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Russian Bibliography of 2014 Publications Linked to the Current NPAFC Science Plan

by

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Russian Bibliography of 2014 Publications Linked to the Current NPAFC Science Plan

ABSTRACT

The bibliography lists original papers and documents published in 2014 by Russian scientists and their collaborators relevant to the 2011-2015 NPAFC Science Plan. The bibliography lists 55 papers, corresponding to the five key research components of the NPAFC Science Plan.

INTRODUCTION

The Science Sub-Committee of the North Pacific Anadromous Fish Commission (NPAFC) developed a five-year Science Plan (2011-2015). The plan includes five components: 1) Migration and survival mechanisms of juvenile salmon in the ocean ecosystems; 2) Climate impacts on Pacific salmon production in the Bering Sea (BASIS) and adjacent waters; 3) Winter survival of Pacific salmon in the North Pacific Ocean; 4) Biological monitoring of key salmon populations; and 5) Development and application of stock identification methods and models for management of Pacific salmon.

The current bibliography lists original papers and documents published in 2014 by Russian scientists and their collaborators relevant to the 2011-2015 NPAFC Science Plan as well as other salmon studies. The bibliography lists 55 papers, corresponding to the five key research components of the NPAFC Science Plan. Each publication is listed under one research component, although some of them are relevant to several components. The references were given with abstracts if papers included abstracts in English. Otherwise, they listed without abstracts.

BIBLIOGRAPHY

COMPONENT 1: MIGRATION AND SURVIVAL MECHANISMS OF JUVENILE SALMON IN THE OCEAN ECOSYSTEMS

Lazhentsev, A.E. and O.A. Maznikova. 2014. Juveniles of pink and chum salmon in the southern Okhotsk Sea in their late marine stage (August-October 2012). Distribution, feeding, patterns of growth. Izv. TINRO 176: 51–61. (In Russian with English abstract).
Ontogeny of one generation of pink and chum salmons is described for the period after their juveniles redistribution from coastal waters to deep-water areas in the central and southern
Okhotsk Sea in August-November, 2012. The juveniles fed very intensively in August when their diet had about 85 % of proteins and 15 % of lipids due to prevalence of hyperiids and oikopleuras with low fat content. Their growth rate was high at this stage, and energy expenditure on growth took about a half of the ration (56–63 % for pink salmon and 40 % for chum salmon). The feeding intensity became lower in October, but caloric content of the food increased because of partial replacement of its protein fraction by lipids, which content exceeded 75 %. Linear growth rate decreased in October in 3.8 times for pink salmon and in 1.8 times for chum salmon, it took 21–27 % of food energy for the pink and almost the same portion as in August for the chum. Both feeding activity, growth rate, and fat deposit depended on temperature. Temperature in August was more favorable for feeding and metabolic processes, in particular for pink salmon that was able to consume daily up to 1/10 of its body weight and spend > 50 % of the energy for the growth, but water cooling in October caused lesser feeding, lower metabolism, and slower growth.

Starovoytov, A.N., A.A. Somov, P.O. Emelin, and O.A. Maznikova. 2014. Pacific salmon in the nekton community of the upper epipelagic of the south-western Bering Sea in October 2014. Bulletin of Pacific salmon studies in the Russian Far East 9: 173-184. (In Russian).

COMPONENT 2: CLIMATE IMPACTS ON PACIFIC SALMON PRODUCTION IN THE BERING SEA (BASIS) AND ADJACENT WATERS

Dulepova, E.P. 2014. Dynamics of production parameters for zooplankton as the main component of forage base for nekton in the western Bering Sea. Izv. TINRO 179: 236-249. (In Russian with English abstract).
Production parameters of zooplankton are calculated and analyzed on the data of plankton surveys in the framework of BASIS-1 and BASIS-2 research projects conducted in the western Bering Sea in 2002–2013. Top-ten species forming the bulk of non-predatory zooplankton production are the copepods *Calanus glacialis, Eucalanus bungi, Neocalanus plumchrus, Pseudocalanus minutus, Metridia pacifica, Oithona similis,* and *Neocalanus cristatus* and euphausiids *Thysanoessa inermis, Th. raschii,* and *Th. longipes*. The arrowwarm *Sagitta elegans* produces the main part of predatory zooplankton production. Functional characteristics of trophic groups and production of the whole zooplankton community depend on ratio of these mass species. During the surveyed period, the non-predatory zooplankton production was the highest in the northern part of the western Bering Sea (2531–3160 mg/m^{3}yr) and the lowest in the deep-water part (944 mg/m^{3}yr), whereas the predatory zooplankton production was the highest in the deep-water part of the Sea and over the western shelf. The portion of zooplankton production available for grazing by fish is estimated, and the areas with possible problems for planktivorous consumers are determined: all of them are located in the deep-water part of the western Bering Seas.

Volkov, A.F. 2014. State of Pacific salmon forage base in the Bering Sea in 2003-2012 (The result of the international expedition BASIS-1 and 2). Izv. TINRO 179: 250-271.
Research of Pacific salmon in the Bering Sea on the program NPAFC covered two periods: warm (2003-2006) and cold (2007-2012). The data on the ice cover show synchrony of its dynamics in the western and eastern parts. Indicators of progress of the ice cover and bottom temperatures indicate a short duration of these periods before 2000 (1-3 years), followed by a long warm (2001-2006) And cold, which started in 2006 has lasted for 6 years. In 2013, the position of the southern boundary of the maximum sea ice extent has changed insignificantly, so there is no reason to think this year the end of the cold period. These climatic changes are most radical impact on the structure of plankton communities east of the sea: the dominance of zooplankton SF and MF was replaced by the dominance of LF by increasing the biomass of common species of large groups of plankton - euphausiids hyperiids, copepods and Sagitta. This restructuring adequately reflected in the nutrition of Pacific salmon: for example, if in 2003-2006. basis of the diet of pink, chum and sockeye salmon fingerlings were pollock, sand lance, capelin, flounder larvae, fry of small demersal fish and crab larvae, starting from 2007 became the basis of food zooplankton: euphausiids hyperiids, pteropods. In the western part of the sea of perestroika in the plankton diet of salmon, similar to that observed in the eastern part, did not occur, although the annual dynamics of the abundance of common species and groups of LF, form the basis of forage salmon was great, but more often than offset by the sharp decline in the following year, a sharp increase.

