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Vityaz-Avto, Delta, Kamber, Pymta West Kamchatka Salmon Fisheries

Public Comment Draft Report

May 2021

Conformity Assessment Body (CAB)	**MRAG Americas, Inc.**
Assessment team	**Raymond Beamesderfer and Dmitry Lajus**
Fishery client	**Vityaz-Avto Co Ltd, Delta Co Ltd, Pymta Co Ltd, Kamber Co Ltd**
Assessment Type	**First reassessment**

Document Control Record

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ACDR	RB, DL	28 August 2020	ASP	22 Sept 2020
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Contents

1 Executive summary

The target species of this assessment are sockeye (Oncorhynchus nerka), chum (O. keta), pink (O. gorbuscha) and coho (O. kisutch) salmon, which are fished in the sea and certain rivers on the southwest and west coast of Kamchatka Peninsula, Russia. Coho salmon are widely targeted by the fishery but unit of certification includes only coho in the Kamchatka-Kuril fishery management subzone due to limited data availability for coho in other areas of the fishery. The gears used by the fishery are coastal trap nets and beach seines. The materials for the assessment were provided by the Client, obtained from KamchatNIRO and also based on Internet search and previous MSC assessment reports for Kamchatka fisheries (see references section).

There are four fishing companies included in this assessment: Vityaz-Avto, Delta Co Ltd, Kamber Co Ltd and Pymta Co Ltd. Viyaz-Avto was founded in 1997 and grew quickly. The company has three branches in the western coast of Kamchatka in the towns of Ozernovsky, Oktiabrsky and Sobolevo. Delta has operated in the Ozernaya and Opala river areas of Kamchatka since 1998. The fishery processing facility for Kamber Co Ltd is located two kilometers south of the mouth of the Pymta River. The fish processing plant for Pymta Co Ltd is located 1.6 km south of the Pymta River.

Sockeye, pink, chum and coho salmon are at historically high levels of production throughout west Kamchatka. High productivity results from near-pristine habitat conditions in salmon production areas, favorable climate conditions in freshwater and the ocean, curtailment of drift gill netting in the Russian Economic Exclusion Zone and effective management to protect spawning escapements. Changes in the commercial fishery management system in the early 2000s have largely eliminated industrial scale illegal commercial fishing. Long-term lease agreements for fishing sites have provided strong incentives for fishing companies to protect spawning escapements and participate in stock assessment and enforcement programs.

The fishery is effectively regulated with a well-developed harvest reporting and management system. Catches, run composition and spawning escapement are assessed inseason and used as a basis for regulating effort and harvest according to abundance. Annual spawning escapements have long been monitored throughout the fishery area using aerial surveys. These stock assessments have demonstrated that current fisheries consistently produce significant spawning escapements. Continuing high annual harvests demonstrate the efficacy of the current system. The use of terminal fisheries and scheduled weekly “passing days” when the fishery is closed is central to the effectiveness of the harvest control rules. This system ensures significant escapement even in the absence of intensive inseason stock assessment and management such as is typically practiced in North American commercial salmon fisheries. The scale of the stock assessments is generally appropriate to the extensive management practice of the fishery.

While historical monitoring and sustainable harvest outcomes has demonstrated that current fishery strategies are effective, stock assessments for pink, chum and coho salmon have suffered reductions in recent years due government funding cutbacks.

2 Report details

2.1 Authorship and peer review details

Mr. Ray Beamesderfer (Team Leader), M.S., Senior Fish Scientist, Fish Science Solutions, USA. Mr. Beamesderfer holds a bachelor's degree in Wildlife and Fisheries Biology from the University of California, Davis, and a Master's in Fishery Resources from the University of Idaho. As a consultant, Ray has completed a wide variety of projects in fishery management, biological assessment, and conservation/recovery planning. He is the author of numerous reports, biological assessments, management plans, and scientific articles on fish population dynamics, fish conservation, fishery, and hatchery management, sampling, and species interactions. Ray has served on MRAG and other fishery assessment teams for salmon fisheries in Alaska, Japan and Russia and brings perspective and harmonization between salmon fishery assessments in the Pacific.

Dr. Dmitry Lajus, Associate Professor in the Department of Ichthyology and Hydrobiology of St Petersburg State University. Dmitry holds a BS and MS from St. Petersburg University, and a PhD from the Zoological Institute of the Russian Academy of Sciences. Dr. Lajus has conducted multiple MSC pre-assessments and full assessments for a number of fisheries in the European and Asian parts of Russia. He also provides consultations to fisheries in their MSC certification projects in Russia and EU. Dmitry's research interests include population biology of marine fish and invertebrates, population phenogenetics, stress assessment, history of fisheries, fisheries management, historical ecology, and population dynamics. He authored numerous peer-reviewed research articles and book chapters.

No conflicts of interest and biases were identified in discussion between team members.

Peer Reviewers

Dr. David Stormer has almost two decades of fisheries research and management experience across a variety of disciplines and a range of employment types. He has worked as a fisheries professional for two state agencies (Florida and Washington) and at several academic institutions across North America providing him with extensive geographic coverage and wide-ranging perspective on fisheries management. David takes immense pride in his fisheries scientific and management background, particularly the application potential of his research. Dr Stormer has published multiple peer reviewed publications on fish population dynamics and ecology with broad ranging management implications. His expertise in fisheries science, management and conservation has been requested by several popular journals to serve as a manuscript reviewer and he takes this responsibility with all the rigor and seriousness that it deserves.

Greg Ruggerone, Ph.D., has investigated population dynamics, ecology, and fisheries management of Pacific salmon in Alaska and the Pacific Northwest since 1979, as a Research Scientist at the University of Washington and owner of Natural Resources Consultants, Inc. Most of his research involves factors that affect growth, age at maturation, and survival of salmon in freshwater and marine habitats, including interactions between wild and hatchery salmon, density-dependence, and sustainable fisheries management. He often contributes to independent and interdisciplinary scientific review panels in the Columbia River Basin, California, British Columbia, and Alaska. He was recently selected to be a member of the Hatchery Scientific Reform Group, established by the US Congress. Beginning in 2005, he contributed to the development of MSC scoring criteria and guidelines for Pacific salmon. He has completed MSC assessments and reviews in Alaska, California, British Columbia, and Russia.

2.2 Version details

Document	Version number
MSC Fisheries Certification Process	**Version 2.1**
MSC Fisheries Standard	**Version 2.01**
MSC General Certification Requirements	**Version 2.4.1**
MSC Reporting Template	**Version 1.1**

3 Unit(s) of Assessment and Certification, and Results Overview

MRAG Americas has confirmed that this fishery is within scope for MSC fisheries certification through the following determinations (FCP v2.2 7.4):

7.4.2.1 The following taxa are not target species under Principle 1:
- *a. Amphibians*
- *b. Reptiles*
- *c. Birds*
- *d. Mammals*

7.4.2.2 The fishery does not use poisons or explosives.

7.4.2.3 The fishery is not conducted under a controversial unilateral exemption to an international agreement.

7.4.2.4 No member of the client group has been successfully prosecuted for a forced or child labour violation in the last 2 years.

7.4.2.10 The fishery has not been convicted for a shark finning violation in the last 2 years.

7.4.2.11 The fishery has a mechanism for resolving disputes and disputes do not overwhelm the fishery.

7.4.2.12 The fishery is not enhanced.

7.4.2.13 The fishery is not based on introduced species.

Unit(s) of Assessment and Unit(s) of Certification

UoA 1	***Description***
Species	Sockeye Salmon *(Oncorhynchus nerka)*
Stock	Sockeye Salmon spawning in the Ozernaya River on the southwestern coast of Kamchatka (i.e., Ozernaya sockeye)[1]
Geographical area	The southwestern coast of Kamchatka, Sea of Okhotsk, Kamchatka-Kuril fishery management subzone (61.05.4)
Harvest method / gear	Coastal trap nets, beach seines
Client group	Vityaz-Avto Co Ltd, Delta Co Ltd, Kamber Co Ltd., Pymta Co Ltd
Other eligible fishers	None at this time
UoA 2	***Description***
Species	Pink Salmon *(Oncorhynchus gorbuscha)*
Stock	Populations of Pink salmon spawning on the southwestern coast of Kamchatka including the Ozernaya, Yavinskaya, Koshegochek, Golygina, Opala, Pymta and Kol and also adjacent rivers whose populations can be intercepted by the fishery. (i.e., Kamchatka-Kuril pink salmon).
Geographical area	The southwestern coast of Kamchatka, Sea of Okhotsk, Kamchatka-Kuril fishery management subzone (61.05.4).

[1] Kamchatka-Kuril subzone and Western Kamchatka subzone sockeye other than the Ozernaya River population are not included.

Harvest method / gear	Coastal trap nets, beach seines
Client group	Vityaz-Avto Co Ltd, Delta Co Ltd, Kamber Co Ltd., Pymta Co Ltd
Other eligible fishers	None at this time
UoA 3	***Description***
Species	Pink Salmon *(Oncorhynchus gorbuscha)*
Stock	Populations of Pink salmon spawning on the western coast of Kamchatka including the Vorovskaya River, and also adjacent rivers whose populations can be intercepted by the fishery. (i.e., West Kamchatka pink salmon)
Geographical area	The western coast of Kamchatka, Sea of Okhotsk, Western Kamchatka-fishery management subzone (61.05.2).
Harvest method / gear	Coastal trap nets, beach seines
Client group	Vityaz-Avto Co Ltd, Delta Co Ltd, Kamber Co Ltd., Pymta Co Ltd
Other eligible fishers	None at this time
UoA 4	***Description***
Species	Chum Salmon *(Oncorhynchus keta)*
Stock	Populations of Chum salmon spawning on the southwestern coast of Kamchatka including the Ozernaya, Yavinskaya, Koshegochek, Golygina, Opala, and Pymta, and Kol and also adjacent rivers whose populations can be intercepted by the fishery. (i.e., Kamchatka-Kuril chum salmon)
Geographical area	The southwestern coast of Kamchatka, Sea of Okhotsk, Kamchatka-Kuril management fishery subzone (61.05.4).
Harvest method / gear	Coastal trap nets, beach seines
Client group	Vityaz-Avto Co Ltd, Delta Co Ltd, Kamber Co Ltd., Pymta Co Ltd
Other eligible fishers	None at this time
UoA 5	***Description***
Species	Chum Salmon *(Oncorhynchus keta)*
Stock	Populations of Chum salmon spawning on the western coast of Kamchatka including the Vorovskaya River, and also adjacent rivers whose populations can be intercepted by the fishery. (i.e., West Kamchatka chum salmon)
Geographical area	The western coast of Kamchatka, Sea of Okhotsk, Western Kamchatka-fishery management subzone (61.05.2).
Harvest method / gear	Coastal trap nets, beach seines
Client group	Vityaz-Avto Co Ltd, Delta Co Ltd, Kamber Co Ltd., Pymta Co Ltd
Other eligible fishers	None at this time
UoA 6	***Description***
Species	Coho Salmon *(Oncorhynchus kisutch)*
Stock	Coho salmon spawning on the southwestern coast of Kamchatka including the Ozernaya, Yavinskaya, Koshegochek, Golygina, Opala, Pymta, and Kol and also adjacent rivers whose populations can be intercepted by the fishery. (i.e., Kamchatka-Kuril coho salmon) The

	Vorovskaya River is not included in this unit of assessment as it is located in the Western Kamchatka fishery management subzone with different management regime.
Geographical area	The southwestern coast of Kamchatka, Sea of Okhotsk, Kamchatka-Kuril fishery management subzone (61.05.4)
Harvest method / gear	Coastal trap nets, beach seines
Client group	Vityaz-Avto Co Ltd, Delta Co Ltd, Kamber Co Ltd., Pymta Co Ltd
Other eligible fishers	None at this time

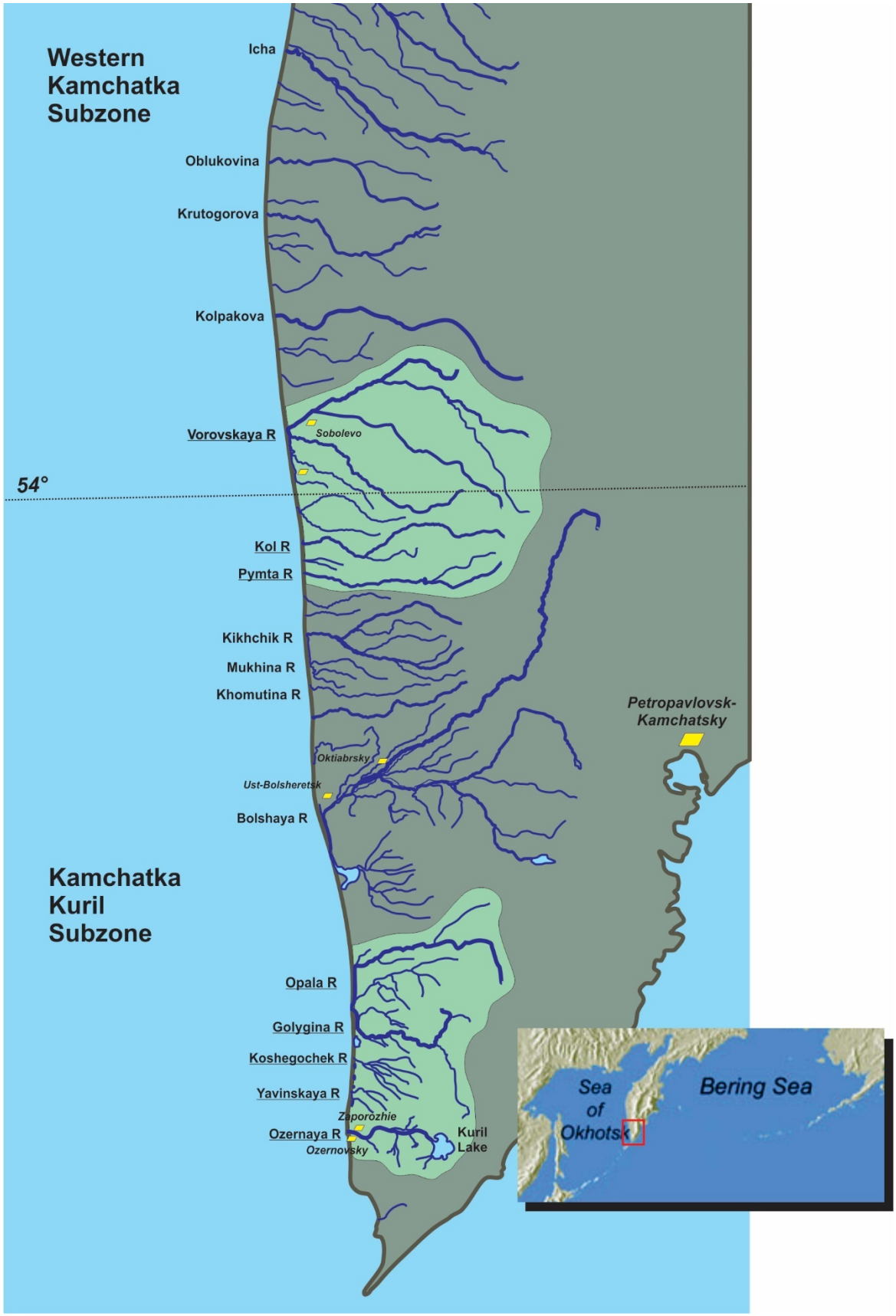


Figure 1 Location of the fishery units of certification in western Kamchatka rivers included are highlighted and underlined.

3.1.1 Scope of assessment in relation to enhanced or introduced fisheries

The stocks under the assessment are not enhanced. The stocks under assessment are native.

3.2 Assessment results overview

3.2.1 Determination, formal conclusion and agreement

MRAG Americas has recommended the Ozernaya sockeye, Kamchatka-Kuril pink, West Kamchatka pink, Kamchatka-Kuril chum, West Kamchatka chum, and Kamchatka-Kuril coho fisheries be recertified as sustainable against the MSC standard. Non-Ozernaya sockeye are identified as inseparable or practically inseparable.

3.2.2 Principle level scores

Principle	Units of Certification					
	1. Ozernaya Sockeye	2. KK Pink	3. WK Pink	4. KK Chum	5. WK Chum	6. KK Coho
Principle 1 – Target Species	98.7	83.7	83.7	84.4	83.7	83.7
Principle 2 – Ecosystem	84.0					
Principle 3 – Management System	84.6					

3.2.3 Summary of conditions

Condition number	Performance Indicator	Condition	Timeline for compliance
1	1.1.1	Demonstrate that it is highly likely that escapements of Kamchatka-Kuril pink (odd-year), West Kamchatka pink (odd-year), Western Kamchatka chum and Kamchatka-Kuril coho SMU's are above effective limit reference points where recruitment would be impaired.	2025
2	1.2.3	Demonstrate that indicators of spawning escapement are available for Kamchatka-Kuril Pink, Western Kamchatka Pink, Kamchatka-Kuril Chum, Western Kamchatka Chum, and Kamchatka-Kuril Coho monitored with sufficient frequency to support the harvest control rule.	2025
3	3.2.2	Demonstrate that information on the fishery's performance and management action is available on request, and explanations are provided for any actions or lack of action associated with findings and relevant recommendations emerging from research, monitoring, evaluation and review activity.	2025

3.2.4 Recommendations

Provide the following information at annual surveillance audits (including or in addition to information provided to address specific conditions identified above):

- Annual harvest in salmon fishery by species of the fishing companies included in the assessment and totals for all fishing companies operating in west Kamchatka (separate totals for the West Kamchatka and Kamchatka-Kuril fishery management subzones).
- Aerial survey effort (hours), dates and rivers.
- Spawning escapement goals by species and river in the area of the fishery in the year of assessment.
- Salmon spawning escapements by species and river in the area of the fishery in the year of assessment.
- Fishery management actions by the Anadromous Fish Commission in the area of the fishery.
- A summary of enforcement effort and violations in the area of the fishery.

4 Traceability and eligibility

4.1 Eligibility date

The eligibility date will be upon publication of the Public Comment Draft Report.

4.2 Traceability within the fishery

Daily catch of salmon from traps is delivered by boats to the shore, where it is weighed and reloaded to mobile containers that transport chilled fish. Catch from beach seines and gill nets is brought ashore by the nets and loaded to mobile containers that transport chilled fish. Ice is used for cooling the fish. While the catch is transported, it is accompanied by a document specifying the place and the crew that captured it, the weights of the transported fish, and the processing facility where the catch is being delivered. Upon delivery, the fish are weighed again by the processing facility and then the catch is sent for processing. The processing plants track numbers of salmon by species by day for each fishing parcel. Transhipment does not occur.

Arriving catch is recorded in the log of the processing facility. The processing plants track numbers of salmon by species by day for each fishing parcel. The record contains the location of the catch and company which submits catch. Both the companies' logs and the processing facilities' logs are regularly checked by SVTU inspectors, sanitary-epidemiological control and territorial RosPrirodNadzor. The facts of such inspections are also being recorded in appropriate logs.

All fish delivered from landing sites have documentation that shows date, location, volumes, species, and fishing operator. Since each operator has a commercial fishing permit that also identifies gear type, documentation of the different gear types and operators would prevent substitution at delivery. Subsequent chain of custody would assure separation after the initial delivery.

Some risk occurs that illegally harvested fish or fish harvested by a company not under the certificate sharing agreement could be accepted at a processing facility as certified. Substantial efforts by the certificate holders-sharing companies to enhance enforcement activities by supplying personnel, equipment, and funding to the authorities minimizes the opportunity for illegal harvest in the beach regions where legal fishing occurs. These companies also support enforcement activities in rivers to minimize the opportunity of illegal harvest of roe. Therefore, the likelihood is low of illegal product entering the processing facilities with the proper documentation and weights that would pass inspections by the authorities.

MSC traceability requirements cover only salmon landed at authorized fishing parcels by the legally permitted and certificate-holding fishing company in the Unit of Certification and delivered to processing facilities, where the landings can be monitored in accordance with MSC chain of custody requirements. The certified fishing company in the Unit of Certification may use the certificate and apply the MSC logo if they deliver to a processing facility that holds MSC chain of custody certification.

The occurrence of illegal fishing in the Russian Far East suggests a need for robust chain of custody to mitigate the risk of product from a non-certified source entering the supply chain. Chain of custody would begin at the point of delivery of product from the certified company in the Unit of Certification to a processing facility, whether the facility is owned by the participating company or by another entity.

Table 1. Traceability within the fishery.

Factor	Description
Will the fishery use gears that are not part of the Unit of Certification (UoC)?	Not present. All gears employed in the fishery are in the assessment.
Will vessels in the UoC also fish outside the UoC geographic area?	Not present. Vessels are owned by the companies and are assigned to the active fishing parcels. Vessels could not obtain fish from beyond company fishing parcels without detection because the plants and government inspectors compare logbook records from parcels with landings at the plant.
Do the fishery client members ever handle certified and non-certified products during any of the activities covered by the fishery certificate? This refers to both at-sea activities and on-land activities.	Yes, some other species are handled that are not certified. However, these are readily visually distinguishable and there is no risk of substitution. All fish delivered from landing sites must have documentation that shows data, location, volumes, species and fishing operator and this must match with the fish receiving registry that the plant provides, and all subsequent documentation through the chain of custody as verified with the chain of custody audit. Each operator has a commercial fishing permit that identifies the gear type. These documents prevent substitution of fish at delivery.
Does transhipment occur within the fishery?	No at-sea transhipment. Chain of custody starts at delivery to the processing plant, with chain of custody documented in all subsequent processing steps.
Are there any other risks of mixing or substitution between certified and non-certified fish?	Not present.

4.3 Eligibility to enter further chains of custody

The product of the fishery is eligible to be sold as MSC certified or carry the MSC ecolabel. Vityaz-Avto, Delta Co Ltd, Kamber Co Ltd and Pymta Co Ltd will be eligible to use the fishery certificate if the assessment is successful, and sell product as MSC certified. These companies process their catches at their own factories. Production goes to the Russian market and is also sold to international markets.

Acting as a client for the current certification, these companies may share certification with another fishing company or companies operated in the UoC on terms of Certificate Sharing Agreement. The current list of companies and their fishing parcels eligible for the current fishery certification will be published on the MSC website and may be changed. Salmon species specified in the UoC of the assessment, harvested by the companies of the Client Group with gears allowed in the Fishing Rules (as specified in this unit of certification), and landed from authorized parcels in the rivers of the West Kamchatka are eligible to enter further chains of custody.

The landing points are fish-processing facilities belonging to the Clients of the certification and are situated in the Ust-Bolsheretsky administrative districts of Kamchatka Krai. This is a point from which

subsequent Chain of Custody certification is required. Chain of custody begins at delivery of salmon to a processing facility in the client group or at a point of change in ownership of the fish, whichever comes first.

Members of the Client Group own the fish they catch, commencing at the point of fish catch. Fishing sites are leased and operated by the members of the Client Group, which also operate the processing plants. Documentation of the fish is sufficient such that chain of custody is not necessary for transport of wholly-owned fish from the point of catch to delivery at the processing plant (mode of delivery normally comprises retrieval of fish from traps into net barges towed to shore and then pumped into tanks at the processing plant. Should other companies share the certificate at some point in the future and sell fish to the client group or other companies holding chain of custody, chain of custody would start at the point of sale, but no later than delivery to a processing plant. Any companies buying from processing facilities that receive certified product are required to have chain of custody certification for further sale and distribution. To use the MSC logo, subsequent links in the distribution chain must enter into a separate chain of custody certification that proves they can track the salmon product to a chain of custody holder or the certified fishery.

4.4 Eligibility of Inseparable or Practicably Inseparable (IPI) stock(s)

About 90% of the sockeye salmon harvested from marine parcels south of the Opala River have been found to be Ozernaya-bound sockeye (Shevlyakov 2014; see Figure 2). The majority of this fish is processed together with UoA Ozernaya sockeye (defined as sockeye harvested from marine parcels south of the Koshegochek River, and those in the Ozernaya river). Thus, sockeye from marine parcels between the Opala and Ozernaya rivers are candidates to be considered as non-local Inseparable or Practicably inseparable (IPI) catches and sold as certified. Table 2 shows the catches by parcel and summarized by geographic area for this fishery. The average percentage of sockeye catch from north of the UoA parcels and south of the Opala River is 9%., and since it has been shown that 90% of this 9% is from the Ozernaya stock (headed back to spawn), that means approximately 0.9% is truly non-Ozernaya sockeye. (See section 5.2.1 for further explanation).

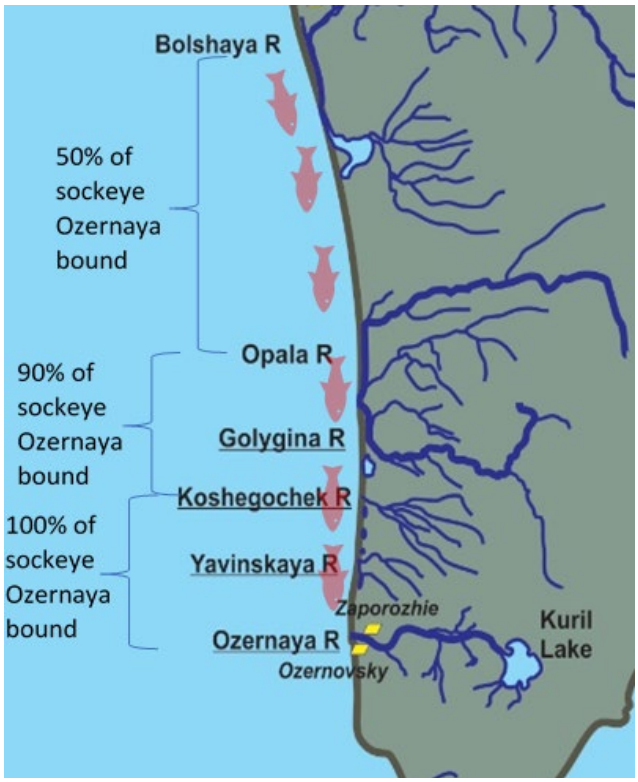


Figure 2. Movement of migrating sockeye salmon southward toward the Ozernaya river.

The non-local salmon IPI requirements are as follows:

Where the proposed IPI stocks are non-local stocks of the same species as the P1 target stock within the UoA (SC6.1.1.b.):

The total catches from the IPI stock(s) shall not exceed 5% by weight of the total combined catches of target and IPI stock(s) within the UoA; and

a. FCP 7.5.8.1.d shall not apply to these stocks, but, if outside biologically based limits, the team shall demonstrate that the fishery:

i. Does not catch a significant proportion of the total catch of the stock; and

ii. ii. Is highly likely not to significantly hinder its recovery, and practical measures have been implemented to reduce impacts on the stock.

Non-local sockeye returning to rivers between the Opala and Ozernaya have been assessed as a minor primary species in the assessment, and it is unlikely they are outside safe biological limits. Based on this analysis, **sockeye salmon catches originating from client group parcels south of and including the Opala River may be sold as certified along with the UoA sockeye**.

Table 2. Client group sockeye salmon catches (in tonnes) by parcel number for 2015-2020. Marine parcels are listed north to south, followed by in-river parcels. Color coding indicates location of parcel relative to important rivers. Dark orange is parcels north of the Opala River, peach are marine parcels south of the Opala River and north of the Koshegochek River (the IPI candidate catches), and green are parcels currently included in the Ozernaya sockeye salmon UoA. In-River parcels are as indicated in the "River" column.

Company	Parcel	Location	2015	2016	2017	2018	2019	2020	Avg.	% of total
Delta	177	Marine	18	27	42	48	95	53	47	1%
Delta	178	Marine	17	30	41	59	46	75	45	1%
Delta	179	Marine	23	57	23	63	45	84	49	1%
Delta	180	Marine	33	48	22	47	35	74	43	1%
Delta	181	Marine	30	41	22	69	8	181	59	1%
Delta	184	Marine	0	73	77	25	122	259	93	1%
Vityaz-Avto	189	Marine	0	200	36	220	209	318	164	2%
Vityaz-Avto	190	Marine	372	300	22	286	370	295	274	3%
Vityaz-Avto	191	Marine	238	440	43	426	267	236	275	3%
Vityaz-Avto	197	Marine	771	890	609	687	444	323	621	8%
Delta	198	Marine	701	814	295	1,223	922	449	734	9%
Vityaz-Avto	203	Marine	816	900	367	1,036	1,136	451	784	10%
Vityaz-Avto	204	Marine	845	944	832	1,196	1,391	358	928	11%
Delta	740	Opala R	14	25	21	28	46	41	29	0%
Vityaz-Avto	746	Golygina R	0	24	0	0	0	6	5	0%
Vityaz-Avto	747	Koshegochek R	0	701	0	0	0	0	117	1%
Vityaz-Avto	752	Ozernaya R	4,692	2,240	2,552	2,507	4,083	1,596	2,945	36%
Delta	755	Ozernaya R	906	1,289	1,033	969	1,280	125	934	11%
Vityaz-Avto	757	Ozernaya R	0	24	0	0	0	0	4	0%
Total			**9,476**	**9,067**	**6,037**	**8,889**	**10,500**	**4,924**	**8,149**	**100%**
Total south of Opala			**9,341**	**8,742**	**5,789**	**8,550**	**10,101**	**4,151**	**7,779**	**95%**
Total north of certified Ozernaya and south of Opala			**610**	**940**	**101**	**932**	**846**	**849**	**713**	**9%**

5 Scoring

5.1 Summary of Performance Indicator level scores

Prin-ciple	Wt (L1)	Component	Wt (L2)	PI No.	Performance Indicator (PI)	Wt (L3)	Weight in Principle	Score					
								1. OZ sockeye	2. KK pink	3. WK pink	4. KK chum	5. WK chum	6. KK coho
One	1	Outcome	0.25	1.1.1	Stock status	0.25	0.063	100	70	70	80	70	70
				1.1.2	Stock rebuilding	0.25	0.063	na	85	85	na	85	85
		Management	0.5	1.2.1	Harvest strategy	0.5	0.250	95	80	80	80	80	80
				1.2.2	Harvest control rules & tools	0.5	0.250	100	80	80	80	80	80
				1.2.3	Information & monitoring	0.5	0.250	100	75	75	75	75	75
				1.2.4	Assessment of stock status	0.5	0.250	95	80	80	80	80	80
		Enhancement	0.25	1.3.1	Enhancement outcome	0.25	0.063	100	100	100	100	100	100
				1.3.2	Enhancement management	0.25	0.063	100	100	100	100	100	100
				1.3.3	Enhancement information	0.25	0.063	100	100	100	100	100	100
Two	1	Primary species	0.2	2.1.1	Outcome	0.333	0.067	90					
				2.1.2	Management	0.333	0.067	85					
				2.1.3	Information	0.333	0.067	80					
		Secondary species	0.2	2.2.1	Outcome	0.333	0.067	90					
				2.2.2	Management	0.333	0.067	80					
				2.2.3	Information	0.333	0.067	80					
		ETP species	0.2	2.3.1	Outcome	0.333	0.067	80					
				2.3.2	Management	0.333	0.067	80					
				2.3.3	Information	0.333	0.067	80					
		Habitats	0.2	2.4.1	Outcome	0.333	0.067	95					
				2.4.2	Management	0.333	0.067	80					
				2.4.3	Information	0.333	0.067	80					
		Ecosystem	0.2	2.5.1	Outcome	0.333	0.067	90					
				2.5.2	Management	0.333	0.067	90					
				2.5.3	Information	0.333	0.067	80					
Three	1	Governance and policy	0.5	3.1.1	Legal & customary framework	0.3	0.150	95					
				3.1.2	Consultation, roles & responsibilities	0.3	0.150	95					
				3.1.3	Long term objectives	0.3	0.150	80					
		Fishery specific management system	0.5	3.2.1	Fishery specific objectives	0.25	0.125	80					
				3.2.2	Decision making processes	0.25	0.125	75					
				3.2.3	Compliance & enforcement	0.25	0.125	85					
				3.2.4	Management performance evaluation	0.25	0.125	80					

5.2 Principle 1

5.2.1 Principle 1 background

Fishery Description

The fishery occurs in the Sea of Okhotsk along the southwestern and western coast of Kamchatka and the lower reaches of several coastal rivers including the Ozernaya, Golygina and Opala (Figure 1). The region of the fishery is remote and largely undeveloped. Watersheds are in excellent condition and salmon habitat diverse and highly productive. The human population is concentrated in about 10 small communities. The largest towns, Ust-Bolsheretsk, Oktiabrsky, Sobolevo are located on the Bolshaya and Vorovskaya River. Two small towns are also located near the mouth of the Ozernaya River, Ozernovsky and Zaporozhie, each consist of about 2,500 residents. During the two-month fishing season, many people also come to the region from Petropavlovsk-Kamchatsky and from mainland Russia for seasonal work with the fishing companies. The local population has been declining recently due to limited economic opportunity in the region.

Road access to the fishery is limited in comparison with majority of other Kamchatka fisheries. There is a road connecting Petropavlovsk-Kamchatsky to the west Kamchatka coast at the Bolshaya River, the total distance is about 200 km. Vehicle access to rivers north and south of the Bolshaya is made along the beach, conditions permitting. However, most travel between fishing rivers occurs by helicopter or boat.

Figure 3. Ozernaya River mouth (from Bugaev et al. 2009). Processing facilities of Vityaz-Avto are on the right-hand side.

Historical development of the Fishery

Fishing is and has always been the primary occupation of people of West Kamchatka including indigenous peoples. Since the beginning of Kamchatka colonization, the western coast played a significant role in the local economy because of rich and diverse Pacific salmon resources. A settlement near Bolshaya River is one of the first in Kamchatka; it is known since early 18th century.

Industrial salmon fisheries have operated in the mouth of Ozernaya River since 1907 when migrants from Kherson province founded village Zaporozhie on the right bank of Ozernaya river. Since 1914 at the left bank, the cannery by entrepreneur S. Grushetsky started to operate, and worked until 1925.

The fishing industry expanded during the Soviet period, although catches began to decrease in the 1950s due to Japanese driftnet fishing and unfavorable ocean conditions for salmon production.

The fishery situation fundamentally changed in the early 1990s when the collapse of the Soviet Union led to economic crisis. At the same time, salmon returns increased considerably following improvements in ocean conditions for salmon throughout the North Pacific during the 1980s and an international ban in 1993 on unregulated high seas drift net fishing outside of the Russian Exclusive Economic Zone. Fishing parcels and fishing rights were also redistributed during the economic crisis. Until Perestroika, fishing was conducted by very few governmental enterprises. After 1990, commercial fishery access was leased to small private companies. Eventually, number of owners and companies reduced, and redistribution of fishing parcels took place in 2008. Before this time salmon fisheries were under TAC regulation, but after that they are regulated with recommended catch which made the management more time efficient.

Fishermen are now hired by contract to the fishing companies – they have a salary and then extra pay by their results based on catch. In addition to employing the local inhabitants in fish processing factories, the companies also pay considerable attention to investing in community development projects of the towns in West Kamchatka for located near towns.

Fishing Methods

The fishery is executed with fixed trap nets in coastal nearshore marine waters, and beach seines are used in the lower reaches of area rivers. Coastal trap nets[2] (Figure 4) typically consist of a mesh lead set perpendicular to shore to guide fish into one or more mesh wing-style traps where narrowing mesh fykes make it difficult for fish to exit. The mesh lead or “fence” is usually 1100 -1300 m in length and 11-15 m deep at low tide. The mesh size of the central net and the traps is being chosen to prevent fish from being gilled in the net cells. Traps are constructed of net mesh on a steel frame, typically have a wall height of 9 m and do not reach bottom. Coastal trap nets are effective because tidal amplitude is relatively small and coastal areas are wide and gradually-sloped. This type of fishing is passive and catch per unit effort is related to the fish abundance. Coastal trap nets are operated from small boats. Catch is typically taken from traps and dip netted into the boats for transport a short distance to shore or the fish processing plant where they are off-loaded by crane or hand at the beach.

Beach seines are long nets used to encircle and crowd fish toward shore where they can be captured. These seines are typically 200 m in length. Seines are fished in the shallow waters of the lower river where the current is relatively slow and the river is shallow. Seines are set from small skiffs and hauled from shore with vehicles and by hand.

Gillnets are not employed by the fishing companies included in this assessment. Gillnet use is prohibited in southwestern Kamchatka commercial salmon fisheries south of 54▪N. Several of the fishing companies operate north of 54▪ but these companies use only coastal trap nets and beach seines.

[2] Coastal trap nets are similar to stationary uncovered pound nets according to FAO standards (http://www.fao.org/fishery/geartype/search/en).

Figure 4. Photos of fishing gear deployment: coastal trap net (upper) and beach seine (lower).

Fishery Location

Administratively, the fishing areas are parts of Kamchatka Kray of Far East Federal Region of the Russian Federation (Figure 6). For management purposes, the fishing areas in Russia are subdivided into zones and subzones (Figure 5). Units of certification in this assessment are located in the Kamchatka-Kuril subzone (05.4) and the Western Kamchatka subzone (05.2).

Fishing parcels consisting of trap or seine sites are leased to fishing companies under a long-term lease arrangement. Fishing parcels were distributed for period 2008-2027. Only commercial fishing occurs in sea fishing parcels. River parcels may be allocated for commercial fishing, sport fishing or hatchery purposes. Vityaz-Avto leases 18 fishing parcels, 14 of which are in the sea, and four of which are in the Ozernaya, Koshegochek, Golygina and Kol rivers. Delta leases nine fishing parcels, seven of which are in the sea, and two of which are in the Ozernaya and Opala rivers. The Vityaz-Avto and Delta companies have fished on the Vorovskaya, Opala and Ozernaya rivers since 1998 and the Kol since 2004. The companies also participate in marine fisheries for white fish. Kamber Co. leases six fishing parcels, five in the sea and one in the Pymta River. Pymta Co. leases seven fishing parcels, 6 in the sea and 1 in the Pymta River. There are several other companies participating in fisheries within the Units of Assessment.

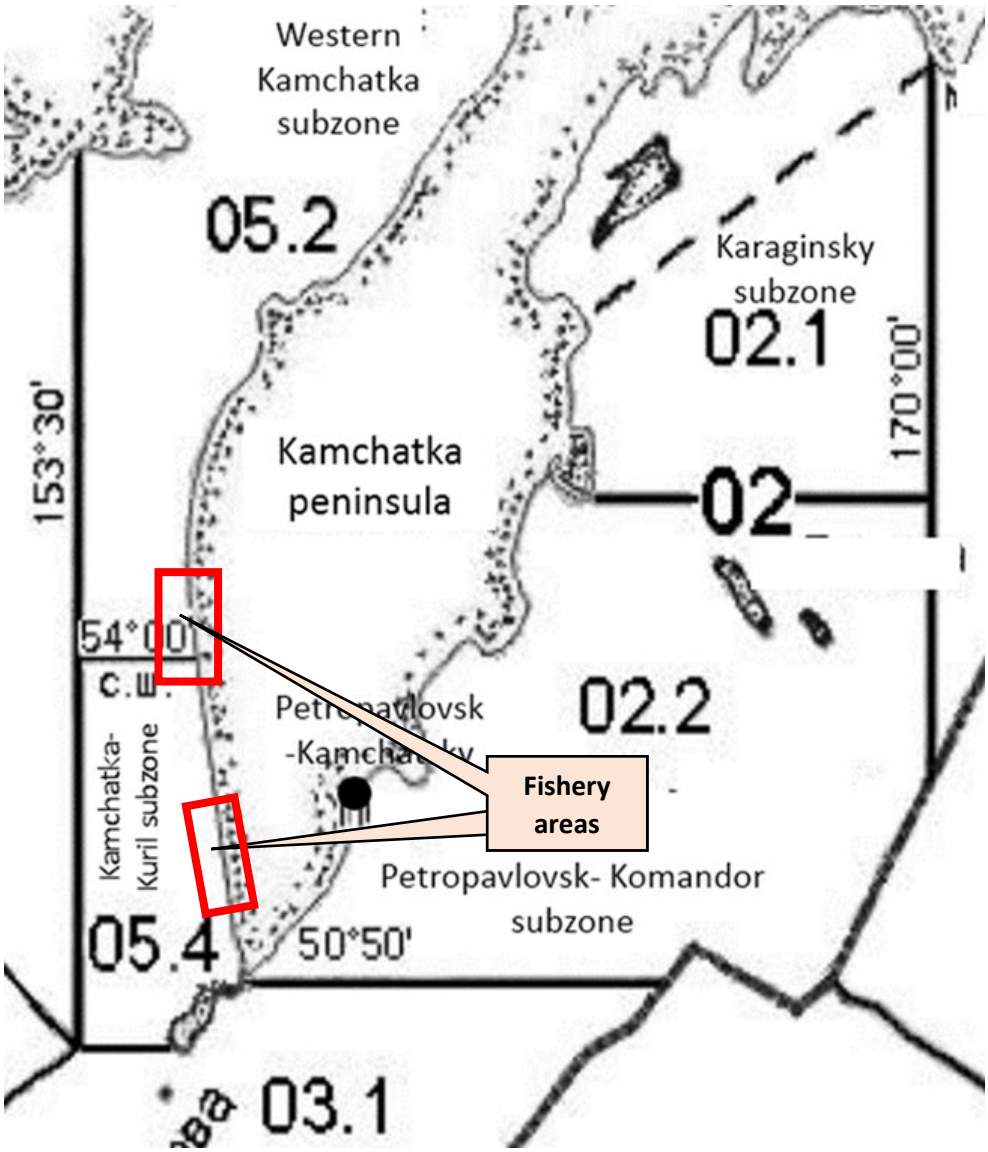


Figure 5. Administrative units (subzones) for Kamchatka peninsula fishery management.

Table 3. List of fishing parcels permitted for use by fishing companies included in this Unit of Assessment. Parcels denoted with a * are rarely fished in practice.

Co.	Parcel	Water body	Latitude			Longitude			Length/ width (m)	Processing location
			Deg	min	sec	Deg	min	sec		
Vityaz-Avto	752	Ozernaya river	Low point - 1000 m from the mouth, top point - 1200 m from the mouth (south part of the island)						200/'--	Ozernaya
	189	Sea of Okhotsk	51	48	20	156	30	06	300/2000	Ozernaya and Koshegochek
	190	Sea of Okhotsk								Ozernaya and Koshegochek
	191	Sea of Okhotsk	51	46	10	156	30	10	300/2000	Ozernaya and Koshegochek
	197	Sea of Okhotsk	51	39	43	156	29	58	300/2000	Ozernaya
	203	Sea of Okhotsk	51	32	44	156	29	07	300/2000	Ozernaya
	204	Sea of Okhotsk	51	31	38	156	29	07	300/2000	Ozernaya

Co.	Parcel	Water body	Latitude			Longitude			Length/ width (m)	Processing location
			Deg	min	sec	Deg	min	sec		
	746	Golygina river	Low point - 4000 m from the mouth, top point - 6200 m from the mouth (left shore)						2200/--	Ozernaya and Koshegochek
	747	Koshegochek river	Low point - 1000 m from the mouth, top point - 1500 m from the mouth (both shores)						500/--	Ozernaya and Koshegochek
	697	Kol river	Low point - 3000 m from the mouth, top point - 5000 m from the mouth (both shores)						2000/--	Kol
	90	Sea of Okhotsk	53	48	18	155	57	04	300/2000	Kol
	89	Sea of Okhotsk	53	49	22	155	56	49	300/2000	Kol
	*81	Sea of Okhotsk	54	03	11	155	52	29	300/2000	at sea (vessels)
	*80	Sea of Okhotsk	54	04	15	155	52	03	300/2000	at sea (vessels)
	*79	Sea of Okhotsk	54	05	18	155	51	41	300/2000	at sea (vessels)
	78	Sea of Okhotsk	54	06	22	155	51	17	300/2000	Ozernaya and Koshegochek
	77	Sea of Okhotsk	54	07	25	155	50	53	300/2000	Ozernaya and Koshegochek
	76	Sea of Okhotsk	54	08	29	155	50	29	300/2000	Ozernaya and Koshegochek
	*60	Sea of Okhotsk	54	23	55	155	44	51	300/2000	at sea (vessels)
Delta	755	Ozernaya river	Low point - 2000 m from the mouth, top point - 2400 m from the mouth (left shore)						400/--	Ozernaya
	740	Opala river	Low point - 1000 m from the river mouth, top point - 2000 m from the river mouth (both shores)						1000/--	Opala
	177	Sea of Okhotsk	52	03	43	156	28	40	300/2000	Opala
	178	Sea of Okhotsk	52	02	39	156	28	49	300/2000	Opala
	179	Sea of Okhotsk	52	01	34	156	28	56	300/2000	Opala
	180	Sea of Okhotsk	52	00	30	156	29	02	300/2000	Opala
	181	Sea of Okhotsk	51	59	25	156	29	08	300/2000	Opala
	184	Sea of Okhotsk	51	54	49	156	29	31	300/2000	at sea (vessels)
	198	Sea of Okhotsk	51	37	13	156	29	53	300/2000	Ozernaya
Kamber	91	Sea of Okhotsk	53	46	42	155	57	26	300/2000	Pymta
	92	Sea of Okhotsk	53	45	37	155	57	41	300/2000	Pymta
	93	Sea of Okhotsk	53	44	33	155	57	57	300/2000	Pymta
	94	Sea of Okhotsk	53	42	23	155	58	35	300/2000	Pymta
	96	Sea of Okhotsk	53	40	46	155	58	55	300/2000	Pymta
	699	Pymta River	Low point - 2500 m from the river mouth, top point - 2600 m from the river mouth (both shores)						100/--	Pymta
Pymta	1124	Sea of Okhotsk	53	33	36	156	00	11	300/2000	Pymta
	1119	Sea of Okhotsk	54	27	00	155	43	51	300/2000	Pymta
	83	Sea of Okhotsk	54	01	04	155	53	16	300/2000	Pymta
	82	Sea of Okhotsk	54	02	08	155	52	52	300/2000	Pymta
	98	Sea of Okhotsk	53	38	37	155	59	21	300/2000	Pymta
	97	Sea of Okhotsk	53	39	42	155	59	09	300/2000	Pymta
	700	Pymta River	Low point - 3600 m from the river mouth, top point - 3750 m from the river mouth (both shores)						150/--	Pymta

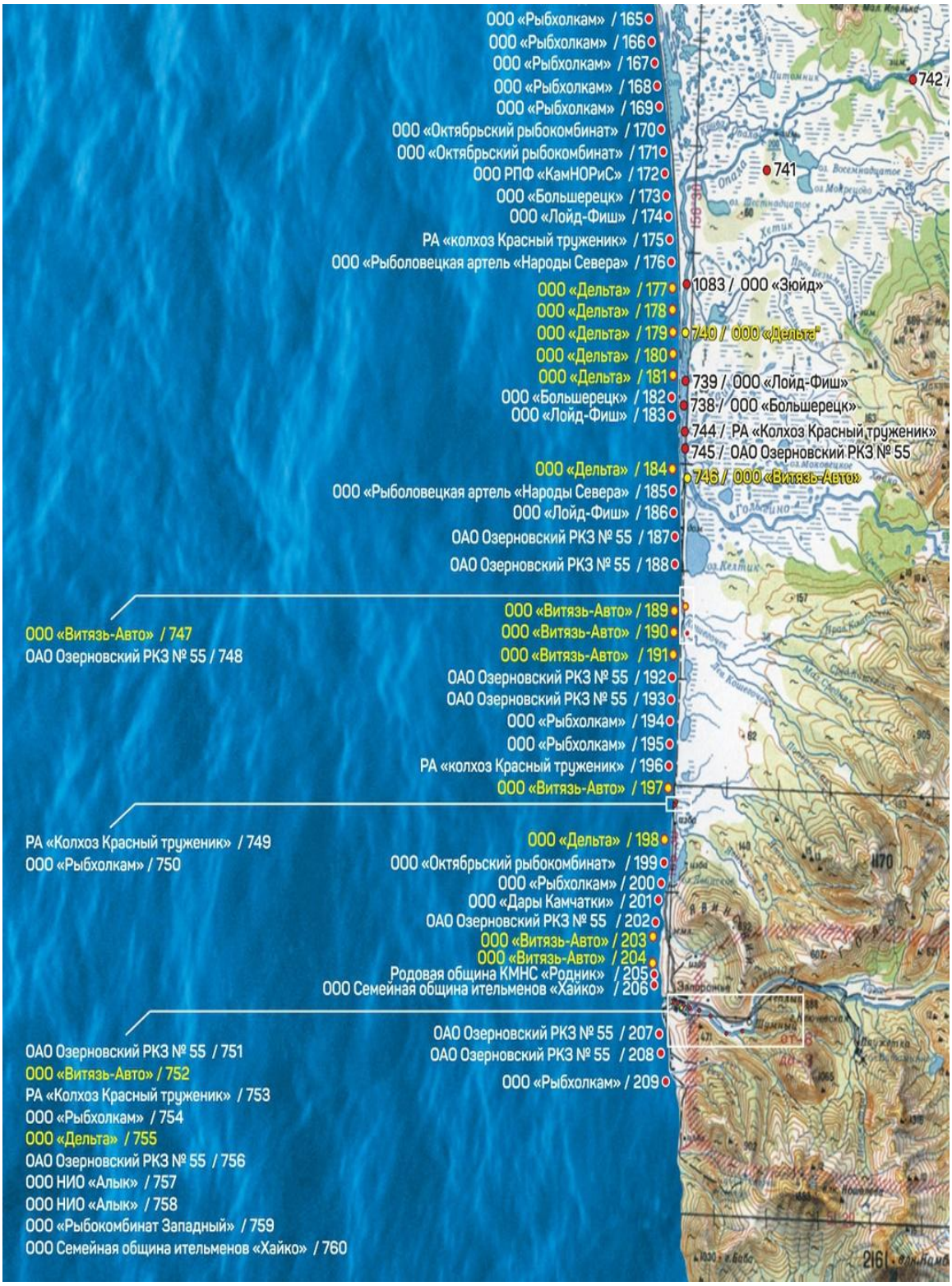


Figure 6. Locations of fishing parcels in the southwestern Kamchatka UoC's (all parcels within the area including the fishing companies addressed by this assessment).

Figure 7. Locations of fishing parcels in the western Kamchatka UoC's (all parcels within the area including the fishing companies addressed by this assessment).

Fishing Seasons

Commercial salmon fishing generally occurs from July until September. Fishing in the rivers generally begins around July 5-9. Fishing in sea nets generally begins around July 15-20. Salmon species return and are harvested in broadly overlapping distributions throughout this period (Figure 8). Fishing generally continues as long as fish abundance and weather permit. Sea nets are typically removed in September as the bulk of the salmon run is complete and autumn storms begin. Fishing may continue in river sites when fish are available.

The start of the commercial season is timed to avoid harvest of Chinook and Cherry Salmon which return from May until early or mid-July. Commercial sockeye harvest typically begins in the second week of July. Maximum catches occur from mid-July until mid-August, and the latest industrial catches occur in late August to mid-September. Pink harvest typically begins around the third week of July. Maximum catches occur in the early-mid August. Catches are largely complete in even years by the beginning of September and in odd years from late August to mid-September. Chum harvest begins in mid- to late July with peak catches in early to mid-August. The latest catches generally occur in the early to mid-September. Coho harvest typically begins in mid- August with maximum catches in the early to mid-September, and catches until the beginning of October. The large majority of the coho harvest in the commercial fishery occurs after the period of sockeye, pink and chum catches. Fishing seasons may be modified based on fish abundance.

Commercial Fishery

The large majority of the salmon harvest (90%) occurs in the commercial fishery. Salmon are also harvested by sport fishing; for personal consumption fisheries by communities, families and individual representatives of indigenous peoples; and by salmon hatcheries for reproduction purposes (although no hatcheries occur on the rivers in the UoA).

Commercial salmon harvest data is available for West Kamchatka since the 1930s. Extensive catch records are kept by the commercial fisheries. Each fishing parcel has an individual log book that is maintained by the captain of that crew. Fishing companies compile and report numbers to the management systems. Numbers were historically tracked relative to fishery quota allocations and are currently the basis for landing tax assessments.

Annual salmon harvest in West Kamchatka commercial fisheries currently averages about 90,000 mt per year. Pink salmon average about 60% of the even year harvest and 10% of the odd year harvest. Chum average about 20%, sockeye about 30%, coho about 5%.

Pink salmon are caught primarily by coastal set nets in even years. During odd years, pink salmon harvest is distributed between sea and river sites. Chum salmon catch is distributed between sea and river sites. Sockeye are harvested primarily in sea nets where the harvest included substantial numbers of the large Ozernaya run which migrates south along the coast. Coho salmon (non-target) are harvested mainly in the river. In even-numbered years 62% of total catch occurs in the sea areas, in odd-numbered— 37%.

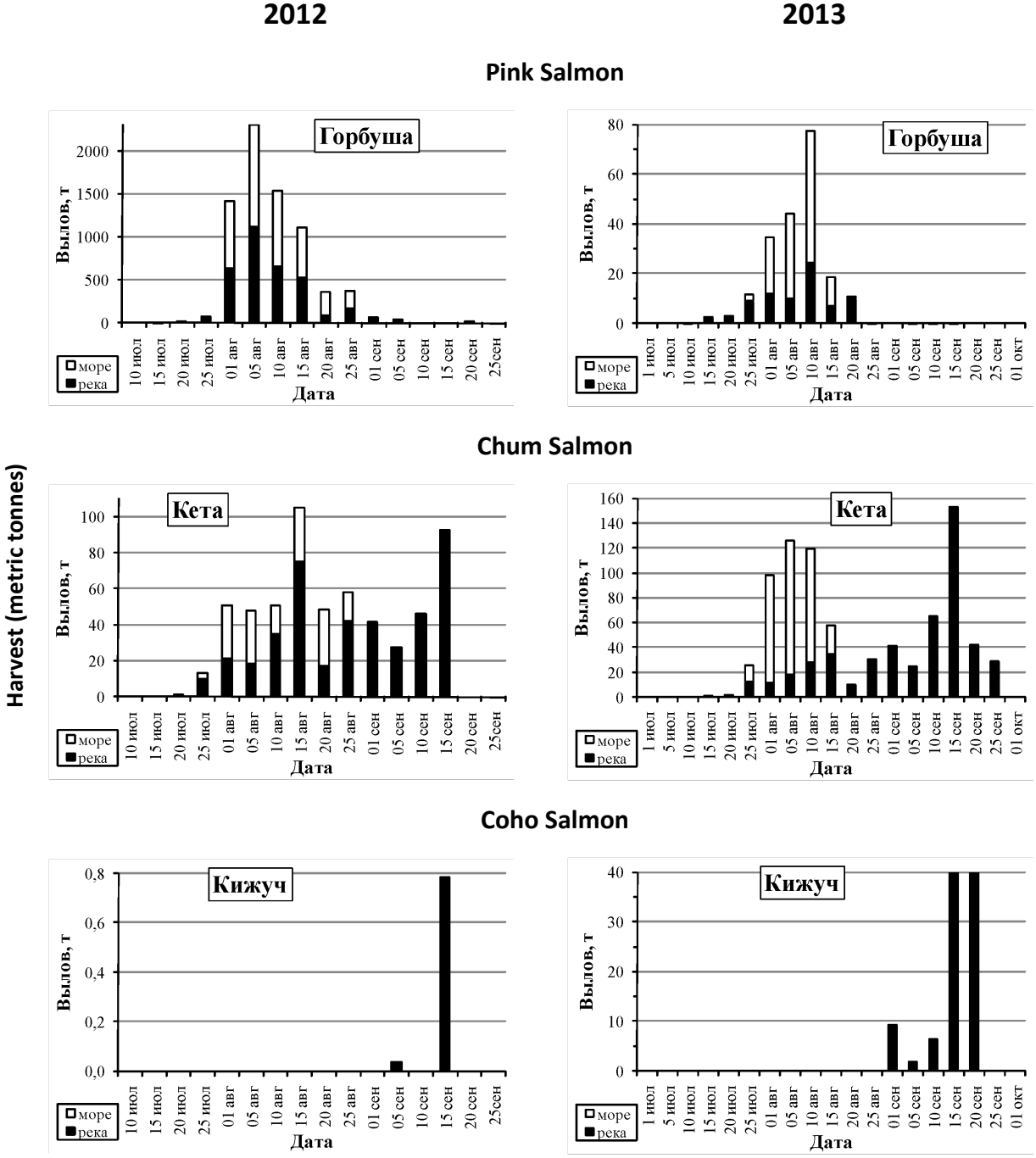
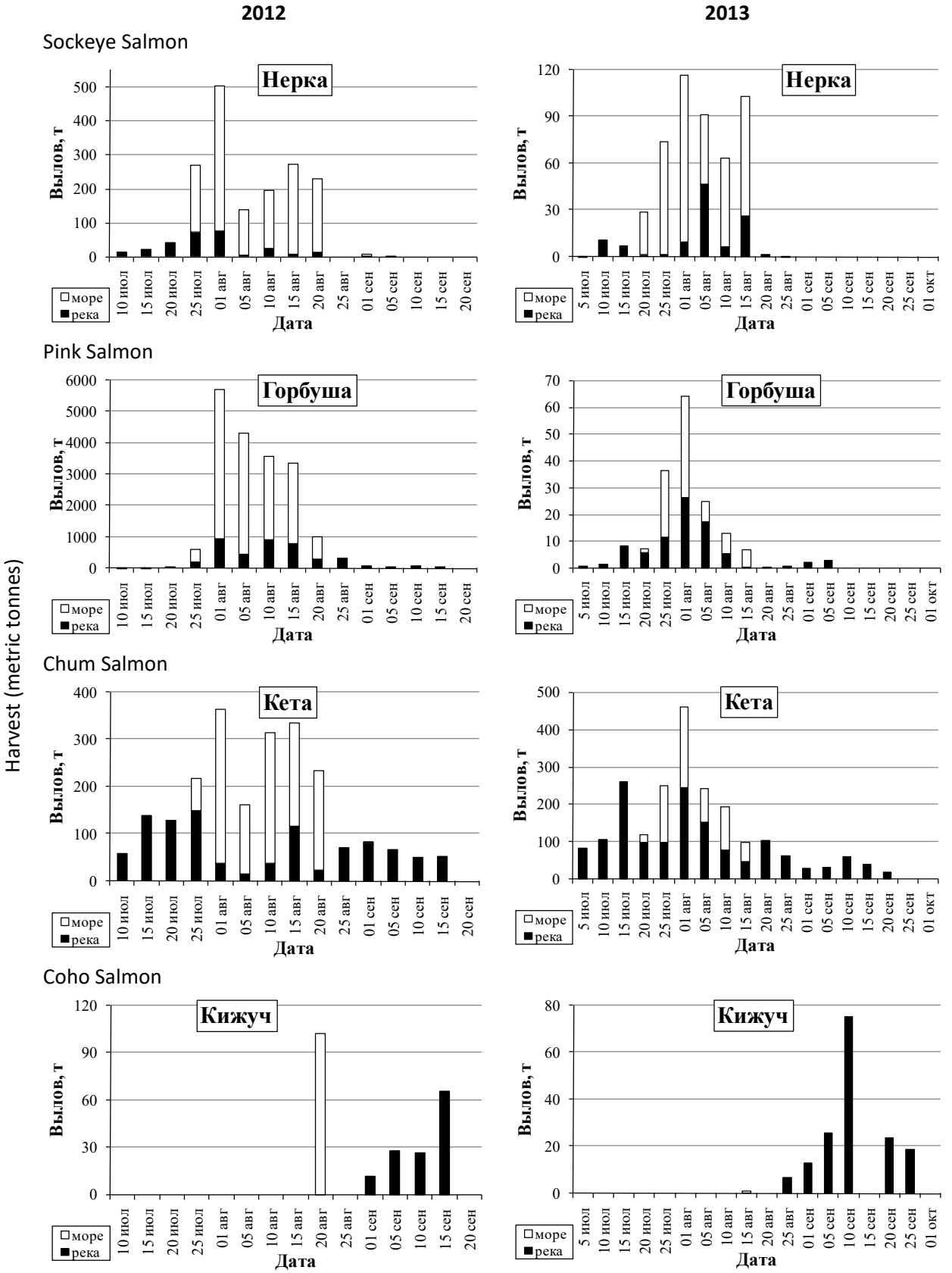


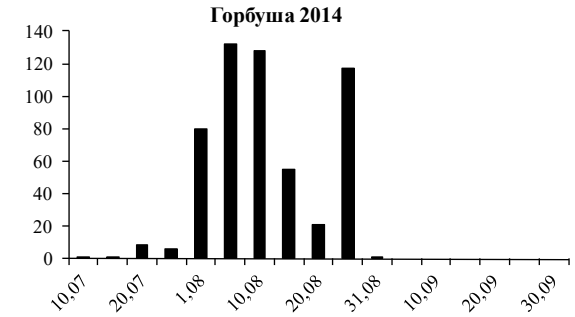
Figure 8. Run timing pattern based on salmon harvest in the Ozernaya River, 2012-2013, by five-day period (□ Sea, ■ River).

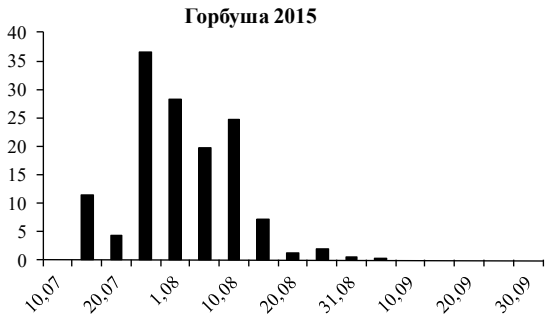


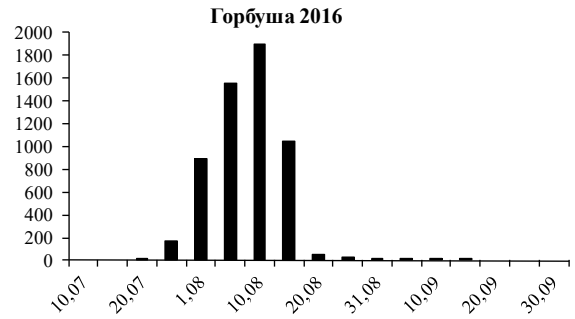
10 Jul, 15 Jul, 20 Jul, 25 Jul, 01 Aug, 05 Aug, 15 Aug, 20 Aug, 25 Aug, 01 Sep, 05 Sep, 10 Sep, 15 Sep, 20 Sep, 25 Sep, 01 Oct

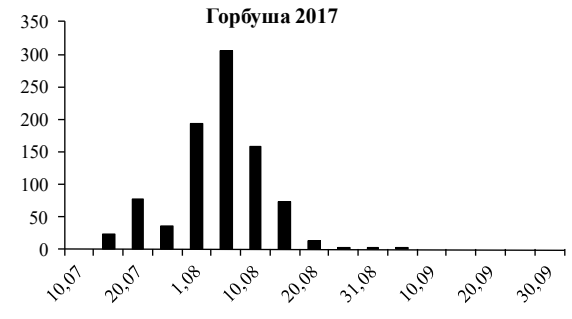
Figure 9. Salmon harvest in the Opala River, 2012-2013, by five-day period (□ Sea, ■ River).

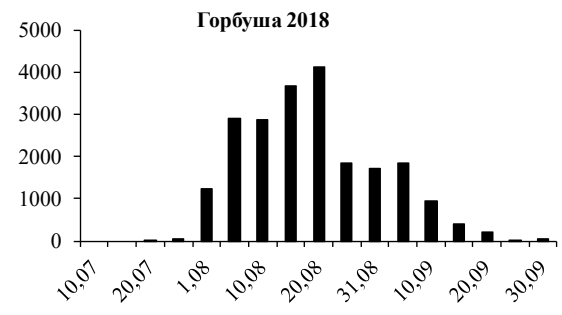
Pink Salmon



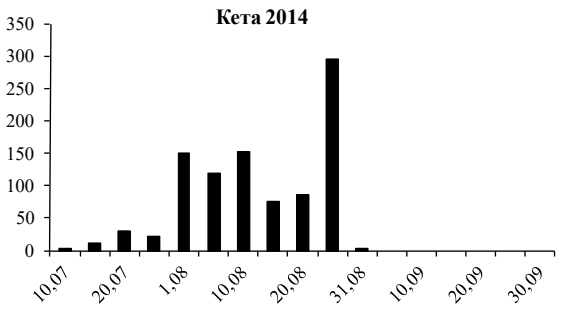


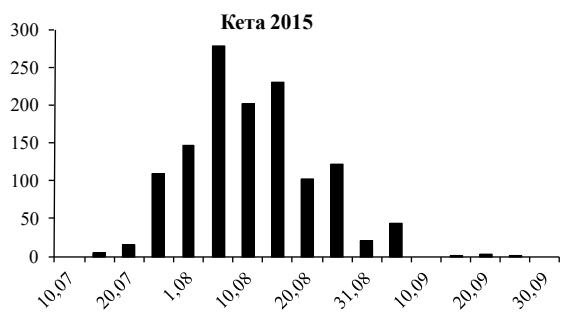


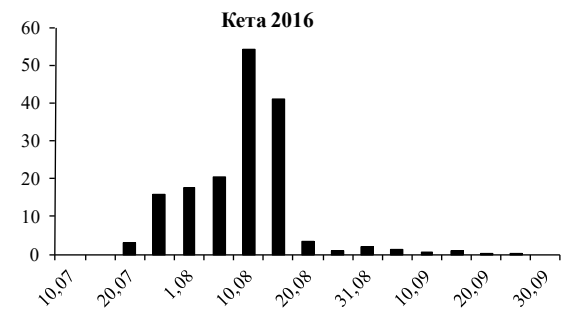




Chum Salmon







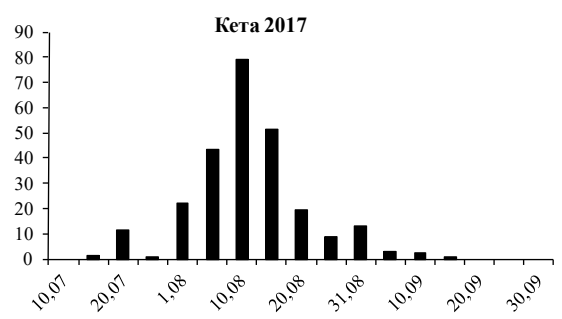


Figure 10. Salmon harvest (tonnes) in the Pymta River by five-day period.

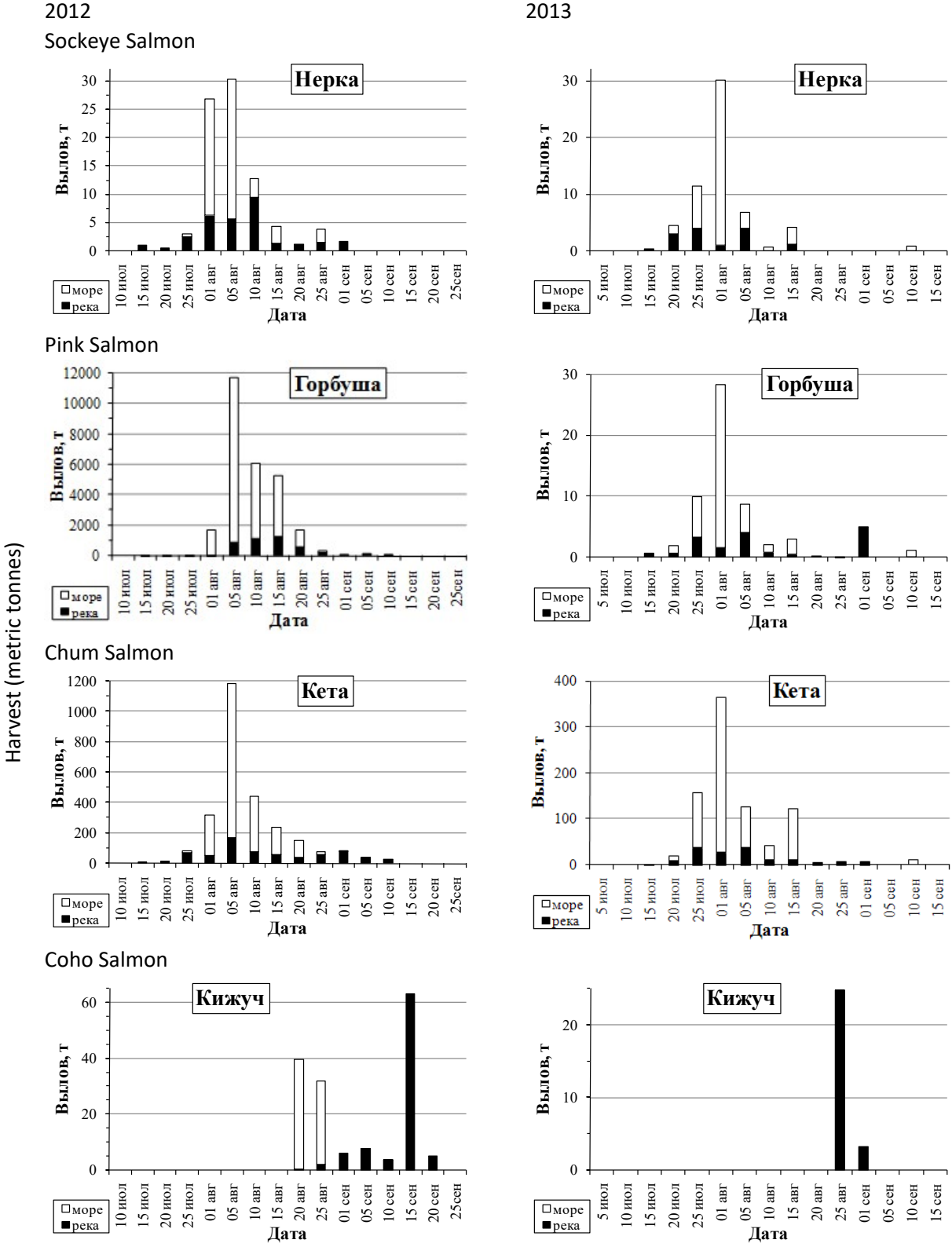
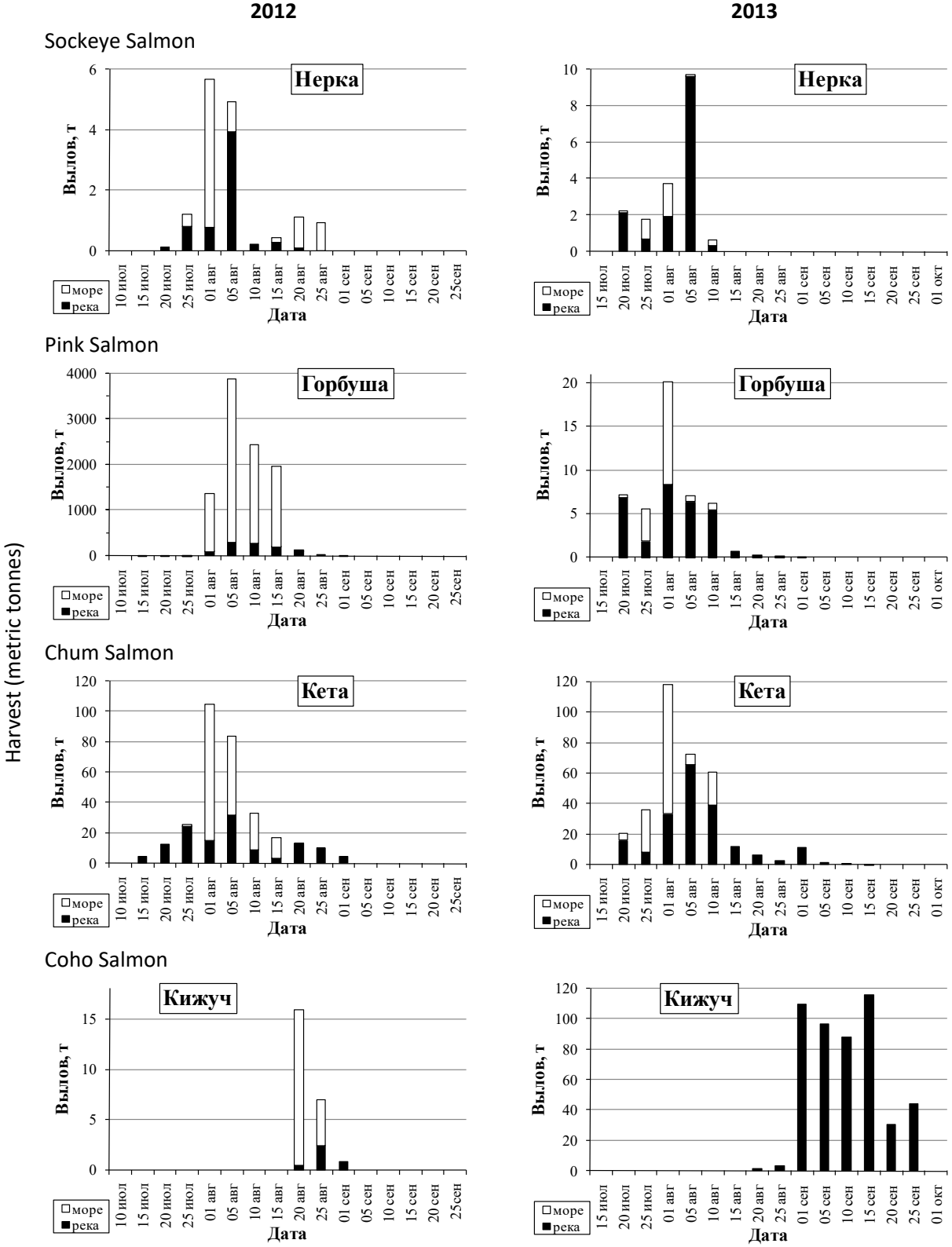


Figure 11. Salmon harvest in the Vorovskaya River, 2012-2013, by five-day period (□ Sea, ■ River).



10 Jul, 15 Jul, 20 Jul, 25 Jul, 01 Aug, 05 Aug, 15 Aug, 20 Aug, 25 Aug, 01 Sep, 05 Sep, 10 Sep, 15 Sep, 20 Sep, 25 Sep, 01 Oct

Figure 12. Salmon harvest in the Kol River, 2012-2013, by five-day period (□ Sea, ■ River).

Sport Fishery

Sport fisheries exist for all salmon species but are primarily focused on Chinook and coho salmon. In the Russian practice, sport and amateur fishing can occur with sports gear (spinning or rod) or amateur fishing gear (various types of nets). Sport and amateur fishing are limited to designated fishing parcels some of which may be leased to fishing companies. There are two sport fishing parcels in the Vorovskaya River basin, four parcels on the Opala River, and one on the Kol River. The sport fishery on the Ozernaya River is not limited to a specific parcel.

Chinook salmon support very popular sport fisheries in rivers throughout West Kamchatka. The sport fishery is now the primary harvester of Chinook salmon in many rivers since closure of early commercial fishing seasons beginning in 2010. Harvest allocations are identified for Chinook sport fisheries. The demand for such quotas of king salmon is very high and exceeds the offered ones significantly. Catch and release fishing for Chinook is significant and this fishery attracts numerous foreign anglers. The Russian system does not specifically provide for catch and release sport fishing but this type of fishing allows repeated catch without loss for reproduction within allocated quotas.

Sport and/or amateur fisheries have occurred on the Vorovskaya and Ozernaya rivers since 1994. These sport fisheries have expanded to other species in subsequent years (although amateur net fishing was closed in the Ozernaya River after 2006). Catches are very low in relation to the volume of commercial harvest.

Table 4. Average annual sport fishery harvest (tonnes) by river and species, 2001-2015 (Shevlyakov et al. 2016).

River		Pink	Chum	Sockeye	Coho	Chinook	Char
Vorovskaya	2001-2015	27.3	18.1	1.2	11.5	2.1	0.3
Kol	2001-2015	0.2	0.8	--	0.9	1.0	0.5
Opala	2009-2015	1.9	5.8	3.9	7.0	1.7	5.5
Golygina	2007-2008	--	7.0	--	1.5	--	--
Ozernaya	2001-2006	12.0	1.0	40.0	--	--	--

Indigenous fishing

Annual fishing volumes for Pacific salmon are established for indigenous minorities of the Russian Federation All species of salmon are harvested for consumption by communities, families and individual representatives of indigenous peoples. In 2009, the government decreed in Document №631 that the indigenous peoples of Kamchatka territory were allowed to fish for personal consumption without written permits/documents. Personal limits of 50 kg per year are allocated for indigenous people. Native communities may also be provided with a specific allocation which varies from river to river. Indigenous quota has priority relative to industrial quota. Indigenous catch may be retained for subsistence and personal use or sold.

Indigenous fisheries in the unit of certification assessment occur in the Ozernaya Rivers. Annual indigenous catch of combined salmon species typically averages 90 t (90% coho) in the Ozernaya. Subsistence fisheries do not occur in other areas of the UoC due to remote locations. The largest indigenous fishery in the region occurs in the Bolshaya River, which is not in the unit of certification. Indigenous harvest in some rivers like the Bolshaya, has increased considerably in the last ten years, and currently comprises 9 to 10% of the total catch of chum, coho, and Chinook salmon. The indigenous fishery is reportedly the source of some abuse as qualifications for permits are loose,

individual harvest limits are difficult to enforce, and permits are sometimes illegally transferred to others to fish.

Marine Drift Net Fishery

Kamchatka sockeye are subject to harvest in Russian and Japanese drift net fisheries occurring in areas of the Pacific Ocean, Sea of Okhotsk, and Bering Sea (Bugaev and Dubynin 2000; Bugaev et al. 2009). This fishery primarily targets mature Sockeye, using net mesh size to avoid catch of smaller, immature fish. By-catch of pink, chum, and masu salmon taken in high seas drift nets is typically discarded. The research institute estimates that the combined chum and pink bycatch roughly equals the reported sockeye catch.

Marine harvest rates of Kamchatka salmon have varied considerably over the years in response to changes in management of the drift fisheries. High returns of salmon in Kamchatka occurred during 1941-1950 with the reduction and cessation of the Japanese marine drift net fishery. Resumption of the unregulated drift net fishery in marine waters resulted in an extended period of low salmon returns until the 1970s. Prior to introduction of the 200-mile exclusive economic zone in 1977 and 1978, most harvest of Kamchatka salmon occurred in this fishery. The drift net fishery outside of the EEZ was finally banned in 1993.

From 1977 until 1991, drift fishing effort within the EEZ was very limited and corresponding harvest of Kamchatka sockeye was very low. However, drift fisheries continued in the Pacific Ocean outside of the EEZ until 1993. This fishery harvested large numbers of salmon including those of Kamchatka origin but estimation of specific numbers is difficult due to incomplete catch data and the mixed stock nature of the far-flung fishery. In 1993, drift fisheries outside of the EEZ's were banned by agreement between Russia, Japan, Canada, and the United States under the "Convention for the Conservation of Anadromous Fish Stocks in the North Pacific Ocean."

Beginning in 1992, Russia began leasing some drift fishing rights inside the EEZ to Japanese vessels under bilateral agreements between the governments of the USSR and Japan adopted in 1984 and 1985. For instance, Japan has secured quota from Russia for 10,275 tons of salmon in 2007 and 9,735 tons of salmon in 2008 from the Russian EEZ. Pressure of ocean driftnet fishing is relatively stable in recent years, which makes it easier to account for harvest of Ozernaya sockeye in marine drift net fisheries estimated annually based on reported harvest and catch composition data. This task has been made much simpler by the current distribution of the drift fishery inside of the EEZ where it primarily harvests Asian sockeye stocks of which the Ozernaya is the largest (Bugaev and Dubynin 2000). Drift net fisheries are currently estimated to account for less than 20% of the annual harvest of Ozernaya sockeye with annual exploitation rates in all fisheries of approximately 67-88% (average 81%) since 2000. These values are likely to apply to other West Kamchatka sockeye as well.

The high seas drift gillnet fishery was closed in the Russian Exclusive Economic Zone beginning in 2015. This closure included Russian vessels based on Sakhalin and Japanese vessels licensed to operate in Russian waters. On June 29, 2015, Federal Law No. 208-ФЗ "On Amending the Federal Law "On Fisheries and the Conservation of Aquatic Biological Resources" was issued (Bugaev et al. 2020a). This law prohibited the use of drift nets in the industrial fishing and fishing for scientific research and monitoring purposes, and coastal fishing for anadromous fish species in the inland waters of the Russian Federation, in the territorial sea of the Russian Federation and in the exclusive economic Russian zone. The law entered into force on January 1, 2016.

Illegal, Unregulated & Unreported Harvest

Illegal or Unreported harvest is a chronic concern for salmon fisheries throughout Kamchatka (Clark 2007; Clarke et al. 2009; Dronova and Spiridonov 2008; Maksimov and Lehman 2008; Zaporozhets et al. 2007a, 2007b). However, the incidence of illegal fishing is reported to be negligible in these UoC's due to its remote location and active enforcement activities funded by the local and regional government as well as the fishing companies.

It is fundamentally a social problem resulting from economic factors and ineffective enforcement. Illegal fishing can take various forms (Maksimov and Leman 2008):

- Industrial poaching: exceeding of quota by fishing companies.
- Criminal poaching: organized illegal fishing in industrial scale.
- Everyday poaching of first type: unorganized illegal fishing by the local population for sale to the market, processing factories and/or illegal packers.
- Everyday poaching of second type: unorganized illegal fishing by the local population primarily for personal use.

Industrial and everyday poaching use both fish and roe, whereas criminal poaching generally uses only roe. Geographically, industrial poaching takes place mostly at sea, at the mouths of spawning rivers and in large rivers, while criminal and everyday poaching are located in rivers and in spawning grounds. In most cases it is poaching for roe. Roe is extracted from fish caught with gillnets, beach seines or weirs (in case of small river). Both locals and outside people poach, although locals predominate.

Large-scale illegal harvest grew rapidly after 1988 during uncertain economic times accompanying the dissolution of the Soviet Union. During the political and economic upheaval of the 1990s, many of the local people lost work and began fishing illegally, focusing on the valuable caviar market. State enforcement efforts during this period were weak. During this period high levels of poaching substantially influenced salmon population dynamics. The volume of historical levels of illegal harvest is difficult to estimate reliably but a 2008 study by TRAFFIC Russia (Dronova and Spiridonov 2008) concluded that scale of illegal harvest varies considerably from area to area depending on transportation infrastructure; illegal harvest may be comparable or exceed official catch by up to three-fold in a number of large river systems which are major contributors of commercial catch.

Since 2002 KamchatNIRO has conducted research on the scale of poaching in Kamchatka (Zaporozhets et al. 2007, 2008; Regionalnaia… 2008). Data have been published through 2006. The following approaches were used for analysis of poaching production:

- Analysis of changes of sex ratio in the river mouth and spawning ground (assuming that poaching is mostly targeted on females).
- Comparison of official data and total removal obtained by modelling of catch per unit effort data.
- Comparison of current fisheries statistics and past statistical data assuming acceptable level of misreporting.
- Confidential surveys of people who have direct or indirect relation to poaching (legal and illegal businessmen, fisheries inspection, and the local population).
- Analysis of economical indices of fishery (official catch data, amount of products produced after adjusting to raw weight, total amount of fish products sold locally and imported adjusted to raw weight).

The change in ratio of males to females between the river mouth and spawning grounds was taken as one of the clearest indicators of the magnitude of illegal harvest. Females are selectively removed by poachers fishing for caviar while males are thrown back. This selective harvest can also confound estimates of the effective spawning escapement when it is heavily skewed toward males.

Illegal harvest during 2002-2006 was estimated to equal or exceed the legal catch depending on species (Table 5, Figure 13). The studies have shown that in the period 2000-2006, the illegal catch of salmon averaged about 75% of the total runs of fish to the mouth of the river, excluding Pink Salmon, for which this indicator was at the level of about 15%. The levels of illegal harvest likely had serious and direct consequences for salmon populations throughout this period.

Illegal harvest was most significant in the Bolshaya River due to its accessibility by a developed road system. The dependence on road access on poaching was highlighted by a large reduction in the contribution of the Tolmacheva river to Bolshaya basin salmon production from 3.8% in 1987-1996 to 0.6% in 1997-2005 after a road was completed in 1996.

Poaching pressure on low-abundance species (Sockeye, Coho, Chinook) was typically much higher than on high-abundance (Pink and Chum). For instance, an estimated 50-60 poaching teams operated in the Bolshaya River between the river mouth and Ust-Bolsheretsk from mid-May to mid-June of 2006. These groups caught an estimated 500 mt or 230,000 individual spring Sockeye and 150 mt or 25,000 individual Chinook. Poaching rates were higher in years with lower salmon runs (243% of legal catch) than in years of higher salmon years in low-years (58% of legal catch).

Illegal harvest levels were reportedly much lower in other western Kamchatka rivers than the Bolshaya River due to difficulty of access. Transport of illegal harvest is not easy because of necessity to cross several rivers and police control posts along the main road. Several rivers north of the Bolshaya, including the Kikhchik and Kol, are crossed in the middle reach with a road serving the natural gas pipeline. This has provided access for small groups of poachers. However, the total amount of illegal harvest was estimated to be low based on normal sex ratios observed on spawning grounds. Illegal fishing in the Opala and Ozernaya areas is reported to be negligible because of inaccessibility, local peoples are primarily employed by the fishing companies, and fishing companies are heavily involved in fishing control activities. The Vorovskaya River supports small local communities but fishing parcels have been provided for local inhabitants to take salmon for personal consumption.

Estimates of illegal harvest during 2002-2006 included substantial levels of industrial poaching by licensed fishing companies as well as criminal poaching by unlicensed fishermen. During these years, commercial fishing companies operated under a quota system where allowable catch levels were assigned prior to the season based on run forecasts and allocation formula established by the fishery management system. This system encouraged widespread under and misreporting. Much of the illegal harvest occurred in the form of misreporting of one species as another to avoid species-specific quota limits.

Illegal harvest appears to have been considerably reduced since 2002-2006 because of economic improvements, changes in the management system, and an increased commitment to enforcement. Economic conditions have continued to improve over time following the upheaval of the 1990s and these improvements have provided other opportunities for employment. At the same time, social reasons for poaching continue to exist, particularly among the local populace of communities on the Bolshaya River.

Table 5. Illegal harvest of salmon in Kamchatka and in the Bolshaya River, 2002-2006 average (Regionalnaia… 2008).

