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Illegal, Unreported, and Unregulated Pacific Salmon Fishing at Kamchatka

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Illegal, Unreported, and Unregulated Pacific Salmon Fishing in Kamchatka

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Contents

Acknowledgements	3
Abbreviations	3
Executive Summary	4
The state of salmon resources in Kamchatka	4
Fisheries management	4
The main importers of Pacific salmon and the volume of exports from Russia	4
The domestic market for Pacific salmon products	5
Salmon poaching on Kamchatka	5
Evaluation of the IUU catch	5
Methods of resolving the IUU fishing problem	5
The socio-economic importance of fishing	6
Introduction	7
Background	7
Definition of the problem	8
Material and methods	8
1. The Main Target Species and Characteristics of the Salmon Yield in Kamchatka	10
Pink salmon	10
Chum Salmon	10
Sockeye salmon	11
Coho salmon	11
Chinook salmon	12
Cherry salmon	12
Rainbow trout	12
2. Fisheries Management	13
3. The Recorded Catch	19
4. The Volume of Salmon Export from Russia	20
4.1. Export of Salmon Products	20
4.2. Foreign Imports of Salmon from Russia	22
4.2.1. List of Russian salmon products exported to Japan	22
4.2.2. The volume and cost of Japanese salmon imports from Russia. Dynamics of import volumes and prices	23
4.2.3. The supply of Russian salmon to Japan: Shipments direct from Russia and via the Republic of Korea	24
4.2.4. Imports of Russian Pacific salmon by the Republic of Korea	26
4.2.5. Imports of Russian Pacific salmon by the People's Republic of China	26
4.2.6. Exports of Russian sockeye salmon, compared to the total yield of the species in Russia	26
5. Evaluation of the Domestic Market	29
6. Violations of Fishing Legislation and Poaching in the Far East	33
Illegal commercial fishing	34
Poaching on the rivers	36
7. Assessment of the Scope of IUU Fishing	37
8. Methods of Resolving the IUU Fishing Problem	38
9. Socio-Economic Importance of Salmon Fishing	40
Recommendations	41
Recommendations for governmental agencies	41
Recommendations for fish processing and trade companies in the Russian Federation, as well as in the major importing countries	42
Recommendations for environmental NGOs and other concerned organizations in the Russian Federation, as well as in the major importing countries	42
References	43
Appendices	45
1. Methodology of Assessment of Illegal, Unreported, and Unregulated Salmon Fishing	45
2. Russian Codes of the Foreign Economic Activity Commodity Classification Referring to the Pacific Salmon Products	49
3. Structure of the federal institutions involved in marine fishery management and enforcement in Russia	51

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RAIPON – The Russian Association of Indigenous Peoples of the North

ABR – aquatic biological resources

Goskomrybolovstvo – The State Fisheries Committee of the Russian Federation

EEZ of the Russian Federation – exclusive economic zone of the Russian Federation

KamchatNIRO – The Kamchatka Research Institute of Fisheries and Oceanography

IUU fishing – Illegal, Unreported, and Unregulated fishing

TAC – Total Allowable Catch

CSIPN – The Center for Support of Indigenous Peoples of the North

ROSSTAT – The Federal State Statistics Service

TINRO-Centre – The Pacific Research Fisheries Centre

M_INFO – a private agency, which collects original information directly from every customs declaration.

NPAFC – The North-Pacific Anadromous Fisheries Commission

Executive Summary

The goal of this study was to analyze available information on various types of poaching, assess the scale of illegal, unreported, and unregulated (IUU) fishing, and develop recommendations towards reducing the illegal catch.

Up to 95% of the reproductive stock may be destroyed in those basins of Kamchatka's rivers and lakes, located near roads and highways.

Kamchatka is a large peninsula in the North-east of Asia; it is connected to the mainland by an isthmus. As this territory is surrounded by the cold and productive waters of the North Pacific, Kamchatka's economy historically depended on fishing and seafood processing. The fishing and processing of salmon played, and continue to play, a major role in the economy.

At least ten species of salmon inhabit the waters of the peninsula, five of which (pink salmon, *Oncorhynchus gorbucha*; chum salmon, *Oncorhynchus keta*; sockeye salmon, *Oncorhynchus nerka*; coho salmon, *Oncorhynchus kisutch* and chinook salmon, *Oncorhynchus tshawytscha*) are fished commercially.

Salmon fishing has a long history in Kamchatka, and remains an important source of economic stability and external income. In addition, the industry supplies a significant portion of the entire country's seafood. Between 2000 and 2004, Pacific salmon comprised 6.17 % of the overall Russian catch, and 16.51% of total catch in Kamchatka's waters.

Poaching has a significant negative impact on the Pacific salmon stock in Russian waters. Well-organized illegal fishing undermines the management of the salmon stock, and in many

cases leads to stock depletion. In addition, organized illegal fishing contributes to corruption and criminalization of society, draws fishing income out of the region, and weakens incentives for economic development of the region and sustainable fishing.

In this report, the term "salmon poaching" implies the following:

- illegal and unrecorded commercial fishing (in excess of allocated quotas) in the seas and large rivers;
- illegal fishing for the purpose of roe extraction at the approaches to spawning grounds; and
- fishing by the local people, without permission, for personal consumption.

The goal of this study was to analyze available information on various types of poaching, assess the scale of illegal, unreported, and unregulated (IUU) fishing, and develop recommendations towards reducing the illegal catch.

The report was prepared under the auspices of the Project for conservation of the Kamchatka salmon and its habitat. The project was financed by the Gordon and Betty Moore Foundation.

small amounts, for prices averaging USD 3.16-3.69 per kg.

The volume of Russian Pacific salmon imported by the [People's Republic of China](#) has increased considerably in recent years. Most of the imported products are inexpensive, such as frozen pink and chum salmon (proportions by species are unknown, as they are recorded together); 40.4 thousand tons of frozen salmon were imported in 2005, and around 49 thousand tons were imported in 2006. Average prices increased to USD1.92 per kg in 2006 (from USD1.66 per kg in 2005). Sockeye imports are recorded separately; China imported 600 tons of frozen sockeye products in 2005, and 860 tons in 2006.

