

Russian Bibliography Publications Linked to the NPAFC Science Plan in 2017

by

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Submitted to the

NORTH PACIFIC ANADROMOUS FISH COMMISSION

by

Russia

April 2018

THIS PAPER MAY BE CITED IN THE FOLLOWING MANNER:

Kanzeparova, A.N., O.S. Temnykh, V.A. Shevlyakov, A.V. Bugaev, N.V. Klovach, V.V. Volobuev, E.V. Golub, and V.I. Ostrovsky. 2018. Russian bibliography publications linked to the NPAFC Science Plan in 2017. NPAFC Doc. 1753. 18 pp. Pacific Scientific Research Fisheries Center (TINRO-Center), Kamchatka Research Institute of Fisheries and Oceanography (KamchatNIRO), Russian Federal Research Institute of Fisheries and Oceanography (VNIRO), Magadan Research Institute of Fisheries and Oceanography (MagadanNIRO), Pacific Scientific Research Fisheries Center, Chukotka (ChukotTINRO), and Pacific Scientific Research Fisheries Center, Khabarovsk (KhfTINRO) (Available at <http://www.npafc.org>).

Russian Bibliography Publications Linked to the Current NPAFC Science Plan in 2017

ABSTRACT

The current bibliography lists original papers published in 2017 by Russian scientists and their collaborators relevant to the 2017–2020 NPAFC Science Plan as well as other salmon studies. The bibliography lists 85 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. Publications are listed in alphabetic order, because most 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

Bachevskaya L.T. and G.A. Agapova. 2017. Intrapopulation variability of the chum salmon *Oncorhynchus keta* (Walbaum) from the Northern part of the of the Sea of Okhotsk with natural and artificial reproductive types. Bulletin of the North-East Scientific center, Russia Academy of Sciences 2: 65-73. (In Russia with English abstract).

On the basis of the long-term data analysis, genetic and phonetic diversity of the chum salmon populations from the northern part of Sea of Okhotsk influenced by artificial reproduction was estimated. In the course of study, no relationship between the variability level by the studied markers and the population number has been revealed. In all examined localities, growth tendency or statistically significant increase of genetic diversity concerning natural breeding period, possibly caused by outbreeding, has been detected. Another reason may be the use of insufficient percentage of the gene pool of spawning populations for fish-breeding purposes, which (under a high level of intrapopulation heterogeneity) leads to the shift of genetic diversity values compared to historically developed one, and, consequently, results in the number reduction.

Batts B., S. Rudakova, E. Bochkova, R. Breyta and G. Kurath. 2017. Comparison of Russian IHNV Glycoprotein Sequences to Historical Virus Strains. 58th Western Fish Disease Workshop on June 20-22, 2017 at the Clearwater Resort, Suquamish, Washington.

Bochkova E.V. 2017. First detection of infectious hematopoietic necrosis virus in mature chum salmon (*Oncorhynchus keta*) on salmon hatchery (Kamchatka). Salmonids: biology, conservation and restoration. Proceedings of the international conference. 18–22 September (Petrozavodsk, Karelia, Russia): 25-26. (In Russia with English abstract).

About the first case of isolation of the virus of infectious hematopoietic necrosis virus in hatchery chum salmon (*Oncorhynchus keta*) spawners in Kamchatka.

Bugaev A.V. 2017. Evaluation of contributions of stock abundance and global temperature anomaly to mean body weight of pacific salmon in the North Pacific basin. Izv. TINRO 191: 3-31. (In Russia with English abstract).

Dynamics of stocks is considered for pacific salmon in the North Pacific in 1925–2015 on the data from Russia, Japan, Canada, and the USA. The mean body weight dependence on the stock values and global air and sea surface water temperature is examined and evaluated by means of multi-dimensional regression analysis for the period 1961–2015. For many cases, interannual dynamics of the mean body weight depends strongly on combined effect of the corresponding stocks fluctuations and change of the global temperature anomaly index for the North Hemisphere: the multiple regression coefficient is $R > 0.6$ for 40% of the tested time series. The highest correlation is found for chum and chinook salmon from Russia, pink and chinook salmon from Alaska, chum and sockeye salmon from Canada, and pink and chum salmon from Washington, Oregon, and California (Japanese data on body weight aren't analyzed because of drift nets selectivity). Dominant predictors correlate negatively with the body weight for all species. Contribution of the global temperature index prevails for approximately 70% of the rows. The stock is more important for pink and sockeye salmon from Russia and Alaska and in the former case the temperature index has positive correlation with the body weight. The relationships do not reflect direct influence of stocks or temperature on the weight but are presumably based on adaptive response of the populations to changes of feeding conditions for optimization of the stocks. This mechanism is confirmed by such temporal pattern as sub-trend dynamics typical for fluctuations of the salmon's mean body weight, that means that this parameter demonstrates a tendency to long-term increasing or decreasing, changing periodically. Recent level of the body weight and catch indicates sustainable feeding conditions for pacific salmon in the North

Pacific, at least in the last two decades, that unfortunately cannot be confirmed for the whole region by direct observations.

Bugaev A.V., S.L. Rudakova, N.A Rastyagaeva., A.I. Chistyakova. Romadenkova N.N. and Frolov O.V. 2017. Scientific basis for activities in Pacific salmon aquaculture in Kamchatka territory. Bulletin of Pacific salmon studies in Far East 12: 143-154. (In Russian).

Chernova, O.F., O.M. Zaporozhets, and Y.Y. Dgebuadze. 2017. Scanning electron microscopy of scales of the chum salmon *Oncorhynchus keta* (Salmonidae). Journal of Ichthyology. Vol. 57. № 6: 743-749. (In Russia with English abstract).

Using scanning electron microscopy, the main structures of the surface sculpture of scales of mature wild and hatchery fishes and hatchery juveniles of chum salmon *Oncorhynchus keta* from Kamchatka rivers are examined and described.

Chistyakova A.I. and A.V. Bugaev. 2017. An assessment of the part of juvenile hatchery pink and chum salmon during fall migrations in the Sea of Okhotsk in 2015 on the results of the otolith marking. Aquatic biological resources of Russia: status, monitoring, management. Materials of Russian scientific conference with foreign participation, dedicated to the 85th anniversary of Kamchatka Research Institute of Fisheries and Oceanography (October, 3–6, 2017, Petropavlovsk-Kamchatsky):369-373. (In Russia with English abstract).

The research was made to study the otolith structure of juvenile pink and chum salmon from the trawl catches of complex survey carried out by the R/V “Professor Kaganovsky” in October of 2015. The otoliths were collected from 725 pink and 1074 chum salmon individuals. Obtained results allowed to identify hatchery marked individuals in the mixed samples. There were 2% of pink salmon and 4.1% of otolith marked chum salmon individuals from the salmon hatcheries of Russian Far East and Japan revealed. Analysis of the otolith structure of juvenile pink salmon from the Sea of Okhotsk has indicated that the ratio between the fish from different regions in the catches is generally similar to the structure of the hatchery releases of juvenile pink salmon in the region of the Sea of Okhotsk. Similar analysis of juvenile chum salmon otoliths has shown that the percentage of fish from Russian regions in the catches corresponds to the structure of Russian hatchery marked chum salmon releases. The view of the spatial distribution of marked juvenile pink salmon in the western part of the Sea of Okhotsk demonstrates that the plots where the fish were sampled are generally the plots of increased densities of feeding juvenile pink salmon, but feeding juvenile chum salmon released from Russian and Japan salmon hatcheries demonstrate different spatial distribution.