		Pink	Chum	Sockeye	Coho	Chinook
Kamchatka	Amount (mt)	16,139	20,298	12,376	4,065	1,110
	% of legal catch	28%	201%	61%	376%	230%
Bolshaya R	Amount (mt)	1,510	3,393	2,484	402	498
	% of legal catch	22%	438%	484%	555%	2109%

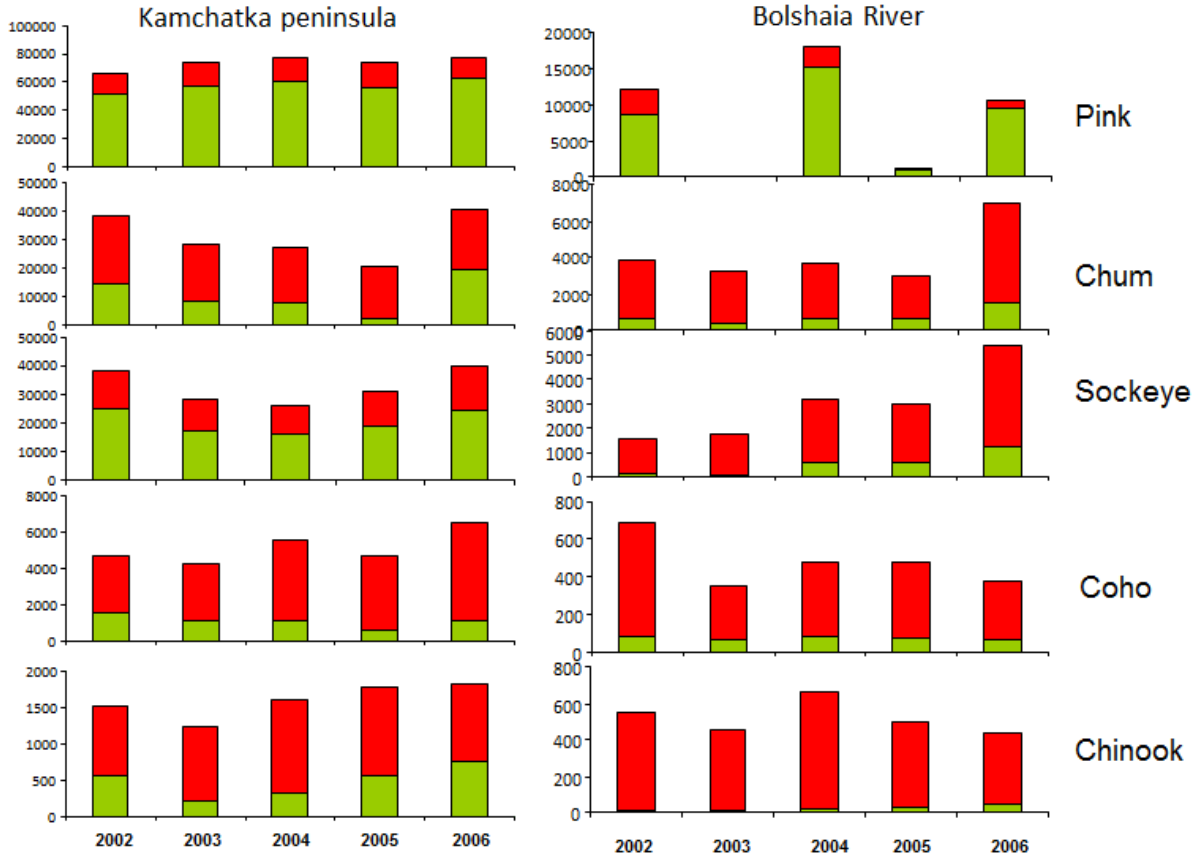


Figure 13. Legal (green) and illegal (red) landings, mt, of different species of Pacific salmon in Kamchatka peninsula and Bolshaya river 2002-2006, mt (Regionalnaia… 2008)

Reforms in the fishery management in 2008 have substantially reduced incentives for industrial poaching (Shevlyakov 2013). Fishing parcels were allocated to specific users for 20 years. Harvest quotas are now established for management units rather than individual companies (Vinnikov et al. 2012). Under the current "Olympic" system, companies may harvest as many fish as they can at designated sites when the fishery is open. Companies no longer need to hide the catch because of absence of individual total allowable catches (TAC). Moreover, the size of official catch is taken into consideration during competition for fishing parcels, and therefore companies with larger catch will have advantages at next distribution of leases. Where fishing is regulated exclusively by days closed to fishing, commercial poaching basically means fishing during closed days. This is not easy to do, especially in those fishing parcels that are adjacent to settlements, because all fishing operations in the lower part of the river are easily observed from the town. Commercial catch reporting is now believed to be close to actual catch because of these changes.

Enforcement efforts have been improved in recent years by state agencies and their cooperation with fisheries companies. Governmental resources for enforcement remain limited but increased support from fishing companies has been key to reducing the incidence of illegal fishing. Long term leases of fishing parcels have now incentivized investments by fishing companies in resource protection. Many of the larger companies provide joint enforcement efforts with the state enforcement agency, SVTU, in their fishing areas.

In addition to river patrols, enforcement agencies conduct regular inspections of fishing plants and records. Disparate catches in adjacent set nets or fishing sites are an indicator of accepting illegal fish. Enforcement has instruments for limiting catches of suspicious companies even though there as an Olympic system.

KamchatNIRO estimates that illegal harvest has been substantially reduced from historical levels (Figure 14). In 2007-2009, an estimated illegal salmon harvest of 3-19 thousand tons from the Bolshaya River accounted for 70 to 85% of the runs. By 2012, the total illegal catch of salmon, excluding Pink Salmon, dropped to 1-3 thousand tons. Illegal catch fell in 2012 to just 9% of the total Chum Salmon run and 14% of the total Sockeye run. Illegal harvest in other rivers is reportedly much less than in the Bolshaya due to limited access.

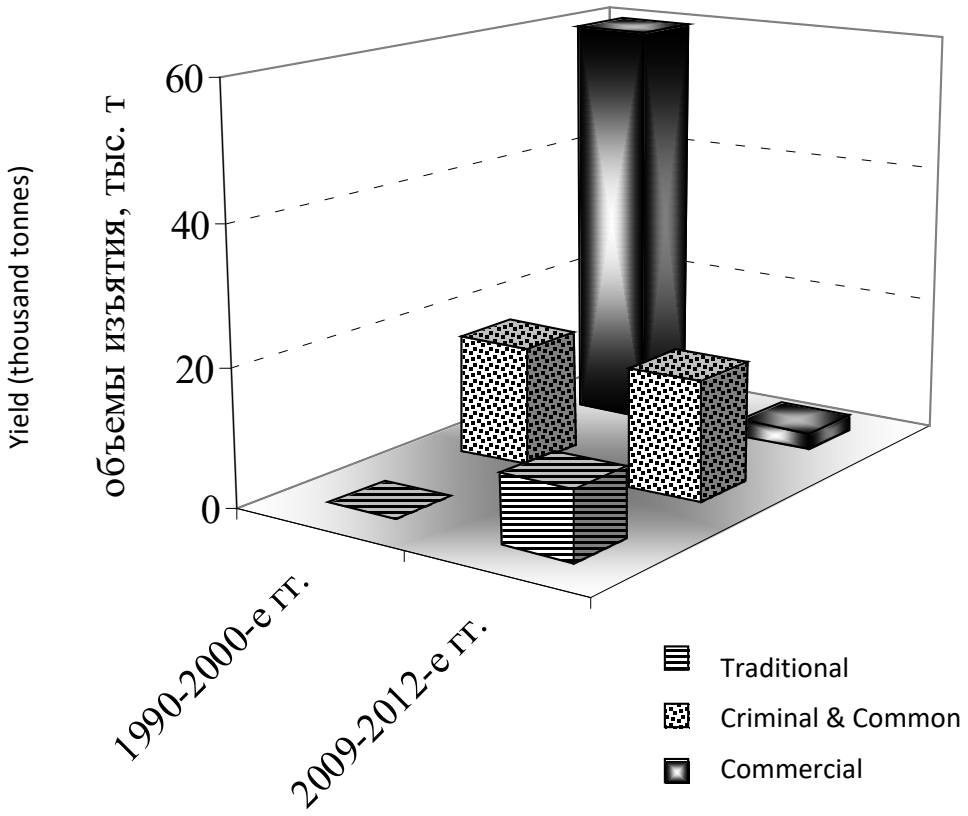


Figure 14. Dynamics of illegal harvest of Pacific salmon in the Kamchatka Region (Shevlyakov et al. 2016).

A project of socio-anthropological research of Illegal salmon fishing in Western Kamchatka was initiated in 2017-2019 by Veronika Simonova of Sociological Institute of the Russian Academy of Science with funding by the fishing companies. A preliminary report of year 1 activities and findings was provided in 2019. This report presented initial findings though more study is needed for conclusive results regarding quantification of poaching/illegal harvesting activity in Kamchatka. However, it is clear that the rivers fished by Vityaz-Avto and the subject of this certification are low risk for significant levels of poaching relative to other areas of Kamchatka (e.g., Bolshaya and Kamchatka Rivers), as

fishing and processing sites (other than Ozernaya River which is tightly patrolled) are remote with little to no means of transportation overland. Therefore, this sociological/anthropological study will continue and will be refined in order to get better information on poaching in areas where it is most prevalent.

Management & Stock Assessment

Overview - Management is based on stock assessments that include catch estimation based on daily reporting of commercial fishery landings, fishery catch per unit effort, regular subsampling of the catch for estimation of biological characteristics, and estimation of run size and spawning escapement. Run size and spawning escapement data is estimated with a combination of aerial surveys, ground surveys, and remote sensing. Optimum escapement objectives are established by KamchatNIRO for each salmon species and management area based on analysis of historical production patterns. Recent work by KamchatNIRO has developed river-specific reference points based on stock-recruitment analysis.

The fishery is managed in-season with time and area openings and closures based on catch, biological characteristics of the catch, run size and escapement information. Management occurs with time and area closures. Fishery openings and closures may be made on short notice based on fish availability and progress in meeting spawning escapement objectives. A primary means of controlling harvest in freshwater is through the use of passing days where fishing is closed.

Management in the Ozernaya River is a special case due to the productive and valuable sockeye salmon run in that river. Ozernaya sockeye are managed based on a robust weir-based stock assessment and a stock-specific escapement goal derived from long term stock-recruitment data.

Harvest & Catch Sampling - Detailed records on daily harvest are kept because fishermen are paid in part based on their catch volume and companies are required to maintain detailed records for production and licensing purposes. Fish volumes are recording upon delivery to the processing plants. Biological sampling of the catch is conducted periodically throughout at fishing season in fish processing plants by government inspectors. Measurements include length, weight, sex and age.

Aerial escapement surveys **-** Aerial surveys of rivers are a primary assessment tool throughout Kamchatka due to the numerous rivers and vast area involved. The fishery area includes dozens of significant rivers and streams of which only a subset, are currently included in annual surveys. Index areas were established by selecting the most representative areas in the comprehensive historical data set. KamchatNIRO provided an analysis of the coherence of between the status of the indicator streams and the status of the other populations they represent within the management unit (Shevlyakov and Maslov 2011). Counts from index areas are expanded to non-index areas based on formulae established from historical sampling data. This approach has proven to be effective because species-specific run sizes have been observed to be highly correlated across broad areas (Bugaev et al. 2019a).

KamchatNIRO estimates that it takes about 600 hours of aerial surveys to adequately cover all the salmon spawning rivers in Kamchatka (Bugaev et al. 2019a). However, aerial survey monitoring has been reduced from 545 hours in 2001 to an average of 131 hours over the past ten years due to budget constraints (Figure 15). This has increased the uncertainty related to escapement estimates for all salmon species.

Current effort is allocated to high value index areas and flights are timed to allow counting of multiple species. For instance, Bugaev et al. (2019) report that at present for the Pymta River, due to the lack of funding, aerial work in full is carried out only to count number of humpback and chum salmon. Number of red and coho salmon are irregular and often fragmented. Eleven index rivers are used to

monitor pink salmon escapements in West Kamchatka (Table 6). These rivers account for up to 75% of total escapements and KamchatNIRO indicates they can estimate total even year pink salmon escapements in West Kamchatka rivers with 99% accuracy (Bugaev et al. 2019a). Accuracy of odd year pink salmon escapement estimates is not as good due to the smaller escapement numbers and greater variability but sufficient for management purposes.

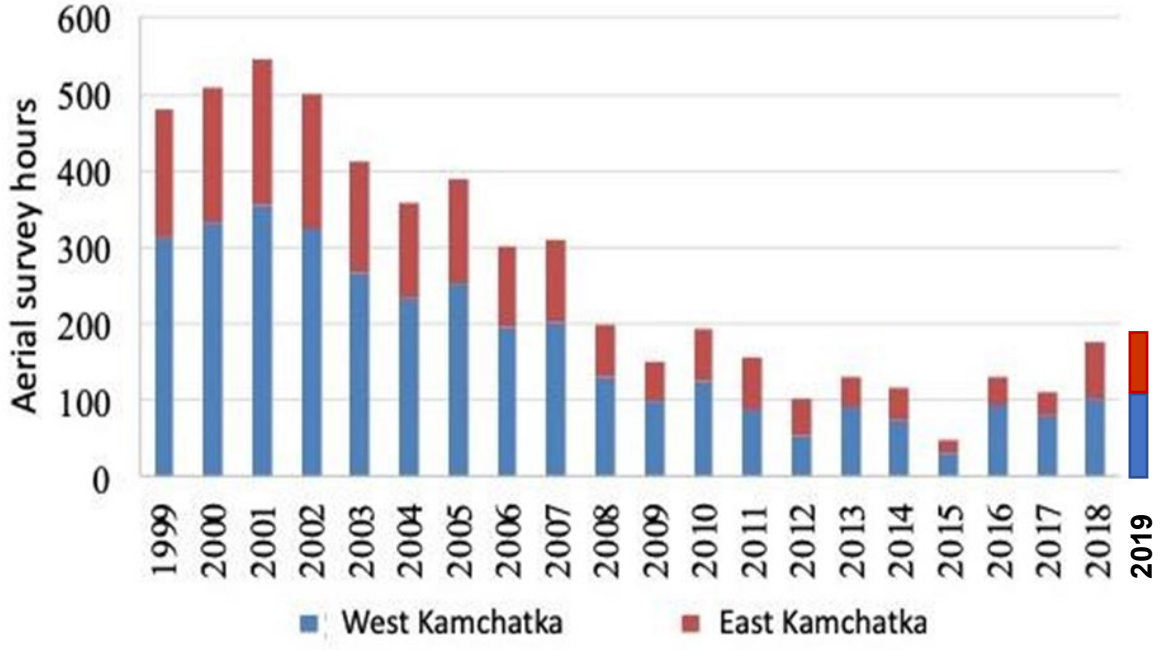


Figure 15. Annual aerial survey escapement monitoring effort (flight hours) conducted by KamchatNIRO, 1999-2018. Source: Bugaev et al. 2019a, 2020.

Table 6. Index rivers (denoted by shading) for West Kamchatka Salmon by subzone (KamchatNIRO unpublished)

Sub zone	River	Chinook	Sockeye	Pink even years	Pink odd years	Chum	Coho
West-Kamchatka Subzone	Palana	■	■				■
	Tigil	■	■				■
	Moroshechnaya						■
	Icha		■	■	■	■	■
	Oblukovina	■	■				■
	Krutogorova	■	■				
	Kolpakova	■	■	■	■	■	■
	Bryumka			■	■	■	
	Vorovskaya	■	■	■	■	■	■
Kamchatka-Kuril Subzone	Kol	■	■	■	■	■	■
	Pymta	■		■	■	■	■
	Kikhchik	■	■	■	■	■	■
	Bolshaya	■	■	■	■	■	■
	Opala			■	■	■	
	Golygina			■	■		
	Koshegochek			■	■		
	Ozernaya (western)		■				

Table 7. Flight hours used for monitoring escapement of salmon in the target rivers (as planned and actual data) for 2018 in western Kamchatka.

Species	Rivers	Time	Flight hours as planned	Actual time	Actual flight hours
Early form of chum salmon	Ozernaya Koshegochek Golygina Opala	End of July	6 h	- - - 20.07; 06.08	5 h
	Kol, Vorovskaya	End of July – beginning of August	6 h	07.08, -	1 h 40 min
Early form of chum salmon Pink salmon	Ozernaya Koshegochek Golygina Opala	End of August	6 h	04.09 04.09 04.09 04.09	6 h
	Kol, Vorovskaya	End of August	6 h	30.08; 01.09	5 h 30 min
Late form of chum salmon Coho salmon	Ozernaya Koshegochek Golygina Opala	The first decade of September	6 h	- - - 08.09	3 h 30 min
	Kol, Vorovskaya	Middle of September	6 h	-, 27.09	2 h
Late form of chum salmon Coho salmon	Ozernaya Koshegochek Golygina Opala	End of September	6 h	- - - 08.10	3 h 10 min
	Kol, Vorovskaya	End of September – Beginning of October	6 h	11.10; 15.10	3 h 20 min
Total hours:			**48 h**	-	**29 h**

Table 8. Timeline for aerovisual surveys of Pacific salmon in target rivers in 2019.

Date	River	View
14.07	Pymta	chinook salmon, masu
14.07	Kol	chinook salmon, masu
15.07	Vorovskaya	chinook salmon, masu
25.07	Opala	Chinook salmon, chum salmon
05.08	Opala	Chinook salmon, chum salmon
05.08	Vorovskaya	Chinook salmon, sockeye salmon, chum salmon
05.08	Kol	Chinook salmon, sockeye salmon, chum salmon
05.08	Pymta	Chinook salmon, sockeye salmon, chum salmon
23.08	Opala	sockeye salmon, chum salmon, pink salmon
23.08	Golygina	sockeye salmon, chum salmon, pink salmon
23.08	Koshegochek	sockeye salmon, chum salmon, pink salmon
23.08	Ozernaya	sockeye salmon, chum salmon, pink salmon
28.08	Kol	sockeye salmon, chum salmon, pink salmon

28.08	Pymta	sockeye salmon, chum salmon, pink salmon
30.08	Vorovskaya	sockeye salmon, chum salmon, pink salmon
18.09	Ozernaya	sockeye salmon, chum salmon, pink salmon
29.09	Pymta	sockeye salmon, coho salmon
29.09	Kol	sockeye salmon, coho salmon
29.09	Vorovskaya	sockeye salmon, coho salmon
12.10.	Opal	sockeye salmon, coho salmon
12.10.	Golygina	sockeye salmon, coho salmon

Other surveys **-** Extensive ground counts of fish numbers are made in some rivers to supplement aerial surveys. Counts are made weekly or every other week in each of the Bolshaya, Opala and Kikhchik rivers. Ground surveys also include smaller streams not included in aerial surveys. Biological samples are collected concurrently by beach seine. Fishing associations and several fishing companies currently help support the stock assessment program by providing food, accommodation and transportation.

Remote methods include hydroacoustic methods, and photo and video recording are also being evaluated as an alternative for stock assessment. Similar equipment has long been used in eastern Kamchatka (Degtev et al. 2012) and Alaska. Hydroacoustic equipment was tested in the Kikhchik River in 2013 for Coho Salmon but effectiveness was limited due to an unseasonal flood.

Reference Points

The main goal of fish stock management is to maximize the catch and replenishment (and, consequently, the stock) while minimizing the biological risk of stock degradation (Feldman et al. 2018a). Spawning escapements consistent with high levels of sustained yield have been established by species for regional aggregate stocks based on analysis of historical production patterns. These estimates are generally based on stock-recruitment analysis which relate progeny to parents.

The management strategy is scaled to the vast area of the region and the limitations of the available institutional resources for stock assessment and management. Fishing effort and strategies have been based on historical information to ensure spawning escapements consistent with high sustained yields during most years in most areas. Use of established passing days effectively limits exploitation rates and ensures that significant escapement will occur. Fishing effort may be adjusted somewhat in-season based on annual stock assessments but the fishery is not intensively managed at a fine scale in order to maximize harvest in any given year. Given the demonstrated success of this approach it has not proven necessary to quantify river-specific escapement of every stock in every year.

Potential improvements in population-specific management with population-specific escapement objectives are also being explored. Over the last decade, the federal fishery scientific agency (KamchatNIRO) has been refining the scientific basis for salmon management by developing productivity functions for stocks and populations throughout Kamchatka. With this work, KamchatNIRO has been formalizing estimation and application of quantitative reference points including optimum spawning levels and points of potential reproductive impairment. River specific objectives are being identified by apportioning the stock-recruitment totals based on relative population sizes in the various areas. The portions are based on relative run sizes and available spawning habitats.

This information is currently being tested by the management systems but has not yet been fully incorporated, in part due to limitations in annual stock assessments. (Due to past reductions in aerial survey effort, data on spawning escapements in some rivers is lacking in some years and

corresponding escapement are reported as low values by KamchatNIRO). It is expected that future evaluations will consider consideration in management.

Target reference points - Justifying of the target escapement values for the main stock units is one of the key conditions for the rational use of salmon resources. In Kamchatka krai, the FSBSI "KamchatNIRO" employees have been carrying out such work for more than a decade. At present, escapement targets have been defined for the most commercially significant stocks for each species.

The number of spawners needed to achieve maximum sustained yield (MSY) for populations of Pacific salmon in the fishing zone was estimated using modelling and historical data on parental salmon escapements (S) and the recruitment of adults (R) in following years using the methodology of Feldman and Shevlyakov (2015):

$$\frac{aS^2}{\sqrt{(S_0^2 - S^2)^2 + b^2 S^2}}$$

where parameters meaning is the following:

a is the recruitment limit of R with unlimited spawning stock S,
b is the spawning stock necessary for producing replenishment *a* with maximum survival,
S_O – spawning stock, ensuring maximum survival of the descendants.

Parameter *a* is measured in the same units as replenishment R, and parameters *b* and S_0 have the same dimension as the parent stock S (Figure 16).

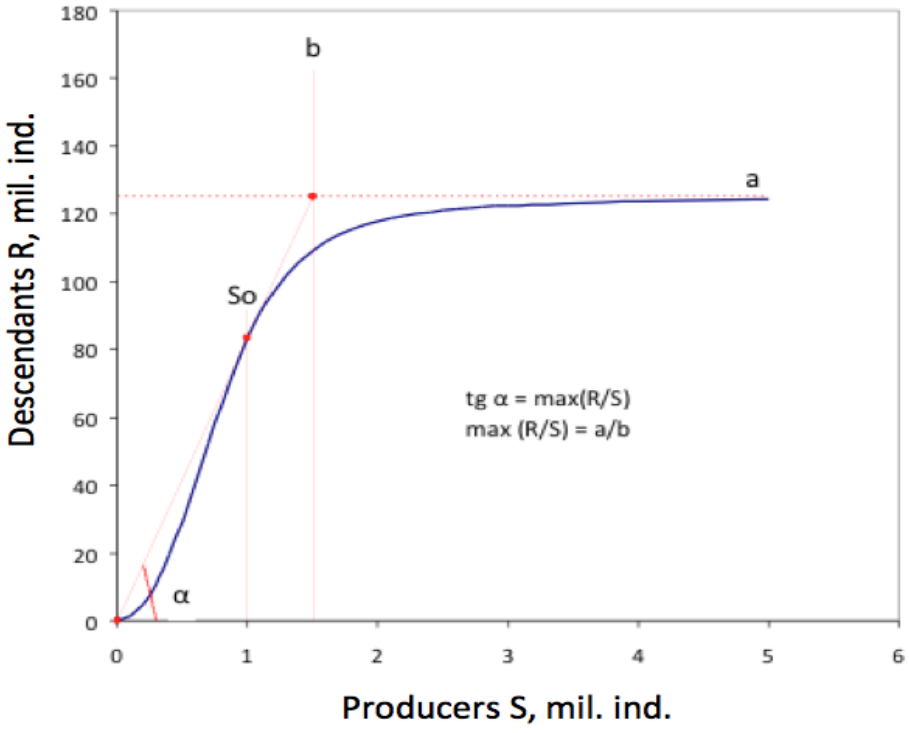


Figure 16. Graphic interpretation of parameters a, b and S_o of model. Source: Bugaev et al. 2018a.

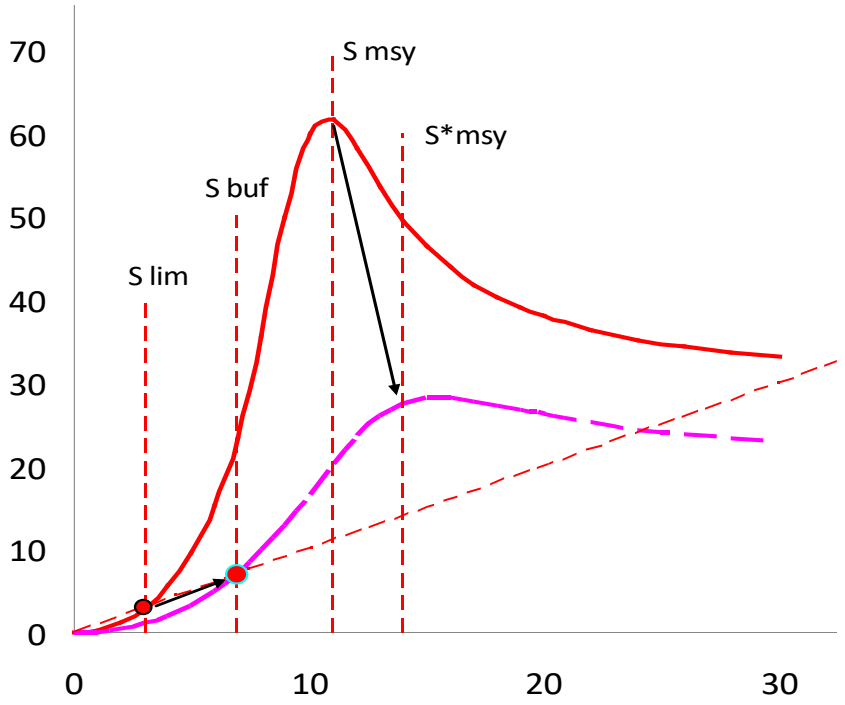


Figure 17. Depiction of boundary and buffer reference points (right) defined for West Kamchatka Chum Salmon stock-recruitment model (left).

Definitions of references points from Shevlyakov et al. 2016 are as follows:

S_{lim} = boundary reference point set to the model parameter S_0 (spawner level S with maximum survival recruits per spawner. This serves as a proxy Limit Reference Point.

S_{buf} = precautionary estimate of spawning escapement at lower boundary the estimate of maximum sustainable yield;

S_{MSY} = spawning escapement at maximum sustainable yield;

S^*_{MSY} = precautionary estimate of spawning escapement at maximum sustainable yield determined for the lower boundary of the confidence interval of model regression (α = 0.05).

The filling level of spawning grounds by producers, providing the maximum steady catch SMSY is estimated for the entire set of populations of each species. SMSY levels for populations of specific water bodies studied were determined using models, the parameters of which were obtained in proportion to the average multiyear shares of producers and descendants.

All estimates of the target reference points for escapement of the Pacific salmon from various water bodies in the area are used to predict their possible catch in the region. Accounting on control/reference rivers allows, using the obtained dependencies, to extrapolate the number to the entire spawning stocks in the reproduction areas under consideration, but does not allow the data to be extrapolated to individual watercourses. In particular, therefore, estimates of the value of the stock are subsequently calculated for large units, rather than for individual watercourses. In addition, the strategy of fishing for salmon by fixed nets and other fishing gear in the sea coastal area implies that they intercept part of the transit aggregations that follow to their spawning bodies of water. This circumstance does not allow unambiguously attribute even the targeted volumes of salmon catch to these or other population complexes, and even those located in close proximity to them. That, in turn, introduces uncertainties in the assessment of both the general approach of producers in each particular year, and the size of the generations themselves. For example, the area of suitable spawning grounds is estimated based on the areas occupied by producers annually, without ranking them by the efficiency of reproduction. In addition, the lack of clear guidelines on the area suitable for

spawning does not allow adequate assessment of the density factors regulating the number of populations. Therefore, the focus of study is always placed on the most commercially significant rivers. Thus, the existing fishing strategy, as well as the presence of a large number of relatively small units of stocks, suggests evaluating the needs of salmon reproduction as a combination of the spawning fund of the entire fishing area without a division into specific populations.

Limit reference points - Formal limit reference points are not used in management of salmon fisheries in Russia. In this system, target reference points based on maximum yields function as operational equivalents of limit reference points. However, the management system has begun to describe boundary guidelines which provide a precautionary approach to the management of fish stocks (Babayan 2000). Boundary reference points are defined as S_{lim} (minimum producers) and E_{lim} (maximum exploitation).

In-season management - Pre-season run forecasts are made for each salmon species by the Fisheries Research Institute (KamchatNIRO). The Federal Fishery Agency (FFA) approves a recommended annual catch for each fishery subzone based of this forecast. The pre-season forecast is now used primarily for planning purposes and possibly to establish quotas for some non-commercial fisheries. The forecast was historically used to establish total allowable catches and quotas for fishing companies. However, this system has now been replaced with an “Olympic” system where fishing companies operate in designated areas and periods and are allowed to harvest fish as available, as opposed to artificially limited by a specific allocation. Harvest quotas are still established for the fishery as a whole in each river but these quotas are adjusted in-season based on real time data.

The fishery is managed in-season with time and area openings and closures based on catch, biological characteristics of the catch, run size and escapement information. Fishery openings and closures may be made on short notice based on fish availability and progress in meeting spawning escapement objectives. Fishery regulations may be modified in-season by the Anadromous Fish Commission based on harvest and stock assessment information provided by KamchatNIRO. For instance, in 2018 a total of 34 meetings of the Anadromous Fish Commission were held. In addition to Pacific salmon management, the Commission deals with management of other anadromous fish such as smelt and char. Meetings of the Commission were organized by the minister of fisheries of Kamchatka Krai Vladimir Galitsyn. Representatives of Kamchatka ministry of Fisheries, SevvostRybvod, North-Eastern administration of Federal Fishery Agency, KamchatNIRO, Federal Security Service, RosPrirodNadzor, Federal border guard service, Federal antimonopoly service, Indigenous people associations, fishing companies and fisheries associations attended the meetings. The following questions were considered: dates of beginning and terminating of fishing for particular fish species and for different geographic regions, setting up and changes of fishing regime (setting up days off and on), providing additional quota for specific regions and license holders. The detailed information about all the decisions is provided at website of Northeastern administration of the Federal Fishery Agency (svtu.ru, свту.рф).

Management typically involves time and area closures. A primary means of controlling harvest in freshwater is through the use of passing days where fishing is closed. Harvest is regulated by passing days in the river and closed seasons or net number limitations in the sea. The normal pattern of passing days, which are set up in the beginning of the season. The number of passing days may be reduced to avoid exceeding established escapement goals or increased to avoid falling short of achieving escapement goals. Areas and dates that sea nets can be fished are also regulated. Regulations may take the form of temporary closures where leads and traps are tied up so as to allow fish to pass or season-long closures where nets are removed.

For instance, the normal pattern in the Ozernaya River is 2 open and 2 closed. The number of passing days was reduced in 2013 and 2015 to avoid exceeding the escapement goal. During large salmon

runs, the potential harvest exceeds the capacity of the fish processing plants and so fishing companies voluntarily reduce their fishing time even when the fishery is open. For instance, in 2015 the Ozernaya fishing companies voluntarily stopped fishing on five open fishing days in August to allow employees to rest (Semenov et al. 2016). Therefore, harvest rates are effectively reduced by capacity limitations even when passing days are cancelled due to large escapements. Escapements of other salmon species likely benefit in large pink salmon years due to this effect.

Areas and dates that sea nets can be fished are also regulated. Regulations may take the form of temporary closures where leads and traps are tied up so as to allow fish to pass or season-long closures where nets are removed. Sea nets are very effective and can take up to 90% of the catch if unregulated. The majority of sea nets are typically fished only during even years when the dominant cohort of Pink Salmon is returning.

During large Pink Salmon runs, the potential harvest exceeds the capacity of the fish processing plants and so fishing companies voluntarily reduce their fishing time even when the fishery is open. In this case, harvest rates are effectively reduced by capacity limitations even when passing days are cancelled due to large escapements. Escapements of other salmon species likely benefit in large Pink Salmon years due to this effect.

Enhancement

No hatcheries are present on rivers included in this assessment. In total, five hatcheries exist in the Kamchatka region, three on the eastern coast and two in the western coast on the Bolshaya River (Malkinsky and Ozerki hatcheries). Hatchery objectives are to increase salmon returns for commercial fisheries.

Hatcheries were established on the Bolshaya River as early as 1914 and these were among first salmon hatcheries in the Russian Far East. They first operated a very short period, incubating eggs in 1914, 1915 and 1918, and releasing fry in only two years (0.62 and 1.5 million of unidentified species (Rossokhina 1988, cited by Zaporozhets and Zaporozhets 2011). Malkinsky hatchery is situated in Kliuchevka river, which is a right tributary of Bystraia river (left tributary of Bolshaya river), near a geothermal water source. A hatchery operated at this site from 1956-57 until 1964 (Rossokhina 1988, cited by Zaporozhets and Zaporozhets 2011). The hatchery resumed operation in 1982 and was reconstructed in 1992-1996. During the 1980s, this hatchery reared Chinook, Coho, Sockeye and Chum (Zaporozhets and Zaporozhets 2011). Currently, it rears only Chinook and Sockeye. Chum releases were discontinued due to no returns from large numbers of released juveniles apparently due to a shortage of warm water for incubation. The Ozerki hatchery was built on the Plotnikov River in 1992 with compensation for use of Russian fish resources by Japan. There is sockeye hatchery production in the Bolshaya River but these fish are estimated to contribute 5-6% of the total commercial catch in the Bolshaya based on scales pattern analysis (Bugaev et al. 2001; Bugaev 2011).

The scale of hatchery production is relatively small and hatchery origin fish do not comprise a large percentage of the basin return for any species, except in the vicinity of the hatchery. Since 1996 all the production of the Malkinsky and Ozerki hatcheries has been marked with thermal marks. Hatcheries are operated by the government agency SevVostRybVod.

There are periodic proposals to build new hatcheries on Kamchatka, which have not been implemented due to budget limitations. The last of them was “Development of aquaculture in the Kamchatka territory for 2013-2020”; it was initiated by the Government of the Kamchatka region and was presented in 2012. This program has proposed construction of two new Chum hatcheries in the Bolshaya basin: on the Nachilova River (the right tributary of the first order) in 2017-2018, and on the Shikova River (a tributary of the Plotnikov River) in 2018-2019's. No financing has been identified for these programs and KamchatNIRO has determined that the construction of new hatcheries in the basin of the Bolshaya River is unlikely to contribute the increase to salmon population there. Given

the dynamics of the processes of construction, these projects are unlikely to be implemented (KamchatNIRO 2013).

Sockeye Salmon

Three sockeye stock management units were distinguished in this assessment based on distribution, abundance productivity, and genetics:

Ozernaya sockeye occur in the Kamchatka-Kuril area of southwest Kamchatka (fishery subzone 05.4). The sockeye return to this fishery subzone is almost entirely comprised of the Ozernaya stock. This stock was treated as a P1 species in this assessment.

Non-Ozernaya sockeye returning to other rivers south of the Bolshaya in the Kamchatka-Kuril area of southwest Kamchatka (fishery subzone 05.4) were identified as an IPI species due to their more-northerly distribution relative to the fishery targeting Ozernaya sockeye.

Sockeye in western Kamchatka north of the Bolshaya were identified as a minor P2 species due to limited stock assessment data for sockeye in this area. This area of the fishery includes the northern portion of the Kamchatka-Kuril fishery subzone (05.4) and the southern portion of the Western Kamchatka subzone (05.2).

Distribution

Sockeye salmon can achieve large abundances in systems where lakes provide preferred rearing habitats (Bugaev 1995). Smaller populations may also be found in rivers without large lake systems (Bugaev et al. 2018).

Kuril Lake in the Ozernaya system supports one of only two large sockeye populations in Russia (the other being the Kamchatka River in eastern Kamchatka). The Ozernaya sockeye run dominates the west Kamchatka sockeye return. Significant Sockeye populations also occur in Western Kamchatka in the Bolshaya River system (including Lake Nachikinskoe) and the Palana River (Figure 18). Smaller sockeye populations also occur in other systems rivers throughout the Kamchatka-Kuril subzone including lakes Golyginskoe and lake Kambalnoe, Opala River, Lake Nachikinskoe in the Bolshaya River, Kikhchik River and Kol River. Some Sockeye hatchery production occurs in the Bolshaya River but these fish are estimated to contribute 5-6% of the total commercial catch in the Bolshaya based on scales pattern analysis (Bugaev et al. 2001; Bugaev 2011).

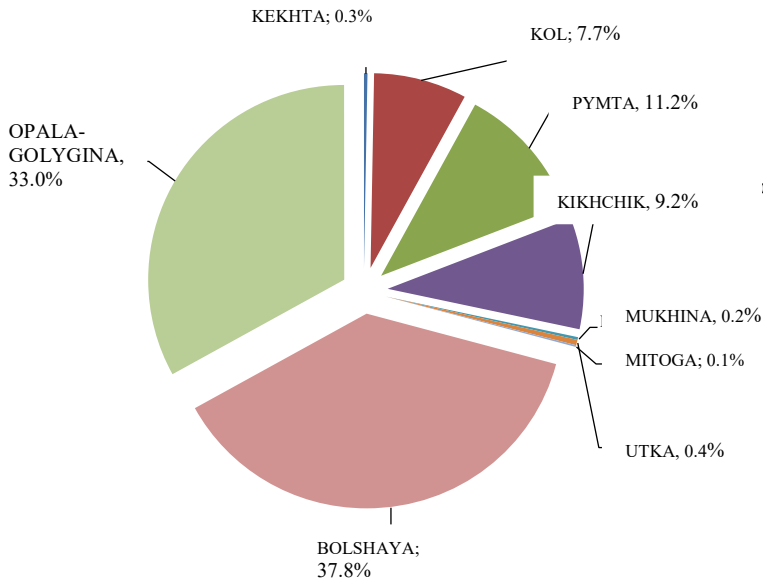


Figure 18. Shares of spawners of basic spawning streams and clusters of the South-West of Kamchatka, not including the large Ozernaya stock (Bugaev et al. 2019a).

Ozernaya sockeye range up to 2000 km from their home river into the North Pacific (Birman and Konovalov 1968; Konovalov 1971; Bugaev 1995; Bugaev 2002). Upon return to the Sea of Okhotsk, many fish migrate southward along the west coast of Kamchatka where they may be intercepted in marine trap nets before entering the river (Bugaev 1983, 2002; Bugaev and and Zikunova 2021c). As a result, Sockeye harvest along the coast south of the Bolshaya is dominated by large contributions of Ozernaya population. Ozernaya Sockeye are estimated to account for 50% of the coastal marine trapnet harvest near the Bolshaya River, 90% near the Opala, and almost 100% south of the Koshegochek Rivers. Estimates are based on analysis of the structure of the scales, parasite infection, catch statistics and escapement in Kamchatka-Kuril subzone rivers (Bugaev and and Zikunova 2021c). Since 2019, KamchatNIRO has been collecting genetic samples from Western Kamchatka sockeye salmon spawners, both from catches in sea RLU (fixed nets) and from river catches. The first research results are expected to be obtained in 2021 (Bugaev and and Zikunova 2021c).

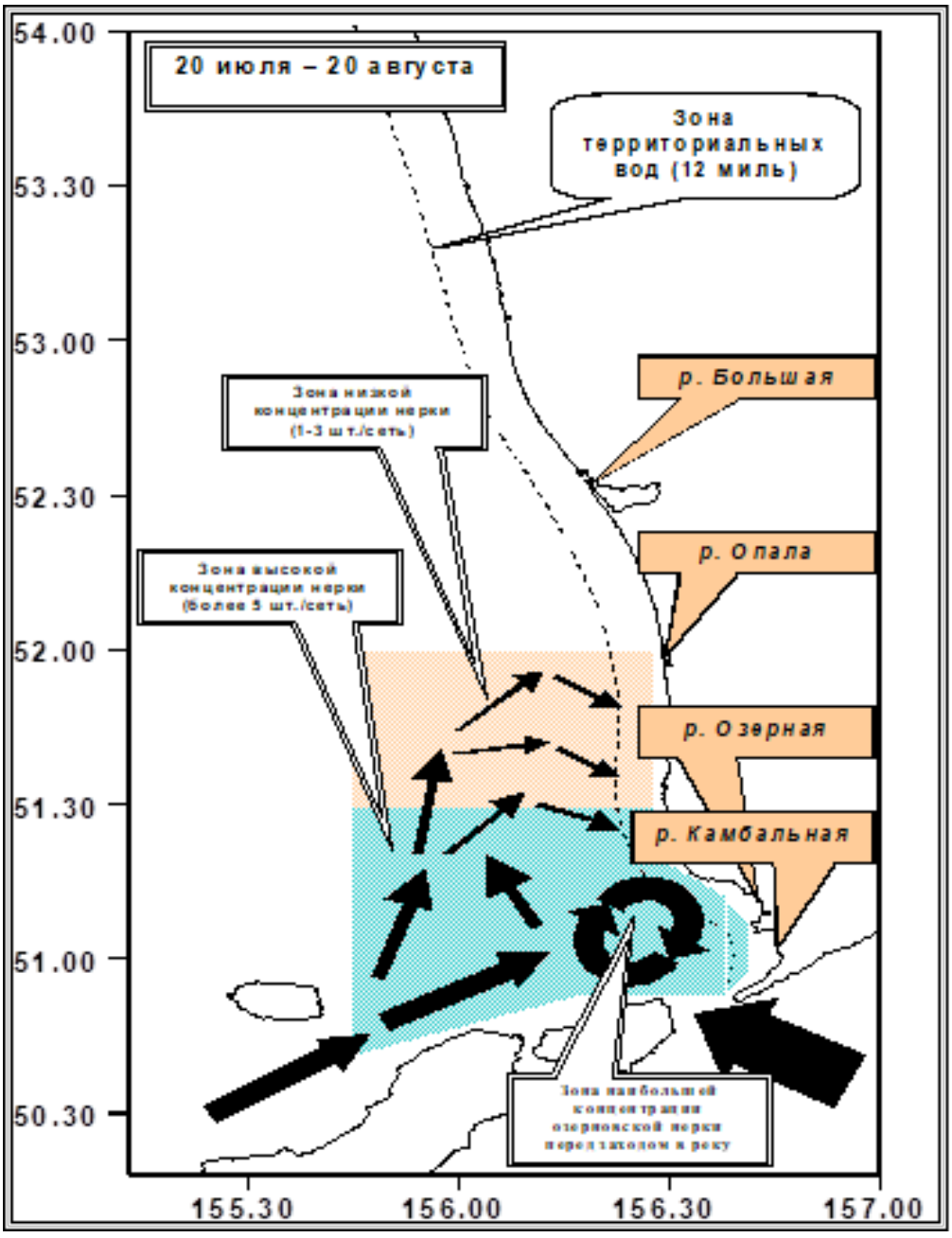


Figure 19. General scheme of pre-spawning migrations of Ozernaya sockeye salmon in the Kamchatka-Kuril subzone - 61.05.4 (Bugaev 2002 as presented in Bugaev and Zikunova 2021c).

Life History

In general, sockeye salmon prefer lake and lake-river systems where juveniles feed on zooplankton and typically rear for one to three years before undergoing a physiological transformation to smolts and migrating to the sea in June and July.

Sockeye can achieve large abundances in large lake systems like the Ozernaya (Bugaev 1995). The life history and limiting factors of Ozernaya sockeye are among the most studied and documented of any salmon species anywhere (Bugaev 2011). Ozernaya sockeye return to freshwater from late May to early September (Bugaev 1991, 1995, 2011; Bugaev et al. 2001, 2009). The peak of the run typically occurs in late July and early August. Adults generally return to spawn at 5 or 6 years of age after 2 or 3 years at sea. Size typically averages 2 to 3 kg and 55 to 60 cm in length. Spawning occurs predominately in the littoral zone of Kuril Lake at depths of 3 m or less (71%) and also in the upstream part of Ozernaya River (26%) and in lake tributaries (3%). Lake tributary spawners comprise the early portion of the run returning primarily in June and early July (Bugaev 1983; Konovalov 1971).

Sockeye Salmon production in small and medium river basins is low. Spawning may occur in lake tributaries, outlet streams or along the lake shore. In the Pymta River, sockeye appear to spawn in the river and associated sloughs (Figure 20). Commercial quantities are generally available from late May to early August.

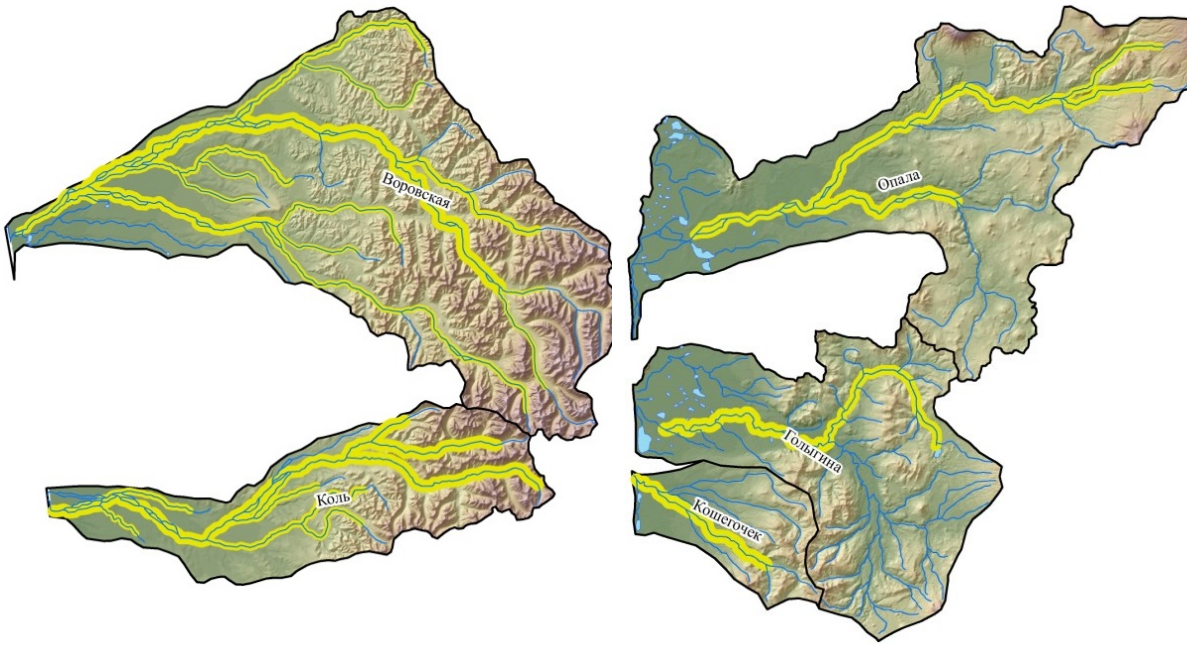


Figure 20. Spawning distribution of Sockeye Salmon in the Vorovskaya, Kol, Opala, Golygina, and Koshegochek rivers (Shevlyakov et al. 2016).

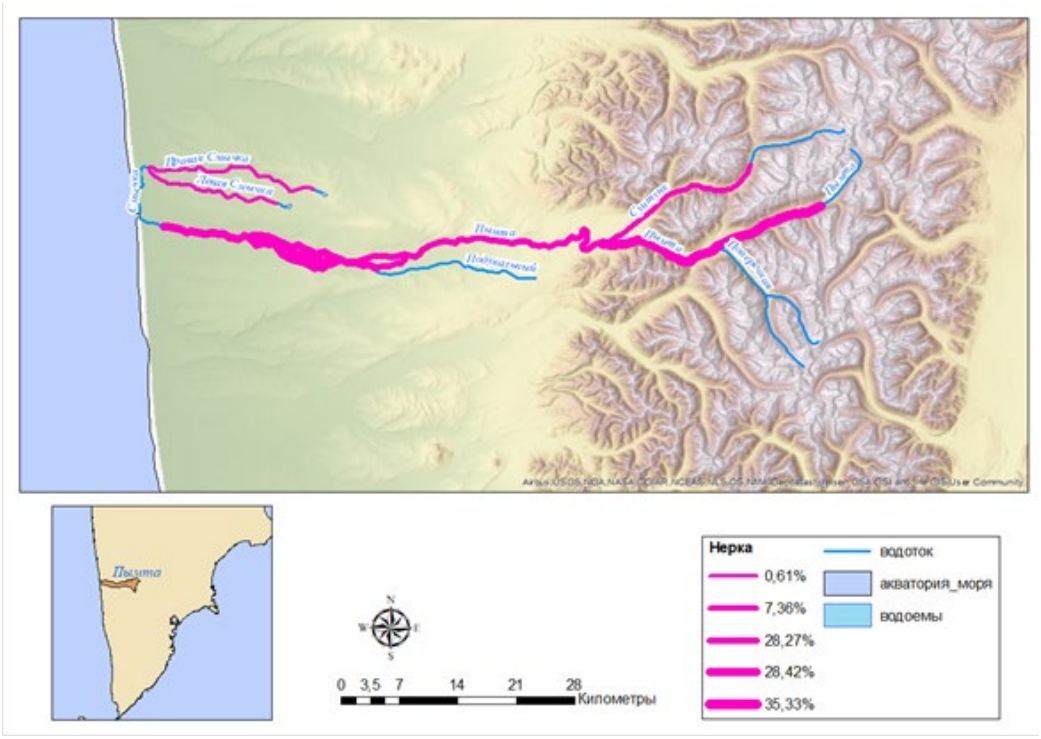


Figure 21. Distribution of spawning grounds of sockeye salmon in the Pymta River (Bugaev et al. 2019a). Thickness of the rose line reflects contribution of respective spawning grounds to the total capacity of spawning grounds.

Stock Structure

Sockeye runs are generally comprised of populations returning to specific spawning and rearing areas. These populations are typically demographically and genetically distinct. Late run Sockeye are generally larger than early run Sockeye but age composition is often similar.

Two seasonal runs of sockeye are recognized in the Ozernaya River. The early run returning primarily in June and early July typically spawns in tributaries to Kuril Lake. The late run returning primarily in July and August spawns in Kuril Lake and the Ozernaya River. The later part of the early run and the early portion of the late run overlap substantially in timing. The late run predominates and its contribution in total amount is approximately 98%.

Seasonal runs of Sockeye are also recognized in many other areas of west Kamchatka. In the Bolshaya River, early (May-June) and late (July-August) returning portions of the run are believed to be primarily lake and stream spawners, respectively. Four isolated temporal groups are identified in the Bolshaya system: early and late runs of Lake Nachikinskoe, and late runs in the main tributaries of the rivers Bystraya and Plotnikova. The early run in Lake Nachikinskoe spawns in tributary streams while the late run spawns in littoral areas of the lake. Early Sockeye currently predominate (55%) in the Bolshaya River, although late Sockeye comprised 70-75% of the total run in the 1930s and 1940s. The Opala River Sockeye run also includes a significant early component.

Status

Sockeye are currently at historically high levels of production in Western Kamchatka (Figure 21). High levels are a product of an extended period of favorable ocean conditions and the benefits of elimination of high seas drift gillnet fisheries. Increases in reported harvest may also be in part due to the elimination of incentives for under-reporting of commercial harvest following management system changes in 2008. Outside of the Bolshaya and Ozernaya Rivers, most harvest of sockeye in West Kamchatka occurs in marine waters (Shevlyakov et al. 2016). Catches of sockeye salmon in and near most rivers are relatively incidental and small compared to those of Pink, Chum and Coho Salmon.

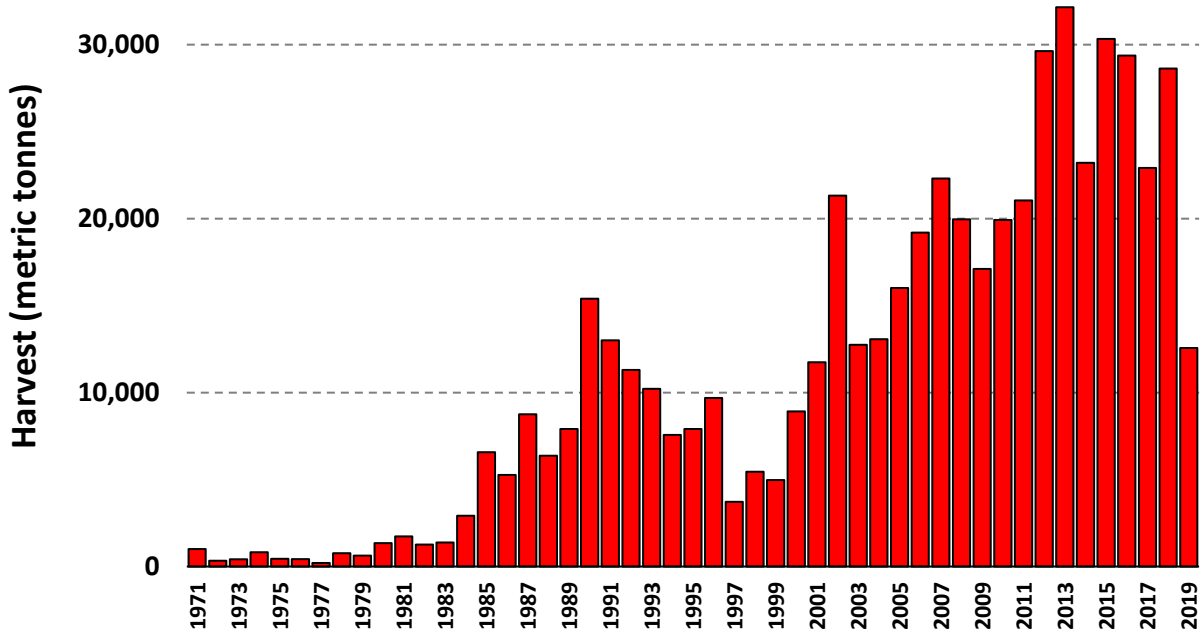


Figure 22. Total annual harvest of sockeye salmon in West Kamchatka (Western Kamchatka and Kamchatka-Kuril subzones, source: North Pacific Anadromous Fish Commission).

The Ozernaya/Kuril system supports the largest and most productive stock of sockeye salmon in Asia. This stock supports over 90% of the annual average catch of sockeye along the west coast of Kamchatka. Run size and escapement of Ozernaya sockeye has been collected since 1940 when the Pacific Institute for Fisheries and Oceanography established a research station and fish counting weir (Figure 22) downstream from Kuril Lake (Bugaev 1991, 1995, 2011; Bugaev et al. 2001, 2009). In addition to counting fish which enter the Kuril Lake, regular observations of spawning grounds in the lake and inflowing rivers are also made. Annual estimates of juvenile abundance have begun to be made in recent years. Data are also collected on size, age and sex structure of commercial catches in the sea, mouth and source of river, survival of eggs, and distribution and feeding of juveniles.

Figure 23. Photo of salmon counting weir in the Ozernaya River at the outlet of Kuril Lake.

Abundance of Ozernaya sockeye is currently at record high levels (Figure 23). Run size has averaged over 12 million sockeye per year over the last 10 years (Figure 24, Table 9). An average of 1.7 million sockeye were historically harvested in marine drift net fisheries in the Russian exclusive economic zone but this fishery was closed in 2015. Annual exploitation rates of Ozernaya Sockeye currently average about 85%. These rates equal or exceed the highest exploitation rates documented for any Pacific Sockeye population.

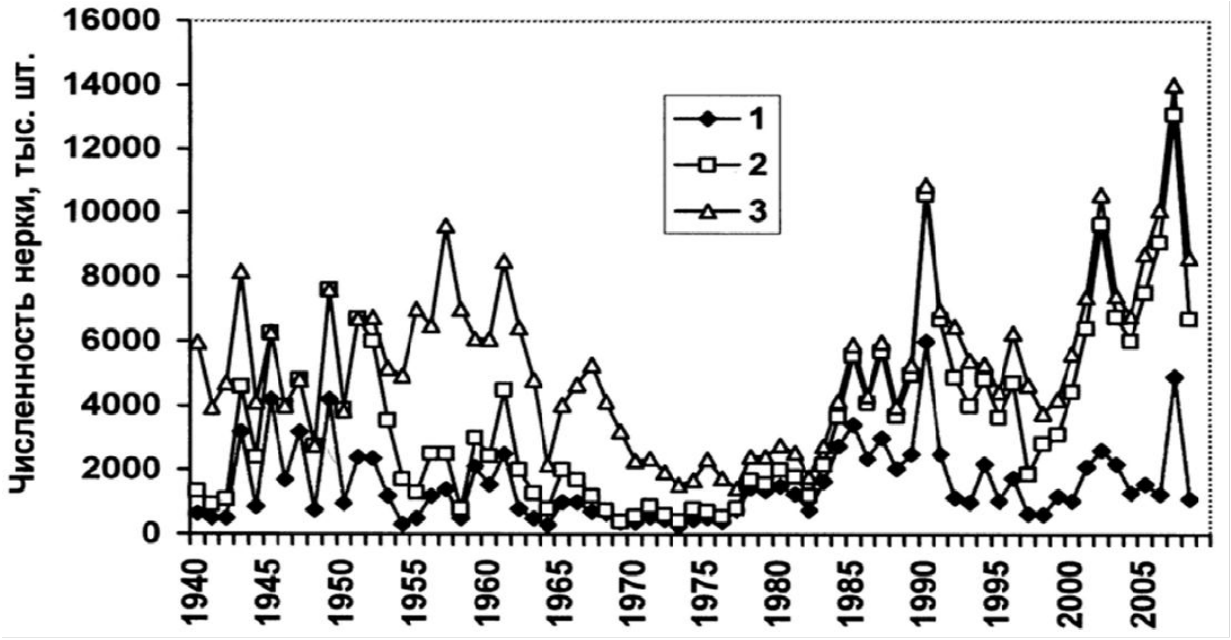


Figure 24. Ozernaya sockeye abundance (millions), 1941-2010 (Dubynin et al. 2007; Antonov et al. 2007; Bugaev et al. 2009). 1=mature part of the stock, 2=fish approaching the shore, 3=spawners.

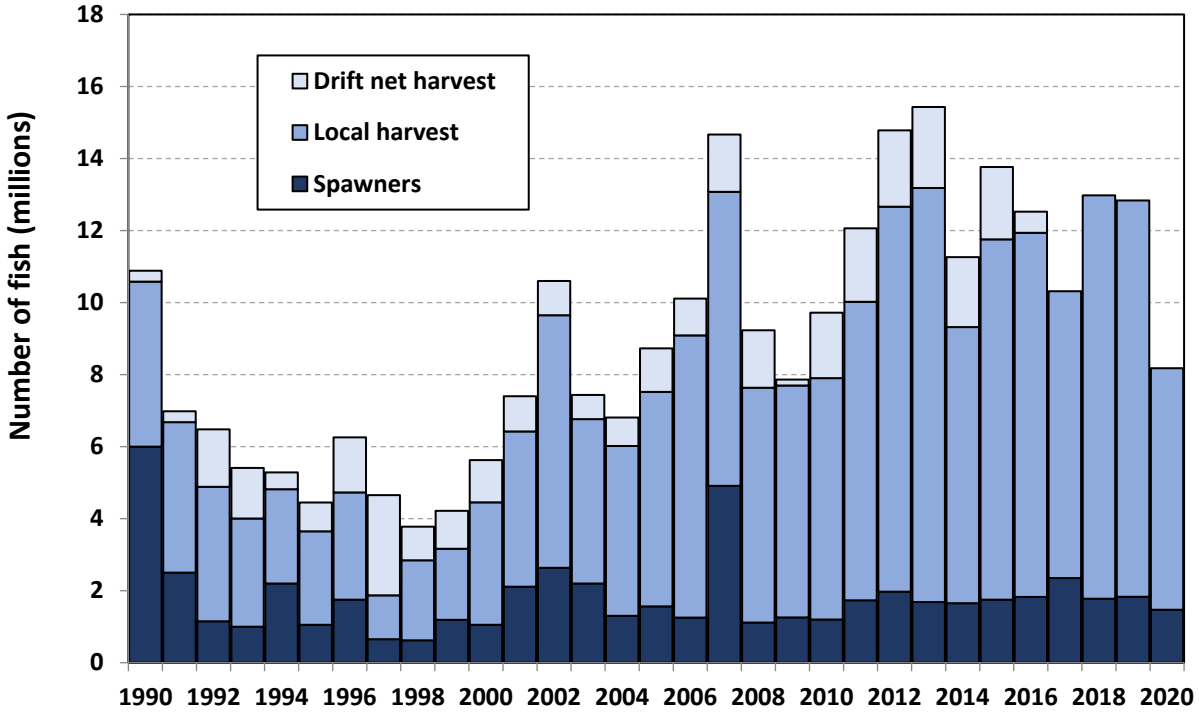


Figure 25. Abundance, harvest and escapement of Ozernaya sockeye, 1990-2018.

Table 9. Abundance, harvest and exploitation rates of Ozernaya sockeye, 1990-2019 (unpublished KamchatNIRO data).

	Abundance (thousands)			Harvest (thousands)			Exploitation rates		
Year	Ocean	Coast return	Spawners	Drift net	Coast	Total	Drift net	Local	Total
1990	10,883	10,583	6,000	300	4,583	4,883	3%	43%	45%
1991	6,979	6,679	2,500	300	4,179	4,479	4%	63%	64%
1992	6,477	4,883	1,150	1,594	3,733	5,327	25%	76%	82%
1993	5,408	4,005	1,000	1,403	3,005	4,408	26%	75%	82%
1994	5,282	4,818	2,200	464	2,618	3,082	9%	54%	58%
1995	4,448	3,648	1,050	800	2,598	3,398	18%	71%	76%
1996	6,258	4,728	1,750	1,530	2,978	4,508	24%	63%	72%
1997	4,654	1,870	650	2,784	1,220	4,004	60%	65%	86%
1998	3,778	2,842	620	936	2,222	3,158	25%	78%	84%
1999	4,217	3,163	1,190	1,054	1,973	3,027	25%	62%	72%
2000	5,625	4,450	1,050	1,175	3,400	4,575	21%	76%	81%
2001	7,398	6,421	2,110	977	4,311	5,288	13%	67%	71%
2002	10,598	9,650	2,635	948	7,015	7,963	9%	73%	75%
2003	7,433	6,764	2,200	669	4,564	5,233	9%	61%	70%
2004	6,806	6,016	1,300	790	4,716	5,506	12%	69%	81%
2005	8,726	7,520	1,565	1,206	5,955	7,161	14%	68%	82%
2006	10,111	9,088	1,250	1,023	7,838	8,861	10%	78%	88%
2007	14,667	13,073	4,910	1,594	8,163	9,757	11%	56%	67%
2008	9,229	7,633	1,114	1,596	6,519	8,115	17%	71%	88%
2009	7,862	7,697	1,255	165	6,442	6,607	2%	82%	84%
2010	9,719	7,899	1,200	1,820	6,699	8,519	19%	69%	88%
2011	12,062	10,020	1,730	2,042	8,290	10,332	17%	69%	86%
2012	14,783	12,660	1,972	2,123	10,688	12,811	14%	72%	87%
2013	15,432	13,182	1,681	2,250	11,501	11,236	15%	75%	89%
2014	11,263	9,320	1,650	1,943	7,670	8,639	17%	68%	85%
2015	13,765	11,755	1,750	2,010	10,005	12,015	15%	73%	87%
2016	12,524	11,936	1,826	588	10,110	10,698	5%	81%	85%
2017	10,314	10,314	2,350	0	7,964	7,964	0%	77%	77%
2018	12,976	12,976	1,778	0	11,198	11,198	0%	86%	86%
2019	12,836	12,836	1,830	0	11,606	11,606	0%	86%	86%
2020	8,178	8,178	1,471	0	6,707	6,707	0%	82%	82%
Avg. (all)	9,055	7,955	1,830	14%	71%	79%	21%		1,099
Avg. 10-yr	12,413	11,318	1,804	8%	77%	85%	14%		1,096

Spawning escapement of other western Kamchatka sockeye Salmon is estimated based on expansions of aerial counts in a series of index areas.

Table 10. Recent estimates of Sockeye Salmon spawning escapement (thousands) (non Ozernaya).

Year	SW Kamchatka total	Koshegochek	Opala Golygina	Bolshaya	Kol	Pymta	W Kamchatka total	Icha, Oblukina, Krutogorova, Kolpakova, Vorovskaya	Vorovskaya
2004		0.4	6	90	4	7		45	10
2005		1.4	6	50	28	36		280	58
2006		2.5	35	30	20	64		240	16
2007		2.4	28	10	16	3		100	28
2008		–	5	20	1	2		30	1
2009		1.4	21	60	6	4		120	16
2010		2.2	24	20	5	5		70	22
2011		--	5	10	11	--		10	2
2012		--	7	90	6	10		20	11
2013		--	2	40	4	--		5	0
2014		--	8	5	45	48		40	18
2015		--	--		--	--		5	--
2016		--	--	40	1	3.8		5	--
2017		--	1.9	130	--	7.5		10	6
2018		--	25.3	180	--	--		5	--
2019		--	51.6	150	0	1			1
Avg.		***1.7***	***16.1***	***61.7***	***11.2***	***15.9***		***65.7***	***14.5***

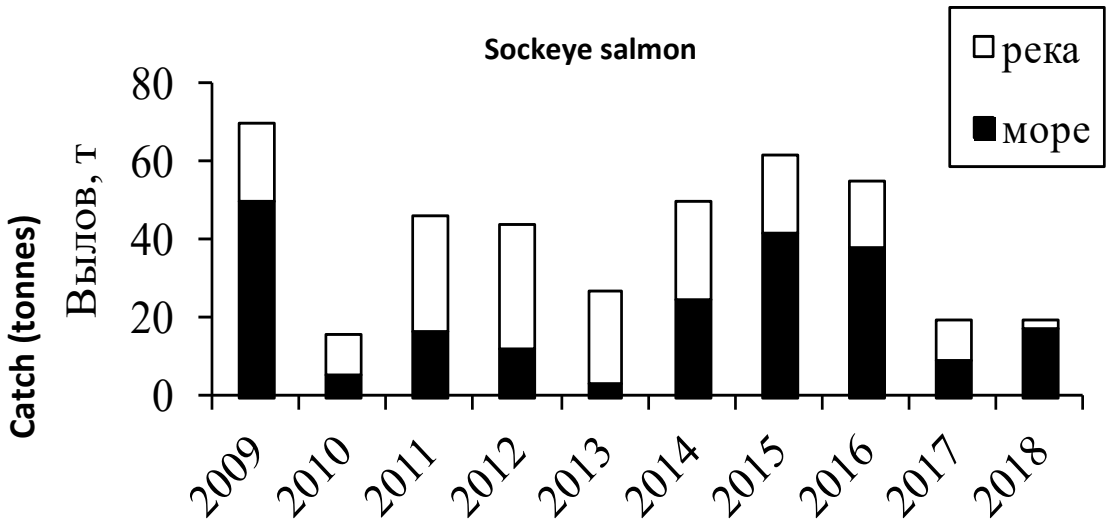


Figure 26. Pacific salmon catch dynamics of sockeye salmon in the Pymta river in 2009-2018 (□ River, ■ Sea).

Management

Escapements of Ozernaya sockeye are managed to produce maximum sustained yield based on production curves fit to spawner-recruit data. Escapement goals have been refined over the years as more information has become available and productivity has changed (Figure 26). A significant general increase in the number of Ozernaya sockeye salmon spawning run has been recorded since 2000, when fish of the 1994 and 1995 generations provided the returns (Bugaev 2011). Escapement goals for 1995-2009 were 1 to 2.3 million sockeye as counted at the weir (1.5-1.9 million optimum). Escapement goals for the period 1970-1994 were 2.5-3.5 million (3 million optimum). Current biological reference points are 0.75-1.9 million (Table 11). Escapement goals have been consistently met or exceeded since the goal was reduced in 1994.

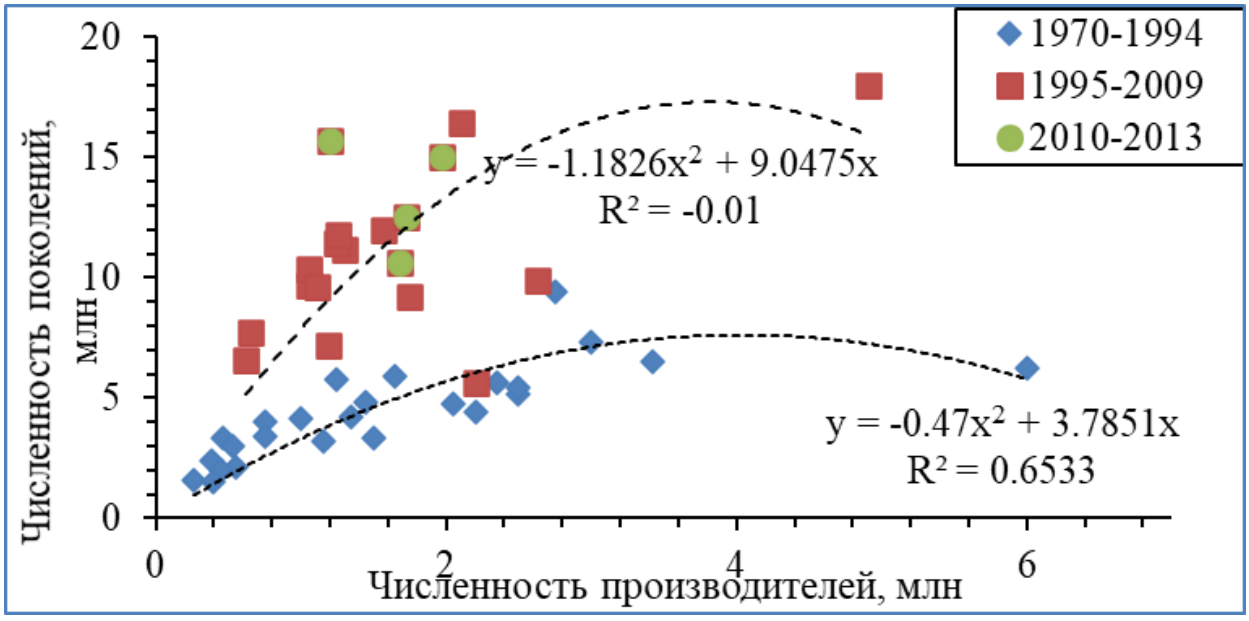


Figure 27. Spawner-recruit relationships for Ozernaya sockeye (millions of fish) (updated from Bugaev and Zikunova 2021).

Table 11. Management reference points for Ozernaya sockeye salmon fishery, million spawners (Shevlyakov et al. 2020).

Waterbody	Buffer (*Sbuf)*	Target (*Smsy)*	Maximum (*Smax)*
R. Ozernaya	0.75	1.14	1.9

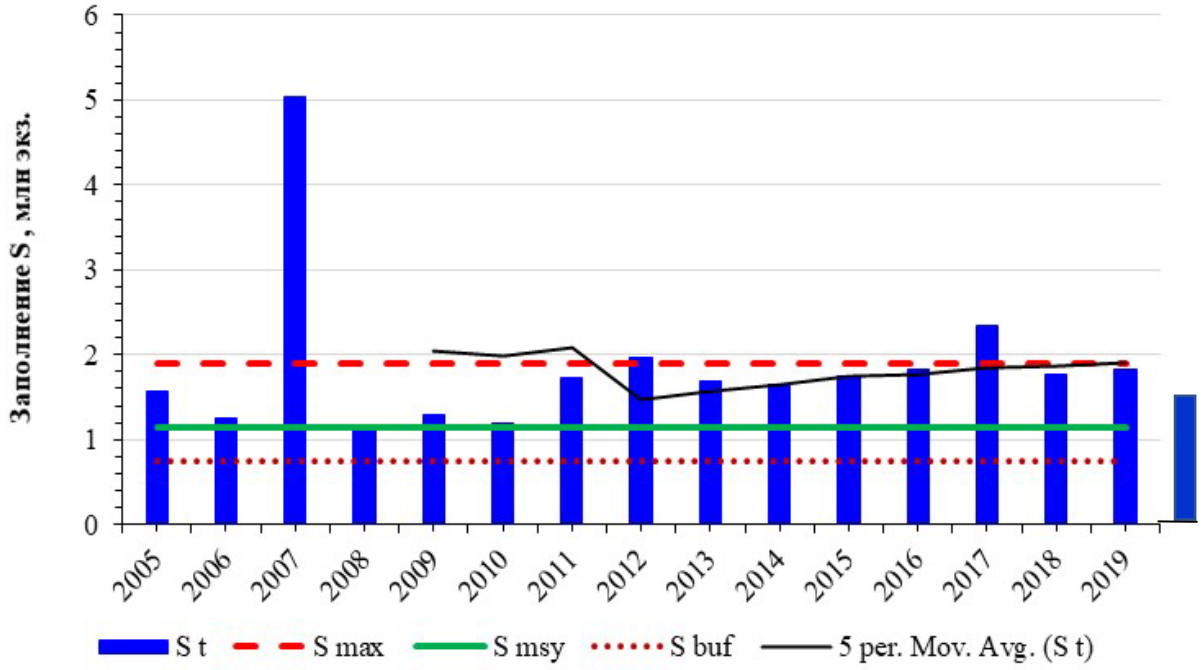


Figure 28. Sockeye salmon escapement level in Kuril lake (Ozernaya River) against the target reference points (Shevlyakov et al. 2020).

Optimum escapement levels of other western Kamchatka sockeye salmon have been identified based on analyses of historical production and habitat availability. Recent work by KamchatNIRO has developed river-specific reference points based on stock-recruitment analysis. Sockeye escapements after that time period are thought to be biased low due to a reduction in aerial escapement monitoring effort (Bugaev et al. 2018). More recent surveys were conducted primarily to monitor pink and chum salmon and did not include the peak of the sockeye spawning, accordingly sockeye escapement data after 2010 should be considered under-estimates.

Table 12. Escapement reference points (thousands of fish) for sockeye salmon in west Kamchatka Rivers (non Ozernaya).

	S_{lim}	S_{buf}	S_{MSY}	S^*_{MSY}
Kamchatka-Kuril subzone	43	80	95	204
Western Kamchatka subzone	na	na	na	na
Koshegochek			40	50
Opala-Golygina	14		31	67
Bolshaya	16		36	75
Kol				
Pymta	5	9	11	23
Vorovskaya	3		6	8

na = not available

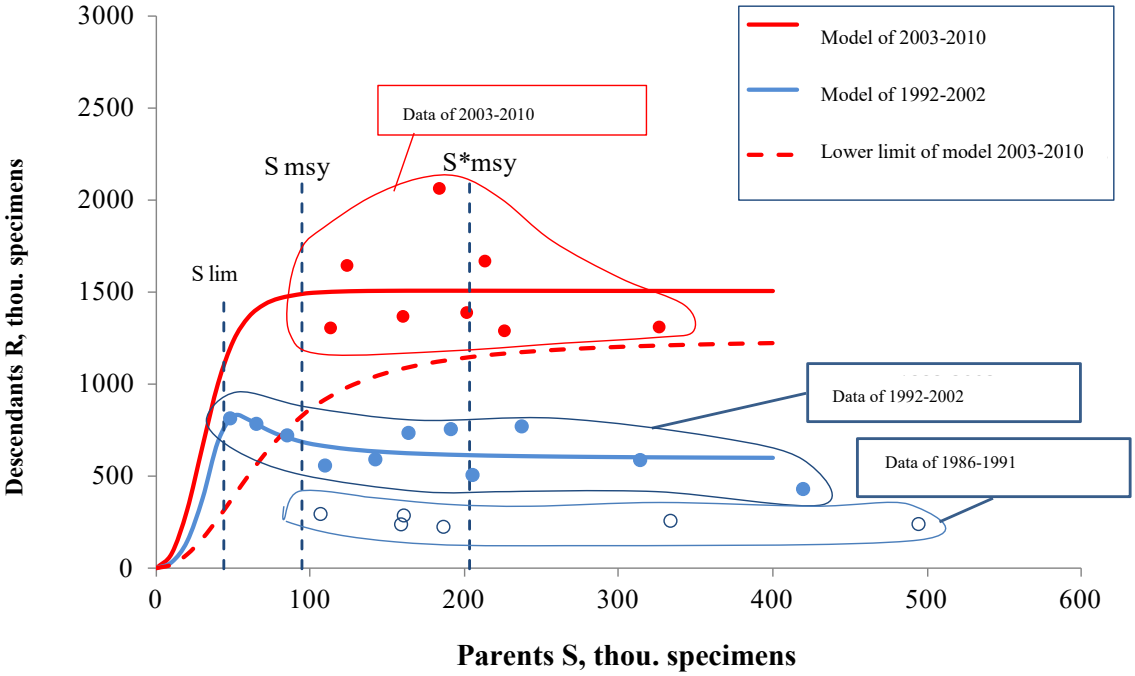


Figure 29. General model of recruit dependence on sockeye salmon spawners in the Kamchatka-Kuril subzone (Bugaev et al. 2019a).

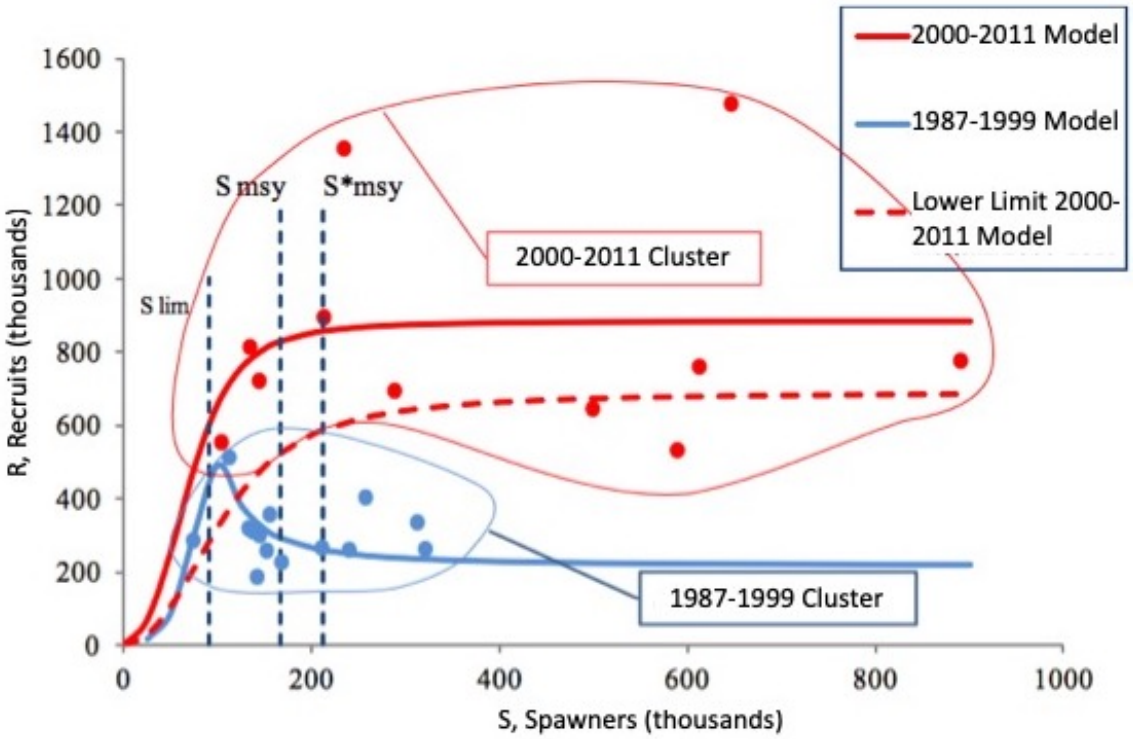


Figure 30. Spawner– Recruit analysis for West Kamchatka sockeye salmon (Bugaev et al. 2018).

Pink Salmon

Distribution

Pink salmon are the most abundant salmon species in West Kamchatka (Semko 1954). This species is found throughout the north Pacific, including streams of West Kamchatka south of 54° Northern Latitude. The largest populations in West Kamchatka occur in the Bolshaya, Vorovskaya, and Kikhchik rivers. Unit of certification rivers contribute approximately 30% of the regional return on average (Shevlyakov et al. 2016). The distribution of pink salmon in West Kamchatka Rivers changed from 1998 to 2006, generally shifting northward.

Russian pink salmon generally range into ocean waters of the Okhotsk and Bering seas. The deep-water part of the Okhotsk Sea is the major feeding ground of juvenile salmon within the Russian EEZ. The western Bering Sea has a low foraging importance for juveniles (Temnykh and Kurenkova 2006; Shuntov and Temnykh 2008a). High seas tag-and-recapture experiments have revealed that pink salmon originating from specific coastal areas have characteristic distributions at sea which are overlapping, non-random, and similar from year to year. Pink salmon are abundant in the Yavinskaya, Koshegochek and Golygina. Pink salmon are less abundant in the Ozernaya River due to the colder temperature of this lake-fed system.

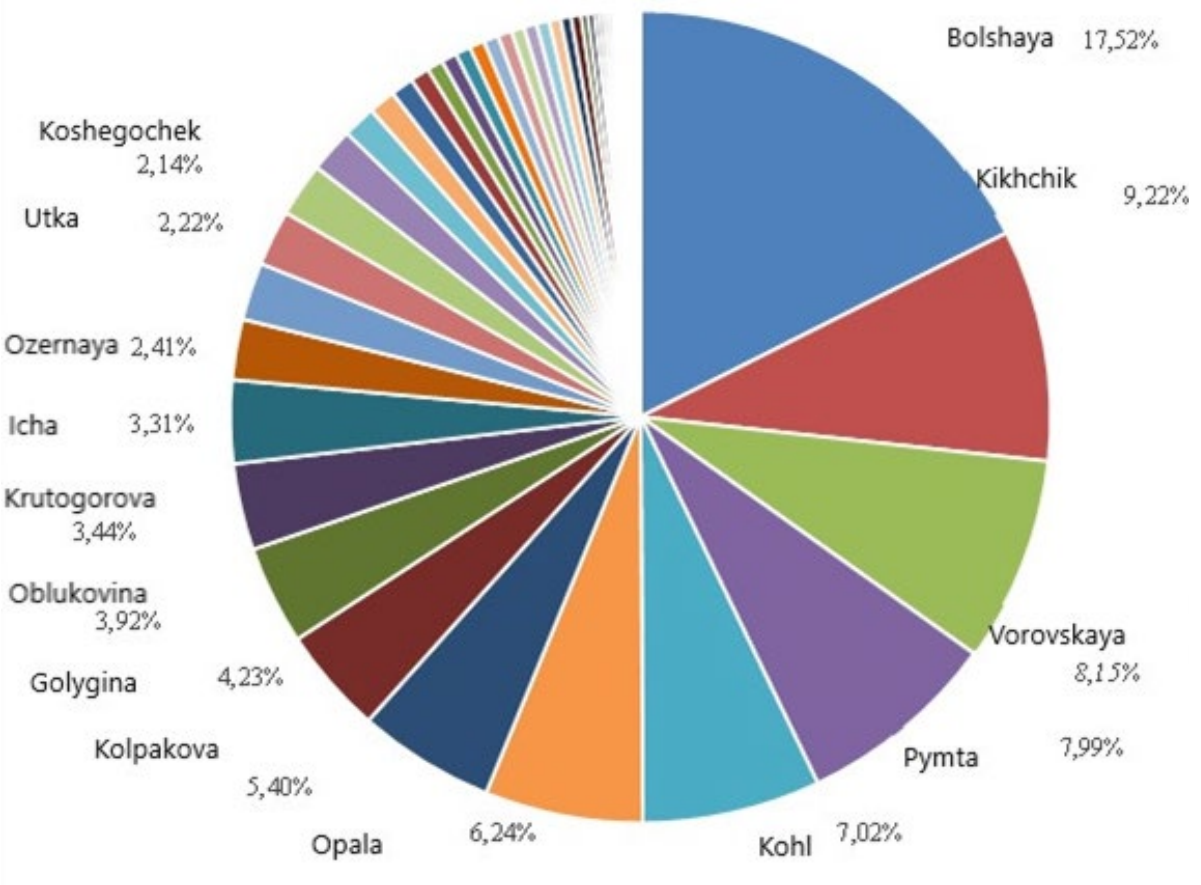


Figure 31. Spawning distribution of pink salmon in West Kamchatka (Bugaev et al. 2020).