On the whole, trade statistics suggest volumes of sockeye significantly larger than the recorded Russian sockeye catch. The amount by which Japanese sockeye imports exceeded the official catch was greatest in 2005, totaling 9.7 thousand excess tons (the total recorded catch was 23 985 tons).

Overall sockeye imports by Japan, China, and South Korea in 2000-2006 (according to data provided by these countries) significantly exceeded both the total Russian export of frozen sockeye (by 27% on average) and the recorded sockeye catch (by 20 % on average). This indicates both illegal fishing and poor control by the executive authorities.

THE DOMESTIC MARKET FOR PACIFIC SALMON PRODUCTS

The volume of the entire Moscow salmon market was estimated at 103.5 thousand tons (USD 1.412 million) in 2007. Pacific salmon constitute 28% of all salmon sold, so we estimate that annual sales of Pacific salmon on the Moscow market amount to 29 thousand tons. A precise assessment of the capacity of the entire Russian market would require similar studies in different regions and cities, which is not feasible in a study such as this one. In the absence of other published data on salmon products, ratios were used derived from market investigations of

other types of fish products, in order to extrapolate the size of the entire domestic market from that of Moscow's. According to these rough estimates, the capacity of the Russian Pacific salmon market may total 219-319 thousand tons.

Annual volumes of roe production, including illegal production, in the territory of the Russian Federation average 18 thousand tons (11 to 26 thousand tons, according to data obtained from various sources). Of this total, 8-12 thousand tons are produced legally, while 3 to 6 thousand tons are procured by poachers and processed illegally.

SALMON POACHING ON KAMCHATKA

forms the economic foundation for the inhabitants of many of the peninsula's settlements. Poachers on Kamchatka harvest at least 54 thousand tons of the salmon annually, primarily for the purpose of roe extraction (fish carcasses are often discarded). Up to 95% of the reproductive stock may be destroyed in those basins of Kamchatka's rivers and lakes, located near roads and highways.

EVALUATION OF THE IUU CATCH

Overall imports from Russia of all species of Pacific salmon by Japan, PRC, and the Republic of Korea amounted to 107 thousand tons in 2006 (raw weight). Our rough estimate of the volume of the domestic market is 219 to 319 thousand tons. Accordingly, the actual catch could range between 326 and 426 thousand tons. These are our most conservative estimates, not taking into account fish discarded on site after roe extraction (about 55 thousand additional tons), fish caught for personal consumption, etc.

The recorded catch in the Far East amounted to 273 thousand tons in 2006, which suggests excess fishing of at least 53 to 153 thousand tons, or 1.2-1.6 times official numbers. However, survey participants, officials, and salmon experts on more

than one occasion suggested a total yield 3 times the recorded one.

Thus, various estimates indicate the actual catch as being between 1.5 and 3 times larger than officially recorded.

METHODS OF RESOLVING THE IUU FISHING PROBLEM

Authorities have proposed a system of rights-based use for fishing areas, with the aim of mitigating the effects of poaching. When we began the preparation of this report, such a system was being discussed, and at present the administrative reform of fishing rights is already underway. Fishing areas could be allocated for long-term use in accordance with the "one body of water - one user" principle. Criminal codes should also be updated to enhance the efficiency of poaching control. Not only the captains of the fishing vessels, but also the chief managers (owners) of the fishing companies need to be held responsible for illegal salmon fishing. Poachers' means of transport and fishing equipment need to be confiscated.

Obligatory customs certification of products exported abroad would deter illegal fishing in the Russian economic zone, as well as the uncontrolled export of raw products. This is the only legal means for Russia to contend with countries importing illegal products. Positive changes in this direction are already notable. According to the amendments to the Law "On Fishing," beginning on the 1st of January 2009, all fish harvested in the exclusive economic zone of the Russian Federation must be delivered to Russian customs, i.e. transferred through Russian ports. Beginning that same year, all fish products delivered to the ports can be sold only via the Russian Fish Exchange.

Participants in our sociological research proposed several means of settling the poaching problem, including control over air transportation of roe, the use of aircraft to protect spawning areas, and regular verification by Kamchatka inspectors of vessels accepting salmon. Most of the

THE STATE OF SALMON RESOURCES IN KAMCHATKA

In recent years, stocks of commercial species of Pacific salmon in Kamchatka have been adequate, though most of the valuable species (chinook, coho, and certain stocks of sockeye) are decreasing in numbers. This is a result of concealed overfishing and poaching, which lead to permanent shortages in reproductive stock at the spawning grounds.

The catch of Pacific salmon has been relatively stable or growing in recent years: 2004 – 161.6 thousand tons, 2005 – 260.2 thousand tons, 2006 – 273.4 thousand tons). Kamchatka provides Russia with 41.4 % of its pink salmon, 40.1 % of its chum salmon, up to 100 % of its sockeye and chinook, and 82.2 % of its coho salmon.

FISHERIES MANAGEMENT

At present, determining the total allowable catch (TAC) is an essential step towards distributing quotas between fishing companies. The procedures for determining and approving TAC's for marine biological resources, as well as any changes to them, are specified by the government of the Russian Federation.

The TAC is adopted for each salmon fishing season.

Salmon are fished in the exclusive economic zone in accordance with allocated quotas. The quotas are distributed among Russian fishermen for data control purposes (catch data are used to adjust the forecast of the salmon's approach to the coast), and among Japanese fishing companies, as per the Intergovernmental Agreement signed by Russia and Japan on 12 May 1985.

As it stands today research fishing is "research" in name only. Insofar as it only targets valuable commercial salmon species, and the sockeye salmon in particular, it does not principally differ from commercial fishing. The fish are caught for control purposes, but the catch amounts to several thousand tons annually.

On average, the officially recorded catch in the Russian Pacific exceeded the TAC by approximately 10 % in the years 1995-2005, though this figure varies depending on the particular region.