Gavruseva T.V., E.V. Bochkova, T.V. Ryazanova, N.V. Sergeenko and E.A. Ustimenko. 2017. Influence of some environmental factors on juvenile coho salmon *ONCORHYNCHUS KISUTCH* reared at the Viluy sky hatchery (Kamchatka) in 2017. The researches of the aquatic biological resources of Kamchatka and of the north-west part of the Pacific Ocean. Collection of scientific papers. Vol. 45: 62-70. (In Russia with English abstract).

In this study, we analyzed the causes of increased mortality of juvenile coho salmon reared at the Vilyuisky hatchery in 2017. Based on the results of complex (virological, bacteriological, parasitological) studies of fish, it was established that the epizootic situation at the hatchery was satisfactory. The results of the histological and hematological studies showed structural abnormalities in the kidneys, liver and gills and degenerative changes in blood cells characteristic of toxicosis. Most likely, the increased mortality of fish arose against the backdrop of chronic toxicosis caused by poor-quality feeds and the periodic introduction of contaminated stream water in to the hatchery.

Golub E.V. and A.P. Golub. 2017. About spawning of Pacific salmon in the Kazachka River. Bulletin of Pacific salmon studies in Far East 12: 139-142. (In Russian).

Golub E.V. and A.P. Golub. 2017. The research and harvest of the Pacific salmon in Chukotka in 2017. Bulletin of Pacific salmon studies in Far East 12: 39-45. (In Russian).

Gorodovskaya S.B. and A.S. Sushkevich. 2017. Gametogenesis of juvenile chum salmon during the periods of early sea and fall migration in the Sea of Okhotsk and some ovary histomorphologic changes in 2014. Bulletin of Kamchatka State Technical University. № 39: 46-54. (In Russia with English abstract).

Based on the histological analysis of ovaries of juvenile chum salmon during the early period of feeding at sea and the autumn period, the development rate of ovaries in 2014 is shown. The presence of oocytes with the initial phase of vitellogenesis demonstrates accelerated development gonads of juvenile chum salmon in open waters of the Sea of Okhotsk. Anomalies in the female reproductive system of juvenile chum salmon are revealed for the first time: there are oocytes with holoschisis, gamete deformation and changes in the vitelline membrane. Ovary abnormality of juvenile chum salmon serves as a criterion of the level of anthropogenous impact and gradually will lead to reducing fertility and as a result decreasing spawning efficiency, reducing the level of natural reproduction of the species.

Gorodovskaya S.B. and A.S. Sushkevich. 2017. Histomorphological transformations in ovaries of juvenile Pacific salmon in early marine and fall migrations in the Sea of Okhotsk in 2014 and 2016. Salmonids: biology, conservation and restoration. Proceedings of the international conference. 18–22 September (Petrozavodsk, Karelia, Russia): 44-47. (In Russia with English abstract).

Histological analysis of the ovaries of juvenile Pacific salmon in early marine and fall periods of life has indicated morphological transformations of the ovaries in 2014 and 2016. Various abnormalities in female reproductive system of juvenile chum salmon (from 8 to 10 % of all individuals examined in different years) are revealed first time. Oocytes with the traits of amitotic division of the nucleus, gamete deformations and changes in yolk envelopes were observed. These pathological deviations of the gonad development in juvenile fish will not create problem for females to participate in spawning process, but with time can lead to significant reduction of fecundity and hence to reduce spawning efficiency, number of spawners and scale of natural salmon production.

Ignatov N.N., A.V. Artyukhin and B.P. Safronkov. 2017. Biological monitoring of artificially created chum salmon population in the Kulkuty River (Tauysky Bay of the Sea of Okhotsk). Bulletin of Pacific salmon studies in Far East 12: 64-70. (In Russian).

Ignatov N.N., A.V. Artyukhin and B.P. Safronkov. 2017. The results of fish-breeding actions on Pacific salmon incubatory material collecting in the Magadan area in 2017. Bulletin of Pacific salmon studies in Far East 12: 71-73. (In Russian).

Ivanov O.A. 2017. Marine ecology of Pacific salmon (*Oncorhynchus spp.*) myths and reality. Salmonids: biology, conservation and restoration. Proceedings of the international conference. 18–22 September (Petrozavodsk, Karelia, Russia): 65-66. (In Russia with English abstract).

Kaev A.M. 2017. Pink salmon (*Onchorhynchus gorbuscha*) of the Sakhalin-Kuril region: monitoring and some of its results. Aquatic biological resources of Russia: status, monitoring, management. Materials of Russian scientific conference with foreign participation, dedicated to the 85th anniversary of Kamchatka Research Institute of Fisheries and Oceanography (October, 3–6, 2017, Petropavlovsk-Kamchatsky): 148-155. (In Russian with English abstract).

The current state of monitoring for pink salmon *Onchorhynchus gorbuscha* abundance and reproduction in spawning river basins of the major stocks of the Sakhalin-Kuril region (control of the number of spawners on spawning grounds, the number of stations for annual sampling of juvenile escapement in monitored rivers, the sites of setting the trap-nets, where biological data are collected) is described. The forecast of the pink salmon stock abundance is usually based on estimation of the ratio between the number of juvenile escapement and the number of returned adult individuals from the corresponding year classes. Errors of the forecast are often high in the years when the ratio between the abundances of different generative lines has changed.

Kaev A.M. 2017. The results of pink and chum salmon fishery on the Sakhalin and southern Kuril Islands in 2017. Bulletin of Pacific salmon studies in Far East 12: 24-32. (In Russian).

Kaev A.M. 2017. To the discussion on pink salmon abundance decline in Aniva Bay (southern Sakhalin Island). Bulletin of Pacific salmon studies in Far East 12: 94-97. (In Russian).

Kaev A.M. and D.A. Kaev. 2017. Results of studies of scale circulus structure of the southeastern Sakhalin pink salmon in 2016. Bulletin of Pacific salmon studies in Far East 12: 155-158. (In Russian).

Kaev A.M. and L.V. Romasenko. 2017. Pink and chum salmon of Kunashir Island (stock structure, reproduction, and fishing). Yuzhno-Sakhalinsk: Publishing house of the Sakhalin State University: 124.

The monograph presents long-term data of the Kunashir Island pink and chum salmon harvest, their abundance and biological features. Peculiarities of the adult return and juvenile downstream migration of these species are studied. The offspring survival in the freshwater and marine periods of life is estimated. The dynamics of pink salmon stocks is shown to be determined by two temporal forms – early and late, and that of chum salmon by a river form and a unique lake form known only for the Kuril Islands. The book will be useful both for scientists and specialists engaged in different spheres of fisheries, and for students because it introduces some fundamental aspects of Pacific salmon population dynamics.

Kaev A.M., D.V. Avdeev, G.N. Dzen, A.V. Zakharov and V.D. Nikitin. 2017. The results of count of juvenile pink salmon migrants in rivers of Sakhalin-Kuril region in 2017. Bulletin of Pacific salmon studies in Far East 12: 74-81. (In Russian).

Kalchenko E.I. and T.N. Travina. 2017. The effects of the spawning runs of the Pacific Salmon on the biochemical indexes of zoobenthos in Bolshaya river (West Kamchatka). Salmonids: biology, conservation and restoration. Proceedings of the international conference. 18–22 September (Petrozavodsk, Karelia, Russia): 71. (In Russian with English abstract).