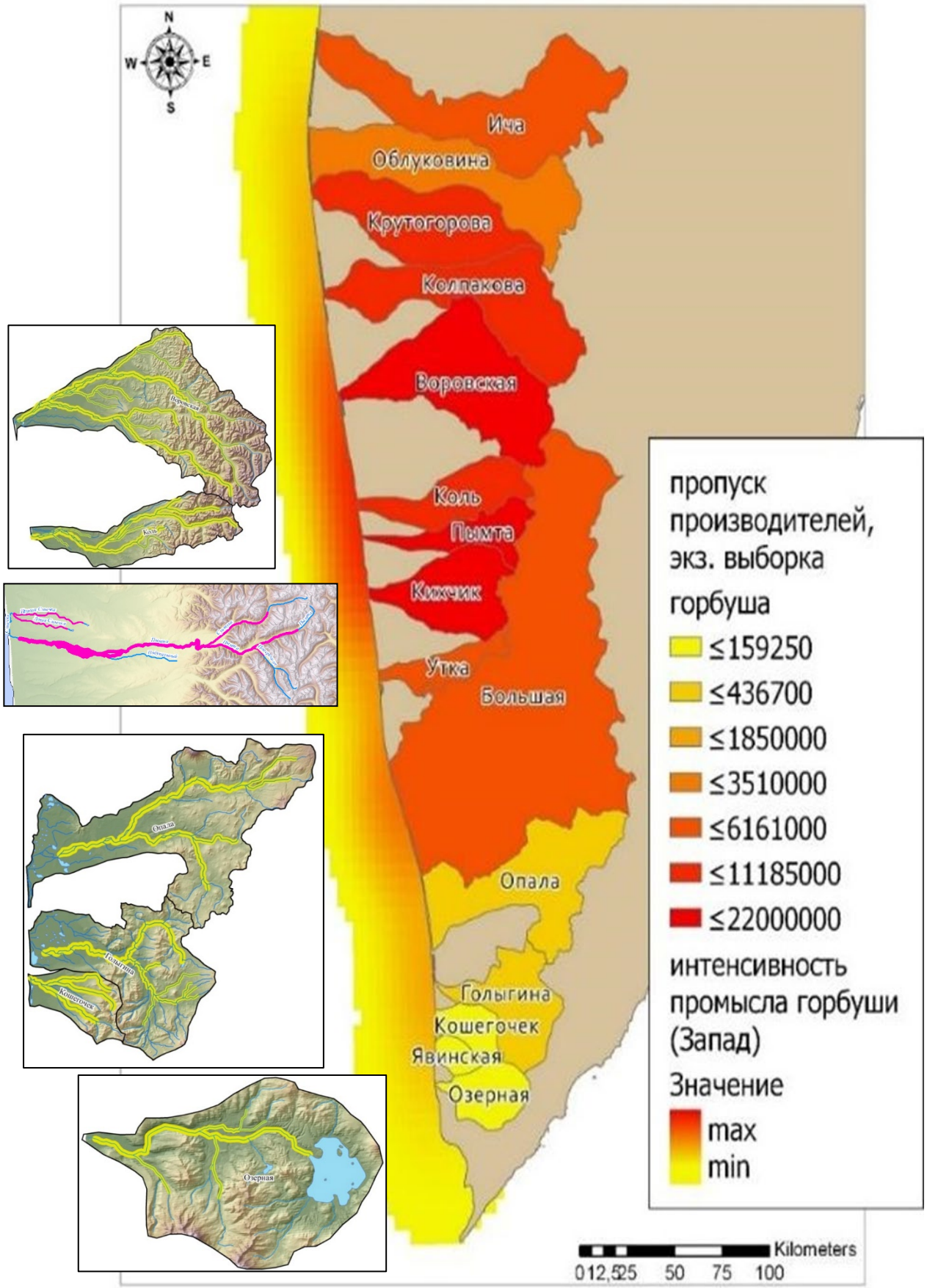


Figure 32. Pink salmon spawning escapement (inside coastline) and catch intensity (outside coastline) in West Kamchatka rivers and in 2018 (Bugaev et al. 2019b). Spawning distribution of pink salmon in selected rivers (Shevlyakov et al. 2016).

Life History

Pink salmon return to West Kamchatka primarily in July and August, and spawning occurs in August and September. Spawning typically occurs in the lower and middle reaches of streams, rivers and sometimes the intertidal zone at the mouths of streams. After spawning all pink salmon die.

Like all salmon, eggs are buried in redds excavated by the females in coarse gravel or cobble-size rock, often of shallow riffles and the downstream ends of pools. Fecundity typically averages about 1,500 eggs per female. Fry hatch after several months, then spend several weeks in the gravel before emerging in late winter or spring to migrate downstream into salt water. Pink salmon fry spend only a few days in river.

In West Kamchatka, pink salmon typically average 1.2 - 1.5 kg and 50 cm. Extensive information on pink salmon size and sex is collected by KamchatNIRO (2014) on an annual basis from the commercial catch in West Kamchatka rivers. All pink salmon spawn at the age of two years. As a result, this species forms two independent populations in the same river, entering the river in odd and even years. The odd-year or even-year cycle will typically predominate, although in some streams both odd- and even-year pink salmon are about equally abundant. Cycle dominance will occasionally shift with the previously weak cycle become most abundant. In West Kamchatka, a massive run of pink salmon in 1983 resulted in excessive spawning escapement that subsequently depressed odd-year runs (KamchatNIRO 2013). The even-year return now dominates.

Stock Structure

Run patterns in larger river systems suggest that the aggregate return includes a number of substocks. KamchatNIRO (2013) reports that up to five overlapping runs can be distinguished in large systems like the Bolshaya River based on run timing, size and sex ratio. Smaller systems may support fewer types. Genetic analyses of pink salmon stock structure have generally identified broad geographical patterns but little or no difference among local populations in any given region. Genetic differences appear to be less in Asian pink salmon than in North American pink salmon (Zhivotovsky, personal communication). Natural straying among local populations of pink salmon is generally assumed to be more significant than in other salmon species (Sharp et al. 1994; Zhivotovsky et al. 2008; Shpigalskaya et al. 2011). However, the available information on pink salmon genetic stock structure and straying patterns is not conclusive. It remains unclear whether historical genetic methods found no stock structure because none existed or because the available methods lacked sufficient power to identify differences. More recent genetic analyses of pink salmon using microsatellites have been similarly inconclusive.

Status

Spawning escapement of pink salmon is estimated based on expansions of aerial counts in a series of index areas throughout West Kamchatka. These surveys estimate that millions of pink salmon spawn in West Kamchatka Rivers during dominant (even-numbered) years. Estimates are also made in subdominant (odd-numbered) years. However, Shevlyakov and Maslov (2011) reported that odd-year escapement estimates are subject to significant error and cannot be used as a prognostic parameter.

This species is currently at historical levels of high production throughout the western Pacific including the west Kamchatka rivers (Figure 33). High levels of production are demonstrated by high levels of commercial harvest during even years since the late 1990s. This follows an extended period of low returns from the 1950s through the 1970s due to impact of the Japanese high seas drift net fishery and unfavorable ocean environmental conditions. Harvest of the now-dominant even-year return increased substantially in West Kamchatka after the 1983 collapse of the dominant odd-year cycle.

Directed fishing on pink salmon is limited to the even years. Pink salmon harvest in odd years occurs incidental to harvest of other salmon species, primarily at fishing sites within the river. Total harvest in even years currently averaged approximately 100 million fish per year with annual exploitation rates of 40-80%.

Run sizes during odd years have been much lower than even years since 1983 when a very large spawning escapement resulted in a shift in cycle dominance from odd to even years. An abnormally high abundance of spawners in the west Kamchatka rivers in 1983 was believed to subsequently depress the odd-year cohort due to digging of the spawning grounds, excessive density of spawners therein and high mortality of the offspring at early stages of ontogenesis resulting from organic contamination of nests and spawning grounds (Shevlyakov et al. 2016). The odd-year cohort has begun to rebound somewhat with several significant runs since 2003.

Even-year numbers have decreased in the 2012-2014 cycle for unknown reasons (Shevlyakov et al. 2016). Spawning escapement was high in 2012 and produced a strong year-class of downstream migrants. Work on genetic identification of the west Kamchatka origin pink salmon in trawl catches during autumn in the Sea of Okhotsk showed a drop abundance as confirmed by a low run to the west Kamchatka coast in 2014. Numbers have subsequently rebounded with a large run in 2016 and a very large run in 2018.

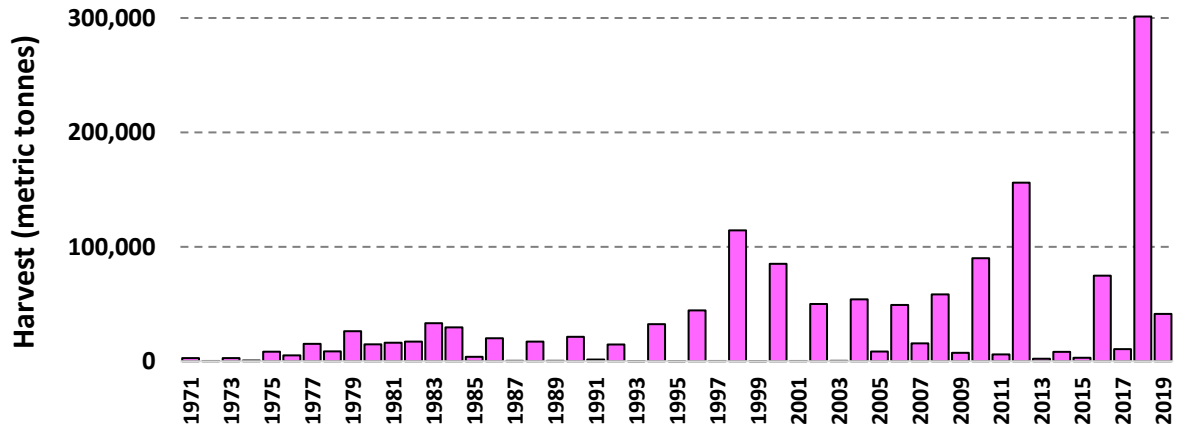


Figure 33. Commercial pink salmon catch (mt) in West Kamchatka (NPAFC 2020).

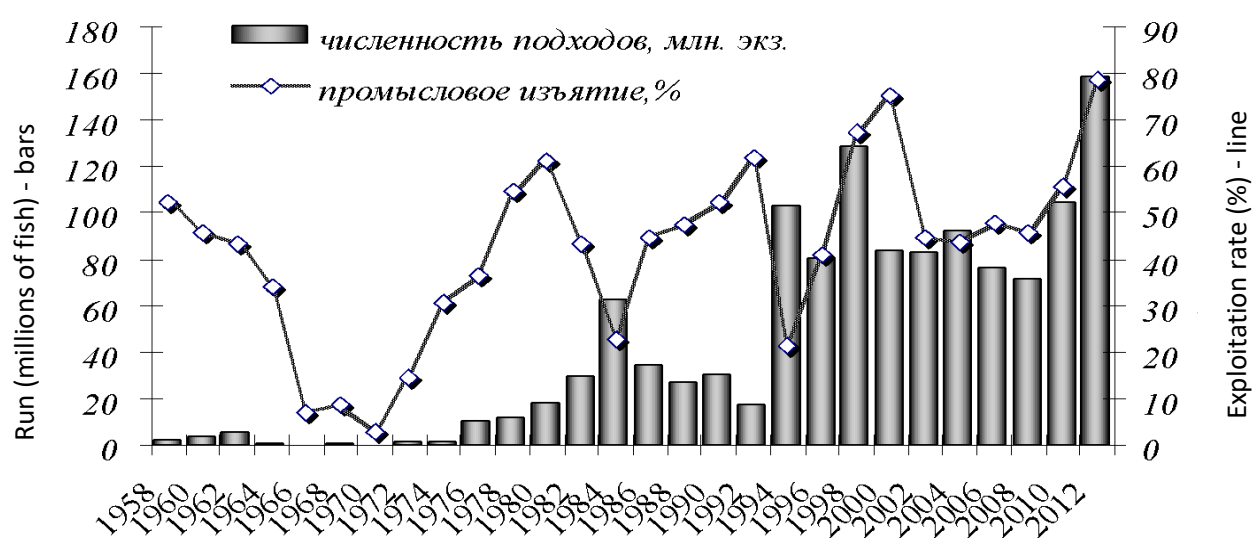


Figure 34. Dynamics of even-year commercial catch of pink salmon of West Kamchatka (vertical bars = run size, left; line = exploitation rate, right).

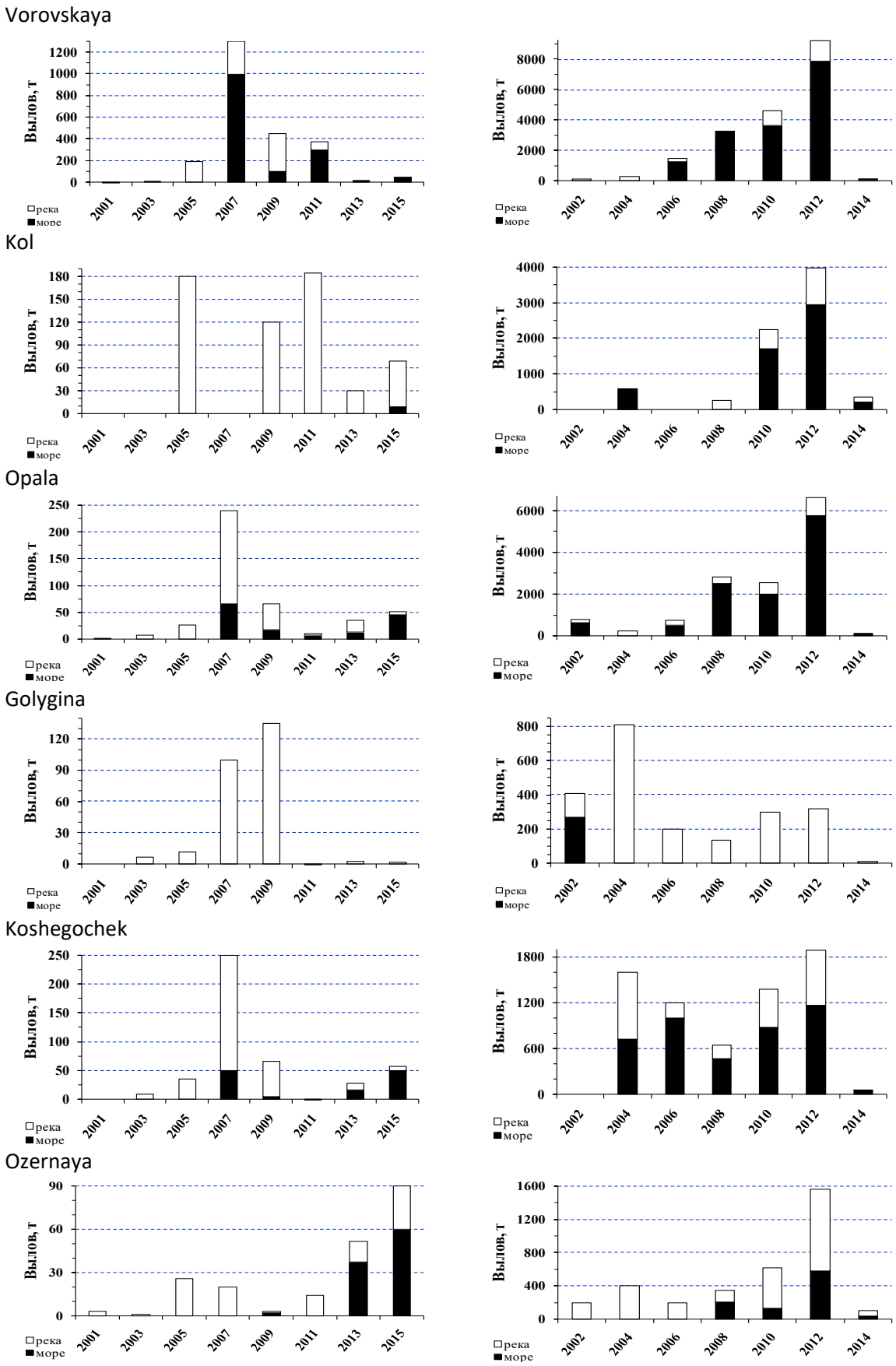


Figure 35. Odd and even year Pink Salmon commercial harvest by area (river harvest = white, sea harvest = black)

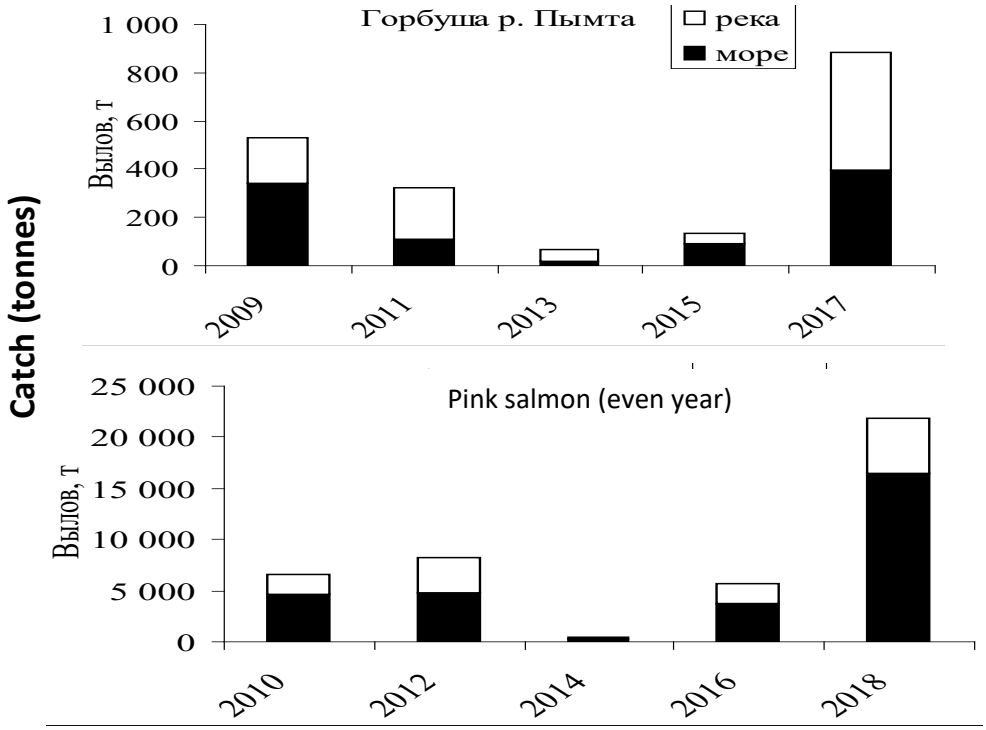


Figure 36. Pacific salmon catch dynamics by species in the Pymta river in 2009-2018 (□ River, ■ Sea).

Table 13. Recent estimates of Pink Salmon run size and spawning escapement (millions).

Year	West Kamchatka total	Vorovskaya	Kol	Pymta	Opala- Golygina	Koshegochek	Ozernaya
2005	18	2.4	0.8	1.3	1.1	0.1	0.1
2006	30	3.2	2.7	3.2	4.6	0.5	0.1
2007	3	0.2	0.1	0.1	0.1	0.01	
2008	38	6.0	4.3	2.4	3.2	0.2	0.8
2009	1		0.2	0.1	0.1		
2010	46	6.5	5.2	6.8	0.8	0.1	
2011	1		0.2	0.3			
2012	20		3.6	6.7	0.5		
2013	1		0.2	0.1	0.1		
2014	--		0.2		0.1		
2015	--	--	--	--	--	--	--
2016	15	0.1	3.3	4.6	--	--	--
2017	3	0.2	0.6	1.2	--	--	--
2018	112	16.4	11.2	14.8	0.8	0.03	0.01
2019	15	1.45	2.2	4.0	0.1	0.03	0.01
Even year avg.	43.5	6.4	4.4	6.4	1.7	0.2	0.3
Odd year avg.	6.0	1.1	0.6	1.0	0.3	0.0	0.1

-- indicates no data.

Management

The fishery is managed to provide spawning escapements consistent with sustaining high levels of production and yield. Historical practice has been to manage for broadly-defined goals for aggregate regional stocks which included a number of river-specific populations. Goals were generally based on objective spawner densities in available spawning habitat. Fisheries are regulated to ensure that significant escapements are distributed among individual rivers (Figure 30) but each river was not managed to achieve a river-specific goal as long as the aggregate goal is being achieved. Thus, some rivers are fished at higher rates and some at lower rates but MSY-based goals are generally achieved in aggregate.

More recently, the regional fishery scientific agency (KamchatNIRO) has been exploring development and application of more-specific escapement goals based on stock-recruitment analysis (Figure 36). This is a substantive step toward a more optimum and intensive salmon management system and this work has also been bolstered by fishery participation in the MSC program. However, this remains a work in progress, the fishery is considering their application and effectiveness in management and specific objectives have not fully incorporated into management.

Biological reference points are being developed from stock-recruitment data including river-specific values. These BRPs are the basis for provisional escapement objectives consistent with recruitment impairment and maximum yield. At the same time, the fishery is moving to support funding of additional spawning ground surveys necessary to implement a more subarea-specific management assessment. Over time, government funding levels for stock assessment have declined and fishing companies are recognizing their interest in funding additional assessment, in part due to the long-term leasing structure of fishing sites in Kamchatka.

Based on these results, KamchatNIRO has identified target reference points for even and odd-year pink cohorts in Western Kamchatka (Figure 36). Until the 2010s based on economic feasibility, aerovisual counting surveys were carried out mainly in even years, and in odd years they were carried out only to count chum or sockeye salmon (Bugaev et al. 2020). It should be noted that pink salmon escapement is not sufficiently estimated both in odd and even years in the rivers south of the river Bolshaya (Opala and Golygina rivers), and even farther south (Koshegochek and Ozernaya rivers) the counts were often not carried out at all (Bugaev et al. 2020).

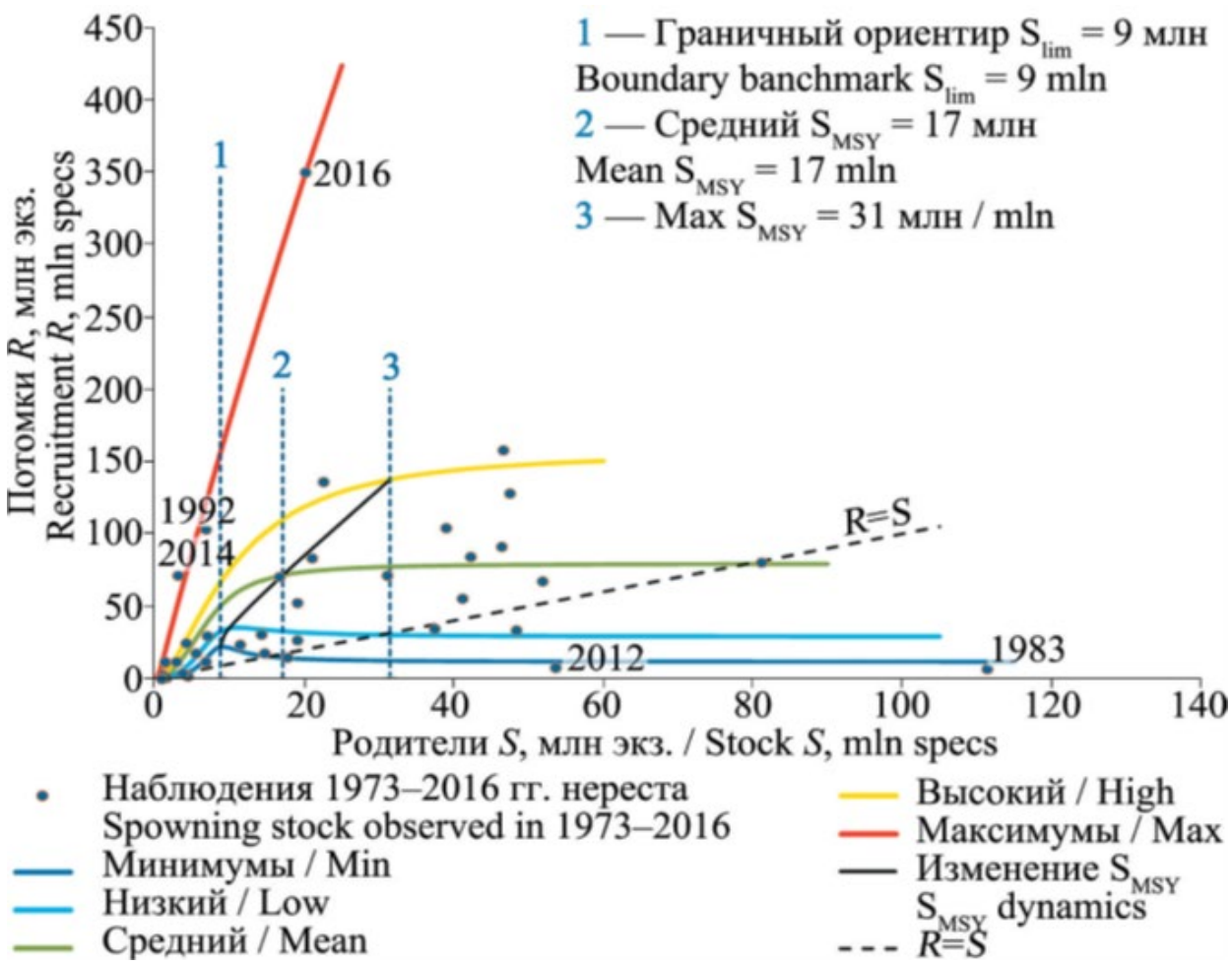


Figure 37. Spawner-recruit relationship for Western Kamchatka pink salmon (Bugaev et al. 2019a).

Table 14. Reference points (million spawners) for pink salmon (Shevlyakov et al. 2020).

Water	Buffer (*S buf)*	Target (*S msy)*	Maximum (*S max)*
West Kamchatka Total	9.0	17.0	31.0
R. Vorovskaya	0.80	1.57	2.89
R. Kol	0.61	1.20	2.20
R. Pymta	0.70	1.36	2.51
Opala-Golygina	1.1	2.2	4.0
R. Koshegochek	0.19	0.37	0.67
R. Ozernaya	0.21	0.41	0.76

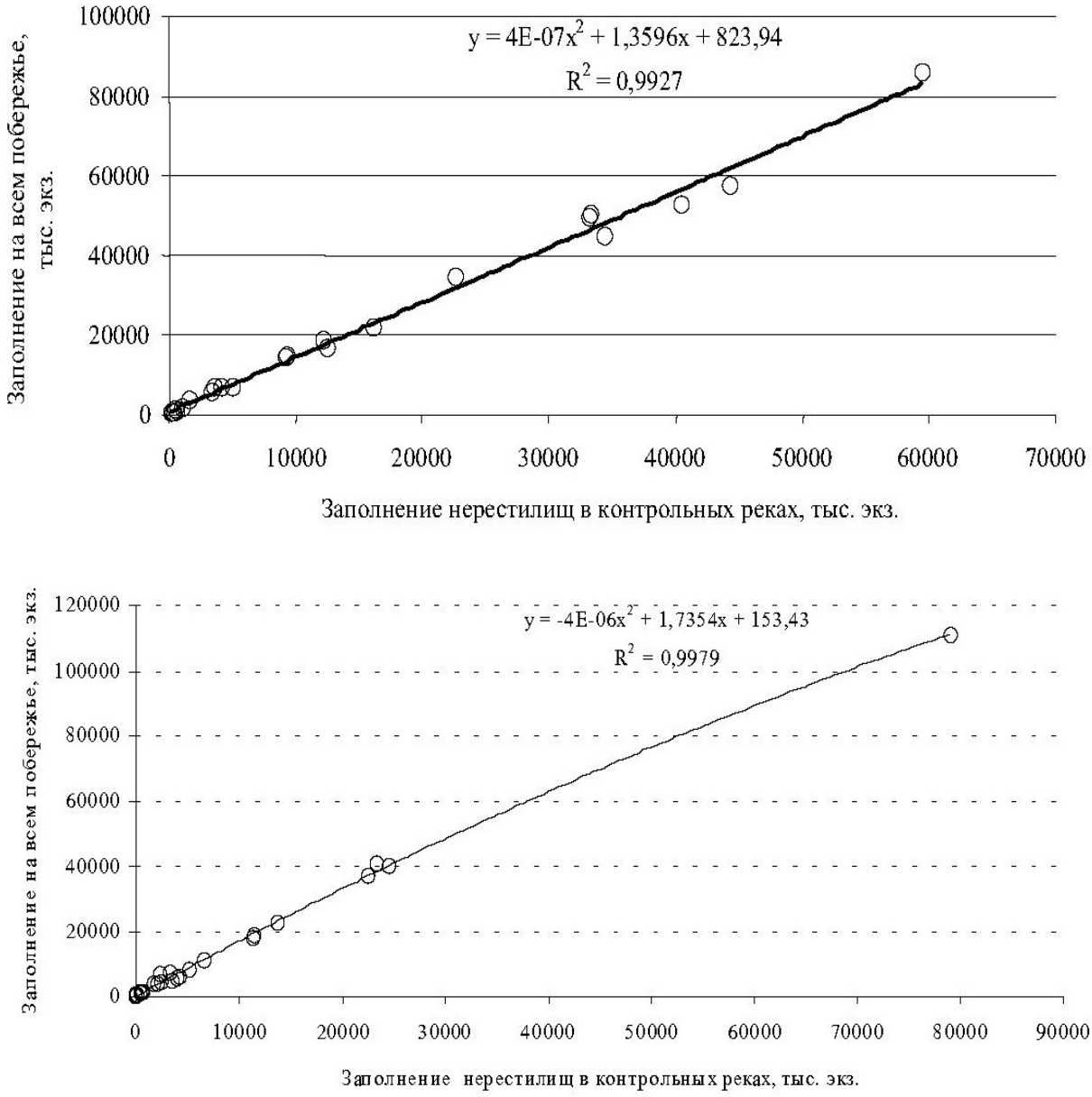


Figure 38. Ratio between total abundance of pink salmon on the west coast of Kamchatka in even (top) and odd (bottom) runs and number of spawning pink salmon in control rivers (Shevliakov and Maslov 2011).

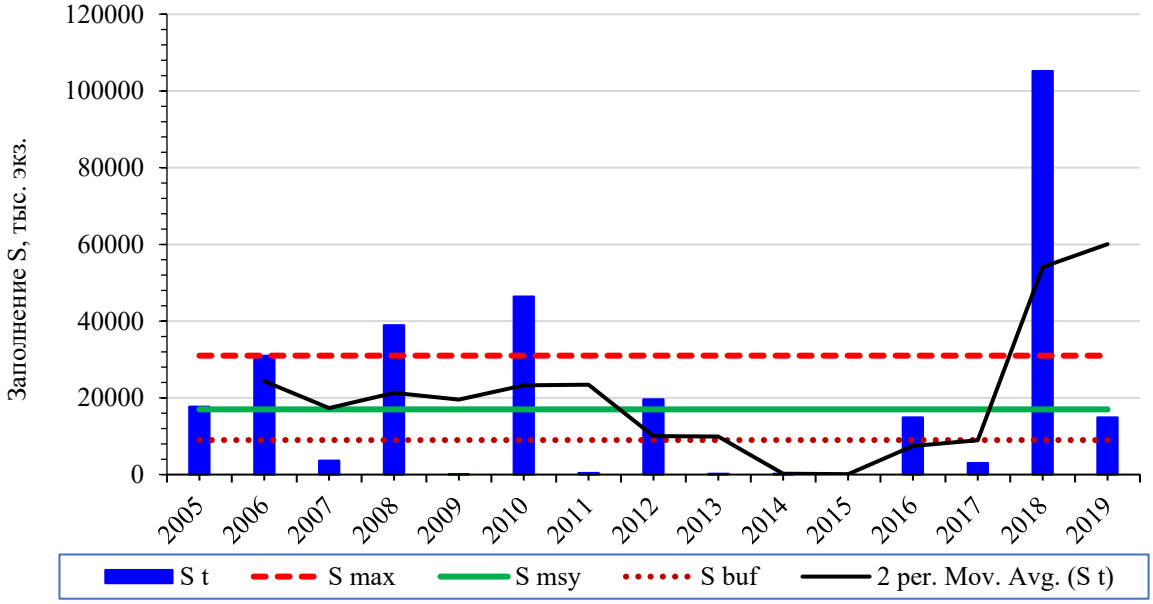


Figure 39. Dynamics of aggregated escapements of pink salmon in the spawning grounds of the Western Kamchatka against target reference points over the past 15 years (Shevlyakov et al. 2020).

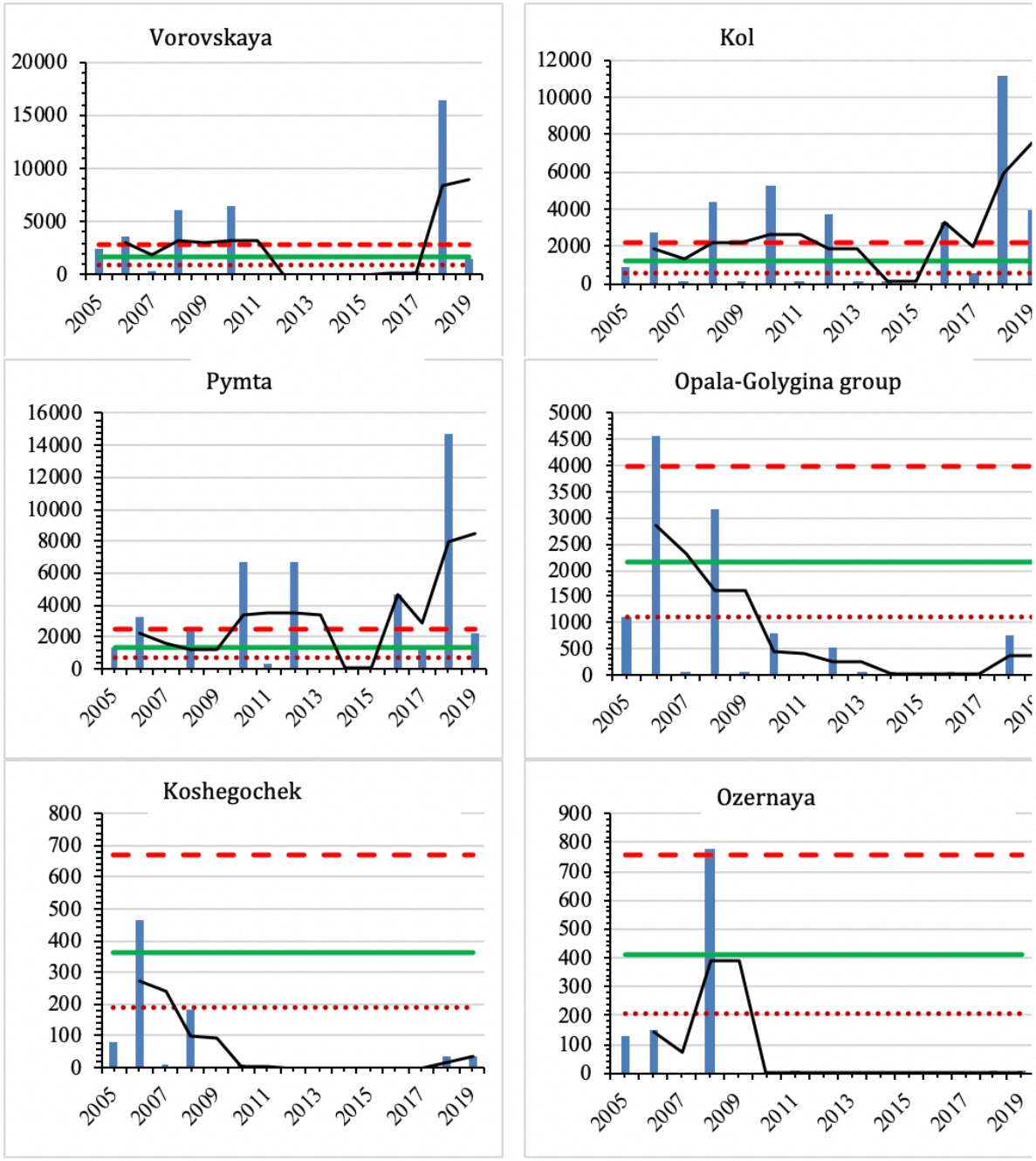


Figure 40. Dynamics of pink salmon escapements in the spawning grounds of studied rivers of the Western Kamchatka against target reference points over the past 15 years, thousands of spawners (Shevlyakov et al. 2020).

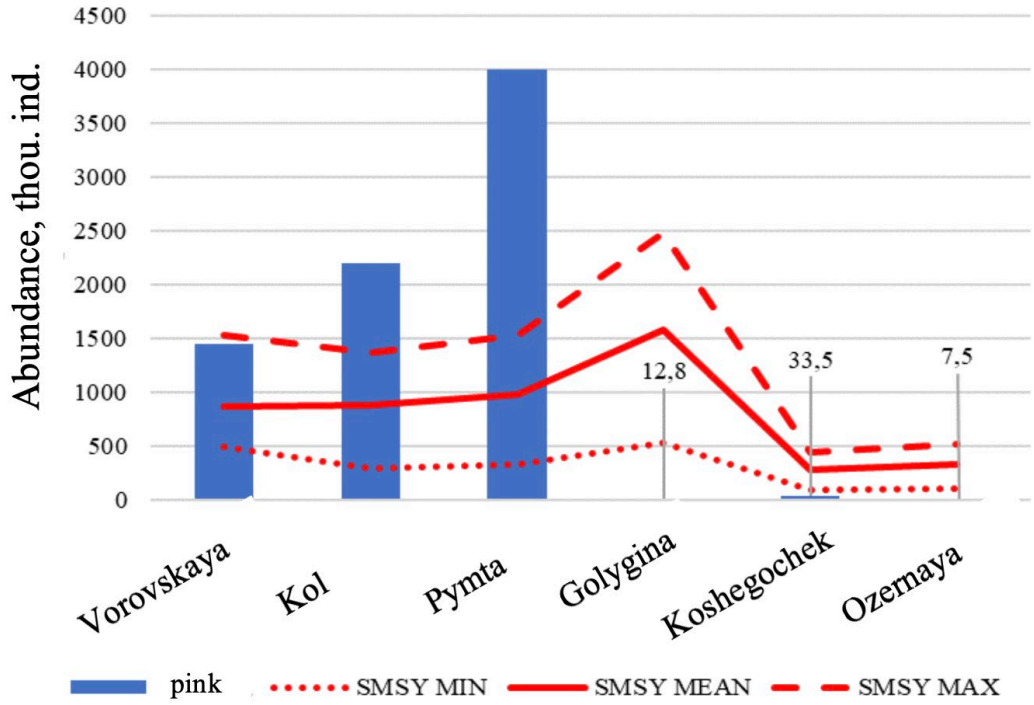


Figure 41. Escapements of pink salmon spawners to the target rivers in 2019 and target reference points calculated for them

Chum Salmon

Distribution

Chum salmon have the widest distribution of any of the Pacific salmon. Chum salmon generally spawn in low gradient temperate and subarctic rivers and streams throughout the north Pacific. They range south to the Sacramento River in California and the island of Kyushu in the Sea of Japan. In the north they range east in the Arctic Ocean to the Mackenzie River in Canada and west to the Lena River in Siberia. Chum salmon are abundant in West Kamchatka streams.

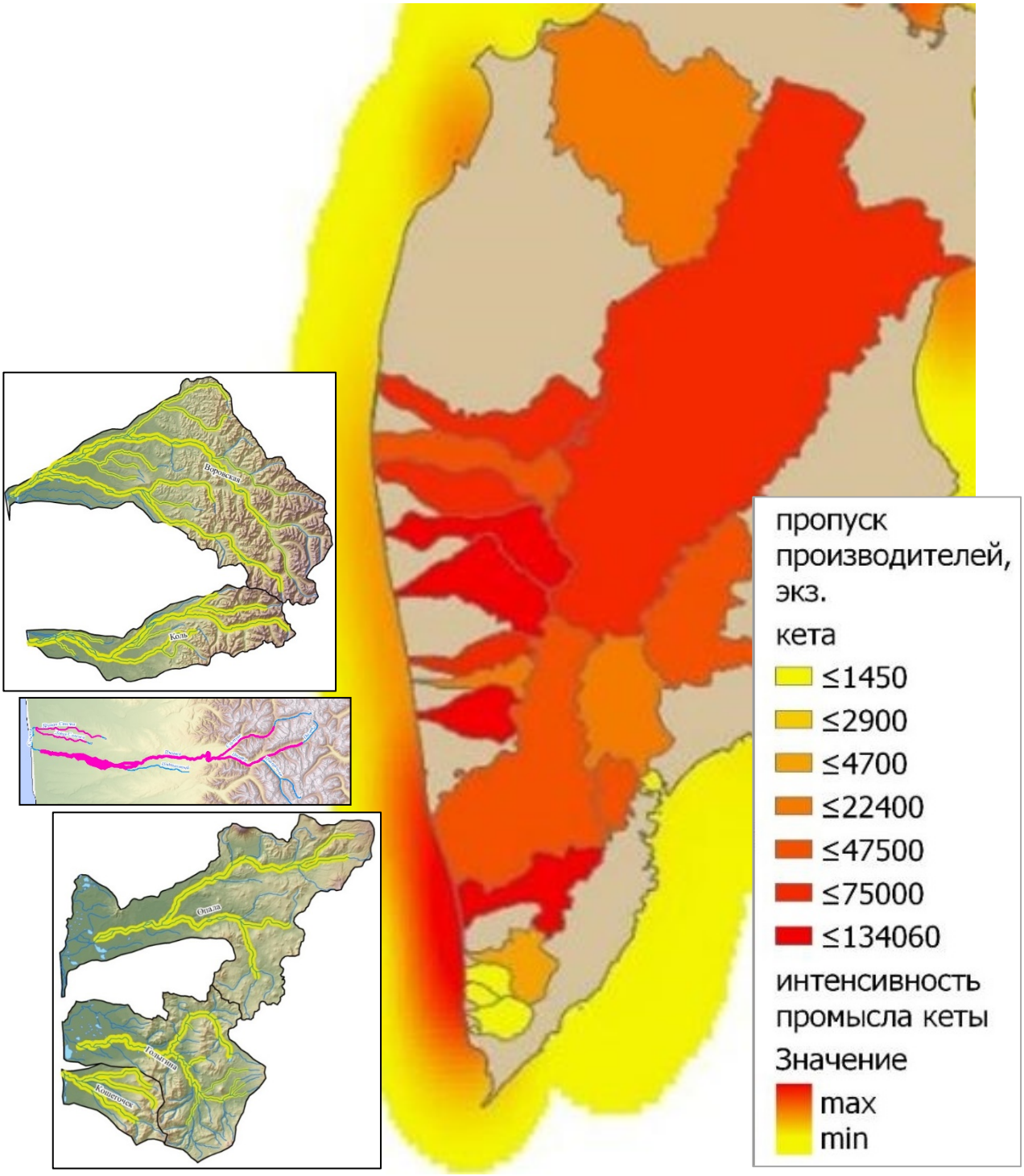


Figure 42. Chum salmon spawning escapement (inside coastline) and catch intensity (outside coastline) in Kamchatka rivers and in 2018 (Bugaev et al. 2019b). Spawning distribution of Chum Salmon in selected rivers (Shevlyakov et al. 2016).

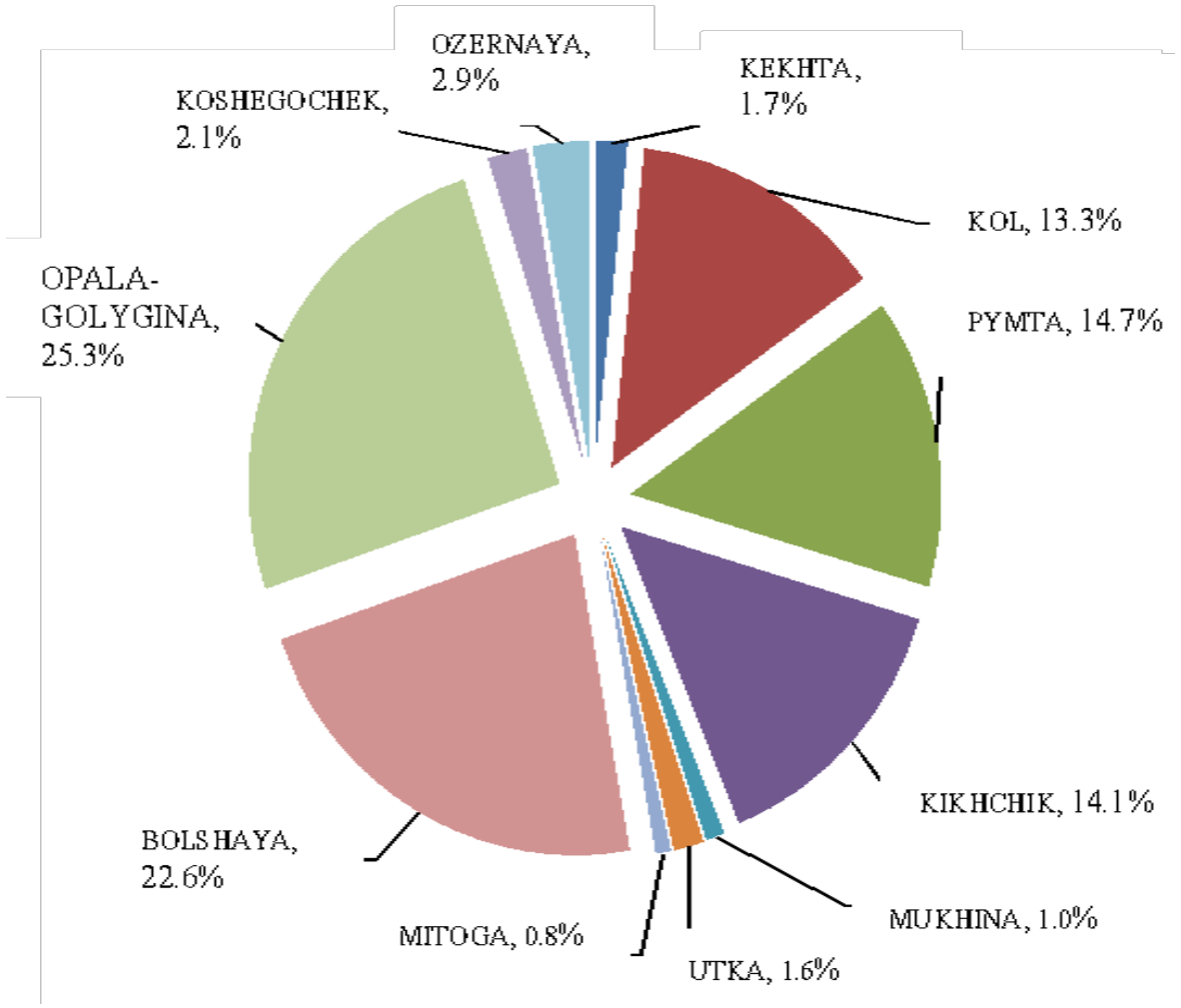


Figure 43. Chum salmon spawning distribution in southwest Kamchatka (Bugaev et al. 2019a).

Life History

Chum salmon generally return to West Kamchatka from late June through October. Numbers peak in late August and early September. Chum salmon typically reach their spawning grounds in August and September. Spawning typically occurs in the lower and middle reaches of streams, rivers and sometimes the intertidal zone at the mouths of streams. Spawning areas often occur in areas of upwelling springs. After spawning all chum salmon die.

West Kamchatka chum salmon typically average about 3 to 4 kg in weight and 60 to 70 cm in length. Age of maturity is 2 to 6 years (primarily at 4 years of age). Age composition of Bolshaya chum has varied over 70 years of records. Percentages of younger fish (2+ and 3+) increased from 1940-1960. The percentage of older fish (4+, 5+, 6+) has increased since the early 1970s. Older fish are typically more abundant in the early portion of the run and younger fish in the later portion of the run.

Fecundity typically ranges between 2,400 and 3,100 eggs. Eggs incubate over the winter before hatching in early spring. Juvenile chum salmon spend one-two months in the fresh water after hatching and then migrate to the sea soon after emergence in the spring.

Table 15. The age structure of some groups of chum salmon on the Western coast of Kamchatka.

Years	Age structure, %						Average age
	1+	2+	3+	4+	5+	6+	
Vorovskaya River							
1991–1995	–	0.6	37.6	54.3	7.5	–	3.69
1996–2000	–	0.7	47.1	43.7	8.5	–	3.60
2001–2005	–	0.9	50.5	43.9	4.7	+	3.52
2006–2010	–	1.1	42.4	49.1	7.2	0.2	3.63
2011–2013	0.1	1.0	22.0	63.3	13.4	0.2	3.90
Kol River							
2001–2005	–	0.1	48.5	41.9	9.5	–	3.61
2006–2010	–	1.1	22.7	55.6	20.6	–	3.96
2011–2013	–	3.1	14.6	50.0	32.3	–	4.11
Opala River							
2001–2005	–	1.1	55.0	39.0	4.9	–	3.48
2006–2010	–	0.9	49.9	38.3	10.9	–	3.59
2011–2013	–	2.3	26.7	62.9	8.1	–	3.77

Stock Structure

Kamchatka chum include spring, summer and fall runs, returning in June, July-August, and October-November, respectively. Different runs typically spawn in different portions of a basin with earlier fish generally traveling farther upstream. Genetic analyses have generally identified system and run-specific differences among chum populations in other regions. All three stocks are present in the area of this assessment. The early run is significant in the Opala River.

Status

Chum salmon returns and commercial harvest rates have steadily increased in West Kamchatka from very low levels observed in the 1970s (Figure 44). Total run size averaged about 420,000 fish from 1970-1985 with commercial catch and exploitation rate averaging 300 mt and 20%, respectively. From 1986-2000 run size averaged 1.3 million fish with commercial catch and exploitation rate averaging 2,000 mt and about 44%, respectively. Since 2010, runs have averaged about 5 million chum per year, exploitation rates have averaged 90% for an annual average harvest of 17,000 mt. The assessment team suspects that increases in run size and harvest since 2008 result from more accurate commercial catch reporting following the implementation of the "Olympic" management system.

Historical abundance of chum salmon has varied widely as evidenced by harvest numbers (Figure 42). Mortality of juvenile chum salmon in the Japanese drift net fishery in the open ocean explains much of the variation (KamchatNIRO 2013). High catches in Kamchatka during 1941-1950 coincide with the reduction and cessation of the drift fishery. Returns declined from 1960 - 1980 with the resumption of the drift fishery and climatic factors. Numbers rebounded beginning in the 1990s with regulation of the high seas drift net fishery and favorable ocean conditions for salmon throughout the north Pacific.

Since the mid-1970s, the intensity of fishing has been steadily increasing, reaching a maximum in the last 11 years. Chum are currently the primary focus of the commercial fishery in odd-numbered years when salmon are less abundant. Chum salmon escapement objectives may limit the catch of pink salmon in large pink return years.

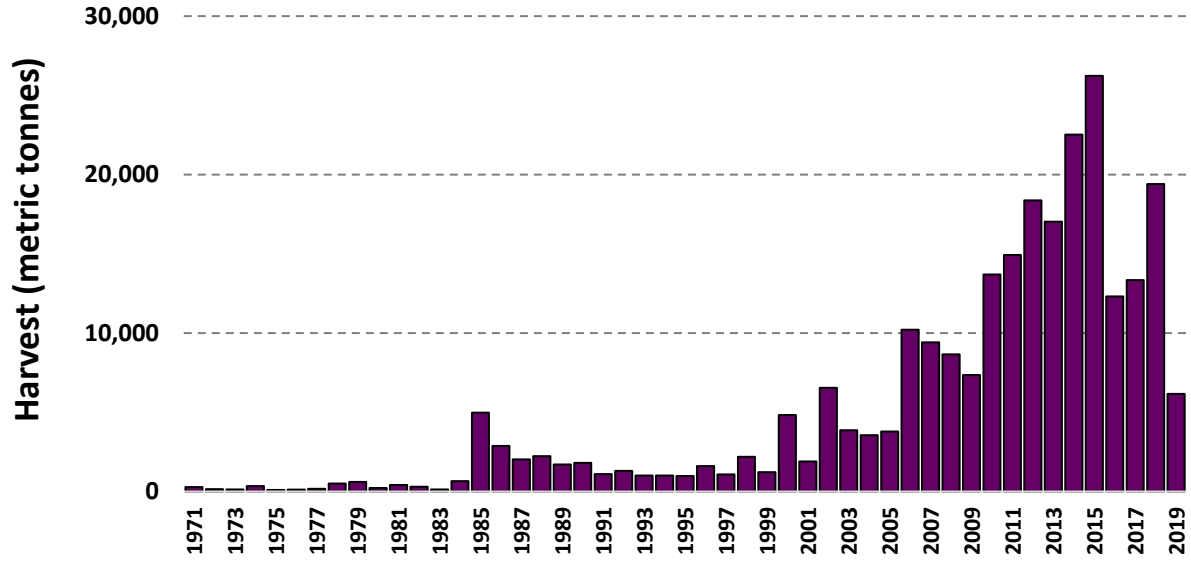


Figure 44. Commercial chum salmon catch (mt) in West Kamchatka (NPAFC 2020).

Figure 45. Dynamics of commercial catch of chum salmon of West Kamchatka (vertical bars = run size, left; line = exploitation rate, right).

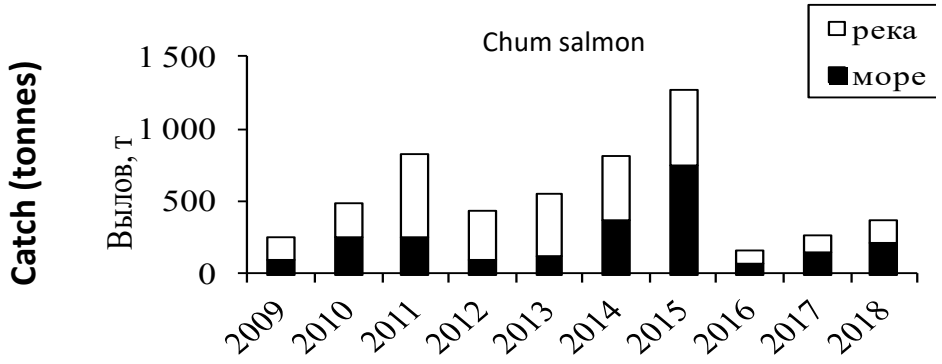


Figure 46. Pacific salmon catch dynamics by species in the Pymta river in 2009-2018 (□ River, ■ Sea).

Table 16. Recent estimates of Chum Salmon run size and spawning escapement (thousands).

Year	W Kamchatka subzone	Kamchatka-Kuril subzone	Vorovskaya	Kol	Pymta	Opala-Golygina	Koshegochek	Ozernaya
2005	470	570	16	190	67	160	5	3
2006	1,100	420	82	30	72	180	13	5
2007	580	270	55	10	7	230	2	7
2008	400	170	52	30	6	70		6
2009	500	200	28	15	26	110	2	3
2010	210	160	30	10	9	70	2	1
2011	300	130	30	14	55	20		1
2012	170	220		5	5	145		--
2013	100	180	8	40	7	90		--
2014	190	170	8	15	62	20		--
2015	80	10				0.2		--
2016	380	80	0.5	7.5	17.0	--	--	--
2017	80	160	42.6	23.5	12.0	44.6	--	--
2018	410	340	100.0	54.0	14.5	138.76	--	0.6
2019	70	180	38.1	19.5	10.2	98.0	0.1	0.9
Avg.	***336***	***217***	**37.7**	**33.1**	**26.4**	**98.5**	**4.0**	**3.1**

-- indicates no data.

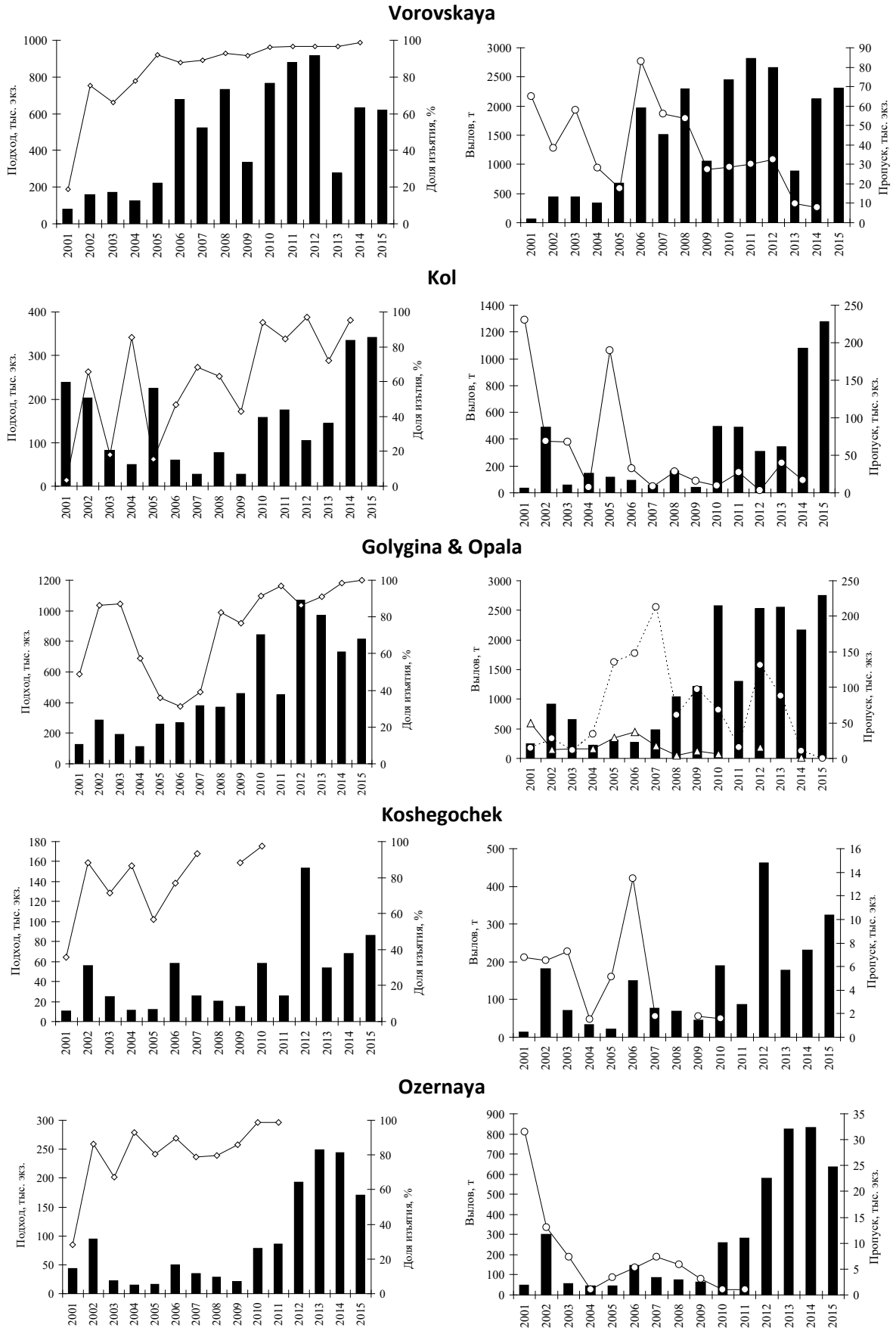


Figure 47. Chum Salmon status in selected western Kamchatka Rivers. Left panel: Run size in thousands of fish (bars) and exploitation rate (lines). Right panel: Yield (bars) and spawning escapement (lines) (Shevlyakov et al. 2016).

KamchatNIRO reports that spawning escapement estimates are substantially underestimated due to incomplete spawning surveys, particularly in recent years. As a result, exploitation rates derived from harvest and escapement numbers are substantial overestimates. For instance, rates of 100% are reported in years when no spawning escapement data is available due to a reduction in aerial survey funding. As a result, numbers reported for escapement should be considered indices rather than absolute estimates.

Management

Escapement objectives are identified for chum salmon based on historical production patterns although the spawner-recruit relationship is not as pronounced for chum salmon as for other species in West Kamchatka (Shevlyakov 2004). Maximum yield is estimated to be produced by an aggregate spawning escapement of 300,000 Chum (Figure 47). Based on the spawner-recruit analysis, the low boundary mark of chum salmon escapement for the whole South-West Kamchatka is set equal to 172 thousand specimens (parameter S0), and benchmark is within 300–373 thousand specimens (Bugaev et al. 2019a).

Western Kamchatka chum salmon are managed to achieve region-wide escapement goals. Fisheries are regulated to ensure that significant escapements are distributed among individual rivers but each river is not managed to achieve a river-specific goal as long as the aggregate goal is being achieved. Thus, some rivers are fished at higher rates and some at lower rates. Estimated exploitation rates of chum salmon in some rivers can approach 95% rate in some years. Such high rates would exceed average values in other wild chum fisheries throughout the Pacific with the exception of years of big returns for productive stocks. However, KamchatNIRO suggests that high rates in recent years are overestimates due to undercounting of escapement during large run years (Shevyakov et al. 2016).[3] Recent work by KamchatNIRO has developed river-specific reference points based on stock-recruitment analysis (Table 17).

[3] KamchatNIRO reports that spawning escapement estimates are substantial underestimates salmon due to incomplete spawning surveys, particularly in recent years. As a result, exploitation rates derived from harvest and escapement numbers are substantial overestimates. For instance, rates of 100% are reported in years when no spawning escapement data is available due to a reduction in aerial survey funding. As a result, numbers reported for escapement in Table 16 should be considered indices rather than absolute estimates.

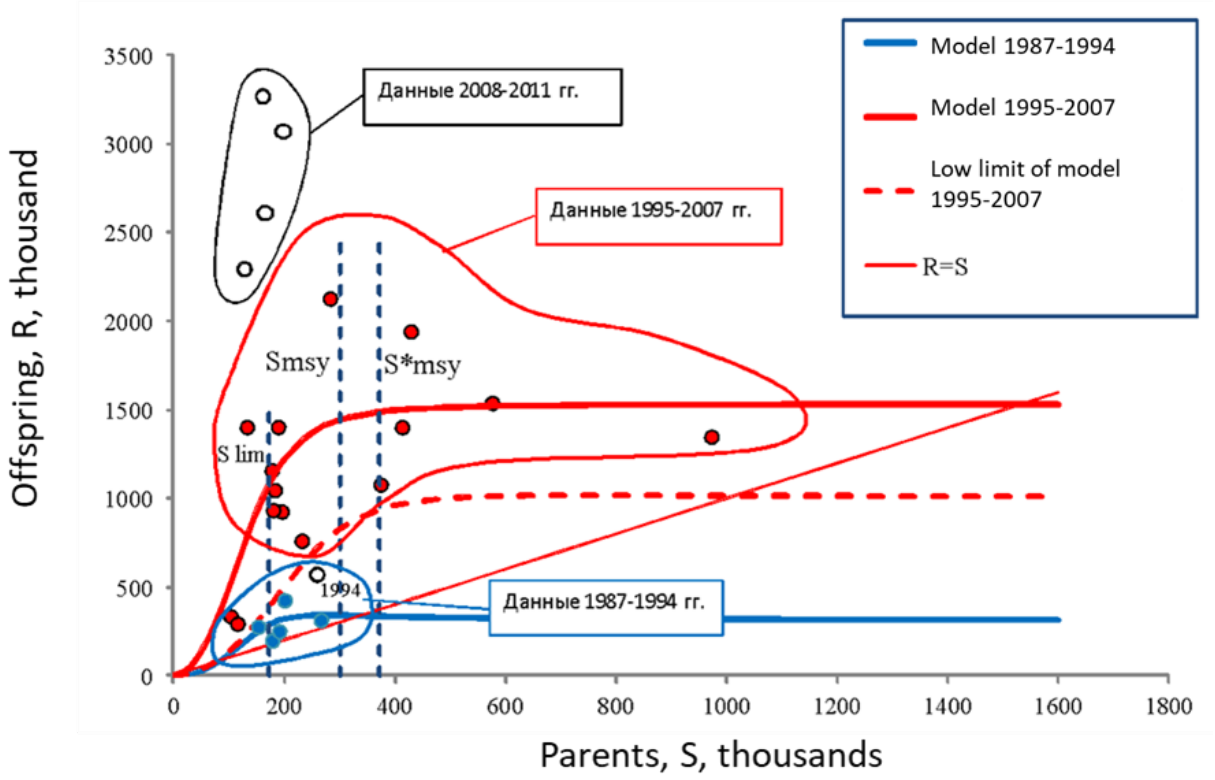


Figure 48. General model of chum salmon recruit dependence on spawners for the southwest of Kamchatka. Marker without filling means unused observations (Bugaev et al. 2019a).

Table 17. Escapement reference points (thousands of fish) for chum salmon in west Kamchatka Rivers (Bugaev et al. 2020).

	Slim[a]	Buffer (Sbuf)	Target (Smsy)	Maximum (S*msy)
Western Kamchatka subzone	128	255	338	471
Kamchatka-Kuril subzone	86	172	300	373
Vorovskaya	11	22	29	41
Kol	12	23	40	50
Pymta	13	25	44	55
Opala & Golygina	22	43.5	76.0	94.0
Koshegochek	2	3.5	6.2	7.7
Ozernaya	3	5.1	8.8	11.0

[a] *S_{lim} based on 50% S_{buf} for the purposes of this analysis.*

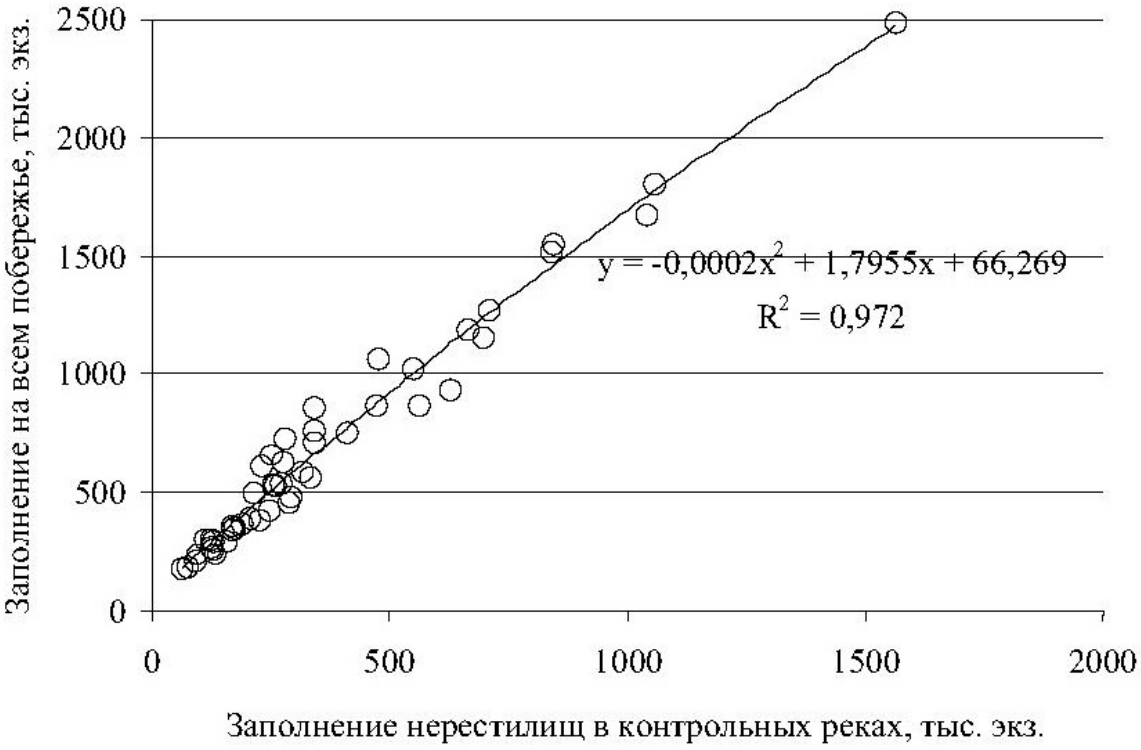


Figure 49. Ratio between total abundance of chum salmon on the west coast of Kamchatka and number of spawning chum salmon in control rivers (Shevliakov and Maslov 2011).

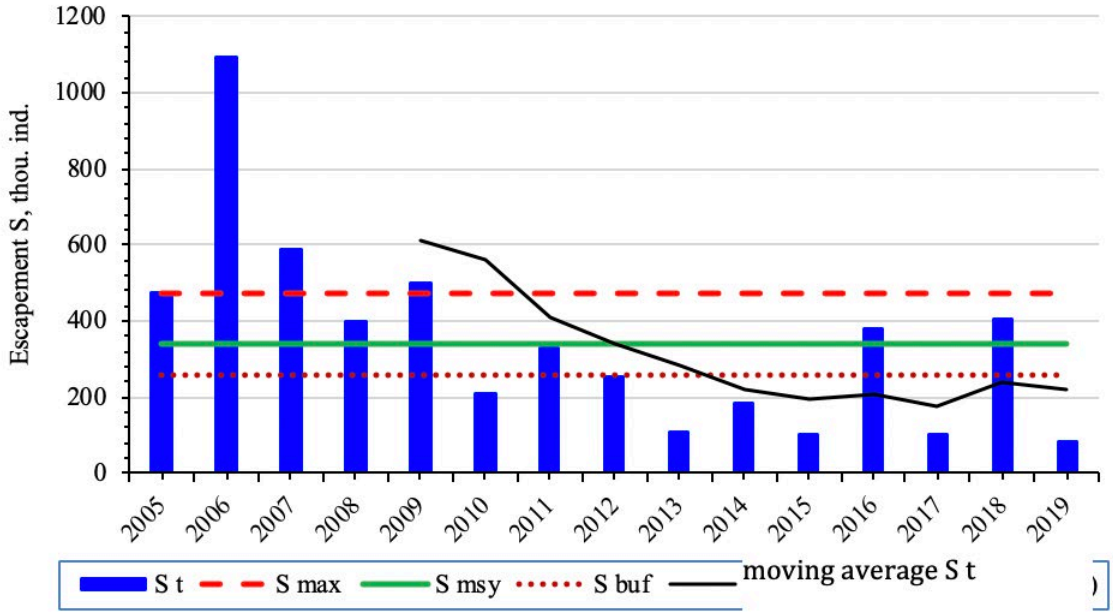


Figure 50. Dynamics of aggregated chum salmon escapements in the spawning grounds of the Western Kamchatka subzones against target reference points over the past 15 years (Bugaev et al. 2020).

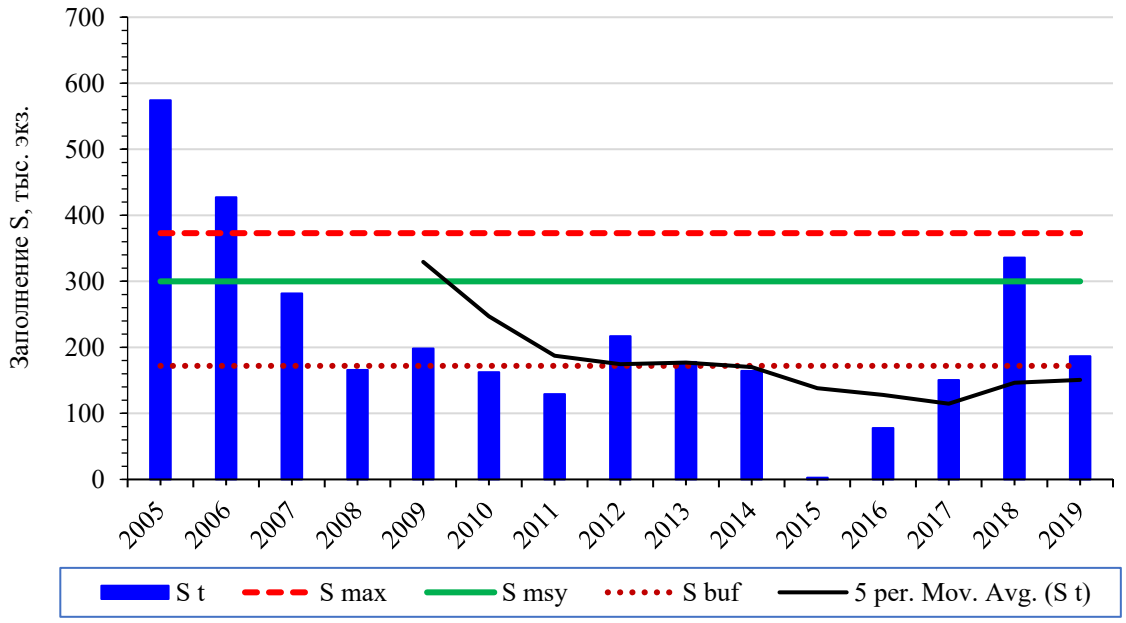


Figure 51. Dynamics of aggregated chum salmon escapements in the spawning grounds of Kamchatka-Kuril subzone against target reference points over the past 15 years (Bugaev et al. 2020).

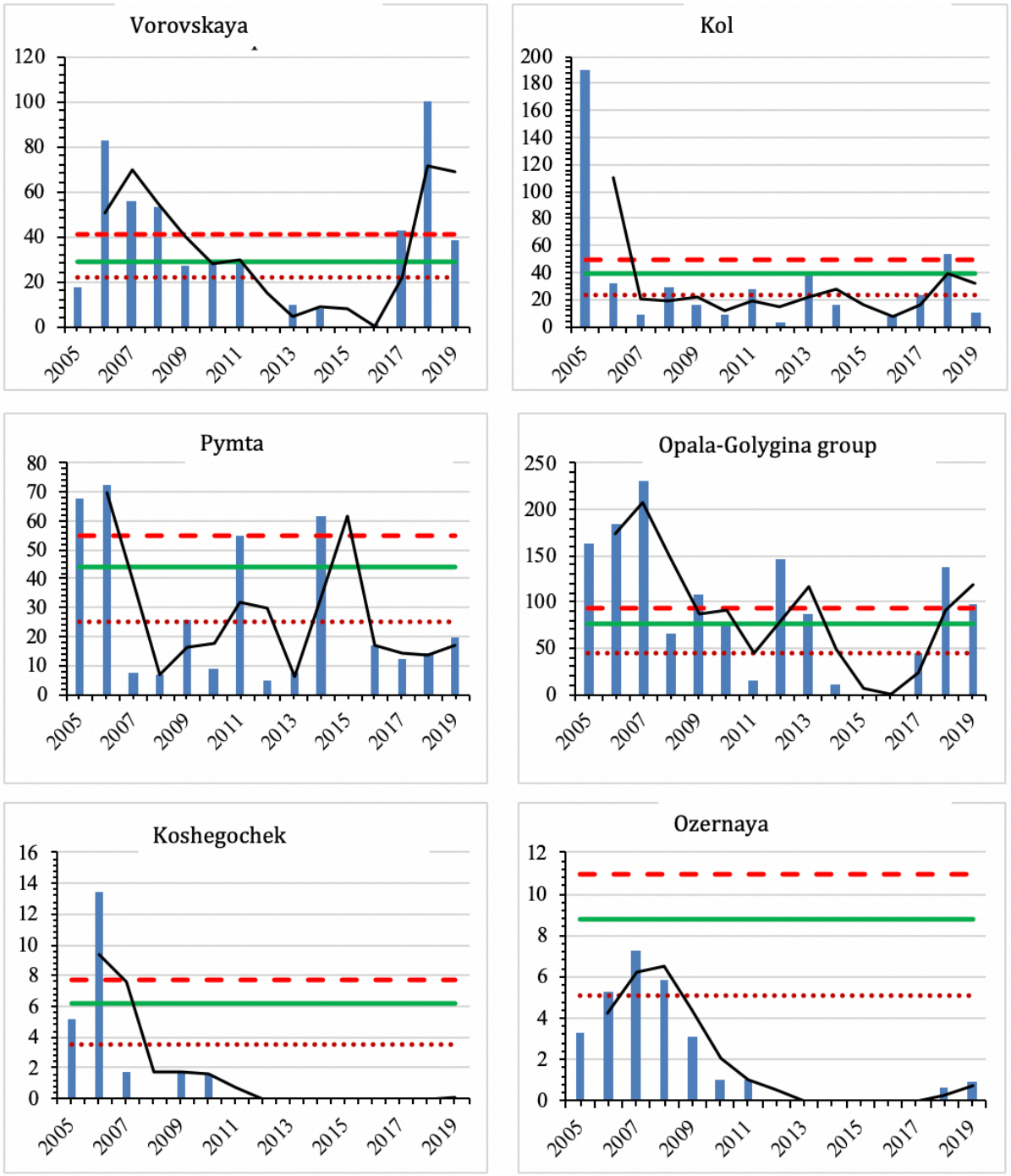


Figure 52. Dynamics of aggregated chum salmon escapements in the spawning grounds of West Kamchatka against target reference points over the past 15 years (Bugaev et al. 2020).

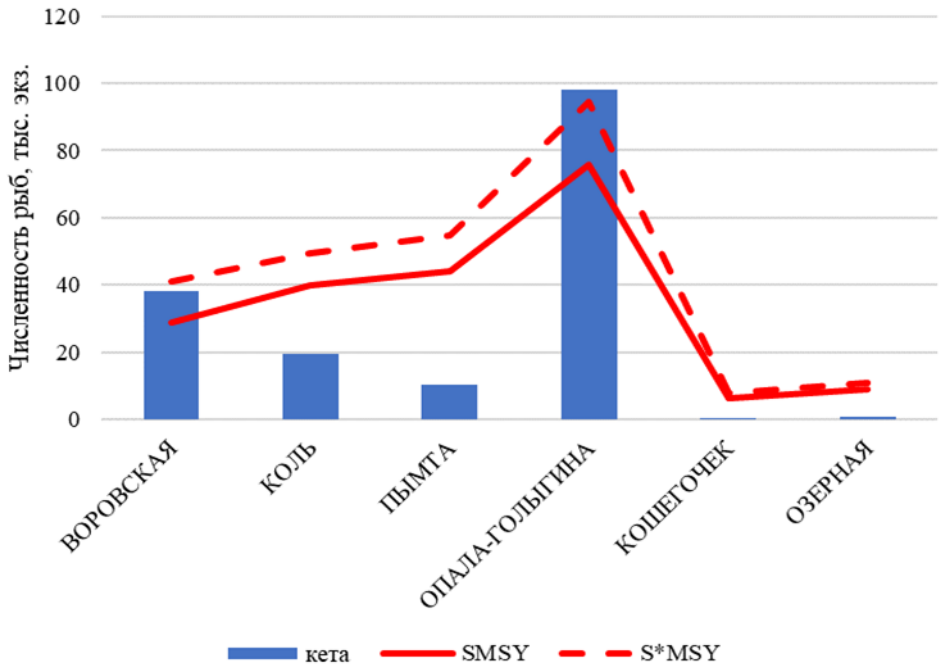


Figure 53. Escapement level of chum salmon spawners in the target rivers in 2019 and target reference points calculated for them (Bugaev et al. 2020).

Coho

Distribution

Coho salmon are generally distributed in streams and rivers throughout the subarctic and temperate north Pacific from the Sea of Okhotsk to northern California (Sandercock 1991). Distribution in Kamchatka is generally limited to the southern portion of the Peninsula where they may be found in most mid-large and large bodies of water. Significant populations occur in most rivers of southwest Kamchatka. The amount of coho salmon spawning habitat varies by river in West Kamchatka. The Vorovskaya River is one of the largest rivers and accounts for about 8% of the total spawning grounds along the western coast. The Kol, Opala and Ozernaya Rivers contribute 5.0%, 3.3% and 1.7%, respectively of the coho salmon spawning habitat in West Kamchatka (Shevlyakov et al. 2016). The greatest densities of spawners are found in groundwater upwelling areas where production potential is higher. The Ozernaya has the least amount of suitable coho spawning habitat.

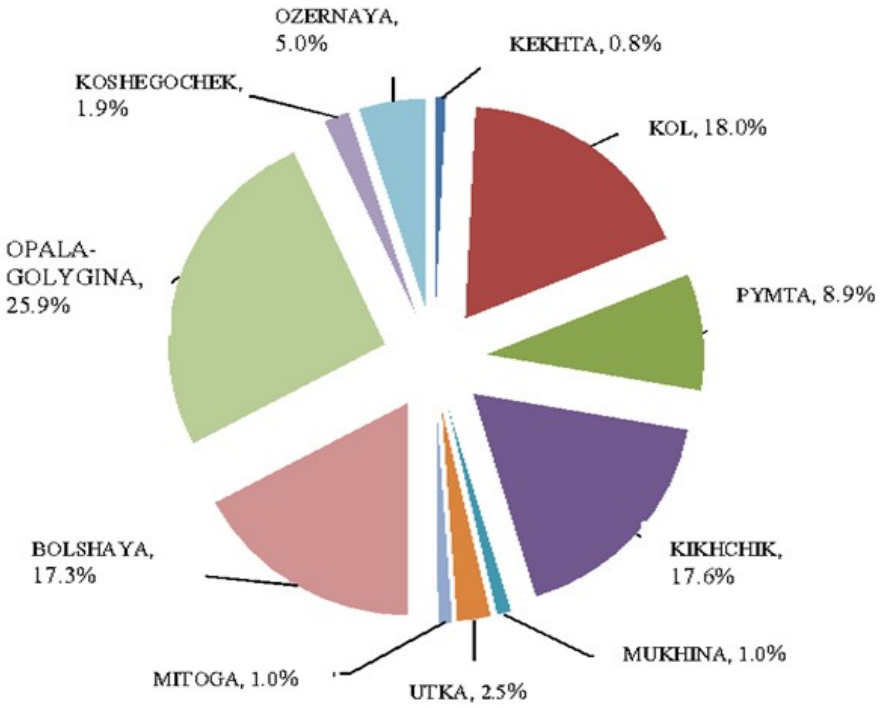


Figure 54. Coho salmon spawning distribution in southwest Kamchatka (Bugaev et al. 2019a)

Life History

Coho return over a protracted period from August to December with spawning as late as February. Spawning typically occurs in a wide range of rivers and streams, including the uppermost accessible tributaries. Low water temperatures and the presence of shallow gravel areas allow coho salmon to spawn along nearly the entire lengths of the rivers. Coho salmon prefer to spawn in areas with intra-gravel water flow and/or areas with groundwater upwelling. West Kamchatka coho average 3.0 - 3.5 kg in size but may reach 5 to 7 kg. Adults typically return to spawn at 3 to 4 years of age after 1 year at sea. Juvenile coho may rear in streams for one to three years before undergoing a physiological transformation to smolts and migrating to the sea. As with other species that have a protracted freshwater rearing period, coho salmon are characterized by a complex age structure that includes up to 8 different age-at-maturity groups. The commercial harvest is almost always comprised of age of 1.1+, 2.1+, 3.1+ fish that reared in freshwater 1 to 3 years and resided one year in the ocean. In some years, the spawning run may include a small number of fish that spent two years at sea (1.2+ 2.2+), and also a small number of “jacks” or “kaurkas” that return to freshwater the same year they out-

migrate to sea (1.0, 2.0, 3.0). On average, the dominant age class is age 2.1+ (i.e. most juveniles resided in the river for two years before out-migrating to the sea.

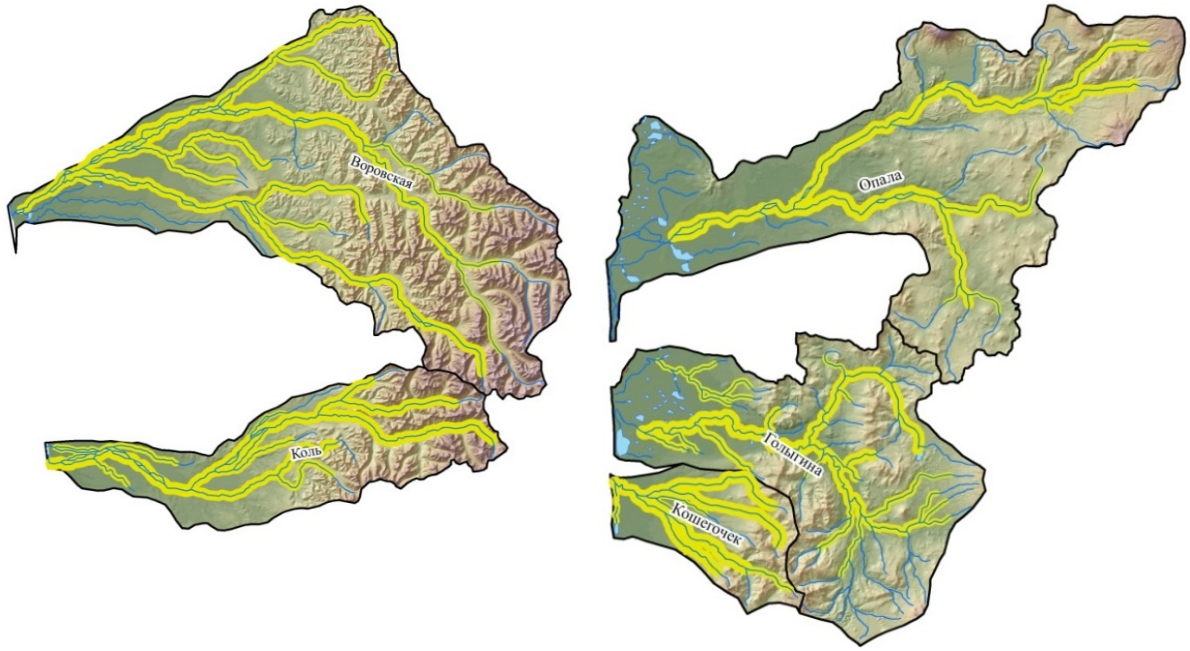


Figure 55. Spawning distribution of Coho Salmon in Vorovskaya, Kol, Opala, Golygina and Koshegochek rivers (Shevlyakov et al. 2016).

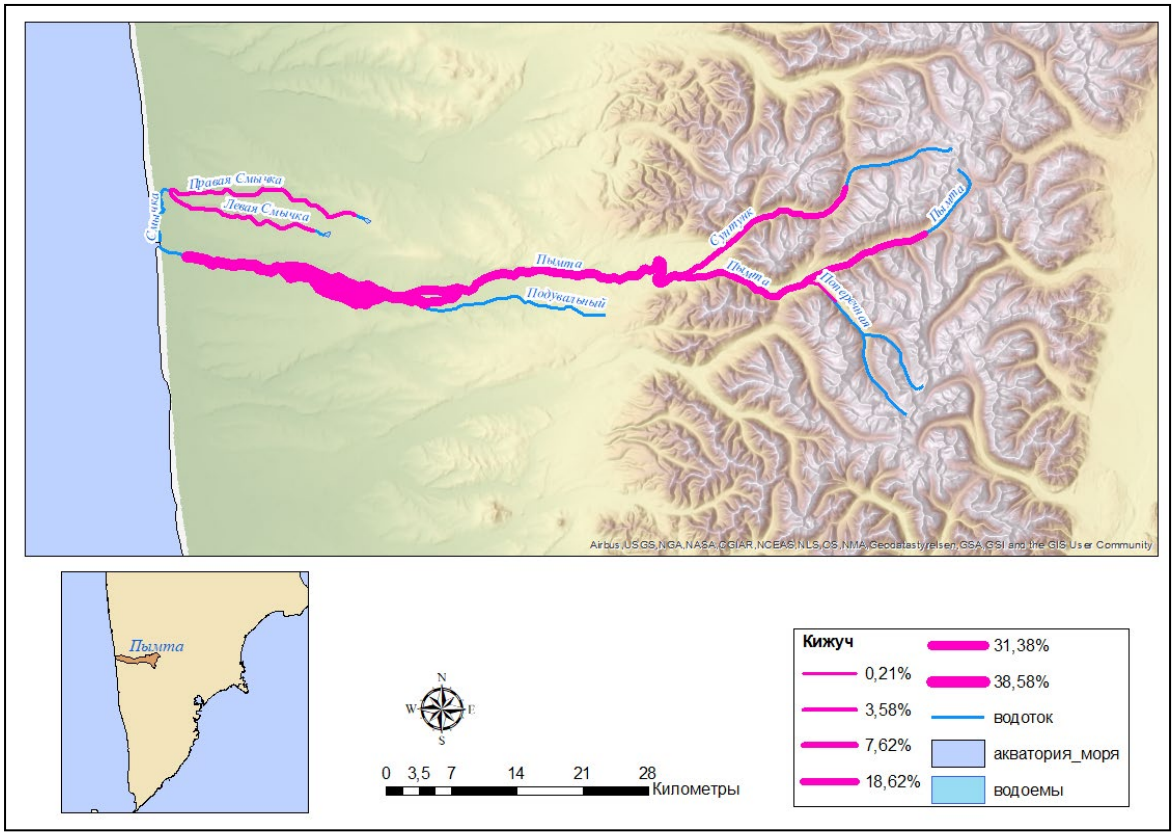


Figure 56. Distribution of spawning grounds of Coho Salmon in the Pymta River (Bugaev et al. 2019a). Thickness of the rose line reflects contribution of respective spawning grounds to the total capacity of spawning grounds.