Zavolokin, A.V., V.I. Radchenko, and V.V. Kulik. 2014. Dynamics of trophic structure for the epipelagic community in the western Bering Sea. Izv. TINRO 179: 204–219. (In Russian with English abstract).
Changes of quantitative composition and trophic structure of the nekton community in the western Bering Sea are considered for the last decades and role of pacific salmons in dynamics of trophic flows is evaluated in dependence on their abundance using the ecosystem model Ecopath. Two models are developed that describe trophic structure of the community in two cases: 1) low biomass of salmons and high biomass of walleye pollock (in 1980s, the year 1986 is analyzed as an example) and 2) decreased pollock biomass and increasing salmon biomass (in 2000s, the year 2006 as an example). Besides, a hypothetical situation is modeled with the salmon biomass multiplied by 1.5 relative to its level in 2006. Significant decrease of pollock abundance between 1980s and 2000s caused twofold reduction of total food consumption by nekton species; the heightened consumption by salmons and squids in the 2000s compensated only a small part of this reduction. However, the tenfold increase of salmons biomass changed their main diets with lowering of the prey trophic level from amphipods and squids to euphausiids, copepods, and pteropods. Now the salmons are the only numerous predator group of the fourth trophic level in the upper pelagic layer of offshore waters in the western Bering Sea. Due to their high trophic plasticity, they can feed by wide range of prey belonged to 2–3rd trophic levels that supplies them by a large amount of food. Even in the modeled case of increasing of the salmon biomass in 1.5 times relative to the level of 2000s, the current level of forage resources is able to support their populations. There is concluded that carrying capacity of the western Bering Sea is excessively sufficient for pacific salmons in periods of their high abundance.

COMPONENT 3: WINTER SURVIVAL OF PACIFIC SALMON IN THE NORTH PACIFIC OCEAN ECOSYSTEM

Naydenko, S.V. and A.L. Figurkin. 2014. Spatial distribution of pink salmon in the Subarctic Front zone in winter-spring. NPAFC Doc. 1507 . 22 pp. (Available at http://www.npafc.org)
Spatial distribution of pink salmon and the habitat conditions in the central and western parts of the Subarctic Front zone are considered on the data obtained in the winter-spring season of 1986–1992 and 2009–2011. The pink salmon spreads widely in the epipelagic layer of the mixing zone and adjacent waters, in the wide range of the salinity (32.7–34.9 ‰) and sea surface temperature (0.5–12.0 °C). Its distribution is determined by shape of the landscape zone favorable for its dwelling in winter-spring, so depends on the mode of the western Subarctic gyre in the North-West Pacific, on the mode of the Subarctic Front, and on intensity of the ocean branches of the East-Kamchatka Current and Aleutian Current. Besides, the quantitative parameters of its distribution depend on fluctuations of the pink salmon abundance between odd and even years.

COMPONENT 4: BIOLOGICAL MONITORING OF KEY SALMON POPULATIONS

Antonov, A.A., A.V. Buslov, I.Yu. Bragina, A.A. Zhivoglyadov, and P.S. Sukhonos. 2014. The results of marking of pink salmon along southeastern Sakhalin in 2014. Bulletin of Pacific salmon studies in the Russian Far East 9: 154-157. (In Russian).

Elnikov, A.N. and A.V. Gritsenko. 2014. Dynamics of biological characteristics of pacific salmon *Oncorhynchus* spawners from the Apuka River and the Olutorskiy gulf of the Bering Sea in 2007-2012. The researches of the aquatic biological resources of Kamchatka and of the North-West part of the Pacific Ocean 33: 5-14 (In Russian with English abstract).
The article gives results of 2007-2012 research studies of matured Pacific salmon g. *Oncorhynchus* collected from the Apuka River and the Olutorskiy gulf of the Bering Sea describing interannual and seasonal dynamics of their biological characteristics and the causes of such dynamics.

Erokhin, V.G. 2014. Commercial catch of Kamchatka sockeye salmon in the conditions of time reduction of gillnet fishing in an economic zone of Russia. Bulletin of Pacific salmon studies in the Russian Far East 9: 146–149. (In Russian).

Erokhin, V.G. and E.S. Voronova 2014. Forecasting run size of chum salmon spawners of the North–Eastern Kamchatka in 2012–2014 basing on trawl counting of its juveniles during the initial year of their ocean residence. The researches of the aquatic biological resources of Kamchatka and of the north–west part of the Pacific Ocean Collection of scientific papers. 33: 15–24. (In Russian with English abstract).
On the base of 12 seasonal trawl accountings of juvenile chum salmon (*Oncorhynchus keta*) abundance in the Bering Sea estimation of fingerling abundance has been performed, the relationship between the smolt abundance and spawner's returns has been analyzed. According to the results of trawl surveys carried out in 2008 and 2010 the number of returns of accounted generations has been forecasted for the period 2010–2016 and for the following years: 2012 (4.1 mln inds.), 2013 (6.0–6.2 mln inds.), 2014 (5.3–5.4 mln inds.).

Fadeev, E.S. 2014. Hydroacoustic assessment of adult escapement of Pacific salmon (genus Oncorhynchus) in small and mediate river systems. The researches of the aquatic biological resources of Kamchatka and of the north–west part of the Pacific Ocean Collection of scientific papers. 34: 29–34. (In Russian with English abstract).
Abundance of sockeye salmon *Oncorhynchus nerka* and coho salmon O. kisutch spawners in the

Azabach'e Lake and Kikhchik River respectively was assessed with the use of "NetCor" hydroacoustic complex in 2013. It has been figured out operation specifics of the device at mentioned water bodies and recommendations on the use in order to improve quantitative valuation of Pacific salmon in streams of Kamchatka. Comparative analysis was made for data obtained from using the hydroacoustic complex, visual observations from the air and from the land. The number of spawners in the channel of Azabach'e Lake reviled by the hydroacoustic method was strongly different from the number estimated from the helicopter. The difference possibly may be caused by extensive predation of bears on spawning grounds, reducing the number of fish. An erroneous counting chars as Pacific salmon, unavoidable for the hydroacoustic complex, also may distort true number of Pacific salmon spawners.