Effects of Pacific salmon spawning escapement on the quality indexes of macrozoobenthos in Bolsjaya river (West Kamchatka) are demonstrated.

Kalchenko E.I., T.N. Travina, I.Yu. Bezludskaya, V.F. Bugaev, N.A. Rastyagaeva and O.O. Kim. 2017. Effects of salmon hatchery activities on the quality of zoobenthos and juvenile Pacific salmon in Bolshaya river (West Kamchatka). Vladimir Ya. Levanidov's Biennial Memorial Meetings. Vol. 7.: 33. (In Russia with English abstract).

Estimation of the effects of activities of the SH «Ozerki» in Plotnikova river (the Bolshaya river basin) on the quality of benthos invertebrates and juvenile Pacific salmon is made.

Kanzeparova A.N. 2017. The dynamics of the pink salmon sizes on the northwestern continental coast of the Okhotsk sea. Salmonids: biology, conservation and restoration. Proceedings of the international conference. 18–22 September (Petrozavodsk, Karelia, Russia): 73-74. (In Russia with English abstract).

Khrustaleva A.M., Klovach N.V., Seeb J.E. 2017. Genetic variability and population structure of sockeye salmon from the Asian Coast of Pacific Ocean Russ J Genet. 53: 1126-1136. (In English).

Variability of six microsatellite loci and 45 single nucleotide polymorphism (SNP) loci was analyzed in 17 samples of sockeye salmon from 10 major spawning watersheds on the Asian coast of the Pacific Ocean. On the basis of the analysis of SNP loci variability of sockeye salmon in the examined part of the range, five population groups were identified, including local stocks from the Palana, Okhota, and Kamchatka rivers, as well as the population groups of Southwestern Kamchatka, and Northeastern Kamchatka and Chukotka. Rather different pattern of samples differentiation was obtained by estimating variability of six microsatellite DNA loci. Regional complexes of the eastern and western coasts of Kamchatka were identified. Moreover, sockeye salmon from the Palana River fell into the cluster of Western Kamchatka populations, while the population from the Okhota River and Meynypilgin lake–river system (Chukotka), confined to the subperiphery of the range, where the most differentiated from the others. The possible reasons for the discrepancies and high divergence of the Palana River and the Okhota River sockeye salmon populations, inferred from the SNP markers analysis, are discussed.

Khrustaleva A.M., Ponomareva E.V., Ponomareva M.V., Klovach N.V. 2017. Study of single nucleotide polymorphism DNA in populations of sockeye salmon at Kamchatka, northwestern coast of the Okhotsk Sea, and Chukotka. Izv. TINRO 190: 18-32. (In Russia with English abstract).

Population structure of Asian sockeye salmon is considered by variability of 45 loci of single nucleotide polymorphism DNA (SNP) in 17 samples from its 10 major spawning grounds at Chukotka, Kamchatka, and northwestern coast of the Okhotsk Sea. General pattern of genetic heterogeneity of sockeye salmon is well corresponded with spatial-geographic structure of the species. Five groups of populations are determined by cluster analysis and AMOVA: the so called nuclear populations at Kamchatka, as the population complexes of the Ozernaja River and Kamchatka River, the group of secondary stocks of the lake-river systems at Koryak coast, and two subperipheral populations of Chukotka and the Okhota and Palana Rivers. The groups split to the south and north complexes. Possible mechanisms of such differentiation with close similarity among populations of South-East Kamchatka and strongly separate population of the Palana and Okhota Rivers are discussed taking into account other markers (microsatellite loci, mtDNA). There is supposed that high differentiation of the Palana and Okhota River sockeye is caused by mutual impact of adaptive (local selection) and demographic (gene drift, effective number decrease) processes in this population.

Klovach N.V., Leman V.N., Uglova T.Yu. 2017. Current state of the stocks and the fishery of Iturup island (the Southern Kuril Islands) pink salmon. *Rybnoe khozyajstvo*. 6:41-45. (In Russia with English abstract).

The article presents data on the dynamics of the pink salmon fishery in the southern Kuril Islands against the backdrop of the dynamics of salmon in the Far East in general, Sakhalin and Hokkaido. Factors affecting the stock status of individual stocks and the causes that led to reduction of Iturup pink salmon in recent years are considered.

L.A. Zhivotovsky, A.E. Lapshina, P.B. Mikheev, E.V. Podorozhnyuk, O.I. Pasechnik, A.V. Mamaeva, T.A. Rakitskaya, G.A. Rubtsova, K.I. Afanasiev and M. V. Shitova. 2017. Divergence of the seasonal races of chum salmon, *Oncorhynchus keta* Walbaum, 1792, in the Amur and Poronai rivers: ecology, genetics, and morphology. *Journal of marine biology*. Vol. 43. №. 4: 284–292. (In Russia with English abstract).

Chum salmon of the Amur River (the mainland part of the Far East) and the Poronai River (Terpenia Bay, Sakhalin Island) are historically related with one another, as the drainage basins of these rivers are the remnants of the formerly single river system, the Paleoamur, which existed when Sakhalin Island was a part of the continent. Both river populations of chum salmon consist of the early-run and late-run ecological forms (seasonal races), also referred to as the summer and autumn races. They are reproductively isolated from each other by spawning at different times and in different types of spawning grounds. To assess the direction, pattern, and degree of divergence between these chum salmon races in the both river fragments occurred since the Paleoamur, it is necessary to compare them with two types of traits: selectively neutral DNA markers, and morphological and physiological traits, variations in which may have an adaptive value. For this, we have studied chum salmon from both rivers in terms of microsatellite DNA markers, body counts and measurements, body weight, and fecundity. In both the Amur River and the Poronai River, the autumn race of chum salmon prevails over the summer one in body length and weight, fecundity, number of pyloric caeca, and some other meristic traits. The intra-basin differences between the races are much more pronounced in the Amur chum salmon. The inter-race differences in microsatellites are also greater in the Amur chum salmon compared to the Poronai chum. Using microsatellites, three levels of differentiation have been revealed: (1) between the basins of the Amur and Poronai rivers, (2) between the races within each of the river basins, (3) and between population samples within each race of each basin. A hypothesis is proposed that the currently existing races of chum salmon in the Amur and Poronai rivers have evolved since the breakup of the Paleoamur, and the intra-basin divergence of the races started in the Amur River earlier than in the Poronai River. An analysis of our own and the published data suggests that adaptation of the seasonal races of chum salmon to the conditions of their spawning grounds is determined by a complex of morphological and physiological traits, including the number of pyloric caeca, which is an adaptive and highly heritable trait associated with the incubation temperature of water.

Lepskaya E.V. and O.A. Pilganchuk. 2017. Kokanee of Kronotskoye lake. Possibility and necessity of biomanipulation. Materials of the second regional scientific-practical conference «Specially protected natural areas in Kamchatka territory: experience, management problems and prospects of development»: 144–147. (In Russia).

Lepskaya E.V., E.A. Kirillova, M.V. Koval, V.F. Bugaev, O.B. Tepnin, K.V. Bogdanova and A.A. Polyakova. 2017. Inrapopulation differentiation of kokanee (*Oncorhynchus nerka* Walbaum) in Tolmachevskoye reservoir (Kamchatka). Vladimir Ya. Levanidov's Biennial Memorial Meetings. Vol. 7.: 118-126. (In Russia with English abstract).