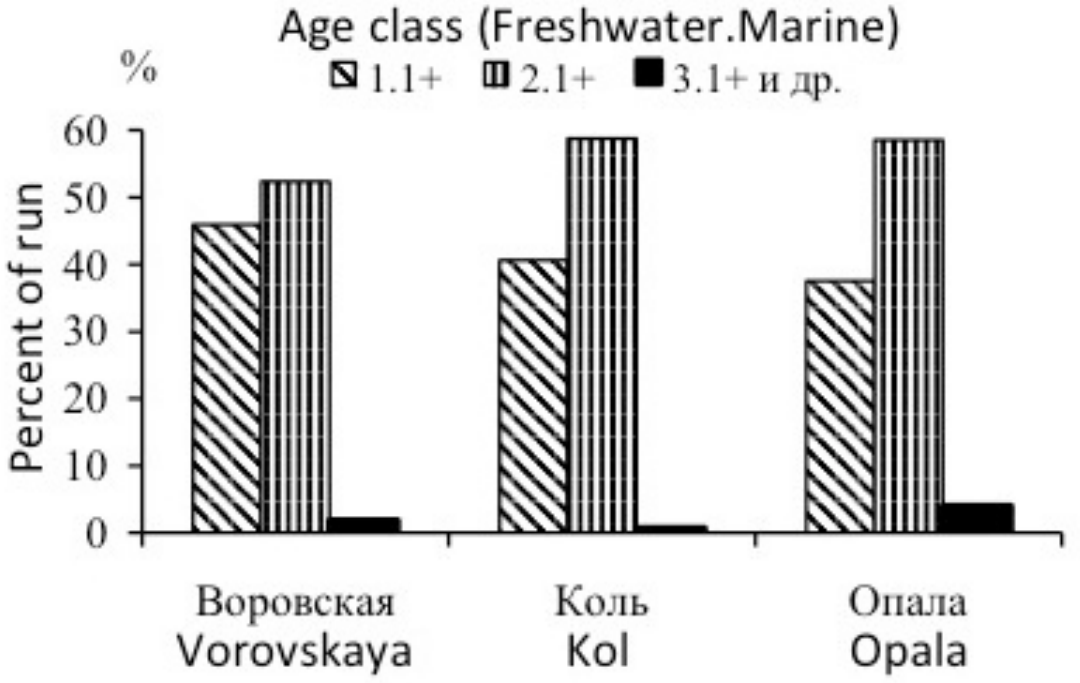


Figure 57. Coho Salmon age structure for some Western Kamchatka Rivers.

Stock Structure

Rivers with significant groundwater upwelling areas typically include two distinct runs - summer and autumn (early and late). The early run includes fish returning in August and September. The late run includes fish returning beginning in late September. In years of high coho salmon returns, competition for available spawning area forces some fish to spawn in sub-optimal habitats where the egg survival is poor.

Status

Kamchatka coho salmon stocks have been at relatively high levels since 2009 based on commercial catch information (Figure 53). At least some of the increase since 2000 may have resulted from improved catch reporting due to changes of management system. Favorable environmental conditions and a reduction in marine drift net fishery interception have also contributed the currently high levels of return.

KamchatNIRO reports that reliable fishing statistics are available since 1970 but additional data is available as far back as 1934. Coho salmon returns were heavily impacted by unregulated drift gillnet fishing in the ocean from 1950 until the 1970s. In the 1970s and 1980s, run timing of coho shifted approximately 15 days later in the rivers of the Western coast. Age composition also shifted with a decrease in the percentage of three-year-old fish (1.1+). Changes were attributed to a reduction in spawning escapement, conditions in wintering and feeding in the ocean, and poorly controlled fishing beyond the 200-mile zone. Beginning in the 1990s, run timing and age composition have returned to more normal levels. Run sizes improved from 1979-1990 with the restriction and closure of the drift fishery.

Spawning escapement of coho salmon is estimated based on expansions of aerial counts in a series of index areas (Figure 58). Aerial surveys were relatively well funded through 2009. Since that time aerial surveys have been timed to monitor the most commercially important species, pink and chum salmon due to budget constraints. Information on coho salmon has been gathered opportunistically, but aerial

surveys were typically completed by early September. Thus, the actual survey data presented reflects only the early portion of the spawning run in West Kamchatka rivers due to the protracted run timing of coho and difficulty of conducting surveys later in the year (Bugaev et al. 2019a). Most coho salmon spawn late in the season after aerial surveys have been conducted (Shevlyakov 2014) so escapements are likely under-estimated. KamchatNIRO estimates that counts include only 50 to 70% of the total number.

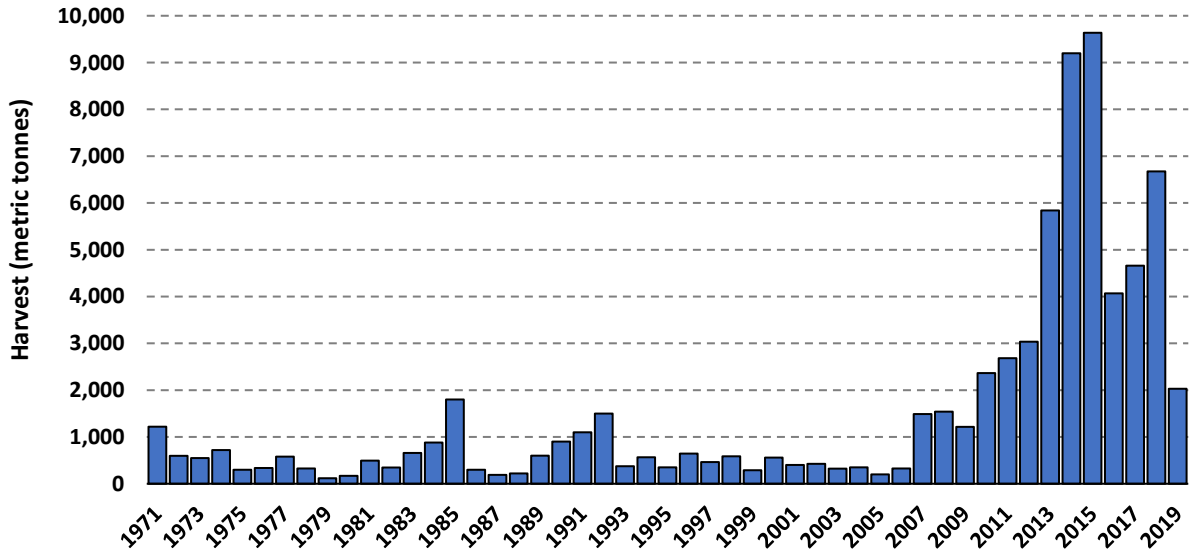


Figure 58. Total annual harvest of coho salmon in West Kamchatka (source: North Pacific Anadromous Fish Commission).

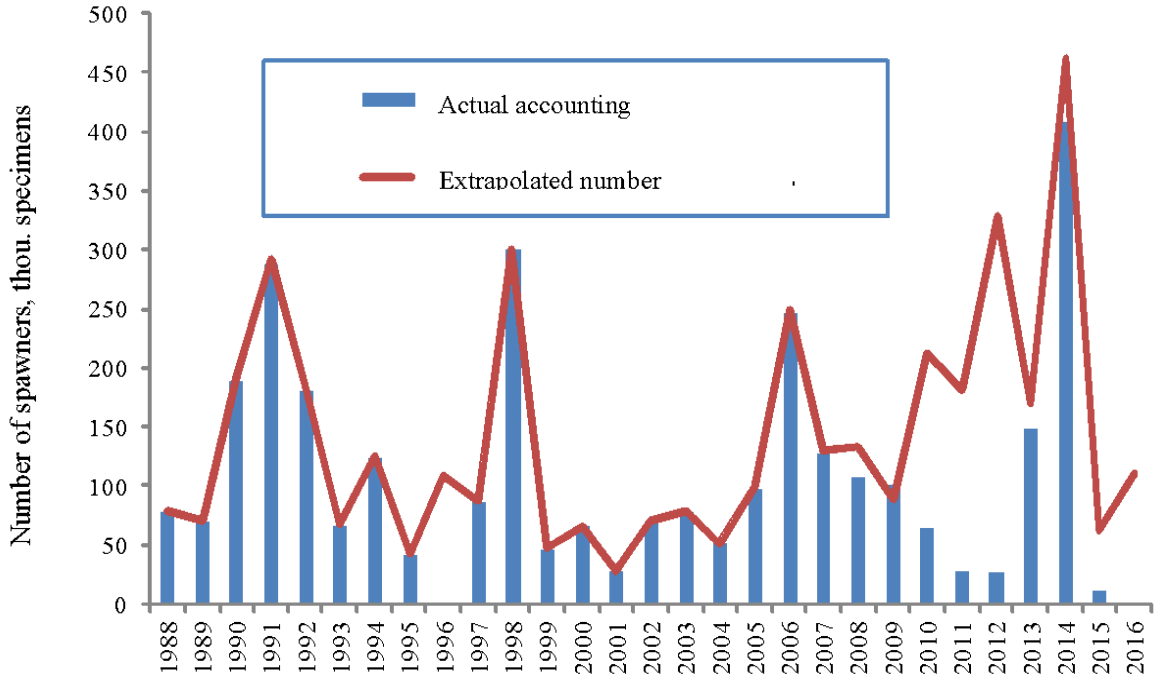


Figure 59. Actual and extrapolated number of coho salmon spawners in the West Kamchatka fishing subzone, 1988-2016. Source: Bugaev et al. 2019a.

Table 18. Recent estimates of coho salmon run size and spawning escapement (thousands).

Year	Western Kamchatka subzone	Kamchatka-Kuril subzone	Vorovskaya	Kol	Pymta	Opala- Golygina	Koshegochek	Ozernaya
2005	290	100		15	9			
2006	470	250		35	22			
2007	430	125		45	4			
2008	100	110		16	22			
2009	200	110		15	17			
2010	120	75		15	7			
2011	10	40		10	7			
2012	5	50		15	3			
2013	30	170		60	53			
2014	170	460		135	36	9.4		
2015	5	70		--	--			
2016	--	--	--	--	--	--	--	--
2017	--	20	--	--	--	--	--	--
2018		70	5	13.0	16	10.5	--	--
2019		40	8	17.5	10	1.9	--	--
Avg.	***166***	***121***	***7***	***33***	***17***	***7***		

-- indicates no data.

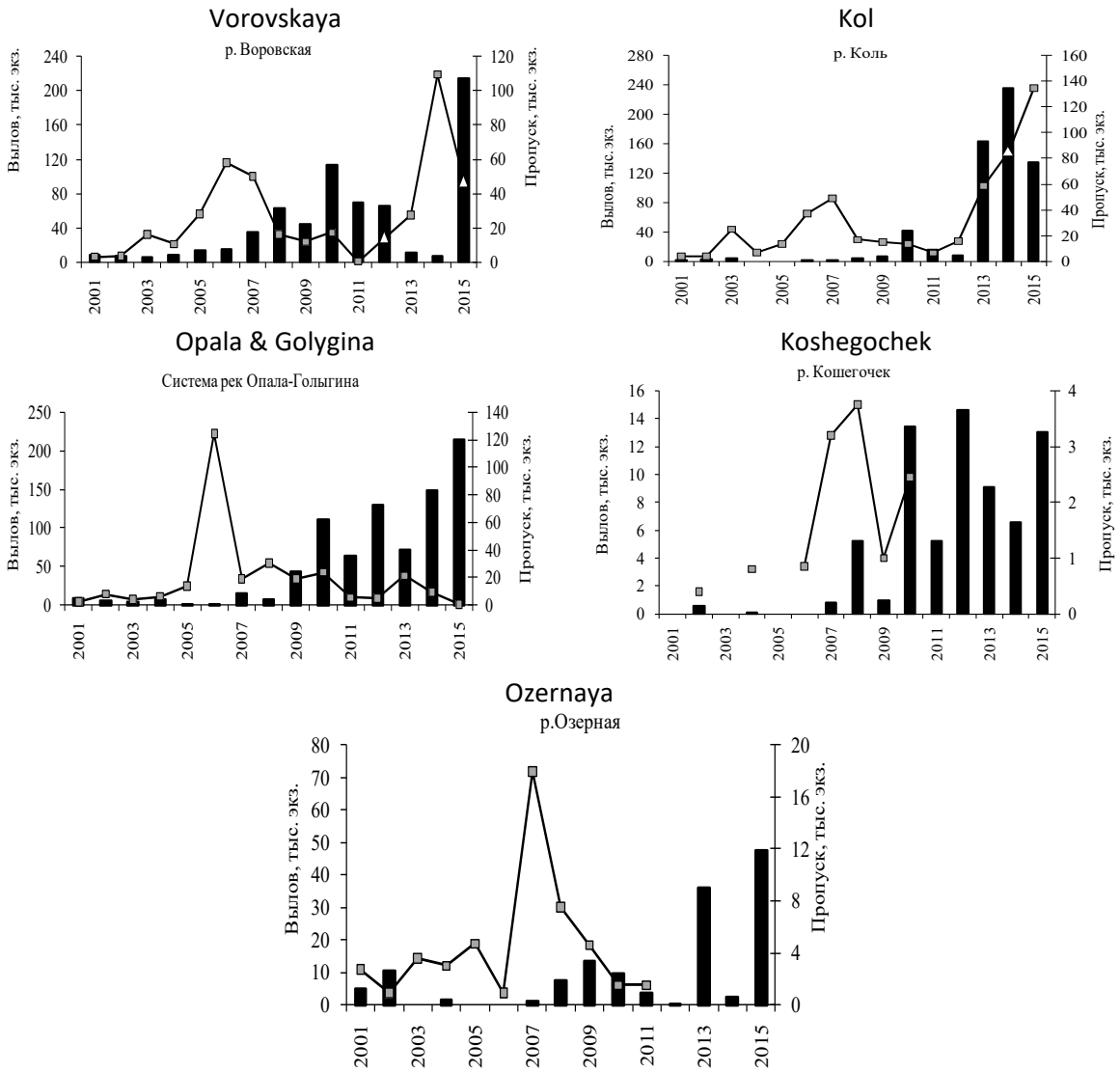


Figure 60. Annual catch (bars) and escapement (lines with square markers) of Coho Salmon (thousands) in selected western Kamchatka rivers, 2001-2013 (Shevlyakov et al. 2016).

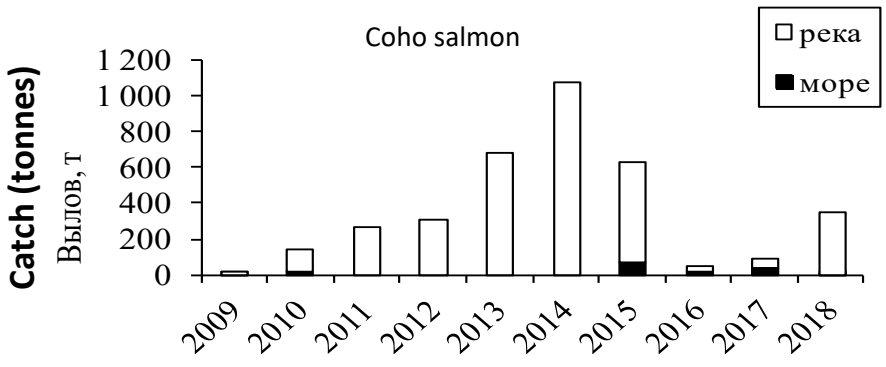


Figure 61. Pacific salmon catch dynamics by species in the Pymta river in 2009-2018 (□ River, ■ Sea).

Management

Spawning escapement targets have been estimated for southwestern Kamchatka coho salmon based on spawner-recruit data (Figure 61). KamchatNIRO extrapolated missing coho escapement data using historical relationships. Longer-term changes in climate made it possible to stratify data for periods of low and high productivity. This analysis has estimated that maximum sustained yield (MSY) is produced by spawning escapements of approximately 178-223 thousand coho salmon (Bugaev et al. 2019a). The boundary benchmark of coho salmon pass for the whole southwest is set equal to 84 thousand specimens (parameter S0).

Fisheries are regulated to ensure that significant escapements are distributed among individual rivers but each river is not managed to achieve a river-specific goal as long as the aggregate goal is being achieved. Recent work by KamchatNIRO has developed river-specific reference points based on stock-recruitment analysis. Recent average escapements generally meet or exceed a range between described by precautionary boundary (S_{buf}) and precautionary MSY (S^*_{msy}) reference points.

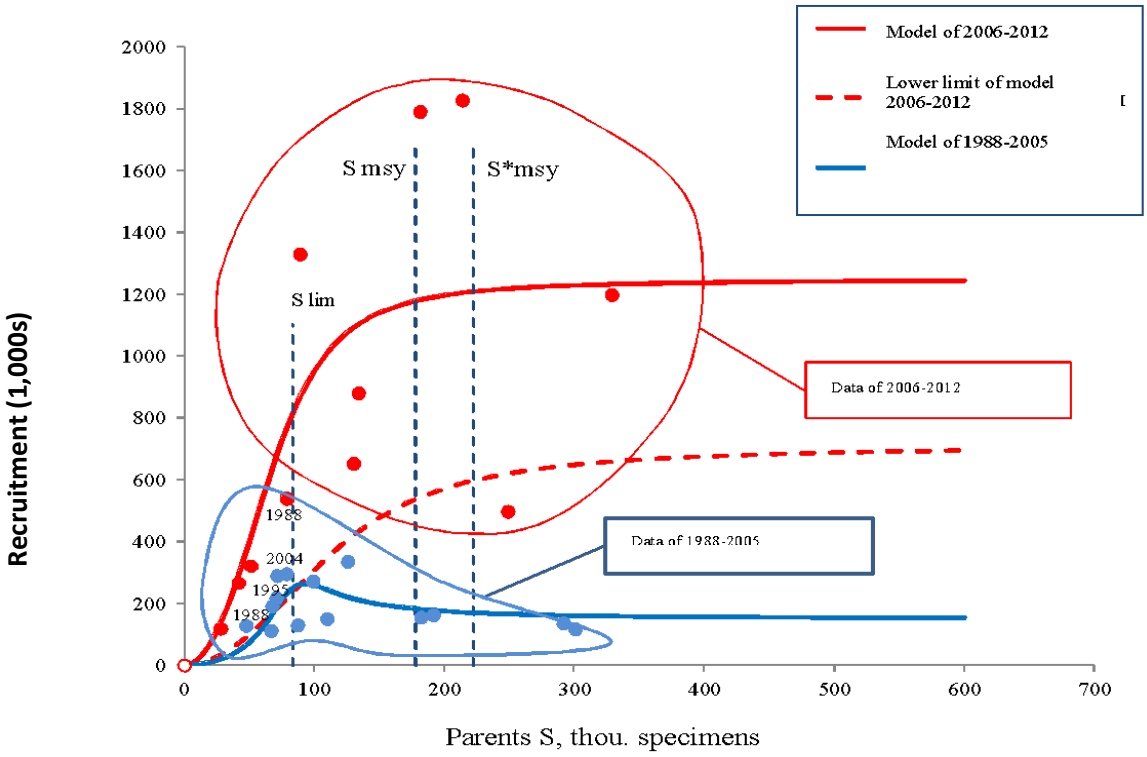


Figure 62. Spawner– Recruit analysis for West Kamchatka coho salmon. Source: Bugaev et al. 2019a.

Table 19. Escapement reference points (thousands of fish) for Coho Salmon in west Kamchatka Rivers (Shevlyakov et al. 2016; Bugaev et al. 2019a).

	S_{buf}	S_{msy}	S_{max}
Western Kamchatka subzone	130.0	178.0	223.0
Kamchatka-Kuril subzone	84	128	223
Vorovskaya	11.75	20.21	23.59
Kol	15	32	61
Pymta		15.9	
Opala & Golygina	4.24	12.99	19.92
Koshegochek	0.94	2.50	2.64
Ozernaya	0.88	1.54	2.71

Information on Coho spawning escapement in the Pymta River is limited in recent years (Figure 64). Bugaev et al. (2019) reports that due to the lack of funding, monitoring of coho typically occurs in the form of joint counts with other types of salmon (red salmon, chum) which includes only the early and, more rarely, the average return time. As a rule, aerial surveys of work on coho salmon end in the first half of September less frequently at the end of September. Thus, the presented estimate of abundance does not fully reflect the real number of spawners into the river. The lack of reliable information on Coho spawning escapement in the Pymta River precludes meeting the Principle 1 standard.

Escapement of coho salmon spawners from 2004 till 2018 averaged 17 thou. specimens, that is a little lower than the calculated target benchmarks, based on precautionary approach (S*msy) of 19.8 thou. specimens. In 2013 and 2014 the number spawning was 53 and 36 thou. specimens, respectively. During these years, they managed to carry out the most complete accounting work. Abundance of coho salmon was estimated in the first part of September, which made it possible to take into account spawners at the stage of entering the river, when fish formed dense pre-spawning accumulations in the mainstream before distribution along the river system, and at the end of September, fish were recorded in the additional system of the river. Subsequently from 2015 to 2017 aerial surveys of coho salmon were not performed. In 2018, the counting can be considered valid, but due to the extraordinary number of Pink Salmon, the start of spawning migration of coho salmon into the river was shifted to a later date. Spawning escapement was relatively weak, and by mid-October about 16 thousand spawners were observed. Carrying out aerial surveys at a later date did not make sense, because during this period, optical properties of water are noticeably reduced, making it dark against the background of a land cover of snow, which significantly impedes airborne visual work.

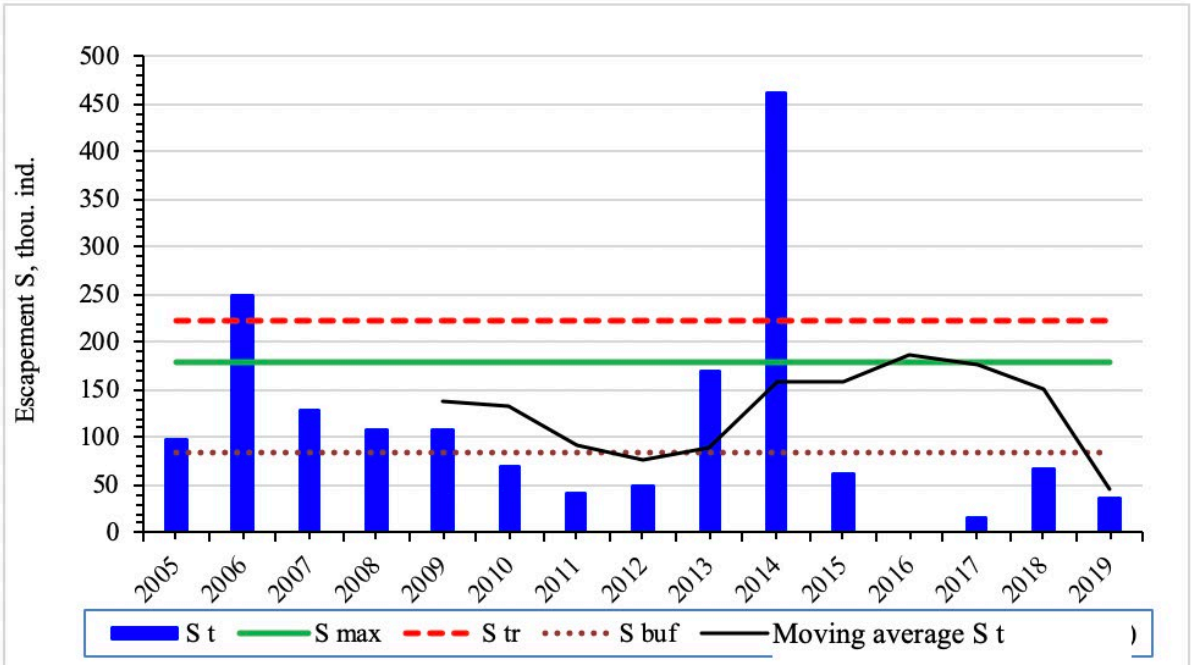


Figure 63. Dynamics of aggregated coho salmon escapements in Kamchatka Kuril subzones against target reference points over the past 15 years (Bugaev et al. 2020).

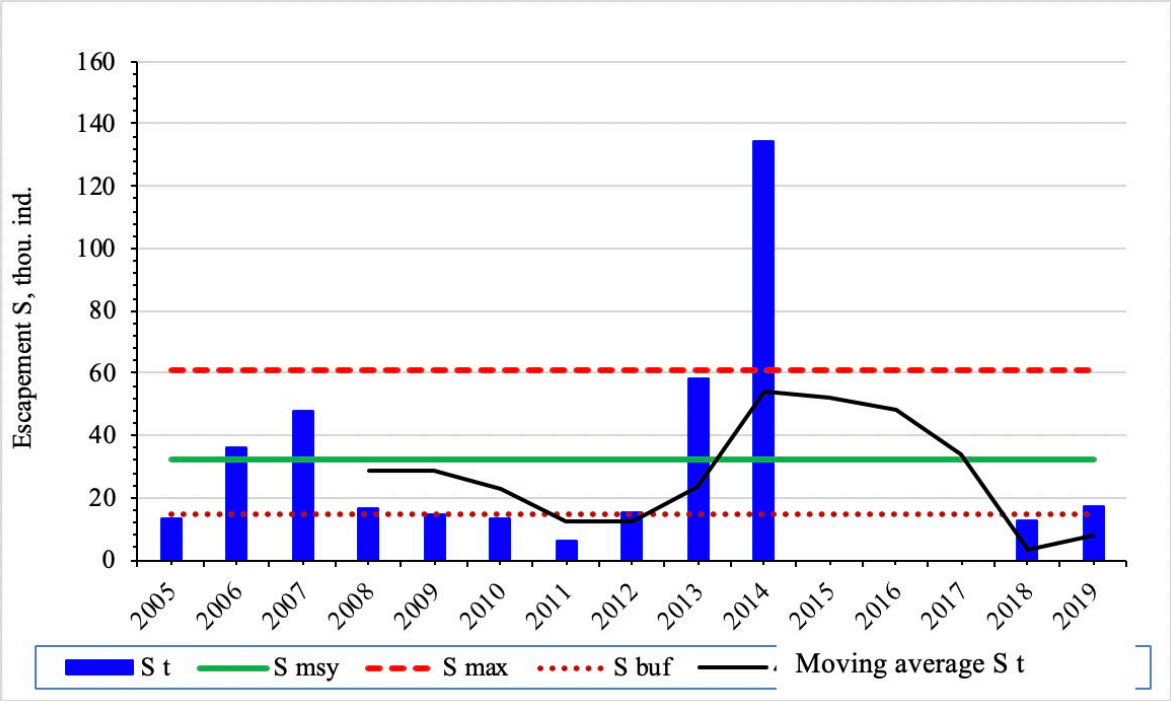


Figure 64. Dynamics of coho escapement level in spawning grounds of Kol river relative to targets reference points over the past 15 years (Bugaev et al. 2020).

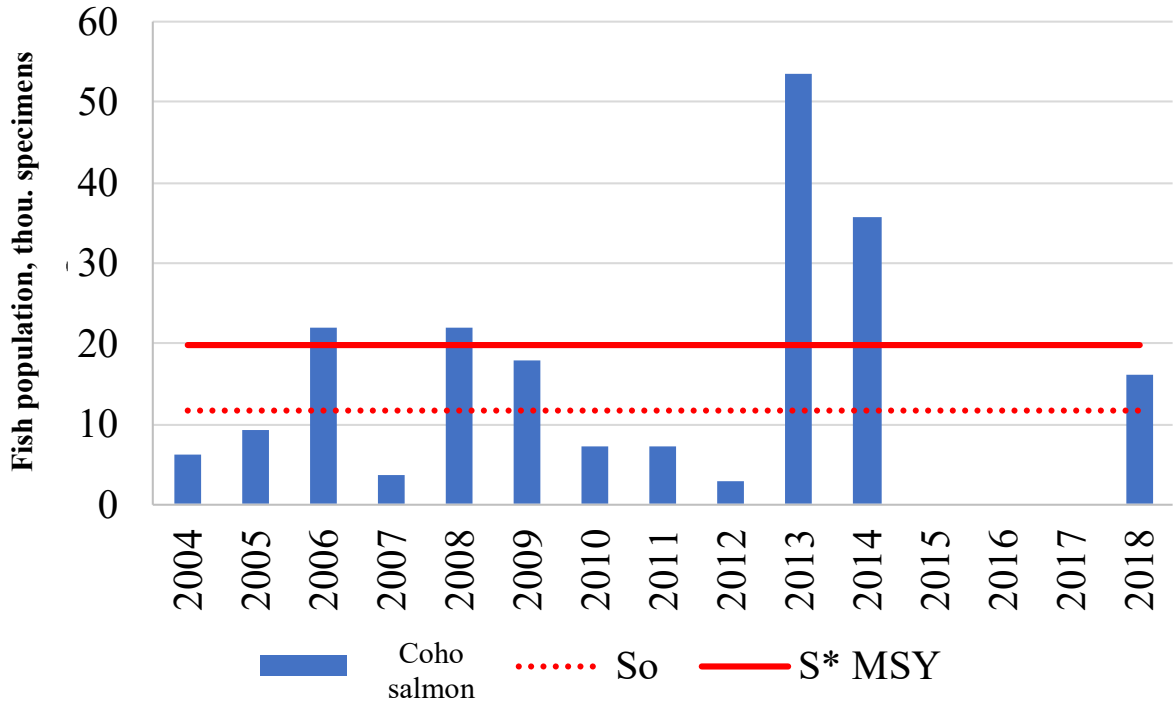


Figure 65. Spawning escapement dynamics of Coho Salmon to the Pymta river in 2004–2018 in relation to goals (Bugaev et al. 2019a).

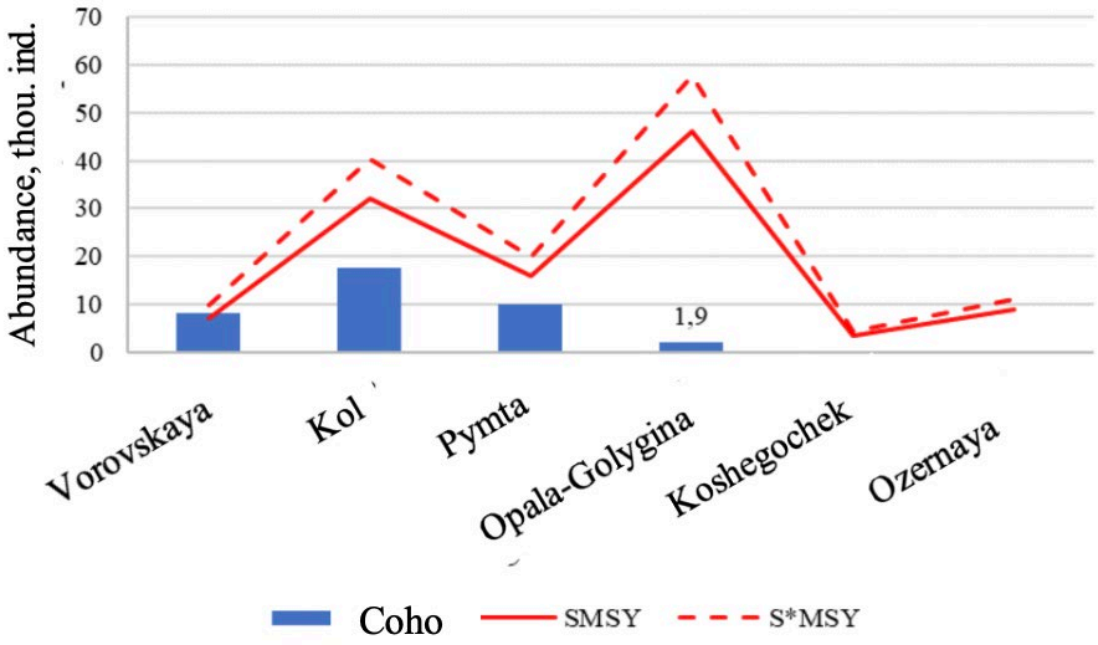


Figure 66. Escapement level of coho salmon spawners in the target rivers in 2019 and target reference points for escapement (Bugaev et al. 2020).

5.2.2 Catch

Annual salmon harvest in western Kamchatka commercial fisheries has averaged about 86,000 mt per year. Pink salmon average about 72% of the even year harvest and 22% of the odd year harvest. Chum typically comprise about 13%, sockeye about 24%, coho about 3%. pink salmon are caught primarily by sea nets in even years. During odd years, pink salmon harvest is distributed between sea and river sites. Chum salmon catch is distributed between sea and river sites. Sockeye are harvested primarily in sea nets where the harvest included substantial numbers of the large Ozernaya run which migrates south along the coast. Coho salmon are harvested mainly in the rivers.

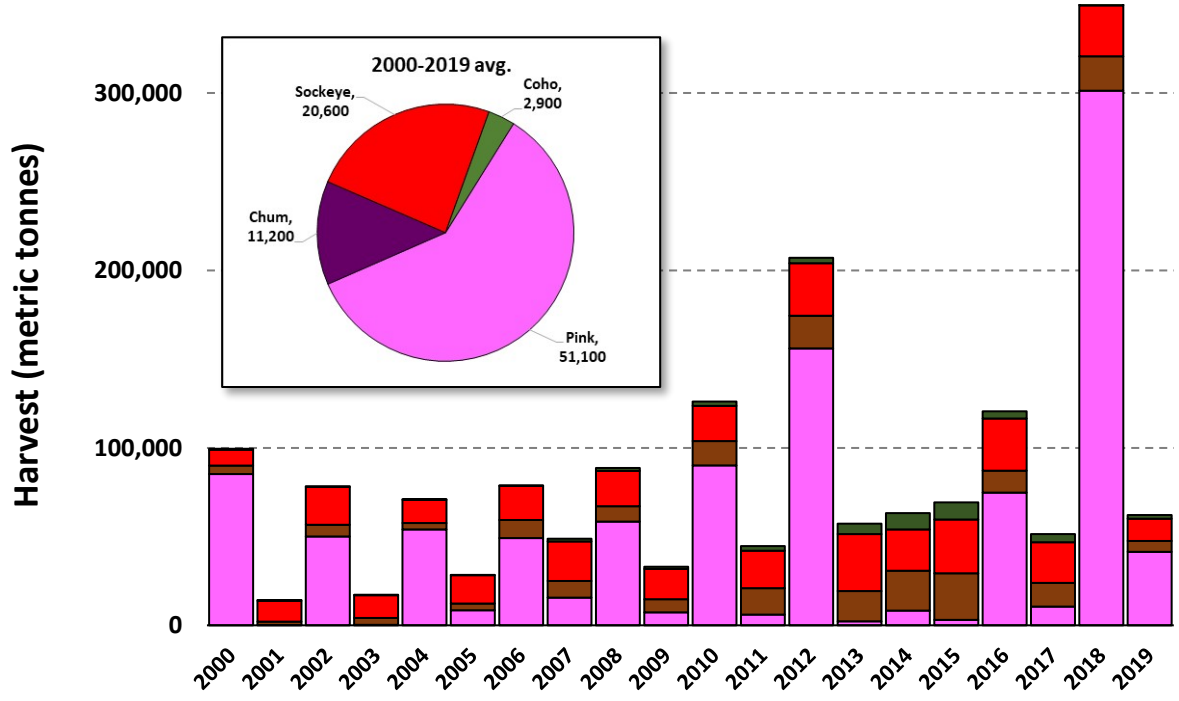


Figure 67. Total annual harvest of salmon in west Kamchatka, 2000-2019 (*North Pacific Anadromous Fish Commission*).

Table 20. Salmon and char harvest by all fishing companies in western Kamchatka (metric tonnes) (Bugaev and Zikunova 2020c).

Subzone	Species	2015	2016	2017	2018	2019
West Kamchatka	sockeye salmon	2,308	2,258	1,650	1,113	1,666
	pink salmon	1,204	37,351	4,315	123,602	25,442
	chum	13,501	6,594	5,416	8,069	11,729
	coho salmon	4,494	1,857	2,991	4,040	3,333
	char	1,445	960	719	293	1,083
Kamchatka-Kuril	sockeye salmon	28,018	27,114	21,265	27,514	29,277
	pink salmon	1,856	37,475	6,236	177,714	34,767
	chum	12,726	5,719	7,920	11,336	8,309
	coho salmon	5,143	2,210	1,669	2,633	2,622
	char	2,284	1,436	766	509	1,429
Total	sockeye salmon	30,326	29,372	22,915	28,627	30,943
	pink salmon	3,060	74,826	10,551	301,316	60,209
	chum	26,227	12,313	13,336	19,405	20,038
	coho salmon	9,637	4,067	4,660	6,673	5,955
	char	3,729	2,396	1,485	802	2,512

Table 21. Total Allowable Catch (TAC) and catch data for sockeye salmon (Kamchatka-Kuril subzone).

TAC	Year	NA[a]	Amount	--
UoA share of TAC	Year	NA[a]	Amount	--
UoA share of (UoA)	Year	2020	Amount	68%[b]
Total green weight catch by UoC	Year (most recent)	2020	Amount	4,924 mt
	Year (second most recent)	2019	Amount	10,500 mt

[a] *Not applicable: Fishery managed based on realized annual escapements rather than a prescribed total allowable catch.*

[b] *Based on West Kamchatka total reported by Bugaev and Zikunova 2020c.*

Table 22. Total Allowable Catch (TAC) and catch data for pink salmon (Kamchatka-Kuril subzone).

TAC	Year	NA[a]	Amount	--
UoA share of TAC	Year	NA[a]	Amount	--
UoA share of (UoA)	Year	2019	Amount	41%[b]
Total green weight catch by UoC	Year (most recent)	2020	Amount	47,253 mt
	Year (second most recent)	2019	Amount	24,567 mt

Table 23. Total Allowable Catch (TAC) and catch data for pink salmon (Western Kamchatka subzone).

TAC	Year	NA[a]	Amount	--
UoA share of TAC	Year	NA[a]	Amount	--
UoA share of (UoA)	Year	2019	Amount	5%[b]
Total green weight catch by UoC	Year (most recent)	2020	Amount	7,013mt
	Year (second most recent)	2019	Amount	3,224 mt

Table 24. Total Allowable Catch (TAC) and catch data for chum salmon (Kamchatka-Kuril subzone).

TAC	Year	NA[a]	Amount	--
UoA share of TAC	Year	NA[a]	Amount	--
UoA share of (UoA)	Year	2019	Amount	25%[b]
Total green weight catch by UoC	Year (most recent)	2020	Amount	4,336mt
	Year (second most recent)	2019	Amount	5,017 mt

Table 25. Total Allowable Catch (TAC) and catch data for chum salmon (Western Kamchatka subzone).

TAC	Year	NA[a]	Amount	--
UoA share of TAC	Year	NA[a]	Amount	--

UoA share of (UoA)	Year	2019	Amount	2%[b]
Total green weight catch by UoC	Year (most recent)	2020	Amount	852 mt
	Year (second most recent)	2019	Amount	348 mt

Table 266. Total Allowable Catch (TAC) and catch data for coho salmon (Kamchatka-Kuril subzone).

TAC	Year	NA[a]	Amount	--
UoA share of TAC	Year	NA[a]	Amount	--
UoA share of (UoA)	Year	2019	Amount	28%[b]
Total green weight catch by UoC	Year (most recent)	2020	Amount	1,454 mt
	Year (second most recent)	2019	Amount	1,643 mt

Table 27. Salmon and char harvest by fishing area of fishing companies included in Unit of Certification (metric tonnes).

Year	Area (River & Sea Parcels)	Pink (*горбуша*)	Chum (*кета*)	Sockeye (*нерка*)	Coho (*кижуч*)	Char (голец, Кижуч)
2010	Vorovskaya	0.0	0.0	0.0	0.0	0.0
	Kol	0.0	0.0	0.0	0.0	0.0
	Pymta	8,595.5	803.0	41.6	123.5	219.8
	Opala	2,563.8	570.7	144.3	55.0	64.7
	Golygina/Koshegochek	65.6	31.3	241.3	5.8	3.9
	Ozernaya	282.5	20.0	2,207.2	0.0	10.9
	Total	*11,507.4*	*1,425.0*	*2,634.4*	*184.3*	*299.3*
2011	Vorovskaya	374.2	1,078.4	95.3	105.6	79.0
	Kol	185.0	366.4	10.0	47.0	66.7
	Pymta	367.2	898.7	49.3	268.8	89.0
	Opala	0.0	0.0	0.0	0.0	0.0
	Golygina/Koshegochek	0.2	170.5	111.8	45.1	0.3
	Ozernaya	14.2	61.4	4,174.0	0.0	0.6
	Total	*940.8*	*2,575.4*	*4,440.5*	*466.5*	*235.5*
2012	Vorovskaya	9,247.0	843.4	21.1	86.4	38.6
	Kol	3,982.7	170.9	10.8	23.7	42.9
	Pymta	12,367.2	541.8	36.9	300.7	149.0
	Opala	6,971.0	488.7	293.4	0.0	12.4
	Golygina/Koshegochek	2,932.6	529.6	713.1	87.0	10.1
	Ozernaya	2,229.9	217.3	9,514.6	0.0	12.3
	Total	*37,730.3*	*2,791.6*	*10,590.0*	*497.8*	*265.4*
2013	Vorovskaya	15.6	234.9	10.8	21.8	36.9
	Kol	29.9	197.2	14.6	487.3	49.5
	Pymta	84.5	737.7	30.4	680.0	315.9
	Opala	35.0	466.7	33.1	0.0	76.8
	Golygina/Koshegochek	86.4	346.9	2,763.8	54.7	42.1
	Ozernaya	65.4	216.8	10,409.5	74.6	8.0
	Total	*316.7*	*2,200.4*	*13,262.2*	*1,318.4*	*529.2*
2014	Vorovskaya	113.2	507.8	31.2	4.9	86.4

	Kol	340.4	822.9	53.8	704.5	145.5
	Pymta	717.6	1,510.7	86.0	1,279.0	1,306.0
	Opala	130.2	446.2	117.0	0.0	42.9
	Golygina/Koshegochek	90.8	268.0	1,010.3	34.4	8.6
	Ozernaya	105.6	247.4	6,675.1	0.0	10.4
	Total	*1,497.7*	*3,803.0*	*7,973.3*	*2,022.9*	*1,599.9*
2015	Vorovskaya	45.4	631.6	28.0	300.1	49.3
	Kol	68.7	790.8	32.9	444.7	68.0
	Pymta	175.4	1,800.5	84.7	577.6	335.8
	Opala	38.5	374.0	135.1	7.2	1.2
	Golygina/Koshegochek	97.1	335.2	2,081.6	46.2	17.3
	Ozernaya	107.1	198.5	7,259.6	64.0	13.4
	Total	*532.2*	*4,130.6*	*9,621.9*	*1,440.0*	*484.9*
2016	Vorovskaya	3,490.8	163.0	30.5	51.3	24.9
	Kol	5,735.4	166.8	34.8	41.1	54.2
	Pymta	7,716.5	293.5	100.4	99.0	118.1
	Opala	1,040.3	263.8	301.3	5.8	0.3
	Golygina/Koshegochek	686.5	66.9	2,644.7	0.0	16.0
	Ozernaya	325.0	154.6	5,372.6	22.2	8.9
	Total	*18,994*	*1,109*	*8,484*	*219*	*222*
2017	Vorovskaya	73.5	62.2	6.7	85.9	0.0
	Kol	486.9	149.5	11.8	127.8	0.9
	Pymta	1,088.8	426.3	39.2	182.4	20.1
	Opala	86.9	389.9	247.3	4.0	0.0
	Golygina/Koshegochek	224.7	128.3	1,005.3	0.0	0.0
	Ozernaya	91.5	133.1	4,784.6	7.3	0.1
	Total	*2,052.3*	*1,289.4*	*6,094.8*	*407.4*	*21.1*
2018	Vorovskaya	22,316.6	333.3	8.2	190.7	4.8
	Kol	12,525.8	329.4	6.9	14.2	0.3
	Pymta	33,848.5	655.3	25.7	575.2	2,426.6
	Opala	5,637.6	514.0	338.9	0.0	9.7
	Golygina/Koshegochek	3,831.0	513.6	2,843.3	0.0	5.9
	Ozernaya	1,847.3	721.8	5,708.3	5.0	13.1
	Total	*80,006.8*	*3,067.3*	*8,931.2*	*785.0*	*2,460.4*
2019	Vorovskaya	3,223.8	347.8	16.7	141.6	9.8
	Kol	2,629.3	304.9	13.2	141.5	28.2
	Pymta	5,590.0	953.0	39.8	521.6	88.4
	Opala	476.3	381.5	398.0	36.0	29.6
	Golygina/Koshegochek	1,357.4	337.9	2,212.2	41.0	64.6
	Ozernaya	618.4	357.1	7,889.6	10.4	22.1
	Total	*13,895.2*	*2,682.3*	*10,569.5*	*892.1*	*242.8*
2020	Vorovskaya	7,012.9	852.0	132.0	385.9	134.1
	Kol	6,324.7	335.7	52.5	203.1	103.1
	Pymta	11,318.9	830.3	142.8	311.0	346.2
	Opala	923.2	322.4	766.8	7.6	41.9
	Golygina/Koshegochek	1,206.5	157.2	1,627.0	12.5	113.0
	Ozernaya	346.6	96.5	2,529.8	0.0	35.5
	Total	*27,132.7*	*2,594.0*	*5,250.9*	*920.0*	*773.8*

5.2.3 Principle 1 Performance Indicator scores and rationales

PI 1.1.1 – Stock status

PI 1.1.1		The stock management unit (SMU) is at a level which maintains high production and has a low probability of falling below its limit reference point (LRP)		
Scoring Issue		SG 60	SG 80	SG 100
a	Stock status			
	Guide post	It is **likely** that the SMU is above the limit reference point (LRP).	It is **highly likely** that the SMU is above the LRP.	There is a **high degree of certainty** that the SMU is above the LRP.
	Met?	1. Oz. Sockeye - Yes 2. KK Pink – Yes 3. WK Pink - Yes 4. KK Chum – Yes 5. WK Chum - Yes 6. KK Coho – Yes	1. Oz. Sockeye - Yes 2. KK Pink – No 3. WK Pink - No 4. KK Chum – Yes 5. WK Chum - No 6. KK Coho – No	1. Oz. Sockeye - Yes 2. KK Pink – No 3. WK Pink - No 4. KK Chum – No 5. WK Chum - No 6. KK Coho – No
Rationale				

SG 60 – See SG80.

SG80 –Quantitative data on long-term production trends and escapement indicate that sockeye, pink, chum and coho are currently at historically high levels of production where recruitment is not significantly impaired by the current commercial fishery. Run sizes, harvest and escapement have all increased or remained at high levels for all three species over the last decade. In part, this is related to an extended period of favorable ocean conditions for these species throughout the northern Pacific. These stocks have also benefited by improvements in fishery management structures and enforcement which appear to have substantially reduced the illegal and unreported harvest which reduced spawning escapements.

Productivity functions have been estimated and optimum spawning levels have been identified relative to the point where recruitment would be impaired. Stock assessment information indicates that spawning escapements consistent with optimum production levels are consistently achieved. KamchatNIRO reported that for the subject populations the escapement value rarely go below the limit reference point, and the range of escapement values for the most species tends to or exceeds the target reference points (Bugaev et al. 2020).

Management for optimum spawning escapement levels provides a conservative standard for protecting populations from critical low levels that impact diversity, resilience and future production. Management for these target reference points effectively provides an operational equivalent of a limit reference point in salmon management systems by effectively avoiding lower escapements to the extent that this is possible by regulating fisheries. Highly variable annual run sizes are characteristic of salmon. Thus, it is not always possible to meet optimum targets in every population and year. However, effective management for target reference points should ensure that average escapements will be maintained over the long term above the level at which there is an appreciable risk of impairing reproductive capacity. Consistent high levels of sockeye, pink and chum salmon production over the last decade confirm that the management strategy based on target reference points has effectively maintained the reproductive capacity of the aggregate stock of each species.

Freshwater habitat conditions in West Kamchatka, with few exceptions, are excellent for salmon production. Watersheds are virtually pristine and support tremendous diversity of aquatic systems including rivers, streams, lakes and wetlands which provide ideal conditions for salmon production. These conditions are conducive to high levels of salmon productivity and inherent resilience to harvest which in turn can sustain robust levels of fishery exploitation.

At the same time, fishery management intensity is scaled to the vast area of the region and the limitations of the available institutional resources for stock assessment and management. Stocks of each species are effectively managed as regional aggregates which is generally appropriate given the productivity of the habitat and the normal covariation among substocks resulting from shared freshwater and ocean productivity patterns. System-specific regulatory mechanisms are implemented based on local abundance and fishery dynamics. Potential improvements in population-specific management with population-specific escapement objectives are also being explored.

Occasional poor run years and escapements into portions of some systems are characteristic of salmon. Long term population viability and fishery sustainability for salmon is maintained under these circumstances by a diverse meta-population structure including multiple, interacting populations and subpopulations, and by only a portion of each population or brood year Cohort returning to spawn in any given year (McElhany et al. 2000).

Scoring of this PI was evaluated relative to guidance identified in SC2.2.3.1 regarding the frequency that limit reference points are met or exceeded. "Likely" is interpreted to mean ≥60% of the 15 most recent years. "Highly likely" is interpreted to mean ≥80% of the 15 most recent years. "High degree of certainty " is interpreted to mean ≥90% of the 15 most recent years.

- Ozernaya Sockeye - Spawning escapement exceeds the effective limit reference point value in 100% of the previous 15 years. Therefore, this UoA exceeds the standard for SG60, SG80, and SG100.
- Southwest Pink – Spawning escapement in the combined Kamchatka-Kuril and Western Kamchatka subzones exceeds the effective limit reference point in 100% of the dominant even year runs of the last 15 years. Therefore, this UoC meets the SG80 standard for this run component. This level of aggregation is defined by treatment of these UoCs by KamchatNIRO. Abundance varies concurrently throughout west Kamchatka and status is assessed based on the dominant even-year return.[4] The SG100 standard is not met due to limitations of information available on the subdominant cohort and specific subzones within the region.

  KamchatNIRO has previously considered stock-recruitment analysis that separated even and odd year brood cycles but it is our current understanding that separate reference points are not currently applied. This concern is qualified by observations of lower productivity in the subdominant brood cycle of pinks (see Figure 36 in assessment) and the likelihood of significant interaction affects with the dominant brood cycle. Similar patterns are observed in pink salmon across the Pacific. The cycle dominance switch around 1985 in West Kamchatka provides strong evidence for depressive effects. These depressive effects are important considerations in interpretation of pink salmon productivity patterns. Stock-recruitment analyses suggest that it is likely that the subdominant is producing maximum or near maximum sustained yields and are unlikely to benefit from increased escapement. However, clarification is needed on the status of the subdominant return relative to the limit reference

[4] KamchatNIRO analyses indicate that returns are not strongly-related to abundance in the subdominant (odd-year) brood cycle. Commercial fishing effort is also substantially lower in the less-profitable odd year brood cycle which places on added measure of protection of spawning escapements for this component of the run. Therefore, the assessment team is confident that the fishery does not result in recruitment overfishing of the odd year return.

point. Thus, the SG80 standard is not met for the subdominant (even-year) brood cycle of pink salmon.

- West Kamchatka Pink - Spawning escapement in the combined Kamchatka-Kuril and Western Kamchatka subzones exceeds the effective limit reference point in 100% of the dominant even year runs of the last 15 years. Therefore, this UoC meets the SG80 standard for this run component. This level of aggregation is defined by treatment of these UoCs by KamchatNIRO. Abundance varies concurrently throughout west Kamchatka and status is assessed based on the dominant even-year return. The SG100 standard is not met due to limitations of information available on the subdominant cohort and specific subzones within the region.

  KamchatNIRO has previously considered stock-recruitment analysis that separated even and odd year brood cycles but it is our current understanding that separate reference points are not currently applied. This concern is qualified by observations of lower productivity in the subdominant brood cycle of pinks (see Figure 36 in assessment) and the likelihood of significant interaction affects with the dominant brood cycle. Similar patterns are observed in pink salmon across the Pacific. The cycle dominance switch around 1985 in West Kamchatka provides strong evidence for depressive effects. These depressive effects are important considerations in interpretation of pink salmon productivity patterns. Stock-recruitment analyses suggest that it is likely that the subdominant is producing maximum or near maximum sustained yields and are unlikely to benefit from increased escapement. However, clarification is needed on the status of the subdominant return relative to the limit reference point. Thus, the SG80 standard is not met for the subdominant (even-year) brood cycle of pink salmon.

- Kamchatka-Kuril Chum - Aggregate spawning escapement in the Kamchatka-Kuril management subzone exceeds the effective limit reference point value in 87% of the previous 15 years. Therefore, this UoA meets the SG80 standard (≥80%) but not the SG100 standard (≥90%).
- West Kamchatka Chum - Aggregate spawning escapement in the west Kamchatka management subzone exceeds the effective limit reference point value in 73% of the previous 15 years. Therefore, this UoA meets the SG60 standard (≥60%) but not the SG80 standard (≥80%).
- Southwest Coho – Aggregate spawning escapement in the Kamchatka-Kuril management subzone exceeds the effective limit reference point value in 79% of the previous 15 years where escapement was estimated (n=14). Therefore, this UoA meets the SG60 standard (≥80%) but not the SG80 standard (≥80%). (Note that West Kamchatka coho do not meet this standard due to limitations in stock assessment during the last 10 years.)

SG100 – This standard is met for Ozernaya sockeye where annual stock assessments demonstrate that the stock is fluctuating around a target reference point which is substantially above a point of reproductive impairment. Current stock-recruitment data demonstrate that escapements of 1 million sockeye or greater consistently produce high levels of recruitment. The fishery is managed for escapement goals in order to avoid recruitment overfishing due to low escapements and density-related reductions in freshwater productivity due to exceeding spawning or rearing habitat capacities. These goals have been met or exceeded since 1999.

A high degree of certainty is precluded for pink, chum and coho in the UoCs because specific limit reference points have not been incorporated into management practice and not every population is fished at optimum levels in every year. For pink salmon, information is also limited on the subdominant odd-year return and subzones within the region. A complex mixed species and stock fishery results from substantial overlap in run timing of salmon species, interannual variation in run

sizes of different species, different fishing capacity and intensity in different systems, and a higher incidence of illegal, unaccounted, non-industrial fishing in some areas. The management system has developed a methodology for identifying precautionary limit reference points at a population scale for the UoA and it is expected that the applicability and utility of these reference points will be further evaluated in coming years.

	Stock status in relation to target reference point (TRP, e.g., target escapement goal or target harvest rate)			
b	Guide post		The SMU is at or fluctuating around its TRP.	There is **a high degree of certainty** that the SMU has been fluctuating around its TRP, or has been above its target reference point over recent years.
	Met?		1. Oz. Sockeye - Yes 2. KK Pink – Yes 3. WK Pink - Yes 4. KK Chum – Yes 5. WK Chum - Yes 6. KK Coho – Yes	1. Oz. Sockeye - Yes 2. KK Pink – No 3. WK Pink - No 4. KK Chum – No 5. WK Chum - No 6. KK Coho – No
Rationale				

SG80 - Annual stock assessments clearly demonstrate that Ozernaya sockeye are fluctuating around its target reference point. Under the current management system which was adopted in 2008, quantitative stock assessments of UoC pink, chum and coho salmon indicate that aggregate stocks in the Unit of Assessment are generally fluctuating in the past decade around spawning escapements that were historically demonstrated to produce high sustained yields in conventional spawner stock recruitment analyses. Species are generally fished at levels consistent with high yields (and low probability of recruitment overfishing).

Scoring of this PI was evaluated relative to guidance identified in SC2.2.3.2 regarding stock status in relation to target reference points. "Fluctuating around" at the SG80 level means an SMU meeting its target reference point in ≥50% of the most recent years. A "high degree of certainty" at the SG100 level shall be interpreted to mean that the SMU has met its target reference point ≥80% of the last 15 years. Target reference points are defined by a goal range based on escapements that produce MSY (S_{msy}) identified in this management system as S_{buf} - S^*_{msy}.

- Ozernaya Sockeye - Spawning escapement exceeds the minimum MSY-based escapement goal range in 100% of the previous 15 years. Escapements exceeded the MSY level in 14 of 15 years. Therefore, this UoA exceeds the standard for SG80 and SG100.
- Southwest Pink – Spawning escapement in the combined Kamchatka-Kuril and Western Kamchatka subzones exceeds the minimum MSY-based escapement goal (Sbuf) in 100% of the dominant even year runs of the last 15 years. Average escapement for all years (23 million) exceeds the estimate of spawners at MSY (17 million). Therefore, this UoC meets the SG80 standard for this run component. This level of aggregation is defined by treatment of these UoCs by KamchatNIRO. Abundance varies concurrently throughout west Kamchatka and status is assessed based on the dominant even-year return. The SG100 standard is not met due to limitations of information available on the subdominant cohort and specific subzones within the region.
- West Kamchatka Pink - Spawning escapement in the combined Kamchatka-Kuril and Western Kamchatka subzones exceeds the minimum MSY-based escapement goal (Sbuf) in 100% of

the dominant even year runs of the last 15 years. Average escapement for all years (23 million) exceeds the estimate of spawners at MSY (17 million). Therefore, this UoC meets the SG80 standard for this run component. This level of aggregation is defined by treatment of these UoCs by KamchatNIRO. Abundance varies concurrently throughout west Kamchatka and status is assessed based on the dominant even-year return. The SG100 standard is not met due to limitations of information available on the subdominant cohort and specific subzones within the region.

- Kamchatka-Kuril Chum - Spawning escapement exceeds the minimum MSY-based goal (Sbuf) for the aggregate stocks in 53% of the previous 15 years. Therefore, this UoA meets the standard for SG80 but does not meet the SG100 standard.
- West Kamchatka Chum - Spawning escapement exceeds the minimum MSY-based goal (Sbuf) for the aggregate stocks in 53% of the previous 15 years. Average escapement (336,000) is similar to the estimate of spawners at MSY (338,000). Therefore, this UoA meets the standard for SG80 but does not meet the SG100 standard.
- Southwest Coho – Spawning escapement exceeds the minimum MSY-based goal (Sbuf) for the aggregate stock in 50% of the previous 15 years. Average escapement (121,000) is similar to the estimate of spawners at MSY (128,000). Therefore, this UoA meets the standard for SG80 but does not meet the SG100 standard. Minimum target goal ranges are achieved in 83% and 50% for the Kol and Pymta populations respectively. (Note that West Kamchatka coho do not meet this standard due to limitations in stock assessment during the last 10 years.)

Salmon fishery management and stock assessment continues to evolve in Kamchatka with an increasing attention on the potential of subarea-specific management and stock assessment. The historical practice has been to manage for loosely-defined escapement objectives for indicator areas shown in historical assessment to be generally representative of regional stocks (measured as number of spawners per square meter). This approach was demonstrated to be effective in part due to the precautionary management approach of gear limitations and in some cases, established passing days. Fishing effort was scaled by practice over a period of time to sustain high levels of production on average.

Salmon escapement goals are managed based on production functions defined by stock-recruitment curves relating spawner numbers with adults produced in the next generation of return. Escapements greater than the habitat capacity will reduce productivity due to density-dependent regulating factors involving competition for limited space and food. Escapements substantially less than capacity reduce fishery yields. Maximum sustainable yield typically occurs somewhere between 50% and 100% of the habitat capacity where capacity is defined based on the point of maximum production in the stock recruitment curve (Ricker 1975). Stock-recruitment curves are utilized to derive escapement objectives for West Kamchatka salmon consistent with a biomass that produces high levels of sustained yields and high rates of replacement in the historical dataset. Spawning escapements were historically assessed each year relative the target values and in-season management is used to regulate fishing intensity in order to achieve spawning objectives.

Over the last decade, the federal fishery scientific agency (KamchatNIRO) has been refining the scientific basis for salmon management by developing productivity functions for pink and chum stocks and populations throughout Kamchatka. Production functions were generally based on regional aggregates by species. Spawning escapement goals were then derived for specific river systems by apportioning aggregate values based on the relative sizes of the respective populations in each system. With this work, KamchatNIRO has been formalizing estimation and application of quantitative reference points including optimum spawning levels and points of potential reproductive impairment. This information is currently being tested by the management systems but has not yet been fully incorporated, in part due to limitations in annual stock assessments which are addressed in PI 1.2.4. (Due to past reductions in aerial survey effort, data on spawning escapements in some rivers is lacking

in some years and corresponding escapement are reported as low values by KamchatNIRO). This assessment reports results of recent estimates of spawning escapement relative to preliminary reference points identified by KamchatNIRO but these results are not the primary basis for scoring of the PI which places more emphasis on long turn abundance and harvest trends under current fishing intensity. However, KamchatNIRO reports that spawning escapements consistent with optimum production levels are regularly achieved and the range of escapement values for the most species tends to or exceeds the target reference points (Shevlyakov et al. 2016; Bugaev et al. 2019a).

Consistent high levels of UoC pink, chum and coho salmon production over the last decade confirm that the management strategy based on target reference points has effectively maintained the reproductive capacity of the aggregate stock of each species. Fishing effort and strategies have been scaled based on historical information to ensure adequate spawning escapement during most years in most areas. Fishing effort may be scaled somewhat in-season based on annual stock assessments but the fishery is not intensively managed at a fine scale in order to maximize harvest in any given year. Given the demonstrated success of this approach it is not necessary to quantify river-specific escapement of every stock in every year.

SG 100 – The standard is met for Ozernaya sockeye where rigorous stock assessments provide a high degree of certainty that the stock is fluctuating around its TRP which is well above a point of reproductive impairment. Target reference points are clearly defined as escapement goals based on weir counts. Escapements consistently meet or exceed goals. Annual escapement is estimated with a high degree of certainty with the counting weir. This method of stock assessment is extremely effective in the Ozernaya system because of the mediating effect of the large lake on streamflow in the Ozernaya River. The lake dampens the effect of daily and seasonal flow patterns which can limit the effectiveness of weirs for counting fish. The clear waters of the system also make visual counting methods effective. Use of the same location and counting methods at the weir over a long period of time also provides a consistent basis for escapement estimation.

The target reference point for Ozernaya sockeye, defined as an escapement goal range, is specifically designed to produce maximum sustained yield based on the spawner stock-recruitment function. The stock-recruitment analysis uses historical data on run size and age composition to reconstruct brood tables showing the total number of adult progeny produced by a given spawning escapement. MSY escapement levels are identified based on statistical fits of standard nonlinear functions to the available data. The shape of the stock-recruitment, and corresponding estimates of escapements that produce MSY, are related to the biological characteristics of the stock, productivity and capacity of the available spawning and rearing habitat, and survival rates related to conditions during migration and marine portions of the life cycle. Habitat and marine conditions vary from year to year but also vary in broad patterns extending over a decade or more. Therefore, production functions and escapement goals are periodically reviewed and revised as new data becomes available. This has been the case for Ozernaya sockeye and current goals reflect conditions prevalent for 1995-2009 brood years. Current goals appear to be generally consistent with MSY escapement levels under current conditions based on the available data.

The SG 100 standard is not achieved for UoC pink, chum and coho salmon because of uncertainty regarding stock status relative to TRPs due to the aggregate nature of the stock assessment to derive goals, reductions in annual assessments of spawning escapement due to recent funding constraints and differences in fishing intensity in different systems. However, objective values may not be met in every system and every year. It is unclear whether objectives maximize sustained yield.

c Status of component populations

	Guide post		.	The **majority** of component populations in the SMU are within the range of expected variability.
	Met?			1. Oz. Sockeye - Yes 2. KK Pink – No 3. WK Pink - No 4. KK Chum – No 5. WK Chum - No 6. KK Coho – No
Rationale				

The standard is met for Ozernaya sockeye. Discrete populations of Sockeye have not been identified in the Ozernaya system but extensive research and monitoring has demonstrated that this stock is extremely diverse, consisting a variety of subcomponents returning at different times and spawning in different areas and conditions. Early and late stock components are recognized by the management system and there may even be finer distinctions within those, particularly in the late component which comprises the majority of the run (e.g., lake vs. river spawners). Escapement goals have been established for the aggregate run and it is not practical to establish and monitor separate goals for different subcomponents given overlap and annual variability in run timing. However, the importance of protecting all run components is recognized by the management system and current practices are designed to avoid overfishing any specific run component. Guidelines are established and followed for the proportion of the escapements that should be achieved at different points in the run. Progress toward meeting daily and annual targets is monitored and regulated in season based on daily harvest and escapement information. The leading and ending portions of the run are not subject to fishing which also ensures conservation of fish at the ends of the spectrum of diversity. Intensive management to avoid large escapements also protects some early run components from being over-spawned by later run components. Passing days are established periodically throughout the run to provide escapement windows for various run components. Escapement estimates throughout the duration of the sockeye run indicate that the subpopulations of the Ozernaya sockeye stock are within the range of expected variability.

The standard is not met for UoC pink, chum and coho salmon. While the majority of the component populations are within the range of expected variability under the aggregate stock assessment approach, it cannot be concluded that target reference points provide a standard sufficient to meet the 100-scoring guidepost without explicit consideration of stock and system-specific escapement goals derived independently for each system. The management system has developed a methodology for identifying precautionary target reference points at a population scale for the UoA and it is expected that the applicability and utility of these reference points will be further evaluated in coming years.

References

See Section 5.2.1 Principle Species Background. Antonov et al. 2007, Bugaev 1991, 1995, 2011; Bugaev et al. 2001, 2009, 2019, 2020a, 2020b; Dubynin et al. 2007

Stock status relative to reference points

	Type of reference point	Value of reference point	Current stock status relative to reference point
Reference point used in scoring	S_{lim}: Oz. Sockeye	375,000	100% exceedance
	S_{lim}: KK Pink (even year)	4,500,000	100% exceedance
	S_{lim}: WK Pink (even year)	4,500,000	100% exceedance

stock relative to PRI (SIa)	S_{lim}: KK Chum	86,000	87% exceedance
	S_{lim}: WK Chum	128,000	73% exceedance
	S_{lim}: KK Coho	42,000	79% exceedance
Reference point used in scoring stock relative to MSY (SIb)	S_{buf} - S^*_{msy}: Oz. Sockeye	750,000 - 1,900,000	≥ minimum in 100% of years
	S_{buf} - S^*_{msy}: KK Pink	9-13 million[a]	≥ minimum in 100% of years
	S_{buf} - S^*_{msy}: WK Pink	9-13 million[a]	≥ minimum in 100% of years
	S_{buf} - S^*_{msy}: KK Chum	172,000 - 373,000	≥ minimum in 53% of years
	S_{buf} - S^*_{msy}: WK Chum	255,000 - 471,000	≥ minimum in 53% of years
	S_{buf} - S^*_{msy}: KK Coho	84,000-223,000	≥ minimum in 50% of years

[a] *combined Kamchatka-Kuril and Western Kamchatka subzones.*

Draft scoring range and information gap indicator added at Announcement Comment Draft Report

Draft scoring range	All species ≥80
Information gap indicator	Need annual escapement information, pink, chum, coho

Overall Performance Indicator scores added from Client and Peer Review Draft Report

Overall Performance Indicator score	1. Oz. Sockeye - 100 2. KK Pink – 70 3. WK Pink - 70 4. KK Chum – 80 5. WK Chum - 70 6. KK Coho – 70
Condition number (if relevant)	1

Condition 1. Demonstrate that it is highly likely that escapements of Kamchatka-Kuril pink (odd-year), West Kamchatka pink (odd-year), West Kamchatka chum and Kamchatka-Kuril coho SMU's are above effective limit reference points where recruitment would be impaired.

PI 1.1.2 – Stock rebuilding

PI 1.1.2		Where the stock management unit (SMU) is reduced, there is evidence of stock rebuilding within a specified timeframe		
Scoring Issue		SG 60	SG 80	SG 100
a	Rebuilding timeframes			
	Guide post	A rebuilding timeframe is specified for the SMU that is the **shorter of 20 years or 2 times its generation time**. For cases where 2 generations is less than 5 years, the rebuilding timeframe is up to 5 years.		The shortest practicable rebuilding timeframe is specified which does not exceed **one generation time** for the SMU.
	Met?	1. Oz. Sockeye - NA 2. KK Pink – Yes 3. WK Pink - Yes 4. KK Chum – NA 5. WK Chum - Yes 6. KK Coho – Yes		1. Oz. Sockeye - NA 2. KK Pink – No 3. WK Pink - No 4. KK Chum – NA 5. WK Chum - No 6. KK Coho – No
Rationale				

Ozernaya sockeye and KK Chum are not reduced and this PI is not applicable (NA). Scoring of PI 1.1.2 is required only for scores less than 80 in PI 1.1.1.

SG60 - This standard is met for Kamchatka-Kuril subzone pink salmon, Western Kamchatka subzone pink salmon, Western Kamchatka subzone chum salmon and Kamchatka-Kuril coho. Low escapements of these SMUs in some years are likely due to normal variation in survival typical of salmon in combination with reduced stock assessment efforts. Reduced spawning escapement surveys have led to underestimates of abundance. Non-quantitative information suggests that these stocks are currently fluctuating in productive range that exceeds historical levels of abundance. With resumption of more-comprehensive stock assessments in recent years, it is likely that achievement of escapement goals will be consistently documented.

SG80 - Rebuilding within one generation is uncertain.

B	**Rebuilding evaluation**			
	Guide post	Monitoring is in place to determine whether the rebuilding strategies are effective in rebuilding the SMU within the specified timeframe.	There is **evidence** that the fishery-based rebuilding strategies are being implemented effectively, **or it is likely** based on simulation modelling, exploitation rates or previous performance that they will be able to rebuild the SMU	There is **strong evidence** that the rebuilding strategies are being implemented effectively, **or it is highly likely** based on simulation modelling, exploitation rates or previous performance that they will be able to rebuild the SMU within the **specified timeframe**.

			within the **specified timeframe**.	
	Met?	1. Oz. Sockeye - NA 2. KK Pink – Yes 3. WK Pink - Yes 4. KK Chum – NA 5. WK Chum - Yes 6. KK Coho – Yes	1. Oz. Sockeye - NA 2. KK Pink – Yes 3. WK Pink - Yes 4. KK Chum – NA 5. WK Chum - Yes 6. KK Coho – Yes	1. Oz. Sockeye - NA 2. KK Pink – No 3. WK Pink - No 4. KK Chum – NA 5. WK Chum - No 6. KK Coho – No
Rationale				

Scoring of PI 1.1.2 is required only for scores less than 80 in PI 1.1.1.

SG60 - This standard is met for Kamchatka-Kuril subzone pink salmon, Western Kamchatka subzone pink salmon, Western Kamchatka subzone chum salmon and Kamchatka-Kuril coho. Increased monitoring of spawning escapement has been implemented to assess status.

SG80 - This standard is met for Kamchatka-Kuril subzone pink salmon, Western Kamchatka subzone pink salmon, Western Kamchatka subzone chum salmon and Kamchatka-Kuril coho. Evidence has been provided for Increased monitoring needed to demonstrate that escapement goals are consistently met.

SG100 -This standard is not met due to uncertainty in normal annuals patterns of salmon abundance.

C	**Use of enhancement in stock rebuilding**			
	Guide post	Enhancement activities are **not routinely used** as a stock rebuilding strategy but may be temporarily in place as a conservation measure to preserve or restore wild diversity threatened by human or natural impacts.	Enhancement activities are **very seldom used** as a stock rebuilding strategy.	Enhancement activities are **not used** as a stock rebuilding strategy.
	Met?	1. Oz. Sockeye - NA 2. KK Pink – Yes 3. WK Pink - Yes 4. KK Chum – NA 5. WK Chum - Yes 6. KK Coho – Yes	1. Oz. Sockeye - NA 2. KK Pink – Yes 3. WK Pink - Yes 4. KK Chum – NA 5. WK Chum - Yes 6. KK Coho – Yes	1. Oz. Sockeye - NA 2. KK Pink – Yes 3. WK Pink - Yes 4. KK Chum – NA 5. WK Chum - Yes 6. KK Coho – Yes
Rationale				

Scoring of PI 1.1.2 is required only for scores less than 80 in PI 1.1.1. No enhancement occurs in the area of this fishery.

References

See Section 5.2.1. Antonov et al. 2007, Bugaev 1991, 1995, 2011; Bugaev et al. 2001, 2009, 2019, 2020a, 2020b; Dubynin et al. 2007

Draft scoring range and information gap indicator added at Announcement Comment Draft Report

Draft scoring range	Not applicable
Information gap indicator	Information sufficient to score PI

Overall Performance Indicator scores added from Client and Peer Review Draft Report

Overall Performance Indicator score	1. Oz. Sockeye - not applicable 2. KK Pink – 85 3. WK Pink - 85 4. KK Chum – not applicable 5. WK Chum - 85 6. KK Coho – 85
Condition number (if relevant)	--

PI 1.2.1 – Harvest strategy

PI 1.2.1		**There is a robust and precautionary harvest strategy in place**		
Scoring Issue		SG 60	SG 80	SG 100
a	Harvest strategy design			
	Guide post	The harvest strategy is **expected** to achieve SMU management objectives reflected in PI 1.1.1 SG80 including measures that address component population status issues.	The harvest strategy is responsive to the state of the SMU and the elements of the harvest strategy **work together** towards achieving SMU management objectives reflected in PI 1.1.1 SG80 including measures that address population status issues.	The harvest strategy is responsive to the state of the SMU and is **designed** to achieve stock management objectives reflected in PI 1.1.1 SG80 including measures that address component population status issues.
	Met?	1. Oz. Sockeye - Yes 2. KK Pink – Yes 3. WK Pink - Yes 4. KK Chum – Yes 5. WK Chum - Yes 6. KK Coho – Yes	1. Oz. Sockeye - Yes 2. KK Pink – Yes 3. WK Pink - Yes 4. KK Chum – Yes 5. WK Chum - Yes 6. KK Coho – Yes	1. Oz. Sockeye - Yes 2. KK Pink – No 3. WK Pink - No 4. KK Chum – No 5. WK Chum - No 6. KK Coho – No
Rationale				

SG60 - See SG80

SG80 - The harvest strategy in place is responsive to the state of the SMU and works effectively to achieve escapement-based management objectives. The strategy involves establishing fishing seasons, scheduled passing days of no fishing to limit exploitation rates and distribute escapement throughout the season, in-season monitoring of harvest, species composition, biological indicators, and spawning escapements, and in-season fishery management based on this information. Fishery times and areas are designed and regulated specifically to fill the available natural spawning areas and to achieve corresponding escapement objectives. For instance, fishing areas, specific nets or dates may be closed to ensure escapement. Management of Ozernaya sockeye is intensive Management of

pink and chum salmon occurs on a regional basis to ensure that spawning escapement is a primary priority of the management system.

SG100 – The SG100 standard is met for Ozernaya sockeye because of the highly developed stock assessment and harvest strategy for meeting escapement goals. The SG100 standard is not met for UoC pink, chum and coho salmon because the aggregate SMU-based strategy employed in West Kamchatka may not meet population-specific objectives in every case (although it generally achieves goals at the SMU level).

b	**Harvest strategy evaluation**			
	Guide post	The harvest strategy is **likely** to work based on prior experience or plausible argument.	The harvest strategy may not have been **fully tested** but evidence exists that it is achieving its objectives.	The performance of the harvest strategy has been **fully evaluated** and evidence exists to show that it is achieving its objectives including being clearly able to maintain stocks at target levels.
	Met?	1. Oz. Sockeye - Yes 2. KK Pink – Yes 3. WK Pink - Yes 4. KK Chum – Yes 5. WK Chum - Yes 6. KK Coho – Yes	1. Oz. Sockeye - Yes 2. KK Pink – Yes 3. WK Pink - Yes 4. KK Chum – Yes 5. WK Chum - Yes 6. KK Coho – Yes	1. Oz. Sockeye - No 2. KK Pink – No 3. WK Pink - No 4. KK Chum – No 5. WK Chum - No 6. KK Coho – No
Rationale				

SG60 - See SG80

SG80 - Direct evidence including documentation of in-season restrictions based on abundance and assessments of spawning escapement, demonstrates that the harvest strategy is generally achieving its objectives. Fishery restrictions based on time and area closures are regularly adopted in-season based on real-time information on run size and catch composition. Established regulations and in-season measures have consistently distributed spawning escapements around established goals.

SG100 - The current harvest strategy has been in place since only 2008 and may not have been fully tested under a wide range of conditions including the inherent variability in abundance and run timing of salmon. In particular, it is not clear whether the system has been challenged by an extended interval of low salmon productivity. High productivity and large runs under favorable ocean regimes can compensate for management systems limitations which can create challenges under less favorable ocean productivity regimes. Large numbers also feed high expectations of the fishers. Current high exploitation rates, reductions in escapement goals relative to historical levels, escapements tending toward the lower end of the range, and expansions of processing capacity may all be regarded as symptoms of a narrow safety factor in the management of this fishery. Therefore, UoC sockeye, pink, chum and coho do not meet the SG100 standard.

c	**Harvest strategy monitoring**	
	Guide post	Monitoring is in place that is expected to determine whether the harvest strategy is working.
	Met?	1. Oz. Sockeye - Yes 2. KK Pink – Yes

				3. WK Pink - Yes 4. KK Chum – Yes 5. WK Chum - Yes 6. KK Coho – Yes
Rationale				

SG60 - Monitoring is in place for UoC pink, chum and coho that is expected to determine whether the harvest strategy is working based on run strength, harvest and spawning escapement, therefore the SG60 is met. The harvest strategy involves extensive in-season monitoring of harvest, catch per unit effort, biological indicators (sex and age), and spawning escapement. These indicators are compared with historical values and patterns to determine run size and timing, and make corresponding adjustments in fishing times and areas. The harvest strategy is grounded in a well-developed system of scientific assessment and monitoring. Run forecasts are made based on brood year escapements and recent production patterns to identify recommended harvest levels as preseason planning tools. Once the fishing season begins, management to control exploitation rates is based on in-season data. Data are referenced to seasonal patterns in previous years to distinguish run timing and strength. Forecasts are typically uncertain and run timing may also vary from year to year. Overfishing might occur when run timing effects are mistaken for run size (for instance, mistaking a strong earlier-than-average return for a larger-than-forecast number). In-season management utilizes indicators based on biological characteristics of the harvest to avoid this potential problem. For instance, the early portion of each run typically includes a larger percentage of males which declines as the run progresses. Average fish size varies in tandem as male and female sizes are different.

d	**Harvest strategy review**			
	Guide post			The harvest strategy is periodically reviewed and improved as necessary.
	Met?			1. Oz. Sockeye - Yes 2. KK Pink – No 3. WK Pink - No 4. KK Chum – No 5. WK Chum - No 6. KK Coho – No
Rationale				

SG100 - The harvest strategy is periodically reviewed and improved as necessary. Extensive changes in the strategies adopted by the regional management system since 2008 provide for more local and responsive regulation are evidence to this effect. Ozernaya sockeye harvest strategies are under continual review due to the high value of that stock. Most recently, stock assessment was enhanced with the addition of an advanced sonar fish counter upstream from the fishing area to reduce inseason management uncertainty due to a several-day lag time until sockeye transit upstream to be counted at the weir. Similar reviews of sockeye productivity patterns in the Kuril Lake are ongoing in response to changing environmental patterns. Therefore, Ozernaya sockeye meet this standard. Recent work to develop population-specific limit and target reference points based on river-specific stock-recruitment data for pink and chum salmon provide more evidence to this effect. However, questions regarding the sufficiency of review in light of recent reductions in stock assessment information cause this indicator not to pass the SG100 level for UoC pink, chum and coho salmon.

e	**Shark finning**			

	Guide post	It is **likely** that shark finning is not taking place.	It is **highly likely** that shark finning is not taking place.	There is a **high degree of certainty** that shark finning is not taking place.
	Met?	**Not relevant**	**Not relevant**	**Not relevant**
Rationale				

Sharks are not harvested or encountered in this fishery

	Review of alternative measures			
f	Guide post	There has been a review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of unwanted catch of the target stock.	There is a **regular** review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of unwanted catch of the target stock and they are implemented as appropriate.	There is a **biennial** review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of unwanted catch of the target stock, and they are implemented, as appropriate.
	Met?	**Not applicable**	**Not applicable**	**Not applicable**
Rationale				

There is no unwanted catch of the target stock.

References

See Section 5.2.1 Principle Species Background. Shevlyakov et al. 2013, 2016; 2019; Bugaev et al. 2020a, 2020b.

Draft scoring range and information gap indicator at Announcement Comment Draft Report

Draft scoring range	All species ≥80
Information gap indicator	Information sufficient to score PI

Overall Performance Indicator scores added from Client and Peer Review Draft Report

Overall Performance Indicator score	1. Oz. Sockeye - 95 2. KK Pink – 80 3. WK Pink - 80 4. KK Chum – 80 5. WK Chum - 80 6. KK Coho –80
Condition number (if relevant)	--

PI 1.2.2 – Harvest control rules and tools

PI 1.2.2		There are well defined and effective harvest control rules (HCRs) in place		
Scoring Issue		SG 60	SG 80	SG 100
a	HCRs design and application			
	Guide post	**Generally understood** HCRs are in place **or available** that are **expected** to reduce the exploitation rate as the SMU **LRP** is approached.	**Well defined** HCRs are **in place** that **ensure** that the exploitation rate is reduced as the **LRP** is approached, are expected to keep the SMU **fluctuating around** a target level consistent with MSY.	The HCRs are expected to keep the SMU **fluctuating at or above** a target level consistent with MSY, or another more appropriate level taking into account the ecological role of the stock, **most** of the time.
	Met?	1. Oz. Sockeye - Yes 2. KK Pink – Yes 3. WK Pink - Yes 4. KK Chum – Yes 5. WK Chum - Yes 6. KK Coho – Yes	1. Oz. Sockeye - Yes 2. KK Pink – Yes 3. WK Pink - Yes 4. KK Chum – Yes 5. WK Chum - Yes 6. KK Coho – Yes	1. Oz. Sockeye - Yes 2. KK Pink – No 3. WK Pink - No 4. KK Chum – No 5. WK Chum - No 6. KK Coho – No
Rationale				

SG60 – Generally understood control rules include season dates, establishing passing days, and time/area closures based on real time escapement monitoring data in conjunction with other indicators of run strength and timing based on harvest and biological composition of the harvest. Operation of the fishing gear is modified in response to whether escapement goals are being met. Harvest control rules are specifically defined in licenses issued for commercial fishery operation and in-season regulation changes adopted by an Anadromous Fish Commission as appropriate at the recommendation of scientific and fishery management authorities. In-season management has the effect of reducing exploitation rates at low abundance.

SG80 – The SG80 is met because harvest control rules are in place that ensure the exploitation rate is reduced during years of low abundance. As a result, the SMUs are generally fluctuating around escapement levels consistent with MSY (Bugaev et al. 2019a, 2018b). Fishing effort is regulated according to escapement to ensure that the stock achieves or exceeds target levels consistent with MSY. Management for MSY escapements ensure that the exploitation rate is reduced long before limit reference points are approached. HCRs include licensing for exclusive use of fishing areas, limitations on numbers and spacing of trap nets in marine waters, and fishery closure days in the river based on real time escapement monitoring data in conjunction with other indicators of run strength and timing based on harvest and biological composition of the harvest. Catch per effort, fish size, and sex ratio are all utilized as indicators. The fishery is managed on a daily basis to regulate harvest consistent with escapement targets. The largely terminal nature of this fishery provides a high degree of control of exploitation in response to actual rather than forecast run strength.

SG100 – This standard is met for Ozernaya sockeye where well-defined harvest control rules keep the stock fluctuating around a target level consistent with MSY. The ecological role of the stock is well recognized with extensive historical research on the aquatic and terrestrial ecosystems of Kuril Lake where the large majority of Ozernaya sockeye spawn and rear. The SG100 standard is not met for UoC

pink, chum or coho salmon because escapement objectives are not always met for stocks in some rivers and years.

	HCRs robustness to uncertainty			
b	Guide Post		The HCRs are likely to be robust to the main uncertainties.	The HCRs take account of a **wide** range of uncertainties including the ecological role of the stock, and there is **evidence** that the HCRs are robust to the main uncertainties.
	Met?		1. Oz. Sockeye - Yes 2. KK Pink – Yes 3. WK Pink - Yes 4. KK Chum – Yes 5. WK Chum - Yes 6. KK Coho – Yes	1. Oz. Sockeye - Yes 2. KK Pink – No 3. WK Pink - No 4. KK Chum – No 5. WK Chum - No 6. KK Coho – No
Rationale				

SG80 – This standard is met for all species. The main uncertainty affecting HCRs is annual variability in run strength and run timing. HCR's appear to be generally effective in regulating exploitation rates under conditions of normal annual variability during the current period of high salmon productivity in West Kamchatka in a period of favorable marine conditions. High productivity makes these stocks extremely resilient and capable of sustaining high harvests and harvest rates. Production remains high even in the face of periodic low escapements that sometimes occur among exploited salmon populations as a result of normal annual variability in returns and inexact forecast and assessment methods.