Feldman, M.G., E.A. Shevlyakov, and Zh.Kh. Zorbidi. 2014. Forecasting the runs of pacific salmon (for example – a coho salmon of the Western Kamchatka) on the base of "stock–recruitment" models and time series extrapolation simulations. The researches of the aquatic biological resources of Kamchatka and of the north–west part of the Pacific Ocean Collection of scientific papers. 34: 87–106. (In Russian with English abstract).

The paper provides analysis of the issues of forecasting runs of Pacific salmon. The stock used as a basis in simulation was the West Kamchatkan stock of coho salmon *Oncorhynchus kisutch*. Simulations of two classes were compared and used in regression analysis: of time series and of the relationship between the spawning stock and the recruitment. It is suggested to perform the forecast either as a product of probability density of forecasts of different models or as an average weighted result of density–based forecasts of several regression models.

Golub, E.V. 2014. Age composition of Chukchi sockeye salmon Oncorhynchus nerka. Izv. TINRO 179: 10–31. (In Russian with English abstract).

Long-term data on age composition for Chukchi populations of sockeye salmon are presented. Spawners of 23 ages are recognized in the period 1970-2013 for 10 populations: 2+, 3+, 0.1+, 0.2+, 0.3+, 0.4+, 0.5+, 1.1+, 1.2+, 1.3+, 1.4+, 1.5+, 2.1+, 2.2+, 2.3+, 2.4+, 2.5+, 3.1+, 3.2+, 3.3+, 3.4+, 4.2+, and 4.3+. The brood stock basis is formed by five- and six-year fish of 1–2-year freshwater feeding and 3-year marine feeding. The greatest diversity in the age composition is observed at the northern limit of the Asian sockeye salmon natural habitat — i.e. in the Seutakan and Achchen lake-river systems. The spawners dropped into the sea at the age of 0+ and 1+ years are more common in the populations with prevailing limnophilous forms of sockeye (rivers Khatyrka, Tumanskaya and Anadyr, Seutakan lake-river system), and the spawners dropped at the age 2+ and 3+ years — in the populations with domination of its rheophilous form (Meinypilgyn lake-river system, Orianda and Amaam lagoons). As compared with the sockeye salmon from central spawning areas of the habitat, the Chukchi sockeye has more complicated age composition of reproductive part of stocks, greater duration of marine feeding, females predominance among fast-maturing fish returning after 2 years of marine life, higher portion of males in senior age groups, and minor level of kokanee salmon and jacks. Brief description of spawning and/or feeding ponds for Chukchi sockeye salmon is presented.

Golub, E.V., A.P. Golub, S.B. Baranov, Y.A. Diachkova, and U.V. Bauer. 2014. The research and harvest of the Pacific salmon in Chukotka in 2014. Bulletin of Pacific salmon studies in the Russian Far East 9: 68–73. (In Russian).

Gorodovskaya, S.B. and A.S. Sushkevich. 2014. Rate of gonads development of different species of Pacific salmon during the early sea period of life in 2010–2012. Vestnik of Kamchatka University 29: 57–64. (In Russian).

Goryainov, A.A., N.I. Krupyanko, and A.V. Lisenko. 2014. The state of stocks of pink and chum salmon in the Primorskiy region. Vladimir Ya. Levanidov's Biennial Memorial Meetings 6: 181-190. (In Russian).

Goryainov, A.A., N.I. Krupyanko, and A.V. Lisenko. 2014. Salmon fishing season in the Primorskiy region in 2014. Bulletin of Pacific salmon studies in the Russian Far East 9: 59-64. (In Russian).

In-channel processes hazards and salmon habitats at the Kamchatka peninsula. Edited by S.R. Chalov, V.N. Leman, A.S. Chalova Moscow: VNIRO Publ. 2014. 240 p (In Russian with English abstract).

The Kamchatka Peninsula lies between the Pacific Ocean to the east and the Sea of Okhotsk to the west and is considered the last global gene pool for wild salmon (Oncorhynchus). This study is based on research from the point of view of geomorphology, ecology, hydraulics, sediment transport, environmental management and river engineering. A detailed, integrated treatment of river channel dynamics is developed in the study to better understand natural and human-induced hazards of in-channel processes. The latter include man-made structures, severe bank erosion and river widening, and degradation of aquatic and riparian habitats.

The abundant field research of in-channel processes conducted over the last few decades on the Kamchatka peninsula gives a comprehensive assessment of stream morphodynamics and salmon populations in the context of current river engineering on the peninsula. The book also contains the full story of the construction of the Kamchatka gas pipeline, bridges and channel bank protection structures along Kamchatka rivers with a special focus on the impacts on channel adjustments and salmon populations.This book will be of interest to academics and advanced level students who are studying fluvial geomorphology, river engineering, and ecology. It will also appeal to all engineers and managers who are interested in river adjustment and management.

Kanzeparova, A.N. and S.F. Zolotukhin. 2014. Trauma as Pacific salmon mortality rate from predators and fishing gear. Vladimir Ya. Levanidov's Biennial Memorial Meetings 6: 294-301.

This paper presents analysis of some types of injuries that occur in the Pacific salmon in their native watersheds: Amur River, northwestern parts of the Sea of Okhotsk and the Sea of Japan. Conclusions about prevailing reasons for the elimination of the adult pink and chum salmon in different areas of the Sea of Okhotsk and the Sea of Japan are presented. Two scales for assessing of wild and anthropogenic impact for chum and pink salmon is introduced.