THE MAIN IMPORTERS OF PACIFIC SALMON AND THE VOLUME OF EXPORTS FROM RUSSIA

Japan, China, and the Republic of Korea import most of Russia's salmon products. The amount of salmon imported by other countries is negli-

ble, as it does not exceed a few tons.

[Japan](#) is the leading importer of Russian salmon products. Although the list of salmon products bought from Russia is extensive, frozen products, in particular frozen sockeye, make up the bulk of all imports. In the 2000s, import volumes of frozen sockeye ranged between 16.3 and 24.8 thousand tons per year. The long-term trends for imports of frozen sockeye from Russia suggest an increasing volume, a decrease in average prices, and an increasing total import value.

In recent years, the average annual price for sockeye imported from Russia has ranged between JPY 585 (USD 4.9) per kg (2001) and JPY461 (USD3.9) per kg (2006). With regard to other species of Pacific salmon (excluding sockeye and coho), import dynamics suggest a decrease in import volume, increasing average prices, and stable total import value.

Imports of other frozen Pacific salmon ranged between 5 277 and 8 394 tons; prices averaged JPY142 (USD1.2) to JPY 355 (USD2.98) per kg.

[The Republic of Korea](#) imports small amounts of frozen Pacific salmon from Russia. The greatest volumes of Pacific salmon were imported in 2000 and 2001 (1.8 to 3.2 thousands tons); prices averaged USD 0.96-1.38 per kg. In subsequent years, sockeye and other Pacific salmon were imported in

respondents, as well as a number of interviewed experts, emphasized the necessity of strategic regulation of fishing by interdepartmental agencies during the salmon fishing seasons. In their opinion, the state should establish a monopoly over salmon roe trade.

THE SOCIO-ECONOMIC IMPORTANCE OF FISHING

About two thirds of Russia's total aquatic biological resources come from the Far East. Hence, the fishing industry is one of the Far East's largest employers.

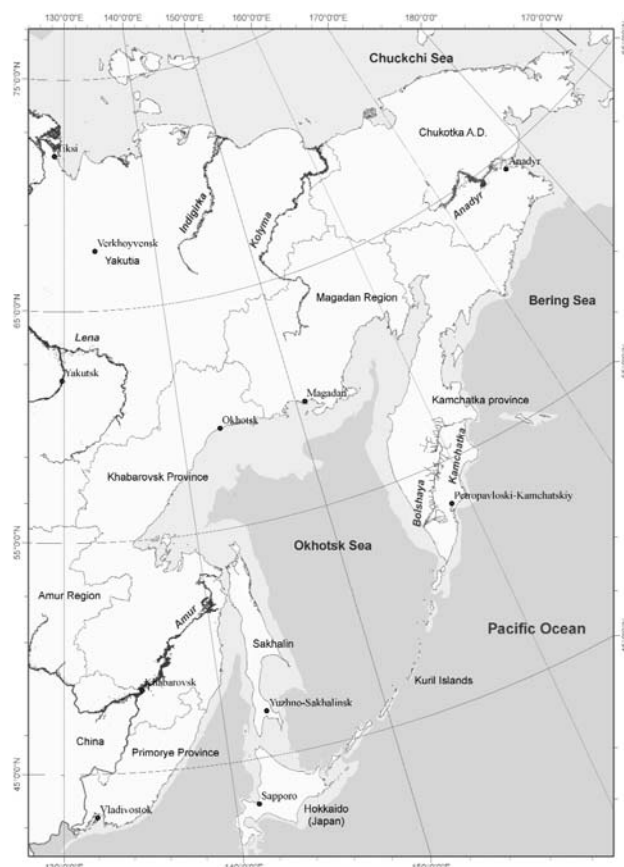
Fishing in Kamchatka Kray is of great social importance, as it ensures employment for the local population, particularly in the coastal areas (Ust-Kamchatskiy, Ust-Bolsheretskiy, Sobolevskiy, Aleutskiy, Milkovskiy, and Elizovskiy districts). In these districts listed above, fishing is the major source of income for the locals and, in part, funds local budgets for the development of social infrastructure. In 2006, the fishing industry in Kamchatka Kray employed around 16 thousand workers, or more than a half of all employees of industrial enterprises.

The needs of the indigenous peoples of Kamchatka, as well as those of other residents of the coastal areas, need to be considered when quotas are allotted.

It is important to remember, that Russian salmon are ecologically pure, as they are caught in the wild instead of bred in captivity. The global demand for wild salmon is very large, and it is priced well above farmed varieties. In Russia, wild salmon are not a limited resource, so they can and must be priced more competitively. The promotion of Russian wild salmon harvested in accordance with legal regulations, in both domestic and international markets, is a guarantee of stability and wellbeing for the residents of Kamchatka.

The following is a summary of our recommendations for governmental organizations, the business sector and NGOs:

- Governmental bodies must improve the system of monitoring, surveillance and control through changes to legislation, development of technologies (VMS, the use of helicopters to protect



Kamchatka and Russian Far East

spawning grounds), institutional development (an effective monitoring system), the tracking of vessels engaged in IUU fishing, improved training for lower and mid-level employees of the surveillance bodies (as well as increased salaries and responsibilities), development of deputisation of surveillance rights to, representatives of the local people.

- Governmental bodies must also evaluate the efficiency of the new salmon fisheries management system, and hold public forums on the topic every four years (two cycles for pink salmon and approximately one cycle for other salmon species) following implementation of the standards set forth in Article 29.1 of Federal Law No. 333, "On Fishing and Conservation of Aquatic Biological Resources" (in the version passed December 6th, 2007).

- Authorities should critically evaluate local budget revenues from taxation of fishing conducted by long-term users and other services and development

opportunities provided by them to local communities, and take necessary measures if the new practice of long-term fishing area leases does not contribute to sustainable management of resources and development of local communities.

- Governmental bodies and the private sector should develop market mechanisms aimed at achieving sustainable fisheries, and in particular promote branding and labeling of salmon products. Russian brands should be built on a reputation for high quality products and legal fishing methods.