A wide-ranging experiment on the introduction of resident form of sockeye salmon (*Oncorhynchus nerka* Walbaum) – kokanee to fish-less eutrophic lakes was conducted in 1980th in Kamchatka. Tolmacheva Lake was among such water bodies. In 1997 this lake was artificially transformed into water storage reservoir. As a result, its morphology and temperature regime were changed. Natural population of kokanee from Kronotskoye Lake and artificial population from Karymskoye Lake were used as donors for introduction. Land-locked sockeye salmon from Kronotskoye Lake is represented by two phenotypic groups, which differ in the number of gill rakers (g.r.), body length, timing of spawning and location of spawning grounds. Kokanee was introduced to Karymskoye Lake from Kronotskoye earlier. Fish of unknown phenotypic groups were introduced to Tolmacheva Lake from Kronotskoye and many-rakered group was introduced from Karymskoye Lake. Accordingly, the primary ratio of fish from different phenotypic groups within the introduced ones to Tolmacheva Lake is unknown. Ratio of plankton-eating and benthos-eating kokanee was evaluated in Tolmachevskoye Reservoir in 2016 on the basis of data on the number of gill rakers. Three groups were marked out in the lake: few-rakered (38 g.r.). The most numerous is the group of many-rakered fish. Few-rakered fish and the ones from intermediate group are relatively small in number. Reliable difference in the body length, food spectrum and food bolus composition was not revealed. Causes of the intraspecific differentiation are discussed. Stability of the population structure in future and genetic differentiation of the groups are the questions for further investigations.

Lepskaya E.V., M.V. Koval, V.F. Bugaev, O.B. Tepnin, T.V. Gavryuseva, R.S. Galyamov and I.A. Zaochniy. 2017. The kokanee population from Tolmatcheskoe reservoir in 2016. // Materials of the VIII Russian scientific conference with foreign participation, devoted to the 75th anniversary of Kamchatka State Technical University “Natural resources: modern status, protection, commercial and technical use (April, 12-14, 2017, Petropavlovsk-Kamchatsky): 137-141. (In Russia with English abstract).

The kokanee population of Tolmatchevskoy Reservoir, including fish health, in 2016 is described.

Lepskaya E.V., M.V. Koval, O.B. Tepnin, V.F. Bugaev, T.V. Ryazanova, A.V. Sogrina and I.A. Zaochniy. 2017. Condition of the population of kokanee (*Oncorhynchus nerka*) in Tolmachevskoye reservoir in 2017. The researches of the aquatic biological resources of Kamchatka and of the north-west part of the Pacific Ocean. Collection of scientific papers. In print. (In Russia with English abstract).

Results of monitoring for the population condition of kokanee *Oncorhynchus nerka* in Tolmachev reservoir in 2017 are provided compared to 2011–2016. Length-weight, age, and gender structure, fecundity, health condition of feeding and spawning part of the population are analyzed in the river-reservoir continuum. An assessment of the stock and the spatial distribution of kokanee is made according the data of acoustic surveys.

Lepskaya E.V., T.A. Mogilnikova, S.V. Shubkin and O.B. Tepnin. 2017. First ever risks for fisheries in the course of fishing during the «red tides» on East Kamchatka. Bulletin of Pacific salmon studies in Far East 12: 106-112. (In Russian).

Lozovoy A.P. and V.I. Karpenko. 2017. Specifics of juvenile coho salmon scale structure in the lower part of the river Kol (West Kamchatka) in 2011. Bulletin of Kamchatka State Technical University. № 42: 71-76. (In Russia with English abstract).

Juvenile coho salmon scale structure has been analyzed for the Kol river population. Formation and growth specific of sclerites on the scales of juvenile coho salmon with the body length of 15-64

mm was clarified. Comparative data on the juvenile body length of the other pacific salmon species at the time of leaving the spawning gravels and transition to external feeding are provided. The differences revealed can be species specific in particular regions of reproduction. The character of sclerite growth dynamics on coho salmon scale in the Kol is figured out.

Markevich G.N., E.V. Yesin, V.N. Leman, K.V. Kuzischin and E.A. Shevlyakov. 2017. Prospects of fisheries development of Kronotskoye lake (Kamchatka). Problems of Fisheries. In print. (In Russia with English abstract).

Risk analysis for making anadromous stock of sockeye salmon *Oncorhynchus nerka* in the basin of Kronotskoye lake is made, taking into account world wide experience in constructing fish ladders and assisting juvenile migration process on risky plots. Approximate dimensions of the ladders, different from initially suggested in projects by TINRO, Leningradproect and Giproribprom, are suggested based on existing experience in constructing and using salmon ladders. In its scale the project has nothing to compare in the world. Sphere of challenges, requiring more research data to succeed, is figured out. A forecast of transformation of the lake ecosystem is provided and it says in favour of degradation of the original endemic fauna on introducing anadromous salmon. General possibilities of the use of the modern fauna of the lake without anthropogenic interference are figured out.

Markovtzev V.G., E.I. Barabanshchikov. 2017. Feeding base of the Russian zone of the Sea of Japan for feeding juvenile salmon. Bulletin of Pacific salmon studies in Far East 12: 117-121. (In Russian).

Naydenko S.V. 2017. The role of Pacific salmon in the trophic structure of the nekton communities of the upper epipelagic layer of the north-west Pacific Ocean. Salmonids: biology, conservation and restoration. Proceedings of the international conference. 18–22 September (Petrozavodsk, Karelia, Russia): 106-107. (In Russia with English abstract).

Ostrovsky V.I. 2017. Short-term forecasting of the result of fishery on the Amur salmon gen. *Oncorhynchus*. Izv. TINRO. Vol. 189: 25-34. (In Russia with English abstract).

Usefulness of operational data on catch of pacific salmon for forecasting of their annual landings is considered. The landing dependence on daily and cumulative catch is analyzed. The former index has better correlation with the annual landing in the beginning of the fishery season but later loses this advantage. The landing relationship with the latter index increases naturally with time and rather reliable forecasts could be based on its value from early July for pink salmon, from middle July for summer chum salmon, and from middle August for fall chum salmon.

Ostrovsky V.I. 2017. Short-term forecasting of the result of fishery on the Amur chum salmon (*Oncorhynchus keta*). The current state and prospects for the development of salmon farming in the Russian Far East. Yuzhno-Sakhalinsk, November 7-8: 24-25. (In Russian).

Ostrovsky V.I. 2017. Short-term forecasting of the results of chars (*Salvelinus sp.*) fishery campaign in the Okhotsk region. Aquatic biological resources of Russia: status, monitoring, management. Materials of Russian scientific conference with foreign participation, dedicated to the 85th anniversary of Kamchatka Research Institute of Fisheries and Oceanography (October, 3–6, 2017, Petropavlovsk-Kamchatsky): 163-166. (In Russia with English abstract).

Usefulness of operational data on catch of chars for forecasting of their annual landings is considered. The landing dependence on cumulative catch is analyzed. The landing relationship with

the cumulative catch increases naturally with time and rather reliable forecasts could be based on its value from 10 days, from start of fishery season.