Kaev, A.M. 2014. Some results of pink salmon fishery at Sakhalin and southern Kuril Islands in 2014. Bulletin of Pacific salmon studies in the Russian Far East 9: 37-43. (In Russian).

Kaev, A.M., A.A. Antonov, A.V. Zakharov, Yu.I. Ignatyev, K.Y. Kim, and L.V. Romasenko. 2014. The results of quantitative account of the fry pink salmon migrants in Sakhalin rivers in 2014. Bulletin of Pacific salmon studies in the Russian Far East 9: 69-78. (In Russian).

Kaev, A.M. and N.V. Klovach. 2014. Revision of data on pink salmon abundance in East Sakhalin and Kuril Islands. NPAFC Doc. 1501. 11 pp. (Available at www.npafc.org)

Pink salmon reproduction parameters vary substantially in different regions of East Sakhalin coast, North and South Kuril Islands. Trends in population dynamics differ as well. On this evidence we carry out a revision of data on pink salmon abundance (catches) in East Sakhalin coast and Kuril

Islands. The data were represented separately on northwest coast, north and south parts of east coast of Sakhalin Island, as well as on north and south Kuril Islands

Kaev, A.M. and Yu.I. Ignatyev. 2014. Distribution of fry pink salmon migrants in a small Sakhalin river. 2014. Bulletin of Pacific salmon studies in the Russian Far East 9: 79-83. (In Russian).

Koval, M.V., E.V. Lepskaya, V.A. Dubynin, and E.A. Shevlyakov. Biological monitoring of a key salmon population: Ozernaya River sockeye salmon of West Kamchatka. Newsletter of the North Pacific Anadromous Fish Commission N35. January 2014. Published by NPAFC Secretariat (Suite 502, 889 West Pender Street Vancouver, B.C., CANADA): 15–20 (Available at http:// www.npafc.org).

Lepskaya, E.V., M.V. Koval, L.A. Bazarkina et al. 2014. Formation and modern state of ecosystem in Tolmachevskoye reservoir (Kamchatka) and the acclimatized there population of kokanee (*Oncorhynchus nerka kennerlyi*). Izv. TINRO 178: 95–115. (In Russian with English abstract).

Evolution of local ecosystem in Tolmachevskoye reservoir and changes in its artificia population of kokanee salmon are traced on the data of authors' observations in 2009–2013 and previous archival and cited data. Decreasing of inorganic phosphorous, nitrogen, and bioavailable iron is detected in the water against a background of water warming. As the result, phytoplankton production and abundance decrease, its species composition becomes simpler, chlorophyll a concentration becomes lower. Zooplankton abundance is stable (1–2 g/m3), as before the reservoir appearance, but species structure of plankton crustaceans is changed, and the copepods Cyclops scutifer, small cladocerans Holopedium gibberum, Bosmina longirostris, and Daphnia (Daphnia) cristata group prevail recently. The salmon food spectrum is wide and includes a lot of unedible fractions as wood chips and plant detritus; coefficientof consumption is high – these factors indicate a deficiency of forage resources for fish. The fish condition indicates a chronic malnutrition. The state of female gonads is satisfactory, without any visible pathology, as in 2003–2007, but the oocytes resorption goes concurrently with maturation of gonads that is a sign of hard competition for the food within the kokanee population. The current stable state of the population differs from preceded stages of its development by lower stock add smaller size of fish, the age of spawning is now 4–7 years. Among other freshwater fish, the kokanee salmon is distinguished by high content of щ–3 polyunsaturated fatty acids. Artificial populations in Kamchatka could be considered as a resource for both amateur or sport fishing and commercial aquaculture.

Markevich, G.N. and D.S. Pavlov. 2014. Biological characteristics of some Pacific salmon species in the lower reaches of the Kamchatka River at the beginning of the XX–th century (by the results of the analyzed unpublished archival data of P. Yu. Schmidt). The researches of the aquatic biological resources of Kamchatka and of the north-west part of the Pacific Ocean 32: 59–63. (In Russian with English abstract).

1908–1909 never before published data on biological characteristics of Pacific salmons and catch dynamics in the lower reaches of the Kamchatka River collected by the Kamchatkan Expedition of Russian Geographical Society (the Ryabushinskiy's expedition) are reported in this article. The data presented in original materials (diaries, letters and separate notes) which were written by the head of zoological group of P. Yu. Schmidt's expedition now are stored in the archives of the Russian Academy of Sciences and Russian Geographical Society. The authors of the article discovered, processed and analyzed them.

Ostrovsky, V.I. 2014. Factors controlling abundance of downstream juvenile pink salmon (Oncorhynchus gorbuscha) in the Mi River. Izv. TINRO 177: 156-166. (In Russian with English abstract).

Nonlinear multiplicative model is developed that describes dependence of the pink salmon juveniles abundance in the Mi River (Amur Estuary) on number of their parents and some meteorological factors. The spawning stock is the most significant factor that explains 44.7 % of the abundance dispersion. Among meteorological factors, winter air temperature correlates positively (23.9 % of dispersion) and air temperature during anadromous migration and spawning of pink salmon correlates negatively (5.8 % of dispersion) with the juveniles abundance. In sum, these factors explain 73.7 % of abundance variability for the downstream migrants. In the years with equal number of spawners, the highest abundance of juveniles can be in 6.69 times higher than their lowest abundance because of the meteorological factors influence.

Ostrovsky, V.I. 2014. Factors controlling the pacific salmon juvenile abundance. Vladimir Ya. Levanidov's Biennial Memorial Meetings 6: 502-508. (In Russian with English abstract).

Simulation modeling results of a dependence of Pacific salmon juveniles abundance on their parents number and on some meteorological factors are presented. These models are elaborated for 3 chum populations (Oncorhynchus keta) and 2 pink salmon populations (Oncorhynchus gorbuscha) from Khabarovsk territory rivers. It is revealed for all these populations that such factor as a number of parents has the most significant influence on juvenile abundance. Each particular factor has the same direction of relation to juvenile abundance in different populations. Chum juvenile abundance is more influenced by precipitation changes, as pink salmon abundance is more dependent on air temperatures. Analysis of a model sensitivity shows that meteorological conditions variations within the observed values can lead to 6-10 fold changes in juvenile abundance.