- NGOs should work with relevant state agencies to enhance incentives and motivation to carry out the measures proposed in this document. They must also continue monitoring the domestic market and IUU fishing of Pacific salmon, and distribute collected information among relevant state bodies and other interested parties for the purpose of stock protection and economically efficient exploitation of Pacific salmon.

Introduction

BACKGROUND

Salmon fishing has a long history in Kamchatka, and remains an important source of economic stability and external income. In addition, the industry supplies a significant portion of the entire country's seafood. Russians are proud to call Pacific salmon one of the major symbols of Kamchatka, Kamchatka's "brand," as the region's financial stability, and image on the world market, depend on successful salmon yields.

Up to one fifth of the world stock of wild Pacific salmon reproduces in Kamchatka (Sinyakov, 2004). At least ten salmon species inhabit the waters of the peninsula, five of which (pink salmon, *Oncorhynchus gorbuscha*; chum, *Oncorhynchus keta*; sockeye, *Oncorhynchus nerka*; coho, *Oncorhynchus kisutch* and chinook, *Oncorhynchus tshawytscha*) are fished commercially. Aquaculture and fish farming are rapidly expanding worldwide - more than half of all salmon traded on the world market are bred in captivity. However, Kamchatka is a large region of the western Pacific with favorable conditions for natural salmon reproduction still preserved, as well as a region with a significant "genetic reserve" of the species.

In the first third of the last century, the registered Pacific salmon catch averaged 800 thousand tons. Around half of all Pacific salmon bred along the American coast, while the rest reproduced in Asia. From the 1950s to the 1970s, there was a sharp decline in salmon stock and annual catches halved, dropping to only 400 thousand tons (Sinyakov, 2004). Salmon population numbers fluctuate considerably from year to year, and the reasons for such fluctuations are not always evident. Nevertheless, most experts agree that the noticeable decline resulted from large-scale salmon fishing by the Japanese commercial fleet, using drift nets on the open sea. After exclusive economic zones were established in 1982, and the Convention on the Conservation of Anadromous Fish in the Northern



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Pacific Ocean (which prohibited drift net fishing outside these zones) was signed (Moscow, 1992), Pacific salmon populations increased. Their numbers are fairly high now in the northwestern Pacific, as well as in Alaska (Sinyakov, 2004).

1995 saw the largest catches ever recorded in the northern Pacific, at 1027 thousand tons. However, a decline of Alaskan salmon population was followed by their recovery to the level of the 1920-1930s, while Russian stocks remain half the size of the stocks from those years (Sinyakov, 2004). In addition, recent years have seen a different specific structure of the catch, and variation in population size in particular breeding regions from the norms of the 1930's and 1940s. Thus, the yields of the most valuable species, such as chinook, coho, and sockeye, are declining in some regions, even though the official data indicate stable migration of breeders to spawning grounds. The share of chinook and coho salmon in the total Russian catch has declined 4-5 times over (Sinyakov, 2004). This was caused by concealed overfishing and poaching, which led to a permanent shortage in reproduc-

tive stock at the spawning grounds.

The scale of poaching at spawning grounds has increased considerably (compared to the 1950's-1970s) due to enhanced economic incentives, accessibility of the spawning areas, greater free trade of salmon products, and frequent restructuring of the fish protection agencies, which naturally impairs their ability to work efficiently. This explains why the true number of spawning fish is lower, even while official statistics report the number of breeders to be equal to that recorded in the 1950's-1970s (Sinyakov, 2004). The end result is that, in spite of a peak in food resources for the salmon, the situation may turn critical. The stock is already low due to natural cyclic fluctuations caused by large-scale changes in the northern Pacific ecosystem, and current fishing practices, along with poaching, may bring the stock levels lower than the minimum of the 1970s. Additionally, the economic situation in Kamchatka is changing. More and more people believe that the social and economic problems of Kamchatka Kray cannot be solved without prioritizing development of hydrocarbon and mineral

The goal of this study is to analyze available information on various types of poaching, assess the scale of illegal, unreported, and unregulated (IUU) fishing, and develop recommendations towards reducing the illegal catch.

resources. There are large-scale plans for oil and gas development on the Kamchatka shelf, and numerous projects aimed at developing various mineral deposits on the peninsula. The residents of Kamchatka expect to benefit greatly from the implementation of these plans (Orlov, 2007). Experience in implementation of similar projects in the other regions, however, and on Sakhalin in particular, doesn't inspire such optimism (Spiridonov, 2008). Negative factors associated with industrial development, such as pollution, construction in the coastal areas, and increased accessibility to spawning areas may considerably aggravate the effects of illegal fishing and improper resource management, particularly given the lack of tools available to truly protect the salmon stock.

Anadromous salmon are one of the vital elements of the Kamchatka ecosystem, as they deliver great amounts of organic material, produced by the ocean ecosystem, to the peninsula's rivers. In this way, the ocean ensures constant annual eutrophication of the terrestrial ecosystems of Kamchatka. The salmon also provide food for other animals. For example, Pacific salmon (pink, chum, sockeye, and coho salmon) are an important component of the diet of Kamchatka brown bears, and are crucial during their fattening period (Seredkin, Pachkovskiy, 2006). Many other inhabitants of the peninsula (Steller's sea eagles, red foxes, etc.) greatly depend upon the state of the salmon stock.

DEFINITION OF THE PROBLEM

Poaching can be considered the scourge of commercial salmon fishing, and the main threat to the Pacific salmon stock in Russian waters. In this report, the term "salmon poaching" implies the following:

- illegal and unrecorded commercial fishing (in excess of allocated quotas) in the seas and large rivers;

- illegal fishing for roe at the approaches to the spawning grounds; and

- fishing by the local people, without permission, for personal consumption.

Well-organized illegal fishing undermines the management of the salmon stock, and in many cases leads to stock depletion. In addition, organized illegal fishing contributes to corruption and criminalization of society, draws fishing income out of the region, and weakens incentives for economic development of the region and sustainable fishing.