Ostrovsky V.I., D.V. Kotsyuk, T.N. Mironova, E.V. Podorozhnyuk, A.S. Ponomarev, and A.P. Shmigirilov. 2017. Results of the salmon fishery in Khabarovsk region in 2017. Bulletin of Pacific salmon studies in the Russian Far East 12: 46-54 (In Russian).

Pilganchuk O.A. and N.Yu. Shpigalskaya. 2017. Genetic differentiation of sockeye salmon *Oncorhynchus nerka* (Walbaum) of the basin of Kamchatka river. Proceedings of the International Scientific Conference commemorating the 80th birthday of Academician Yury P. Altukhov (1936–2006) and dedicated to the 45th Anniversary of the Laboratory of Population Genetics VIGG RAS named after Yu. P. Altukhov (held at S. N. Skadovsky Zvenigorod Biological Station of Biological Faculty of Lomonosov Moscow State University on April 17–21, 2017): 209-210. (In Russia with English abstract).

Results of examination of 16 samples of sockeye salmon (752 individuals), collected on spawning grounds in different locations in the basin of Kamchatka river are demonstrated in this paper. The analysis was carried out for 10 microsatellite loci: Oki1a, Oki1b, Oki6, Ots100, Ots107, Ots2, OtsG68, One104, One109, Omm1037G. It was demonstrated as a result of the examination of genetic differentiation in the program block STRUCTURE 2.3.4., that 4 clusters (samples from spawning grounds in the upper and middle parts of Kamchatka river, of early and late morphs in Azabachye lake) had the maximal value ΔK . The values of the identification probability for mentioned population groups in mixed aggregation are rather high 69.4–81.1 %.

Pilganchuk O.A., N.Yu. Shpigalskaya and A.D. Denisenko. 2017. Diversity of the microsatellite loci of sockeye salmon *Oncorhynchus nerka* (Walbaum, 1792) of the west coast of Kamchatka, continental coast of the Sea of Okhotsk and Kurile Islands. Aquatic biological resources of Russia: status, monitoring, management. Materials of Russian scientific conference with foreign participation, dedicated to the 85th anniversary of Kamchatka Research Institute of Fisheries and Oceanography (October, 3–6, 2017, Petropavlovsk-Kamchatsky): 190-194. (In Russia with English abstract).

Diversity in nine sockeye salmon samples from spawning rivers on the west coast of Kamchatka, continental coast of the Sea of Okhotsk and Kuril Islands was examined on seven microsatellite loci (Ots107, Oki1a, Oki1b, One104, One109, OtsG68, Oki6). The values of the interpopulation differentiation (θ_{st}) were statistically significant on all the loci. In the average the values were up to 6.46 %. The genetic markers used are an effective tool to provide future population-genetic researches in mentioned area.

Rastyagaeva N.A. 2017. To the issue of evaluation of forage capacity of some of salmon rivers of Kamchatka territory. Vladimir Ya. Levanidov's Biennial Memorial Meetings. Vol. 7.: 51. (In Russia with English abstract).

A decision proposed for the issue of optimal releases of juvenile hatchery Pacific salmon.

Rastyagaeva N.A., N.N. Romadenkova and O.O. Kim. 2017. Artificial reproduction of chum salmon *Oncorhynchus keta* Walbaum (*Salmonidae*) in the hatcheries of Kamchatka krai in 2014–2016. Aquatic biological resources of Russia: status, monitoring, management. Materials of Russian scientific conference with foreign participation, dedicated to the 85th anniversary of Kamchatka Research Institute of Fisheries and Oceanography (October, 3–6, 2017, Petropavlovsk-Kamchatsky): 362-368. (In Russia with English abstract).

Specific technological traits of rearing juvenile chum salmon at the salmon hatcheries of Kamchatka are demonstrated. Results of biological monitoring of artificial reproduction of chum salmon in 2014–2016, including analysis of the dynamics of the hatchery stocks of chum salmon and results of examination of otolith marking, are shown. Evaluation of the effectiveness of artificial reproduction of chum salmon at salmon hatcheries of Kamchatka is made.

Romadenkova N.N. 2017. Rearing juvenile chum salmon in the cold water supplied hatcheries of Kamchatka territory // Materials of the IV International scientific-technical conference «Scientific and practical issues of fishery regulation», May, 18-19, 2017, in Vladivostok. — P. 251–253. (In Russian).

Romasenko L.V., D.V. Avdeev, A.L. Zakharkin, O.N. Palkina, S.V. Chesnakova and V.A. Shevlyakov. 2017. Commercial-biological characteristic of pink salmon in the main areas of its fishery in Sakhalin region in 2017. Bulletin of Pacific salmon studies in the Russian Far East 12: 89-93. (In Russian).

Romasenko L.V., D.V. Avdeev, Yu.A. Batiuk, I.E. Onischenko and I.V. Chesnakov. 2017. Biological characteristic of pink salmon in the main areas of its fishery in Sakhalin region in 2016. Bulletin of Pacific salmon studies in the Russian Far East 12: 82-88. (In Russian).

Rudakova S.L., E.V. Bochkova and A.N. Akbatyrov. 2017. The epizooty of the infectious hematopoietic necrosis among juvenile sockeye salmon *Oncorhynchus nerka* (Walbaum) at the «Ozerki» salmon hatchery (Kamchatka) in 2017 r. Aquatic biological resources of Russia: status, monitoring, management. Materials of Russian scientific conference with foreign participation, dedicated to the 85th anniversary of Kamchatka Research Institute of Fisheries and Oceanography (October, 3–6, 2017, Petropavlovsk-Kamchatsky): 329-334. (In Russia with English abstract).

Clinical signs of infection diseases were observed in course of examination of juvenile sockeye *Oncorhynchus nerka* (Walbaum) at the SH “Ozerki” in March of 2017. The inoculation of this material on the cell line CHSE-214 and EPC revealed traits of cytopathic effect. The virus infectious hematopoietic necrosis (IHNV) was identified in the polymerase chain reaction (PCR). The main virus titres of tested material was $0.4 \times 106.86 \text{TCD}_{50}/\text{ml}$. The first acute loss of juvenile sockeye salmon was observed in mid-March, 10 days on rising the larvae and just in one basin. In mid-April the losses of the fish were observed in next 5 basins, where IHN was also found. In May three more waves of the disease were in basin clusters. The disease was acute with typical sings of the pathology for mentioned disease. The fish in the basins infected were killed according to veterinary prescriptions. As a result of the disease 60 % of juvenile sockeye salmon reared at the SH “Ozerki” dead or were terminated. It is most likely, that the outbreak of the IHN among juvenile sockeye salmon was due to vertical transmission of the virus from parents to progeny.

Savin V.A., R.A. Shaporev and A.V. Bugae. 2017. Scale structure as differentiating complex to figure out pink salmon *Oncorhynchus gorbuscha* intraspecific composition in mixed marine catches. Aquatic biological resources of Russia: status, monitoring, management. Materials of Russian scientific conference with foreign participation, dedicated to the 85th anniversary of Kamchatka Research Institute of Fisheries and Oceanography (October, 3–6, 2017, Petropavlovsk-Kamchatsky): 225-226. (In Russia with English abstract).

Results of analysis of Asian pink salmon scale structure are demonstrated and estimation of the possible use of the structure as a differentiation marker in identification of mixed marine catches

is made. Five regional complexes of stocks are figured out on the base of the analysis of baselines collected in 2010, each having specific formation of sclerites in the first annual zone on the scale: 1) of Japan (Hokkaido); 2) of Sakhalin; 3) Northern Kuril populations (Paramushir); 4) of West Kamchatka; 5) of East Kamchatka. Identification is made for the samples from the drift net catches collected by RMV “Kadet-701” and SRTM-K “Leonid Khodyko” in June–August of 2010, and it is demonstrated that the results illustrate general commercial conjuncture in the year of the research.

