Adamov A.A., Soshin A.V. 2018. Results of the use of various fishing gears during pacific salmon fishery campaign in Kamchatka Region in 2017. The researches of the aquatic biological resources of Kamchatka and of the north-west part of the Pacific Ocean 49: 85–99. (In Russian). Results of Pacific salmon fishery campaign in Kamchatka in 2017 are demonstrated. Data on the salmon commercial marine and coastal catches in different fishing plots of fishing were analysed depending of the type of fishing gear used. General specifics of the gears and typical patterns are described for salmon fisheries using different gears. Recommendations to further design and development of salmon fisheries in Kamchatka are provided on the results obtained.

Ponomareva E.V., Khrustaleva A.M., Ponomareva M.V., Volkov A.A., Shubina E.A. 2018. Features of D-loop mtDNA haplotypes diversity of sockeye salmon *Oncorhynchus nerka* Walbaum . Genetika i razvedenie zhivotnykh. 2: 45–50. (In Russian with English abstract). The haplotypes of the D-loop mtDNA complete sequence in 60 sockeye salmon (Oncorhynchusnerka Walbaum) specimens from the mainland part (the Anadyr River, the Pakhacha River, the Azabachye Lake,the Kamchatka River, the Vorovskaya River) and the island part (Iturup, Paramushir, Shumshu) of the areal were analyzed. After multiple alignment of the sequences, a part of 1025 bp mtDNA comprising the entire D-loop sequence was examined, the GC content of this fragment was 39.8%. Four polymorphic sites were identified (0.3%of all sites), 4 of them informative, all substitutions were transitions, and four indels were identified. Only one substitution was observed in the D-loop region before poly-T repeat, the remaining variable sites were located in the second half of the analyzed mtDNA fragment. For Sockeye Salmon, a low diversity of D-loop haplotypesis characteristic: in total, 4 haplotypes for substitution and 7 haplotypes with indels were identified. Two haplogroups were identified, differing in three substitutions. Two most common haplotypes A and B are distinguished, differing by 3 substitutions. Haplotypes A and B are present in both groups of populations, two more haplotypes are found among the mainland populations. On the Kuril Islands there are only A and B haplotypes. Taking into account the indeles, haplotypes A and B differ by 3 substitutions and 2 indeles and, taking into account the indeles, a haplotype which was found only in fishes of the Kurile Islands was revealed. Taking into account the indels, the index of the haplotypes diversity (Hd) increases to 0.75, the haplotypes diversity index in group of continental populations is higher than in the populations of the Kurile Islands. Thus, the D-loop of mitochondrial DNA of sockeye salmon possesses structural features: most variable sites are located at a site after poly-T repeat, and a large number of indeles are present with low haplotypic diversity. With that, in the structure of the current genetic diversity of sockeye salmon there is traced a decrease in the population number and fragmentation of the sockeye salmon areal in the Late Pleistocene.

Zaporozhets O.M., Zaporozhets G.V. 2018. Results of the instrumental evaluation of the abundance of early sockeye salmon in tributaries of Nachikinskoye lake (the basin of the Bolshaya river, West Kamchatka) in 2018. Bulletin of Pacific salmon studies in the Far East 13: 149–152. (In Russian). The survey provided in the basin of the lake Nachikinskoye in 2018 with the use of the quadrocopter Phantom 4 Pro allowed to examine distribution of early spawning sockeye salmon in details, to evaluate density and summary escapement. In particular prespawning aggregations of the early race of sockeye salmon in the lake from late June to late July were examined first time, and photographies of the spawning grounds were made from the air in tributaries of the lake. It is concluded, based on interpretation of the photography and calculations that the run of early sockeye salmon in 2018 was 28-30 thousand specs.

Zelennikov O. V., Varaksin I. A. The approach to determination the ratio of both sexes of pink salmon juveniles. Bulletin of Pacific salmon studies in the Far East 13: 145–148. (in Russian). There is caution that fish farmers may influence on fish sex during the breeding and feeding salmon juveniles at their first life stages. It is the fact that the newly spawned salmon juveniles are not eating during their migrations through the Sakhalin short rivers. The main goal of the current issue is to analyses a number of fish samples sufficiently required to determine the ratio of fish sexes. Juveniles sex was identified by sampling the fish before their releasing from the fish hatchery and by catching other salmon juveniles during their migration from the spawning area. In total, there were collected around 50 samples with at least of 100 fish individuals (usually more than 100) in each sample, and fish sex was definitely identified for 7710 juveniles. We suppose that the common sample of 100 or even 200 individuals is not sufficient and informative. However, the two or more samples with more than 200 ind. per each probably may significantly increase the representativeness and reveal the actual sex ratio among pink salmon juveniles.

Zolotukhin S.F. 2018. Methods of chum and pink salmon stock evaluation in the Amur River basin. Bulletin of Pacific salmon studies in the Far East 13: 134–139. (in Russian). For the Amur River and its estuary`s fishing area, the largest salmon river in the Russian Far East, long period of change in methods for Pacific salmon stocks assessing was a characteristic feature of the resources management. Given the scarcity of Funds and personnel specialists, Khabarovsk branch of TINRO-center in 2006 was faced to the assessment of the Pacific salmon stock by Petersen`s tagging method. The accounting point was chosen not for the spawning area, but the mouth of the Amur. It should be noted by R. Beaverton and S. Holt that "tagging can be used to estimate mortality, not to determine the fish number". So, wrong data on Amur River pacific salmon abundance were got during last decade. In these conditions, it is time to return to standard methods for escapement estimating and stop chum salmon and pink salmon tagging. To improve the accuracy of model calculations for salmon stocks in the Amur River, we consider it necessary to provide an annual survey of spawning grounds. This project will require certain funds (transportation, equipment, funds per diem), as well as building human scientific and technical capacity of Khabarovsk branch (2–3 groups of 2–3 people) in August and October. The abundance of chum salmon and pink salmon can be estimated from the known total spawning areas and observed average density of fish.