The fight against poaching is complicated not only by the remoteness of the spawning rivers, technical complications, and corruption. Another major complicating factor is that illegal salmon fishing, with the aim of roe extraction, is effectively the main source of income for residents of villages in Kamchatka.

The scale of illegal fishing must be known, in order to combat it. However, assessing the volume of illegal fishing, both recent and potential, as well as the damage it inflicts on the salmon population, is a problem unto itself.

The goal of this study is to analyze available information on various types of poaching, assess the scale of illegal, unreported, and unregulated (IUU) fishing, and develop recommendations towards reducing the illegal catch.

The report was prepared under the auspices of the Project on conservation of the Kamchatka salmon and its habitats. Financial support for the project comes from the Gordon and Betty Moore Foundation.

MATERIAL AND METHODS

The present report is based on published data, information from a number of agencies, and the results of studies carried out in Kamchatka over a two-year period, as well as a study of the Moscow salmon product market.

The following information on fisheries issues in the Kamchatka region was collected and analyzed:

- reports by the government of the Kamchatka Oblast;

- information posted on the websites of fishermen's co-ops, fishing companies, and online versions of periodicals (e.g., www.dalryba.ru, www.fishery.ru, www.rybak.com.ru, www.fish-seafood.ru, www.npacific.ru, www.kamchatkasalmon.ru, among other online resources);

- materials from the Russian Association of Indigenous Peoples of the North (RAIPON) and the Center for Support of Indigenous Peoples of the North (CSIPN), which are devoted to the social and economic conditions of the indigenous peoples of Kamchatka.

Catch data

Data on the Russian recorded¹ catch and total allowable catches (TAC) were obtained from the Forecasts for the fishing seasons (TINRO-Centre, 2000 - TINRO-Centre, 2007). The Forecasts were compiled on the basis of reports and forecasts from basin institutes and



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divisions of the Pacific Research Fisheries Centre (TINRO-Centre) of the Ministry of Agriculture of the Russian Federation. The TINRO-Centre provides data for the North Pacific Anadromous Fish Commission (NPAFC) (www.npafc.org/new/publications/Statistical).

Export data

Materials from the M_INFO database (the counterpart of North American PIERS) were used for the analysis of exports from 1996 through 2006. M_INFO is a private company that collects original information directly from every customs declaration. The study period extends from 2001 to 2005 and also encompasses 11 months of 2006.

Import data

Data on Japanese customs statistics were obtained from the website of the Ministry of Finance of Japan <http://www.customs.go.jp>. Information collected from the M_INFO database (1996-2006) were also used. Statistical data on the import of salmon products from Russia by the Republic of Korea were obtained from <https://trade.suhyp.co.kr/index.asp> (1995-2006). To calculate actual weight of catch based on gutted and headless frozen salmon the conversion ratio of 1.33 (adopted by TINRO-Centre, see Tsygir, 2007) was used.

Data on the domestic market

The project used a review compiled by the Norge-Fish Ltd. Company, "Analysis of the current state and tendencies of fisheries and fish market development in Russia (catch, export, import, production, and consumption (including Moscow supermarket chains and HoReCa) of fresh, refrigerated, frozen, processed, and finished fish and seafood from 2000-2005" (available at <http://mi.aup.ru/res/03/1208703.html>). In addition, the results of a study by RBTL communication group, carried out under the auspices of this project, are used.

Investigators conducted an audit of sales outlets (866 stores of 24 leading grocery chains) in August and September 2007, using standard methodology adopted from market investigations.

We estimated the total weight of female fish caught from the known weight of traded roe based on a coefficient of 4% roe to fish weight that Greenpeace Russia derived in their survey of available records. (Greenpeace Russia communication, <http://www.greenpeace.org/russia/ru/campaigns/660660/660736>).

This coefficient is within the range of species-specific coefficients adopted by TINRO Centre (Internal Standard of State Agency of Fishery, 2004).

Assessment of IUU fishing

Illegal, unreported, and unregulated fishing was evaluated on the basis of the general methodical approach described by V.A. Spiridonov (see appendix 1).

Data on roe exports via the Petropavlovsk-Kamchatskiy airport

The project used published materials on intercepted shipments of salmon roe in Kamchatka and in Moscow, as well as relevant Internet resources. The monitoring of roe transportation in hand luggage via the passenger and, partly, cargo terminals of the Elizovo Airport (Petropavlovsk-Kamchatskiy) was conducted in July 2006 through December 2007. The amount of exported roe and destination of flights (Moscow, Saint-Petersburg, Novosibirsk, Khabarovsk, Krasnoyarsk, Samara, and Kemerovo) were recorded.

As part of this project, a sociological survey was conducted from November 2006 through March 2007. The survey was meant to ascertain the positions of representatives from major professional groups involved in salmon fishing, on the key problems of salmon conservation and sustainable development of fisheries

(poaching, certification, quotas, etc.). Over the course of the survey, representatives from fishing companies, fishermen, and fish inspection officials of the Kamchatka region were questioned. A total of 150 individuals were interviewed, 58 managerial and executive staff of fishing companies, 43 fishermen (including the leaders of teams involved in coastal fishing), and 49 fish inspectors. The sample is representative, because the target subjects are already a small group, in a narrowly specialized field. The questionnaire contained interconnected sets of questions, aimed at ascertaining the respondents' attitudes toward the following issues:

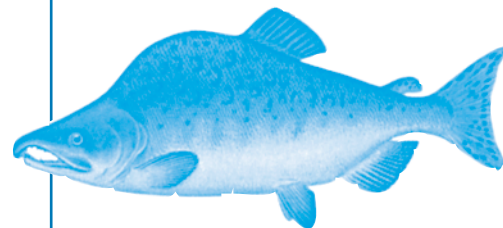
- catch and trade volumes;
- quotas and limits;
- efficiency of salmon fishery management in the region;
- poaching; and
- measures aimed at protection of the salmon.

Results of the questionnaire were analyzed by professional sociologists from the Institute of Sociology of the Russian Academy of Sciences.