SG100 – This standard is met for Ozernaya sockeye. The selection of the harvest control rules takes into account a wider range of uncertainties including those related to run strength and timing. While run forecasts are made based on brood year escapements and recent production patterns, recommended harvest levels based on these forecasts are utilized primarily as preseason planning tools. Once the fishing season begins, management to control exploitation rates is based on in-season data. Data is referenced to seasonal patterns in previous years to distinguish run timing and strength. Forecasts are typically uncertain and run timing may also vary from year to year. In-season management utilizes indicators based on biological characteristics of the harvest to avoid this potential problem. Related assessments previously identified uncertainties related to potential uneven patterns of patterns of exploitation of different portions of the run due in part to the lack of specific escapement objectives for stock subcomponents, trends and variability in interception of Ozernaya sockeye in marine trap nets north of the Ozernaya area, and trends and variability in the high seas drift net fishery. However, all of these questions were satisfactorily addressed by information provided by KamchatNIRO.

The SG100 standard is not met for UoC pink, chum and coho salmon because evidence will be needed to demonstrate that harvest control rules are sufficiently robust to maintain appropriate levels of escapement in the event of a prolonged period of reduced ocean productivity. High harvests create an expectation for continuing high harvest and a fishery infrastructure consistent with supporting demands. Salmon productivity has been observed to increase and decrease in long term cycles related to periodic shifts in marine productivity patterns. These shifts can pose significant challenges to

harvest control rules in the implementation of timely restrictions of fisheries consistent with reduced stock productivity. The risk is significant overfishing relative to yield potential.

	HCRs evaluation			
c	Guide post	There is **some evidence** that tools used **or available** to implement HCRs are appropriate and effective in controlling exploitation.	**Available evidence indicates** that the tools in use are appropriate and effective in achieving the exploitation levels required under the HCRs.	**Evidence clearly shows** that the tools in use are effective in achieving the exploitation levels required under the HCRs.
	Met?	1. Oz. Sockeye - Yes 2. KK Pink – Yes 3. WK Pink - Yes 4. KK Chum – Yes 5. WK Chum - Yes 6. KK Coho – Yes	1. Oz. Sockeye - Yes 2. KK Pink – Yes 3. WK Pink - Yes 4. KK Chum – Yes 5. WK Chum - Yes 6. KK Coho – Yes	1. Oz. Sockeye - Yes 2. KK Pink – No 3. WK Pink - No 4. KK Chum – No 5. WK Chum - No 6. KK Coho – No
Rationale				

SG60 - see SG80

SG80 – Available evidence based on indicates that the tools in use are appropriate and effective in achieving the exploitation levels for UoC sockeye, pink, chum and coho required under the HCRs. Significant escapements of target stocks are consistently achieved and continuing high levels of salmon production provide evidence that harvest control rules are effective in producing appropriate exploitation rates. The fishery is managed on a daily basis using real time stock assessment information to regulate harvest consistent with escapement targets. Fisheries are restricted as appropriate based on actual run size and escapement. For instance, the harvest strategy has been revised to allow two passing days after every two fishing days to protect escapement for below average returns and harvesting has been suspended for the same reason during years of very poor runs (Shevlyakov et al. 2016).

SG100 – For Ozernaya sockeye, evidence clearly shows that the tools in use are effective in achieving the exploitation levels required under the harvest control rules. Consistent achievement of escapement goals across a wide range of run sizes indicates that harvest control rules are generally effective in achieving sustainable exploitation rates defined by the current stock-recruitment data. Therefore, the SG100 standard is met for Ozernaya sockeye. The standard is not met for UoC pink, chum and coho salmon - it remains to be seen whether harvest control rules will be adequate to control exploitation during poor runs or extended periods of reduced salmon productivity for pink and chum salmon.

	Maintenance of wild population components			
d	Guide Post	It is **likely** that the HCRs and tools are consistent with maintaining the diversity and productivity of the wild component population(s).	It is **highly likely**, that the HCRs and tools are consistent with maintaining the diversity and productivity of the wild component population(s).	There is a **high degree of certainty** that the HCRs and tools are consistent with maintaining the diversity and productivity of the wild component population(s).

	Met?	1. Oz. Sockeye - Yes 2. KK Pink – Yes 3. WK Pink - Yes 4. KK Chum – Yes 5. WK Chum - Yes 6. KK Coho – Yes	1. Oz. Sockeye - Yes 2. KK Pink – Yes 3. WK Pink - Yes 4. KK Chum – Yes 5. WK Chum - Yes 6. KK Coho – Yes	1. Oz. Sockeye - Yes 2. KK Pink – No 3. WK Pink - No 4. KK Chum – No 5. WK Chum - No 6. KK Coho – No
Rationale				

SG60 – See SG80

SG80 – The standard is met for all stocks. Diversity in salmon is represented among populations inhabiting different rivers within a species management unit and substocks returning to different areas within each river, often with different run timing (early vs. late for instance). Current harvest control rules maintain this diversity by managing to protect escapements in all rivers and across the duration of the run. Stock assessment data indicates this system is generally effective.

In the case of Ozernaya sockeye, this consistency is demonstrated as follow. Discrete populations of sockeye have not been identified in the Ozernaya system but extensive research and monitoring has demonstrated that this stock is extremely diverse, consisting a variety of subcomponents returning at different times and spawning in different areas and conditions. Early and late stock components are recognized by the management system and there may even be finer distinctions within those, particularly in the late component which comprises the majority of the run (e.g., lake vs. river spawners). The importance of protecting all run components is recognized by the management system and current practices are designed to avoid overfishing any specific run component. Guidelines are established and followed for the proportion of the escapements that should be achieved at different points in the run. Progress toward meeting daily and annual targets is monitored and regulated in season based on daily harvest and escapement information. The leading and ending portions of the run are not subject to fishing which also ensures conservation of fish at the ends of the spectrum of diversity. Intensive management to avoid large escapements also protects some early run components from being over-spawned by later run components. Passing days are established periodically throughout the run to provide escapement windows for various run components.

SG100 – This standard is not met for Ozernaya sockeye met because explicit escapement goals have not been established for different components of the run. Escapement goals have been established for the aggregate run and the KamchatNIRO has indicated that it is not practical to establish and monitor separate goals for different subcomponents given overlap and annual variability in run timing. The SG 100 is not met for UoC pink, chum and coho salmon because specific objectives for component populations and substocks are not explicitly incorporated in management.

References

See Section 5.2.1 Principle I Species Background. Shevlyakov et al. 2013, 2016, Bugaev et al. 2019a, 2020a, 2020b

Draft scoring range and information gap indicator added at Announcement Comment Draft Report

Draft scoring range	All species ≥80
Information gap indicator	Information sufficient to score PI

Overall Performance Indicator scores added from Client and Peer Review Draft Report

Overall Performance Indicator score	1. Oz. Sockeye - 100 2. KK Pink – 80 3. WK Pink - 80 4. KK Chum – 80 5. WK Chum - 80 6. KK Coho – 80
Condition number (if relevant)	--

PI 1.2.3 – Information and monitoring

PI 1.2.3		**Relevant information is collected to support the harvest strategy**		
Scoring Issue		SG 60	SG 80	SG 100
a	Range of information			
	Guide post	**Some** relevant information related to stock structure, stock productivity and fleet composition is available to support the harvest strategy.	**Sufficient** relevant information related to stock structure, stock productivity, fleet composition and other data are available to support the harvest strategy.	A **comprehensive range** of information (on stock structure, stock productivity, fleet composition, stock abundance, UoA removals and other information such as environmental information), including some that may not be directly related to the current harvest strategy, is available.
	Met?	1. Oz. Sockeye - Yes 2. KK Pink – Yes 3. WK Pink - Yes 4. KK Chum – Yes 5. WK Chum - Yes 6. SW Coho – Yes	1. Oz. Sockeye - Yes 2. KK Pink – Yes 3. WK Pink - Yes 4. KK Chum – Yes 5. WK Chum - Yes 6. KK Coho – Yes	1. Oz. Sockeye - Yes 2. KK Pink – No 3. WK Pink - No 4. KK Chum – No 5. WK Chum - No 6. KK Coho – No
Rationale				

SG60 –See SG80

SG80 – This standard is met for sockeye, pink, chum and Kamchatka-Kuril coho salmon. A large amount of relevant information is collected to support the harvest strategy. This includes extensive data on stock structure, stock productivity, fleet composition and other data on biological characteristics of the run, run timing, spawning distribution, and spawning escapement. Assessments also include direct estimates of natural stock productivity by salmon species.

Escapement of pink and chum salmon is currently estimated in index areas with basin-wide inferences based on historical distribution patterns. Historical information on catches and escapements in relation to abundance and passing days supports the effectiveness of the current harvest strategy. Passing days have been effectively shown to provide opportunities for significant spawning escapement sufficient to sustain yields under current conditions of high marine productivity which

prevail for these salmon species. Therefore, the available assessments based on index stocks and historical distribution patterns are generally adequate for current management of these species.

See SG100 for further explanation regarding Ozernaya sockeye.

SG100 – This standard is met for Ozernaya sockeye. A comprehensive range of information including stock structure, productivity, fleet composition and other data is available to support the harvest strategy. Due to their fishery significance and the long-term operation of a research station at Kuril Lake, Ozernaya sockeye are among the most intensively monitored and studied salmon stocks in the world. Annual harvest of this stock is estimated in the offshore drift net fishery in the Pacific Ocean and Sea of Okhotsk, marine trap net fishery on the west coast of Kamchatka, and the freshwater fishery in the Ozernaya River. Biological data (age, sex, size) is collected from samples of the catch. Spawning escapement is estimated based on weir counts which provide a very high level of accuracy. Biological data is also collected from the escapement. Run timing and spawner distribution are assessed annually. Escapement and run size information is used to derive stock-recruitment production functions which provide of sound basis for establishing escapement targets and exploitation rates consistent with maximum sustained yield. Extensive information is collected on the juvenile life history, abundance, population dynamics, and environmental conditions in Lake Kuril which provides a very strong basis for understanding factors limiting and regulating productivity. Extensive data is also collected on the fishery sector including in-river seine, coastal trap net and high seas drift gillnet fisheries. The available information has been very thoroughly documented in the scientific literature (Bugaev et al. 2009; Bugaev 2011).

TheSG100 standard is not met for UoC pink, chum or coho salmon because recent reductions in aerial surveys of escapement mean that a majority of wild component populations are no longer represented. Stocks of west Kamchatka salmon are comprised of subcomponents including substocks (e. g., early and late runs), demographically-independent populations (e.g., species returning to home rivers or lakes), and with a spectrum of natural diversity expressed in run timing and spatial distribution. Stocks including major populations are well defined based on river system, run timing, and spawning distribution. Major substocks include five groups of pink salmon; summer and fall runs of chum salmon, and early and late coho runs. Substocks can be distinguished over the course of the fishing season based on run timing, size and sex ratio. Assessments are made of the major component stocks and management and include considerations for each. Assessments based on index stocks and historical distribution patterns may not be adequate for long-term management under conditions of changing fishery dynamics, fish productivity or fish distribution patterns.

	Monitoring			
b	Guide post	Stock abundance and UoA removals are monitored and **at least one indicator** is available and monitored with sufficient frequency to support the harvest control rule.	Stock abundance and UoA removals are **regularly monitored at a level of accuracy and coverage consistent with the harvest control rule**, and **one or more indicators** are available and monitored with sufficient frequency to support the harvest control rule.	**All information** required by the harvest control rule is monitored with high frequency and a high degree of certainty, and there is a good understanding of inherent **uncertainties** in the information [data] and the robustness of assessment and management to this uncertainty.
	Met?	1. Oz. Sockeye - Yes	1. Oz. Sockeye - Yes	1. Oz. Sockeye - Yes

		2. KK Pink – Yes 3. WK Pink - Yes 4. KK Chum – Yes 5. WK Chum - Yes 6. SW Coho – Yes	2. KK Pink – No 3. WK Pink - No 4. KK Chum – No 5. WK Chum - No 6. SW Coho – No	2. KK Pink – No 3. WK Pink - No 4. KK Chum – No 5. WK Chum - No 6. KK Coho – No
Rationale				

SG60 – Extensive information is collected on harvest in the commercial salmon fishery. Numbers are estimated multiple stages of the harvest and processing chain. Detailed records are required and kept by the fishery and the government. Changes in the management system over the previous decade ensure accuracy of catch reporting by removing incentives for inaccurate accounting to avoid taxes or remain within a designated allocation. Catch data are reported on a real-time basis during the fishing season. Catch data are assessed in-season relative to historical levels which effectively provide for spawning escapement under the passing day system of management.

SG-80 – This standard is met for Ozernaya sockeye. Stock abundance and fishery removals are regularly monitored at a level of accuracy and coverage consistent with the harvest control rule, and one or more indicators are available and monitored with sufficient frequency to support the harvest control rule. Harvest, data, and biological data are collected daily and have been collected in a standardized manner for many years. This long-term data series provides a very robust basis for evaluation of status and limiting factors of this stock, as well as appropriate fishing strategies. There is good information on commercial fishery removals of this stock in the freshwater in the Ozernaya River fishery, the marine trapnet fishery along the west coast of Kamchatka, and in the offshore drift net fishery operating in the Russian EEZ. Historical data in offshore drift net fishery and illegal harvest in freshwater was likely incomplete but current numbers are reported by KamchatNIRO to be accurate with respect to Ozernaya sockeye. Shevlyakov 2013a reported that illegal harvest has been reduced to low levels in the last decade. The offshore drift gillnet fishery has been closed.

The SG80 standard for regular monitoring is not met for UoC pink, chum and coho because recent reductions in aerial survey intensity throughout West Kamchatka have substantially reduced the accuracy and precision of spawning escapement estimates used to guide management decisions. The continuing effectiveness of the harvest strategy will depend also on monitoring of spawning escapements. Surveys have been reduced due to budget limitations. The current survey intensity likely provides sufficient precision to distinguish large and small runs but lack the resolution to avoid estimation bias due to differences in run timing or fish distribution. Historical assessments have generally been sufficient to support the current harvest strategy but current survey frequency may not be sufficient to identify any future changes in productivity or distribution patterns which might confound effective implementation of the harvest control rules.

SG100 – This standard is met for Ozernaya sockeye. Related assessments previously identified management uncertainties introduced by the location of the fish counting weir well upstream from the fishery location. KamchatNIRO reports that a travel time of several days between the fishery and the counting weir can introduce uncertainty in fishery management in some years depending on migration patterns. As a result, optimum harvest efficiencies were not always realized. Fishery managers have now implemented an Alaska-style sonar counting system immediately upstream from the fishery to provide more real-time data. This advancement effectively addresses the related uncertainty.

C	**Comprehensiveness of information**

	Guide post	There is good information on all other fishery removals from the stock.	
	Met?	1. Oz. Sockeye - Yes 2. KK Pink – Yes 3. WK Pink - Yes 4. KK Chum – Yes 5. WK Chum - Yes 6. SW Coho – Yes	
Rationale			

SG 80 – This standard is met for UoC sockeye, pink, chum and coho salmon. Recreational and indigenous harvest is monitored. KamchatNIRO has also conducted extensive study on historical and current levels of salmon removals by illegal fishing in Kamchatka Rivers (Shevlyakov 2013; Shevlyakov et al. 2016). Illegal harvest has long been a significant problem in Kamchatka salmon fisheries but the incidence has been greatly reduced by changes in the management system. KamchatNIRO has estimated that illegal harvest substantially reduced historical spawning escapements in many rivers. However, industrial levels of poaching have been largely eliminated by changes in the management system. In 2008, with introduction of the Olympic system, individual quotas disappeared. With that change, incentives to exceed the quota disappeared too, thus eliminating industrial illegal fishing which a significant problem before 2008. Illegal harvest remains a concern in areas with a significant local populace and reported abuses of the indigenous permitting system. This problem is most significant in rivers outside the UoC such as the Bolshaya due to its local population and road accessibility (the Bolshaya in not in the unit of assessment). Fishing companies, governmental agencies and environmental stakeholders all report that illegal harvest in this UoC has been largely controlled by current enforcement efforts. The unique situation of the Ozernaya, including lack of access to this remote area and protection of the spawning grounds by a national park, has made these efforts particularly effective. A consistent supply of salmon from legal fishing companies, current low prices for salmon, high costs of helicopter access, extensive enforcement activities, and penalties have effectively eliminated financial incentives for large scale illegal fishing for salmon in remote areas such as southwest Kamchatka.

Harvest of Kamchatka salmon also historically occurred outside the UoC in commercial drift gillnet fisheries in marine waters of the Russian Exclusive Economic Zone. These catches were subject to a reporting and monitoring system which estimated catch levels for high value species such as sockeye. Data were provided documenting estimates of high seas drift net harvest of Ozernaya sockeye in the Russian Exclusive Economic Zone fisheries from 2000 through 2014. The marine drift net fishery in Russian waters was permanently closed by the government in 2015.

Interceptions of Ozernaya sockeye in marine trapnet fisheries north of the Ozernaya River are also assessed by the management system. Ozernaya sockeye comprise an increasing percentage of the sockeye harvest from the Bolshaya River southward.

An independent observer program was also previously implemented in cooperation with other fishing companies in this UoC, the WWF and the Kamchatka State Technical University. A pilot effort was conducted in 2013 and 2014 involving observers under the supervision of Denis Semenov of the WWF. Two student observers participated in the program each year for two weeks during the peak of the fishing season. Students observed effort and catch by river nets, documented observations and prepared a report. The observer program continued in 2015 and 2016 with refinements in methodology (Semenov et al. 2016, KFF 2017). Information on current harvest in offshore driftnet and other nearshore coastal trapnet fisheries north of the Ozernaya area is adequate to meet the 80

scoring criteria for this indicator. The independent observer program confirmed a low incidence of unaccounted illegal harvest.

References

See Section 5.2.1 Principle I Species Background. Antonov et al. 2007, Bugaev 1991, 1995, 2011; Bugaev et al. 2001, 2009, 2019, 2020a, 2020b; Dubynin et al. 2007; Shevlyakov et al. 2013, 2016

Draft scoring range and information gap indicator added at Announcement Comment Draft Report

Draft scoring range	1. Oz. Sockeye ≥80 2. KK Pink 60-79 3. WK Pink 60-79 4. KK Chum 60-79 5. WK Chum 60-79 6. Kol Coho 60-79
Information gap indicator1.2.4.	Information sufficient to score PI

Overall Performance Indicator scores added from Client and Peer Review Draft Report

Overall Performance Indicator score	1. Oz. Sockeye - 100 2. KK Pink – 75 3. WK Pink - 75 4. KK Chum – 75 5. WK Chum - 75 6. KK Coho – 75
Condition number (if relevant)	**2**

Condition 2. Demonstrate that indicators of spawning escapement are available for Southwest Pink, Western Pink, Southwest Chum, Western Chum and Southwest Coho monitored with sufficient frequency to support the harvest control rule.

PI 1.2.4 – Assessment of stock status

PI 1.2.4		**There is an adequate assessment of the stock status**		
Scoring Issue		SG 60	SG 80	SG 100
a	**Appropriateness of assessment to stock under consideration**			
	Guide post		The assessment is appropriate for the stock and for the harvest control rule.	The assessment takes into account the major features relevant to the biology of the species and the nature of the UoA.
	Met?		1. Oz. Sockeye - Yes 2. KK Pink – Yes 3. WK Pink - Yes 4. KK Chum – Yes 5. WK Chum - Yes 6. KK Coho – Yes	1. Oz. Sockeye - Yes 2. KK Pink – No 3. WK Pink - No 4. KK Chum – No 5. WK Chum - No 6. KK Coho – No
Rationale				

SG 80 – This standard is met for sockeye, pink and chum salmon. The assessment includes in-season estimation of harvest, catch per effort, biological characteristics, timing and distribution of harvest and returns, and spawning escapement. This in-season information is used in real time to guide harvest control rules designed to optimize harvest and ensure escapement sufficient to sustain future production. Spawning escapement is estimated for representative samples of stock management units for each species.

SG100 – This standard is met for Ozernaya sockeye. Status is evaluated based on weir counts which provide very accurate estimates of abundance on the majority of the spawning grounds. Reference points are defined based on escapement goals demonstrated to be appropriate for this stock. Harvest is controlled in-season based on real-time data on spawning escapement as well as numbers and characteristics of fish entering the fishery. Extensive information on life history dynamics, ecological interactions, and ecosystem conditions is also being collected by a long-term research program at Kuril Lake.

This standard is not met for UoC pink, chum or coho salmon. Not all major features of stock structure are fully addressed by the stock assessment. In many cases, assessments and management actions are based on aggregate rather than component stock considerations. For instance, production curves used to identify optimum escapement levels are historically based on data aggregated over multiple component stocks for a species.

	Assessment approach			
B	Guide post	The assessment estimates stock status relative to generic reference points appropriate to the species category.	The assessment estimates stock status relative to reference points that are appropriate to the stock and can be estimated.	The assessment estimates with a high level of confidence both stock status and reference points that are appropriate to the SMU and its wild component populations.
	Met?	1. Oz. Sockeye - Yes 2. KK Pink – Yes 3. WK Pink - Yes 4. KK Chum – Yes 5. WK Chum - Yes 6. KK Coho – Yes	1. Oz. Sockeye - Yes 2. KK Pink – Yes 3. WK Pink - Yes 4. KK Chum – Yes 5. WK Chum - Yes 6. KK Coho – Yes	1. Oz. Sockeye - Yes 2. KK Pink – No 3. WK Pink - No 4. KK Chum – No 5. WK Chum - No 6. KK Coho – No
Rationale				

SG 60 - This standard is met for sockeye, pink and chum salmon. Stock status is estimated by species, river system, and sometimes major substock. These escapement estimates are evaluated relative to target spawner numbers for each system. S0pawning escapement goals are historically established based on production functions for the aggregate return of West Kamchatka salmon by species apportioned by the relative size of the respective populations. The management system is exploring the development of goals based on population-specific analyses.

SG80 - This standard is met for Ozernaya sockeye. The assessment estimates stock status of Ozernaya sockeye relative to target reference points derived from stock-recruitment data collected at a weir between the fishing area and the large majority of the spawning grounds. A long-term dataset is available and escapement goals have been revised based on historical changes in productivity. The fishing weir and terminal harvest strategies afford high confidence in the accuracy of both escapement and removals. Target reference points are defined in terms of escapement goals as measured by fish counts in a weir downstream from the primary spawning grounds in Kuril Lake and its tributaries.

Goals are derived from stock-recruitment analysis of recent historical data. Goals are represented as a range that will avoid recruitment overfishing due to low escapements and density-related reductions in freshwater productivity due to exceeding spawning or rearing habitat capacities. Escapements can be estimated with high confidence based on weir counts – this assures that there is relatively little measurement error in derivation of the production function or assessments of whether goals are being met.

The SG80 standard is met for UoC pink, chum and coho salmon based on information on stock status and reference points provided by KamchatNIRO (Bugaev et al. 2019a, 2019b). Recent information has been provided by KamchatNIRO (Bugaev et al. 2019b) on the coherence between the status of stocks in indicator streams and other populations they represent within the management unit as inferred from historical data. Recent stock assessment efforts have been expanded due to support and funding provided by the fishing companies. This follows a period of reducing stock assessment as government funding was curtailed.

SG100 – This standard is not met for Ozernaya sockeye because component-specific reference points are not identified. This standard is not met for pink or chum salmon because status and reference points of some wild component populations are inferred from index or aggregate stock information. Current assessments provide low resolution on major stock subcomponents and limited precision due to a reliance on peak escapement counts in selected index areas. Stock assessment has become increasingly reliant on indicator streams with the reduction in sampling rate but changing distribution pattern over time at different scales of abundance can confound interpretation of index samples. Reliance on index areas may not provide representative estimates for a full spectrum of strong and weak stock subcomponents within a system. Peak spawner counts from the most productive habitats may not be representative of the total stock under conditions of low productivity or declining returns. Further, escapement goals are generally based on production functions for aggregate stock and river populations of a species. Curves and goals thus represent an average stock and may be disproportionately driven by large strong stocks in the aggregate.

c	**Uncertainty in the assessment**			
	Guide post	The assessment **identifies major sources** of uncertainty.	The assessment **takes uncertainty into account**.	The assessment takes into account uncertainty and is evaluating stock status relative to reference points in a **probabilistic** way.
	Met?	1. Oz. Sockeye - Yes 2. KK Pink – Yes 3. WK Pink - Yes 4. KK Chum – Yes 5. WK Chum - Yes 6. KK Coho – Yes	1. Oz. Sockeye - Yes 2. KK Pink – Yes 3. WK Pink - Yes 4. KK Chum – Yes 5. WK Chum - Yes 6. KK Coho – Yes	1. Oz. Sockeye - No 2. KK Pink – No 3. WK Pink - No 4. KK Chum – No 5. WK Chum - No 6. KK Coho – No
Rationale				

SG60 - This standard is met for UoC sockeye, pink, chum and coho salmon. The stock assessment has identified major sources of uncertainty including normal environmentally-driven variability in productivity, normal annual variability in run timing and distribution, and heterogeneity in productivity of major stock subcomponents.

SG80 – This standard is met for sockeye, pink and chum salmon. Major uncertainties are taken into account in management. Harvest is controlled in-season based on real-time data on spawning escapement in aerial spawning ground surveys as well as numbers and characteristics of fish entering

the fishery. In-season assessments allow fisheries to be regulated based on normal annual variability in productivity and run timing. Assessments incorporate spatial patterns which address heterogeneity in major stock subcomponents. The management system is also exploring the development of goals based on population-specific stock-recruitment analyses. These goals include explicit precautionary safety factors based on statistical analysis uncertainty in population-specific stock-recruitment relationships.

SG100 - This standard is not met for UoC sockeye, pink, chum and coho salmon. Stock status is not evaluated relative to reference points in a probabilistic way. Uncertainty in estimates of various biological parameters is regularly represented with statistical confidence intervals or qualified descriptively. However, probabilistic risk analyses of stock status and fishery effects have not been extensively employed to evaluate population risks of measurement error, normal variation in productivity, or long-term productivity trends or changes

	Evaluation of assessment			
d	Guide post			The assessment has been tested and shown to be robust. Alternative hypotheses and assessment approaches have been rigorously explored.
	Met?			1. Oz. Sockeye - Yes 2. KK Pink – No 3. WK Pink - No 4. KK Chum – No 5. WK Chum - No 6. KK Coho – No
Rationale				

This standard is met for Ozernaya sockeye. The assessment has been tested and shown to be robust. Alternative hypotheses and assessment approaches have been rigorously explored (Shevlyakov et al. 2013, 2016).

This standard is not met for UoC pink, chum of coho salmon where a rigorous exploration of alternative hypotheses and approaches has not been reported.

	Peer review of assessment			
e	Guide post		The assessment of stock status is subject to peer review.	The assessment has been **internally and externally** peer reviewed.
	Met?		1. Oz. Sockeye - Yes 2. KK Pink – Yes 3. WK Pink - Yes 4. KK Chum – Yes 5. WK Chum - Yes 6. KK Coho – Yes	1. Oz. Sockeye - Yes 2. KK Pink – No 3. WK Pink - No 4. KK Chum – No 5. WK Chum - No 6. KK Coho – No
Rationale				

SG80 - The stock assessment is subject to extensive peer review within the management system. KamchatNIRO scientists regularly review and improve assessment methodologies and results which are subject to additional review by the regional scientific institute (VNiro). In-season assessment

information receives extensive review as part of the annual management process overseen by the Anadromous Fish Commission.

SG100 – This standard is met for Ozernaya sockeye. Assessments have been subjected to extensive internal and external peer review through the governmental scientific agency and by extensive publication in the technical scientific literature (e.g., Antonov et al. 2007, Bugaev 1991, 1995, 2011; Bugaev et al. 2001, 2009, 2019; Dubynin et al. 2007; Shevlyakov et al. 2013, 2016).

The SG100 standard is not met for UoC pink, chum and coho salmon where external peer review is limited.

f	Representativeness of indicator populations			
	Guidepost	Where indicator stocks are used as the primary source of information for making management decisions on SMUs, there is some scientific basis for the indicator's selection.	Where indicator stocks are used as the primary source of information for making management decisions on SMUs, there is some evidence of coherence between the status of the indicator streams and the status of the other populations they represent within the management unit, including selection of indicator stocks with low productivity (i.e., those with a higher conservation risk) to match those of the representative SMU where applicable.	Where indicator stocks are used as the primary source of information for making management decisions on SMUs, the status of the indicator streams are well correlated with other populations they represent within the management unit, including stocks with lower productivity (i.e., those with a higher conservation risk).
	Met?	1. Oz. Sockeye - Yes 2. KK Pink – Yes 3. WK Pink - Yes 4. KK Chum – Yes 5. WK Chum - Yes 6. KK Coho – Yes	1. Oz. Sockeye - Yes 2. KK Pink – Yes 3. WK Pink - Yes 4. KK Chum – Yes 5. WK Chum - Yes 6. KK Coho – Yes	1. Oz. Sockeye - Yes 2. KK Pink – No 3. WK Pink - No 4. KK Chum – No 5. WK Chum - No 6. KK Coho – No
Rationale				

SG60 – For UoC pink, chum and coho, the stock assessment historically surveyed representative areas of most river systems for each salmon species. Index reaches were selected based on their representative nature based on analysis of a fuller complement of historical survey areas. Guideposts related to indicator stocks are not applicable for Ozernaya sockeye as the entire stock is assessed and indicator stocks are not utilized.

SG80 – This guidepost is met for UoC pink, chum and coho salmon based on recent information provided by KamchatNIRO (Bugaev et al. 2019b) on the coherence between the status of stocks in indicator streams and other populations they represent within the management unit as inferred from historical data. Conclusions are bolstered by recent increases in stock assessment funded by the fishing companies. Guideposts related to indicator stocks are not applicable for Ozernaya sockeye as the entire stock is assessed and indicator stocks are not utilized.

SG100 – This guidepost is not met for UoC pink, chum and coho due to limited stock assessment in recent years of nonindex streams as a result of previous reductions in aerial survey efforts. Stock assessment has become increasingly reliant on indicator streams with the reduction in sampling rate but changing distribution pattern over time at different scales of abundance can confound interpretation of index samples. Reliance on index areas may not provide representative estimates for a full spectrum of strong and weak stock subcomponents within a system. Peak spawner counts from the most productive habitats may not be representative of the total stock under conditions of low productivity or declining returns. Further, escapement goals are generally based on production functions for aggregate stock and river populations of a species. Curves and goals thus represent an average stock and may be disproportionately driven by large strong stocks in the aggregate. Guideposts related to indicator stocks are not applicable for Ozernaya sockeye as the entire stock is assessed and indicator stocks are not utilized.

g	Definition of Stock Management Units (SMUs)			
	Guidepost	The majority of SMUs are defined with a clear rationale for conservation, fishery management and stock assessment requirements.	The SMUs are well-defined and include definitions of the major populations with a clear rationale for conservation, fishery management and stock assessment requirements.	There is an unambiguous description of each SMU that may include the geographic location, run timing, migration patterns, and/or genetics of component populations with a clear rationale for conservation, fishery management and stock assessment requirements.
	Met?	1. Oz. Sockeye - Yes 2. KK Pink – Yes 3. WK Pink - Yes 4. KK Chum – Yes 5. WK Chum - Yes 6. KK Coho – Yes	1. Oz. Sockeye - Yes 2. KK Pink – Yes 3. WK Pink - Yes 4. KK Chum – Yes 5. WK Chum - Yes 6. KK Coho – Yes	1. Oz. Sockeye - Yes 2. KK Pink – No 3. WK Pink - No 4. KK Chum – No 5. WK Chum - No 6. KK Coho – Yes
Rationale				

SG60 – See SG 80 for UoC pink, chum, and coho. SG 100 for sockeye.

SG80 – (UoC pink, chum and coho) Stocks of west Kamchatka salmon are comprised of subcomponents including substocks (e. g., early and late runs), demographically-independent populations (e.g., species returning to home rivers or lakes), and with a spectrum of natural diversity expressed in run timing and spatial distribution. Stocks including major populations are well defined based on river system, run timing, and spawning distribution. Major substocks include five groups of pink salmon; and summer and fall runs of chum salmon. Substocks can be distinguished over the course of the fishing season based on run timing, size and sex ratio. Early and late run coho stocks are distinguished. Assessments are made of the major component stocks and management and include considerations for each. Therefore, this standard is met.

(sockeye) – see SG100

SG100 - (UoC pink, chum and coho) Descriptions and rationale for stock management are not unambiguous. Harvest and escapement of stock components are understood based on run timing and spatial distribution, respectively. Information is generally sufficient to estimate the significance of

fishery harvest at the species and river system level but not at the substock level within a river system. Substock-specific estimates of harvest and escapement are limited.

(sockeye) – There is no ambiguity in the description of this stock. Its geographic location, run timing, and component stocks are thoroughly described and documented. This is a terminal fishery on a single stock of sockeye originating entirely the Ozernaya River. Clear rationales for conservation, fishery management and stock assessment requirements are very thoroughly described and documented (Bugaev et al. 2009; Bugaev 2011). Therefore, the 100 standard is met for this SG.

References

See Section 5.2.1 Principle I Species Background. Antonov et al. 2007, Bugaev 1991, 1995, 2011; Bugaev et al. 2001, 2009, 2019, 2020a, 2020b; Dubynin et al. 2007; Shevlyakov et al. 2013, 2016; Koval et al. 2014; Ostroumov 1964

Draft scoring range and information gap indicator added at Announcement Comment Draft Report

Draft scoring range	All stocks ≥80
Information gap indicator	Information sufficient to score PI

Overall Performance Indicator scores added from Client and Peer Review Draft Report

Overall Performance Indicator score	1. Oz. Sockeye - 95 2. KK Pink – 80 3. WK Pink - 80 4. KK Chum – 80 5. WK Chum - 80 6. KK Coho –80
Condition number (if relevant)	--

PI 1.3.1 – Enhancement outcomes

PI 1.3.1		**Enhancement activities do not negatively impact wild stock(s)**		
Scoring Issue		SG 60	SG 80	SG 100
a	**Enhancement impacts**			
	Guide post	It is **likely** that the enhancement activities do not have significant negative impacts on the local adaptation, reproductive performance or productivity and diversity of wild stocks.	It is **highly likely** that the enhancement activities do not have significant negative impacts on the local adaptation, reproductive performance or productivity and diversity of wild stocks.	There is a **high degree of certainty** that the enhancement activities do not have significant negative impacts on the local adaptation, reproductive performance or productivity and diversity of wild stocks.
	Met?	1. Oz. Sockeye - Yes 2. KK Pink – Yes 3. WK Pink - Yes 4. KK Chum – Yes	1. Oz. Sockeye - Yes 2. KK Pink – Yes 3. WK Pink - Yes 4. KK Chum – Yes	1. Oz. Sockeye - Yes 2. KK Pink – Yes 3. WK Pink - Yes 4. KK Chum – Yes

		5. WK Chum - Yes 6. KK Coho – Yes	5. WK Chum - Yes 6. KK Coho – Yes	5. WK Chum - Yes 6. KK Coho – Yes
Rationale				
No hatchery enhancement of any salmon species occurs in unit of certification systems.				
References				

Draft scoring range and information gap indicator added at Announcement Comment Draft Report

Draft scoring range	All species ≥80
Information gap indicator	Information sufficient to score PI

Overall Performance Indicator scores added from Client and Peer Review Draft Report

Overall Performance Indicator score	1. Oz. Sockeye - 100 2. KK Pink – 100 3. WK Pink - 100 4. KK Chum – 100 5. WK Chum - 100 6. KK Coho – 100
Condition number (if relevant)	--

PI 1.3.2 – Enhancement management

PI 1.3.2		**Effective enhancement and fishery strategies are in place to address effects of enhancement activities on wild stock(s)**		
Scoring Issue		SG 60	SG 80	SG 100
a	**Management strategy in place**			
	Guide post	**Practices and protocols** are in place to protect wild stocks from significant negative impacts of enhancement.	There is a **partial strategy** in place to protect wild stocks from significant negative impacts of enhancement.	There is a **comprehensive strategy** in place to protect wild stocks from significant negative impacts of enhancement.
	Met?	1. Oz. Sockeye - Yes 2. KK Pink – Yes 3. WK Pink - Yes 4. KK Chum – Yes 5. WK Chum - Yes 6. KK Coho – Yes	1. Oz. Sockeye - Yes 2. KK Pink – Yes 3. WK Pink - Yes 4. KK Chum – Yes 5. WK Chum - Yes 6. KK Coho – Yes	1. Oz. Sockeye - Yes 2. KK Pink – Yes 3. WK Pink - Yes 4. KK Chum – Yes 5. WK Chum - Yes 6. KK Coho – Yes
Rationale				
No hatchery enhancement of any salmon species occurs in unit of certification systems.				
b	**Management strategy evaluation**			
	Guide post	The practices and protocols in place are **considered likely** to be effective based on plausible argument.	There is **some objective basis for confidence** that the strategy is effective, based on	There is **clear evidence** that the comprehensive strategy is successfully protecting wild stocks from significant

			evidence that the strategy is achieving the outcome metrics used to define the minimum detrimental impacts.	detrimental impacts of enhancement.
	Met?	1. Oz. Sockeye - Yes 2. KK Pink – Yes 3. WK Pink - Yes 4. KK Chum – Yes 5. WK Chum - Yes 6. KK Coho – Yes	1. Oz. Sockeye - Yes 2. KK Pink – Yes 3. WK Pink - Yes 4. KK Chum – Yes 5. WK Chum - Yes 6. KK Coho – Yes	1. Oz. Sockeye - Yes 2. KK Pink – Yes 3. WK Pink - Yes 4. KK Chum – Yes 5. WK Chum - Yes 6. KK Coho – Yes
Rationale				
No hatchery enhancement of any salmon species occurs in unit of certification systems.				
References				

Draft scoring range and information gap indicator added at Announcement Comment Draft Report

Draft scoring range	All species ≥80
Information gap indicator	Information sufficient to score PI

Overall Performance Indicator scores added from Client and Peer Review Draft Report

Overall Performance Indicator score	1. Oz. Sockeye - 100 2. KK Pink – 100 3. WK Pink - 100 4. KK Chum – 100 5. WK Chum - 100 6. KK Coho – 100
Condition number (if relevant)	--

PI 1.3.3 – Enhancement information

PI 1.3.3		**Relevant information is collected and assessments are adequate to determine the effect of enhancement activities on wild stock(s)**		
Scoring Issue		SG 60	SG 80	SG 100
a	Information adequacy			
	Guide post	**Some** relevant information is available on the contribution of enhanced fish to the fishery harvest, total escapement (wild plus enhanced), and hatchery broodstock.	**Sufficient** relevant qualitative and quantitative information is available on the contribution of enhanced fish to the fishery harvest, total escapement (wild plus enhanced) and hatchery broodstock.	A **comprehensive range** of relevant quantitative information is available on the contribution of enhanced fish to the fishery harvest, total escapement (wild plus enhanced) and hatchery broodstock.
	Met?	1. Oz. Sockeye - Yes	1. Oz. Sockeye - Yes	1. Oz. Sockeye - Yes

		2. KK Pink – Yes 3. WK Pink - Yes 4. KK Chum – Yes 5. WK Chum - Yes 6. KK Coho – Yes	2. KK Pink – Yes 3. WK Pink - Yes 4. KK Chum – Yes 5. WK Chum - Yes 6. KK Coho – Yes	2. KK Pink – Yes 3. WK Pink - Yes 4. KK Chum – Yes 5. WK Chum - Yes 6. KK Coho – Yes
Rationale				
No hatchery enhancement of any salmon species occurs in unit of certification systems.				
b	**Use of information in assessment**			
	Guide post	The effect of enhancement activities on wild stock status, productivity and diversity are taken into account qualitatively.	A **moderate-level analysis** of relevant information is conducted and used by decision makers to quantitatively estimate the impact of enhancement activities on wild-stock status, productivity, and diversity.	A **comprehensive analysis** of relevant information is conducted and routinely used by decision makers to determine, with a high degree of certainty, the quantitative impact of enhancement activities on wild-stock status, productivity, and diversity.
	Met?	1. Oz. Sockeye - Yes 2. KK Pink – Yes 3. WK Pink - Yes 4. KK Chum – Yes 5. WK Chum - Yes 6. KK Coho – Yes	1. Oz. Sockeye - Yes 2. KK Pink – Yes 3. WK Pink - Yes 4. KK Chum – Yes 5. WK Chum - Yes 6. KK Coho – Yes	1. Oz. Sockeye - Yes 2. KK Pink – Yes 3. WK Pink - Yes 4. KK Chum – Yes 5. WK Chum - Yes 6. KK Coho – Yes
Rationale				
No hatchery enhancement of any salmon species occurs in unit of certification systems.				
References				

Draft scoring range and information gap indicator added at Announcement Comment Draft Report

Draft scoring range	All species ≥80
Information gap indicator	Information sufficient to score PI

Overall Performance Indicator scores added from Client and Peer Review Draft Report

Overall Performance Indicator score	1. Oz. Sockeye - 100 2. KK Pink – 100 3. WK Pink - 100 4. KK Chum – 100 5. WK Chum - 100 6. KK Coho – 100
Condition number (if relevant)	--

5.3 Principle 2

5.3.1 Principle 2 background

For the purposes of this assessment, primary species in the catch are defined as those not included under Principle 1 in the Unit of Assessment but subject to management tools and measures intended to achieve stock management objectives reflected in either target or limit reference points. MSC assessment criteria further distinguish Principle 2 species based on level of harvest. “Main species” constitute 5% or more of the catch by weight. There are also provisions for identifying a “main” primary species if there is concern that the fishery is having a negative impact on the stock status or if the volume of the fishery is very large. All other species are identified as “not main.” For the purposes of this assessment, all gears are combined for scoring purposes.

Primary species include non-target, managed species that are intercepted by the fishery during salmon harvesting activities.

- Coho salmon origination to Western Kamchatka subzone rivers are considered to be a minor primary species under P2 of this assessment. Coho are caught incidental to harvest of other salmon and also targeted by the fishery at the end of the fishing season. Coho comprise 3% of the harvest in by the fishing companies included in this assessment.
- Ozernaya sockeye, which are the primary focus of this fishery, are addressed under P1 of this assessment. Sockeye salmon spawning in other rivers of the Kamchatka-Kuril and subzone fishery management area are considered to be a separate unit of assessment due to differences in status, productivity and distribution from the Ozernaya River stock. Non-Ozernaya sockeye are considered to be a minor primary species in this fishery. Rivers of origin are almost entirely north of the fishery area and adult sockeye follow a north to south migratory pathway. In UoC areas north of the Opala, sockeye comprise just 1% of the catch on average.
- Chinook salmon are not subject to commercial fishing or sale but small numbers may occasionally be caught during early season fisheries in some rivers. Chinook Salmon are considered bycatch as current regulations prohibit retention. Chinook salmon are not considered a main primary species because this species is protected from commercial harvest, commercial seasons are scheduled to avoid Chinook run times, and incidental catch levels are very small.
- Primary species also include capelin, saffron cod (navaga) and rainbow smelt.

None of the primary species comprise more than 5% of the total salmon harvest in the UoA. Therefore, none are a main primary species.

Table 28. Scoring elements.

Component	Scoring elements	Designation	Data-deficient
Primary	Coho salmon (Western Kamchatka subzone)	Minor	No
Primary	Sockeye salmon (non-Ozernaya)	Minor	No
Primary	Chinook salmon	Minor	No
Primary	Saffron cod	Minor	No
Primary	Rainbow smelt	Minor	No
Primary	Capelin	Minor	No
Secondary	Chars	Minor	No
Secondary	Flatfish spp.	Minor	No

Primary Species

Coho Salmon (Western Kamchatka subzone)

See P1 descriptions

Chinook Salmon

Chinook salmon (*Oncorhynchus tshawytscha*) are considered bycatch as current regulations prohibit retention. Chinook salmon are not targeted by the commercial fishery and their spawning migration is earlier than the target species (Bugaev et al. 2019a).

Distribution - Chinook salmon production in Asia is primarily limited to the Kamchatka peninsula, where significant populations may be found in large rivers of the western and eastern coasts. The bulk of the Chinook salmon reproduction occurs on the eastern coast of the peninsula in the basin of the Kamchatka River (KamchatNIRO 2017). On the west coast of Kamchatka, Chinook salmon may be found in the Palana, Tigil, Khairyuzovo, Icha, Oblukovina, Krutogorova, Bolshaya, Kolpakova, Vorovskaya, Kikhchik, and Opala rivers (MRAG 2016). Chinook Salmon habitat is very limited in the Ozernaya River and is insufficient to support a significant population.

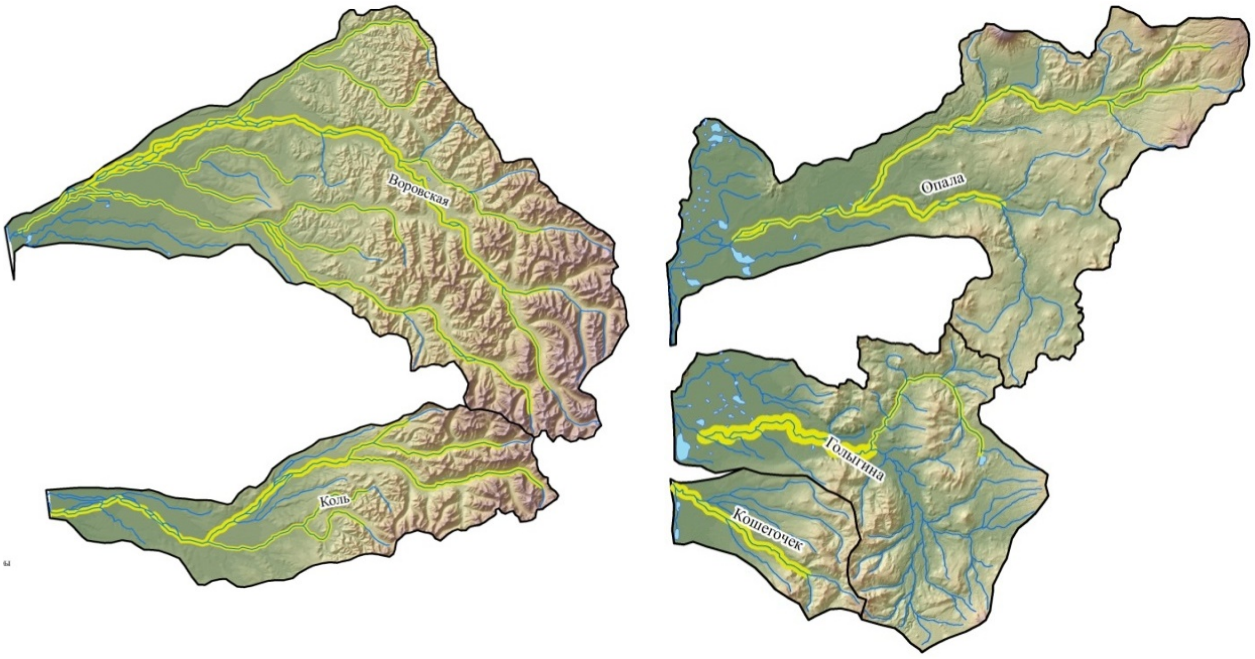


Figure 68. Spawning distribution of Chinook Salmon in the Vorovskaya, Kol, Opala, Golygina and Koshegochek rivers (Shevlyakov et al. 2016).

Life History - West Kamchatka Chinook typically average 6 – 10 kg in size but may reach 20 to 30 kg. Adults typically return to spawn at 3 to 5 years of age after 2 to 4 years at sea. Predominate ages are 1.3, 1.4 and 1.2 (MRAG 2016). Age composition has shifted since the 1990s with fewer older fish (5+ 6+) in the run. Spawning occurs in large rivers and streams. Chinook return to freshwater from May through July and spawn in July and August. Juvenile Chinook generally rear in streams for one year but some individuals may spend from a few months to three years before emigrating substocks of Chinook salmon have not been identified within West Kamchatka rivers. Average size is typically greater in the early portion of the run because the portion of females in catches is larger, and size-weight indicators of females are usually higher in comparison with males.

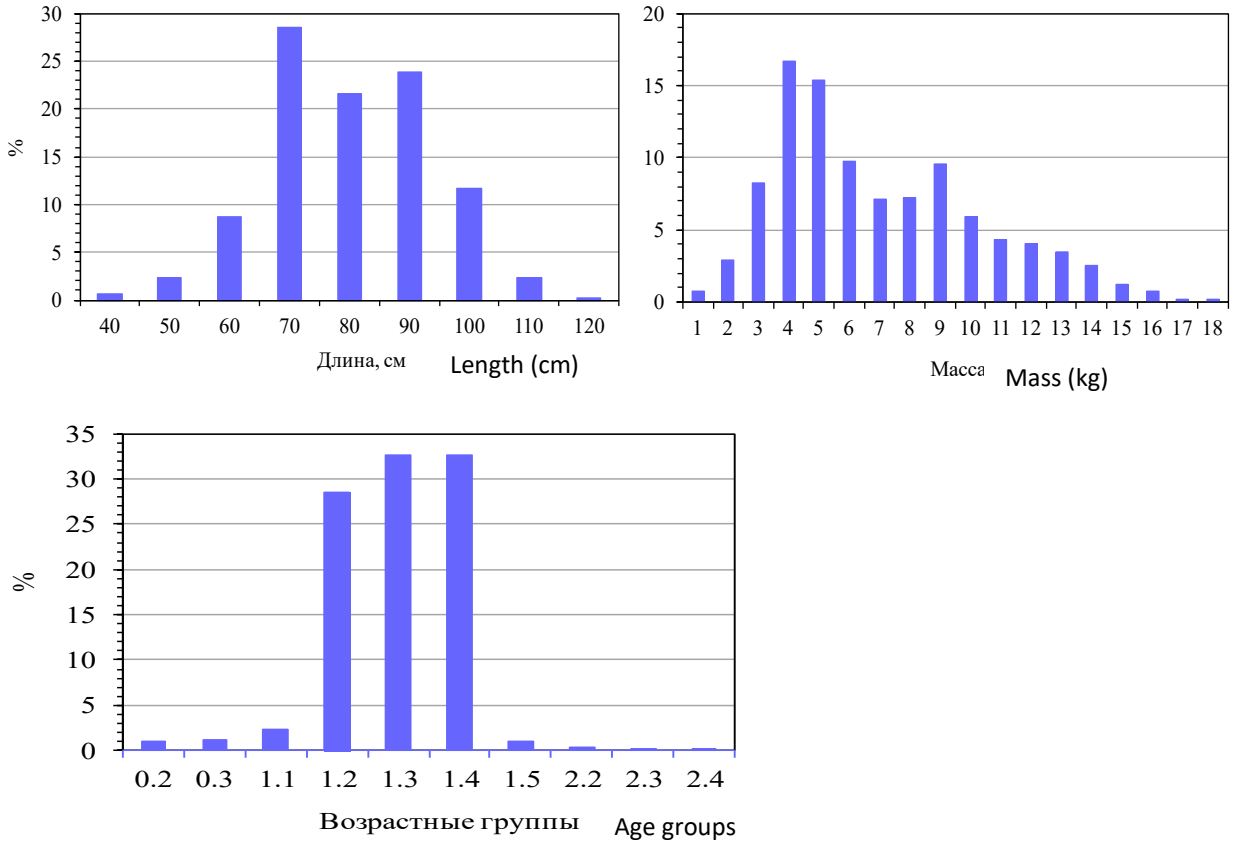


Figure 69. Length, weight and age composition of Chinook spawners in rivers Vorovskaya, Kol and Opala, 2001-2015 (Shevlyakov et al. 2016).

Status - Chinook numbers have rebounded from low levels observed during the early 2000s. Harvest data from the UoA is not available. In other rivers of West Kamchatka, Chinook harvest peaked during the 1970s and then declined (Figure 69, Figure 70) until the recent improvements (Figure 71, Figure 72). Similar patterns have been observed for Chinook salmon stocks throughout the North Pacific and are related in part to patterns of ocean productivity. In Kamchatka, declines were also exacerbated by commercial and illegal harvest in some areas (e.g. Bolshaya River). More conservative fishery management and reductions in illegal harvest have contributed to improvements. Chinook are a very minor component of the UoA fishery, as commercial fishing for Chinook salmon is closed.

Escapement of Chinook is assessed based on aerial surveys of representative spawning areas. Optimum spawning escapements have been identified based on historical production data. Rebounds in Chinook returns and reductions in harvest have restored escapement to optimum near-optimum levels in some rivers but not others. However, it should also be recognized that historical optimums may be difficult to achieve under conditions of reduced ocean productivity for Chinook.

Since 2010 commercial fishing for Chinook Salmon has been closed in the fishery area. Industrial fishing of Chinook salmon was also significantly reduced in recent years prior to 2010, and in some years (2000, 2006, 2008) it was totally absent. Chinook run timing occurs prior to the beginning of current commercial fishing seasons which are established to minimize Chinook harvest. Even minimal occurrence of Chinook in the catches may result in closure of a fishing area. Chinook salmon are currently reserved for sports and traditional fishing. The sport fishery is very popular. Allocations are small.

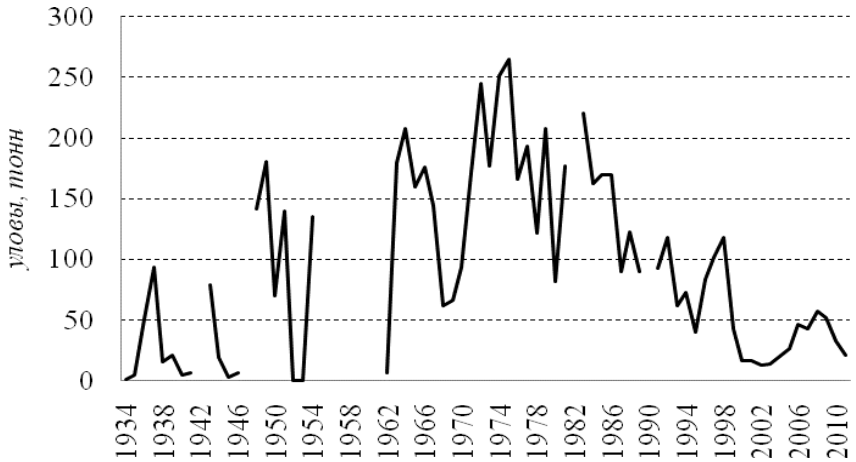


Figure 70. Chinook salmon catch (tons) Bolshaya River commercial fisheries, 1933-2010 (Shevlyakov et al. 2014).

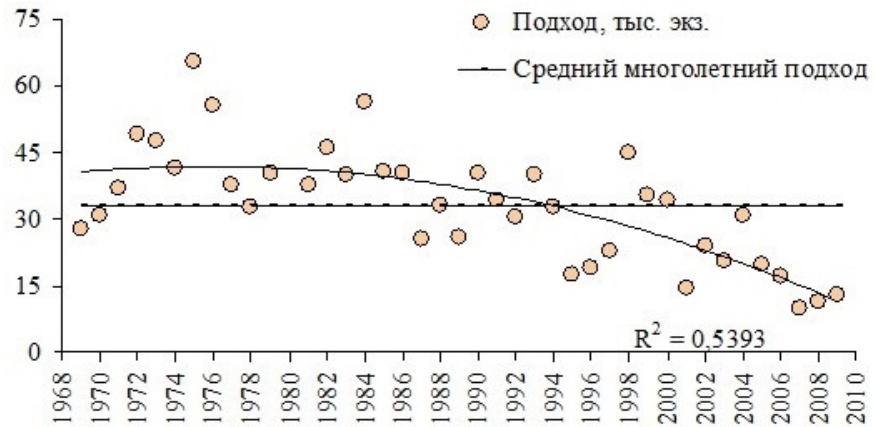


Figure 71. Run size of Chinook salmon to the Vorovskaya River in 1969-2009 (brown points and trend line) relative to the long-term average (horizontal line) of approximately 35,000 (Shevlyakov et al. 2014).

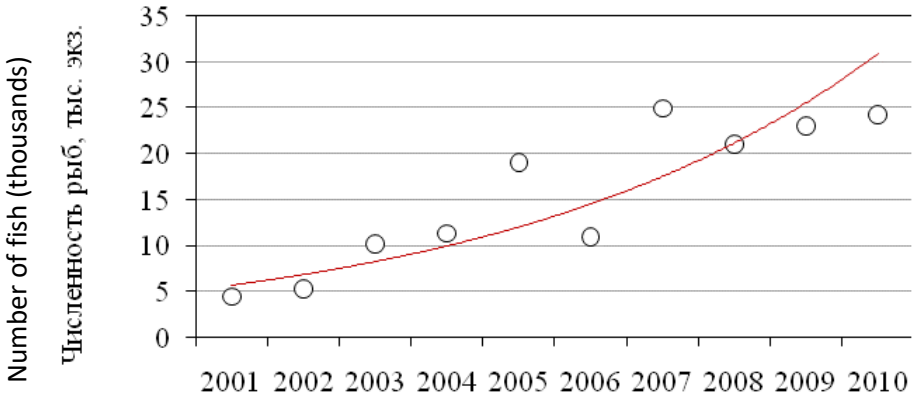


Figure 72. Recent escapement trends of Chinook Salmon in the Vorovskaya, Kol and Opala rivers (Shevlyakov et al. 2016).

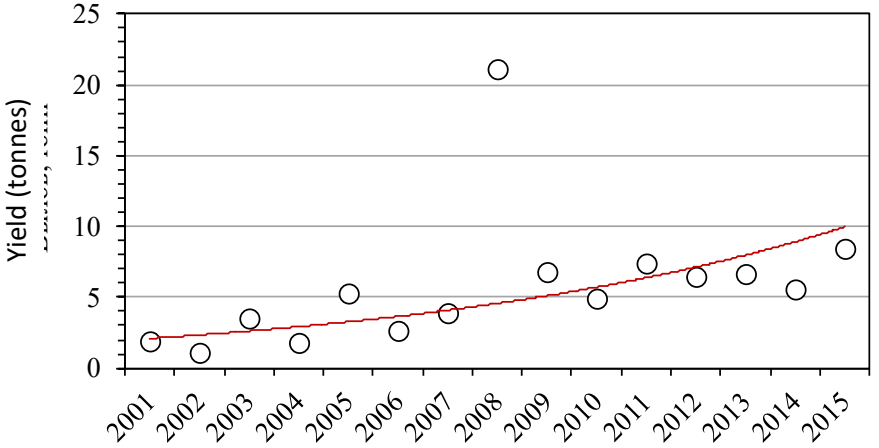


Figure 73. Recent yield trends of Chinook Salmon in the Vorovskaya, Kol and Opala rivers (Shevlyakov et al. 2016).

Table 29. Optimum and long-term average spawning escapements for Chinook in west Kamchatka Rivers (Shevlyakov et al. 2014, 2016).

River	Optimum	Avg. escapement
Vorovskaya	8,000 – 12,000	4,500
Kol	na	2,000
Kikhchik	3,000 - 5,000	Na
Bolshaya	20,000 – 30,000	< optimum
Opala	5,000 - 7,500	6,000
Golygina	na	1,000
Kochegochek	--	200
Ozernaya	--	200

na = not available

Sockeye Salmon (non-Ozernaya)

See P1 descriptions

Saffron Cod (navaga)

Saffron cod (*Eleginus gracilis*) are occasionally caught early during the beginning or end of salmon fishing season. This species spans the North Pacific, from Korea and the Sea of Okhotsk in the west to the northern Gulf of Alaska and eastern Banks Island in the east. It normally occurs in shallow coastal waters at less than 60 m depth but may also be found at depths up to 200 m. Saffron cod may also enter brackish and even fresh waters, occurring quite far up rivers and streams, but remaining within regions of tidal influence. Saffron cod begin to mature during their third year of life. They feed on fish and small crustaceans. They are commercially fished in many areas of the northwestern Pacific. The country with the largest catch is Russia. It is used for human consumption in the Russian Federation and Japan, fresh or frozen.

Saffron cod can be harvested as bycatch in commercial fisheries in West Kamchatka. Over the past seven years (2011-2017), the average saffron cod catch in West Kamchatka was 15.2 thousand mt (Bugaev et al. 2019a). Intensive fishing of saffron cod can occur outside of the salmon fishing season in other fisheries. In West Kamchatka in 2017, the catch of saffron cod peaked before the salmon fishing season began, from April to June, when 58.6% of the total annual catch was harvested (Bugaev et al. 2019a).

Spawning stock abundance is dependent on food availability. Recent fishery catch data suggest that the stock abundance in the West Kamchatka is high. According to the results of the bottom survey performed in 2017, the total stock of saffron cod is estimated at 156,586 mt, with an estimated abundance of about 82,990 mt in the Kamchatka-Kuril subzone and 73,595 mt in West Kamchatka. The majority of catch was harvested by companies outside of the UoC (Bugaev et al. 2019a). Saffron cod is mainly caught outside of the salmon fishing season, and catch of saffron cod during the salmon fishing season is well below 5% of the total catch; therefore, saffron cod is considered a minor primary species.

Rainbow smelt

Rainbow smelt (*Osmerus mordax*) is an anadromous species that ranges in the North Atlantic, Arctic and North Pacific drainages including Alaska and Russia. Rainbow smelt reproduce in the far Eastern seas of Russia. Rainbow smelt is harvested both in the sea plots and in the river plots associated with the salmon fishery. According to a bottom trawl survey conducted by “TINRO” in 2016-2017, the total population and

biomass of rainbow smelt in the West Kamchatka shelf was estimated to be 25.8 thousand mt, with 18.1 thousand mt (70%) of the biomass in West Kamchatka. KamchatNIRO's analysis found that biological indicators and age structure of rainbow smelt have been stable in West Kamchatka over the past 6 years (Bugaev et al. 2019a). Rainbow smelt comprise far less than 5% of the total catch in the salmon fishery and are considered a minor primary species.

Capelin

Capelin (*Mallotus villosus*) may be caught as bycatch in the salmon fishery, and are also the target of a separate fishery, which takes place mainly before the salmon fishing season gets underway. Capelin reproduce from late May to early July, with a peak in mid-June. In West Kamchatka, the beginning of spawning and active spawning is shifted to later dates, by about a week.

Capelin are managed with recommended catch levels. Historically, the catch has been well below the recommended catch level, due to low demand. In 2016, however, market conditions led to greatly increased demand for capelin, and the catch increased dramatically, slightly exceeding the recommended catch level for that year.

According to aerial survey results, the stock abundance of capelin in West Kamchatka varied from 8.3 thousand mt (1999) to 229.2 thousand mt (1998). The stock abundance was estimated at 13.1 thousand mt in 2016, but this is believed to be a significant underestimate because the survey took place after the spawning peak. The commercial spawning stock is predicted to reach about 25 thousand mt in 2019 (Bugaev et al. 2019a). Capelin is mainly caught outside of the salmon fishing season, and catch of capelin during the salmon fishing season is likely well below 5% of the total catch; therefore, capelin is considered a minor primary species.

Secondary Species

For the purposes of this assessment, secondary species in the catch are defined as those not included under Principle 1 in the Unit of Assessment and not identified as primary. These include both retained and nonretained catch. Retained secondary species in this fishery predominately include char, which are harvested in significant numbers for commercial use. Non-retained catch includes a variety of species, none of which comprise a significant volume of catch. There are no main secondary species.

Retained species include those which provide a commercial value significant enough to warrant processing and sale (and thus an economic incentive for capture). All retained fish delivered to the plants for processing and sale are weighed and numbers are reported to the management agencies. Information about retained species is collected by fisheries inspection and research institute.

Other species that are not typically processed for commercial value are treated as bycatch. Bycatch of non-retained species comprises a negligible portion of the harvest in the fishery. Due to the very low percentage of bycatch relative to the total fishery, no 'main' bycatch species are identified. Bycatch can also include a variety of unmanaged marine and freshwater species including sculpins (Cottidae) and jellyfish (Blikshteyn 2011; Semanov et al. 2016).

Trap nets and seines employed in this fishery generally keep the entire catch of all target and non-target species alive until it gets loaded into boats or trucks for delivery to the processor. Small numbers of small-sized bycatch species might become gilled in net. Some sorting of bycatch may occur at the fishing sites and some bycatch may be delivered to fish processing plants along with the target species. Fishers don't typically handle fish directly as the catch is dipped or brailed from the trap or seine; however, an attempt is made to remove bycatch species as the catch is removed from the nets. Fishers might brail only

commercially-important species, while leaving more bottom-oriented bycatch species (like flatfish) behind until they are ready to empty the net completely. If discarded, flatfish and cottids probably stay alive because they are very resistant to handling.

Bycatch species delivered to the processing plants are sorted from the retained catch at the start of the processing lines. Amounts typically do not exceed 15 or 20 kg per delivery. Any non-target species delivered to the plants are generally processed for fish meal along with heads and guts of the commercial catch. There is a large market for fish meal in Russia.

Because of its low volume, bycatch is not assessed by the fishery or the management system. There is no official reporting of bycatch such as cod, flounder, silver smelt and birds in these fisheries (Shevlyakov 2014). Bycatch species are reported to be abundant throughout the region and fishery managers do not consider harvest levels to significantly affect these species. Bycatch assessments in other similar salmon fisheries in the Russian Far East, including Iturup, Sakhalin Island, and Ozernaya sockeye, have found similarly low levels of bycatch. For instance, a quantitative bycatch sampling program conducted in 2011 for the Ozernaya sockeye fishery (Blikshteyn 2011) found that by weight, bycatch numbers comprised a negligible percentage of the total harvest consisting of tons of retained species. Fisheries managers consider incidental levels of harvest in salmon fisheries to pose no danger to bycatch species (Shevlyakov et al. 2016).

Commercial catch of char was found to comprise about <2% of the total catch in the UoA, on average, from 2014-2017. Char is not considered highly vulnerable and does not meet the threshold to be considered a “main” secondary species. No specific information on other secondary species in this fishery was available, but KamchatNIRO indicates that bycatch of flounder and cod is small (Bugaev et al. 2019a). It is highly unlikely that the catch of any of the secondary species accounts for 5% or more of the total catch. Therefore, there are no “main” secondary species for the purposes of this assessment.

By-catch assessments in other similar salmon fisheries in the Russian Far East, including Iturup, Sakhalin Island, and Ozernaya sockeye, have found similarly low levels of by-catch. For instance, a quantitative bycatch sampling program conducted in 2011 for the Ozernaya Sockeye fishery (Blikshteyn 2011) found that by weight, by-catch numbers comprised a negligible percentage of the total harvest consisting of tons of retained species.

Table 30. Bycatch reported (number by species) for marine and river fishing site samples at the Vityaz-Avto Ozernaya processing plant (taken from MRAG 2012).

	Fishing area		Totals	
Species	**Marine**	**River**	**Number**	**%**
Number of net days	38	13	51	
Starry flounder (*Platichthys stellatus*)	364	106	470	84.2%
Japanese sandfish (*Arctoscopus japonicas*)	69	14	83	14.9%
Sculpin (*Melletes papilio*)	2	0	2	0.4%
Rock sole *(Lepidopsetta bilineata)*	0	1	1	0.2%
Longhead dab (*Limanda proboscidea*)	0	2	2	0.4%
Fish/sample	11.4	9.5	10.9	

Char

Char are widely distributed and abundant throughout the Kamchatka region. Char abundance throughout the region is believed to be increasing. Life history of these species is diverse and includes anadromous

and resident individuals. Char generally move upstream following the coho during late summer and return back downstream along with the juvenile salmon outmigration in spring.

Two species of char – Dolly varden (*Salvelinus malma*) and white-spotted char (*S. leucomaensis*) – are caught as bycatch during salmon fishing, retained and sold. Target commercial char fisheries also occur in some areas. Char catch as a percentage of total harvest during salmon seasons varies from year to year, due to differences in pink salmon abundance in even vs odd years, and from river to river. Chars comprise less than 2% of the catch on average in the UoA, hence are classified as minor secondary species. Previous assessments of West Kamchatka fisheries also classified chars as minor secondary species (MRAG 2016, 2018).

Harvest levels are established for char by the management system based on historical catch levels, i.e. some elements of management of this species is presented, but research supporting this management is not as comprehensive as for Pacific salmon. Fishery independent information on stock status of char is not collected (Shevlyakov et al. 2017). The total commercial harvest of char is typically 70-80% of recommended catch during salmon season. Harvest rates are typically much less in alternate years when large abundance of pink salmon results in less fishing effort due to limitations in fish processing capacity. Recent increases in commercial harvest of char are likely a result of more accurate catch reporting since management system changes in 2008 rather than an expansion of fishing effort. Char are not managed for specific stock levels or escapement objectives. Rather, catch levels and age composition are monitored over time to identify any changes in numbers which might be indicative of overfishing (Shevlyakov et al. 2016). Trends in these indicators have been observed to generally fluctuate around long-term averages, which have led KamchatNIRO to conclude that current harvest levels and fishing rates are sustainable (Shevlyakov et al. 2016).

Char are included in the official quota system for regional catch. Generally, the two species are not recorded individually, but both appear in the fishery statistics under the common name char. The majority of the catch reported as “char” is *S. malma* (Bugaev et al. 2019a).

According to KamchatNIRO, abundance of char varies in both 30-year and 6-year cycles. Abundance on the west coast of Kamchatka is experiencing a longer-term increasing trend, and catches increased until 2015, though populations may be experiencing a short-term decline since 2016. In general, abundance is thought to reflect oceanographic conditions, which have been favorable for *S. malma* in recent years, contributing to their stock increase (Bugaev et al. 2019a).

Char can be harvested in rivers year-round, but winter fishing is poorly developed, and the resource is under-utilized in some places due to inaccessibility of transport. On the west coast of Kamchatka, the Icha, Kolpakova, Oblukovina, Kol, Pymta, Kikhchik, Ozernaya, and Opala rivers have the most productive char stocks (Tiller 2007; Bugaev et al 2018). KamchatNIRO’s scientific analysis has found that char in West Kamchatka maintains a stable size-age structure, which indicates the stock is stable in this region (Bugaev et al. 2019a).

Harvest of char in West Kamchatka has averaged 851 mt in West Kamchatka from 2009-2018. The annual catch ranged from a low of 292.5 mt in 2018 to a high of 1444.8 mt in 2015 (Figure 75). Char is harvested both in the sea and river plots.

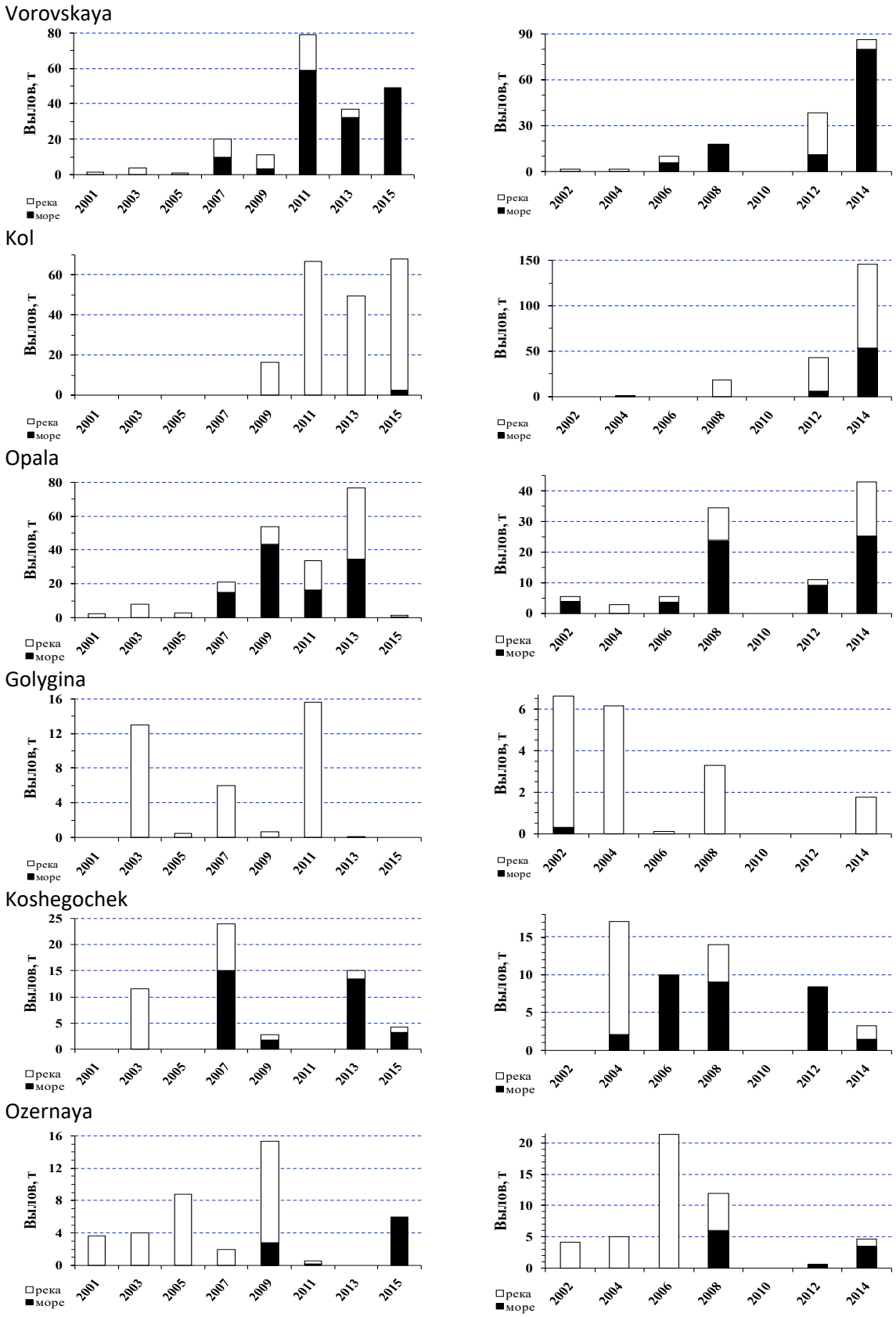


Figure 74. Odd and even year char commercial harvest by area (river harvest = white, sea harvest = black)

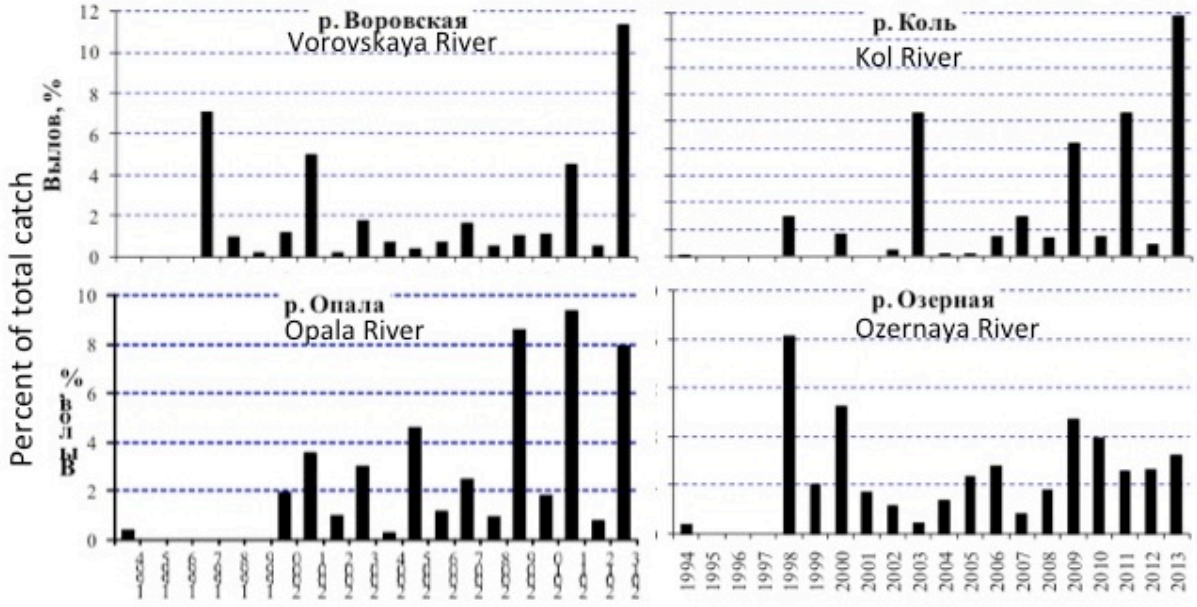


Figure 75. Char catch as a percent of the total commercial catch in the Vorovskaya, Kol, Opala, and Ozernaya Rivers, 1994 to 2013. Char catch data was not available for every year and river.

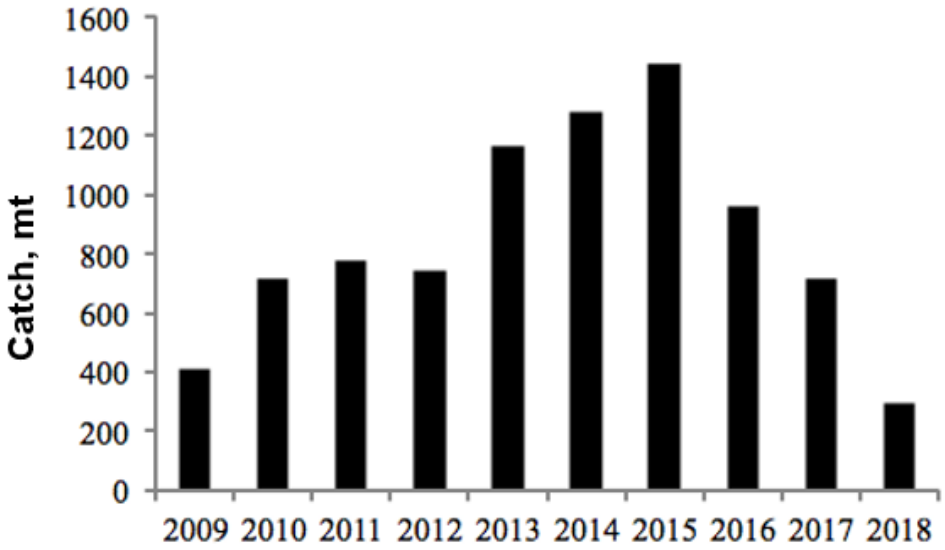


Figure 76. Annual char catch in the West Kamchatka in 2009-2018 (Bugaev et al. 2019a).

Masu Salmon

Although Masu (cherry) Salmon (*Oncorhynchus masu*) are not caught in significant numbers, this assessment reviewed the available information for West Kamchatka as status of this species is sensitive in other parts of this range. Masu Salmon occur in some southern Kamchatka streams which represent the northern distribution of their range. The Kikhchik, Bolshaya, and Opala rivers all support small populations of Masu Salmon. Adults typically return to freshwater from March through May at three or four years of age and spend the summer in freshwater before moving to headwaters to spawn in September and October (Groot and Margolis 1991). In western Kamchatka streams, adults average about 46 cm in length and 1.4 kg in weight. Fecundity averages about 2,200 eggs. Spawning occurs primarily in groundwater and spring fed streams or brooks. Adults feed actively while in freshwater. Juveniles typically

rear in freshwater for one year before smoltification and seaward migration in the spring and early summer.

Masu salmon abundance has increased substantially in recent years, apparently due to favorable environmental conditions (Shevlyakov et al. 2016). Due to their early run timing, Masu Salmon do not occur in the commercial fishery in significant numbers. Closure dates for Chinook also protect the Masu spawning migration. With the recent increase in abundance, small quantities have been allocated for the research purposes and sport pole-and-line fishing.

ETP Species

For the purposes of this assessment, endangered, threatened, or protected species are those that are recognized by national legislation, binding international agreements (e.g., CITES) to which jurisdictions controlling the fishery under assessment are party, or 'out-of-scope' species (amphibians, reptiles, birds and mammals) that are listed in the IUCN Red List as vulnerable (VU), endangered (EN) or critically endangered (CE). In this case, national legislation provides for protection of ETP species identified in the Russian Federation Red Data Book, also known simply as the Red Book. The Red Book is based largely on the International Union for Protection of Nature and Natural Resources (IUCN), which formally designates protected species subject to enhanced regulatory protection. Related natural conservation legislation was adopted in the 1980s-1990s including laws for protection of natural environment and fauna, natural (wildlife) areas under special protection, and ecological expertise along with a number of various decrees by the Russian Federation Government. These regulations established conservation priorities for the Red Book's rare fauna and flora species and liabilities for damage inflicted to the species and their habitats.

Steelhead (*Oncorhynchus mykiss*) are red-listed in Kamchatka. There is one red-listed species of marine mammal in this area, the Steller sea lion (*Eumetopias jubatus*). Another seal species, harbor seal (*Phoca vitulina*) is quite common and is not included in the Red List. One red-listed bird species, the Steller sea eagle (*Haliaeetus pelagicus*), is present. Although no ongoing observer program exists for the fisheries, federal scientists, managers, and inspectors regularly visit the fishing sites and processing plants throughout the season. Over the course of the many years of fishing operations, none of these species is observed to have adverse impacts from the fishery. The fishing authorities have determined that the fishery has such low impacts that it needs no specific data collections on interactions with ETP species.

<u>Steelhead</u>

Steelhead are a sea-run form of rainbow trout present in large rivers of West Kamchatka. Both resident and sea run life histories occur in the same systems, and are demographically and genetically related. Steelhead may reach 10-12 kg in size but are typically half that. Kamchatka steelhead enter rivers in September-November, i.e., later than main fishing season of Pacific salmon. Steelhead spawn in May and June after overwintering in freshwater. Spawning may be broadly distributed in rivers and streams. Unlike salmon, not all steelhead adults die after spawning. Adults typically may reach twelve years of age and spawn repeatedly over their lifespan. Juvenile steelhead may rear in streams for one to several years before emigrating.

Catch of any Red listed species in Russia is prohibited and they must be immediately released if caught. Steelhead are also largely protected from significant catch in the commercial salmon fishery by season dates. Run timing of adults in fall is outside the period of the fishery. Emigration timing of adults and juveniles is prior to beginning of the fishing season.

KamchatNIRO (Shevlyakov 2015, unpublished) reports:

> *According to the Russian classification rainbow trout is not a species of the Oncorhynchus and belongs to the Parasalmo. In spite the fact that in the recent past Russian researchers have proved that Kamchatka salmon \mikizha and Atlantic salmon\ Salmo salar are the (landlocked\living and passing) forms of the same species - P. mykiss, only anadromous form has the status of endangered species. The ratio of landlocked and anadromous forms of mikizha is determined by the capacity of the watercourse, by the development of hydro network, by the presence of comfortable habitats for the landlocked form. The southern border of Salmo salar distribution is The Bolshaya River. Quite a large population of mikizha landlocked form is in The Opala River, however, neither the documentary facts on its passing form catch nor oral statements have been recorded. Salmo salar main spawning run in the rivers is in late September - early October (winter form), and in April-May (spring form). Neither in the first case nor in the second one there is no official fishing at these periods of time. In late September, salmon commercial fishing on the West coast is finished because of spawning run end of silver\Coho Salmon, and also due to the beginning of Salmo salar spawning. In spring there is a limited fishing of Pink\char in rivers during its escapement to the sea for feeding; the mesh size of used nets is 30 mm, fishing locations are in the lower parts of the rivers on salmon fishing parcels. These limits are designed to eliminate the possibility of Salmo salar bycatch during the fishing of the other species.*

Marine Mammals

Information on population abundance of Kamchatka marine mammals is well documented in the scientific literature (Burkanov 1986, 1988; Lagerev 1988; Kosygin et al. 1986). Steller sea lions are included in the Red book of Kamchatka (2006), and hunting of this species is illegal. This species inhabits the coast of West Kamchatka year-round, but its distribution and number changes seasonally. Approximately 2,500 sea lions gather in a rookery on Sivuchiy Cape during winter before dispersing generally northward during spring and summer. Small groups or individual sea lions are occasionally observed in the fishing area in summer. Sea lions sometimes enter the trap or fish well where they feed on fish. Large males sometimes damage nets to get at salmon. In Russia, the major Steller Sea Lion rookeries were protected under a Northern Fur Seal and Sea Otter conservation act in the late 1950s. They were listed as endangered (category 2) in the Russian Red Data Book in 1994 and harvest was prohibited. These measures had a positive effect in the western portion of the range as the population increased around Sakhalin Island, the Kuril Islands, and in the northern Sea of Okhotsk. Take of sea lions is illegal as it is a protected species.

Other seals are abundant in the area and frequently observed around the marine trapnets. The most numerous species in the Russian Far East is spotted seal or larga. A number of researchers consider that harbor seal (*Phoca vitulina*) in the Russian Far East is represented by subspecies called *P. vitulina largha*, but others consider them as a separate species *P. largha*. This species is found in local waters year-round. Large numbers gather in rookeries along the western coast of Kamchatka from February until mid-March. These seals concentrate near estuaries and capes to feed almost exclusively in salmon during salmon spawning runs. The only sea mammal that regularly interact with the set nets is larga (seal) (Bugaev and Zikunova 2021c). These seals constantly enter marine net traps, eat or damage fish, and then freely leave the nets. Often, animals do not even eat fish, but only bite it, injuring it and reducing its commercial value. According to KamchatNIRO employees, there was not a single case of natural mortality of seals from falling into the nets. Beach seines do not normally encounter marine mammals. Incidental take of these seals or sea lions by tangling in gear has not been observed due to the nature of the gear.

Seals may be hunted with the proper license but the harvest allocation is considerably underused because of degradation of hunting infrastructure. Licenses can be obtained for commercial harvest but have not by the assessment companies. Seals are regarded as a nuisance by fishers. Bugaev and Zikunova (2021c) do not exclude the possibility of fishermen shooting especially active animals, but these actions are illegal, therefore potential incidents do not appear in official statistics. KamchatNIRO scientists report that in the past, prior to adoption by Vityaz-Avto of a company policy prohibiting firearms on boats, fishermen drove off seals from nets. The available information indicates that this occurred at a low level, was not systematic, and fishermen generally complied with the law.

Other marine animals present in the area include killer whales and white whales. There was no mention by government officials or fishing industry representatives of other sea mammals captured or killed by the gears. The nature of the fixed trap net gear substantially reduces opportunities for encounters with marine mammals. Beach seines and gill nets do not normally encounter or affect marine mammals.

Birds

One red listed bird species, Steller sea eagle (*Haliaeetus pelagicus*) depends on Pacific salmon as an important food item. Steller sea eagle feeds on various animals such as aquatic birds, small mammals, marine invertebrates, but mostly they prey on Pacific salmon. They feed both on live fish and dead fish. Some other birds and mammals feed on the remains from fish killed by Steller sea eagle. In a whole, the population of this species is stable, but it is considered that nesting gathering in the mouth of the Kamchatka River is under threat because of declines of salmon stocks in this area (Red list of Kamchatka, 2006).