Shevlyakov, E.A., D.Yu. Khivrenko, G.V. Bazarkin. 2014. Some results of the research of anadromous juvenile pacific salmon in Kamchatka Rive for the period from 2000 to 2010. The researches of the aquatic biological resources of Kamchatka and of the north-west part of the Pacific Ocean 32: 35–47. (In Russian with English abstract).

Juvenile Pacific salmon biostatistician data, collected in the system of Kamchatka River for the period 2000−2010, have been analyzed. Description of morphological and weight characteristics has provided for all species. Two waves in juvenile down stream migration of chum salmon underyearlings has revealed. Otherwise, there was no any authentic correlation between parental stock and generation they produce or certain age group in the generation revealed for mentioned data pool.

Shuntov, V.P., O.S. Temnykh, and V.A. Shevlyakov. 2014. "Failed" salmon fishing season–2014: expected result and more favorable forecast for fishing season–2015. Bulletin of Pacific salmon studies in the Russian Far East 9: 3-10. (In Russian).

Starovoytov, A.N., A.A. Khoruzhiy, A.A. Somov, and O.A. Maznikova. 2014. Pacific salmon in the nekton community of the upper epipelagic of the western North Pacific in June-July 2014. Bulletin of Pacific salmon studies in the Russian Far East 9: 167-172. (In Russian).

Zavolokin, A.V., V.V. Kulik, and L.O. Zavarina. 2014. The food supply of the pacific salmon of the genus Oncorhynchus in the northwestern Pacific Ocean. 1. The dynamics of the food spectra and feeding intensity. Russian Journal of Marine Biology 40(2): 100-111.

Based on the data of 28 surveys that were carried out by the Pacific Fisheries Research Center in the Sea of Okhotsk, Bering Sea, and Pacific waters during 2001–2010, we analyzed the interannual variability of indirect indices of the food supply of the Pacific salmon (Oncorhynchus spp.): the daily food ration, daily consumption rate, diel feeding chronology, diet overlap, trophic niche breadth, number of prey items, and the share of minor food. The years of the most pronounced changes in the diet composition and consumption rate of Pacific salmon were revealed. The variability of different trophic characteristics as indicators of the salmon food supply is discussed. Despite a significant increase in salmon abundance in the 2000s compared to previous years, no marked changes occurred in their feeding spectra and consumption rates.

Zavolokin, A.V., V.V. Kulik, and L.O. Zavarina. 2014. The food supply of the Pacific salmon of the genus Oncorhynchus in the northwestern Pacific Ocean. 2. Comparative characterization and general state. Russian Journal of Marine Biology 40(3): 199-207.
The interannual variations and general state of the food supply of Pacific salmon (Oncorhynchus spp.) in the 2000s in the northwestern Pacific Ocean (including the Bering Sea and the Sea of Okhotsk) were analyzed based on indirect characteristics that indicate the variability of their forage base, feeding habits, growth, and biomass. A new index for the quantitative evaluation of food supply was suggested. The food supply of the Pacific salmon during the 2000s was found to be sufficient to maintain the normal functioning of populations. With high abundance of Pacific salmon, the food supply tended to decrease. However, this caused no negative consequences for the survival of major salmon stocks during the marine period of life and, as a rule, no marked decrease in the food consumption and growth rates of fish. A relative increase in food competition was compensated by adaptive changes in the diet and diel feeding rhythm of salmon. With the shortage of preferred food organisms (amphipods, euphausiids, and pteropods), Pacific salmon changed to consuming minor prey (copepods and chaetognaths), and numerous mesopelagic species of macroplankton and micronekton in the evening hours.

Zikunova, O.V. 2014. Biological characteristics for chinook salmon *Oncorhynchus tschawytscha* (Walbaum) spawners in the Kamchatka River basin. The researches of the aquatic biological resources of Kamchatka and of the north-west part of the Pacific Ocean 32: 48–58. (In Russian with English abstract).
Materials including both historical and present–day data are presented in this article. Analysis of population structure of Chinook salmon of the Kamchatka River basin has been carried out. The aggregated biostatistical data provide evidence that the following considerable changes have occurred by the present time in the population structure: “rejuvenation”, declines in the average size, reduction of the fecundity of females and their number. The abundance of Chinook salmon of the Kamchatka River basin shows a significant decreasing trend caused by abrupt diminution of run size.

Zorbidi, Zh.H., A.M. Biryukov, and T.N. Travina. 2014. Biology of juvenile coho salmon in some lake–river systems of Kamchatka. The researches of the aquatic biological resources of Kamchatka and of the north–west part of the Pacific Ocean Collection of scientific papers. 33: 55–63. (In Russian with English abstract).
Results of biological analysis of juvenile coho salmon from some lake–river systems – Palanskoye Lake, Nalychevo L., Kalygyr L.) of Kamchatka are demonstrated. Age composition of foraging juvenile coho salmon stocks and character of their feeding is figured out, data on morphometry are provided. Juvenile coho salmons in Nalychevo lake–river system are generally smaller comparing to those in the other systems. Underyearling coho salmon of Palanskoye Lake demonstrated extensive

variety of body length and weight, body condition and intensity of foraging. The exterior difference between the representatives of different lakes is generally determined by configuration and size of pectoral fns and disposition of single and pair fns on the body. In this way the most active swimmers should be considered coho salmon of Kalygyr Lake.

COMPONENT 5: DEVELOPMENT AND APPLICATIONS OF STOCK IDENTIFICATION METHODS AND MODELS FOR MANAGEMENT OF PACIFIC SALMON

Bugaev, A.V., R.A. Shaporev, and A.V. Zavolokin. 2014. Origin and distribution of chum salmon *Oncorhynchus keta* stocks in the western Bering Sea and North–West Pacific in 2009 and 2010. Izv. TINRO 179: 177–203 (In Russian with English abstract).