¹ In the cited publications of TINRO-Centre the "recorded" catch is called "actual". In our opinion, this may cause confusion. That is why we use the term "recorded" for the catch reflected in the official documents and "actual" for the overall (recorded as well as unrecorded, including poaching) catch.

1 The Main Target Species and Characteristics of the Salmon Yield in Kamchatka

PINK SALMON



Pink salmon (*Oncorhynchus gorbuscha*) is the most abundant of Pacific salmon species. Along with chum salmon, pink salmon are a major target of fishing. In Kamchatka, they constitute up to 80 % of the overall salmon catch. The species can grow up to 76 cm in length and weigh up to 5.5 kg. When heading upstream to the spawning grounds, the fish are usually 32-64 cm long (the majority being between 38 and 59 cm), and weigh between 1.4 and 2.3 kg. In years of higher population numbers, pink salmon are usually 2.5 to 5.7 cm smaller than in years of population decline. Usually, spawning fish enter rivers in the summer and autumn; in Kamchatka, this occurs in July and August. The males outnumber females in the beginning of the spawning period, but the opposite is true by the end.

The pink salmon stock of eastern Kamchatka has been increasing in numbers since the mid-1970s. At present, more than 13 million individuals approach the coast in even years (TINRO-Centre, 2004). The population on Kamchatka's eastern coast is characterized by alternating generations of high and low numbers. At present (1990-2005), an average of 61.5 thousand tons of pink salmon are harvested in the coastal areas in odd years, compared to 8.2 thousand tons in even years (TINRO-Centre, 2006).

In 2005, 24 million pink salmon approached the western coast of Kamchatka; the total catch amounted to 8.5 thousand tons (TINRO-Centre, 2007).



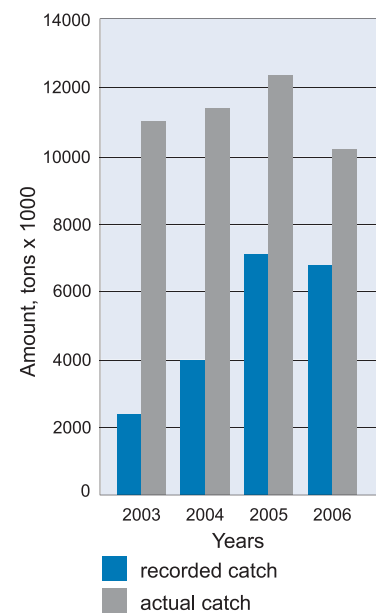
CHUM SALMON

Chum salmon (*Oncorhynchus keta*) are the second most abundant of Far-Eastern salmon species. The chum salmon was the second most numerous of Far-Eastern salmon species, after the pink salmon. In recent years, however, the chum yield has become the third largest, behind pink and sockeye salmon (TINRO-Centre, 2007).

Chum salmon spawn between the ages of 3 and 10, most of them between 4 and 6. Throughout the entire range of the species, the salmon are divided into two forms - summer and autumn. The two forms differ in both qualitative traits and ecological peculiarities. The autumn chum salmon, growing up to 1 m in length, are larger and more valuable than the summer variant. They are prevalent in the southern parts of the range. Upon entering the rivers of western Kamchatka, chum are 52 to 78 cm long, and weigh between 1.7 and 5.4 kg. The fish spawn in quiet areas of small rivers with fine pebble and gravel beds. In Kamchatka, chum enter the rivers in July through October. In severe winters, the spawning areas often freeze through, destroying a large portion of the offspring. The autumn form of chum salmon is less susceptible to the cold, as they prefer to spawn in areas where ground water comes to the surface. Their eggs are relatively large, measuring 6.5-9.1 mm in diameter.

The chum stock in Kamchatka has been stable in recent years. Nevertheless, the species' population numbers in some parts of the peninsula leave much to be desired. The situation is aggravated by drift-net fishing in Russia's exclusive economic zone, and by the fact that coastal fishing of

Figure 1. The recorded and actual catch of chum salmon in the Karaginskaya subzone (TINRO-Centre, 2007).



chum salmon coincides with the harvest of other salmon species. Chum are usually harvested as a by-product of sockeye, pink, and coho salmon harvest.

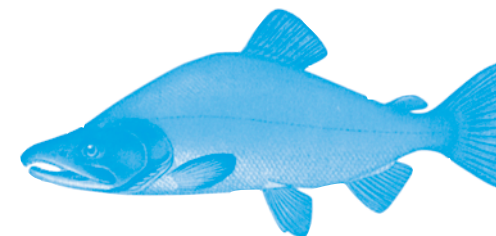
According to available data, the concealed catch of Pacific salmon, chum included (as a by-product of pink salmon fishing), has grown since 2002, when regulation of fishing was effectively halted. Regional authorities are no longer entitled to strategic regulation of fishing during the fishing season, and recent experience has shown chum limits are usually exceeded in the first two weeks of the pink salmon harvest. After that, the chum salmon yield goes unrecorded in the statistics. It is either omitted from the calculations altogether, or is traded illicitly (TINRO-Centre, 2007).

According to unofficial data (information collected from fishing vessels, questionnaire data, data on confiscated and exported fish products provided by enforcement agencies, etc.), the catch of chum in the Karaginskaya subzone (the eastern coast of Kamchatka) between 2003 and 2006 considerably exceeded the recom-

mended values. These data indicate that 11 020 tons of chum salmon were harvested in 2003, 11 250 tons in 2004, 12 650 tons in 2005, and 10 125 tons in 2006 (Zaporozhets et al., 2007). Thus, the actual catch exceeded the recorded one by 427% in 2003, by 283% in 2004, by 182% in 2005, and by 148% in 2006 (see fig. 1).

In recent years, the sizes of different chum salmon generations in the Bolshaya River (the western coast of Kamchatka) have ranged between 3.3 and 195.2 thousand individuals (TINRO-Centre, 2007).