Another related species, *H. albicilla*, white-tail eagle, also depends on salmon as a food source. Similarly, with the previous Steller sea eagle, the population is quite stable in general. Some other birds of prey, such as the bald eagle (*H. leucocephalus*) and golden eagle (*Aquila chrysaetos*), also depend on salmon in their feeding, but to a lesser extent than the aforementioned species. As they are distributed throughout Kamchatka, they also may be less affected by local declines of salmon.

Bugaev and Zikunova (2021c) report that bycatch of seabirds in the fishery is negligible. In the river fishing plots, salmon is harvested by rafting of beach seines. However, the whole operation usually takes about 1 hour and constant noise from motor boats and people scare birds away. Plus, typically seabirds do not hunt in rivers. By-catch of birds also does not occur in set nets, as the standard mesh size is about 20–25 mm. This is a very noticeable obstacle that scares away birds.

Management

The Ministry of Natural Resources and Ecology is responsible for managing sensitive species. The Red list of Russian Federation is regularly updated. Leading experts are involved in the updating of the Red List. Including of a species in the Red List not only certifies its official status, but also provides the necessary basis for management decisions. Species included on the Red List are subdivided into the following categories: 0 – probably extinct, 1 – under threat of extinction, 2 – decrease of abundance, 3 – rare, 4 – status is unclear, 5 – recovering. Based on the Law of the Russian Federation “On animal world”, all the red listed species are protected regardless of the categories they belong to. If they are accidentally caught in fishing gear, they should be recorded in logbooks and released with minimal possible damage.

Organizationally, the Red List is under responsibility of the Commission on rare and endangered animals, plants and fungi, which is created and operates in accordance with the procedure approved by Order of State Committee on Ecology of the Russian Federation from 24.09.1998 № 542 "On the maintenance work on keeping the Red Book of the Russian Federation." The Commission includes representatives of leading

Russian scientific organizations, including the Institute of Ecology and Evolution of the Russian Academy of Sciences named by A.N. Severtsov and the State Organization "All-Russian Research Institute for Nature Conservation" The functions of this Commission is to provide recommendations on including endangered species in the Red Book of the Russian Federation or the exclusion of species (subspecies, populations) of wild animals, wild plants and fungi from the Red Book of the Russian Federation. Each region in Russia (oblast, autonomous republic) has its own Red lists. Red list of Kamchatka was prepared by Pacific Institute of Geography and published in 2007. In total, it includes 123 species of animals – 13-invertebrates, 30 fish species, 60 birds and 23 terrestrial and marine mammals.

Habitats

Condition

The footprint and scale of human development in West Kamchatka is very small and impacts on watershed and river habitats and functions are very limited. Human habitation is concentrated in only a few sites. Alterations of these sites may be substantial but impacts appeared to be quite localized. Similarly, road construction was very limited in the basins and related habitat effects appeared minor relative to the scale of the watershed and impacts were likely localized to a few areas. Coastal habitats are shaped entirely by natural processes rather than human activities.

Fishing activities with traps, seines and gill nets do not have a significant long-term impact on habitat. Any effects of stationary trap construction or operation are localized and temporary. The traps are anchored to the sea bottom with large bags full of sand. Permits are required to dig. Net leads and wings are weighted to rest on the bottom but trap boxes constructed on steel frames are constructed on floats and do not contact the bottom where mechanical damage to benthic organisms might occur. KamchatNIRO scientists report no harmful effect on bottom flora or fauna. Assessments of this gear in other regions (i.e., Iturup and Sakhalin) have also shown minimal impacts. There is a special agency, State Sanitary-epidemiological inspection that monitors whether the fishery affects the fishing operation zone. In a case of violations, it is a usual practice to levy fines on the company.

Beach seines used in the river and estuary may be dragged along the bottom but any impact is minor and temporary. The river bottom is comprised of gravel and cobble which is regularly redistributed by floods.

Discharge of fish waste from processing plants is limited to liquids because offal is processed into fish meal. This liquid is discharged to the ocean by permit and a fee is paid to the government for discharge. The government also monitors quality of the discharge. As part of plant reconstruction, the fishing companies have acquired new equipment to also make fish oil which will further reduce discharge as well as discharge license fees. Fish by-products from more remote processing sites (e.g., Kikhchik) are placed in special areas designated by the government administration.

Beach travel by vehicle from some rivers for delivery of fish to processing facilities involves crossing of several rivers for which the government assesses fees to compensate for any related environmental damage. Fees are paid to SVTU and utilized by hatcheries.

Environmental Protection

Protection of the salmon habitat is achieved through observance of the current laws of the Russian Federation. Any type of utilization either of natural resources directly or that impacts them indirectly, including fisheries, water and timber utilization, construction, etc., must be evaluated as to the extent of impact on the environment. The evaluation itself is performed by an expert commission having state ecological expertise, and the main federal agency responsible for conducting the state ecological expert

review is the Rosprirodnadzor. In addition, activity related to natural utilization that has already been permitted is regulated to the extent to which it impacts the environment by a series of standards documents at the federal, departmental and local levels.

For the protection of fish habitat within the area of its competence, responsibility is borne by the Rosprirodnadzor under Ministry of Natural Resources and Ecology of Russian Federation, and the Federal Ecological, Technological and Atomic Oversight Service (Rostekhnadzor), the Agency of Fisheries of Russian Federation, and local governments of the territorial subjects of the Russian Federation. The Natural Protection Prosecutor's Office of the Russian Federation is responsible for enforcing laws relating to natural utilization.

Building/construction projects are regulated by a governmental agency (Rospotrebnadzor Sanitation Service) which requires completion of an environmental Impact Study (EIS) prior to approval of a project permit. Projects are monitored and can be delayed by the service if the builder does not fulfil the requirements. Assessments address discharges, disposal, drainage, soil pollution, the burial of wastes in the environment, accidents and catastrophes. The EIS includes a project description, descriptions of the environments subject to impact, and a characterization of the extent of the impact (based on a worst-case maximum), including a determination of the subsequent value of the losses, the form of compensation both in kind and in monetary terms, and development of the engineering for loss compensation. Also included are descriptions of the extent to which the conditions for land use and the requirements issued by the respective government agencies of supervision and control have been followed, a study of the risks associated with possible accidents, as well as the adequacy of the anticipated material resources and financial reserves to localize and eliminate the effects of accidents, and a study of the fullness and effectiveness of the anticipated measures for protecting the health of the population living in the surroundings of the environmental area. Decisions adopted must conform to the laws and standards of the Russian Federation and the Kamchatsky Kray.

The main indicator of success with respect to actions aimed at protecting fish (salmon) habitat is the record size of the harvests of Pacific salmon. It should be noted, however, that other factors such as sea conditions also impact to stock abundance and therefore catches.

Ecosystem Structure and Function

The salmon life cycle encompasses a vast ecosystem including natal rivers and lakes, the near-shore ocean, and the high seas of the North Pacific Ocean. Salmon migrate across large areas of the North Pacific Ocean which provides major feeding habitats for various salmon stocks originating from Asia and North America (Myers et al. 2009; Urawa et al. 2009). Juveniles gain over 90% of their biomass in the ocean before returning to freshwater to spawn (Groot and Margolis 1991). Ecosystem effects of salmon harvest and enhancement can be significant.

Marine-derived nutrients from salmon carcasses can have a significant impact on freshwater and riparian communities. The flux of salmon biomass entering fresh water from the ocean can be massive (Gende et al. 2002; Schindler et al., 2003). It is known that these nutrients form a base for the development of zooplankton in coastal areas, which serves as food for young salmon just after downstream migration. Russian scientists estimate that each pink salmon carcass is 0.5% organic phosphorus (Kizevetter 1971), and in dominant pink salmon years, carcasses provide a large amount of nutrients to the ecosystem. For example, KamchatNIRO has estimated that the pink salmon run in 1994 contributed about 110,000 mt of carcasses or 550 mt of organic phosphorus to the ecosystem (Shevlyakov 2014). Some dead fish drift to the sea, but the rest remain in the floodplains of the rivers, where carcasses are transformed into organic material that is incorporated into the food chain.

Removal of Pacific salmon by the fishery has consequences for river ecosystems. The relationships between salmon and the population dynamics of their terrestrial predators has been well documented (Gende et al. 2002). Possibly, the most serious of them is the decrease of food for predator animals and predator birds, which to a considerable extent consists of spawning salmon. The following animals depend on salmon in their diet: brown bear (*Ursus arctos*), Kamchatka fox (*Vulpes vulpes*), sable (*Martes zibellina*), ermine (*Mustela erminea kaneii*), mink (*M. vison*), Steller's sea eagle (*H. pelagicus*), Pacific seagull (*Larus schistisagus*), whooper swan (*Cygnus cygnus*) and many other mammals and birds.

Brown bears depend on salmon for food. The number of Kamchatka bears is inseparably linked with the abundance of spawning salmon entering rivers. In periods of high salmon abundance, bear populations grow due to increases in the birth rate and survival of offspring, and, on the contrary, in the years of depression, salmon stocks limit the number of consumers, both young and adults. With introduction of the large-scale salmon fishing, former relationships in the local ecosystem changed. It is assumed that in the wild ecosystem, without human influence, fluctuations of salmon abundance were higher than now. Indirectly, this can be judged from the periodically occurring famine of the indigenous peoples inhabiting Kamchatka (Steller 1999). According to modern ideas, the periods of low salmon returns could be a consequence of a change in the cycles of salmon population growth and its fall as a result of mechanisms of density-dependent regulation of the size of populations.

In different years, depending on the periods of operation and the accounting methods used, the number of brown bears on the peninsula was estimated from 8-10 thousand to 15-20 thousand individuals (Ostroumov, 1968; Gordienko and Gordienko, 2005). In the modern period as of April 2015, according to experts of the Agency of Forestry and Wildlife Conservation in Kamchatka, there are about 21.5 thousand individuals, of which 5,665 are in the area of the Kamchatka River. It is clear that these values possess some uncertainties; however, at present they are the only estimates obtained using standard methods in the field. Therefore, it is seen that there is no decrease of bear population in Kamchatka, and even some increase.

Salmon also play a significant role in marine ecosystems. It is clear that salmon influence the food webs in the North Pacific Ocean although the effect varies widely between systems and is dependent on many factors like timing, scale and alternative nutrient sources, etc. (Naydenko 2009). Resolving interaction strengths in the food web is made difficult by limited data and confounding effects of environmental forcing (Essington 2009). Ecosystem models that have been developed for the Eastern Bering Sea, Aleutian Islands and the Gulf of Alaska (Gaichas and Francis 2008, Aydin et al. 2008) do not suggest a critical or unique role of salmon with respect to the structure of the food web in the ocean. Gaichas and Francis (2008) used network theory to identify potentially key species in the Gulf of Alaska food web on the basis of high connectivity and four species (Pacific cod, Pacific halibut, walleye pollock and arrowtooth flounder) were identified as highly connected species.

Extensive research has been conducted by the Russian Scientific Institutes on (1) Juvenile Anadromous Stocks in Ocean Ecosystems; (2) Anadromous Stocks in the Bering Sea Ecosystem (BASIS); and (3) Anadromous Stocks in the Western Subarctic Gyre and Gulf of Alaska Ecosystems (Temnykh et al. 2010) This work also involved substantial monitoring and research of related ecosystem components including food web composition, production and dynamics. The regional scientific agencies are conducting ongoing research and monitoring of the aquatic ecosystem of area rivers. Stationary or seasonal research stations are established in each significant river. An extensive annual sampling program is also conducted to measure biological characteristics of the commercial salmon harvest in all three assessment rivers including length, weight, sex and age as indicators of ecosystem function.

Enhancement of Pacific salmon across the Pacific Rim since the 1970s has resulted in very large abundance in the North Pacific Ocean (Mahnken et al. 1998; Irvine et al. 2009; Ruggerone et al. 2010). There is some evidence that high salmon abundances in the ocean might adversely affect wild salmon through competition (Peterman 1991). Ocean growth of pink salmon inversely correlated to their own abundance and survival of chum, Chinook, and sockeye appears to be reduced in years of high pink salmon abundance (Ruggerone et al. 2003, Ruggerone and Goetz 2004, Ruggerone and Nielsen 2004, Ruggerone et al. 2005; Ruggerone et al. 2010). There is growing concern that the ocean carrying capacity of pink and chum salmon has been globally reached. However, salmon populations in the fishery under assessment have not been significantly enhanced.

The regional scientific agencies are conducting ongoing research and monitoring of the aquatic ecosystem of area rivers. Stationary or seasonal research stations are established in many areas.

5.3.2 Principle 2 Performance Indicator scores and rationales

PI 2.1.1 – Primary species outcome

PI 2.1.1		The UoA aims to maintain primary species above the point where recruitment would be impaired (PRI) and does not hinder recovery of primary species if they are below the PRI		
Scoring Issue		SG 60	SG 80	SG 100
a	**Main primary species stock status**			
	Guide post	Main primary species are **likely** to be above the PRI. OR If the species is below the PRI, the UoA has measures in place that are **expected** to ensure that the UoA does not hinder recovery and rebuilding.	Main primary species are **highly likely** to be above the PRI. OR If the species is below the PRI, there is either **evidence of recovery** or a demonstrably effective strategy in place **between all MSC UoAs which categorise this species as main**, to ensure that they collectively do not hinder recovery and rebuilding.	There is a **high degree of certainty** that main primary species are above the PRI **and are** fluctuating around a level consistent with MSY.
	Met?	Yes	Yes	Yes
Rationale				
There are no main primary species for this fishery, therefore SG100 is met by default.				
b	**Minor primary species stock status**			
	Guide post			Minor primary species are highly likely to be above the PRI. OR If below the PRI, there is evidence that the UoA does not hinder the recovery and rebuilding of minor primary species.
	Met?			No
Rationale				
Minor primary species have not been assessed, hence the SG100 is not met.				
References				
MRAG 2016; Bugaev et al. 2019a				

Draft scoring range and information gap indicator added at Announcement Comment Draft Report	
Draft scoring range	**≥80**
Information gap indicator	**Information sufficient to score PI**
Overall Performance Indicator scores added from Client and Peer Review Draft Report	
Overall Performance Indicator score	**90**
Condition number (if relevant)	**--**

PI 2.1.2 – Primary species management strategy

PI 2.1.2		**There is a strategy in place that is designed to maintain or to not hinder rebuilding of primary species, and the UoA regularly reviews and implements measures, as appropriate, to minimise the mortality of unwanted catch**		
a	Management strategy in place			
	Guide post	There are **measures** in place for the UoA, if necessary, that are expected to maintain or to not hinder rebuilding of the main primary species at/to levels which are likely to be above the PRI.	There is a **partial strategy** in place for the UoA, if necessary, that is expected to maintain or to not hinder rebuilding of the main primary species at/to levels which are highly likely to be above the PRI.	There is a **strategy** in place for the UoA for managing main and minor primary species.
	Met?	NA	NA	Yes
Rationale				
There are no main primary species for this fishery and SG 60 and SG 80 is scored as NA. West Kamchatka coho, non-Ozernaya sockeye, rainbow smelt and saffron cod are actively managed by regulation of fishery gear, seasons and areas. Chinook salmon are effectively protected by closure of the commercial fishery.				
b	**Management strategy evaluation**			
	Guide post	The measures are considered **likely** to work, based on plausible argument (e.g., general experience, theory or comparison with similar fisheries/species).	There is some **objective basis for confidence** that the measures/partial strategy will work, based on some information directly about the fishery and/or species involved.	**Testing** supports **high confidence** that the partial strategy/strategy will work, based on information directly about the fishery and/or species involved.
	Met?	NA	NA	Yes – Chinook; saffron cod (navaga), rainbow smelt, and capelin No – Coho and Sockeye

Rationale				
There are no main primary species for this fishery and SG 60 and SG 80 is scored as NA. SG100 - The minor primary species are targeted and actively managed in other fisheries, except for Chinook, which is not caught in significant amounts due to the commercial fishery closure. The salmon fishery occurs after the bulk of the harvest occurs for Chinook salmon, saffron cod (navaga), rainbow smelt, and capelin. Documentation of in-season restrictions based on abundance and assessments of spawning escapement, provide an objective basis for confidence that management measures are effective for sustaining sockeye and coho. Fishery restrictions based on time and area closures are regularly adopted in-season based on real-time information on run size and catch composition. The current harvest strategy has been in place since only 2008 and may not have been fully tested under a wide range of conditions including the inherent variability in abundance and run timing of salmon. In particular, it is not clear whether the system has been challenged by an extended interval of low salmon productivity. The current system may not have effectively regulated harvest of Coho Salmon to achieve MSY escapement objectives in Western Kamchatka subzone rivers and Sockeye from rivers other than the Ozernaya. West Kamchtaka Coho are not included as a target species in this assessment, in part due to this issue.				
c	**Management strategy implementation**			
	Guide post		There is **some evidence** that the measures/partial strategy is being **implemented successfully**.	There is clear evidence that the partial strategy/strategy is being implemented successfully and is achieving its overall objective as set out in scoring issue (a).
	Met?		Yes	Yes – Chinook; saffron cod (navaga), rainbow smelt, and capelin No – Coho and Sockeye
Rationale				
SG80 - Stock assessments are in place to monitor abundance of primary species and limit harvest in targeted fisheries when necessary. Documentation of in-season restrictions based on abundance and assessments of spawning escapement, provide evidence that management measures are being implemented successfully to maintain Sockeye and Coho above a point of recruitment impairment. Increases in Chinook abundance following closure of the commercial fishery provide clear evidence that measures are being effectively implemented. SG100 - The current system may not have effectively regulated harvest of Western Kamchatka subzone coho salmon or sockeye outside the Ozenaya to achieve yield-based escapement objectives in many area rivers. Western Kamchatka subzone Coho and non-Ozernaya sockeye are not included as P1 species in this assessment, in part due to this issue.				
d	**Shark finning**			
	Guide post	It is **likely** that shark finning is not taking place.	It is **highly likely** that shark finning is not taking place.	There is a **high degree of certainty** that shark finning is not taking place.

	Met?	NA	NA	NA
Rationale				
Sharks are not caught in this fishery.				
e	**Review of alternative measures**			
	Guide post	There is a review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of unwanted catch of main primary species.	There is a **regular** review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of unwanted catch of main primary species and they are implemented as appropriate.	There is a **biennial** review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of unwanted catch of all primary species, and they are implemented, as appropriate.
	Met?	NA	NA	No
Rationale				
There are no main primary species for this fishery and SG 60 and SG 80 is scored as NA. SG100 – Regular review of the effectiveness of management measures for the protection of all salmon species is incorporated in the current management program. These measures were adopted following extensive review of the previous management strategy which included commercial harvest, but biennial review does not occur.				
References				
MRAG 2016; Bugaev et al. 2019a				

Draft scoring range and information gap indicator added at Announcement Comment Draft Report

Draft scoring range	**≥80**
Information gap indicator	**Information sufficient to score PI**

Overall Performance Indicator scores added from Client and Peer Review Draft Report

Overall Performance Indicator score	**85**
Condition number (if relevant)	**--**

PI 2.1.3 – Primary species information

PI 2.1.3		Information on the nature and extent of primary species is adequate to determine the risk posed by the UoA and the effectiveness of the strategy to manage primary species		
Scoring Issue		SG 60	SG 80	SG 100
a	Information adequacy for assessment of impact on main primary species			
	Guide post	Qualitative information is **adequate to estimate** the impact of the UoA on the main primary species with respect to status. OR If RBF is used to score PI 2.1.1 for the UoA: Qualitative information is adequate to estimate productivity and susceptibility attributes for main primary species.	Some quantitative information is available and is **adequate to assess** the impact of the UoA on the main primary species with respect to status. OR If RBF is used to score PI 2.1.1 for the UoA: Some quantitative information is adequate to assess productivity and susceptibility attributes for main primary species.	Quantitative information is available and is **adequate to assess with a high degree of certainty** the impact of the UoA on main primary species with respect to status.
	Met?	NA	NA	NA
Rationale				
There are no main primary species for this fishery and so guideposts are scored as NA.				
b	**Information adequacy for assessment of impact on minor primary species**			
	Guide post			Some quantitative information is adequate to estimate the impact of the UoA on minor primary species with respect to status.
	Met?			No
Rationale				
There are stock assessment programs for primary species. The salmon fishery catches very few primary species; certainly, much less than the targeted fisheries which are managed based on stock abundance. Quantitative information on the effectiveness of commercial season closures for reducing catch of Chinook is available in the form of harvest reports. Spawning escapement data has demonstrated an increase in abundance following these measures. Some quantitative information is available for Western Kamchatka subzone coho and non-Ozernaya sockeye. This includes data on stock structure, stock productivity, fleet composition and biological characteristics of the run, run timing, spawning distribution, and spawning escapement. Detailed information is collected on harvest in the commercial salmon fishery. Numbers are estimated multiple stages of the harvest and processing chain. Detailed records are required and kept by the fishery and				

the government. Changes in the management system over the previous decade ensure accuracy of catch reporting by removing incentives for inaccurate accounting to avoid taxes or remain within a designated allocation. Catch data are reported on a real time basis during the fishing season. Assessments also include direct estimates of natural stock productivity on a regional and population-specific.
However, reductions in aerial survey effort raises concern for the sufficiency of information on spawning escapements. The SG80 standard is not met for Western Kamchatka subzone coho and non-Ozernaya sockeye due limitations in the accuracy and precision of wild abundance estimates for these stocks.

c	**Information adequacy for management strategy**			
	Guide post	Information is adequate to support **measures** to manage **main** primary species.	Information is adequate to support a **partial strategy** to manage **main** primary species.	Information is adequate to support a **strategy** to manage **all** primary species, and evaluate with a **high degree of certainty** whether the strategy is achieving its objective.
	Met?	NA	NA	No

Rationale

SG 60 and 80 are scored as not applicable because there are no main primary species. SG100 is not met because future management abilities to regulate exploitation based on abundance to achieve established escapement goals with a high degree of certainty is jeopardized by limitations in aerial survey effort for Western Kamchatka subzone coho and non-Ozernaya sockeye.

References

MRAG 2016; Bugaev et al. 2019a

Draft scoring range and information gap indicator added at Announcement Comment Draft Report

Draft scoring range	**≥80**
Information gap indicator	**Information sufficient to score PI**

Overall Performance Indicator scores added from Client and Peer Review Draft Report

Overall Performance Indicator score	**80**
Condition number (if relevant)	**--**

PI 2.2.1 – Secondary species outcome

PI 2.2.1		The UoA aims to maintain secondary species above a biologically based limit and does not hinder recovery of secondary species if they are below a biological based limit		
Scoring Issue		SG 60	SG 80	SG 100
a	**Main secondary species stock status**			
	Guide post	Main secondary species are **likely** to be above biologically based limits. OR If below biologically based limits, there are **measures** in place expected to ensure that the UoA does not hinder recovery and rebuilding.	Main secondary species are **highly likely** to be above biologically based limits. OR If below biologically based limits, there is either **evidence of recovery** or a **demonstrably effective partial strategy** in place such that the UoA does not hinder recovery and rebuilding. AND Where catches of a main secondary species outside of biological limits are considerable, there is either evidence of recovery or a, demonstrably effective strategy in place between those MSC UoAs that have considerable catches of the species, to ensure that they collectively do not hinder recovery and rebuilding.	There is a **high degree of certainty** that main secondary species are above biologically based limits.
	Met?	Yes	Yes	Yes
Rationale				
Based on the available information, there are no main secondary species, hence the SG100 is met by default. Non-retained catch includes a variety of species, none of which comprise a significant volume of catch. A large proportion of the non-retained catch is released alive from trapnets and beach seines. The most abundant secondary species, char comprise less than 2% of the total harvest by weight and catches of other species are even smaller. No secondary species is less resilient or otherwise vulnerable.				
b	**Minor secondary species stock status**			

	Guide post			Minor secondary species are highly likely to be above biologically based limits. OR If below biologically based limits', there is evidence that the UoA does not hinder the recovery and rebuilding of secondary species
	Met?			No

Rationale
Minor secondary species have not been assessed, hence the SG100 is not met.

References
MRAG 2016; Bugaev et al. 2019a

Draft scoring range and information gap indicator added at Announcement Comment Draft Report

Draft scoring range	≥80
Information gap indicator	Information sufficient to score PI
Data-deficient? (Risk-Based Framework needed)	No

Overall Performance Indicator scores added from Client and Peer Review Draft Report

Overall Performance Indicator score	**90**
Condition number (if relevant)	--

PI 2.2.2 – Secondary species management strategy

PI 2.2.2		**There is a strategy in place for managing secondary species that is designed to maintain or to not hinder rebuilding of secondary species and the UoA regularly reviews and implements measures, as appropriate, to minimise the mortality of unwanted catch**		
Scoring Issue		SG 60	SG 80	SG 100
a	**Management strategy in place**			
	Guide post	There are **measures** in place, if necessary, which are expected to maintain or not hinder rebuilding of main secondary species at/to levels which are	There is a **partial strategy** in place, if necessary, for the UoA that is expected to maintain or not hinder rebuilding of main secondary species at/to	There is a **strategy** in place for the UoA for managing main and minor secondary species.

		highly likely to be above biologically based limits or to ensure that the UoA does not hinder their recovery.	levels which are highly likely to be above biologically based limits or to ensure that the UoA does not hinder their recovery.	
	Met?	NA	NA	No

Rationale

SG 60 and 80 are scored as not applicable because there are no main secondary species.

There is a partial strategy for managing and minimizing catch of secondary species in the commercial salmon fishery by use of fixed trap nets and beach seines, which have a low capture rate of secondary species, and monitoring catch of some secondary species. These gears are very effective in concentrating harvest on salmon during spawning migrations while also avoiding significant catches of other non-migratory local fish species. There are no main secondary species. Catch monitoring demonstrates use of gears with low capture rate and ensures that incidental harvest levels of minor secondary species such as char in the salmon fishery do not substantially reduce sustainability. Other minor secondary species are generally not retained and many are released alive in order to limit fishery impacts. The SG100 is not met because a comprehensive strategy for managing secondary species has not been defined. The management system regards bycatch reduction strategies beyond current levels as unnecessary because current exploitation rates are considered to be minor.

b	**Management strategy evaluation**			
	Guide post	The measures are considered **likely** to work, based on plausible argument (e.g., general experience, theory or comparison with similar UoAs/species).	There is **some objective basis for confidence** that the measures/partial strategy will work, based on some information directly about the UoA and/or species involved.	**Testing** supports **high confidence** that the partial strategy/strategy will work, based on information directly about the UoA and/or species involved.
	Met?	NA	NA	No

Rationale

SG60 - See SG80

SG80 - The very low incidence of secondary species in the catch, based on information directly about the fishery and the species involved, provides a strong objective basis that this strategy is effective. Information from independent observer efforts of the Ozernaya sockeye fishery and similar fisheries on Iturup and Sakhalin islands supports high confidence that the fishery strategy is effective for managing bycatch. There is also an objective basis for confidence that the strategy is effective for flatfish and other finfish, for which there is a management strategy for these species in the Sea of Okhotsk. The nearshore salmon fishery comprises a negligible portion of the total harvest of flatfish.

SG100 – Catch monitoring and biological sampling of char retained and sold by the fishery provides sound testing to support high confidence that the management strategy is effective for this species.

SG100 is not met because the strategy has not been tested directly with a regular quantitative bycatch sampling program for other species, many of which are not retained or only partially retained.

c	**Management strategy implementation**			
	Guide post		There is **some evidence** that the measures/partial strategy is being **implemented successfully**.	There is clear evidence that the partial strategy/strategy is being implemented successfully and is achieving its objective as set out in scoring issue (a).
	Met?		Yes	No

Rationale

SG80 – Periodic observer observations of salmon fisheries throughout the region provide evidence that the fishing strategy is being implemented successfully to harvest salmon with minimal catch of other secondary species, as the gear inherently have low bycatch rates and allow for live releases of some bycatch species.

The SG 100 is not met because a regular quantitative bycatch sampling program is not conducted for other species, many of which are not retained or only partially retained.

d	**Shark finning**			
	Guide post	It is **likely** that shark finning is not taking place.	It is **highly likely** that shark finning is not taking place.	There is a **high degree of certainty** that shark finning is not taking place.
	Met?	NA	NA	NA

Rationale

Scoring issue need not be scored if no secondary species are sharks.

e	**Review of alternative measures to minimise mortality of unwanted catch**			
	Guide post	There is a review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of **unwanted** catch of main secondary species.	There is a **regular** review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of **unwanted** catch of main secondary species and they are implemented as appropriate.	There is a **biennial** review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of **unwanted** catch of all secondary species, and they are implemented, as appropriate.

	Met?	NA	NA	No
Rationale				
There are no main secondary species. Very small numbers of unwanted catch of minor secondary species occur. There is no regular review of alternative measures for these minor species because the level of exploitation is negligible and most non-target species caught are released from traps alive.				
References				
MRAG 2016; Bugaev et al. 2019a				

Draft scoring range and information gap indicator added at Announcement Comment Draft Report

Draft scoring range	≥80
Information gap indicator	Information sufficient to score PI

Overall Performance Indicator scores added from Client and Peer Review Draft Report

Overall Performance Indicator score	**80**
Condition number (if relevant)	--

PI 2.2.3 – Secondary species information

PI 2.2.3		**Information on the nature and amount of secondary species taken is adequate to determine the risk posed by the UoA and the effectiveness of the strategy to manage secondary species**		
Scoring Issue		SG 60	SG 80	SG 100
a	**Information adequacy for assessment of impacts on main secondary species**			
	Guide post	Qualitative information is **adequate to estimate** the impact of the UoA on the main secondary species with respect to status. OR If RBF is used to score PI 2.2.1 for the UoA: Qualitative information is adequate to estimate productivity and susceptibility attributes for main secondary species.	Some quantitative information is available and **adequate to assess** the impact of the UoA on main secondary species with respect to status. OR If RBF is used to score PI 2.2.1 for the UoA: Some quantitative information is adequate to assess productivity and susceptibility attributes for main secondary species.	Quantitative information is available and **adequate to assess with a high degree of certainty** the impact of the UoA on main secondary species with respect to status.
	Met?	NA	NA	NA

Rationale				
SG 60, 80 and 100 are not applicable because there are no main secondary species.				
b	**Information adequacy for assessment of impacts on minor secondary species**			
	Guide post			Some quantitative information is adequate to estimate the impact of the UoA on minor secondary species with respect to status.
	Met?			No
Rationale				
Minor secondary species have not been assessed here. Quantitative information is available on the level of annual harvest of char in this fishery. Sustainability of current char harvest levels is inferred from long term trends in catch and size composition. However, estimates of abundance are not available for use in estimating exploitation rates of char. Qualitative information on the amount of other minor secondary species affected by the fishery is available from limited observer sampling. This information is sufficient to confirm that catch of other secondary species is relatively insignificant. However, catch and the status of bycatch species is not quantified in regular management practice.				
c	**Information adequacy for management strategy**			
	Guide post	Information is adequate to support **measures** to manage **main** secondary species.	Information is adequate to support a **partial strategy** to manage **main** secondary species.	Information is adequate to support a **strategy** to manage **all** secondary species, and **evaluate** with a **high degree of certainty** whether the strategy is **achieving its objective**.
	Met?	Yes	Yes	No
Rationale				
SG 60 and 80 are met by default because there are no main secondary species. Qualitative information on the amount of other minor secondary species affected by the fishery is available from limited observer sampling. This information is sufficient to confirm that the catch of other secondary species in relatively insignificant. However, catch and the status of bycatch species is not quantified in regular management practice, so does not meet SG100.				
References				
MRAG 2016; Bugaev et al. 2019a				

Draft scoring range and information gap indicator added at Announcement Comment Draft Report

Draft scoring range	≥80
Information gap indicator	Information sufficient to score PI

Overall Performance Indicator scores added from Client and Peer Review Draft Report

Overall Performance Indicator score	**80**
Condition number (if relevant)88	--

PI 2.3.1 – ETP species outcome

PI 2.3.1		**The UoA meets national and international requirements for the protection of ETP species The UoA and associated enhancement activities do not hinder recovery of ETP species**		
Scoring Issue		SG 60	SG 80	SG 100
a	**Effects of the UoA on population/stocks within national or international limits, where applicable**			
	Guide post	Where national and international requirements set limits for ETP species, the **effects of the UoA** and associated enhancement activities on the population/stock are known and **likely** to be within these limits.	Where national and/ or international requirements set limits for ETP species, the **combined effects of the MSC UoAs and associated enhancement activities** on the population/stock are known and **highly likely** to be within these limits.	Where national and/ or international requirements set limits for ETP species, there is a **high degree of certainty** that the **combined effects of the MSC UoAs** and associated enhancement activities are within these limits.
	Met?	NA	NA	NA
Rationale				
No numerical limits on impacts, such as through setting Potential Biological Removal Level (the maximum number of animals, not including natural mortalities, that may be removed from a stock while allowing that stock to reach or maintain its optimum sustainable population), has been set for any ETP species. However, national legislation requires that fishing operations avoid adverse impacts on Red Book listed species present in this area (Steelhead, Steller Sea Lions, Steller Sea Eagles, White-tail Eagle, Bald Eagle, Golden Eagle). Steelhead are also largely protected from significant catch in the commercial salmon fishery by season dates. Additionally, rookeries for Steller sea lions have been protected in Russia. The low occurrence of ETP species in the area of this fishery provide a high likelihood that the effects of the fishery are within limits of national and international requirements for protection of ETP species. None of these species interact with the fishery or any other salmon fishery in the region to any significant degree. Therefore, it is highly likely that the combined effects of the MSC UoAs are within national requirements. Other marine animals present in the area, including seals, killer whales, white whales, and cormorants, are managed or protected by federal regulation.				

For the purposes of this assessment, all gears are combined for scoring purposes as impacts are negligible.

b	**Direct effects**			
	Guide post	Known direct effects of the UoA including enhancement activities are **likely to not hinder recovery** of ETP species.	Direct effects of the UoA including enhancement activities are **highly likely to not hinder recovery** of ETP species.	There is a **high degree of confidence** that there are no **significant detrimental direct effects** of the UoA including enhancement activities on ETP species.
	Met?	Yes	Yes	No

Rationale

SG60 - See SG80

SG80 - Direct effects of the fishery on ETP are highly unlikely to create unacceptable impacts to these ETP species. Effects are negligible due to a lack of significant interactions of most species with the fishing gear. Incidental take of these species by tangling in gear has not been observed due to the nature of the gear.

Seals are the only species regularly observed to encounter gear. These seals constantly enter net traps, eat or damage fish, and then freely leave the nets. Entanglements have not been reported. Seals are regarded as a nuisance by fishers. KamchatNIRO scientists report that fisherman drive off seals from nets by making noise. Seals are not depleted – they may be hunted with the proper license and the harvest allocation is considerably underused because of degradation of hunting infrastructure. Licenses can be obtained for commercial harvest but have not by the assessment companies. No hatchery enhancement occurs in this fishery.

SG100 – The SG100 guidepost is not met due to the lack of a systematic observer program for the portion of the fishery in marine waters and limited availability of direct impact assessments and status monitoring information for Steller Sea Lions.

c	**Indirect effects**			
	Guide post		Indirect effects have been considered for the UoA including enhancement activities and are thought to be **highly likely** to not create unacceptable impacts.	There is a **high degree of confidence** that there are no **significant detrimental indirect effects** of the UoA including enhancement activities on ETP species.
	Met?		Yes	No

Rationale

SG80 - No significant indirect effects of fisheries have been identified which might pose unacceptable risk to these species. The likelihood of significant indirect effects of the fishery on protected species is considered to be very low due to the low degree of interaction. Any indirect effects would likely result from ecosystem effects of salmon harvest. However, management of fisheries to maintain high levels of salmon production might be regarded as beneficial from a food chain perspective for species such as sea lions and seals. KamchatNIRO has conducted feeding studies of seal which have demonstrated

that salmon are a primary seasonal food item. Predators of salmon must adapt to normally high fluctuations in salmon abundance. SG100 - The SG100 guidepost is not met due to the lack of indirect impact assessments and status monitoring information for Steller Sea Lions.	
References	
MRAG 2016; Bugaev et al. 2019a	

Draft scoring range and information gap indicator added at Announcement Comment Draft Report

Draft scoring range	≥80
Information gap indicator	Information sufficient to score PI

Overall Performance Indicator scores added from Client and Peer Review Draft Report

Overall Performance Indicator score	**80**
Condition number (if relevant)	--

PI 2.3.2 – ETP species management strategy

PI 2.3.2		**The UoA and associated enhancement activities have in place precautionary management strategies designed to:** - **meet national and international requirements** - **ensure the UoA does not hinder recovery of ETP species** **Also, the UoA regularly reviews and implements measures, as appropriate, to minimise the mortality of ETP species**		
Scoring Issue		SG 60	SG 80	SG 100
a	**Management strategy in place (national and international requirements)**			
	Guide post	There are **measures** in place that minimise the UoA-related mortality of ETP species due to the UoA including enhancement activities, and are **expected to be highly likely** to achieve national and international requirements for the protection of ETP species.	There is a **strategy** in place for managing the UoA and enhancement activities' impact on ETP species, including measures to minimise mortality, which is designed to be **highly likely to achieve** national and international requirements for the protection of ETP species.	There is a **comprehensive strategy** in place for managing the UoA **and enhancement activities'** impact on ETP species, including measures to minimise mortality, which is designed to **achieve above** national and international requirements for the protection of ETP species.
	Met?	Yes	Yes	No
Rationale				

SG60 - See SG100

SG80 - National legislation provides for protection of ETP species identified in the Russian Federation Red Data Book. In addition to general protection of ETP species, in particular, imposing fines for their retaining, the timing and operation of the fishery assure minimal adverse interactions with ETP species. The strategy involves fishery times and areas where ETP species are uncommon and a ban on retention of these species. Catch of any Red listed species in Russia is prohibited and in case of catch, they must be immediately released. The absence of enhancement precludes impacts on ETP species. Therefore, SG80 is met.

SG100 -This SG is not met because it is not clear that the fishing strategy was specifically designed to manage ETP impacts

b	**Management strategy in place (alternative)**			
	Guide post	There are **measures** in place that are expected to ensure the UoA including enhancement activities do not hinder the recovery of ETP species.	There is a **strategy** in place that is expected to ensure the UoA including enhancement activities do not hinder the recovery of ETP species.	There is a **comprehensive strategy** in place for managing ETP species, to ensure the UoA including enhancement activities do not hinder the recovery of ETP species.
	Met?	Not applicable	Not applicable	Not applicable

Rationale

See scoring issue A. This issue applies only where species are recognized as ETP but requirements are not defined in legislation or agreements. There is no salmon enhancement in the UoA.

c	**Management strategy evaluation**			
	Guide post	The measures are **considered likely** to work, based on **plausible argument** (e.g., general experience, theory or comparison with similar UoA/species).	There is an **objective basis for confidence** that the measures/strategy will work, based on **information** directly about the UoA and/or the species involved.	The strategy/ comprehensive strategy is mainly based on information directly about the UoA and/or species involved, and a **quantitative analysis** supports **high confidence** that the strategy will work.
	Met?	Yes	Yes	No

Rationale

SG60 - See SG80

SG80 - Observations of a low incidence of ETP catch in the fishery consistent spatial and temporal in occurrence of ETP species in the fishery, provide an objective basis for confidence that the fishery strategy will work based on qualitative information directly about the fishery and/or the species involved, hence the SG80 is met.

SG100 - Information is not specifically collected on ETP species in this fishery due to the low incidence of these species in the fishery and the corresponding low level of concern hence the SG100 is not met.

d	**Management strategy implementation**			
	Guide post		There is some **evidence** that the measures/strategy is being implemented successfully.	There is **clear evidence** that the strategy/comprehensive strategy is being implemented successfully and is **achieving its objective as set out in scoring issue (a) or (b).**
	Met?		Yes	No

Rationale

SG80 – The available information from KamchatNIRO and independent observer reports for other salmon fisheries in the region provides clear evidence that the strategy is being implemented successfully. The incidence of interactions with endangered or threatened species is reportedly very low hence the SG80 is met.

SG100 – Information is not specifically collected on ETP species in this fishery due to the low incidence of these species in the fishery and the corresponding low level of concern, hence the SG100 is not met.

e	**Review of alternative measures to minimize mortality of ETP species**			
	Guide post	There is a **review** of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of ETP species.	There is a **regular review** of the potential effectiveness and practicality of alternative measures to minimise UoA and enhancement related mortality of ETP species and they are implemented as appropriate.	There is a **biennial review** of the potential effectiveness and practicality of alternative measures to minimise UoA and enhancement related mortality ETP species, and they are implemented, as appropriate.
	Met?	Yes	Yes	No

Rationale

SG60 – see SG80

SG80 – Effective protection of ETP species is regularly reviewed in the normal course of activity by regional fishery management and environmental protection agencies of the Government, hence the SG80 is met.

SG100 – Formal reviews are not scheduled in the normal course of events given the low level of concern, hence the SG100 is not met.

References

MRAG 2016; Bugaev et al. 2019a

Draft scoring range and information gap indicator added at Announcement Comment Draft Report

Draft scoring range	≥80
Information gap indicator	Information sufficient to score PI

Overall Performance Indicator scores added from Client and Peer Review Draft Report

Overall Performance Indicator score	**80**
Condition number (if relevant)	**--**

PI 2.3.3 – ETP species information

PI 2.3.3		**Relevant information is collected to support the management of UoA and enhancement activities impacts on ETP species, including:** - **Information for the development of the management strategy;** - **Information to assess the effectiveness of the management strategy; and** - **Information to determine the outcome status of ETP species**		
Scoring Issue		SG 60	SG 80	SG 100
a	**Information adequacy for assessment of impacts**			
	Guide post	Qualitative information is **adequate to estimate** the impact of the UoA and associated enhancement on ETP species. OR if RBF is used to score PI 2.3.1 for the UoA: Qualitative information is **adequate to estimate productivity and susceptibility** attributes for ETP species.	Some quantitative information is **adequate to assess** the UoA related mortality and impact and to determine whether the UoA and associated enhancement may be a threat to protection and recovery of the ETP species. OR if RBF is used to score PI 2.3.1 for the UoA: Some quantitative information is **adequate to assess productivity and susceptibility** attributes for ETP species.	Quantitative information is available to assess with a high degree of certainty the magnitude of UoA- and associated enhancement related impacts, mortalities and injuries and the consequences for the status of ETP species.
	Met?	Yes	Yes	No
Rationale				

SG60 - See SG80

SG80 - Information on the negligible incidence of interaction of the fishery with ETP species is sufficient to determine that any related mortality or impact is sufficiently low as to not threaten protection or imped recovery. Although no ongoing observer program exists for the fisheries, federal scientists, managers, and inspectors regularly visit the fishing sites and processing plants throughout the season. Over the course of the many years of fishing operations, none of these species are observed to have adverse impacts from the fishery. The fishing authorities have determined that the fishery has such low impacts that it needs no specific data collections on interactions with ETP species, hence the SG80 is met.

SG100 – Impacts, mortalities and injuries are not explicitly quantified hence the SG100 is not met.

	Information adequacy for management strategy			
b	Guide post	Information is adequate to support **measures** to manage the impacts on ETP species.	Information is adequate to measure trends and support a **strategy** to manage impacts on ETP species.	Information is adequate to support a **comprehensive strategy** to manage impacts, minimize mortality and injury of ETP species, and evaluate with a **high degree of certainty** whether a strategy is achieving its objectives.
	Met?	Yes	Yes	No

Rationale

SG60 - See SG80

SG80 - Information from observations by scientists, managers, and inspectors, though not from a formal observer program, on the lack of impacts is adequate to support the management strategy for ETP species; the SG80 is met.

SG100 - Impacts, mortalities and injuries are not explicitly quantified; the SG100 is not met.

References

MRAG 2016; Bugaev et al. 2019a

Draft scoring range and information gap indicator added at Announcement Comment Draft Report

Draft scoring range	≥80
Information gap indicator	Information sufficient to score PI

Overall Performance Indicator scores added from Client and Peer Review Draft Report

Overall Performance Indicator score	**80**
Condition number (if relevant)	--

PI 2.4.1 – Habitats outcome

PI 2.4.1		**The UoA and its associated enhancement activities do not cause serious or irreversible harm to habitat structure and function, considered on the basis of the area covered by the governance body(s) responsible for fisheries management in the area(s) where the UoA operates**		
Scoring Issue		SG 60	SG 80	SG 100
a	**Commonly encountered habitat status**			
	Guide post	The UoA is **unlikely** to reduce structure and function of the commonly encountered habitats to a point where there would be serious or irreversible harm.	The UoA is **highly unlikely** to reduce structure and function of the commonly encountered habitats to a point where there would be serious or irreversible harm.	There is **evidence** that the UoA is highly unlikely to reduce structure and function of the commonly encountered habitats to a point where there would be serious or irreversible harm.
	Met?	Yes	Yes	Yes

Rationale

The allocation of parcels to fishing companies requires that fishing activities occur at the same locations year after year. This limits the footprint of the gear to a small portion of the available habitat. The fishery is highly unlikely to reduce habitat structure and function to a point where there would be serious or irreversible harm. No significant marine habitat impacts are associated with marine trap net use. The only conceivable effects would involve highly localized and temporary disturbances of the substrate due to net anchors or possibly occasional movement of weighed lead lines. Any related damage to the bottom communities is minor and local relative to redistribution of sediments during storms.

Limited habitat effects result from beach seine or gill net site preparation activities in river fishing parcels prior to the fishing season. These might include removal of snags such as boulders or trees which might snag nets. Beach seines operation can impact the bottom, but this damage is considered minor compared to spring flooding in the rivers. Site preparation activities regulated and monitored by the government. Enhancement programs for salmon do not occur in the UoA.

SGs 60, 80 and 100 are met.

b	**VME habitat status**			
	Guide post	The UoA is unlikely to reduce structure and function of the VME habitats to a point where there would be serious or irreversible harm.	The UoA is highly unlikely to reduce structure and function of the VME habitats to a point where there would be serious or irreversible harm.	There is evidence that the UoA is highly unlikely to reduce structure and function of the VME habitats to a point where there would be serious or irreversible harm.

	Met?	Not relevant	Not relevant	Not relevant
Rationale				
No Vulnerable Marine Ecosystems or potential VME are identified in the area of the unit of assessment.				
c	**Minor habitat status**			
	Guide post			There is evidence that the UoA is highly unlikely to reduce structure and function of the minor habitats to a point where there would be serious or irreversible harm.
	Met?			No
Rationale				
Limited habitat effects might result from beach seine or gill net site preparation activities in river fishing parcels prior to the fishing season. Areas where these activities occur can be considered minor habitats. Serious or irreversible harm is not observed from these fishery-related activities, however there is no direct evidence of this, hence the SG100 is not met.				
d	**Impacts due to enhancement activities within the UoA**			
	Guide post	The enhancement activities are **unlikely** to have adverse impacts on habitat.	The enhancement activities are **highly unlikely** to have adverse impacts on habitat.	There is a high degree of certainty that the enhancement activities are do not have adverse impacts on habitat.
	Met?	Yes	Yes	Yes
Rationale				
No enhancement occurs in the UoA.				
References				
MRAG 2016				

Draft scoring range and information gap indicator added at Announcement Comment Draft Report

Draft scoring range	≥80
Information gap indicator	Information sufficient to score PI

Overall Performance Indicator scores added from Client and Peer Review Draft Report

Overall Performance Indicator score	**95**
Condition number (if relevant)	**--**

PI 2.4.2 – Habitats management strategy

PI 2.4.2		There is a strategy in place that is designed to ensure the UoA and associated enhancement activities do not pose a risk of serious or irreversible harm to the habitats		
Scoring Issue		SG 60	SG 80	SG 100
a	**Management strategy in place**			
	Guide post	There are **measures** in place, if necessary, that are expected to achieve the Habitat Outcome 80 level of performance.	There is a **partial strategy** in place, if necessary, that is expected to achieve the Habitat Outcome 80 level of performance or above.	There is a **strategy** in place for managing the impact of all MSC UoAs/non-MSC fisheries UoA **and associated enhancement activities** on habitats.
	Met?	Yes	Yes	No
Rationale				
SG60 - See SG80 SG80 - The fishing strategy involves use of trap nets, gill nets and beach seines, none of which has significant physical habitat effects; fishing gear has minimal impact relative to natural disturbances such as storms and floods. Cumulative impacts from non-MSC fisheries are similarly negligible. The enhancement strategy involves no operation of hatcheries in the UoA hence the SG is met. SG100 - The degree to which the fishing strategy is specifically intended to manage the impact of fishing activities on habitats is unclear. Therefore, the SG100 is not considered to be met.				
b	**Management strategy evaluation**			
	Guide post	The measures are **considered likely** to work, based on plausible argument (e.g., general experience, theory or comparison with similar UoAs/ enhancement activities/habitats).	There is some objective basis for confidence that the measures/partial strategy will work, based on information directly about the UoA, enhancement activities and/or habitats involved.	Testing supports high confidence that the partial strategy/strategy will work, based on information directly about the UoA, enhancement activities and/or habitats involved.
	Met?	Yes	Yes	No
Rationale				
SG60 - See SG80 SG80 - The limited scale of the fishery relative to the available habitat provides an objective basis for confidence that the partial strategy will work and is being implemented successfully; the SG80 is met. SG100 - Testing does not occur; the SG100 is not met.				

c	**Management strategy implementation**			
	Guide post		There is **some quantitative evidence** that the measures/partial strategy is being implemented successfully.	There is **clear quantitative evidence** that the partial strategy/strategy is being implemented successfully and is achieving its objective, as outlined in scoring issue (a).
	Met?		Yes	No
Rationale				
SG80 - Information from observations by scientists, managers, and inspectors, though not from a formal observer program, demonstrates that the fishing operations occur within parcels and with the gear authorized. Observations of habitat conditions in the fishery zone provide clear evidence that habitat impacts are very low or negligible at a regional scale. Quantitative evidence on the successful implementation of habitat protection measures has been provided for the Ozernaya in the form of a physical habitat assessment completed as a condition of another assessment; the Ozernaya results apply throughout the West Kamchatka system as the fishing activities and habitat are so similar hence the SG80 is met. SG100 - Clear quantitative evidence on effects of fishing and related activities on the habitat is not available. Therefore, the SG100 is not considered to be met.				
d	Compliance with management requirements and other MSC UoAs'/non-MSC fisheries' measures to protect VMEs			
	Guide post	There is **qualitative evidence** that the UoA complies with its management requirements to protect VMEs.	There is some **quantitative evidence** that the UoA and associated enhancement activities comply with both its management requirements and with protection measures afforded to VMEs by other MSC UoAs/non-MSC fisheries, where relevant.	There is **clear quantitative evidence** that the UoA and **associated enhancement activities** comply with both its management requirements and with protection measures afforded to VMEs by other MSC UoAs/non-MSC fisheries, where relevant.
	Met?	Not relevant	Not relevant	Not relevant
Rationale				
There are no vulnerable marine ecosystems in the area of the unit of assessment.				
References				
MRAG 2016				

Draft scoring range and information gap indicator added at Announcement Comment Draft Report

Draft scoring range	≥80
Information gap indicator	Information sufficient to score PI

Overall Performance Indicator scores added from Client and Peer Review Draft Report

Overall Performance Indicator score	**80**
Condition number (if relevant)	--

PI 2.4.3 – Habitats information

PI 2.4.3		**Information is adequate to determine the risk posed to the habitat by the UoA and associated enhancement activities and the effectiveness of the strategy to manage impacts on the habitat**		
Scoring Issue		SG 60	SG 80	SG 100
a	**Information quality**			
	Guide post	The types and distribution of the main habitats are **broadly understood**. *OR* If CSA is used to score PI 2.4.1 for the UoA: Qualitative information is adequate to estimate the types and distribution of the main habitats.	The nature, distribution and **vulnerability** of the main habitats in the UoA area are known at a level of detail relevant to the scale and intensity of the UoA. *OR* If CSA is used to score PI 2.4.1 for the UoA: Some quantitative information is available and is adequate to estimate the types and distribution of the main habitats.	The distribution of all habitats is known over their range, with particular attention to the occurrence of vulnerable habitats.
	Met?	Yes	Yes	No
Rationale				
SG60 - See SG80 SG80 - The nature and distribution of habitat types, including vulnerable areas, in the fishery area are known at a level of detail relevant to the scale and intensity of the fishery. The operation of the fishing gear requires the proper kind of substrate, and exploration early in the development of the fishery determined suitable sites. The distribution and quality of available spawning habitat is well known from ongoing spawning ground surveys. Streams have been mapped at a regional scale.				

SG100 – Habitat quantity and quality have not been formally detailed for all known habitats in the region. As a result, the 100-scoring guidepost for this indicator is not met.

	Information adequacy for assessment of impacts			
b	Guide post	Information is adequate to broadly understand the nature of the main impacts of gear use and enhancement activities on the main habitats, including spatial overlap of habitat with fishing gear. ***OR*** **If CSA is used to score PI 2.4.1 for the UoA:** Qualitative information is adequate to estimate the consequence and spatial attributes of the main habitats.	Information is adequate to allow for identification of the main impacts of the UoA and enhancement activities on the main habitats, and there is reliable information on the spatial extent of interaction and on the timing and location of use of the fishing gear. ***OR*** **If CSA is used to score PI 2.4.1 for the UoA:** Some quantitative information is available and is adequate to estimate the consequence and spatial attributes of the main habitats.	The physical impacts of the gear and enhancement activities on all habitats have been quantified fully.
	Met?	Yes	Yes	No

Rationale

SG60 - See SG100

SG80 - Habitat types are identified and there is reliable information on the spatial extent, timing and location of use of the fishing gear. Fishing gear impacts on the sand bottom in coastal and riverine fishing areas is known to be minimal and to have all signs of fishing obliterated during natural events such as storms and floods. Sufficient information is available to determine that fishery activities do not have a quantifiable impact on habitat. All such activities are licensed and monitored by the government. Enhancement does not occur in the UoA.

SG100 – Quantitative evidence of required assessment of habitat related impact as per SA3.13.1 and SA3.13.2 is limited. As a result, the 100-scoring guidepost for this indicator is not met.

	Monitoring			
c	Guide post		Adequate information continues to be collected to detect any increase in risk to the main habitats.	Changes in all habitat distributions over time are measured.

	Met?		Yes	No
Rationale				
SG60 - See SG80 SG80 - Risks of fishery impacts to habitat may be assessed based on the number and location of fishing parcels which are licensed and regulated by the government. Similarly, all fishery construction and operation are regulated by the government. There is a special agency, State Sanitary-epidemiological inspection which controls whether the fishery affects the fishing operation zone. In a case of violations, it is a usual practice to impose fines to the company. This information is sufficient to detect any risk to habitat due to changes in the fishery. SG100 – Physical habitat assessments have not been conducted (due to the lack of significant impacts) hence the SG100 is not met.				
References				
MRAG 2016				

Draft scoring range and information gap indicator added at Announcement Comment Draft Report

Draft scoring range	≥80
Information gap indicator	Information sufficient to score PI

Overall Performance Indicator scores added from Client and Peer Review Draft Report

Overall Performance Indicator score	**80**
Condition number (if relevant)	--

PI 2.5.1 – Ecosystem outcome

PI 2.5.1		**The UoA and associated enhancement activities do not cause serious or irreversible harm to the key elements of ecosystem structure and function**		
Scoring Issue		SG 60	SG 80	SG 100
a	**Ecosystem status**			
	Guide post	The UoA is **unlikely** to disrupt the key elements underlying ecosystem structure and function to a point where there would be a serious or irreversible harm.	The UoA is **highly unlikely** to disrupt the key elements underlying ecosystem structure and function to a point where there would be a serious or irreversible harm.	There is **evidence** that the UoA is highly unlikely to disrupt the key elements underlying ecosystem structure and function to a point where there would be a serious or irreversible harm.
	Met?	Yes	Yes	No

Rationale
SG60 - See SG80 SG80 – Information on the distribution, scale and effect of the fishery provides justification for a conclusion that the fishery is highly unlikely to disrupt the key elements underlying ecosystem structure and function to a point where there would be a serious or irreversible harm. For the purposes of this assessment, all gears are combined for scoring purposes as impacts are negligible. North Pacific Ecosystem - Potential ecosystem concerns related to fishing might involve effects of changes in salmon abundance on ecosystem structure, trophic relationships, and biodiversity. For instance, decreases in salmon abundance due to fishing might favor prey species of salmon and harm predator species of salmon. However, the salmon fishery has complex short and long-term effects on salmon abundance. Salmon fishery management to provide escapements consistent with maximum sustained yield generally increases average abundance in the ocean and return relative to what can be expected in an unmanaged system. Conversely, high exploitation rates and management for optimum rather than equilibrium escapements will substantially reduce the average number of fish escaping to freshwater. Effects of salmon abundance on ecosystem productivity in the ocean have been the subject of extensive research over the last 20 years and the scientific literature generally suggests that high abundance of salmon on the high seas due to the net effects of fishery management and hatchery enhancement throughout the north Pacific Rim has may have contributed to ecosystem changes. However, the contribution from any specific area to total salmon abundance in the ocean is relatively small. Therefore, the UoAs are highly unlikely to serious or irreversible harm to the structure and function of the North Pacific ecosystem. Riverine Ecosystem - Effects of salmon abundance on ecosystem productivity in freshwater have also been well documented in other systems. Larger escapements provide more food for salmon predators such as bears and eagles and also more marine derived nutrients to support primary and secondary productivity. However, while fishery management may affect abundance, it also reduces the variability in abundance relative to what can be expected in an unmanaged system. On balance these effects are not expected to result in serious or irreversible harm to any other component of the ecosystem. Therefore, the UoAs are highly unlikely to serious or irreversible harm to the structure and function of the riverine ecosystem. SG100 - The governmental scientific agency is conducting a series of ecosystem assessments in Kamchatka. These include evaluations of the effects of salmon abundance by species on individual characteristics and population dynamics of other salmon species, assessments of food marine derived nutrient contributions and effects of salmon to freshwater ecosystems, and food web productivity. These assessments provide a basis for evaluating fishery effects on ecosystem structure and function. However, a specific analysis of the likelihood of the fishery to disrupt key elements underlying North Pacific or riverine ecosystem structure and function to a point where there would be a serious or irreversible harm has not been reported hence the SG100 is not met.

	Impacts due to enhancement			
b	Guide post	Enhancement activities are **unlikely** to disrupt the key elements underlying ecosystem	Enhancement activities are **highly unlikely** to disrupt the key elements underlying ecosystem	There is **evidence** that the enhancement activities are **highly unlikely** to disrupt the key elements underlying

		structure and function to a point where there would be a serious or irreversible harm.	structure and function to a point where there would be a serious or irreversible harm.	ecosystem structure and function to a point where there would be a serious or irreversible harm.
	Met?	Yes	Yes	Yes
Rationale				
No enhancement occurs in this UoA.				
References				
MRAG 2016				

Draft scoring range and information gap indicator added at Announcement Comment Draft Report

Draft scoring range	≥80
Information gap indicator	Information sufficient to score PI

Overall Performance Indicator scores added from Client and Peer Review Draft Report

Overall Performance Indicator score	**90**
Condition number (if relevant)	--

PI 2.5.2 – Ecosystem management strategy

PI 2.5.2		**There are measures in place to ensure the UoA and enhancement activities do not pose a risk of serious or irreversible harm to ecosystem structure and function**		
Scoring Issue		SG 60	SG 80	SG 100
a	**Management strategy in place**			
	Guide post	There are **measures** in place, if necessary, which take into account the **potential impacts** of the UoA on key elements of the ecosystem.	There is a **partial strategy** in place, if necessary, which takes into account **available information and is expected to restrain impacts** of the UoA on the ecosystem so as to achieve the Ecosystem Outcome 80 level of performance.	There is a **strategy** that consists of a **plan**, in place which contains measures to **address all main impacts of the UoA** on the ecosystem, and at least some of these measures are in place.
	Met?	Yes	Yes	No
Rationale				

SG60 - See SG80

SG80 - Measures include fishery management goals for spawning escapements adequate to meet ecosystem needs in freshwater systems; including food for bears and provision of marine derived nutrients. This strategy also involves significant monitoring and research of ecosystem components at a regional scale. The partial strategy takes into account available information, monitors new information from the extensive research, and is expected to restrain impacts of the fishery activities on the ecosystem should the research identify any need.

SG100 - It is not apparent that the strategy involves a specific plan containing measures to address all main impacts of the fishery on the North Pacific and riverine ecosystems, nor that all functional relationships between the fishery and the components and elements of the ecosystem are well understood, hence the SG100 is not met.

b	**Management strategy evaluation**			
	Guide post	The **measures** are considered likely to work, based on plausible argument (e.g., general experience, theory or comparison with similar UoA/ ecosystems).	There is **some objective basis for confidence** that the measures/ partial strategy will work, based on some information directly about the UoA and/or the ecosystem involved.	**Testing** supports **high confidence** that the partial strategy/ strategy will work, based on information directly about the UoA and/or ecosystem involved.
	Met?	Yes	Yes	No

Rationale

SG60 - See SG80

SG80 - General experience and information from other systems indicate that the fishery measures are likely to minimize risks of serious or irreversible harm to ecosystem structure and function. Salmon populations are inherently dynamic with large interannual variation on run sizes due to normal environmental variation in abundance. Related ecosystems are affected by these same dynamic conditions. Management of fisheries to provide significant natural spawning escapements and minimal disruption from enhancement ensure future production of salmon to fuel future fisheries while also providing fish and marine derived nutrients critical to sustaining freshwater and nearshore marine ecosystems. The SG80 is met.

SG100 – Systematic testing of the ecosystem effects of fishery is limited and the SG100 is not met.

c	**Management strategy implementation**			
	Guide post		There is **some evidence** that the measures/partial strategy is being **implemented successfully**.	There is clear evidence that the partial strategy/strategy is being implemented successfully and is achieving its

				objective as set out in scoring issue (a).
	Met?		Yes	Yes
Rationale				
SG80 - See SG100 SG100 – Monitoring of new information from the extensive research regularly occurs. Qualitative information and observations readily indicate that stream and nearshore ecosystems are intact, diverse, and productive. West Kamchatka is one of the most remote and pristine areas in the eastern Pacific; the SG100 is met.				
	Management of enhancement activities			
d	Guide post	There is an **established** artificial production strategy in place that is expected to achieve the Ecosystem Outcome 60 level of performance.	There is a **tested and evaluated** artificial production strategy with sufficient monitoring in place and evidence is available to reasonably ensure with high likelihood that the strategy is effective in achieving the Ecosystem Outcome 80 level of performance.	There is a **comprehensive and fully evaluated** artificial production strategy to verify with certainty that the Ecosystem Outcome 100 level of performance.
	Met?	Yes	Yes	Yes
Rationale				
No enhancement occurs in the area of the Unit of Assessment.				
References				
MRAG 2016				

Draft scoring range and information gap indicator added at Announcement Comment Draft Report

Draft scoring range	≥80
Information gap indicator	Information sufficient to score PI

Overall Performance Indicator scores added from Client and Peer Review Draft Report

Overall Performance Indicator score	**90**
Condition number (if relevant)	--

PI 2.5.3 – Ecosystem information

PI 2.5.3		There is adequate knowledge of the impacts of the UoA and associated enhancement activities on the ecosystem		
Scoring Issue		SG 60	SG 80	SG 100
a	**Information quality**			
	Guide post	Information is adequate to **identify** the key elements of the ecosystem.	Information is adequate to **broadly understand** the key elements of the ecosystem.	
	Met?	Yes	Yes	
Rationale				
SG60 - See SG80 SG80 - The salmon life cycle encompasses a vast ecosystem including natal rivers and lakes, the nearshore ocean, and the high seas of the North Pacific Ocean. Key ecosystem elements include trophic structure and function (in particular key prey, predators, and competitors), community composition, productivity pattern (e.g., upwelling or spring bloom, abyssal, etc.), and characteristics of biodiversity. Key elements of the salmon ecosystem are broadly understood based on extensive work by scientists associated with the management system. Extensive research has been conducted on freshwater and marine aquatic ecosystems. This information consists of Kamchatka-specific research and research conducted in other salmon-producing regions; the SG80 is met.				
b	Investigation of UoA impacts			
	Guide post	Main impacts of the UoA and associated enhancement activities on these key ecosystem elements can be inferred from existing information, and **have not been investigated in detail**.	Main impacts of the UoA and associated enhancement activities on these key ecosystem elements can be inferred from existing information and **some have been investigated in detail**.	Main interactions between the UoA and associated enhancement activities and these ecosystem elements can be inferred from existing information, and **have been investigated in detail**.
	Met?	Yes	Yes	No
Rationale				
SG60 - See SG80 SG80 - Marine-derived nutrients from salmon carcasses can have a significant impact on freshwater communities as well as those communities in the freshwater to terrestrial interface. The relationships between salmon and the population dynamics of their terrestrial predators has been well documented in other systems. It has been reported that these nutrients also form a base for rich development of zooplankton in coastal area, which serves food for young salmon just after downstream migration. Many aspects of ecosystem dynamics have been investigated in detail. For instance, estimates of the				

contribution of marine derived nutrients from salmon carcasses have been made for the Bolshaya system and research is underway on food web productivity.

SG100 - Of particular concern to salmon fishery management throughout the North Pacific Region is the effect of ocean environmental conditions on stock productivity. Short term and long-term variability in stock productivity is now understood to be strongly related to patterns of ocean productivity. Ocean productivity regimes have been observed shift periodically to more or less favorable conditions. The region is currently in a very productive ocean regime for many northern salmon stocks including Kamchatka Pink and chum salmon. These patterns and their effects are generally understood but future patterns cannot be forecast. Thus, salmon productivity and sustainability would be negatively affected by a shift to a less favorable regime. It remains unclear whether knowledge of fishery-ecosystem interactions is sufficient to recognize changes and to revise management objectives and practices in a timely fashion. Thus, while information on fishery-ecosystem functions and elements is sufficient to meet 80 scoring guideposts, it does not rise to the standard of the 100 scoring guideposts.

c	**Understanding of component functions**			
	Guide post		The main functions of the components (i.e., P1 target species, primary, secondary and ETP species and Habitats) in the ecosystem are **known**.	The impacts of the UoA and associated enhancement activities on P1 target, primary, secondary and ETP species and Habitats are identified and the main functions of these components in the ecosystem are **understood**.
	Met?		Yes	No

Rationale

SG80 - Salmon significantly influence two ecosystems: spawning rivers of Kamchatka and Sea of Okhotsk and the Pacific ocean. In rivers, they are important source of food for marine mammals and birds of prey, and enhance the whole riverine ecosystem. In the ocean, they consume zooplankton and forage fish and serve as food for predatory fish. Life history and role of non-target species, in ecosystem, some of which are massive (although their share in the salmon catch is low) is also well studied. Riverine habitats got a lot of attention from salmon biologists as provide spawning opportunity for salmon. Extensive studies were performed in the open sea by different nations to study dynamics of species abundance and food webs in this very area of very high productivity.

SG100 – Despite on extensive studies, very high complexity and dynamic nature of these ecosystems results in significant uncertainties while forecasting their responses to environmental changes and thus it cannot be concluded that the main functions of the ecosystems are well understood.

d	**Information relevance**			
	Guide post		Adequate information is available on the impacts of the UoA and associated	Adequate information is available on the impacts of the fishery and associated

			enhancement activities on these components to allow some of the main consequences for the ecosystem to be inferred.	enhancement activities on the components **and elements** to allow the main consequences for the ecosystem to be inferred.
	Met?		Yes	No
Rationale				
SG80 - Sufficient information is available on the impacts of the fishery on these components to allow some of the main consequences for the ecosystem to be inferred. Main consequences include changes in competition levels between salmon species and nutrient contributions to freshwater food webs from marine derived nutrients delivered by salmon carcasses. Scientists of the government research institutes have collected substantial information on pink salmon and their role in the ecosystem. Information on salmon ecosystems throughout the Pacific rim has also provided a good understanding of the salmon's function in freshwater ecosystem, particularly for supporting aquatic and terrestrial food webs either directly by feeding predators and scavengers or indirectly by the delivery of marine derived nutrients. Active fishery management might also help stabilize returns by avoiding excessively large escapements which can depress future returns under some conditions. Enhancement with hatcheries can substantially increase salmon numbers in certain times and areas although hatchery contributions to chum salmon runs remain uncertain. Enhancement of Pacific salmon across the Pacific Rim since the 1970s has resulted in very large abundance in the North Pacific Ocean. There is some evidence that high salmon abundances in the ocean might adversely affect wild salmon through competition. As hatchery production does not occur in the UoA, no adverse impacts are expected. The SG80 is met. SG100 – Information is not sufficient to evaluate fishery impacts on all ecosystem elements. The SG100 is not met.				
e	**Monitoring**			
	Guide post		Adequate data continue to be collected to detect any increase in risk level.	Information is adequate to support the development of strategies to manage ecosystem impacts.
	Met?		Yes	No
SG80 - Extensive research has been conducted on salmon ecosystems in West Kamchatka, particularly for sockeye but also for other salmon species. In marine waters, extensive research has been conducted by the Russian Scientific Institutes on (1) Juvenile Anadromous Stocks in Ocean Ecosystems; (2) Anadromous Stocks in the Bering Sea Ecosystem (BASIS); and (3) Anadromous Stocks in the Western Subarctic Gyre and Gulf of Alaska Ecosystems (Temnykh et al. 2010). SG100 – Detailed strategies for managing ecosystem impacts have not been identified.				
References				
MRAG 2016; Aydin et al. 2008; Bugaev et al. 2018a, 2018b; Burkanov 1988; Kosygin et al. 1986; Ostroumov 1968				

Draft scoring range and information gap indicator added at Announcement Comment Draft Report	
Draft scoring range	≥80
Information gap indicator	Information sufficient to score PI

Overall Performance Indicator scores added from Client and Peer Review Draft Report	
Overall Performance Indicator score	**80**
Condition number (if relevant)	--

5.4 Principle 3

5.4.1 Principle 3 background

Legal & Customary Framework

The current Russian Federation became independent of the former Soviet Union in 1991. As a federation, it consists of numerous jurisdictions with various levels of autonomy. The legal system is based on civil law system with judicial review of legislative acts. The federal government has centralized authority in Moscow, where final decisions are made. The fisheries management consists of complex levels of authority for management and research, with ultimate authority centralized in Moscow. At the same time, recent years more decisions are delegated to the regional level, in particularly, in the Far East, to the Far East Scientific Commercial Fisheries Council in Vladivostok. In-season management is entirely delegated to local agencies. The Federal Agency for Fisheries is governed directly by the government of Russia, is the ultimate authority, reviewing recommendation passed up from the local level and passing directives back, as described in the next section.

The main governmental act framing the salmon fisheries management is the law of 20 December 2004 FZ-166 “On Fishery and Conservation of Aquatic Biological Resources”. The particular law states the basics for accounting the abundance of the aquatic biological resources and their exploitation using a precautionary approach on behalf of the human rights for favorable environment in the future, taking into account interests, rights and relations of all interested parties in the area of fishing, providing the transparency of information on the status of the resources. The law was amended in 2008 and provides more authority to regional management bodies, allowing them to assign quota for individual lease holders for 20 years. Before the reform salmon fisheries were regulated under TAC, and now – under recommended catch, which is not so strictly regulated. As it is widely considered, these changes resulted in more effective and accurate catch reporting of the commercial fisheries, because, due to introduction of Olympic system, there were no more reasons for companies to underreport.

There are a number of other, more generic legislative acts addressing the resource usage and minimizing the environmental anthropogenic impacts, such as the law of 20 December 2001 FZ-7 “On the Protection of Environment” and the law of 19 July 1995 FZ-174 “On the Ecological Expertise”. The law “On the Protection of Environment” defines the responsibilities of governmental bodies, human rights for the favorable environment, economic mechanisms of nature conservation, ecological standards and expertise, liability for violations, necessity for improvement of scientific knowledge, regulation of disputes, and the basics for international cooperation in the sphere of environment protection. The law of 24 April 1995 FZ-52 “On Animal World” (extracted from article 22) states, that any activity resulting in changes of animal environment and deterioration of condition of their reproduction, feeding, rest and migration routes must be performed in accordance with rules of nature conservation.

Some references concerning conservation of environment are contained also in federal laws directly related to fisheries: “On Fisheries and conservation of aquatic biological resources" and “The rules of fishing for the Far Eastern Fishery basin”.

Recently adopted State program “Development of fishery industry” (18 December 2014) (http://government.ru/media/files/ulCPlqzA6Nw.pdf) has a goal to enable the transition from export-commodity type to innovative development based on conservation, reproduction, rational use of aquatic biological resources, introduction of new technologies, the development of import-substitution sub-sectors; providing the sufficient amount of domestic fishery production and competitiveness of Russian fishery products on domestic and foreign markets. Although the main task of the program to increase

fisheries production, quite high attention is also paid to conservation of aquatic biological resources and expanding of scientific research, including ecosystem research.

Management Structure - Consultation, Roles & Responsibilities

Management of Kamchatka salmon fisheries is administered by Federal and Regional governmental agencies. Kamchatka Kray, which includes Kamchatka Oblast and Koryak Autonomous Okrug is the subject of the Russian Federation and is a part of Far Eastern Federal Region (Okrug). It is under the direction and control of the Government of the Russian Federation. Fisheries of Russia are managed and controlled by Federal Fishery Agency (FFA) of the Russian Federation, which is located in Moscow and is also represented by a local office in Kamchatka. Operational management of all activities is performed by the Governor of the Kamchatsky Kray. The description of roles and responsibilities of most important governmental control agencies is presented below.

Federal Fishery Agency

Federal Fishery Agency (FFA: Federal'noe Agentstvo po Rybolovstvu), located in Moscow, is responsible for management and control of fisheries in the Russian Federation. FFA interacts with various agencies at the federal level while controlling its territorial departments. FFA Policies and Regulation of fisheries are created by a consultative process involving a Public Council, which facilitates public discussions of accepted and proposed regulations.

Northeastern Territorial Administration of FFA (Severo Votochnoye Territorialnoye Upravlenie)

SVTU is the Northeastern Territorial Administration of FFA which oversees local management and enforcement for Kamchatka Kray. SVTU has final approval of fishing concessions and in-season fishery management regulation actions (to open and close fisheries). They give fishing companies permission to harvest, monitor fishing companies and processors to ensure regulation compliance, and patrol streams to reduce poaching activities. SVTU posts all approved management decision of Anadromous Fish Commission on its website (www.terkamfish.ru).

Federal Fishery Research Institutes

FFA includes a headquarter research institute called All-Russia Institute for Fisheries Research and Oceanography, VNIRO (ВНИРО or Vserossiiskii nauchno-issledovatelskii institut rybolovstva i okeanografii - Всероссийский научно-исследовательский институт Рыболовства и Океанографии). It includes a network of scientific research organizations conducting the research and development of both applied and fundamental nature in accordance with the program entitled “Scientific and engineering support of the Russia’s fisheries industry.” This network includes 15 scientific research organizations under its direct supervision – of which nine are marine scientific research institutes; they are assigned to appropriate regions on the legal basis and are responsible for the state level monitoring of stocks and additional resources and inclusion of the said resources in harvesting process and also responsible for rational and efficient usage of the bio-resources. Until recently these institutes were independent, but now are all represent departments of VNIRO. FFA Research for the Pacific aquatic biological resources is conducted by the following scientific regional research institutes: TINRO-Center (Vladivostok) (Тихоокеанский научно-исследовательский институт Рыболовства и Океанографии, ТИНРО-Центр or Tikhookeanskii nauchno-issledovatelskii institut rybolovstva i okeanografii) with branches in Khabarovsk and Anadyr; MagadanNIRO (Magadan) (Магаданский научно-исследовательский институт рыбного хозяйства и океанографии, МагаданНИРО or Magadanskii nauchno-issledovatelskii institute rybolovstva i okeanografii), KamchatNIRO (Petropavlovsk-Kamchatsky) (Камчатский научно-исследовательский институт рыбного хозяйства и океанографии, KamchatNIRO or Kamchatskii nauchnoissledovatelskii institut rybolovstva i okeanografii) and SakhNIRO (Yuzhno-Sakhalinsk) (Сахалинский научно-

исследовательский институт рыбного хозяйства и океанографии, СахНИРО or Sakhalinskii nauchno-issledovatelskii institut rybolovstva i okeanografii). Studying of aquatic biological resources of the Arctic, northern Atlantic Ocean, Baltic Sea and Atlantic Ocean and that of Black and Caspian seas, sea of Azov and biological resources of internal freshwater bodies is performed by other territorial institutions.

KamchatNIRO, located in Petropavlovsk-Kamchatsky, is the regional scientific agency responsible for research and monitoring of marine and freshwater resources in the Kamchatka region including the status of commercial species. It is one of a network of scientific research organizations operated by FFA under the oversight of TINRO-Center in Vladivostok. Departments are also located in Khabarovsk and Anadyr; Magadan (MagadanNIRO), and Yuzhno-Sakhalinsk (SakhNIRO).

Northeastern Rybvod (SevvostRybvod)

SevvostRybvod (Севвострыбвод) is a Department of FFA responsible for operation of salmon hatcheries and conduct of related assessments. SevvostRybvod is directly managed by the Federal Fisheries Agency. The area of responsibility of this organization covers Kamchatka Krai and Chukotka Autonomous Okrug. Responsibilities include incorporation of management actions connected with recovery of damaged habitats, artificial reproduction of aquatic biological resources, and also participation in international agreements on protection of aquatic resources.

SVTU controls hatchery permitting and management in the Kamchatka Kray. Sevvostrybvod operates five hatcheries in Kamchatka including two in the Western coast of the Peninsular (Bolshaya river basin). SevvostRybvod does not occupy as important a role in management of salmon fisheries in Kamchatka as, for instance, SakhRybvod in Sakhalin, because artificial reproduction is relatively insignificant in Kamchatka.

Federal Ministry of Natural Resources and Ecology of the Russian Federation encompassing the Federal Service for Subervision in the sphere of Ecology & Natural Resources Use (Rosprirodnadzor)

Rosprirodnadzor (Росприроднадзор) is the Federal agency in a sphere of enforcement and control. According to the Presidential Decree No. 400 issued 30.06.2004, it is responsible for State supervision of usage and protection of water bodies, wildlife and their habitats, federal level wildlife preserves.

Federal Agency for Veterinary and Phytosanitary Supervision (Rosselkhoznadzor)

Rosselkhoznadzor (Россельхознадзор) is the Federal enforcement and control agency for biological resources under the Russian Ministry of Agriculture. Responsibilities include accounting for and analysis of violations of technical regulations and other regulatory documentation, supervision of compliance with Russian Federation laws by the state agencies, local government, and the public supervision of marine fishery ports and vessels, and administration of the Convention on the International Trade in Endangered Species of Wild Fauna and Flora. In total, activities of any enterprise operating on rivers are controlled by 14 different State commissions, but their role is not as significant as those described above.

Public Council for FFA

FFA Policies and Regulation of fisheries are created by a consultative process. In 2008, FFA created the Public Council (PC) in Moscow (Общественный совет по рыболовству, Obschestvennyi sovet po rybolovstvu), which facilitates public discussions of accepted and proposed regulations. The PC is composed of wide range of fishermen associations, environmental institutions, environmental services, the World Wildlife Fund and other interested community organizations. In the consultative process the PC is joined by government agencies and territorial Association of Fishermen, fisheries departments and offices of subjects of Russian Federation. The government policies are finally adopted and implemented

following the process of consideration of the proposed policies and discussions between the PC and the interested parties.

Far East Scientific Commercial Fisheries Council (FESFC)

Far East Scientific Commercial Fisheries Council, FESFC (Дальневосточный рыбопромысловый совет, Dalnevostochny rybopromyslovy sovet) is an independent council made up of representative of the Federal Fisheries Agency, scientific research institutes, non-profit commercial associations of commercial fisheries, minority peoples of the North and Russian Far East, and the union of the pool of professional fishers. The personnel composition of the FESFC is approved by order of FFA based on the recommendations of the Russian Federation territorial subject. However, half of its members must be either from scientific or similar fish conservation or natural resources agencies. The council has the authority to engage other competent authorities, interested parties (or stakeholders) as needed, upon approval of a vote of its members. Meetings are held in Vladivostok at least twice a year. The FESFC meetings can be attended by any interested party, where they may express their opinions and participate in the discussions. Central to the responsibilities of the FESFC is the compilation of scientific information concerning the management of marine bio-resources in the Russian Far East for submission to the Federal Fisheries Agency for final approval. In addition, it reviews and submits its recommendations on fisheries regulations, construction of fish hatcheries and the recommendations for the distribution of quota among its subjects.

Ministry of Fisheries of Kamchatka Krai

Under the new management system, the regional government has the responsibility for in-season management of fisheries. The Kamchatka Ministry of Fisheries (Министерство рыбного хозяйства Камчатского края, Ministerstvo rybnogo khozyaystva Kamchatskogo kraya) is primarily responsible for establishing and operating of the Commission on the Regulation of Harvesting (catch) of Anadromous Fishes (AFC), and providing information on the fishery (such as catch and escapement data collected by KamchatNIRO).

Commission on the Regulation of Harvesting Anadromous Fishes (AFC)

The AFC (Комиссия по регулированию вылова (добычи) анадромных видов рыб, Komissia po regulirovaniu vylova (dobychi) anadromnykh vidov ryb) has the responsibility for the distribution of recommended yearly catch of salmon among users and identifying areas of commercial fishery, recreational fishing, and traditional fishery of the indigenous population. The AFC was established by regional bodies in 2008 to implement management changes identified in new federal regulation. The AFC is chaired by the regional governor and consists of government, industry and interested stakeholders. These include representatives from Federal executive bodies, including the federal security and environment protection authorities, as well as representatives of the regional government, federal, public associations, consolidations of legal entities (associations and unions), and scientific organizations. The list of members of AFCs is suggested by the Governor and approved by the Territorial Administration of FFA (SVTU).

Upon the request of companies, the AFC sets up the recommended catch for a management unit area and accepts applications from the users, each of which cannot exceed the total recommended catch for management unit. In case of approaching recommended catch for some management unit, AFC can close fishing or increase the recommended catch following recommendations of KamchatNIRO. The recommended catch is authorized by FFA and accounts for the number of salmon required for filling in the spawning areas and broodstock hatcheries, as well as quotas for sport fishing and harvest by the indigenous population. The AFC meets regularly (by October 2015, 21 meeting took place), and makes in

season fishery management decisions. Based on the reports about filling of the spawning grounds, the AFC makes operational decisions on the time and duration of fishing by either closing fishing in spawning grounds in case of insufficient filling or by increasing the quotas in order to harvest excessive spawners from the mouths of rivers to avoid overflow of spawning grounds. The AFC's decisions are made through discussions and consultations with stakeholders. All meetings are open to the public. All decisions of AFCs on fisheries management are subject to final approval by Territorial Administrations of FFA. Meeting minutes and decisions are posted on the Territorial Administration website (http://www.terkamfish.ru). Functioning of the Commission is regulated by the order of RF Ministry of Agriculture No. 170, dated April 8, 2013, "Concerning Approval of the Rules of Activity of the Commission on Regulation of Harvesting Anadromous Fish". The key items are the following:

Item 6. The Commission composed of the Chairman, Deputy Chairman, Executive Secretary and members of the Commission is formed.

Item 7. The Commission is headed by the highest official of a corresponding Russian Federation constituent (head of the supreme executive authority of the state government body of Russian Federation constituent) (hereinafter referred to as Commission Chairman). The Commission Chairman conducts meetings of the Commission, makes decisions on procedural issues and signs minutes of the meetings. In the absence of the Commission Chairman its activity is managed by the Deputy Commission Chairman. The Executive Secretary of the Commission assists the Commission Chairman and Deputy Commission Chairman in organization of work of the Commission and work group formed within the Commission, as well as keeps minutes of the meetings and organizes work on their filing to a territorial authority of the Russian Federal Fisheries Agency.

Item 8. The Commission consists of representatives of federal executive authorities, including a representative of the federal executive authority in the sphere of defence, a representative of the federal executive authority in the sphere of organization of safety of the Russian Federation, a representative of the federal executive authority in the sphere of environmental protection, representatives of bodies of state power of Russian Federation constituents, public associations, alliances of legal entities (associations and unions), as well as scientific organizations under the jurisdiction of the Russian Federal Fisheries Agency.

Item 9. Public associations, alliances of legal entities (associations and unions), as well as scientific organizations under the jurisdiction of the Russian Federal Fisheries Agency file proposals related to composition of the Commission to the executive government body of a corresponding Russian Federation constituent. Federal executive authorities (their territorial bodies) and the executive government body of a corresponding Russian Federation constituent file proposals on composition of the Commission to the Ministry of Agriculture of the Russian Federation, who issues an order on approval of personal composition of the Commission for every Russian Federation constituent on the territory of which procurement (yield) of anadromous species of fish will be carried out.

Item 10. Commission's activity is carried out in a form of meetings organized as and when necessary.

Item 11. All members of the Commission have equal rights during discussion of issues being considered at a meeting.

Item 12. The Commission is authorized to make decisions in case more than half of its members are present at the meeting. A decision of the Commission is deemed made in case more than half of its members that are present at the meeting voted for. If votes of Commission's members divide equally, vote of a person chairing the Commission will be decisive.

Item 13. Commission's resolution is documented in a protocol no later than in 2 days after conduct of a regular meeting to be signed by the Commission Chairman or, in its absence, by Deputy Commission Chairman chairing the meeting, and initiated by the Executive Secretary, as well as by all members of the Commission present at the meeting.

Item 14. In case a member of the Commission does not agree with a decision made, it is entitled to express its special opinion in writing, which shall be added to the minutes of the meeting.

Item 15. Minutes of the meeting shall be sent to a territorial administration of the Russian Federal Fisheries Agency within 2 days after its signing to be approved within 2 business days. In case the territorial body of the Russian Federal Fisheries Agency does not approve the minutes of the Commission, it shall notify the Commission thereof in writing within 2 days after receipt of the minutes, indicating reasons preventing approval of minutes of the meeting.

Item 16. After the minutes of the meeting is approved by the territorial body of the Russian Federal Fisheries Agency, it is published on its official website and sent to executive government bodies of Russian Federation constituent within 2 business days and is binding.