Intraspecific structure of feeding and prespawning aggregations of chum salmon in the western Bering Sea in September–October of 2009 and 2010 and in the North–West Pacific in June–July of 2009 and 2010 is investigated on the data of trawl surveys conducted by Pacific Fish. Res. Center (TINRO) aboard RV Professor Kaganovsky in the framework of the Bering–Aleutian Salmon International Survey, second stage (BASIS–II). In total, 4246 specimens of chum salmon from mixed aggregations were subjected to biological analysis, and for 2462 of them the intra–specific status was identified on the base of scale structure (the scale baseline included the scale data for 11460 chum individuals belonged to 43 local stocks from Asia and North America). Both for the Bering Sea and Pacific Ocean, domination of Russian stocks is defined, contribution of Japanese stocks is significantly lower and lowered comparing with previous years, as 2002–2004 and 2006, and contribution of North American stocks is poor and does not exceed statistical error value of the method. For the western Bering Sea the ratio by countries of the fish origin is the following: Russia 93.8–95.3 %, Japan 2.9–5.2 %, USA 1.0–1.9 % for immature chum salmon in autumn of 2009–2010; and Russia 88.8 %, Japan 9.8 %, USA 1.4 % for maturing chum salmon in autumn of 2009. For the North–West Pacific in summer of 2009–2010, the ratio is similar: Russia 75.4–88.7 %, Japan 10.1–23.9 %, USA 0.7–1.2 % for immature chum salmon; and Russia 81.0–83.0 %, Japan 15.9–17.7 %, USA 1.1–1.3 % for maturing chum salmon. Based on this ratio, the relative abundance of stock complexes by countries of origin is assessed (106 ind.): Russia 107.81–123.32, Japan 3.75–5.98, USA 1.15–2.33 for immature chum salmon in the western Bering Sea in 2009 and 2010; Russia 6.34, Japan 0.70, USA 0.10 for maturing chum salmon in the western Bering Sea in 2009; Russia 19.27–37.74, Japan 6.11–4.30, USA 0.18–0.51 for immature chum salmon in the North–West Pacific in 2009 and 2010; and Russia 29.02–42.60, Japan 5.56–9.31, USA 0.38–0.68 for maturing chum salmon in the North–West Pacific in 2009 and 2010. For the immature chum salmon in the North–Western Pacific, the assessments of intraspecific composition and relative abundance of different groups should be considered as preliminary results, because of insufficient number of the scale samples.

Khrustaleva, A.M., M.T. Limborg, and J.E. Seeb. 2014. Genetic variation among major sockeye salmon populations in Kamchatka peninsula inferred from SNP and microsatellite DNA analyses. NPAFC Doc. 1519. 17 pp. (Available at www.npafc.org)

Sockeye salmon samples from six populations from Kamchatka Peninsula were tested for polymorphism at six microsatellite (STR) and forty-five single nucleotide polymorphism (SNP) loci. These populations included the five largest populations in the region. Statistically significant genetic differentiation among the local populations from this part of the species range examined was demonstrated. The STR variability points to pronounced genetic divergence of the populations from two geographical regions, Eastern and Western Kamchatka. The results of SNP analysis further

revealed that the populations of the two northern Kamchatka rivers (Palana River and Pakhacha River) differed significantly from the other populations studied. We estimated the efficiency for both types of markers for individual assignment of fish taken in mixtures. Accuracy was generally higher for assignment with SNP data; however, pooling of the STR and SNP data sets provided higher accuracy than with either one alone.

Khrustaleva, A.M., N.V. Klovach, O.F. Gritsenko, and J.E. Seeb. 2014. Intra- and interpopulation variability of southwestern Kamchatka sockeye salmon *Oncorhynchus nerka* inferred from the data on single nucleotide polymorphism. Russian Journal of Genetics 50(7): 736-748 (In English).

The variability of 45 single nucleotide polymorphism (SNP) loci was studied in nine samples of the sockeye salmon *Oncorhynchus nerka* from the rivers of southwestern Kamchatka. The Wahlund effect, gametic disequilibrium at some loci, and a decrease in interpopulation genetic diversity indices observed in samples from the Bolshaya River outlet can be attributed to the samples' heterogeneity. Partitioning of the mixed samples using some biological characteristics of the individuals led to a noticeable decrease in the frequency of these phenomena. It was demonstrated that the allelic diversity between the populations within the river accounted for the larger part of genetic variation, as compared to the differentiation between the basins. The SNP loci responsible for intra- and interpopulation differentiation of sockeye salmon from the rivers of southwestern Kamchatka were identified. Some recommendations for field population genetic studies of Asian sockeye salmon were formulated.

Pilganchuk, O.A., N.Yu. Shpigalskaya, V.A. Dubynin, O.N. Saravanskiy, U.O. Muravskaya, and N.V. Varnavskaya. 2014. Identification of early river form of sockeye salmon in the Ozernaya Rivebasin with microsatellite loci. The researches of the aquatic biological resources of Kamchatka and of the north–west part of the Pacific Ocean Collection of scientific papers. 34: 62–71. (In Russian with English abstract).

Some results of allelic frequencies analysis of fve microsatellite loci – Oki1a, Oki1b, Oki6, Ots107, Ots3 in sockeye salmon samples taken from the Ozernaya River basin are presented in this paper. Two seasonal–ecological forms differing in these features have been marked out, corresponding to early and late spawning periods. Temporal stability of used molecular–genetic markers has been confirmed. Reference database on allelic frequencies of microsatellite loci has been broadened, its resolving capacity has been defined. It is shown, that accuracy of genetic identification of samples from mixed river catches occurred in the Ozernaya River is on the level 83% for sockeye salmon of early spawning period and 84% – for that of late spawning period. Using of allelic frequencies of microsatellite loci for identification of mixed river samples let to determine the ratio of individuals of the distinguished seasonal forms in different periods of spawning running. It is shown, that individuals, anadromous migration of which occurs till the middle July, with high probability may be referred to the early river form.