SOCKEYE SALMON



Sockeye salmon (*Oncorhynchus nerka*) are the most economically important species. The fish are 52 to 65 cm in length, weigh up to 3 kg, and reach maturity at 5-6 years of age. The fish spawn early, in late May and June in Kamchatka. The run ends by the end of July. Most sockeye spawn in lakes and springs, where ground water reaches the surface. When spawning, the salmon take on a scarlet color. A single salmon produces an average of 3.8 thousand eggs, which are relatively small in size. Unlike chum and pink salmon, the young fish spend a long time in fresh water, only swimming downstream after a year, and in some cases, two or three.

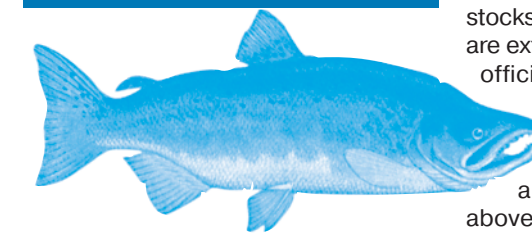
According to multi-year data, around 85 % of sockeye salmon harvested along the entire eastern coast of Kamchatka are caught in the Kamchatka River. In 2004, the number of sockeye breeding in that river declined considerably, and their numbers continued to decrease into 2005. In 2006, the population rebounded.

Estimates by KamchatNIRO experts indicate that the concealed commercial catch of sockeye salmon in the

Kamchatka River amounted to 2.2 thousand tons (880 thousand individuals) in 2006. Additionally, at least 100 thousand breeding sockeye were poached at spawning grounds on the Kamchatka River. These are conservative estimates, compared to those from other sources investigating the issue (Zaporozhets et al., 2007). In 2005, at least 700 thousand individuals that approached the river mouth were omitted from the sockeye catch statistics for this river (TINRO-Centre, 2006).

Between 2000 and 2006, 93.4 % of sockeye harvested along the western coast of Kamchatka were of the Ozernaya River stock (90.8 % in 1989-2006). At present, it is the largest population in the northwestern Pacific. In 2006, 9.088 million sockeye of the Ozernaya River stock approached the coast, 7.838 million (or 17995 tons) of which were caught (TINRO-Centre, 2007).

COHO SALMON



Coho salmon (*Oncorhynchus kisutch*) can be easily distinguished from other salmon species by their bright silver scales; the species' Japanese and American names ('silver salmon'), as well as the old Russian name ('white fish') can be attributed to their color. The fish can grow up to 84 cm in length; the average length is around 60 cm. Coho enter the rivers later than the other salmon species and spawn from early September through March, often under ice cover. During the spawning period, both males and females turn a dark crimson. As with sockeye and chinook, juvenile coho run downstream to the sea after they have spent a year or two in the rivers. Coho spend little time in the sea, though, as

they reach maturity at the age of three. Of all Pacific salmon species, coho are the most thermophilic, and winter further to the south than pink salmon, in waters between 5.5 to 9°C.

Over the last three years, the number of breeding coho approaching the eastern coast of Kamchatka has increased. In 2006, 6.387 million breeders entered spawning areas along the eastern coast; 81.1 % of the TAC was fulfilled (TINRO-Centre, 2007).

The number of breeders spawning along the entire western coast of Kamchatka has been increasing since 2003. In 2004, 227.5 thousand individuals were recorded at spawning grounds; three times as many were recorded in 2006 (TINRO-Centre, 2007).

In 2006, the recorded coho catch in the rivers of the western coast of Kamchatka reached only 60% of the TAC (the TAC was 545 tons). This was due, in part, to the number of spawning fish, but mostly resulted from the concealment of some catches. Most coho stocks on Kamchatka's western coast are extensively exploited. Although the officially recorded catch has not exceeded 600 tons annually over the last five years, it's safe to assume that the actual yield has been significantly above that, due to illegal and unrecorded fishing (TINRO-Centre, 2007).

2 Fisheries Management

The Main Target Species and Characteristics of the Salmon Yield in Kamchatka

CHINOOK SALMON



The chinook salmon (*Oncorhynchus tshawytscha*) is the largest Pacific salmon, as well as the largest anadromous fish in north-eastern Asia. Chinook can grow to a length of 147 cm and weights of 57-61 kg. Most chinook caught in the Kamchatka River are between 78 and 103 cm long, and weigh 5.5-17.0 kg. Individuals weighing up to and above 45 kg have been recorded. Chinook enter the rivers from May through July and spawn between June and late August. Their spawning grounds are located along the entire length of the rivers, from the tidal zone to the headwaters. The salmon breed between the ages of 4 and 7, and a single female produces over 14 thousand large eggs. Juvenile Asian chinook live in freshwater between one and three years, while young American chinook spend anywhere from a few months (ocean type) to two years there (river type). In Kamchatka, most juvenile fish run downstream to the sea after a year, but some leave the freshwater only after two.

Most of the chinook harvested on the eastern coast of Kamchatka breed in the Kamchatka River. Over the last 30 years, the size of the chinook stock in the Kamchatka River basin has ranged from 59 to 303 thousand individuals, with 158 thousand fish on average per year (TINRO-Centre, 2007).

The Bol'shaya River is the main breeding and fishing area of the peninsula's western coast. Over the last 30 years, the chinook stock in the Bol'shaya River has fluctuated between 15 and 56 thousand individuals, averaging 33 thousand fish per year (TINRO-Centre, 2006).

Between 2000 and 2006, commercial fishing of chinook salmon in the Bol'shaya River experienced a three-fold decline in comparison to the 1990s, and the number of breeders at spawning grounds is continually decreasing (TINRO-Centre, 2007).

Cherry Salmon and Rainbow Trout should be also noted among the Pacific salmon of Kamchatka. Although these two species have no commercial value due to their low numbers, they are sometimes recorded as part of the catches.

CHERRY SALMON

Cherry salmon (*Oncorhynchus masou*) is the least abundant of the Pacific salmon in Kamchatka, and is usually omitted from fisheries statistics. Temperature appears to be the limiting factor for the cherry salmon population in Kamchatka, as the climatic conditions of the rivers and surrounding seas are much more severe than in the species' optimal range. Breeding cherry salmon usually enter the rivers in the last ten-day period of May. The spawning period in Kamchatka lasts until late July and coincides with the spawning period of the chinook and the spring sockeye. The spawning grounds are located far from the sea in the upper reaches of the rivers, or in small rocky streams. The young cherry salmon spend one to three years in the rivers (Kamchatka Red Data Book).