Interdistrict Environmental Prosecutor's Office of Kamchatka

The Interdistrict Environmental Prosecutor's Office of Kamchatka (Камчатская межрайонная природоохранная специализированная прокуратура, Kamchatskaya mezhrayonnaya prirodookhrannaya spetsializirovannaya prokuratura) is a specialized department of the Prosector's Office of Kamchatka Krai, which is responsible for supervision over the implementation of laws in the area of ecology and exploitation of natural resources. It also has full powers to perform investigation of violations if there are no responses from other specialized enforcement bodies occurs. The Prosector's Office involves experts for an investigation, acts as a complainant at the court and provides relevant information.

In terms of quality, credibility, reliability and effectiveness against international standards, Russian fisheries management system was ranked fourth behind the management systems of the USA, Iceland and Norway in a robust scientific analysis (Melnychuk et al., 2017).

Fishery Objectives & Measures

Preseason management

The local research fisheries institution, KamchatNIRO, plays a key role in producing fishery forecasts. The forecasts use a regression model of abundance of parental and progeny generations using equations of Ricker, Sheppard and others. The base for forecasts is data obtained by observers on commercial fisheries, surveys of number of spawners entering the river (visual foot counting, aerial visual and photo registration, hydro acoustic techniques, and marking) data on downstream migration of juveniles, and data on trawling of juveniles before feeding migration to high seas mouth during spawning migrations (Figure 76). Catch data are available for Bolshaya River from 1934. In the 1945, the research station of KamchatNIRO begun to work at the Bystraya River, which is a tributary of Bolshaya River. This may be taken as a date of beginning of regular fishery-oriented research in this area. In general, most of data used for forecasts is available from 1957.

The recommended catch is calculated as a difference between total number of returning fish estimated for a season and the target amount of spawners, taking in account a total area of spawning grounds in the district and optimal density of spawners, which depends on river and species. At higher than optimal spawning density on the spawning grounds, overspawning results in decrease of recruits per spawner due to resorption of gonads and destruction of redds by later spawners. An obvious overspawning event occurred in the northwestern Kamchatka in 1983, when huge number of spawners entered rivers because

fishing facilities of the companies were not sufficient to prevent them. As a result, mortality of progeny was very high, and the next generation was weak. Due to this, since this period odd generation of pink depressed and even generation dominants until present.

Given that dynamics of populations in the same area is usually synchronous, several reference populations are studied in more details, at so-called fish monitoring stations, and then the forecast is extrapolated to the entire area. One of stations is situated in Bolshaya River. In the downstream part of Opala and Kikhchik Rivers there are seasonal stations where KamchatNIRO collects data from commercial catches. The proportion of each population in the area is considered to be constant and is determined based on long-term fisheries and research data.

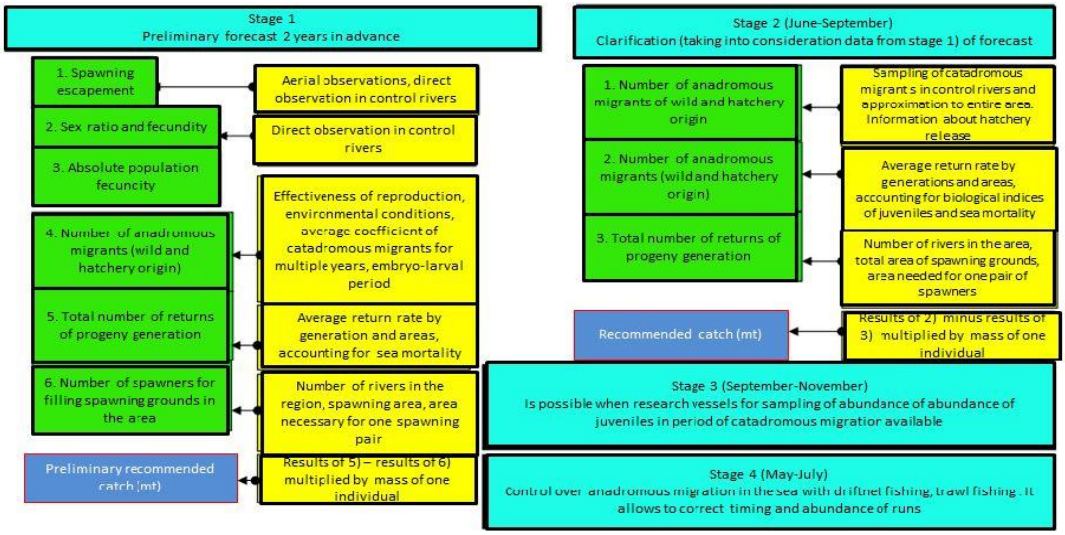


Figure 77. Main stages of issuing of the forecast (recommended catch) of Pacific salmon (Rassadnikov 2006).

The initial forecast provided by the local research team must be approved on different levels (Figure 77). Firstly, the Research Council of KamchatNIRO should approve. Then KamchatNIRO sends the annual forecast to the TINRO-Center; the latter summarizes the forecasts from all regional NIROs (Research Institutes for Fishery and Oceanography). Forecasts are discussed on the Far East Salmon Council, which was created within the TINRO-center with the goal of coordinating the research and forecasting of salmon in the Far Eastern basin. FESC decides on the final value of the forecast of recommended catch and sends the forecast to VNIRO. Because of the change from TAC management to recommended catch management, approval by the State Ecological Expertise on federal level has been also excluded from the process. This makes the process quicker and more transparent, but, at the same time, potentially less precautionary. During the period of approval, discussion with stakeholders takes place with active participation of representatives of fisheries companies, local administrations and federal ministries. On the basis of this forecast FFA approves the recommended annual catch for each fishery subzone. The pre-season forecast is used primarily for planning purposes and possibly to establish quotas for some non-commercial fisheries.

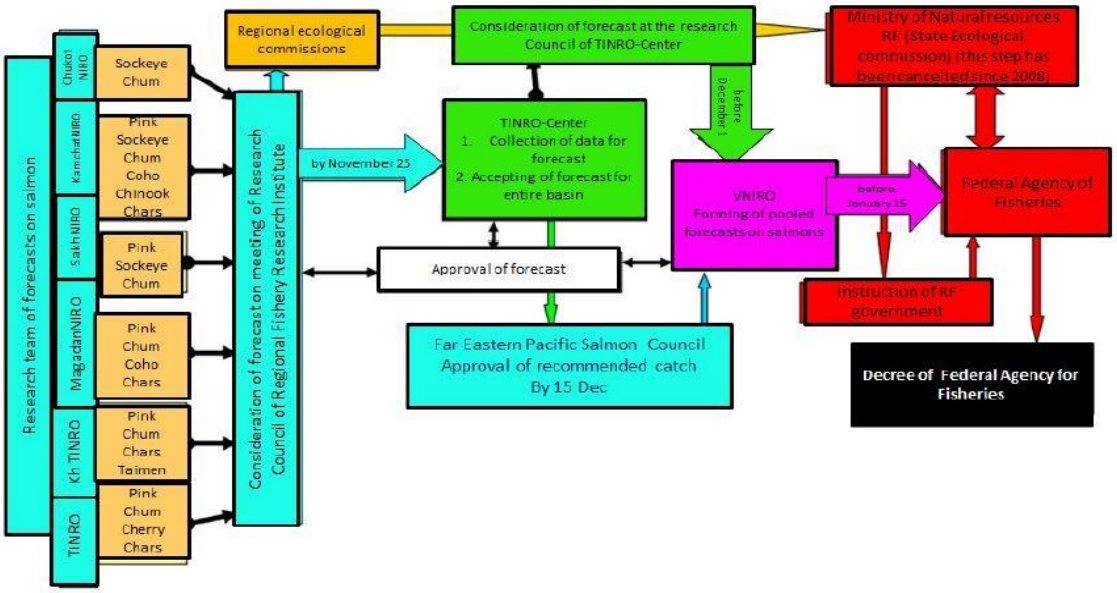


Figure 78. A procedure of issuing of the Pacific salmon recommended catch (Rassadnikov 2006).

In-season process

Each coastal set net or river beach seine is served by a crew of fishermen. The crew leaders report directly to the company's Directors. Each crew keeps fishing log according to the template specified by the FFA. This log records:

- coordinates of seine;
- daily catch (in metric tons);
- species composition and by-catch;

Each company submits information on the catch volumes and species composition to SVTU daily which is then summarized for reporting to the AFC.

The AFC opens and closes fishery times and areas based on harvest and escapement relative to expectations and objectives (Figure 78). To allow a sufficient number of fish to approach spawning grounds, the management system introduces system of pass days when fishery is prohibited. The system of pass-days creates kind of moving window for fish to safely approach the spawning grounds (Shevliakov et al. 2011). It is known that pass-days are used in the river fishing parcels regularly (two-three per week). Moreover, if spawning escapement is not sufficient, additional off days are set up in the river, and, if needed, in the sea. Usually, all these operations are done by decisions of AFC based on recommendations of KamchatNIRO.

Approved value of annual recommended catch may be adjusted by AFC based on real-time data on the number of the salmon approaching the fishing areas and spawning grounds. In order to assist in this adjustment, KamchatNIRO monitors the dynamics of catches and biological indicators of sockeye in the main areas of operation, in the migration routes and the reproduction of the species. The monitoring results are used for developing operational guidelines on salmon fishing.

The procedure of termination of fishing is not complex and can be done by AFC based on recommendations of KamchatNIRO. Following this decision, SVTU terminates all fishing activity if necessary, and may implement special closed days to obtain spawning escapement goals. Based on experience of last years, there are two free-of-fishing days per week in Bolshaya River (usually coincide with weekends). Increase of quota now, when approval by State Ecological Expertise is not necessary

anymore, is also not difficult and can be done by AFC based on recommendations of KamchatNIRO. Such a management system existed during 1990s, before introduction of the State Ecological Expertise and was considered quite convenient.

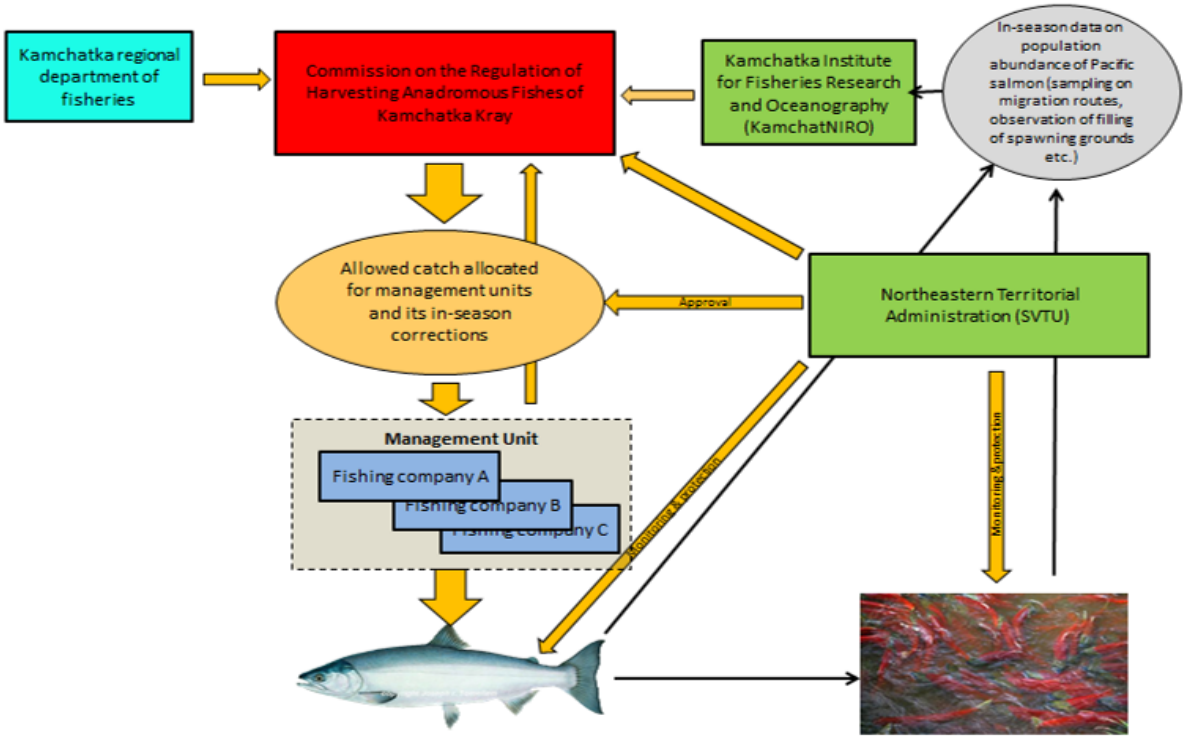


Figure 79. Scheme of in-season management of Pacific salmon fishery.

Since 2009 regulations of salmon fisheries were changed not only due to introduction of 20-year lease for fishing parcels, but also due to changing from the Total Available Catch (TAC) system and introduction of "Olympic system" of management based on achieving spawning escapement. Due to this fisheries management became less complicated and more decisions can be accepted on local level.

In Kamchatka, the "Olympic system" was firstly introduced in 2010. The main principles of this management model are the following:

- determining a management unit as group of fishing parcels situated in close geographical area (usually combination of sea and river parcels) inhabited by salmon populations with similar biology;
- self-dependence of users in terms of use their gear, in particularly, they are not obliged to use all their gear but only some, depending on situation;
- user defines himself size of his quota which, however, cannot exceed total quota for management unit determined by AFC. The companies report their catches to SVTU on a daily basis. After sum of catches of all companies fishing in the management unit achieved the total quota, the fishing terminated if AFC decided not to increase quota.

The main advantage of this system of management is opportunity for users to plan their fishing operations and free competition between them. Moreover, it provides more operative reporting of catches.

Disadvantages are possible exceeding of quota allocated for management unit if two or more companies simultaneously (in the same day) report catches which altogether increase total quota. Thus, the companies do not have individual responsibility not to exceed the quota. Also, companies can report false catches (exceeding the actual) in order to have opportunity to buy illegally obtained caviar.

Enforcement

SVTU enforces the fishing in in land waters and controls the compliance with the law and rules of fishing. SVTU contains in total 12 departments and among them the department of state control, supervision and protection of aquatic resources and habitats with enforcement functions. SVTU includes 12 local departments situated in every administrative district of Kamchatka Oblast. Fishing area assessed in this report is in the territory of Ust-Bolsheretsk and Sobolevo district departments. The level of protection depends on season. In the fishing season, in addition to usual 6 inspectors, the groups up to 15 inspectors are created. SVTU has responded to concerns of bribery and corruption of enforcement officers by monitoring agents through undercover surveillance of officers and monitoring changes in officer life styles; encouraging reporting by competitors and acquaintances; and by increasing penalties including fines and job loss for convictions. SVTU reports that corruption cases have gradually declined during last years. In the sea, the fishery is enforced by the Federal Security Service.

SVTU reports that illegal fishing by fishing companies has diminished to low levels since the beginning of the Olympic System and the removal of individual quotas for the companies. Partly, it is explained just by change of organization of fisheries - now companies do not have incentives to hide their catch, and their reports are more objective. At the same time, sanctions on companies are severe, including fines and loss of fishing privileges (cancellation of leases), which reduce incentives to fish illegally or launder illegal roe. SVTU stated that inflated catches reported by fishing companies to cover purchases of illegal roe have not been detected, and that exchange of information with tax inspectors is used to compare roe production with reported fish quantities. However, other participants in the fishery did report knowledge of companies increasing reported landings to account for illegal roe purchases. The assessment team was unable to determine if such misreporting occurred or the quantity of misreported catch/illegal roe that may have occurred.

As the amount of illegal fishing and misreporting by fishing companies has decreased, the dominant component of illegal fishing comes through poachers from outside the region and from residents, including indigenous people. Most poaching occurs along the Bolshaya River, as a road provides access to much of the river. Shevlyakov (2013a) estimated that criminal poaching represents 5-10% of legal harvest in Kamchatka and traditional poaching represents 3-5%, for a likely range of 8-15%. Rivers, included in this assessment are much more difficult to access by roads and therefore are less affected by poachers. In the Ozernaya river, only one record of poaching in 2013-2015 was observed according to police log books. It was a case of poaching fish by tourists, who drifted by the river on the rafts (Semenov et al 2015).

The companies in this certification process take an active part in the enforcement of salmon spawning grounds. Companies clearly understand that it is a must to protect their resource and SVTU understands it does not have sufficient resources to do this effectively without support from the companies. For instance, in Bolshaya River basin, which has comparatively good road access, and therefore poaching loading, SVTU coordinates activities of companies and subdivided entire Bolshaya River basin into several areas, each of which is under individual responsibility of some company. In Kol, Opala, Golygina, Koshegochek rivers, included in this assessment, there is no settlements, and protection is much easier. In the Ozernaya River, with Ozernovsky town on it, with its abundant population of sockeye (subject of

special MSC assessment, level of protection is very high (see more details at https://www.msc.org/track-a-fishery/fisheries-in-the-program/certified/pacific/ozernaya_river_sockeye_salmon). The largest problems for enforcement exist in the Vorovskaya River with a village of Sobolevo (1721 inhabitants), but extremely poor transport infrastructure of this area and increasing level of enforcement limit level of poaching.

Legal challenges are not currently reported.

Protected, Endangered, or Threatened Species

The Ministry of Natural Resources and Ecology is responsible for managing sensitive species. Red lists of Russian Federation are regularly updated. The last edition was published in 2001, and the next one is issued in 2015. Leading experts are involved in the updating of the Red List. Including of a species in the Red List does not only certifies its official status, but also provides necessary basis for management decisions. Species included to the Red List are subdivided into the following categories: 0 – probably extinct, 1 – under threat of extinction, 2 – decrease of abundance, 3 – rare, 4 – status is unclear, 5 – recovering. Based on the Law of the Russian Federation “On animal world”, all the redlisted species are protected regardless of the categories they belong to. If they are accidentally caught in fishing gear, they should be recorded in logbooks and released with minimal possible damage.

Organizationally, the Red List is under responsibility of the Commission on rare and endangered animals, plants and fungi, which is created and operates in accordance with the procedure approved by Order of State Committee on Ecology of the Russian Federation from 24.09.1998 № 542 "On the maintenance work on keeping the Red Book of the Russian Federation." The Commission includes representatives of leading Russian scientific organizations, including the Institute of Ecology and Evolution of the Russian Academy of Sciences named by A.N. Severtsov and the State Organization "All-Russian Research Institute for Nature Conservation" The functions of this Commission is to provide recommendations on including endangered species in the Red Book of the Russian Federation or the exclusion of species (subspecies, populations) of wild animals, wild plants and fungi from the Red Book of the Russian Federation. Each region in Russia (oblast, autonomous republic) has its own Red lists. Red list of Kamchatka was prepared by Pacific Institute of Geography and published in 2007. In total, it includes 123 species of animals – 13-invertebrates, 30 fish species, 60 birds and 23 terrestrial and marine animals.

Environmental Protection

Protection of the salmon habitat is achieved through observance of the current laws of the Russian Federation. Any type of utilization either of natural resources directly or that impacts them indirectly, including fisheries, water and timber utilization, construction, etc., must be evaluated as to the extent of impact on the environment. The evaluation itself is performed by an expert commission having state ecological expertise, and the main federal agency responsible for conducting the state ecological expert review is the Rosprirodnadzor. In addition, activity related to natural utilization that has already been permitted is regulated to the extent to which it impacts the environment by a series of standards documents at the federal, departmental and local levels.

For the protection of fish habitat within the area of its competence, responsibility is borne by the Rosprirodnadzor under Ministry of Natural Resources and Ecology of Russian Federation, and the Federal Ecological, Technological and Atomic Oversight Service (Rostekhnadzor), the Agency of Fisheries of Russian Federation, and local governments of the territorial subjects of the Russian Federation. The Natural Protection Prosecutor's Office of the Russian Federation is responsible for enforcing laws relating to natural utilization.

Building/construction projects are regulated by a governmental agency (Rospotrebnadzor Sanitation Service) which requires completion of an environmental Impact Study (EIS) prior to approval of a project permit. Projects are monitored and can be delayed by the service if the builder does not fulfill the requirements. Assessments address discharges, disposal, drainage, soil pollution, the burial of wastes in the environment, accidents and catastrophes. The EIS includes a project description, descriptions of the environments subject to impact, and a characterization of the extent of the impact (based on a worst-case maximum), including a determination of the subsequent value of the losses, the form of compensation both in kind and in monetary terms, and development of the engineering for loss compensation. Also included are descriptions of the extent to which the conditions for land use and the requirements issued by the respective government agencies of supervision and control have been followed, a study of the risks associated with possible accidents, as well as the adequacy of the anticipated material resources and financial reserves to localize and eliminate the effects of accidents, and a study of the fullness and effectiveness of the anticipated measures for protecting the health of the population living in the surroundings of the environmental area. Decisions adopted must conform to the laws and standards of the Russian Federation and the Kamchatsky Kray.

The main indicator of success with respect to actions aimed at protecting fish (salmon) habitat is the record size of the harvests of Pacific salmon. It should be noted, however, that other factors such as sea conditions also impact to stock abundance and therefore catches.

Research

Until mid-1990's the studies of salmon in the Far East Russian Federation were performed according to the complex target program "Salmon," which was controlled by the former Committee on Fisheries of Russian Federation (Federal Agency for Fishery). This program was designed for every 5 years starting with mid-1980s. Studies in second half of the 1990s were performed according to 5-year programs, which took into account the basin and partly the ecosystem approaches. In 2005, the TINRO-center with the participation of regional NIROs, have developed "The concept of the Far East basin program for the complex study of Pacific Salmon for period 2006-2010", which was approved by Rosrybolovstvo (which is now FAR). In accordance with this concept TINRO-center has developed the "Far East basin program for complex study of Pacific Salmon for period 2007-2012".

According to the political course of FFA on the centralization of fisheries research in 2009, VNIRO has developed the departmental comprehensive target research program for fisheries of Russian Federation for 2010-2014 named "Scientific support and monitoring of conservation of reproduction and rational using of resources of fisheries base". Within that program the "Far East basin program of complex study of Pacific Salmon for period 2010-2014" was adopted in which the succession of approach and research directions was preserved. In accordance with this program, the TINRO-center develops its annual program of complex research of Pacific Salmon; and regional institutes, including KamchatNIRO, develop their own annual research salmon programs. All annual programs are approved by FFA.

Regional fishery research institutions carry out studies of salmon in the river and early marine life periods, which includes the study of biology, population structure, escapement monitoring, survival of eggs, downstream migration of fry, feeding of juveniles in estuarine period and the collection of statistics of salmon catch. TINRO-center directs and carries out research of marine life period of salmon, including the study of the state of ocean and marine biota in the feeding areas and migration routes of salmon, and total trawl counts of juvenile of salmon during catadromous migration and abundance of salmon in the period of anadromous migration.

At the end of the year, the results of these programs are discussed in the Far East Salmon Council at TINRO-center and published in the annual edition of The Bulletin of the Implementation of the "Concept

of the Far East basin program for the complex study of Pacific Salmon". A total of 9 bulletins for the period 2006-2014 have been published (in 2011-2014 the books were entitled "Bulletin of study of Pacific salmon). Funding for all the programs is provided by FFA from the federal budget.

Research program "Habitat forming role of anadromous fish in formation of ecosystems of riverine and lacustrine ecosystems of the Far East" was started in 2014, and data are partly collected in the Opala River in the area of certification. The ultimate goal of this program is analysis of quantitative relationships between biomass of anadromous fish entering the freshwater and production of rivers, estuaries and lakes of the Far East.

Fishing companies participating in this certification regularly help to workers of KamchatNIRO in terms of providing them infrastructure facilities (transportation, laboratory space etc.).

International Management

Russia is party to the Convention for the Conservation of Anadromous Fish Stocks in the North Pacific Ocean, and a member of the North Pacific Anadromous Fish Commission (NPAFC). The Commission promotes the conservation of anadromous fish in the Convention area, which includes the waters of the North Pacific Ocean and its adjacent seas north of 33° Latitude and beyond the 200-mile zones of the coastal states. The Commission requires member states to:

- Prohibit directed fishing for anadromous fish in the Convention Area.
- Minimize to the maximum extent of the incidental taking of anadromous fish
- Prohibit the retention on board a fishing vessel of anadromous fish taken as an incidental catch during fishing for non-anadromous fish.

The Convention authorizes research fishing for anadromous fish on the high seas if consistent with the NPAFC science program. The parties conduct joint research programs including exchange of information. The parties have an obligation to enforce the provisions of the Convention.

5.4.2 Principle 3 Performance Indicator scores and rationales

PI 3.1.1 – Legal and/or customary framework

PI 3.1.1		The management system exists within an appropriate legal and/or customary framework which ensures that it: - Is capable of delivering sustainability in the UoA(s); - Observes the legal rights created explicitly or established by custom of people dependent on fishing for food or livelihood; and - Incorporates an appropriate dispute resolution framework		
Scoring Issue		SG 60	SG 80	SG 100
a	**Compatibility of laws or standards with effective management**			
	Guide post	There is an effective national legal system **and a framework for cooperation** with other parties, where necessary, to deliver management outcomes consistent with MSC Principles 1 and 2	There is an effective national legal system and **organised and effective cooperation** with other parties, where necessary, to deliver management outcomes consistent with MSC Principles 1 and 2.	There is an effective national legal system and **binding procedures governing cooperation with other parties** which delivers management outcomes consistent with MSC Principles 1 and 2.
	Met?	**Yes**	**Yes**	**No**
Rationale				
		SG60 - see SG80 SG80 - the Russian Federation has an effective salmon fishery management system. Section 7.6.1 (P3 Background) provides details of the Russian management system, including federal and state scientific and management agencies and the laws under which they operate. Management of Kamchatka salmon fisheries is administered by Federal and Regional governmental agencies. Kamchatka Krai, which includes Kamchatka Oblast and Koryak Autonomous Okrug is the subject of the Russian Federation and is a part of Far Eastern Federal Region (Okrug). It is under the direction and control of the Government of the Russian Federation. Fisheries of Russia are managed and controlled by Federal Fishery Agency (FFA) of the Russian Federation, which located in Moscow and also represented by a local office in Kamchatka. Operational management of all activities is performed by the Governor of the Kamchatsky Kray. The Federal Law “On fisheries…” sets that all citizens, public organizations, and associations have the right to participate in decision making process. For these purposes the FFA maintains a multi-level system of public (community) and scientific fishery councils providing opportunities to participate and influence on decision process and regulations. SG100 – given the continuing significance of illegal fishing by some residents of the region, it is not clear that the legal system and cooperation by all parties are 100% effective. Therefore, the SG100 standard is not achieved.		
b	**Resolution of disputes**			

	Guide post	The management system incorporates or is subject by law to a **mechanism** for the resolution of legal disputes arising within the system.	The management system incorporates or is subject by law to a **transparent mechanism** for the resolution of legal disputes which is **considered to be effective** in dealing with most issues and that is appropriate to the context of the UoA.	The management system incorporates or is subject by law to a **transparent mechanism** for the resolution of legal disputes that is appropriate to the context of the fishery and has been **tested and proven to be effective**.
	Met?	**Yes**	**Yes**	**Yes**
Rationale				
SG60,80 - see SG100 SG100 - the management system incorporates or is subject by law to a transparent mechanism for the resolution of legal disputes which is considered to be effective in dealing with most issues and that is appropriate to the context of the fishery. The legal system is based on civil law system with judicial review of legislative acts. An evidence of effectiveness of system of resolution of legal disputes comes from the open-access judicial protocols (http://sudact.ru/regular/participant/nX2uCqjkPrYc/) Although there were no cases of successful accusation of the client company delivered in the regional courts, in all shown cases the company demonstrated obedience with the law and was not observed in multiple repeated violations of the same type. All the disputes were resolved and protocols published transparently. The SG100 is therefore awarded.				
c	**Respect for rights**			
	Guide post	The management system has a mechanism to **generally respect** the legal rights created explicitly or established by custom of people dependent on fishing for food or livelihood in a manner consistent with the objectives of MSC Principles 1 and 2.	The management system has a mechanism to **observe** the legal rights created explicitly or established by custom of people dependent on fishing for food or livelihood in a manner consistent with the objectives of MSC Principles 1 and 2.	The management system has a mechanism to **formally commit** to the legal rights created explicitly or established by custom of people dependent on fishing for food and livelihood in a manner consistent with the objectives of MSC Principles 1 and 2.
	Met?	**Yes**	**Yes**	**Yes**
Rationale				
SG60,80 - see SG100				

SG100 - the management system has a mechanism to formally commit to the legal rights created explicitly and practicing by people dependent on fishing for food or livelihood in a manner consistent with the objectives of MSC Principles 1 and 2 (SG 100). The federal law on indigenous peoples of the Far North applies to the management system to ensure their traditional fisheries and livelihoods. In accordance with the law, every district establishes fishing sites for indigenous peoples near their homes. While distributing quotas for salmon fishing, the Anadromous Fish Commission first sets a quota for indigenous peoples (the rate of 100 kg per person per year of aquatic biological resources for local population has been established by the government of Kamchatka Krai). The remainder of the quota is distributed among the other users of water resources. Representatives of the Association of Indigenous Peoples of Kamchatka are involved in the distribution of the quota. In the case the interests of the indigenous peoples are violated, the legal system intervenes.
References
Federal Law “O rybolovstve i sokhranenii vodnykh biologicheskihk resursov [On Fishery and Conservation of Aquatic Biological Resources]” of December 20 2004 № 166-FZ. Federal Law “O zhivotnom mire [On Animal World]” with changes from 25 December 2018

Draft scoring range and information gap indicator added at Announcement Comment Draft Report

Draft scoring range	**≥80**
Information gap indicator	**Information sufficient to score PI**

Overall Performance Indicator scores added from Client and Peer

Overall Performance Indicator score	**95**
Condition number (if relevant)	**--**

PI 3.1.2 – Consultation, roles and responsibilities

PI 3.1.2		**The management system has effective consultation processes that are open to interested and affected parties** **The roles and responsibilities of organisations and individuals who are involved in the management process are clear and understood by all relevant parties**		
Scoring Issue		SG 60	SG 80	SG 100
a	**Roles and responsibilities**			
	Guide post	Organisations and individuals involved in the management process have been identified. Functions, roles and	Organisations and individuals involved in the management process have been identified. Functions, roles and responsibilities are	Organisations and individuals involved in the management process have been identified. Functions, roles and responsibilities are **explicitly defined and well**

		responsibilities are **generally understood**.	**explicitly defined and well understood for key areas** of responsibility and interaction.	**understood for all areas** of responsibility and interaction.
	Met?	**Yes**	**Yes**	**Yes**

Rationale

SG60 - see SG80

SG80 - organizations and individuals involved in the management process have been identified. Functions, roles and responsibilities are explicitly defined and well understood for key areas of responsibility and interaction, thus should be scored at least SG80. All stakeholders, including fishing companies and public organizations, are able to participate in the decision-making process. All interested parties are part of main management body – The Anadromous Fish Commission on local Kamchatka level. On higher levels, also there are structures which allow to participate interested parties such as Public Council for FFA. Each representative has the right to vote and can influence the decision. This collective body bears the responsibilities for the decisions made.

SG100 – FFA, which is a part of the Russian Ministry of Agriculture, has five regional offices in the Russian Far East, and Kamchatka Kray office (Northeast Territorial administration of FFA) one of them. This agency coordinates fisheries management in Russia including fisheries research, stock assessment, monitoring and enforcement. Activities of different FFA structures are well coordinated. Their analysis allows to conclude that the functions and responsibilities are defined and understood in all areas of fishery management. SG100 is met.

b	**Consultation processes**			
	Guide post	The management system includes consultation processes that **obtain relevant information** from the main affected parties, including local knowledge, to inform the management system.	The management system includes consultation processes that **regularly seek and accept** relevant information, including local knowledge. The management system demonstrates consideration of the information obtained.	The management system includes consultation processes that **regularly seek and accept** relevant information, including local knowledge. The management system demonstrates consideration of the information and **explains how it is used or not used**.
	Met?	**Yes**	**Yes**	**Yes**

Rationale

SG60,80 - see SG100

SG100 - the management system includes consultation processes that regularly seek and accept relevant information, including local knowledge. The management system demonstrates consideration of the information and explains how it is used or not used through public discussions in the Anadromous Fish Commission (AFC) with decisions publicized on the internet. Consultations with stakeholders are conducted on the regional level via the AFC. As part of the consultation process AFC sends information used for pre-season management to all stakeholders. During its meeting, the AFC examines data on the

intensity of salmon runs, hydrological regime in the spawning grounds and fill rate of spawning ground by spawners, as well as recommendation of KamchatNIRO on the timing and regulation of fishing. AFC decisions are recorded. The protocols of the AFC meetings are sent to all interested parties and published on web site of Federal Fishery Agency. SG100 is met.

c	**Participation**			
	Guide post		The consultation process **provides opportunity** for all interested and affected parties to be involved.	The consultation process provides **opportunity and encouragement** for all interested and affected parties to be involved, and **facilitates** their effective engagement.
	Met?		**Yes**	**No**

Rationale

SG80 - the consultation process provides opportunity for all interested and affected parties to be involved and facilitates their effective engagement, thus the SG80 is met. However, the process does not appear to always encourage and facilitate effective engagement by nongovernmental or industry interests. Mechanisms for involvement of environment and different interest groups as well as the broader community are not well developed, but there are number of non-governmental organizations that are interested in salmon fisheries in Kamchatka area. Stakeholders may have an opportunity for involvement but may have reluctance to participate as a carryover from Soviet days.

SG100 - while internal information from the management agencies is technically available to the public, the process for obtaining it can be difficult. This does not allow to score this PI 100.

References

Prikaz Ministerstva sel'skogo khozyaystva Rossiyskoy Federatsii (Minsel'khoz Rossii) ot 8 aprelya 2013 g. N 170 g. Moskva "Ob utverzhdenii Poryadka deyatel'nosti komissii po regulirovaniyu dobychi (vylova) anadromnykh vidov ryb" [Order of the Ministry of Agriculture of the Russian Federation (Minselkhoz of Russia) of April 8, 2013 N 170 Moscow "On approval of the Commission for the regulation of the harvesting (catch) of anadromous fish species".

Draft scoring range and information gap indicator added at Announcement Comment Draft Report

Draft scoring range	**≥80**
Information gap indicator	**Information sufficient to score PI**

Overall Performance Indicator scores added from Client and Peer Review Draft Report

Overall Performance Indicator score	**95**

Condition number (if relevant)	--

PI 3.1.3 – Long term objectives

PI 3.1.3		The management policy for the SMU and associated enhancement activities has clear long-term objectives to guide decision-making that are consistent with MSC fisheries standard, and incorporates the precautionary approach		
Scoring Issue		SG 60	SG 80	SG 100
a	Objectives			
	Guide post	Long-term objectives to guide decision-making, consistent with the MSC Fisheries Standard and the precautionary approach, are **implicit** within management policy.	Clear long-term objectives that guide decision-making, consistent with MSC Fisheries Standard and the precautionary approach are **explicit** within management policy.	Clear long-term objectives that guide decision-making, consistent with MSC Fisheries Standard and the precautionary approach, are **explicit** within **and required by** management policy.
	Met?	Yes	Yes	No

Rationale

SG60 - See SG80

SG80 - Clear long-term objectives that guide decision-making, consistent with MSC Principles and Criteria and the precautionary approach, are explicit within management policy. The over-arching fisheries and resource regulations cited earlier in this report lay out long-term objectives and long-term goals for the salmon fisheries of the Russian Far East. The regional fisheries management demonstrates its strategy towards sustainable use of fish resources by contribution to fisheries research, increasing control over poaching, development of modern fish-processing factory, contribution to social sphere, and organization of protected areas.

SG100 - However, objectives consistent with MSC Principles and Criteria and the precautionary approach are not always required by management policy.

References

Rassadnikov O. A. 2006.

Draft scoring range and information gap indicator added at Announcement Comment Draft Report

Draft scoring range	**≥80**
Information gap indicator	**Information sufficient to score PI**

Overall Performance Indicator scores added from Client and Peer Review Draft Report

Overall Performance Indicator score	**80**
Condition number (if relevant)	**--**

PI 3.2.1 – Fishery-specific objectives

PI 3.2.1		**The fishery-specific and associated enhancement management system(s) activities have clear, specific objectives designed to achieve the outcomes expressed by MSC's Principles 1 and 2**		
Scoring Issue		SG 60	SG 80	SG 100
a	Objectives			
	Guide post	**Objectives,** which are broadly consistent with achieving the outcomes expressed by MSC's Principles 1 and 2, are **implicit** within the fishery and associated enhancement management system(s).	**Short and long-term objectives**, which are consistent with achieving the outcomes expressed by MSC's Principles 1 and 2, are **explicit** within the fishery and associated enhancement management system(s).	**Well defined and measurable short and long-term objectives**, which are demonstrably consistent with achieving the outcomes expressed by MSC's Principles 1 and 2, are **explicit** within the fishery and associated enhancement management system(s).
	Met?	Yes	Yes	No
Rationale				
SG60 - See SG80 SG80 - Short and long-term objectives, which are consistent with achieving the outcomes expressed by MSC's Principles 1 and 2, are explicit within the fishery's management system and enhancement activities. These include short term objectives for spawning escapements intended to provide for maximum sustained yield and long-term objectives for fishery sustainability reflected in management regulation. Objectives consistent with Principles 1 and 2 are also reflected in the absence of enhancement of species in areas which are under scope of this certification. Most rivers are completely free of hatcheries. According to overall strategy of development salmon fisheries in Russia, hatcheries are among the priorities to increase fishery productivity. At the moment, however, there are no specific plans to further develop hatchery system in Kamchatka. SG100 - Short and long-term objectives do not always provide clear measurable standards with respect to effects of fisheries on the ecosystem. Objectives are explicit with respect to protecting spawning escapement but are less clear on the environmental/ecosystem end. If ecosystem changes were observed, a response would be expected; but no substantive changes have occurred at the level of current monitoring. Therefore, this performance indicator might partially meet the SG100 for hatchery objectives but does not meet the SG100 for specific objectives related to fishery effects on the ecosystem.			
References				

Bugaev et al., 2019; Protocols of the Anadromous Fish Commission of North-East Territorial Administration of FFA, 2019.

Draft scoring range and information gap indicator added at Announcement Comment Draft Report

Draft scoring range	**≥80**
Information gap indicator	**Information sufficient to score PI**

Overall Performance Indicator scores added from Client and Peer Review Draft Report

Overall Performance Indicator score	**80**
Condition number (if relevant)	**--**

PI 3.2.2 – Decision-making processes

PI 3.2.2		**The fishery-specific and associated enhancement management system includes effective decision-making processes that result in measures and strategies to achieve the objectives, and has an appropriate approach to actual disputes in the fishery**		
Scoring Issue		SG 60	SG 80	SG 100
a	**Decision-making processes**			
	Guide post	There are **some** decision-making processes in place that result in measures and strategies to achieve the fishery-specific and enhancement objectives.	There are **established** decision-making processes that result in measures and strategies to achieve the fishery-specific and enhancement objectives.	
	Met?	Yes	Yes	
Rationale				
SG60 - See SG80 SG80 - Well-established and formal decision-making processes result in measures and strategies to achieve the fishery-specific objectives. The Anadromous Fish Commission (AFC) is a central feature of the decision-making process. The AFC is responsible for the distribution of recommended yearly catch of salmon among users and identifying areas of commercial fishery, recreational fishing, and traditional fishery of the indigenous population. The AFC is chaired by the regional governor and consists of government, industry and interested stakeholders. These include representatives from Federal executive bodies, including the federal security and environment protection authorities, as well as representatives of the regional government, federal, public associations, consolidations of legal entities (associations and unions), and scientific organizations. Upon the request of fishing companies, the AFC sets up the recommended catch for a management unit area and accepts applications from the users, each of which cannot exceed the total recommended catch for			

management unit. In case of approaching recommended catch for some management unit, AFC can close fishing or increase the recommended catch following recommendations of KamchatNIRO. The AFC meets regularly before and over the course of the fishing season. The AFC's decisions are made through discussions and consultations with stakeholders. All meetings are open to the public.

	Responsiveness of decision-making processes			
b	Guide post	Decision-making processes respond to **serious issues** identified in relevant research, monitoring, evaluation and consultation, in a transparent, timely and adaptive manner and take some account of the wider implications of decisions.	Decision-making processes respond to **serious and other important issues** identified in relevant research, monitoring, evaluation and consultation, in a transparent, timely and adaptive manner and take account of the wider implications of decisions.	Decision-making processes respond to **all issues** identified in relevant research, monitoring, evaluation and consultation, in a transparent, timely and adaptive manner and take account of the wider implications of decisions.
	Met?	Yes	Yes	No

Rationale

SG60 - See SG80

SG80 - Decision-making processes respond to serious and other important issues identified in relevant research, monitoring, evaluation and consultation, in a transparent, timely and adaptive manner and take account of the wider implications of decisions. KamchatNIRO uses relevant information to provide pre-season forecasts so that fishermen, buyers, processors, and the Anadromous Fish Commission can plan for the upcoming season. The Anadromous Fish Commission considers a wide range of issues regularly reported by federal and regional agencies and those brought up by stakeholders to make in-season decisions. All stakeholders have an opportunity to attend the Anadromous Fish Commission meetings.

SG100 - It cannot be concluded that decision-making processes respond to all issues due to the lack of transparency regarding many internal decisions by Russian governmental agencies. For instance, information on run size, harvest by time and area, fishery management actions, and escapement is not typically reported outside the management system except in summary form in the case of serious and other important issues addressed during public processes.

	Use of precautionary approach			
c	Guide post		Decision-making processes use the precautionary approach and are based on best available information.	
	Met?		Yes	

Rationale				
SG80 - The decision-making processes are compliant with the national legislation (Law "On protection of the environment" (2001)) requiring the priority conservation of resources and favorable environment, and are based on best available information provided by research institute KamchatNIRO and territorial branch of FFA - SVTU. The use of diversified Spawner-Recruit models and testing of LRP demonstrate the precautionary approach. Information received in-season assures that the management system uses current information. The target reference point occurs approximately at the midpoint of the optimal escapement range. Higher levels of precaution would occur as the target moved toward the upper end of the range.				
	Accountability and transparency of management system and decision-making process			
d	Guide post	Some information on the fishery's performance and management action is generally available on request to stakeholders.	**Information on the fishery's performance and management action is available on request**, and explanations are provided for any actions or lack of action associated with findings and relevant recommendations emerging from research, monitoring, evaluation and review activity.	Formal reporting to all interested stakeholders **provides comprehensive information on the fishery's performance and management actions** and describes how the management system responded to findings and relevant recommendations emerging from research, monitoring, evaluation and review activity.
	Met?	Yes	No	No
Rationale				
SG60. Formal reporting to all interested stakeholders describes how the management system responded to findings and relevant recommendations emerging from research, monitoring, evaluation and review activity. This is achieved by transparent decision-making in the Anadromous Fish Commission, which gathers for meetings once per several days during a fishing season. For instance, in 2018 the Commission carried out 34 meetings from 9 April to 25 October devoted to management of Pacific salmon and char fisheries. Decisions are available for all interested parties and immediate (usually within a few hours after the meeting) publication of its decisions at the SVTU website (http://xn--b1a3aee.xn--p1ai/organizatsiya-rybolovstva/rybolovstvo-v-tsifrakh/komissiya-po-regulirovaniyu-dobychi-vylova-anadromnykh-vidov-ryb/protokoly-zasedaniya-komissii-po-kamchatskomu-krayu.html). The protocols contain information about participants of the meeting, questions discussed, results of voting and decisions have been made accompanying by relevant information. Moreover, a significant amount of information about current situation is available from the SVTU website. Between the fishing season, management of salmon fishing is discussed on meetings of KamchatNIRO and Far Eastern Commercial Fishing Council (FECFC).				

SG80 - At the same time, monitoring of decision making for the fishery is limited by the inconsistent availability of information outside the local governmental management system. Results of fishing season and effectiveness of management actions undertaken are discussed at the both management agencies such as AFC, SVTU and FFA, and also at Research Councils of fisheries institutes such as KamchatNIRO, TINRO-Center and VNIRO on a regular basis. However, information on run size, harvest by time and area, fishery management actions, and escapement is not typically reported outside the management system except in rare cases. Occasional publications of related information (e.g. Shevlyakov 2013b) provide a historical perspective but are not sufficient to allow tracking action associated with findings and relevant recommendations. Inconsistent availability of annual fish run and fishery information outside the local governmental management system limits the availability of information for actions or lack of action associated with findings and relevant recommendations; therefore, the fishery does not score 80.

	Approach to disputes			
e	Guide post	Although the management authority or fishery may be subject to continuing court challenges, it is not indicating a disrespect or defiance of the law by repeatedly violating the same law or regulation necessary for the sustainability of the fishery.	The management system or fishery is attempting to comply in a timely fashion with judicial decisions arising from any legal challenges.	The management system or fishery acts proactively to avoid legal disputes or rapidly implements judicial decisions arising from legal challenges.
	Met?	Yes	Yes	Yes

Rationale

SG60, 80 – see SG100

SG100 – all stakeholders interested in salvation of disputes are able to appeal to the court. According to the judicial protocols for the legal challenges of the last years, which are available in the open access (http://sudact.ru/regular/participant/nX2uCqjkPrYc/), the client fishery acted proactively to avoid legal disputes. There were no cases of successful accusation of the client company delivered in the regional courts. Nevertheless, the company's position was always represented at the court meetings, there was no disrespect, and the disputes were resolved according to the national legislation, which provides the high probability for the readiness to implement necessary decisions. Based on open-access protocols, it is also unlikely that the company regularly repeats the violations of the same laws, which could have compromised the sustainability required in P1 and P2. Thus, the SG100 can be awarded.

References

Database with court decisions http://sudact.ru/regular/participant/nX2uCqjkPrYc/; Bugaev et al., 2019; Protocols of the Anadromous Fish Commission of North-East Territorial Administration of FFA, 2019.

Draft scoring range and information gap indicator added at Announcement Comment Draft Report

Draft scoring range	**60-79**
Information gap indicator	**Information sufficient to score PI**

Overall Performance Indicator scores added from Client and Peer Review Draft Report

Overall Performance Indicator score	**75**
Condition number (if relevant)	**3**

Condition 3. Demonstrate that information on the fishery's performance and management action is available on request, and explanations are provided for any actions or lack of action associated with findings and relevant recommendations emerging from research, monitoring, evaluation and review activity.

PI 3.2.3 – Compliance and enforcement

PI 3.2.3		**Monitoring, control and surveillance mechanisms ensure the management measures in the fishery and associated enhancement activities are enforced and complied with**		
Scoring Issue		SG 60	SG 80	SG 100
a	**MCS implementation**			
	Guide post	Monitoring, control and surveillance **mechanisms** exist, and are implemented in the fishery and associated enhancement activities and there is a reasonable expectation that they are effective.	A monitoring, control and surveillance **system** has been implemented in the fishery and associated enhancement activities and has demonstrated an ability to enforce relevant management measures, strategies and/or rules.	A **comprehensive** monitoring, control and surveillance system has been implemented in the fishery and associated enhancement activities and has demonstrated a consistent ability to enforce relevant management measures, strategies and/or rules.
	Met?	Yes	Yes	No
Rationale				
SG60 - A monitoring, control and surveillance system has been implemented in the fishery under assessment. On-water enforcement is performed by federal structures such as SVTU and Federal Security Service (FSB). All the enforcement agencies and stakeholders report reduction of level of illegal fishing in all the areas of Kamchatka during the last decade in comparison with extremely high level of illegal fishing during 1990s-early 2000s. Reforms in the management system have effectively addressed high historical levels of under-reported on misreported catches by commercial fishing companies. Well-run and profitable fishing companies, including those in the assessment, reportedly demonstrate a very				

high rate of compliance and also support enforcement efforts throughout the fishery. Valuable long-term leases provide a large incentive for sustainable management and for compliance. Both client companies intensively cooperate with state enforcement agencies (SVTU, FSB) to enforce salmon spawning rivers within UoC (Supplement 1, 2).

SG80 – The SG80 is met. A monitoring, control and surveillance system has been implemented in the fishery and associated enhancement activities and has demonstrated an ability to enforce relevant management measures, strategies and/or rules. All the enforcement agencies and stakeholders report drastic reduce of level of illegal fishing in Ozernaya River and Kuril Lake since 1990s and through 2000s and practical absence of poaching now. In addition to usual enforcement activities, this fishery has a strong additional protection because Kuril Lake, which is a feeding area of juvenile sockeye, is a sanctuary. An assessment of illegal harvest has been completed as a condition of certification of other fisheries in West Kamchatka (Shevlyakov 2013; Shevlyakov et al. 2016). This assessment found that some poaching continues to occur among local residents in some areas, particularly those accessible by road (e.g., Bolshaya and Kamchatka Rivers, but that the current monitoring, control and surveillance system has been implemented and demonstrated an ability to enforce relevant management measures, strategies and/or rules in order to provide significant control of illegal harvest.

SG100. This standard is not met because the monitoring, control and surveillance system has not completely eliminated chronic background levels of illegal harvest.

b	**Sanctions**			
	Guide post	Sanctions to deal with non-compliance exist and there is some evidence that they are applied.	Sanctions to deal with non-compliance exist, **are consistently applied** and thought to provide effective deterrence.	Sanctions to deal with non-compliance exist, are consistently applied and **demonstrably** provide effective deterrence.
	Met?	Yes	Yes	No

Rationale

SG60 - Sanctions to deal with noncompliance exist, are consistently applied and thought to provide effective deterrence for well-run fishing companies including those in this assessment. For example, loss of opportunity to fish when convicted of serious offenses provides a major incentive for fishery operators to stay within the rules.

SG80 – An assessment of illegal harvest has been completed as a condition of the reassessment and documentation has been provided on significant enforcement efforts by the fishing companies. Sanctions to deal with non-compliance exist, are consistently applied and provide effective deterrence.

SG100 - Questions remain regarding the consistency of application and the effectiveness of deterrence for illegal harvest activities in freshwater by non-commercial fishers in other more-accessible areas of Kamchatka. Sanctions do not appear to provide effective deterrence to components of illegal fishing which remains significant in accessible systems. While apparently much reduced from historical levels, illegal harvest remains a chronic concern in other areas. SG100 is not met.

c	**Compliance**

	Guide post	Fishers and hatchery operators are **generally thought** to comply with the management system for the fishery and associated enhancement activities under assessment, including, when required, providing information of importance to the effective management of the fishery.	**Some evidence exists** to demonstrate fishers and hatchery operators comply with the management system under assessment, including, when required, providing information of importance to the effective management of the fishery and associated enhancement activities.	There is a **high degree of confidence** that fishers and hatchery operators comply with the management system under assessment, including, providing information of importance to the effective management of the fishery and associated enhancement activities.
	Met?	Yes	Yes	Yes
Rationale				
SG60, 80 – see SG100. SG100 – This standard is met. There is a high degree of confidence that commercial fishing companies included in this assessment comply with the management system under assessment, including providing information of importance to the effective management of the fishery and its enhancement activities. No evidence of systematic noncompliance by commercial fishing companies included in this assessment has come to the attention of the assessment team regarding monitoring, control, and surveillance activities in the freshwater portion of this fishery. Authorities and stakeholders confirm compliance of the companies participating in this certification. The fishery closely cooperates with SVTU to protect salmon populations from illegal activities and funds enforcement hiring people to help state fish inspection. Moreover, incentives for illegal fishing for companies considerably reduced after introduction of Olympic system of management in 2010.				
d	**Systematic non-compliance**			
	Guide post		There is no evidence of systematic non-compliance.	
	Met?		Yes	
Rationale				
There is no evidence of systematic noncompliance by commercial fishing companies in the judicial protocols, the authorities and stakeholders also confirm the compliance of the companies participating in this certification. Thus, the guidepost is met.				
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Draft scoring range and information gap indicator added at Announcement Comment Draft Report

Draft scoring range	**≥80**
Information gap indicator	**Information sufficient to score PI**

Overall Performance Indicator scores added from Client and Peer Review Draft Report

Overall Performance Indicator score	**85**
Condition number (if relevant)	**--**

PI 3.2.4 – Monitoring and management performance evaluation

PI 3.2.4		**There is a system of monitoring and evaluating the performance of the fishery-specific and enhancement management system(s) against its objectives There is effective and timely review of the fishery-specific and associated enhancement program(s) management system**		
Scoring Issue		SG 60	SG 80	SG 100
a	**Evaluation coverage**			
	Guide post	The fishery and associated enhancement program(s) has in place mechanisms to evaluate **some** parts of the management system.	The fishery and associated enhancement program(s) has in place mechanisms to evaluate **key** parts of the management system.	The fishery and associated enhancement program(s) has in place mechanisms to evaluate **all** parts of the management system.
	Met?	Yes	Yes	No
Rationale				

SG60 – See SG80.

SG80 - The fishery and its enhancement programs have in place mechanisms to evaluate key parts of the management system. Key elements include catch monitoring process and the stock assessment that determine the level of removals occur during the annual fishing season and at the end to ensure the possibility of allowed catch over-run are minimized. There are mechanisms in place to adjust allowed

catch or the allocation of allowed catch between management units these are evaluated annually. At the same time, available information does not prove that all parts of the management system are evaluated, which does not allow to score this element 100.

b	**Internal and/or external review**			
	Guide post	The fishery-specific and associated enhancement program(s) management system is subject to **occasional internal** review.	The fishery-specific and associated enhancement program(s) management system is subject to **regular internal and occasional external** review.	The fishery-specific and associated enhancement program(s) management system is subject to **regular internal and external** review.
	Met?	Yes	Yes	No

Rationale

SG60 – See SG80

SG80 – Guidance for this indicator considers whether there are opportunities and/or forums for decision-makers to receive feedback on the management system. The fishery has in place mechanisms to evaluate key parts of the management system and are subject to regular internal review. Results of fishing season and effectiveness of management actions undertaken are discussed at the both management agencies such as AFC, SVTU and FFA, and also at Research Councils of fisheries institutes such as KamchatNIRO, TINRO-Center and VNIRO on a regular basis (Shevlyakov et al. 2016). Methodical approaches to stock evaluation and the recommended volumes are discussed by a specialized Salmon Council of the Far East industry institutes within the research and engineering association of the Pacific Institute of Fishery and Oceanography (NTO TINRO), then assessed by the Scientific Council of KamchatNIRO, then by the Scientific Council of TINRO-Center and VNIRO (Russian Federation Research Institute of Fishery and Oceanography). After that the recommended regional volumes of Pacific salmon are reviewed and approved by the Industry Council of Rosrybolovstvo (Russian federal Fisheries Agency).

The fishery also has in place mechanisms for occasional external review. External review means external to the fishery management system. This could occur by another department within an agency, another agency or organization, an external government audit, a peer organization or expert peer reviewers. The FFA interacts with various agencies at the federal level while controlling its territorial departments and provides oversight of departments under its jurisdiction. The FFA evaluates the management system through its responsibility for defining the rules and the areas of fisheries and for preparation of federal-level and agency-level reports on the fishing industry. Federal review provides periodic external review of fishery programs implemented by the FFA. The operation of this system was demonstrated by changes in the system of fishery allocation from an assigned quota by fishing company to the Olympic system where the harvestable surplus is not allocated by fishing company prior to the fishing season. This change occurred in response to regional and Federal review processes working on concert.

SG100 – The fishery is not subject to regular external review as part of an established process.

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Protocols of the Anadromous Fish Commission of North-East Territorial Administration of FFA, 2019.

Draft scoring range and information gap indicator added at Announcement Comment Draft Report

Draft scoring range	**≥80**
Information gap indicator	**Information sufficient to score PI**

Overall Performance Indicator scores added from Client and Peer Review Draft Report

Overall Performance Indicator score	**80**
Condition number (if relevant)	**--**

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7 Appendices

7.1 Evaluation processes and techniques

7.1.1 Site visits

The VA-Delta Kamchatka salmon fishery reassessment site visit will be held remotely from October 26-29, 2020 with individuals in Petropavlovsk-Kamchatsky, St. Petersburg, Seattle, and Portland. Participants were in attendance are identified in Table 31. A meeting with government scientific agency KamchatNIRO and with the leader of the region commercial fishery industry group.

The MSC's Covid-19 pandemic Derogation enabled CABs to conduct the site visit remotely when national and local travel restrictions are in place. At the time of the site visit no international travel into Russia was permitted (https://ru.usembassy.gov/covid-19-information/).

Table 31. Site visit meetings attendance, 2020.

Имя / Name	Организация / Organization	Должность / Title
Aleks Ramanauskas	VA-Delta	General Director
Andrei Bokov	VA-Delta	Chief Technologist
Roman Onofryichuk	Kamber-Pymta	General Director
Larisa Graber	Kamber-Pymta	
Natalia Novikova	ForSea Solutions	Founder and Director
Randy Ericksen	ForSea Solutions & RP Ericksen Consulting	Fisheries Advisor
Dmitry Lajus	MRAG, St. Petersburg State University	Independent Consultant and MSC Assessment Team
Ray Beamesderfer	MRAG, Fish Science Solutions	Sr. Fish Scientist and MSC Assessment Team
Alexander Bugaev	KamchatNIRO	Deputy Director of Research
Vladimir Galitsyn	Kamchatka Association of Salmon Fishermen	Head

7.1.2 Stakeholder participation

Stakeholders are invited to provide input or comments on the Announcement Comment Draft Report prior to the site visit and/or participate in the remote site visit. An announcement of the MSC reassessment of the VA-Delta Kamchatka salmon fishery is being published on 24 September 2020. Stakeholders are being informed of the assessment by email and through announcement posted on the MSC website. MRAG sent a direct email regarding this assessment to all stakeholders on our stakeholder list, indicating where the ACDR could be accessed and instructions for how to submit comments or request a meeting with the team. MSC posted the announcement on their track-a-fishery webpage, as well as sent it by email in their Fishery Announcements newsletter to all registered recipients. This was done according to the process requirements as laid out in MSC's Fisheries Certification Process v2.1. Together, these media presented the announcement to a wide audience representing industry, agencies, and other stakeholders.

7.1.3 Evaluation techniques

Relevant materials for the reassessment were submitted to the reassessment team by the Client Companies. ForSeaSolutions has served as a technical liaison between MRAG Americas and the fishery clients. The assessment team and the clients set up meetings with Kamchatka salmon fishery management and science personnel, and industry, and harvest-sector representatives relevant to the fishery assessment. The Fisheries Standard v2.01 default assessment tree for salmon fisheries was used for this assessment, comprising 31 'performance indicators', nine in Principle 1, 15 in Principle 2, and seven in Principle 3. The performance indicators are grouped in each principle by 'component.' Principle 1 has two components, Principle 2 has five, and Principle 3 has two. Each performance indicator consists of one or more 'scoring issues;' a scoring issue is a specific topic for evaluation. 'Scoring Guideposts' define the requirements for meeting each scoring issue at the 60 (conditional pass), 80 (full pass), and 100 (state of the art) levels. Note that some scoring issue may not have a scoring guidepost at each of the 60, 80, and 100 levels. The scoring issues and scoring guideposts are cumulative; this means that a performance indicator is scored first at the SG60 levels. If not all of the SG scoring issues meet the 60 requirements, the fishery fails and no further scoring occurs. If all of the SG60 scoring issues are met, the fishery meets the 60 level, and the scoring moves to SG80 scoring issues. If no scoring issues meet the requirements at the SG80 level, the fishery receives a score of 60. As the fishery meets increasing numbers of SG80 scoring issues, the score increases above 60 in proportion to the number of scoring issues met; performance indicator scoring occurs at 5-point intervals. If the fishery meets half the scoring issues at the 80 level, the performance indicator would score 70; if it meets a quarter, then it would score 65; and it would score 75 by meeting three-quarters of the scoring issues. If the fishery meets all of the SG80 scoring issues, the scoring moves to the SG100 level. Scoring at the SG100 level follows the same pattern as for SG80.

Principle scores result from averaging the scores within each component, and then from averaging the component scores within each Principle. If a Principle averages less than 80, the fishery fails.

Scoring for this fishery followed a consensus process in which the assessment team discussed the information available for evaluating performance indicators to develop a broad opinion of performance of the fishery against each performance indicator. Review of sections 3.2-3.5 by all team members assured that the assessment team was aware of the issues for each performance indicator. Subsequently, the assessment team member responsible for each principle, filled in the scoring table and provided a provisional score. The assessment team members reviewed the rationales and scores, and recommended modifications as necessary, including possible changes in scores.

Performance Indicator scores were entered into MSC's Fishery Assessment Scoring Worksheet to arrive at Principle-level scores (Table 32).

Table 32. Scoring elements

Component	Scoring elements	Main/not main	Retained?	Data-deficient?
Principle 1	Sockeye Salmon (Ozernaya)	--	Yes	No
Principle 1	Chum Salmon (2 UoCs)	--	Yes	No
Principle 1	Pink Salmon (2 UoCs)	--	Yes	No
Principle 1	Coho salmon (Kamchatka-Kuril)	--	Yes	No
Primary	Sockeye Salmon (non-Ozernaya)	Minor	Yes	No
Primary	Coho salmon (non Kol)	Minor	Yes	No
Primary	Chinook Salmon	Minor	No	No
Primary	Saffron cod (navaga)	Minor	Yes	No
Primary	Rainbow smelt	Minor	Yes	No
Primary	Capelin	Minor	Yes	No
Secondary	Chars	Minor	Yes	No
Secondary	Flatfish spp.	Minor	Yes	No
Secondary	Diving birds (misc. spp.)	Main	Yes	No
Secondary	Miscellaneous marine species	Not Main	No	Not assessed
ETP	Steller sea lion	--	No	No
ETP	Steller sea eagle	--	No	No
Habitat	Sand, silt, gravel bottom	Main	--	No
Ecosystem	--	--	--	No

7.2 Peer Review reports

Peer reviews were received from two experts, with each report anonymized. The tables below lay out the peer reviewer general and PI specific comments and the assessment team responses.

Peer Reviewer A - General Comments

Question	Yes/No	Peer Reviewer Justification (as given at initial Peer Review stage).	CAB Response to Peer Reviewer's comments (as included in the Public Comment Draft Report - PCDR)
Is the scoring of the fishery consistent with the MSC standard, and clearly based on the evidence presented in the assessment report?	No	The level of effort to estimate spawning escapements of pink, chum, and coho declined steadily since 2001 and they have been exceptionally low from 2008 through 2019, corresponding the period when the management system changed from catch quota system (and reportedly high poaching and unreported catch) to the "Ölympic" system in which the entire fishery is closed for a specific number of days to allow fish to pass upstream. During the past 10 years, when harvests of each species was high, LRPs are sometimes not met and TRPs are often not met. No TRP or LRP (and evaluation) was presented for odd year pink salmon, which was the dominant run prior to 1985 and still supports a large commercial harvest; its reported escapement was consistently below the LRP and TRP that was developed for even year pink salmon. I am concerned about the quality of data used to 1) develop aggregate spawning counts for the assessment area, 2) develop reference points , 3) inform the harvest control rule, and 3) effectively manage spawning escapement inseason. Aerial escapement counts occur only once every 3 or 4 weeks in a limited and variable number of watersheds. Catch per effort is reportedly used in season but there is no relationship provided that describes the relationship between CPUE and spawning escapement, especially after the management change in 2008 that would have altered this relationship. This fishery and its positive evaluation seem to rely on the high level of harvests in recent year while assuming that low escapement counts are simply a result of low effort.. The evidence provided in the report (i.e., data charts and tables) do not support some of the scores in this fishery.	See detailed responses. To clarify the fishery history, the Olympic regulatory system was put in place in 2008. Under this system, the fishing companies are no longer artificially limited to specific quotas established by the central government in Moscow based on preseason forecasts. Fishing companies can now purchase additional "quota" during the season based on their actual catches. The system in place prior to the Olympic system often resulted in inaccurate catch reporting, particularly in large run years. Passing days have always been utilized in management of this fishery. Aerial survey efforts declined since the 2000s due to reductions in funding from the Federal government but in recent years have begun to increase with funding by the fishing companies. Poaching is a chronic social issue in Kamchatka and was severe following the demise of the Soviet Union in the 1990s but levels have been substantially reduced since the 2000s. Since the adoption of the Olympic system, both the fishing companies and the government scientists believe that total catches have generally been reduced from the prior period due to more effective regulation and enforcement. Score and condition were revised to address reviewer concern over odd-year pink salmon brood cycle. Other scores relative to reference points are consistent with MSC scoring guidance. Information and stock assessments are appropriate to the extensive management strategy employed in this fishery. Concerns for adequacy of survey efforts are addressed by conditions identified.
Are the condition(s) raised appropriately written to achieve the SG80 outcome within the specified timeframe? [Reference: FCP v2.2, 7.18.1 and sub-clauses]	Yes	The three conditions identified in the assessment are very much needed to improve sustainability and management of this fishery. My concern, however, is that these conditions may not be implemented to the extent that is needed. This fishery has been previously certified by the MSC yet these conditions reflect problems that have been ongoing for 10 or more years. My evaluation of scoring indicates a number of additional conditions may be needed to bring this fishery up to MSC standards.	Concerns for the adequacy of information to support the harvest strategy are addressed by the condition of the indicator. Adequacy of the stock assessment system will be assessed based on progress on that condition to be assessed based on annual surveillance audits. Over the course of the certification history for this fishery, we have observed a high level of accountability and responsiveness by the fishing company and the management system to issues and conditions raised by the certifications. For instance, spawning ground surveys have increased in recent years with directed funding from the fishing companies. With funding by the fishing companies, KamchatNIRO has dedicated

			substantial resources to information reporting, stock assessment, and exploration of population-specific reference points for this fishery. Conditions have also contributed to substantial efforts in harvest accounting and enforcement.
Is the client action plan clear and sufficient to close the conditions raised? [Reference FCR v2.0, 7.11.2-7.11.3 and sub-clauses]		Note: Include this row for assessments completed against FCR v1.3 and v2.0, but not for FCP v2.1/v2.2 (in which the client action plan is only prepared at the same time as the peer review). Delete this text from the cell for FCR v1.3/v2.0 reviews or delete the whole row if FCP v2.1/v2.2. No Client Action Plan.	
Enhanced fisheries only: Does the report clearly evaluate any additional impacts that might arise from enhancement activities?		No salmon enhancement.	
Optional: General Comments on the Peer Review Draft Report (including comments on the adequacy of the background information if necessary). Add extra rows if needed below, including the codes in Columns A-C.	NA	The figures showing spawning escapement in relation to target reference points should also show the LRP. This would facilitate the review of whether the LRP was being met. It would be helpful if the CAB made the unpublished reports available to the reviewer and the public since the report relied heavily on these documents. MSC guidance (as per FCP v2.1) for access to information is listed below 4.4 Access to information 4.4.1 The CAB shall ensure that unpublished key information necessary for stakeholders to be able to properly review the logic used by the team to score a PI is made available to stakeholders. 4.4.1.1 The CAB shall make unpublished key information available when referenced in a public assessment report and shall ensure that the information is available throughout the subsequent stages of the assessment process. 4.4.1.2 The CAB shall note that unpublished information does not include peer-reviewed or grey literature. 7.20.5 Any references used to support statements in the evaluation tables of the reports shall be included in the References section of the evaluation table and an in-text reference (e.g. number or author, date) made to the relevant source.	Unpublished reports used in the certification are available in English and Russian.

Peer Reviewer A - PI Comments

UoA stock	UoA gear	PR (A/B/C)	PI	PI Information	PI Scoring	PI Condition	Peer Reviewer Justification (as given at initial Peer Review stage)	CAB Response to Peer Reviewer's comments (as included in the Public Comment Draft Report - PCDR)	CAB Response Code
Oz sockeye	Coastal trap nets, beach seines	PR A	1.1.1	Yes	Yes	NA	Escapement counts support conclusion		NA (No response needed)
KK Pink	Coastal trap nets, beach seines	PR A	1.1.1	No (material score reduction expected to <80)	No (material score reduction expected to <80)	NA	As noted in the report, odd year pink salmon was the dominant run prior to 1985. These fish are genetically distinct from even year pink salmon, and have produced harvests of about 2.3 million pink salmon per odd year, 2011-2019, i.e., a substantial harvest though smaller than in even years since 1985. The data charts clearly show that odd year pink salmon do not meet the assumed limit reference point. Although the odd year run has not been directly targeted in recent years, it should still be managed to meet a limit reference point. Since the odd and even runs are genetically distinct, the managers should develop a limit reference point and TRP for odd year pink salmon, which were the dominant run prior to 1985. Likewise, the reported TRP is not met in most odd years. The reference point, which was developed for even year pink salmon, has not been met even though large incidental commercial harvests of odd year pink salmon have been allowed.	Scores were reduced for Kamchatka-Kuril and West Kamchatka pink salmon in recognition of escapements that appear to fall below an LRP based on even and odd year runs. Condition 1 was expanded to include these stocks. KamchatNIRO has previously considered stock-recruitment analysis that separated even and odd year brood cycles but it is our current understanding that separate reference points are not currently applied. This concern is qualified by observations of lower productivity in the subdominant brood cycle of pinks and the likelihood of significant interaction affects with the dominant brood cycle. The cycle dominance switch around 1985 provides strong evidence for depressive effects. Similar patterns are observed in pink salmon across the Pacific. Stock-recruitment analyses suggest that it is likely that the subdominant is producing maximum or near maximum sustained yields and are unlikely to benefit from increased escapement. However, clarification is needed on the status of the subdominant return relative to the limit reference point.	Accepted (material score reduction to <80)
WK Pink	Coastal trap nets, beach seines	PR A	1.1.1	No (material score reduction expected to <80)	No (material score reduction expected to <80)	NA	As noted in the report, odd year pink salmon was the dominant run prior to 1985. These fish are genetically distinct from even year pink salmon, and have produced harvests of about 2.3 million pink salmon per odd year, 2011-2019, i.e., a substantial harvest though smaller than in even years since 1985. The data charts clearly show that odd year pink salmon do not meet the assumed limit reference point. Although the odd year run has not	Scores were reduced for Kamchatka-Kuril and West Kamchatka pink salmon in recognition of escapements that appear to fall below an LRP based on even and odd year runs. Condition 1 was expanded to include these stocks. KamchatNIRO has previously considered stock-recruitment analysis that separated even and odd year brood cycles but it is our current understanding that separate reference points are not currently applied. This concern is qualified by observations of lower productivity	Accepted (material score reduction to <80)

							been directly targeted in recent years, it should still be managed to meet a limit reference point. Since the odd and even runs are genetically distinct, the managers should develop a limit reference point and TRP for odd year pink salmon, which were the dominant run prior to 1985. Likewise, the reported TRP is not met in most odd years. The reference point, which was developed for even year pink salmon, has not been met even though large incidental commercial harvests of odd year pink salmon have been allowed.	in the subdominant brood cycle of pinks and the likelihood of significant interaction affects with the dominant brood cycle. The cycle dominance switch around 1985 provides strong evidence for depressive effects. Similar patterns are observed in pink salmon across the Pacific. Stock-recruitment analyses suggest that it is likely that the subdominant is producing maximum or near maximum sustained yields and are unlikely to benefit from increased escapement. However, clarification is needed on the status of the subdominant return relative to the limit reference point.	
KK Chum	Coastal trap nets, beach seines	PR A	1.1.1	No (material score reduction expected to <80)	No (material score reduction expected to <80)	NA	Limit reference point met only 87% of past 15 years. Although this apparently meets the 15 year criteria, according to the report, the fact is that very large harvests of chum have caused the escapement to fall below the LRP. The MSC criteria and the management system should not allow large directed commercial harvest to cause the spawning population to decline below the LRP, which is the point that managers must avoid. Likewise, chum salmon have failed to meet the lower TRP (buffer) in 6 of the past 10 years, i.e., less than the 50% criterium for SG80. Again, this is when large commercial harvests have been allowed. The assessment needs to consider the declining trend in meeting the TRP, not just the average over a very long period, especially since the management system for all salmon species changed in 2008.	Scoring of this PI was evaluated relative to guidance identified in SC2.2.3.2 regarding stock status in relation to target reference points. The guidelines were met. The assessment also considered the totality of information available including sustained harvest, escapements and aerial survey efforts. Sustained high harvests clearly indicate that escapements have been adequate to support continuing high productivity. The assessment also considered inherent normal variability in salmon runs and did not place undue weight on periodic low numbers in the absence of a clear long-term trend.	Not accepted (no change)
WK Chum	Coastal trap nets, beach seines	PR A	1.1.1	No (non-material score reduction expected)	No (non-material score reduction expected)	Yes	Scoring did not consider the trend over time in meeting the assumed limit reference point for aggregate chum. Chum was below the assumed limit reference point in 4 of the past 7 years, i.e., it failed to meet the LRP in 60% of recent years. Furthermore, commercial catch of chum has been very high during last 10 years suggesting that the fishery	Scoring of this PI was evaluated relative to guidance identified in SC2.2.3.2 regarding stock status in relation to target reference points. The guidelines were met. The assessment also considered the totality of information available including sustained harvest, escapements and aerial survey efforts. Sustained high harvests clearly indicate that escapements have been adequate to support continuing high	Not accepted (no change)

							caused the escapement to fall below the assumed limit reference point. Likewise, chum salmon have failed to meet the lower TRP (buffer) in 7 of the past 10 years, indicating it did not meet the SG80 criterium if the time trend is considered. Furthermore, this occurred when large commercial harvests have been allowed. The assessment needs to consider the declining trend in meeting the TRP, not just the average over a very long period, especially since the management system for all salmon species changed in 2008.	productivity. The assessment also considered inherent normal variability in salmon runs and did not place undue weight on periodic low numbers in the absence of a clear long-term trend.	
KK Coho	Coastal trap nets, beach seines	PR A	1.1.1	No (material score reduction expected to <60)	No (material score reduction expected to <60)	Yes	Scoring did not consider the trend over time in meeting the assumed limit reference point for aggregate coho. Coho was below the assumed limit reference point in 3 of the past 4 years. Commercial catch of coho was very high during this period indicating that the fishery caused or at least contributed to the escapement to fall below the assumed limit reference point. Please note that the LRP for coho was not defined until the scoring presentation indicating that the management system does not directly consider an LRP for coho. LRP for each species should be clearly shown on the charts, such as Figs 38, 49, 50,and 62. to make it easy for people to see whether or not the LRP is met. Likewise, coho salmon have failed to meet the lower TRP (buffer) in 8 of the past 10 years. This is when large commercial harvests have been allowed. The assessment needs to consider the declining trend in meeting the TRP, not just the average over a very long period, especially since the management system for all salmon species changed in 2008.	Scoring of this PI was evaluated relative to guidance identified in SC2.2.3.2 regarding stock status in relation to target reference points. The guidelines were met. The assessment also considered the totality of information available including sustained harvest, escapements and aerial survey efforts. Sustained high harvests clearly indicate that escapements have been adequate to support continuing high productivity. The assessment also considered inherent normal variability in salmon runs and did not place undue weight on periodic low numbers in the absence of a clear long-term trend. Also note that the management system does consider LRPs for all species, but as explained in the assessment, this fishery like most salmon fisheries, is managed for escapement ranges observed to produce high levels of sustained yields over time.	Not accepted (no change)
Oz sockeye	Coastal trap nets, beach seines	PR A	1.1.2	NA (PI not scored)	NA (PI not scored)	NA			NA (No response needed)

KK Pink	Coastal trap nets, beach seines	PR A	1.1.2	No (scoring implications unknown)	No (scoring implications unknown)	NA	This stock was scored by the AT to be above 80 in PI1.1.1, however the score may need to be less than 80 and therefore require scoring under PI 1.1.2. As noted in the report, odd year pink salmon was the dominant run prior to 1985, raising the question as to whether this run needs reduced incidental harvest, or re-evaluation of the LRP and TRP. These fish are genetically distinct from even year pink salmon. The data charts clearly show that odd year pink salmon do not meet the assumed limit reference point. Although the odd year run has not been directly targeted in recent years, it should still be managed to meet a limit reference point and TRP. Since the odd abd even runs are genetically distinct, the managers should develop a limit reference point (and TRP) for odd year pink salmon, which were the dominant run prior to 1985. Harvests of these fish have averaged about 2.3 million in recent odd years. Likewise, the TRP is not met in most odd years. This is when relatively large incidental commercial harvests have been allowed. If both appropriate monitoring and achievement of LRP and TRP objectives can be met withing the timeframes, then the score could be 80.	Scores were revised to address score changes in PI 1.1.1.	Accepted (non-material score reduction)
WK Pink	Coastal trap nets, beach seines	PR A	1.1.2	No (scoring implications unknown)	No (scoring implications unknown)	NA	This stock was scored by the AT to be above 80 in PI1.1.1, however the score may need to be less than 80 and therefore require scoring under PI 1.1.2. As noted in the report, odd year pink salmon was the dominant run prior to 1985, raising the question as to whether this run needs reduced incidental harvest, or re-evaluation of the LRP and TRP. These fish are genetically distinct from even year pink salmon. The data charts clearly show that odd year pink salmon do not meet the assumed limit reference point. Although the odd year run has not	Scores were revised to address score changes in PI 1.1.1.	Accepted (non-material score reduction)

							been directly targeted in recent years, it should still be managed to meet a limit reference point and TRP. Since the odd Abd even runs are genetically distinct, the managers should develop a limit reference point (and TRP) for odd year pink salmon, which were the dominant run prior to 1985. Harvests of these fish have averaged about 2.3 million in recent odd years. Likewise, the TRP is not met in most odd years. This is when relatively large incidental commercial harvests have been allowed. If both appropriate monitoring and achievement of LRP and TRP objectives can be met withing the timeframes, then the score could be 80.		
KK Chum	Coastal trap nets, beach seines	PR A	1.1.2	No (material score reduction expected to <80)	No (material score reduction expected to <80)	NA	This stock was scored by the AT to be above 80 in PI1.1.1, however the score may need to be less than 80 and therefore require scoring under PI 1.1.2. Limit reference point was met only 87% of time. Although this apparently meets criteria, according to the report, the fact is that very large harvests of chum have caused the escapement to fall below the LRP. The MSC criteria for a well managed fishery should not allow commercial harvest to cause the spawning population to decline below the LRP, which is the point that managers must avoid. Likewise, chum salmon have failed to meet the lower TRP (buffer) in 6 of the past 10 years. Again, this is when large commercial harvests have been allowed following a significant change in the management system in 2008. If both appropriate monitoring and achievement of LRP and TRP objectives can be met withing the timeframes, then the score could be 80.	No changes in PI 1.1.1 or 1.1.2 scores are supported by the available information for this stock. The assessment considered the totality of information available including sustained harvest, escapements and aerial survey efforts. Sustained high harvests clearly indicate that escapements have been adequate to support continuing high productivity.	Not accepted (no change)
WK Chum	Coastal trap nets,	PR A	1.1.2	No (material score reduction	No (material score reduction	NA	The summary scoring table did not provide a score for PI1.1.2, but it should based on the score in PI1.1.1. Scoring did not consider the trend over time in	Summary scoring table was revised to include scores for this PI. No changes in PI 1.1.1 or 1.1.2 scores are supported by the available information for this	Not accepted (no change)

	beach seines			expected to <80)	expected to <80)		meeting the assumed limit reference point for aggregate chum. Chum was below the assumed limit reference point in 4 of the past 7 years, i.e., it failed to meet the LRP in 60% of recent years. Furthermore, commercial catch of chum has been very high during last 10 years, following the significant change in the management system in 2008, suggesting that the fishery caused the escapement to fall below the assumed limit reference point. Likewise, chum salmon have failed to meet the lower TRP (buffer) in 7 of the past 10 years. This occurred when large commercial harvests have been allowed. The current scoring simply assumes that more survey effort will satisfy this rebuilding PI. However, this conclusion is not fully justified because the management system reportedly expands the variable and few aerial survey counts to the aggregate population. The report does not adequately explain how the limited and inconsistent aerial counts are expanded to the entire management area in order to generate productivity estimates and reference points. In other words, the management system must improve monitoring and <u>also</u> evaluate whether harvest rates need to be reduced in order to exceed the LRP and lower TRP. If both appropriate monitoring and achievement of LRP and TRP objectives can be met withing the timeframes, then the score could be 80.	stock. The assessment considered the totality of information available including sustained harvest, escapements and aerial survey efforts. Sustained high harvests clearly indicate that escapements have been adequate to support continuing high productivity. Stock assessments are currently based on aerial surveys in index areas. Index counts are expanded to the entire stock based on fish distribution documented in previous years of more comprehensive aerial surveys. Historical data also indicates that index counts are strongly correlated with total production. Progress in meeting conditions of this assessment will consider whether survey effort is sufficient to confidently estimate spawning escapements and whether escapements are sufficient to continue to sustain high levels of production.	
KK Coho	Coastal trap nets, beach seines	PR A	1.1.2	No (material score reduction expected to <80)	No (material score reduction expected to <80)	NA	The summary scoring table did not provide a score for PI1.1.2, but it should based on the score in PI1.1.1. Scoring did not consider the trend over time in meeting the assumed limit reference point for aggregate coho. Coho was below the assumed limit reference point in 3 of the past 4 years. Commercial catch of coho has been very high during this	Summary scoring table was revised to include scores for this PI. No other changes in PI 1.1.1 or 1.1.2 scores are supported by the available information for this stock. The assessment considered the totality of information available including sustained harvest, escapements and aerial survey efforts. Sustained high harvests clearly indicate that escapements have been adequate to support	Not accepted (no change)

							period indicating that the fishery caused or at least contributed to the escapement to fall below the assumed limit reference point. Please note that the LRP for coho was not defined until the scoring presentation. LRP for each species should be clearly shown on the charts to make it easy for people to see whether or not the targets are met. While limited survey effort may have contributed to low escapement counts, it is also clear that high harvest rates have also contributed to reduced escapement. The current scoring simply assumes that more survey effort will satisfy this PI. In other words, the management system must improve monitoring and also evaluate whether harvest rates need to be reduced in order to exceed the LRP and lower TRP. If both appropriate monitoring and achievement of LRP and TRP objectives can be met withing the timeframes, then the score could be 80. Please see comments above regarding chum, which also apply to coho.	continuing high productivity. Progress in meeting conditions of this assessment will consider whether survey effort is sufficient to confidently estimate spawning escapements and whether escapements are sufficient to continue to sustain high levels of production. The management system does consider LRPs for all species, but as explained in the assessment, this fishery like most salmon fisheries, is managed for escapement ranges observed to produce high levels of sustained yields over time.	
Oz sockeye	Coastal trap nets, beach seines	PR A	1.2.1	Yes	Yes	NA			NA (No response needed)
KK Pink	Coastal trap nets, beach seines	PR A	1.2.1	No (material score reduction expected to <80)	No (material score reduction expected to <80)	No	The harvest strategy for odd year pink salmon is to limit ocean fisheries and harvest them incidentally to other species in the rivers. While this should reduce the harvest rate on odd year pink salmon, this passive approach does not necessarily lead to a well managed fishery that achieves its reference points. Approximately 2.3 million pinks are harvested each odd year in both areas. The report clearly shows that odd year salmon are well below the reference points, which were based on even year pink salmon. Without specific reference points how can a harvest strategy be evaluated for this stock which was the dominant run prior to 1985? In summary,	The harvest strategy involving reducing fishing effort and exploitation in odd years is clearly responsive to the reduced productivity of this brood cycle. The issue of escapements relative to reference points was addressed by a score reduction in PI 1.1.1 and the corresponding condition. As explained previously, the assessment considered the totality of information available including sustained harvest, escapements and aerial survey efforts. Sustained high harvests clearly indicate that escapements have been adequate to support continuing high productivity. See also previous comments regarding brood-cycle interactions which must be considered in interpreting stock assessment information.	Not accepted (no change)

							the harvest strategy is not necessarily responsive to the state of the SMU because there is insufficient monitoring (SI c) and evaluation of the strategy (SI b) in terms of meeting reference point objectives.		
WK Pink	Coastal trap nets, beach seines	PR A	1.2.1	No (material score reduction expected to <80)	No (material score reduction expected to <80)	No	The harvest strategy for odd year pink salmon is to limit ocean fisheries and harvest them incidentally to other species in the rivers. While this should reduce the harvest rate on odd year pink salmon, this passive approach does not necessarily lead to a well managed fishery that achieves its reference points. Approximately 2.3 million pinks are harvested each odd year in both areas. The report clearly shows that odd year salmon are well below the reference points, which were based on even year pink salmon. Without specific reference points how can a harvest strategy be evaluated for this stock which was the dominant run prior to 1985? In summary, the harvest strategy is not necessarily responsive to the state of the SMU because there is insufficient monitoring (SI c) and evaluation of the strategy (SI b) in terms of meeting reference point objectives.	The harvest strategy involving reducing fishing effort and exploitation in odd years is clearly responsive to the reduced productivity of this brood cycle. The issue of escapements relative to reference points was addressed by a score reduction in PI 1.1.1 and the corresponding condition. As explained previously, the assessment considered the totality of information available including sustained harvest, escapements and aerial survey efforts. Sustained high harvests clearly indicate that escapements have been adequate to support continuing high productivity. See also previous comments regarding brood-cycle interactions which must be considered in interpreting stock assessment information.	Not accepted (no change)
KK Chum	Coastal trap nets, beach seines	PR A	1.2.1	No (material score reduction expected to <80)	No (material score reduction expected to <80)	No	The harvest strategy relies upon days for passing salmon upriver in the coastal ocean and in river fisheries. This could be a reasonable strategy to achieve reference points. However, no information was provided on how long it takes for salmon to migrate through the closed fishery. For example, if the fishery is closed 2 days and it takes 2 days for fish to move through the fishing zone, then relatively few fish will escape the fishery. Aerial escapement counts reportedly occur only once every 3 or 4 weeks, which is too infrequent to inform inseason management. Catch per effort data could be misleading if the closed period simply allows the fishing zone to re-fill with fish	Historical production and spawning escapement patterns clearly demonstrate that the passing day fishing strategy has effectively sustained high levels of harvest over and extended period of time. Inseason adjustments are generally limited and based on obvious small or large run sizes as determined by harvest levels and run timing which can be assessed from size and sex composition of the catch. Experience has shown that fish move quicky through the fishing areas. Post season data demonstrates that escapement targets are generally met and that estimates are generally the product of limited survey effort over a period of years.	Not accepted (no change)

							before they are harvested again. No analysis was presented to show how catch per effort was related to spawning escapement. Post season survey data in recent years indicates that reference points are often not met. Perhaps this is due to low survey effort, which is clearly an issue, but it could also stem from high harvest rates given commercial catch has been high in recent years. In summary, the harvest strategy is not necessarily responsive to the state of the SMU because there is insufficient monitoring (SI c) and evaluation of the strategy (SI b) in terms of meeting reference point objectives.		
WK Chum	Coastal trap nets, beach seines	PR A	1.2.1	No (material score reduction expected to <80)	No (material score reduction expected to <80)	No	The harvest strategy relies upon days for passing salmon upriver in the coastal ocean and in river fisheries. This could be a reasonable strategy to achieve reference points. However, no information was provided on how long it takes for salmon to migrate through the closed fishery. For example, if the fishery is closed 2 days and it takes 2 days for fish to move through the fishing zone, then relatively few fish will escape the fishery. Aerial escapement counts reportedly occur only once every 3 or 4 weeks, which is too infrequent to inform inseason management. Catch per effort data could be misleading if the closed period simply allows the fishing zone to re-fill with fish before they are harvested again. No analysis was presented to show how catch per effort was related to spawning escapement. Post season survey data in recent years indicates that reference points are often not met. Perhaps this is due to low survey effort, which is clearly an issue, but it could also stem from high harvest rates given commercial catch has been high in recent years. In summary, the harvest strategy is not necessarily responsive to the state of the SMU because there is insufficient monitoring	Historical production and spawning escapement patterns clearly demonstrate that the passing day fishing strategy has effectively sustained high levels of harvest over an extended period of time. Inseason adjustments are generally limited and based on obvious small or large run sizes as determined by harvest levels and run timing which can be assessed from size and sex composition of the catch. Experience has shown that fish move quicky through the fishing areas. Post season data demonstrates that escapement targets are generally met and that estimates are generally the product of limited survey effort over a period of years.	Not accepted (no change)