Savin V.A., R.A. Shaporev and A.V. Bugaev. 2017. To the issue of the use of Asian pink salmon (*Oncorhynchus gorbuscha*, Walbaum) scale structure for identification in mixed marine catches. The researches of the aquatic biological resources of Kamchatka and of the north-west part of the Pacific Ocean. Collection of scientific papers. Vol. 45: 5-23. (In Russia with English abstract).

Results of analysis of Asian pink salmon scale structure are demonstrated and estimation of the possible use of the structure as a differentiation marker in identification of mixed marine catches is made. Five regional complexes of stocks are figured out on the base of the analysis of baselines collected in 2010, each having specific formation of sclerites in the first annual zone on the scale: 1) of Japan (Hokkaido); 2) of Sakhalin; 3) Northern Kuril populations (Paramushir); 4) of West Kamchatka; 5) of East Kamchatka. A complex of simulation tests is applied and results demonstrate quite high regional resolution ability of the model suggested (93.6% averaged). Identification is made for the samples from the drift net catches collected by RMV “Kadet-701” and SRTM-K “Leonid Khodyko” in June–August of 2010, and it is demonstrated that the results illustrate general commercial conjuncture in the year of the research. Correlations between coefficients of variation of the regional boot-stripe values and the number of sclerites used (in the zone of the 1st year) were analyzed. It is demonstrated that the model is stable when the number of the sclerites used is 11–15, and that allows regional identification of Asian juvenile pink salmon in marine catches possible.

Shevlyakov E.A. and A.I. Chistyakova. 2017. Migrations of juvenile chum salmon in the Okhotsk Sea; comparative analysis of efficiency for fish hatchery complexes in Far East of Russia and in Japan. Izv. TINRO 191: 79-96. (In Russia with English abstract).

Abundance and structure of feeding aggregations of chum salmon are analyzed on the results of the otoliths processing sampled in different areas of the Okhotsk Sea in 2011–2014 and scheme of their autumn migrations in dependence on the sea surface temperature (SST) patterns, using the data on catching the fish with the otoliths marked in hatcheries. The migrations were similar for all chum groupings from the Okhotsk Sea and adjacent waters: their juveniles moved to Kamchatka coast until SST decreasing to 11°C in October, where they formed mixed aggregations, then density of the aggregations increased until SST 9–10°C, after that the aggregations moved to the central part of the sea and further southward passing the Kuril Straits in November under SST 7–8°C. The portion of marked fish from hatcheries in mixed catches was 2.1–7.8% (on average 3.9%). Taking into account these values and the ratio between marked and non-marked fish for certain hatcheries, the ratio between wild stocks and hatchery release of different origin is determined. The portion of chum salmon from Japanese hatcheries is estimated as 9.6–41.6% (on average 27.3%), the portion of chum from Russian hatcheries is considerably lower — 0.5–2.6% (on average 1.2%), and chum salmon of natural origin dominate in all years with the portion 55.8–89.9%. For the fish of artificial origin, the ratio between the number of juveniles feeding in the sea and their release from hatcheries is estimated as 3.0–4.2% (on average 3.6%) for Japanese hatcheries and 0.3–0.7% (on average 0.5%) for Russian hatcheries. So, survival of chum from Japanese hatcheries is higher in 8 times on average, and total abundance of the feeding artificial chum salmon of Japanese origin is higher than those of Russian origin in more than 20 times. However, the hatcheries in Sakhalin and Kuril Islands has similar

efficiency as Japanese ones, in opposite to other areas. The abnormally low estimations of the efficiency for some Russian hatcheries allow us to suppose that the otolith marking program is not realized correctly in some regions of Russian Far East, possibly the marks don't correspond exactly to the schemes of marking.

Shevlyakov E.A., V.A. Dubynin, S.V. Shubkin and N.B. Artukhina. 2017. Preliminary results of salmon fishing campaigns by major stocks in Kamchatka territory in 2017: issues of forecasting and fishery management. Bulletin of Pacific salmon studies in Far East 12: 15-23. (In Russian).

Shuntov V.P. 2017. Program on Pacific salmon complex surveys. Bulletin of Pacific salmon studies in Far East 12: 169-191. (In Russian).

Shuntov V.P. and O.S. Temnykh. 2017. Russian Far Eastern salmon fishery season-2017 through the prism of politics and the conformity of theory and practice. Bulletin of Pacific salmon studies in Far East 12: 3-14. (In Russian).

Shuntov V.P., O.S. Temnykh and O.A. Ivanov. 2017. On the persistence of stereotypes concerning the marine ecology of Pacific salmon (*Oncorhynchus spp.*). Russian Journal of Marine Biology. Vol. 43, No. 7: 507–534. (In English).

Starovoytov A.N. 2017. Trawl estimates of the abundance of pink salmon during early marine migrations in the western part of the Bering Sea in 2017. Bulletin of Pacific salmon studies in Far East 12: 136-137. (In Russian).

Starovoytov A.N., A.N. Kanzeparova and P.G. Milovankin. 2017. The results of trawl surveys of preanadromous pink salmon *Oncorhynchus gorbuscha* in the northwestern part of the Pacific Ocean in June 2017. Expectations and results. Bulletin of Pacific salmon studies in Far East 12: 128-135. (In Russian).

Tarpey C.M., J.E. See, G.J. McKinney, W.D. Templin, A.V. Bugaev, S. Sato and L.W. Seeb. 2017. SNP data describe contemporary population structure and diversity in allochronic lineages of Pink salmon (*Oncorhynchus gorbuscha*). Canadian Journal of Fisheries and Aquatic Sciences. In print.

Temnykh O.S. 2017. "Top-down" and "bottom-up" abundance control as factors of pink salmon (*O. gorbuscha*) mortality in the marine life period. Salmonids: biology, conservation and restoration. Proceedings of the international conference. 18–22 September (Petrozavodsk, Karelia, Russia): 136-137. (In Russia with English abstract).

Temnykh O.S., A.N. Kanzeparova and P.O. Emelin. 2017. Interannual dynamics of the abundance and average sizes of juveniles pink salmon and chum salmon in the Sea of Okhotsk in the 2000s. Bulletin of Pacific salmon studies in Far East 12: 159-168. (In Russian).

Tiller I.V. 2017. Comparative biological characterization of anadromous Dolly Varden the rivers of Kamchatka. Aquatic biological resources of Russia: status, monitoring, management. Materials of Russian scientific conference with foreign participation, dedicated to the 85th anniversary of Kamchatka Research Institute of Fisheries and Oceanography (October, 3–6, 2017, Petropavlovsk-Kamchatsky): 50-56. (In Russia with English abstract).

Populations of anadromous Dolly Varden in nine rivers on the west and east coasts of Kamchatka were analyzed in 2015. In general 5–6-year-old individuals dominated in the age structure of the catches of anadromous Dolly Varden on both coasts. The maximal wide range of the ages included eight groups and was found in the populations of Palana River on the west coast, of Khailulya and Zhupanova Rivers on the east coast, the minimal range (of four age groups) – in the catches of Bolshaya and Avacha Rivers. There are no significant differences between the age groups in the body length and weight. The percent of females was generally higher, but not too much, comparing it to the average value typical for Kamchatkan Dolly Varden. The index of body condition is not high and does not demonstrate any trend. The minimal index was in the populations with a shorter period of feeding at sea.