OTHER PUBLICATIONS

Chalov, S.R., E.V. Esin, and G.V. Aizel. 2014. Geological factors governing ichthyofauna formation in rivers of Semlyachikskii volcanic region (Eastern Kamchatka). Water Resources 41(3): 242-251 (In English).

The role of environmental factors is considered for the lower reaches of rivers and creeks originating from the slopes of volcanoes of the Scmlyachikskaya group (East Kamchatka volcanic region). The

hydro-logical and environmental conditions of rivers and creeks flowing into the Semlyachikskii Llman are described for the first lime. The specific hydrological and geomorphological characteristics of the lower reaches of those streams and the relationship between abiotic characteristics and the specific features of the structure and abundance of fish communities are studied. The spawning intensity (density) of salmon Salmonidae and the complexity (balance) of the structure of young fish and resident fish communities depend on the stream size. The habitation density and the uniformity of young fish distribution are determined by channel slope and the morphology of channel relief forms. The temperature regime determines fish growth rate, and water chemistry determines the phonetic features of resident fish population.

Chalov, S.R. and V.N. Leman. 2014. Management of mining according to environmental standards: case study of Kamchatka peninsula. Water sector of Russia 2: 69-86 (In Russian with English abstract).
Based on long-term data we analyzed possible impacts of mining of salmon river ecosystem. Open-pit mining alters the stream hydrology and enhances sediment transport. The present study focuses on sediment transport in the area of the platinum placer mining located at the north of Russia's Kamchatka Peninsula (Seynav-Galmoenan placer deposits). The regional standards of mining impact are compared with data on salmon diversity shifts. Impact of sediment delivery due to area of disturb lands is correlated with salmon community status.

Esin, E.V. and S.R. Chalov. 2014. Ecological classification of rivers of volcanic Kamchatka's territories. Vladimir Ya. Levanidov's Biennial Memorial Meetings 6: 220-238 (In Russian).
Variety of conditions of the river fauna formation within the volcanic Kamchatka territories is considered. Specific changes in water flow and sediment, turbidity, temperature and stream flow regime as well as the chemical composition of river water are evaluated. Environmental classification based on the ranking factors considered by the degree of adverse effects.

Frolova, N.L., A.V. Stanovova, and S.L. Gorin. 2014. Hydrological regime of the Kamchatka River in the lower reaches and its long-term variability. The researches of the aquatic biological resources of Kamchatka and of the north-west part of the Pacific Ocean 32: 73–78. (In Russian with English abstract).
Analysis of temperature, annual and seasonal precipitation, river and groundwater runoff, hydrological regime variability features for the period 1955-2008 of Kamchatka River in its lower reaches were prepared. Data of other rivers of Kamchatka Peninsula for characterizing of this variability were also used. Modern estimations of river and groundwater water resources for down-stream station and for the whole Kamchatka basin were given.

Gorin, S.L., E.V. Lepskaya, G.N. Markevich, and L.A. Anisimova. 2014. Mouth area of the Kamchatka River at the beginning of the XX-th century: hydrological conditions, morphological structure, aquatic biota (according to the research material of F.P. Ryabushinskiy's expedition). The researches of the aquatic biological resources of Kamchatka and of the north-west part of the Pacific Ocean 32: 89–101. (In Russian with English abstract).
The paper analyzes the research material of F.P. Riabushinskiy's expedition describing mouth area of the Kamchatka river. Among the studied materials there are some rare publications and archives sources whose facts have never been published before. The analyzed expedition's data shows that in 1908–1909 the Nerpiche and Kurilskoe lakes were freshwater, most of the estuarine lagoons were freshwater too and only their seashore areas underwent poor alkalinization at the end of winter period. Lake biota was composed by freshwater lower plants, invertebrates and fish species. But in

spite of all this, “sea” correlation of ions in the Nerpich'e and Kurilskoe lakes as well as relic “sea” composition of fauna was observed throughout the area. Besides occasional catchings of semi-anadromous fish species (herring and smelt) in the Nerpich'e lake were registered. The research data of F.P. Riabushinskiy's expedition describing the Kamchatka river mouth area is not outdated as it can be used for comparing with up-to-date data on brackish-water stage of development of the mouth area.

Izergina, E., I. Izergin, and L. Izergin. 2014. Atlas of blood cells salmonidae of mainland coast of the Northern part of the Sea of Okhotsk. Magadan: Cordis. 127 p. (In Russian).
Given the characteristics of the formed elements of the peripheral blood of chum and pink salmon. Described the adaptive changes in the morphological picture of young salmon’s blood with a short freshwater period occurring during smoltification. It is shown the possibility of using the data for estimation of the survival of juvenile fish in the early period of life. There are original photos of blood cells at different stages of chum and pink salmon smoltification. The book is intended for researchers and practitioners: biology, cytology, physiology, ichthyologists, fish farmers, as well as university students in areas of training "Biology and agriculture."

Khovanskaya, L., B. Safronenko, and E. Fomin. 2014. Manual on artificial breeding of Pacific Salmon in hatcheries of Magadan region. Magadan: Cordis. 147 p. (In Russian).
The manual outlines the methods and techniques of artificial breeding of salmon in the Pacific salmon hatcheries of Magadan region with regard to the specific climatic and geographical conditions of Northern Coast, current and modern breeding biotechnologies of Pacific Salmon in Magadan region and the Russian Far East as well, taking into account species-specific features of Pacific Salmon. There is a fish-breeding standard of biological and physiological characteristics of juvenile chum salmon when it is return from the hatchery as the main subject of reproduction in Magadan region. The manual is intended for professionals involved in the breeding of Pacific Salmon, design research and development of biotechnological solutions for the construction, reconstruction and modernization of salmon hatcheries in Magadan region. In addition, it may be useful to learn the experiences of fish farmers in other regions of the Far East of Russia.