							(SI c) and evaluation of the strategy (SI b) in terms of meeting reference point objectives.		
KK Coho	Coastal trap nets, beach seines	PR A	1.2.1	No (material score reduction expected to <80)	No (material score reduction expected to <80)	No	The harvest strategy relies upon days for passing salmon upriver in the coastal ocean and in river fisheries. This could be a reasonable strategy to achieve reference points. However, no information was provided on how long it takes for salmon to migrate through the closed fishery. For example, if the fishery is closed 2 days and it takes 2 days for fish to move through the fishing zone, then relatively few fish will escape the fishery. Aerial escapement counts reportedly occur only once every 3 or 4 weeks, which is too infrequent to inform inseason management. Catch per effort data could be misleading if the closed period simply allows the fishing zone to re-fill with fish before they are harvested again. No analysis was presented to show how catch per effort was related to spawning escapement. Post season survey data in recent years indicates that reference points are often not met. Perhaps this is due to low survey effort, which is clearly an issue, but it could also stem from high harvest rates given commercial catch has been high in recent years. In summary, the harvest strategy is not necessarily responsive to the state of the SMU because there is insufficient monitoring (SI c) and evaluation of the strategy (SI b) in terms of meeting reference point objectives.	Historical production and spawning escapement patterns clearly demonstrate that the passing day fishing strategy has effectively sustained high levels of harvest over an extended period of time. Inseason adjustments are generally limited and based on obvious small or large run sizes as determined by harvest levels and run timing which can be assessed from size and sex composition of the catch. Experience has shown that fish move quicky through the fishing areas. Post season data demonstrates that escapement targets are generally met and that estimates are generally the product of limited survey effort over a period of years.	Not accepted (no change)
Oz sockeye	Coastal trap nets, beach seines	PR A	1.2.2	Yes	Yes	NA	There is a well defined and effective HCR for Ozernaya sockeye which are managed with a counting weir that provides real-time and reasonable accurate escapement counts.		NA (No response needed)
KK Pink	Coastal trap nets, beach seines	PR A	1.2.2	No (material score reduction	No (material score reduction	No	There is no well defined and effective and robust harvest control rule for odd year pink salmon which were the dominant run prior to 1985, other than moving the most of the fishery into rivers in odd years and	Many high-value eastern Pacific salmon fisheries are intensively managed to maximize harvest in any given year. Kamchatka salmon fisheries are more extensively managed with effort-based limitations designed to sustain	Not accepted (no change)

				expected to <80)	expected to <80)		passively managing pink salmon using data from other salmon species in the fishery. If the LRP and TRP for even year pink salmon is applied to odd year pink salmon, then odd year pink salmon consistently falls below the reference points. SI a, b, c, and d should be re-scored because there is no well defined and effective and robust harvest control rule for odd year pink salmon.	high levels of harvest across extended periods of time. Effective harvest control rules exist in both management strategies. The Kamchatka approach has proven to be robust for that fishery and consistent with the nature of the management information available. It would be a mistake to infer that the Kamchatka strategy is not effective because it is less intensive than an idealized intensive management strategy. The significance of odd year salmon being dominant prior to 1985 is not apparent from the comments. If this reflects an assumption that similarly high levels of production could be restored with higher escapements, this overlooks the apparent depressive effects of the dominant brood cycle typical of pink salmon and reduced survey intensity during odd years.	
WK Pink	Coastal trap nets, beach seines	PR A	1.2.2	No (material score reduction expected to <80)	No (material score reduction expected to <80)	No	There is no well defined and effective and robust harvest control rule for odd year pink salmon which were the dominant run prior to 1985, other than moving the most of the fishery into rivers in odd years and passively managing pink salmon using data from other salmon species in the fishery. If the LRP and TRP for even year pink salmon is applied to odd year pink salmon, then odd year pink salmon consistently falls below the reference points. SI a, b, c, and d should be re-scored because there is no well defined and effective and robust harvest control rule for odd year pink salmon.	Many high-value eastern Pacific salmon fisheries are intensively managed to maximize harvest in any given year. Kamchatka salmon fisheries are more extensively managed with effort-based limitations designed to sustain high levels of harvest across extended periods of time. Effective harvest control rules exist in both management strategies. The Kamchatka approach has proven to be robust for that fishery and consistent with the nature of the management information available. It would be a mistake to infer that the Kamchatka strategy is not effective because it is less intensive than an idealized intensive management strategy. The significance of odd year salmon being dominant prior to 1985 is not apparent from the comments. If this reflects an assumption that similarly high levels of production could be restored with higher escapements, this overlooks the apparent depressive effects of the dominant brood cycle typical of pink salmon and reduced survey intensity during odd years.	Not accepted (no change)
KK Chum	Coastal trap nets, beach seines	PR A	1.2.2	No (material score reduction	No (material score reduction	No	The report states that the fishery is managed in-season with time and area openings and closures based on catch, biological characteristics of the catch, run size and escapement information. This	Historical production and spawning escapement patterns clearly demonstrate that the passing day fishing strategy has effectively sustained high levels of harvest over an extended period of time. Inseason adjustments	Not accepted (no change)

			expected to <80)	expected to <80)		sounds good but on a more detailed examination of the management system, it is not clear that the harvest control rule is well defined, effective and robust to uncertainty. The days open and closed approach is reasonable but it must be linked to the spawning escapement of each species in the assessment area. The report states that the fishery removes ˜90% of the fish in the zone. How many days does it take for fish to pass the fishing zone? If it takes 2 days to pass through the fishery and the fishery is closed only 2 days, then relatively few fish will escape. Catch per effort can be biased by the time it takes for fish to pass through the zone. Aerial escapement counts occur only once every 3 or 4 weeks according to the report, so it is unclear how this low frequency can be used to effectively manage the fishery. How is catch per effort directly linked to spawning escapement across the UoA, especially since 2008 following the significant change in the management system? The report notes that aerial surveys are not conducted in each major watershed every year, yet they reportedly expand escapement counts to the aggregate assessment area as a means to evaluate reference points. How are the inconsistent escapement monitoring data (variable watersheds surveyed) used inseason to open and close the fishery? Fig. 37 and Fig.48 show a relationship between the index count and the expanded escapement count for the region. The regression equations are essentially perfect, which is impossible and misleading for this type of data. How were the regressions developed when there are no supporting data that provide total escapement counts for the region? The escapement data demonstrate that the harvest control rule is not working because the LRP and TRP are often not	are generally limited and based on obvious small or large run sizes as determined by harvest levels and run timing which can be assessed from size and sex composition of the catch. Experience has shown that fish move quicky through the fishing areas. Post season data demonstrates that escapement targets are generally met and that estimates are generally the product of limited survey effort over a period of years.	

							met in the past 10 years, even though harvests have been very high. If the HCR is robust, well defined, and effective, then why are the escapements so low when harvests have been high in recent years? The scores of SI a (well defined rule to ensure objectives are met) and SI c (evidence indicating tool are appropriate and effective in achieving objectives) should be re-evaluated.		
WK Chum	Coastal trap nets, beach seines	PR A	1.2.2	No (material score reduction expected to <80)	No (material score reduction expected to <80)	No	The report states that the fishery is managed in-season with time and area openings and closures based on catch, biological characteristics of the catch, run size and escapement information. This sounds good but on a more detailed examination of the management system, it is not clear that the harvest control rule is well defined, effective and robust to uncertainty. The days open and closed approach is reasonable but it must be linked to the spawning escapement of each species in the assessment area. The report states that the fishery removes ˜90% of the fish in the zone. How many days does it take for fish to pass the fishing zone? If it takes 2 days to pass through the fishery and the fishery is closed only 2 days, then relatively few fish will escape. Catch per effort can be biased by the time it takes for fish to pass through the zone. Aerial escapement counts occur only once every 3 or 4 weeks according to the report, so it is unclear how this low frequency can be used to effectively manage the fishery. The report notes that aerial surveys are not conducted in each major watershed every year, yet they rep[reportedly expand escapement counts to the aggregate assessment area as a means to evaluate reference points. How are the inconsistent escapement monitoring data (variable watersheds surveyed) used inseason to open and close the fishery? Fig. 37 and Fig.48 show a relationship	Historical production and spawning escapement patterns clearly demonstrate that the passing day fishing strategy has effectively sustained high levels of harvest over an extended period of time. Inseason adjustments are generally limited and based on obvious small or large run sizes as determined by harvest levels and run timing which can be assessed from size and sex composition of the catch. Experience has shown that fish move quicky through the fishing areas. Post season data demonstrates that escapement targets are generally met and that estimates are generally the product of limited survey effort over a period of years.	Not accepted (no change)

							between the index count and the expanded escapement count for the region. The regression equations are essentially perfect, which is impossible. How were the regressions developed when there are no supporting data that provide total escapement counts for the region? The escapement data demonstrate that the harvest control rule is not working because the LRP and TRP are often not met in the past 10 years or so even though harvests have been very high. If the HCR is robust, well defined, and effective, then why are the escapements so low when harvests have been high in recent years? The scores of SI a (well defined rule to ensure objectives are met) and SI c (evidence indicating tool are appropriate and effective in achieving objectives) should be re-evaluated.		
KK Coho	Coastal trap nets, beach seines	PR A	1.2.2	No (material score reduction expected to <80)	No (material score reduction expected to <80)	No	The report states that the fishery is managed in-season with time and area openings and closures based on catch, biological characteristics of the catch, run size and escapement information. This sounds good but on a more detailed examination of the management system, it is not clear that the harvest control rule is well defined, effective and robust to uncertainty. The days open and closed approach is reasonable but it must be linked to the spawning escapement of each species in the assessment area. The report states that the fishery removes ˜90% of the fish in the zone. How many days does it take for fish to pass the fishing zone? If it takes 2 days to pass through the fishery and the fishery is closed only 2 days, then relatively few fish will escape. Catch per effort can be biased by the time it takes for fish to pass through the zone. Aerial escapement counts occur only once every 3 or 4 weeks according to the report, so it is unclear how this low frequency can be used to effectively manage the fishery. The	Historical production and spawning escapement patterns clearly demonstrate that the passing day fishing strategy has effectively sustained high levels of harvest over an extended period of time. Inseason adjustments are generally limited and based on obvious small or large run sizes as determined by harvest levels and run timing which can be assessed from size and sex composition of the catch. Experience has shown that fish move quicky through the fishing areas. Post season data demonstrates that escapement targets are generally met and that estimates are generally the product of limited survey effort over a period of years.	Not accepted (no change)

							report notes that aerial surveys are not conducted in each major watershed every year, yet they rep[reportedly expand escapement counts to the aggregate assessment area as a means to evaluate reference points. How are the inconsistent escapement monitoring data (variable watersheds surveyed) used inseason to open and close the fishery? Fig. 37 and Fig.48 show a relationship between the index count and the expanded escapement count for the region. The regression equations are essentially perfect, which is impossible. How were the regressions developed when there are no supporting data that provide total escapement counts for the region? The escapement data demonstrate that the harvest control rule is not working because the LRP and TRP are often not met in the past 10 years even though harvests have been very high. If the HCR is robust, well defined, and effective, then why are the escapements so low when harvests have been high in recent years? The scores of SI a (well defined rule to ensure objectives are met) and SI c (evidence indicating tool are appropriate and effective in achieving objectives) should be re-evaluated.		
Oz sockeye	Coastal trap nets, beach seines	PR A	1.2.3	Yes	Yes	NA	Relevant information is collected for sockeye.		NA (No response needed)
KK Pink	Coastal trap nets, beach seines	PR A	1.2.3	No (non-material score reduction expected)	No (non-material score reduction expected)	No	Please note that the scoring text (not the Table) indicates PI1.2.3 did not meet SGa and SGb), but it also indicates it did meet 80 for SGa, i.e. the text is not consistent. The SG80 standard for regular monitoring is not met for UoC pink, chum and coho because recent reductions in aerial survey intensity throughout West Kamchatka have substantially reduced the accuracy and precision of spawning escapement	Score rationales were revised to clarify the basis for assigned scores. Concerns for the adequacy of information to support the harvest strategy are addressed by the condition of the indicator. Adequacy of the stock assessment system will be assessed based on progress on that condition to be assessed based on annual surveillance audits. Over the course of the certification history for this fishery, we have observed a high level of accountability and responsiveness by the	Not accepted (no change)

						estimates used to guide management decisions. The effectiveness of the harvest strategy depends on monitoring of spawning escapements, estimates of recruitment, and the spawner recruit relationship used to estimate productivity and reference points (scoring issue A, i.e. information is not sufficient). Furthermore, it has not been demonstrated how catch per unit effort in the fishery is linked to inseason management of the spawning escapement (no CPUE data or analysis provided). Therefore, it seems the score should be lower than 75 while noting that I consider the monitoring in SIb to be critical to the scoring in SIa: sufficient information. Condition: I am concerned that the current condition will not lead to a robust escapement monitoring system needed to support the harvest control rule, inseason management, and post season evaluation of harvest management and stock status. This fishery has been MSC certified for a number of years, yet the level of effort for monitoring escapement has declined precipitously compared to what it was prior to ˜2007, a period that generally corresponds with the new management system. In 2019, Table 7 shows that only 29 hours of flight time were used to monitor all species and watersheds in Western Kamchatka from late July through early October. This is huge region with fairly large watersheds with numerous tributaries that should have many more hours of aerial survey. Presently, surveys are only flown once every 3 to 4 weeks. This effort is not sufficient to support inseason management, the harvest control rule, and post season evaluation of management and stock status. Weekly aerial counts are needed and the standard	fishing company and the management system to issues and conditions raised by the certifications. For instance, spawning ground surveys have increased in recent years with directed funding from the fishing companies. With funding by the fishing companies, KamchatNIRO has dedicated substantial resources to information reporting, stock assessment, and exploration of population-specific reference points for this fishery. Conditions have also contributed to substantial efforts in harvest accounting and enforcement. While current aerial survey efforts may not be sufficient to support a highly intensive management strategy apparently envisioned by this reviewer, this information has proven to be generally effective at implementing the more extensive management strategy operating in Kamchatka. The extensive management strategy has effectively sustained continuing high levels of production and is consistent with the scale of the region, the stock structure and dynamics in the region and the management resources available. We do not agree with broad assertions in reviewer comments regarding required survey frequency, expansion methodology, and interpretations of correlations in the context of this fishery.	

							"Area Under the Curve" (AUC) approach is needed to estimate total abundance in each watershed after considering the residence time of each species (English et al. 1992). Furthermore, it is unknown how the management system expands the variable survey areas to calculate total escapement for the aggregate area upon which the evaluation is based. As noted above, Fig. 37 and Fig 48, which shows a perfect relationship between index counts of escapement and total escapement for the region, is highly unrealistic and seems to be misleading. It does not provide confidence because no detailed information on this extrapolation is provided. Also, while the managers provide some stock recruitment curves for species in each watershed as a means to develop reference points and estimate stock productivity, I am concerned about the quality of data that is used to reconstruct salmon returns and the estimates of parent spawning abundance. I suspect considerable error in the productivity estimates which are used to develop reference points. It is largely because of these deficiencies in escapement counts and the direct linkage to harvest management that many of the management steps are judged to be insufficient. The data show that the harvest control rule is not working because reference points are often not met in the past 10 years or so, a time when harvest rates have increased and management system has changed. English et al. (1992). A Robust Procedure for Estimating Salmon Escapement based on the Area-Under-the-Curve Method. Canadian Journal of Fisheries and Aquatic Sciences 49(10):1982-1989.		
WK Pink	Coastal trap nets,	PR A	1.2.3	No (non-material score	No (non-material score	No	Please note that the scoring text (not the Table) indicates PI1.2.3 did not meet 80 for SIa and SIb, but it also indicates it did	Score rationales were revised to clarify the basis for assigned scores. Concerns for the adequacy of information to	Not accepted

beach seines			reduction expected)	reduction expected)		meet 80 for SIa, i.e. the text is not consistent. The SG80 standard for regular monitoring is not met for UoC pink, chum and coho because recent reductions in aerial survey intensity throughout West Kamchatka have substantially reduced the accuracy and precision of spawning escapement estimates used to guide management decisions. The effectiveness of the harvest strategy depends on monitoring of spawning escapements, estimates of recruitment, and the spawner recruit relationship used to estimate productivity and reference points (scoring issue A, i.e. information is not sufficient). Furthermore, it has not been demonstrated how catch per unit effort in the fishery is linked to inseason management of the spawning escapement (no CPUE data or analysis provided). Therefore, it seems the score should be lower than 75 while noting that I consider the monitoring in SIb to be critical to the scoring in SIa: sufficient information. Condition: I am concerned that the current condition will not lead to a robust escapement monitoring system needed to support the harvest control rule, inseason management, and post season evaluation of harvest management and stock status. This fishery has been MSC certified for a number of years, yet the level of effort for monitoring escapement has declined precipitously compared to what it was prior to ~2007, a period that generally corresponds with the new management system. In 2019, Table 7 shows that only 29 hours of flight time were used to monitor all species and watersheds in Western Kamchatka from late July through early October. This is huge region with fairly large watersheds with	support the harvest strategy are addressed by the condition of the indicator. Adequacy of the stock assessment system will be assessed based on progress on that condition to be assessed based on annual surveillance audits. Over the course of the certification history for this fishery, we have observed a high level of accountability and responsiveness by the fishing company and the management system to issues and conditions raised by the certifications. For instance, spawning ground surveys have increased in recent years with directed funding from the fishing companies. With funding by the fishing companies, KamchatNIRO has dedicated substantial resources to information reporting, stock assessment, and exploration of population-specific reference points for this fishery. Conditions have also contributed to substantial efforts in harvest accounting and enforcement. While current aerial survey efforts may not be sufficient to support a highly intensive management strategy apparently envisioned by this reviewer, this information has proven to be generally effective at implementing the more extensive management strategy operating in Kamchatka. The extensive management strategy has effectively sustained continuing high levels of production and is consistent with the scale of the region, the stock structure and dynamics in the region and the management resources available. Based on our review of the information, discussions with Russian scientits and managers and fishery site visits, we do not agree with broad assertions in reviewer comments regarding appropriate survey frequency, expansion methodology, and interpretations of correlations in the context of this fishery.	(no change)

						numerous tributaries that should have many more hours of aerial survey. Presently, surveys are only flown once every 3 to 4 weeks. This effort is not sufficient to support inseason management, the harvest control rule, and post season evaluation of management and stock status. Weekly aerial counts are needed and the standard "Area Under the Curve" (AUC) approach is needed to estimate total abundance in each watershed after considering the residence time of each species (English et al. 1992). Furthermore, it is unknown how the management system expands the variable survey areas to calculate total escapement for the aggregate area upon which the evaluation is based. As noted above, Fig. 37 and Fig 48, which shows a perfect relationship between index counts of escapement and total escapement for the region, is highly unrealistic and seems to be misleading. It does not provide confidence because no detailed information on this extrapolation is provided. Also, while the managers provide some stock recruitment curves for species in each watershed as a means to develop reference points and estimate stock productivity, I am concerned about the quality of data that is used to reconstruct salmon returns and the estimates of parent spawning abundance. I suspect considerable error in the productivity estimates which are used to develop reference points. It is largely because of these deficiencies in escapement counts and the direct linkage to harvest management that many of the management steps are judged to be insufficient. The data show that the harvest control rule is not working because reference points are often not met in the past 10 years or so, a time when harvest rates have increased and management system has changed.		

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KK Chum	Coastal trap nets, beach seines	PR A	1.2.3	No (non-material score reduction expected)	No (non-material score reduction expected)	No	Please note that the scoring text (not the Table) indicates PI1.2.3 did not meet SGa and SGb), but it also indicates it did meet 80 for SGa, i.e., the text is not consistent. The SG80 standard for regular monitoring is not met for UoC pink, chum and coho because recent reductions in aerial survey intensity throughout West Kamchatka have substantially reduced the accuracy and precision of spawning escapement estimates used to guide management decisions. The effectiveness of the harvest strategy depends on monitoring of spawning escapements, estimates of recruitment, and the spawner recruit relationship used to estimate productivity and reference points (scoring issue A, i.e., information is not sufficient). Furthermore, it has not been demonstrated how catch per unit effort in the fishery is linked to inseason management of the spawning escapement (no CPUE data or analysis provided). Therefore, it seems the score should be lower than 75 while noting that I consider the monitoring in SIb to be critical to the scoring in SIa: sufficient information. Condition: I am concerned that the current condition will not lead to a robust escapement monitoring system needed to support the harvest control rule, inseason management, and post season evaluation of harvest management and stock status. This fishery has been MSC certified for a number of years, yet the level of effort for monitoring escapement has declined precipitously compared to what it was	Score rationales were revised to clarify the basis for assigned scores. Concerns for the adequacy of information to support the harvest strategy are addressed by the condition of the indicator. Adequacy of the stock assessment system will be assessed based on progress on that condition to be assessed based on annual surveillance audits. Over the course of the certification history for this fishery, we have observed a high level of accountability and responsiveness by the fishing company and the management system to issues and conditions raised by the certifications. For instance, spawning ground surveys have increased in recent years with directed funding from the fishing companies. With funding by the fishing companies, KamchatNIRO has dedicated substantial resources to information reporting, stock assessment, and exploration of population-specific reference points for this fishery. Conditions have also contributed to substantial efforts in harvest accounting and enforcement. While current aerial survey efforts may not be sufficient to support a highly intensive management strategy apparently envisioned by this reviewer, this information has proven to be generally effective at implementing the more extensive management strategy operating in Kamchatka. The extensive management strategy has effectively sustained continuing high levels of production and is consistent with the scale of the region, the stock structure and dynamics in the region and the management resources available. Based on our review of the information, discussions with Russian scientits and managers and fishery site visits, we do not agree with broad assertions in reviewer comments regarding appropriate survey	Not accepted (no change)

						prior to ~2007, a period that generally corresponds with the new management system. In 2019, Table 7 shows that only 29 hours of flight time were used to monitor all species and watersheds in Western Kamchatka from late July through early October. This is huge region with fairly large watersheds with numerous tributaries that should have many more hours of aerial survey. Presently, surveys are only flown once every 3 to 4 weeks. This effort is not sufficient to support inseason management, the harvest control rule, and post season evaluation of management and stock status. Weekly aerial counts are needed and the standard "Area Under the Curve" (AUC) approach is needed to estimate total abundance in each watershed after considering the residence time of each species (English et al. 1992). Furthermore, it is unknown how the management system expands the variable survey areas to calculate total escapement for the aggregate area upon which the evaluation is based. As noted above, Fig. 37 and Fig 48, which shows a perfect relationship between index counts of escapement and total escapement for the region, is highly unrealistic and seems to be misleading. It does not provide confidence because no detailed information on this extrapolation is provided. Also, while the managers provide some stock recruitment curves for species in each watershed as a means to develop reference points and estimate stock productivity, I am concerned about the quality of data that is used to reconstruct salmon returns and the estimates of parent spawning abundance. I suspect considerable error in the productivity estimates which are used to develop reference points. It is largely because of these deficiencies in escapement counts and the direct linkage	frequency, expansion methodology, and interpretations of correlations in the context of this fishery.	

							to harvest management that many of the management steps are judged to be insufficient. The data show that the harvest control rule is not working because reference points are often not met in the past 10 years or so, a time when harvest rates have increased and management system has changed. English et al. (1992). A Robust Procedure for Estimating Salmon Escapement based on the Area-Under-the-Curve Method. Canadian Journal of Fisheries and Aquatic Sciences 49(10):1982-1989.		
WK Chum	Coastal trap nets, beach seines	PR A	1.2.3	No (non-material score reduction expected)	No (non-material score reduction expected)	No	Please note that the scoring text (not the Table) indicates PI1.2.3 did not meet 80 for SIa and SIb, but it also indicates it did meet 80 for SIa, i.e. the text is not consistent. The SG80 standard for regular monitoring is not met for UoC pink, chum and coho because recent reductions in aerial survey intensity throughout West Kamchatka have substantially reduced the accuracy and precision of spawning escapement estimates used to guide management decisions. The effectiveness of the harvest strategy depends on monitoring of spawning escapements, estimates of recruitment, and the spawner recruit relationship used to estimate productivity and reference points (scoring issue A, i.e. information is not sufficient). Furthermore, it has not been demonstrated how catch per unit effort in the fishery is linked to inseason management of the spawning escapement (no CPUE data or analysis provided). Therefore, it seems the score should be lower than 75 while noting that I consider the monitoring in SIb to be critical to the scoring in SIa: sufficient information. Condition: I am concerned that the	Score rationales were revised to clarify the basis for assigned scores. Concerns for the adequacy of information to support the harvest strategy are addressed by the condition of the indicator. Adequacy of the stock assessment system will be assessed based on progress on that condition to be assessed based on annual surveillance audits. Over the course of the certification history for this fishery, we have observed a high level of accountability and responsiveness by the fishing company and the management system to issues and conditions raised by the certifications. For instance, spawning ground surveys have increased in recent years with directed funding from the fishing companies. With funding by the fishing companies, KamchatNIRO has dedicated substantial resources to information reporting, stock assessment, and exploration of population-specific reference points for this fishery. Conditions have also contributed to substantial efforts in harvest accounting and enforcement. While current aerial survey efforts may not be sufficient to support a highly intensive management strategy apparently envisioned by this reviewer, this information has proven to be generally effective at implementing the more extensive management strategy operating in Kamchatka. The extensive management strategy has effectively sustained continuing high levels of production and is	Not accepted (no change)

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							stock productivity, I am concerned about the quality of data that is used to reconstruct salmon returns and the estimates of parent spawning abundance. I suspect considerable error in the productivity estimates which are used to develop reference points. It is largely because of these deficiencies in escapement counts and the direct linkage to harvest management that many of the management steps are judged to be insufficient. The data show that the harvest control rule is not working because reference points are often not met in the past 10 years or so, a time when harvest rates have increased and management system has changed. English et al. (1992). A Robust Procedure for Estimating Salmon Escapement based on the Area-Under-the-Curve Method. Canadian Journal of Fisheries and Aquatic Sciences 49(10):1982-1989.		
KK Coho	Coastal trap nets, beach seines	PR A	1.2.3	No (non-material score reduction expected)	No (non-material score reduction expected)	No	Please note that the scoring text (not the Table) indicates PI1.2.3 did not meet 80 for SIa and SIb, but it also indicates it did meet 80 for SIa, i.e. the text is not consistent. The SG80 standard for regular monitoring is not met for UoC pink, chum and coho because recent reductions in aerial survey intensity throughout West Kamchatka have substantially reduced the accuracy and precision of spawning escapement estimates used to guide management decisions. The effectiveness of the harvest strategy depends on monitoring of spawning escapements, estimates of recruitment, and the spawner recruit relationship used to estimate productivity and reference points (scoring issue A, i.e. information is not sufficient). Furthermore, it has not been demonstrated how catch per unit effort in the fishery is linked to inseason	Score rationales were revised to clarify the basis for assigned scores. Concerns for the adequacy of information to support the harvest strategy are addressed by the condition of the indicator. Adequacy of the stock assessment system will be assessed based on progress on that condition to be assessed based on annual surveillance audits. Over the course of the certification history for this fishery, we have observed a high level of accountability and responsiveness by the fishing company and the management system to issues and conditions raised by the certifications. For instance, spawning ground surveys have increased in recent years with directed funding from the fishing companies. With funding by the fishing companies, KamchatNIRO has dedicated substantial resources to information reporting, stock assessment, and exploration of population-specific reference points for this fishery. Conditions have also contributed to substantial efforts in harvest accounting and enforcement.	Not accepted (no change)

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							of escapement and total escapement for the region, is highly unrealistic and seems to be misleading. It does not provide confidence because no detailed information on this extrapolation is provided. Also, while the managers provide some stock recruitment curves for species in each watershed as a means to develop reference points and estimate stock productivity, I am concerned about the quality of data that is used to reconstruct salmon returns and the estimates of parent spawning abundance. I suspect considerable error in the productivity estimates which are used to develop reference points. It is largely because of these deficiencies in escapement counts and the direct linkage to harvest management that many of the management steps are judged to be insufficient. The data show that the harvest control rule is not working because reference points are often not met in the past 10 years or so, a time when harvest rates have increased and management system has changed. English et al. (1992). A Robust Procedure for Estimating Salmon Escapement based on the Area-Under-the-Curve Method. Canadian Journal of Fisheries and Aquatic Sciences 49(10):1982-1989.		
Oz sockeye	Coastal trap nets, beach seines	PR A	1.2.4	Yes	Yes	NA	Assessment of sockeye stock status is adequate.		NA (No response needed)
KK Pink	Coastal trap nets, beach seines	PR A	1.2.4	No (material score reduction expected to <80)	No (material score reduction expected to <80)	No	It is not clear that the managers fully consider uncertainty in the assessment (scoring issue C). The managers appear to assume that the salmon populations are adequately managed because habitat is relatively pristine in most areas and harvests are high. However, as discussed above and in the report, effort to monitor the spawning escapement has declined	Spawning ground surveys have increased in recent years with directed funding from the fishing companies. KamchatNIRO has documented resulting estimates of escapement for the purposes of this assessment and considers this information adequate to support current management when used in conjunction with historical information. Concerns for the adequate of odd-	Not accepted (no change)

							during this period of high harvests and it is inadequate to quantitatively evaluate stock status and implementation of the harvest control rule. This is especially true for odd year pink salmon, which is assumed to be well managed as it is captured incidentally in fisheries targeting other species. If reference points for even year pink salmon are applied to odd year pink salmon, then odd year pink salmon rarely meet the reference points.	year pink assessments are ad+L27dressed under PI 1.1.1 above.	
WK Pink	Coastal trap nets, beach seines	PR A	1.2.4	No (material score reduction expected to <80)	No (material score reduction expected to <80)	No	It is not clear that the managers fully consider uncertainty in the assessment (scoring issue C). The managers appear to assume that the salmon populations are adequately managed because habitat is relatively pristine in most areas and harvests are high. However, as discussed above and in the report, effort to monitor the spawning escapement has declined during this period of high harvests and it is inadequate to quantitatively evaluate stock status and implementation of the harvest control rule. This is especially true for odd year pink salmon, which is assumed to be well managed as it is captured incidentally in fisheries targeting other species. If reference points for even year pink salmon are applied to odd year pink salmon, then odd year pink salmon rarely meet the reference points.	Spawning ground surveys have increased in recent years with directed funding from the fishing companies. KamchatNIRO has documented resulting estimates of escapement for the purposes of this assessment and considers this information adequate to support current management when used in conjunction with historical information. Concerns for the adequate of odd-year pink assessments are addressed under PI 1.1.1 above.	Not accepted (no change)
KK Chum	Coastal trap nets, beach seines	PR A	1.2.4	No (material score reduction expected to <80)	No (material score reduction expected to <80)	No	It is not clear that the managers fully consider uncertainty in the assessment (scoring issue C). The managers appear to assume that the salmon populations are adequately managed because habitat is relatively pristine in most areas and harvests are high. However, as discussed above and in the report, effort to monitor the spawning escapement has declined during this period of high harvests and it is inadequate to quantitatively evaluate stock status and implementation of the harvest control rule.	Spawning ground surveys have increased in recent years with directed funding from the fishing companies. KamchatNIRO has documented resulting estimates of escapement for the purposes of this assessment and considers this information adequate to support current management when used in conjunction with historical information.	Not accepted (no change)
WK Chum	Coastal trap	PR A	1.2.4	No (material	No (material	No	It is not clear that the managers fully consider uncertainty in the assessment	Spawning ground surveys have increased in recent years with directed funding from the	Not accepted

	nets, beach seines			score reduction expected to <80)	score reduction expected to <80)		(scoring issue C). The managers appear to assume that the salmon populations are adequately managed because habitat is relatively pristine in most areas and harvests are high. However, as discussed above and in the report, effort to monitor the spawning escapement has declined during this period of high harvests and it is inadequate to quantitatively evaluate stock status and implementation of the harvest control rule.	fishing companies. KamchatNIRO has documented resulting estimates of escapement for the purposes of this assessment and considers this information adequate to support current management when used in conjunction with historical information.	(no change)
KK Coho	Coastal trap nets, beach seines	PR A	1.2.4	No (material score reduction expected to <80)	No (material score reduction expected to <80)	No	It is not clear that the managers fully consider uncertainty in the assessment (scoring issue C). The managers appear to assume that the salmon populations are adequately managed because habitat is relatively pristine in most areas and harvests are high. However, as discussed above and in the report, effort to monitor the spawning escapement has declined during this period of high harvests and it is inadequate to quantitatively evaluate stock status and implementation of the harvest control rule.	Spawning ground surveys have increased in recent years with directed funding from the fishing companies. KamchatNIRO has documented resulting estimates of escapement for the purposes of this assessment and considers this information adequate to support current management when used in conjunction with historical information.	Not accepted (no change)
Oz sockeye	Coastal trap nets, beach seines	PR A	1.3.1	Yes	Yes	NA	No salmon enhancement in this region		NA (No response needed)
KK Pink	Coastal trap nets, beach seines	PR A	1.3.1	Yes	Yes	NA	No salmon enhancement in this region		NA (No response needed)
WK Pink	Coastal trap nets, beach seines	PR A	1.3.1	Yes	Yes	NA	No salmon enhancement in this region		NA (No response needed)
KK Chum	Coastal trap nets, beach seines	PR A	1.3.1	Yes	Yes	NA	No salmon enhancement in this region		NA (No response needed)

WK Chum	Coastal trap nets, beach seines	PR A	1.3.1	Yes	Yes	NA	No salmon enhancement in this region		NA (No response needed)
KK Coho	Coastal trap nets, beach seines	PR A	1.3.1	Yes	Yes	NA	No salmon enhancement in this region		NA (No response needed)
Oz sockeye	Coastal trap nets, beach seines	PR A	1.3.2	Yes	Yes	NA	No salmon enhancement in this region		NA (No response needed)
KK Pink	Coastal trap nets, beach seines	PR A	1.3.2	Yes	Yes	NA	No salmon enhancement in this region		NA (No response needed)
WK Pink	Coastal trap nets, beach seines	PR A	1.3.2	Yes	Yes	NA	No salmon enhancement in this region		NA (No response needed)
KK Chum	Coastal trap nets, beach seines	PR A	1.3.2	Yes	Yes	NA	No salmon enhancement in this region		NA (No response needed)
WK Chum	Coastal trap nets, beach seines	PR A	1.3.2	Yes	Yes	NA	No salmon enhancement in this region		NA (No response needed)
KK Coho	Coastal trap nets, beach seines	PR A	1.3.2	Yes	Yes	NA	No salmon enhancement in this region		NA (No response needed)
Oz sockeye	Coastal trap nets, beach seines	PR A	1.3.3	Yes	Yes	NA	No salmon enhancement in this region		NA (No response needed)

KK Pink	Coastal trap nets, beach seines	PR A	1.3.3	Yes	Yes	NA	No salmon enhancement in this region		NA (No response needed)
WK Pink	Coastal trap nets, beach seines	PR A	1.3.3	Yes	Yes	NA	No salmon enhancement in this region		NA (No response needed)
KK Chum	Coastal trap nets, beach seines	PR A	1.3.3	Yes	Yes	NA	No salmon enhancement in this region		NA (No response needed)
WK Chum	Coastal trap nets, beach seines	PR A	1.3.3	Yes	Yes	NA	No salmon enhancement in this region		NA (No response needed)
KK Coho	Coastal trap nets, beach seines	PR A	1.3.3	Yes	Yes	NA	No salmon enhancement in this region		NA (No response needed)
All stocks	Coastal trap nets, beach seines	PR A	2.1.1	Yes	Yes	NA	Only minor primary species present, assuming other salmon species such as Chinook salmon are considered to be minor based on species composition		NA (No response needed)
All stocks	Coastal trap nets, beach seines	PR A	2.1.2	Yes	Yes	NA	There is some management strategy for the primary species		NA (No response needed)
All stocks	Coastal trap nets, beach seines	PR A	2.1.3	Yes	No (scoring implications unknown)	NA	None of the scoring criteria are met for the minor primary species according to the report, which suggests a score of 80 not 90.	Score was revised downward to reflect the limitations of data for minor secondary species.	Accepted (non-material score reduction)
All stocks	Coastal trap nets, beach seines	PR A	2.2.1	Yes	Yes	NA	Only minor secondary species present according to the report. However, does SIa receive a default score of 100 because there are no main secondary species? See scoring in 2.1.3	Sia (100) is considered met by default where there are no main secondary species.	Not accepted (no change)

All stocks	Coastal trap nets, beach seines	PR A	2.2.2	Yes	Yes	NA	There are no main secondary species.		NA (No response needed)
All stocks	Coastal trap nets, beach seines	PR A	2.2.3	Yes	Yes	NA	There are no main secondary species.		NA (No response needed)
All stocks	Coastal trap nets, beach seines	PR A	2.3.1	Yes	Yes	NA	Limited interaction with ETP species		NA (No response needed)
All stocks	Coastal trap nets, beach seines	PR A	2.3.2	Yes	Yes	NA	Limited interaction with ETP species and some strategy to protect these species.		NA (No response needed)
All stocks	Coastal trap nets, beach seines	PR A	2.3.3	Yes	Yes	NA	Limited interaction with ETP species and some observation support findings		NA (No response needed)
All stocks	Coastal trap nets, beach seines	PR A	2.4.1	Yes	Yes	NA	Observations support conclusion of minimal impact to habitat by the fishing operations.		NA (No response needed)
All stocks	Coastal trap nets, beach seines	PR A	2.4.2	Yes	Yes	NA	Observations support conclusion of minimal impact to habitat by the fishing operations and so scoring of the strategy is adequate		NA (No response needed)
All stocks	Coastal trap nets, beach seines	PR A	2.4.3	Yes	Yes	NA	Information about the habitats is adequate relative to the level of interaction with fishing operations		NA (No response needed)
All stocks	Coastal trap nets, beach seines	PR A	2.5.1	Yes	Yes	NA	No enhancement and the UoA is highly unlikely to disrupt the key elements underlying ecosystem structure and function to a point where there would be a serious or irreversible harm.		NA (No response needed)

All stocks	Coastal trap nets, beach seines	PR A	2.5.2	Yes	Yes	NA	There is an adequate strategy and evaluation that indicates the fishery is not causing serious harm to the ecosystem.		NA (No response needed)
All stocks	Coastal trap nets, beach seines	PR A	2.5.3	Yes	Yes	NA	There is adequate information that tracks the overall ecosystem in relation to the fishery to make sure the fishery does not cause severe harm.		NA (No response needed)
All stocks	Coastal trap nets, beach seines	PR A	3.1.1	Yes	Yes	NA	The management system appears to respect peoples 'rights, allows for resolution of disputes, and has laws consistent with management.		NA (No response needed)
All stocks	Coastal trap nets, beach seines	PR A	3.1.2	Yes	No (score increase expected)	NA	Please check the final score, as it may need to be increased based on the individual scores. The management system appears to have a consultation process and defined management system.	PI score was corrected (from 85 to 95) to reflect individual scores. Previous PI score was a calculation error.	Accepted (score increased)
All stocks	Coastal trap nets, beach seines	PR A	3.1.3	Yes	Yes	NA	Long term objectives are consistent with MSC.		NA (No response needed)
All stocks	Coastal trap nets, beach seines	PR A	3.2.1	Yes	Yes	NA	Short and long-term objectives are apparent and consistent with MSC principles.		NA (No response needed)
All stocks	Coastal trap nets, beach seines	PR A	3.2.2	Yes	Yes	No	The condition is needed to improve information availability on the fishery's performance and management actions. The management system should strive to produce annual management reports that updates all fishery metrics used to manage the fishery and describes management actions taken during the fishery. The management system seems to have involvement by a large number of agencies, which is somewhat concerning because some agencies might over rule decisions by another agency.	Fishery performance information is presented during the fishing seasons at meeting of the Anadromous Fisheries Commission and can be provided upon request but post-season performance reporting is not formalized in this management system where this information is regarded primarily for the purposes of the management system. This is the basis for the condition. Condition 3 calls for demonstrating that information on the fishery's performance and management action is available on request, and explanations are provided for any actions or lack of action associated with findings and relevant recommendations emerging from research, monitoring, evaluation and review activity.	Not accepted (no change)

								The Client action plan commits to providing annual reports documenting the rationale behind fishery management actions taken the previous fishing season affecting the unit of certification. In addition to reporting on Anadromous Fish Commission (AFC) protocols establishing opening dates, initial passing days, modifications to passing days, season closures, etc., the report will provide rationale for the actions. For example, pre-season run forecasts, inseason catch/escapement information may have been used to set or modify passing days based on projected run strength. The Clients will also work with AFC and KamchatNIRO to explore potential options for making this information publicly available (e.g., AFC decision making process). Management authorities are clearly identified in the Russian system. Potentially-competing decisions are referred to higher authorities, primarily the Federal Fisheries Agency.	
All stocks	Coastal trap nets, beach seines	PR A	3.2.3	Yes	Yes	NA	Compliance and enforcement appears to have improved over time and is apparently now adequate.		NA (No response needed)
All stocks	Coastal trap nets, beach seines	PR A	3.2.4	No (material score reduction expected to <80)	No (material score reduction expected to <80)	No	It is apparent that the management system has failed to provide funding and effort needed to adequately monitor and evaluate spawning escapement in this large region. The information is needed for inseason management, implementation of the harvest control rule, post season evaluation of management actions and stock status, including productivity (spawner recruit) relationships needed to establish reference points. Please see comments in P1. The report indicates the management system budget for managing the salmon fisheries has declined even though harvests have increased. If the government does not provide adequate funding for the monitoring and evaluation needed to manage the fishery under MSC standards, then the industry should	Substantial evolution has occurred in the management system following the demise of the Soviet Union in the 1990s and particularly since the 2008 with the implementation of long term leases for fishing sites, an Olympic system for catch allocation among the fishing companies and regional authority for management decisions through the Anadromous Fish Commission. At the same time, due to lack of governmental funding, fishing companies voluntarily participate in assessment and enforcement. And, therefore strongly incentivized to support sustainable fishery management. Fishing companies are now contributing substantial amounts of funding and services for management and enforcement activities. These efforts have reversed the declining trend in stock assessment effort for instance and resulted in more comprehensive surveys being resumed in	Not accepted (no change)

							provide necessary funding. Given these issues, the fishery does not have in place sufficient effort to evaluate key parts of the management system against its objectives (SI a).	recent years. The MSC certifications have reinforced and incentivized the value of these investments and also supported considerations and development of more intensive stock assessment efforts. While substantial improvements have been made, the assessment recognizes the limitations of the current spawning escapement assessments with Condition 2 for PI 1.2.3 PI 3.2.4 considers (a) whether there are mechanisms in place to evaluate key parts of the management system, and (b) whether the system is subject to regular review. Principle 3 indicators are broader than a simple question of funding adequacy for stock assessment (although adequacy of stock assessments is a component of broader considerations). The assessment found that the management system has mechanisms in place for systemic evaluations and that periodic reviews occur. This was clearly demonstrated by systemic changes with the implementation of the Olympic system, Anadromous Fish Commission, and regional management authority over the years. It has also been demonstrated by recognition of the need for the expansion of direct fishery funding to support stock assessment and enforcement activities as central government funding has declined.	

Peer Reviewer B - General Comments

Question	Yes/No	Peer Reviewer Justification	CAB Response to Peer Reviewer's comments (as included in the Public Comment Draft Report - PCDR)
Is the scoring of the fishery consistent with the MSC standard, and clearly based on the evidence presented in the assessment report?	Yes	The fishery was scored correctly and fairly relative to the MSC Fisheries Standard. Broadly, the evidence presented in the assessment report clearly supported the scoring rationales.	No response required
Are the condition(s) raised appropriately written to achieve the SG80 outcome within the specified timeframe? [Reference: FCP v2.2, 7.18.1 and sub-clauses]	Yes	The conditions and condition setting were appropriately constructed to meet the surveillance period milestones and to improve the performance indicator scores to at least the 80 level.	No response required
Is the client action plan clear and sufficient to close the conditions raised? [Reference FCR v2.0, 7.11.2-7.11.3 and sub-clauses]	NA	Note: Include this row for assessments completed against FCR v1.3 and v2.0, but not for FCP v2.1/v2.2 (in which the client action plan is only prepared at the same time as the peer review). Delete this text from the cell for FCR v1.3/v2.0 reviews or delete the whole row if FCP v2.1/v2.2.	No response required
Enhanced fisheries only: Does the report clearly evaluate any additional impacts that might arise from enhancement activities?	NA		No response required
Optional: General Comments on the Peer Review Draft Report (including comments on the adequacy of the background information if necessary). Add extra rows if needed below, including the codes in Columns A-C.		The PRDR provided clear and adequate background information on the description of the fishery, stock assessment and management, non-target catch implications and ETP interactions, impacts to habitat, ecosystem dynamics, legal, regulatory and customs structure, and fishery research, objectives, enforcement and compliance to conduct the assessment. I do have concerns regarding the recently reported increases in exploitation rates and high harvest rates vs reduced or missing spawning escapement estimates of several of the UoCs. A reinvestment in aerial surveys and other monitoring techniques would provide more accurate escapement estimates and likely reduce the potential for overfishing.	The assessment team shares the concern regarding potential risks of high exploitation rates, demands by the fishery resulting from costly investment in processing infrastructure, limitations of stock assessments and the ability of the management system to respond in a precautionary fashion to inherently variable fish run patterns and unforeseen developments. This concern is reflected in Condition 2 for performance indicator 1.2.3 identifying the need to demonstrate that indicators of spawning escapement are available for Kamchatka-Kuril Pink, Western Kamchatka Pink, Kamchatka-Kuril Chum, Western Kamchatka Chum, and Kamchatka-Kuril Coho monitored with sufficient frequency to support the harvest control rule.

Peer Reviewer B - PI Comments

UoA stock	UoA gear	PR (A/B/C)	PI	PI Information	PI Scoring	PI Condition	Peer Reviewer Justification (as given at initial Peer Review stage)	CAB Response to Peer Reviewer's comments (as included in the Public Comment Draft Report - PCDR)	CAB Response Code
Oz. Sockeye	Ocean trap net, gill net and beach seine	PR B	1.1.1	Yes	Yes	NA			NA (No response needed)
KK Pink	Ocean trap net, gill net and beach seine	PR B	1.1.1	Yes	Yes	NA			NA (No response needed)
WK Pink	Ocean trap net, gill net and beach seine	PR B	1.1.1	Yes	Yes	NA			NA (No response needed)
KK Chum	Ocean trap net, gill net and beach seine	PR B	1.1.1	Yes	Yes	NA			NA (No response needed)
WK Chum	Ocean trap net, gill net and beach seine	PR B	1.1.1	Yes	Yes	Yes			NA (No response needed)
KK Coho	Ocean trap net, gill net and beach seine	PR B	1.1.1	Yes	Yes	Yes			NA (No response needed)
Oz. Sockeye, KK Pink, WK Pink, KK Chum	Ocean trap net, gill net and beach seine	PR B	1.1.2	NA (PI not scored)	NA (PI not scored)	NA	Oz, Sockeye, KK and WK Pink, and KK Chum SMUs are currently at historically high levels so this PI is not applicable. There is no enhancement in the fishery.		NA (No response needed)
WK Chum, KK Coho	Ocean trap net, gill net and beach seine	PR B	1.1.2	Yes	Yes	NA	The PI score = 85, so no need for condition setting.		NA (No response needed)
Oz. Sockeye	Ocean trap net, gill net and beach seine	PR B	1.2.1	Yes	Yes	NA	Oz. Sockeye meet the 100 SG standard for SI (a), 80 SG for SI (b), the SI (c) and (d) criteria, and agree with the overall PI score of 95, so no need for condition setting.		NA (No response needed)

KK Pink, WK Pink, KK Chum, WK Chum, KK Coho	Ocean trap net, gill net and beach seine	PR B	1.2.1	Yes	Yes	NA	Although I concur with the overall score of 80 for these UoC stocks so no need for condition setting, I recommend the CAB motivate the client's management strategy to move towards meeting population specific objectives and address recent uncertainty in assessment information.	Over the last 10 years the management system is evolving toward a more rigorous and quantitative stock assessment and goal-based harvest control rules for Kamchatka salmon as fishing companies have become increasingly invested in the long-term sustainability of the resource and have contributed significant resources to management. After an extended period of declining government invest, survey efforts have been progressively increased and government fishery scientists have begun to formalize development and application of stock- and population-specific goals based on rigorous stock-recruitment assessments and management structures. These efforts are being led by government scientists and the fishing industry. MSC assessments have highlighted the potential utility of more robust assessments and have also incentivized support by the government and the fishing industry for these efforts.	Accepted (no score change, additional evidence presented)
Oz. Sockeye	Ocean trap net, gill net and beach seine	PR B	1.2.2	Yes	Yes	NA			NA (No response needed)
KK Pink, WK Pink, KK Chum, WK Chum, KK Coho	Ocean trap net, gill net and beach seine	PR B	1.2.2	Yes	No (material score reduction expected to <80)	NA	Exploitation rates have been considerably high in recent years and additional information and/or rationale is needed to show that the tools in use are appropriate and effective in achieving the exploitation levels required under the HCRs to achieve a score of 80 for scoring issue (c).	Obligatory fixed passing days are the essential tool in the Kamchatka salmon fishery management strategy. Use of established passing days, typically two of every four days or every third day, and the terminal nature of the fishery effectively limits exploitation rates and ensures that significant escapement will occur. This strategy is different from salmon fishing strategies typical of Alaska for instance, which are often much more heavily driven by escapement monitoring and intensive management of time and area openings and closures. Sustained high levels of harvest and stock assessments demonstrate that the strategy has been generally effective in protecting escapements sufficient to support high levels or harvest. It is likely that stock assessments generally underestimate spawning escapements and overestimate apparent exploitation rates.	Not accepted (no change)
Oz. Sockeye	Ocean trap net, gill net	PR B	1.2.3	Yes	Yes	NA	The rationale would benefit from a description of the fleet composition	Section 5.2.1 of the assessment includes a description of the fishery composition. Because this fishery is terminal and conducted at fixed	Accepted (no score change,

	and beach seine							fishing sites, fleet "composition" is best described by fishing sites identified in Table 3 and Figure 7. Each fishing company operates their own small vessels and fishers are employees of the fishing companies. Fish traps in marine waters are tended with a flotilla of small boats including net-bottomed skiffs into which fish are loaded and tender vessels used to tow skiffs. In freshwater, seines are deployed from small outboard skiffs.	additional evidence presented)
KK Pink, WK Pink, KK Chum, WK Chum, KK Coho	Ocean trap net, gill net and beach seine	PR B	1.2.3	Yes	Yes	Yes			NA (No response needed)
Oz. Sockeye	Ocean trap net, gill net and beach seine	PR B	1.2.4	Yes	Yes	NA			NA (No response needed)
KK Pink, WK Pink, KK Chum, WK Chum, KK Coho	Ocean trap net, gill net and beach seine	PR B	1.2.4	Yes	Yes	NA	The fishery would benefit from less ambiguity in defining the components of the Pink, Chum and Coho SMU.	Components of West Kamchatka salmon runs are well understood. Species descriptions in Section 5.2.1 describe stock structure based on run types for each salmon species within the Unit of Certification. Management units of each species are defined to include fishery management subzones which encompass rivers along regional sections of coastline. Rivers are generally similar in character on the broad coastal plain of west Kamchatka, except for the larger Bolshaya system and the unique Ozernaya system which are recognized as distinct subcomponents. Within each subzone, components include populations occurring in each river and sometimes run types characterized by different timing and distribution. KamchatNIRO has previously completed comprehensive assessments of the distribution of each species in systems throughout the region during past years of more-intensive spawning ground surveys. This historical information was the basis for identification of index areas determined to be representative of key stock components of each species within a management subzone. KamchatNIRO has reported correlations of indices with stocks for each species.	Accepted (no score change, additional evidence presented)

Oz. Sockeye, KK Pink, WK Pink, KK Chum, WK Chum, KK Coho	Ocean trap net, gill net and beach seine	PR B	1.3.1	Yes	Yes	NA	No enhancement in the UoC systems		NA (No response needed)
Oz. Sockeye, KK Pink, WK Pink, KK Chum, WK Chum, KK Coho	Ocean trap net, gill net and beach seine	PR B	1.3.2	Yes	Yes	NA	No enhancement in the UoC systems		NA (No response needed)
Oz. Sockeye, KK Pink, WK Pink, KK Chum, WK Chum, KK Coho	Ocean trap net, gill net and beach seine	PR B	1.3.3	Yes	Yes	NA	No enhancement in the UoC systems		NA (No response needed)
Oz. Sockeye, KK Pink, WK Pink, KK Chum, WK Chum, KK Coho	Ocean trap net, gill net and beach seine	PR B	2.1.1	Yes	Yes	NA			NA (No response needed)
Oz. Sockeye, KK Pink, WK Pink, KK Chum, WK Chum, KK Coho	Ocean trap net, gill net and beach seine	PR B	2.1.2	Yes	Yes	NA			NA (No response needed)
Oz. Sockeye, KK Pink, WK Pink, KK Chum, WK Chum, KK Coho	Ocean trap net, gill net and beach seine	PR B	2.1.3	Yes	Yes	NA			NA (No response needed)
Oz. Sockeye, KK Pink, WK Pink,	Ocean trap net, gill net and beach seine	PR B	2.2.1	Yes	Yes	NA			NA (No response needed)

KK Chum, WK Chum, KK Coho									
Oz. Sockeye, KK Pink, WK Pink, KK Chum, WK Chum, KK Coho	Ocean trap net, gill net and beach seine	PR B	2.2.2	Yes	Yes	NA			NA (No response needed)
Oz. Sockeye, KK Pink, WK Pink, KK Chum, WK Chum, KK Coho	Ocean trap net, gill net and beach seine	PR B	2.2.3	Yes	Yes	NA	The fishery assessment would benefit from a more descriptive summary of the observer program.	The fishery does not employ on-board observers but the assessment summarizes results of past observer efforts in marine waters and bycatch inventory at a fish processor. This work confirmed that very limited sorting of bycatch occurs prior to delivery of the catch to the fish processing plants as has also been observed by the assessment team at numerous fishery site visits to West Kamchatka. Catches are closely monitored at delivery for processing by government regulatory agency representatives and bycatch is subject to regulatory limits which are not pertinent to this fishery due to a negligible amount of bycatch.	Not accepted (no change)
Oz. Sockeye, KK Pink, WK Pink, KK Chum, WK Chum, KK Coho	Ocean trap net, gill net and beach seine	PR B	2.3.1	Yes	Yes	NA			NA (No response needed)
Oz. Sockeye, KK Pink, WK Pink, KK Chum, WK Chum, KK Coho	Ocean trap net, gill net and beach seine	PR B	2.3.2	Yes	Yes	NA			NA (No response needed)
Oz. Sockeye, KK Pink, WK Pink, KK Chum, WK Chum, KK Coho	Ocean trap net, gill net and beach seine	PR B	2.3.3	Yes	Yes	NA			NA (No response needed)

Oz. Sockeye, KK Pink, WK Pink, KK Chum, WK Chum, KK Coho	Ocean trap net, gill net and beach seine	PR B	2.4.1	Yes	Yes	NA			NA (No response needed)
Oz. Sockeye, KK Pink, WK Pink, KK Chum, WK Chum, KK Coho	Ocean trap net, gill net and beach seine	PR B	2.4.2	Yes	Yes	NA			NA (No response needed)
Oz. Sockeye, KK Pink, WK Pink, KK Chum, WK Chum, KK Coho	Ocean trap net, gill net and beach seine	PR B	2.4.3	Yes	Yes	NA	I don't recall the mention of the monitoring agency referenced in the rationale in the summary for habitat in the report.	The assessment reports that responsibility for habitat protection is borne by the Rosprirodnadzor under Ministry of Natural Resources and Ecology of Russian Federation, and the Federal Ecological, Technological and Atomic Oversight Service (Rostekhnadzor), the Agency of Fisheries of Russian Federation, and local governments of the territorial subjects of the Russian Federation. The Natural Protection Prosecutor's Office of the Russian Federation is responsible for enforcing laws relating to natural utilization. Building/construction projects are regulated by a governmental agency (Rospotrebnadzor Sanitation Service) which requires completion of an environmental Impact Study (EIS) prior to approval of any project permit.	Not accepted (no change)
Oz. Sockeye, KK Pink, WK Pink, KK Chum, WK Chum, KK Coho	Ocean trap net, gill net and beach seine	PR B	2.5.1	Yes	Yes	NA			NA (No response needed)
Oz. Sockeye, KK Pink, WK Pink, KK Chum, WK Chum, KK Coho	Ocean trap net, gill net and beach seine	PR B	2.5.2	Yes	Yes	NA			NA (No response needed)

Oz. Sockeye, KK Pink, WK Pink, KK Chum, WK Chum, KK Coho	Ocean trap net, gill net and beach seine	PR B	2.5.3	Yes	Yes	NA	The rationale for scoring Issue (c) would benefit from additional detail.	The rationale has been extended to address to comment	Accepted (no score change, additional evidence presented)
Oz. Sockeye, KK Pink, WK Pink, KK Chum, WK Chum, KK Coho	Ocean trap net, gill net and beach seine	PR B	3.1.1	Yes	Yes	NA			NA (No response needed)
Oz. Sockeye, KK Pink, WK Pink, KK Chum, WK Chum, KK Coho	Ocean trap net, gill net and beach seine	PR B	3.1.2	Yes	Yes	NA			NA (No response needed)
Oz. Sockeye, KK Pink, WK Pink, KK Chum, WK Chum, KK Coho	Ocean trap net, gill net and beach seine	PR B	3.1.3	Yes	No (scoring implications unknown)	NA	According to the report, much of the poaching occurs in-river while inseason management occurs prior to this time, so I am not convinced that the scoring issue (a) clear long-term objectives that guide decision-making, consistent with MSC Fisheries Standard and the precautionary approach are explicit within management policy is met at the score 80 level. Applying a poaching estimate to escapement would aid in the precautionary approach.	Illegal harvest remains a chronic social issue in road-accessible rivers of West Kamchatka which are few in this Unit of Certification. KamchatNIRO assesses fish numbers on the spawning grounds and has also conducted assessments of the scale and distribution of illegal harvest in the region. The fishery strategy, including fishing lease sites and passing days has been scaled to ensure significant levels of spawning escapement and sustained high levels of harvest demonstrate the effectiveness of this strategy. Precautionary management in this fishery is implemented through the use of passing days. The fishing companies addressed by this certification were also subject to conditions for assessment of illegal harvest and have made very significant investments as a result of these conditions to assess and control this issue within their fishery area.	Not accepted (no change)
Oz. Sockeye, KK Pink, WK Pink, KK Chum,	Ocean trap net, gill net and beach seine	PR B	3.2.1	Yes	Yes	NA			NA (No response needed)

WK Chum, KK Coho									
Oz. Sockeye, KK Pink, WK Pink, KK Chum, WK Chum, KK Coho	Ocean trap net, gill net and beach seine	PR B	3.2.2	Yes	Yes	Yes	With respect to scoring Issue (d) and condition setting, the rationale supports the assigned score, but a description of post-season performance reporting (or lack thereof) in the Principle 3 background would benefit the assessment and the condition description.	Fishery performance information is presented during the fishing seasons at meeting of the Anadromous Fisheries Commission and can be provided upon request but post-season performance reporting is not formalized in this management system where this information is regarded primarily for the purposes of the management system. Between the fishing season, management is performed by research institutions and FECFC, in which some information is available, but it is quite limited. This is the basis for the condition.	Accepted (no score change, additional evidence presented)
Oz. Sockeye, KK Pink, WK Pink, KK Chum, WK Chum, KK Coho	Ocean trap net, gill net and beach seine	PR B	3.2.3	Yes	Yes	NA	Regarding scoring issue (a), I don't recall mention of actual on-the-water enforcement in the report background, only the presence of and monitoring by inspectors. The SVTU was referenced several times, but in the context of compliance with the law and rules of fishing. What does SVTU stand for and are they the enforcement arm of the government (i.e., officers of the law)? If so, the report should spell out its role in enforcement more clearly.	SVTU is the Russian abbreviation of the Northeastern Territorial Administration of Federal Fisheries Agency which oversees local management and enforcement for Kamchatka Kray. SVTU has final approval of fishing concessions and in-season fishery management regulation actions (to open and close fisheries). They give fishing companies permission to harvest, monitor fishing companies and processors to ensure regulation compliance, and patrol streams to reduce poaching activities. SVTU is the primary fishery enforcement agency in the region. SVTU posts all approved management decision of Anadromous Fish Commission on its website (www.terkamfish.ru). Additional details on enforcement (performed by SVTU, fishing industries and Federal Security Service) is added to the rationale and background section for clarification.	Accepted (no score change, additional evidence presented)
Oz. Sockeye, KK Pink, WK Pink, KK Chum, WK Chum, KK Coho	Ocean trap net, gill net and beach seine	PR B	3.2.4	Yes	Yes	NA			NA (No response needed)

7.3 Stakeholder input

No stakeholder input was received.

7.4 Conditions & Client Action Plan

Condition 1

Performance Indicator	The stock management unit (SMU) is at a level which maintains high production and has a low probability of falling below its limit reference point (LRP)
Score	1. Oz. Sockeye - 100 2. KK Pink – 70 3. WK Pink - 70 4. KK Chum – 80 5. WK Chum - 70 6. KK Coho – 70
Rationale	Kamchatka-Kuril and West Kamchatka Pink (odd-year) - KamchatNIRO has previously considered stock-recruitment analysis that separated even and odd year brood cycles but it is our current understanding that separate reference points are not currently applied. This concern is qualified by observations of lower productivity in the subdominant brood cycle of pinks (see Figure 36 in assessment) and the likelihood of significant interaction affects with the dominant brood cycle. Similar patterns are observed in pink salmon across the Pacific. The cycle dominance switch around 1985 provides strong evidence for depressive effects between brood years of pink salmon in west Kamchatka. These depressive effects are important considerations in interpretation of pink salmon productivity patterns. Stock-recruitment analyses suggest that it is likely that the subdominant is producing maximum or near maximum sustained yields and are unlikely to benefit from increased escapement. However, clarification is needed on the status of the subdominant return relative to the limit reference point. West Kamchatka Chum - Aggregate spawning escapement in the west Kamchatka management subzone exceeds the effective limit reference point value in 73% of the previous 15 years. Therefore, this UoA meets the SG60 standard (≥60%) but not the SG80 standard (≥80%). Southwest Coho – Aggregate spawning escapement in the Kamchatka-Kuril management subzone exceeds the effective limit reference point value in 79% of the previous 15 years where escapement was estimated (n=14). Therefore, this UoA meets the SG60 standard (≥80%) but not the SG80 standard (≥80%). (Note that West Kamchatka coho do not meet this standard due to limitations in stock assessment during the last 10 years.)
Condition	Demonstrate that it is highly likely that escapements of Kamchatka-Kuril pink (odd-year), West Kamchatka pink (odd-year), West Kamchatka chum and Kamchatka-Kuril coho SMU's are above effective limit reference points where recruitment would be impaired.
Milestones	By the first annual surveillance, the client must present evidence that a plan is in place to address this condition.

	By the second annual surveillance, the client must present evidence that the plan has been implemented. By the fourth annual surveillance, the client must demonstrate that the condition has been met, at which time the fishery will rescore at least 80.
Client action plan	The Clients will work with KamchatNIRO to develop a plan to clarify the escapement targets, and improve escapement monitoring for odd-year pink salmon within the Western Kamchatka and Kamchatka-Kuril subzones, improve chum salmon escapement monitoring for chum salmon within the Western Kamchatka subzone, and coho salmon within the Kamchatka-Kuril subzone that will facilitate better inseason management of these fisheries. By the first annual surveillance, the Client will provide a written plan to improve escapement monitoring and clarify odd-year pink salmon escapement targets. Further annual reports will contain odd-year pink salmon, Western Kamchatka chum salmon and Kamchatka-Kuril coho escapement information collected the previous season.
Consultation on condition	The Client will work with KamchatNIRO, AFC and other stakeholders.

Condition 2

Performance Indicator	1.2.3. Information and monitoring - Relevant information is collected to support the harvest strategy
Score	1. Oz. Sockeye - 100 2. KK Pink – 75 3. WK Pink - 75 4. KK Chum – 75 5. WK Chum - 75 6. KK Coho – 75
Rationale	The SG80 standard for regular monitoring is not met for UoC pink, chum and coho because recent reductions in aerial survey intensity throughout West Kamchatka have substantially reduced the accuracy and precision of spawning escapement estimates used to guide management decisions. The continuing effectiveness of the harvest strategy will depend also on monitoring of spawning escapements. Surveys have been reduced due to budget limitations. The current survey intensity likely provides sufficient precision to distinguish large and small runs but lack the resolution to avoid estimation bias due to differences in run timing or fish distribution. Historical assessments have generally been sufficient to support the current harvest strategy but current survey frequency may not be sufficient to identify any future changes in productivity or distribution patterns which might confound effective implementation of the harvest control rules
Condition	Demonstrate that indicators of spawning escapement are available for southwest Pink, Western Pink, Southwest Chum, Western Chum and Southwest Coho monitored with sufficient frequency to support the harvest control rule.
Milestones	By the first annual surveillance, the client must present evidence that a plan is in place to address this condition. By the second annual surveillance, the client must present evidence that the plan has been implemented. By the fourth annual surveillance, the client must demonstrate that the condition has been met, at which time the fishery will rescore at least 80.
Client action plan	The Client will provide a written plan to improve escapement monitoring sufficient to identify the status of pink, chum and coho salmon in relation to harvest in the UoA during the first annual surveillance. The plan will include the methodology (e.g., aerial surveys, weir counts, etc.), approximate time period (e.g., mid-August to early September), frequency (e.g., bi-weekly surveys), streams/stream sections for each species, and identify steps to provide sufficient information on wild spawning escapement to support the harvest strategy and demonstrate monitoring of abundance. The plan will be implemented prior to the second surveillance audit. Information on survey effort and distribution and escapement results from the previous season will be provided during each audit.
Consultation on condition	The Client will work with KamchatNIRO, AFC and other stakeholders.

Condition 3

Performance Indicator	**3.2.2. Decision-making processes - The fishery-specific and associated enhancement management system includes effective decision-making processes that result in measures and strategies to achieve the objectives and has an appropriate approach to actual disputes in the fishery.**
Score	75
Rationale	Monitoring of decision making for the fishery is limited by the inconsistent availability of information outside the local governmental management system. Results of fishing season and effectiveness of management actions undertaken are discussed at the both management agencies such as AFC, SVTU and FFA, and also at Research Councils of fisheries institutes such as KamchatNIRO, TINRO-Center and VNIRO on a regular basis. However, information on run size, harvest by time and area, fishery management actions, and escapement is not typically reported outside the management system except in rare cases. Occasional publications of related information (e.g., Shevliakov 2013b) provide a historical perspective but are not sufficient to allow tracking action associated with findings and relevant recommendations. Inconsistent availability of annual fish run and fishery information outside the local governmental management system limits the availability of information for actions or lack of action associated with findings and relevant recommendations; therefore, the fishery does not score 80.
Condition	Demonstrate that information on the fishery's performance and management action is available on request, and explanations are provided for any actions or lack of action associated with findings and relevant recommendations emerging from research, monitoring, evaluation and review activity.
Milestones	By the first annual surveillance, the client must present evidence that a plan is in place to address this condition. By the second annual surveillance, the client must present evidence that the plan has been implemented. By the fourth annual surveillance, the client must demonstrate that the condition has been met, at which time the fishery will rescore at least 80.
Client action plan	The Clients will provide annual reports documenting the rationale behind fishery management actions taken the previous fishing season affecting the unit of certification. In addition to reporting on Anadromous Fish Commission (AFC) protocols establishing opening dates, initial passing days, modifications to passing days, season closures, etc., the report will provide rationale for the actions. For example, pre-season run forecasts, inseason catch/escapement information may have been used to set or modify passing days based on projected run strength. The Clients will also work with AFC and KamchatNIRO to explore potential options for making this information publicly available (e.g., AFC decision making process).
Consultation on condition	The Clients will work with SVTU, Kamchatka Ministry of Fisheries, and KamchatNIRO.

7.5 Surveillance

The fishery surveillance program will be default Level 6, based on the conditions, and associated deliverables and timelines. Surveillances will be conducted according to program and timeline requirements specified in FCP V2.1 7.28.

Table 33. Fishery surveillance program

Surveillance level	Year 1	Year 2	Year 3	Year 4
Level 6	On-site surveillance audit	On-site surveillance audit	On-site surveillance audit	On-site surveillance audit & re-certification site visit

Table 34. Timing of surveillance audit.

Year	Anniversary date of certificate	Proposed date of surveillance audit	Rationale
1	Before 2022 salmon season	During the 2022 salmon season	Previous year's fishery information will be available and current year fishery can be observed.
2	Before 2023 salmon season	During the 2023 salmon season	
3	Before 2024 salmon season	During the 2024 salmon season	
4	Before 2024 salmon season	During the 2024 salmon season	

Table 35. Surveillance level rationale.

Year	Surveillance activity	Number of auditors	Rationale
1	On-site surveillance audit	2 auditors	From client action plan it can be deduced that information needed to verify progress towards conditions will require on site visits to review progress toward milestones and consult with the fishery client and representative of the management system who provide collaboration in meeting conditions.
2	On-site surveillance audit	2 auditors	
3	On-site surveillance audit	2 auditors	
4	On-site surveillance audit & recertification site visit		

7.6 Harmonised fishery assessments

There are ten salmon fisheries currently MSC certified on the Kamchatka Peninsula (Table 38). Scores and conditions among assessments were reconciled to the extent possible recognizing specific circumstances in different rivers and additional or new information that has become available between assessments. In several cases, differences in scores reflect new information available to the assessment team. Scoring differences for P1 are caused by some differences in stock status of target species (spawning escapement, coverage of information on escapement). Some differences in P3 scores are related to different level of poaching activities in the area, mostly caused by different development of transport infrastructure.

Table 36. Previously-certified salmon fisheries and summary of principle level scores in Kamchatka.

	Companies	Location	Certification status	Certification date	PIs to harmonize	P1					P2	P3
						Pink	Chum	Coho	Sock	Chin	All	All
West Kamchatka	Vityaz-Avto Delta[a]	--	Certified 2016, scope extension 2019[a]	2016	present assessment	86.6a	86.6a	86.6a	97.9	--	85.7	83.1
	Kamber-Pymta[a]		Scope extension	2019	present assessment	86.6	86.6	--	-- --	--	"	"
	ORKZ 55		Certified	2020	P1, P2, P3	84.4	84.4	--	98.1		87.0	84.8
	Narody Severa, Bolsheretsk		Certified	2018	P2, P3	85.4	82.1	--	--	--	84.7	81.2
	Zarya-Kolpakovsky Sobolevo		Certified	2020	P2, P3	83.1	83.1	--	--	--	83.7	81.0
East Kamchatka	Delta Fish	Kamchatka R	Certified	2018	P3	--	83.7	83.3	84.1	83.3	85.0	80.2
	Delfin	Olyutorskiy Bay	Certified	2018	P3	85.4	85.4	--	85.4	--	87.3	82.3
	Tymlat	Karaginsky Bay	Certified	2019	P3	84.6	84.6				87.3	81.7
	Vostochny Bereg, Maksimovsky, Koryakmoreprodukt, Nachikinskoe, Severo Vostochnaya	Karaginsky Bay	Certified	2020	P3	82.5	82.5	--	--	--	85.3	81.7
	Kolkhoz Bekereva, Ukinskij Liman, Belorechensk, Vyvenskoe	Karaginsky Bay	Certified	2020	P3	82.5	82.5	--	--	--	85.3	83.7
		Korfa Bay	Certified	2020	P3	82.5	82.5	--	83.7	--	85.3	83.7

[a] *Scores are for previous assessment.*

Table 37. Rivers and species included in currently-certified fisheries of western Kamchatka.

Subzone			Vityaz-Avto Delta[a]	Kamber-Pymta[a]	Narody Severa et al.	Zarya-Kolpakovsky Sobolevo	ORKZ 55
W Kamchatka	Icha	Pink, Chum	--	--	--	X	--
	Oblukovina	Pink, Chum	--	--	--	X	--
	Krutogorova	Pink, Chum	--	--	--	X	--
	Kolpakova	Pink, Chum	--	--	--	X	--
	Vorovskaya	Pink, Chum	X	--	--	X	--
Kamchatka-Kuril	Kol	Pink, Chum, Coho	X	--	--	--	--
	Pymta	Pink, Chum	--	X	--	--	--
	Kikhchik	Pink, Chum	--	--	X	--	--
	Mukhina	Pink, Chum	--	--	X	--	--
	Khomutina	Pink, Chum	--	--	X	--	--
	Bolshaya	Pink, Chum	--	--	X	--	--
	Opala	Pink, Chum	X	--	X	--	--
	Golygina	Pink, Chum	X	--	--	--	X
	Kochegochek	Pink, Chum	X	--	--	--	X
	Ozernaya	Pink, Chum, Sockeye	X	--	--	--	X

[a] This reassessment

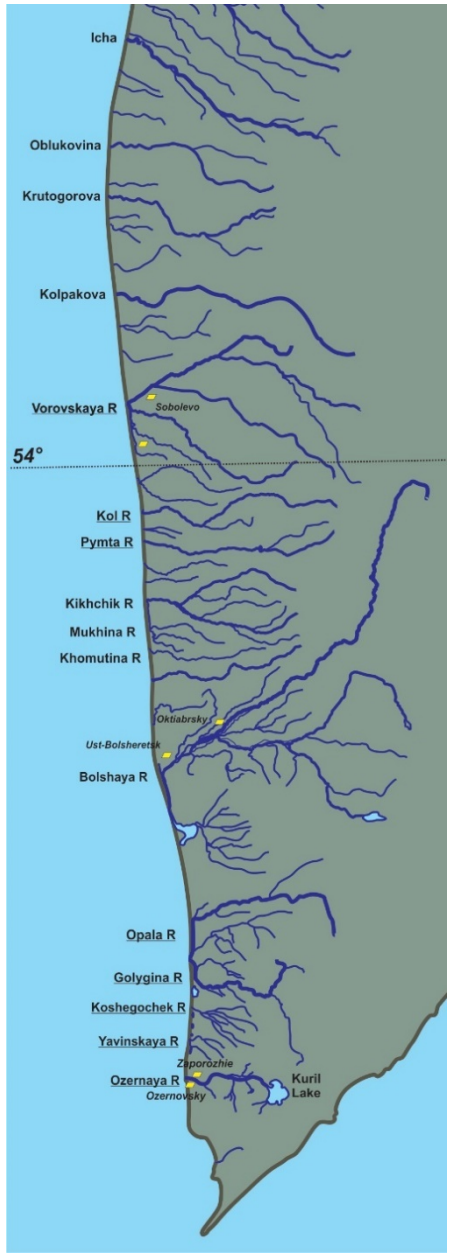

Table 38. Rivers and species included in currently-certified fisheries of eastern Kamchatka.

Bay	River	Species	Deltafish	Delfin	Tymlat	VBMKNSV					KBULBV			
						Vostochny Bereg	Maksimovsky	Koryakmoreprodukt	Nachinskoe	Severo Vostochnaya	Kolkhoz Bekereva	Ukinskij Liman	Belechensk	Vyvenskoe
Olyutorskiy	Anana	Pink, Chum, Sockeye		X										
	Apuka	Pink, Chum, Sockeye		X										
	Pakhacha	Pink, Chum, Sockeye		X										
	Imka	Pink, Chum, Sockeye		X										
	Impuka	Pink, Chum, Sockeye		X										
	Emet	Pink, Chum, Sockeye		X										
Korfa	Thahiybhiymayam	Pink, Chum, Sockeye												X
	Vyvenka	Pink, Chum, Sockeye												X
	Lingenmyvayam	Pink, Chum, Sockeye												X
	Gatymnvayam	Pink, Chum, Sockeye												X
Karaginsky	Khai-Anapka	Pink, Chum											X	
	Anapka	Pink, Chum											X	
	Virovayam	Pink, Chum			X								X	
	Belaya	Pink, Chum			X									
	Kichiga	Pink, Chum			X									
	Paklavayam	Pink, Chum			X									
	Tymlat	Pink, Chum			X									
	Vytvirovayam	Pink, Chum			X					X				
	Ossora	Pink, Chum			X					X				
	Karaga	Pink, Chum			X		X							
	Kayum	Pink, Chum			X		X							
	Makarovaka	Pink, Chum			X	X	X				X			
	Dranka	Pink, Chum			X	X	X				X			
	Ivashka	Pink, Chum				X					X			
	Sukhaya	Pink, Chum				X					X			
	Rusakova	Pink, Chum				X		X			X			
	Khaylyulya	Pink, Chum				X		X			X			
	Esmiyk	Pink, Chum						X			X	X		
	Nachiki	Pink, Chum						X			X	X		
	Uka	Pink, Chum										X		
	Malamvaya	Pink, Chum							X			X		
	Konskaya	Pink, Chum							X					
Kamchatka R		Sockeye, Chum, Coho, Chinook	X											

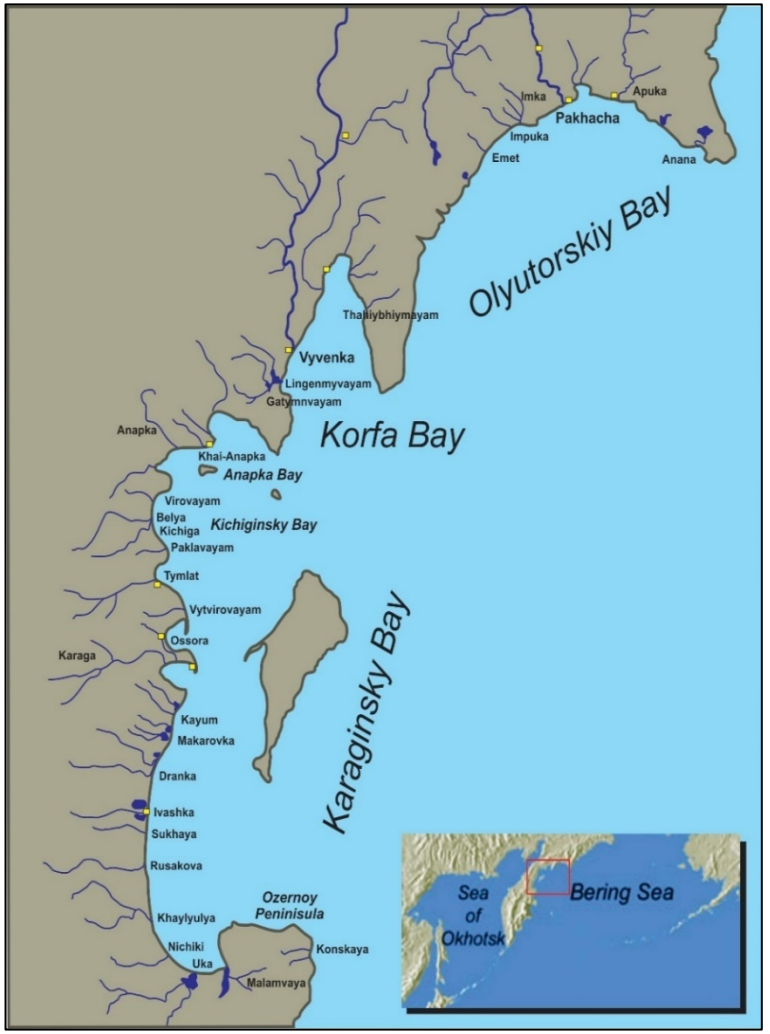

Table 39. Summary of performance indicator level scores for West Kamchatka salmon fisheries.

	Component	PI	Performance Indicator (PI)	Vityaz Avto-Delta[a]				Kamber-Pymta[a]		ORKZ-55			NS-B		ZKS	
				Pink	Chum	Coho (Kol)	Sock (Oz)	Pink	Chum	Sock (Oz)	Pink	Chum	Pink	Chum	Pink	Chum
P1-Target	Outcome	1.1.1	Stock status	80	80	80	100	80	80	100	80	80	80	80	80	80
		1.1.2	Stock rebuilding	80	80	80	na	85	85	na	na	na	na	na	na	na
	Management	1.2.1	Harvest strategy	85	85	85	95	85	85	95	80	80	85	85	80	80
		1.2.2	Harvest control rules & tools	85	85	85	95	80	80	95	80	80	80	80	80	80
		1.2.3	Information & monitoring	65	65	65	90	65	65	100	75	75	65	65	65	65
		1.2.4	Assessment of stock status	80	80	80	95	80	80	95	80	80	70	70	80	80
	Enhancement	1.3.1	Enhancement outcome	100	100	100	100	100	100	100	100	100	100	100	100	100
		1.3.2	Enhancement management	100	100	100	100	100	100	100	100	100	100	80	100	100
		1.3.3	Enhancement information	100	100	100	100	100	100	100	100	100	100	90	100	100
P2-Ecosystem	Primary species	2.1.1	Outcome	80			80	80		100			80		90	
		2.1.2	Management	90			90	90		95			90		90	
		2.1.3	Information	70			80	70		70			70		70	
	Secondary species	2.2.1	Outcome	100			100	100		100			100		90	
		2.2.2	Management	80			80	80		80			80		80	
		2.2.3	Information	80			80	80		85			85		80	
	ETP species	2.3.1	Outcome	85			85	85		80			85		80	
		2.3.2	Management	90			90	90		80			85		80	
		2.3.3	Information	80			80	80		80			80		80	
	Habitats	2.4.1	Outcome	95			95	95		95			95		95	
		2.4.2	Management	95			95	95		80			95		80	
		2.4.3	Information	80			80	80		80			80		80	
	Ecosystem	2.5.1	Outcome	90			90	90		90			80		90	
		2.5.2	Management	90			90	90		90			85		90	
		2.5.3	Information	80			80	80		80			80		80	
P3-Mgmt	Governance & policy	3.1.1	Legal/customary framework	100			100	100		95			100		95	
		3.1.2	Consultation, roles, etc.	85			85	85		85			85		85	
		3.1.3	Long term objectives	80			80	80		80			80		80	
	Management system	3.2.1	Fishery specific objectives	80			80	80		80			80		80	
		3.2.2	Decision making processes	75			75	75		75			75		75	
		3.2.3	Compliance & enforcement	80			80	80		100			65		70	
		3.2.4	Performance evaluation	80			80	80		80			80		80	

[a] *Previous assessment*

Table 40. Summary of performance indicator level scores for East Kamchatka salmon fisheries.

				Tymlat Karaginsky		VBMKNSV Karginsky		KBULBV Karginsky/Korfa					Delta Fish Kamchatka R.				Delfin Olyutorskiy		
	Component	PI	Performance Indicator	Pink	Chum	Pink	Chum	Pink	Chum	Pink	Chum	Sock	Sock	Chum	Coho	Chnk	Pink	Chum	Sock
P1-Target	Outcome	1.1.1	Stock status	70	70	70	70	70	70	70	70	80	70	70	70	70	80	80	80
		1.1.2	Stock rebuilding	85	85	85	85	85	85	85	85	na	85	85	85	85	na	na	na
	Management	1.2.1	Harvest strategy	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80
		1.2.2	Harvest controls	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80
		1.2.3	Information	75	75	75	75	75	75	75	75	80	65	65	65	65	75	75	75
		1.2.4	Assessment	70	70	70	70	70	70	70	70	70	75	70	65	65	70	70	70
	Enhancement	1.3.1	Outcome	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
		1.3.2	Management	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
		1.3.3	Iinformation	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
P2-Ecosystem	Primary species	2.1.1	Outcome	100		100		100					80				100		
		2.1.2	Management	80		80		80					80				80		
		2.1.3	Information	95		95		95					80				95		
	Secondary species	2.2.1	Outcome	100		90		90					100				100		
		2.2.2	Management	80		80		80					80				80		
		2.2.3	Information	85		80		80					80				85		
	ETP species	2.3.1	Outcome	80		80		80					85				80		
		2.3.2	Management	80		80		80					80				80		
		2.3.3	Information	80		80		80					80				80		
	Habitats	2.4.1	Outcome	95		95		95					95				95		
		2.4.2	Management	95		80		95					95				95		
		2.4.3	Information	80		80		80					80				80		
	Ecosystem	2.5.1	Outcome	90		90		90					90				90		
		2.5.2	Management	90		90		90					90				90		
		2.5.3	Information	80		80		80					80				80		
P3-Mgmt	Governance & policy	3.1.1	Legal/customary	95		95		95					95				95		
		3.1.2	Consultation, roles, etc.	85		85		85					80				85		
		3.1.3	Long term objectives	80		80		80					80				80		
	Management system	3.2.1	Fishery objectives	80		80		80					80				80		
		3.2.2	Decision making	75		75		75					75				75		
		3.2.3	Compliance etc.	75		75		75					70				80		
		3.2.4	Performance evaluation	80		80		80					80				80		