Travina T.N. 2017. Daily dynamics of feeding by juvenile sockeye salmon in Plotnikova river (West Kamchatka). Vladimir Ya. Levanidov's Biennial Memorial Meetings: 59. (In Russia with English abstract).

Analysis of daily dynamics of juvenile sockeye salmon feeding in Plotnikova river is made.

Uglova T.Yu., Klovach N.V., Mikodina E.V. Gonads anomalies of the Iturup island pink salmon. Seasonal and interannual dynamics. Possible causes of appearance. VNIRO Proceedings. 166:43-54. (In Russian with English abstract).

During spawning migration of pink salmon (*Oncorhynchus gorbuscha*) — the most numerous Pacific salmon species, at the Okhotsk Sea side of Iturup Island (Southern Kurile Islands) a study the gonads anatomy in the period 2012–2014 was carried out. It has been established that among migrating to the island coast pink salmon spawners having testis anomalies (phenodeviantes) their share varies in the range of 7–49%, changes in different directions in all investigated locations, and has seasonal and annual variability. The dynamics of pink salmon proportion having testis anomalies is similar in different investigated of Iturup Island locations. Possible causes that lead to the reproductive system anomalies in male pink salmon are discussed. Data analysis confirms our hypothesis about environment multifactorial effect on the Pacific salmon sexual glands, which leads to the phenodeviantes appearance. It is not ruled out that part of the male gonad pathologies may be the norm for these fish species.

Ustimenko E.A. and N.V. Sergeenko. 2017. Potentially dangerous bacterial pathogens targeting Pacific salmon at the salmon hatcheries of Kamchatka. Aquatic biological resources of Russia: status, monitoring, management. Materials of Russian scientific conference with foreign participation, dedicated to the 85th anniversary of Kamchatka Research Institute of Fisheries and Oceanography (October, 3–6, 2017, Petropavlovsk-Kamchatsky): 322-25. (In Russia with English abstract).

The paper provides generalized data on the bacterial pathogens, potentially dangerous for Pacific salmon on salmon hatcheries of Kamchatka. Lacks of methodologies and prescriptions currently used to stop some of salmon diseases are figured out. Results of long-term bacteriological studies of hatchery juvenile salmon are demonstrated.

Volobuev V.V., A.M. Korschukova, A.I. Mordovin and V.A. Gruschinetz. 2017. Biological characteristics and fishery of the anadromous Dolly Varden *Salvelinus malma* (Walbaum), Sea of Okhotsk, NorthEast part of the continental coast (Magadan Region). Bulletin of the North-East Scientific center, Russia Academy of Sciences 2: 74-81. (In Russia with English abstract).

The paper discusses the data on stocks, fishery, and basic biological indicators of the anadromous form of the Dolly Varden *Salvelinus malma* in spawning salmon reservoirs of Magadan Region. Results of long-term monitoring condition of the Dolly Varden stocks, fishery, and biological structure are presented, as well as its role in the general Pacific Salmon fishery in Magadan Region.

Volobuev V.V., E.E. Izergina and I.S. Golovanov. 2017. Ecology of the Magadan area pink salmon *Oncorhynchus gorbuscha* (Walbaum) in the fresh-water, estuary, initial maritime periods of life and the major factors defining its survival rate. Bulletin of the North-East Scientific center, Russia Academy of Sciences 1: 67-79. (In Russia with English abstract).

Data on the basic indicators for the biological structure of the juvenile and fry pink salmon in the coastal area of the Sea of Okhotsk are presented. The effect of such biotic and abiotic factors as the raised water level in the river, ice-drift, and chlorophyll-“a” concentration on the survival rate of the fry of pink salmon within the coastal period of life is shown.

Volobuev V.V., V.V. Ovchinnikov, A.M. Korschukova, I.S. Golovanov and V.A. Gruschinetz. 2017. Some biomonitoring elements for Pacific salmon stocks along the Sea of Okhotsk continental coast. Bulletin of Pacific salmon studies in Far East 12: 55-63. (In Russian).

Volobuev V.V., V.V. Ovchinnikov, I.S. Golovanov, A.M. Korschukova, A.I. Mordovin and V.A. Gruschinetz. 2017. The results of the Pacific salmon fishing season in 2017 in the Magadan area and the status of the Pacific salmon stocks of the main species. Bulletin of Pacific salmon studies in Far East 12: 33-38. (In Russian).

Voronova E.S. 2017. Distribution and migration of juvenile pink and chum salmon in early marine period of life in the south-western part of the Bering Sea. Current problems and prospects of fishery complex development: materials of the V scientific-practical conference of young scientists with foreign participation:75–79. (In Russia).

Vvedenskaya T.L., N.A. Rastyagaeva, V.F. Bugaev, S.V. Lipnyagov, A.A. Shatrova, I.S. Kholstova and K.I. Rusin. 2017. Wild and hatchery juvenile coho salmon of the Bolshoy Viliuy lake. The researches of the aquatic biological resources of Kamchatka and of the north-west part of the Pacific Ocean. Collection of scientific papers. Vol. 44: 31-38. (In Russia with English abstract).

Fish biological survey carried in October 20–22, 2015, has it demonstrated that autumn number of hatchery coho salmon 1+ age in the lake is same as the number of wild coho salmon juveniles, 1+age (mainly) and 2+ age individuals. Catches on the 14th of June in 2016 demonstrated that in spring, before releasing new hatchery coho salmon generation of 2+ age on June 17, only a small number of wild juvenile coho salmon of different ages could be observed in the lake. The main bulk of the juvenile stock, origin doesn't play role, migrates to the sea in the age 2+. Licensed fishing of herring, pond and rainbow smelts in the lake in autumn and winter always reveals a number of big wild and hatchery juvenile coho salmon in bycatch. The losses cannot be prevented, because the time of the licensed fishing cannot be changed due to limited time when herring and smelts enter the lake. The total stop of the licensed fishing in the basin of Bolshoy Viluy lake, to prevent harming the valuable salmon resource, can be the only solution of the problem.

Yamborko A.V., V.V. Ovchinnikov, V.V. Volobuev, M.E. Kalyakina, A.M. Korschukova and S.N. Volkova. 2017. The comparative characteristic of hatchery and wild chum salmon *Oncorhynchus keta* (Walbaum) linear growth. Bulletin of Pacific salmon studies in Far East 12:

122-127. (In Russian).

Yamborko A.V., V.V. Ovchinnikov, V.V. Volobuev, M.E. Kalyakina, A.M. Korschukova and S.N. Volkova. 2017. The comparative characteristic of hatchery and wild chum salmon *Oncorhynchus keta* (Walbaum) linear growth Northern part of the of the Sea of Okhotsk. Problems of formation of innovative economy of the region: materials of V scientific and practical conf. (November 21-22, 2017, Magadan,). In print.

Zakharova O.A. and A.M. Biryukov. 2017. Brief characterization of coho salmon spawners in the Olyutorsky district of Kamchatka territory // Aquatic biological resources of Russia: status, monitoring, management. Materials of Russian scientific conference with foreign participation, dedicated to the 85th anniversary of Kamchatka Research Institute of Fisheries and Oceanography (October, 3–6, 2017, Petropavlovsk-Kamchatsky): 57-64. (In Russia with English abstract).