Lepskaya, E.V., O.B. Tepnin, V.V. Kolomeitsev et al. 2014. Historical review of studies of Avachinskaya Bay and principle results of complex ecological monitoring 2013. The researches of the aquatic biological resources of Kamchatka and of the north-west part of the Pacific Ocean 34: 5–21. (In Russian with English abstract).
The article provides brief historical review of ecological studies for Avachinskaya Bay. Results of complex monitoring provided by KamchatNIRO in 2013 are demonstrated. The data were compared to the literature and archival data. Presence in mineral compounds in spring time is shown for nitrogen and phosphorous. In the course of warming and flooding the bay obtains increased number of organic substances. Since 2003 the average concentration of biogenic elements has been almost stable. In 2013, like in the late 1980s, diatom microalgae were dominating in phytoplankton. The maximal bloom of the phytoplankton was observed in autumn. Potentially toxic microalgaes *Alexandrium tamarense*-complex (producing saxitoxin) and *Pseudonitzschia seriata*-complex (proucing domoic acid) have been found in August and in autumn respectively (in the concentrations 1000 cells/l and 20 000 cells/l, both requiring to launch toxicological control of fish and selfish for food if it were in Europe or North America). Predominant zooplankton complex was quite sustainable from 1988. In 2013 the maximum of zooplankton was observed in early summer (June) and minimum — in mid summer (July). The most unsatisfactory plot on sanitary and microbiological indexes in 2013 was the site of the city central beach neighboring area of

Kultushnoye Lake outlet.

Mamontova, E.A., E.N. Tarasova, M.I. Kuzmin, B.Z. Borisov, V.I. Shershneva, V.I. Karpenko. 2014. Some data about parasites contamination and anomalies of Pacific salmon (genus Oncorhynchus) in sea waters. Vestnik of Kamchatka University 29: 89–95. (In Russian).

Markovtsev, V.G. and V.N. Akulin. 2014. Analysis of the state and prospects of salmon hatcheries in the Russian Far East. Bulletin of Pacific salmon studies in the Russian Far East 9: 111-120. (In Russian).

Markovtsev, V.G. 2014. State of artificial reproduction of masu salmon in the countries of the Japan Sea basin. Bulletin of Pacific salmon studies in the Russian Far East 9: 121-126. (In Russian).

Naydenko, S.V. and A.A. Khoruzhiy. 2014. Food supply for nekton in the epipelagic layer of Pacific waters at Kuril Islands in the summer seasons of 2000s. Izv. TINRO 176: 240–260. (In Russian with English abstract).
Data of 8 surveys conducted by Pacific Fisheries Research Center (TINRO-Center) in the Pacific waters at Kuril Islands in 2004–2012 are summarized to consider forage base and food relationships of nekton and plankton and to estimate consumption of forage resourced by nekton. The total stock of zooplankton and micronekton in the epipelagic layer changed from 62 to 158 million tons over the shelf and slope of the surveyed area and from 41 to 75 million tons in its deep-water part. Mezopelagic fishes, squids, pacific salmons, and subtropical fishes were the main consumers of these forage resources in summer. The portion of zooplankton stock consumed annually by nekton was relatively low: 4.2–9.3 % for shelf and slope areas (data for 2004, 2007, and 2011) and 4.5–15.6 % for the deep-waters (data for 2004, 2007, 2009, and 2011), without significant year-to-year changes in the diet composition and feeding intensity of nekton. There is concluded that zooplankton and micronekton of the studied area serve successively the food needs of its consumers and carrying capacity of the epipelagic layer in the Pacific waters at Kuril Islands is quite substantial.

Pospekhov, V., G. Atrashkevich, and O. Orlovskaya. 2014. Parasitic worms of anadromous salmonidae of Northern Sea of Okhotsk. Magadan: Cordis. 128 p. (In Russian).
Summarizing of the results of long-term (2001-2013) Helminthological studies of Pacific Salmon and anadromous chars genus Salvelinus, carried out in the basins of the three largest rivers in the northern part of the mainland coast of the Sea of Okhotsk - Tauy, Yama and Gizhiga, as well as in coastal waters Tauiskaya Guba. Total are found 53 species of helminths (43 genus, 30 families, 13 orders, 5 classes, 3 types - Plathelminthes, Nemathelminthes, Acanthocephales) and 3 species of parasitic cancers (2 genus, 2 family, 1 squad class Crustacea, type Arthropoda).

Zolotukhin, S.F., A.N. Makhinov, and A.N. Kanzeparova. 2014. Features of morphology and hydrology for spawning rivers at the northwestern coast of the Okhotsk Sea. Izv. TINRO 176: 139-154. (In Russian with English abstract).
At the northwestern coast of the Okhotsk Sea, pink salmon finds its spawning grounds both in big rivers (Uda, Okhota, and some other) and small streams because the size, slopes, and structure of alluvial sediments of the majority of local water bodies are suitable for the spawning. In small streams (< 20 km long), the pink salmon prefers to spawn in the simplest parts of beds, with linear channel sloped enough for bottom infiltration, but the chum salmon usually does not spawn there.

These environments are rare for large rivers of this area which are more turbulized, with the beds often transformed by floods, strongly meandering, highly branched, and sometimes splitted to several channels; however, the largest and the most numerous spawning sites of pink and chum salmons are maintained in the latter case of splittedriver-bed that is typical for lower parts of the biggest rivers, though other parts of these rivers are not preferable for their spawning because of high instability of the environments. The spawning grounds of chum salmon are more resistible against floods than the pink salmon ones: they form around either parafluvial (hyporheic) or ortofluvial springs. Generally, theareas with underwater springs preferable for the salmons spawning are more usual for big rivers with variable geomorphology, numerous tributaries, and extended multichannel parts.

Zhmur, N.S., O.M. Lapshin, A.V. Ulatov. 2014. A problem of degradation of salmon reservoirs ecosystems of in the conditions of a gold mining on Kamchatka. Ecology and the industry of Russia 4: 42–47. (In Russian).

Zhmur, N.S., O.M. Lapshin, and A.V. Ulatov. 2014. A problem of preservation of an inhabitancy of salmon fishes in the conditions of development of mineralno–raw making economy of the Kamchatka region. Biosphere 6(1): 5–16. (In Russian).