The article demonstrates results of the analysis of biological data of coho salmon in several rivers of the Olyutorsky district. The age composition of the fish is figured out. Catch statistics is provided, and expert evaluation of the condition of this salmon stock in the district is made.

Zaporozhets G.V. and O.M. Zaporozhets. 2017. Structure of run, abundance and biological characteristics of hatchery and wild chum salmon in the basin of the Paratunka River (southeastern Kamchatka) in 2010–2015. Izv. TINRO 190: 49-61. (In Russia with English abstract).

Some biological parameters of chum salmon in the spawning runs to the Paratunka River (Avachinsky Bay, Kamchatka) are analyzed on the materials of ichthyological researches conducted in 2010–2015 (3699 specimens sampled), observations on filling of the spawning grounds, and fishery statistics. The age at return is defined using scale samples and the age structure of the spawning run both for wild and hatchery populations. The fish origin is determined by the scale circuli patterns in the zone representing the juvenile period, comparing the scale samples from natural spawning grounds and hatchery weir. Accuracy of this method is estimated in 82–99 %. Abundance of the spawners had the increasing tendency since 2009. Three runs with different age structure and size of the fish were observed in the lower river: in early summer, late summer, and fall. The elder wild chum ran to spawning while the body length, weight and fecundity were similar for both stocks. The hatchery stock had higher male : female ratio. Survival of the wild fish from egg to the return was estimated as 0.67%, and of the hatchery fish as 0.28%. Portion of the hatchery fish was 44–48% at the Paratunka mouth and 25–35% on the spawning grounds, whereas it was 70–83% at the hatchery. The chum salmon's straying to certain loci of the river basin is determined.

Zaporozhets G.V. and O.M. Zaporozhets. 2017. Some effects of hatchery reproduction of chum salmon in Paratunka river. Aquatic biological resources of Russia: status, monitoring, management. Materials of Russian scientific conference with foreign participation, dedicated to the 85th anniversary of Kamchatka Research Institute of Fisheries and Oceanography (October, 3–6, 2017, Petropavlovsk-Kamchatsky): 305-309. (In Russia with English abstract).

Some effects of hatchery reproduction of chum salmon in Paratunka River were estimated. Negative correlation between returns and juvenile releases from the Paratunsky SH is observed. The survival of the Paratunsky hatchery salmon was averaged AS 0.36% from juvenile stock or 0.28 % from egg, while the survival wild (from egg) – 0.67%. The fish in the wild stock returns were authentically older than the fish in the hatchery returns, but both stocks are getting younger. The gender ratio in the scientific catches in the estuary in 2010–2015 was in favour of males in the hatchery returns, when the contribution of the hatchery chum salmon was 46 % in the estuary, 27% — on

spawning grounds areas and 75% — near the Paratunsky SH. Evaluation of streng of the hatchery fish on different spawning grounds is made.

Zaporozhets O.M. and G.V. Zaporozhets. 2017. Methodical approaches to the calculation of the number of producers salmon on the spawning grounds with the help of photorgaphic fixation. Conservation of biodiversity of Kamchatka and coastal waters. Materials of the XVIII international scientific conference, dedicated to the 70th anniversary of A. Khomentosky's birthday: 188-190. (In Russian).

Zaporozhets O.M. and G.V. Zaporozhets. 2017. Proportion of chum salmon producers of different origin in the basin of Avacha bay (south-eastern Kamchanka). Conservation of biodiversity of Kamchatka and coastal waters. Materials of the XVI international scientific conference, dedicated to the 70th anniversary of A. Khomentosky's birthday: 235-238. (In Russian).

Zaporozhets O.M., G.V. Zaporozhets and Zh.H. Zorbidi. 2017. Temporale groups of spawning Pacific salmon in the Bolshaya river, west Kamchatka. Aquatic biological resources of Russia: status, monitoring, management. Materials of Russian scientific conference with foreign participation, dedicated to the 85th anniversary of Kamchatka Research Institute of Fisheries and Oceanography (October, 3–6, 2017, Petropavlovsk-Kamchatsky): 183-190. (In Russia with English abstract).

Temporal groups of spawning Pacific salmon in the basin of Bolshaya River were figured out, approximate limits of their spawning runs were estimated on the base of analysis of the occurrence frequency dynamics in the river mouth catches and changes of the maturity coefficient. Statistical comparison is made for the body length, weight, fecundity, freshwater, marine and totals ages of the fish in returns. Reliable differences between figured groups are demonstrated on several characteristics.

Zavarina L.O. 2017. About the change of the stock abundance and population structure of chum salmon in Krutogorova river (west Kamchanka). Salmonids: biology, conservation and restoration. Proceedings of the international conference. 18-22 September 2017 (Petrozavodsk, Karelia, Russia): 56-57. (In Russia with English abstract).

The materials represented include archive and current data; analysis of chum salmon population structure in Krutogorova river is made. It is demonstrated, that along the increase of spawning runs from the 1990s to nowadays (2011–2016) an increase of relative number of younger (2+ and 3+) individuals and individuals 5+ is observed. At the same time a decrease in the body length and weight of the fish and an increase of the percent of females and their average individual fecundity in observed.

Zavarina L.O. 2017. Some biological data of chum salmon (*Oncorhynchus keta*) stock in Listvennichnaya river (South-East Kamchatka). Conservation of biodiversity of Kamchatka and coastal waters. Materials of the XVI international scientific conference, dedicated to the 70th anniversary of A. Khomentosky's birthday: 93–96. (In Russia).

Zavarina L.O. 2017. The-long term dynamics and modern state of biological indexes and commercial stock of chum salmon *Oncorhynchus keta* (Walbaum) in the basin of Kamchatka river. Aquatic biological resources of Russia: status, monitoring, management. Materials of Russian scientific conference with foreign participation, dedicated to the 85th anniversary of

Kamchatka Research Institute of Fisheries and Oceanography (October, 3–6, 2017, Petropavlovsk-Kamchatsky): 43-49. (In Russia with English abstract).

Structural analysis of chum salmon population of the Kamchatka River is made on archive and modern data. The pool of the biological statistics analyzed allows to conclude that for now the population has passed significant structural transformation, getting younger, having less average body length, weight and fecundity, although the stock abundance of chum salmon in the Kamchatka River is increasing.

Zavarina J.O. 2017. On the changes of chum salmon *Oncorhynchus keta* (Walbaum) abundance and spawning stock structure in the basin of Khairyuzova river (West Kamchatka). Actual problems of biodiversity and nature management. Materials of Russian scientific-practical conference. Kerch. September 26–October 1, 2017. Simferopol: 43–48. (In Russia).

Zikunova O.V. 2017. Current status and specifics of chinook salmon fishery management in Kamchatka river Current problems and prospects of fishery complex development: materials of the V scientific-practical conference of young scientists with foreign participation: 132–137. (In Russia).

Zolotukhin S.F., T.V. Kozlova and A.N. Kanzeparova. 2017. Forecast for 4 anadromous fish stocks status in the rivers of the mainland part of Tatarsky Strait (Sea of Japan) to the end of the 21st century. PICES-2017 Environmental changes in the North Pacific and impacts on biological resources and ecosystem services: 124. (In English).