On the whole, the cherry salmon stock in all rivers of western Kamchatka, from the Bolshaya to the Voyampolka River, are low. According to estimates from experts at KamchatNIRO, the number of cherry salmon entering the Utka River in the spawning period ranges from 15 to 50 thousand individuals, depending on the year. The overall annual catch of the cherry salmon, as a by-product of other fish-

ing, does not exceed a few dozen tons (Tokranov, 2002).

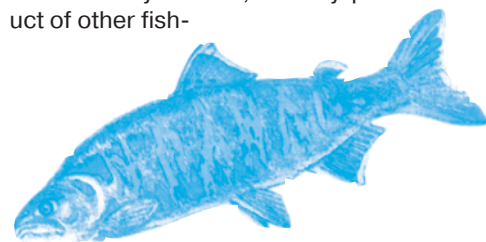
The cherry salmon is listed in the Kamchatka Red Data Book (they are designated as category 3, or a species occurring at the edge of its natural range and requiring study and population control, as an endemic wide-boreal species rare in the rivers of Kamchatka) and the Red Data Book of the Northern Russian Far East.

RAINBOW TROUT



Rainbow Trout (*Parasalmo mykiss*, or *Oncorhynchus mykiss* according to classification adopted by NPAFC) is listed in the Red Data Book of the Russian Federation as a rare anadromous form (category 3). Rainbow trout are more numerous in the northern rivers of western Kamchatka; in the southern rivers, despite a fishing ban, the stock has declined in recent years. No fishing is officially recorded; however, the valuable trout are extensively poached. Their numbers are also limited by a lack of suitable spawning areas and food resources for juveniles in the rivers (Red Data Book of the Russian Federation, 2001).

The species is listed in the Kamchatka Red Data Book (category 2) and the Red Data Book of the Northern Russian Far East as an endemic species of Kamchatka dramatically declining in numbers.



Pacific salmon are monocyclic fish (spawning only once in their lifetime), which distinguishes them from most other fish species with an assigned TAC. Mistakes made in managing polycyclic stocks can be corrected, either by increasing or decreasing fishing pressure in subsequent years. Effective Pacific salmon fishing demands a different approach - it is necessary to remove all fish, not essential for successful breeding². The total allowable catch (TAC) is adopted by federal authorities in the year of the salmon fishing season (the late May through September), following an assessment of the population (see fig. 3 for details).

The government of the Russian Federation specifies the procedures for determining and approving TAC's of aquatic biological resources, as well as making changes to them.

Many different factors influence the spawning run into the rivers. The most important of these are illustrated in figure 2. A network of regional fishing research institutes develops forecasts of the salmon's approach to the coast. This assessment of the state of salmon populations and the forecast of their movements are based on the number of breeders running to the spawning grounds, the numbers of juvenile fish running downstream, commercial catches, and the trawl census at sea (fig. 3). The forecasts are adjusted, based on data from controlled drift net fishing in the salmon' migration routes.

Unfortunately, it is fairly complicated to assess the many factors affecting salmon population numbers. The total number of young fish running downstream cannot be estimated, as it is impossible to survey all the rivers of the peninsula. The sea surveys are irregular and do not always cover all the necessary regions, due to a lack of financial resources. One of the most serious obstacles to forecasting

is extensive poaching, and the lack of reliable data on the unrecorded catch of breeders in the rivers.

Forecasts of the salmon stock rely on homing, or the returning of salmon to their native rivers. As a rule, the salmon return to these rivers after a period of fattening in the sea (TINRO-Centre, 2004). At the same time, data indicate that pink salmon, the most abundant Pacific salmon species, have a more flexible homing behavior in some years.

In order to adjust forecasts, fishing institutes annually conduct sea monitoring (trawl surveys and drift net research). This provides practical information on the timeframes of Pacific salmon's approach to the coasts, and the numbers of approaching fish in major fishing regions (namely western and eastern Kamchatka, eastern Sakhalin, the Kuril Islands, and the mainland coast in the southern Sea of Okhotsk).

According to the Law of the Russian Federation "On Fisheries and Conservation of Aquatic Biological Resources" (No.166-F3, 20.12.2004, version from 06.12.2007), the TAC is divided into the following quotas:

catch (harvest) quotas of aquatic biological resources for commercial fishing (not including coastal fishing) on the continental shelf of the Russian Federation and in the Russian exclusive economic zone (commercial quotas);

catch quotas of aquatic biological resources for coastal fishing in the inner seas of the Russian Federation, the marine territory of the Russian Federation, the continental shelf of the Russian Federation, and the Russian exclusive economic zone (coastal quotas);

catch quotas of aquatic biological resources for fishing for scientific and control purposes (scientific quotas);

catch quotas of aquatic biological resources for fishing for educational and cultural purposes;

catch quotas of aquatic biological resources for fishing, carried out for the purposes of breeding, restoration, and acclimatization;

catch quotas of aquatic biological resources for sport fishing;

catch quotas of aquatic biological resources for support of the traditional economic activities of the indigenous minorities of the North, Siberia and the Far East of the Russian Federation;

catch quotas of aquatic biological resources for the Russian Federation in regions under the jurisdiction of international fisheries and conservation agreements, signed by the Russian Federation;

catch quotas of aquatic biological resources for foreign states in the exclusive economic zone of the Russian Federation, established in accordance with international fisheries and conservation agreements signed by Russian Federation;

catch quotas of aquatic biological resources for commercial fishing in the inner waters of the Russian Federation, excluding Russia's inner seas (commercial freshwater quotas).

Salmon are fished in the exclusive economic zone in accordance with allocated quotas. The quotas are distributed among Russian fishermen for data control purposes (catch data are used to adjust the forecast of the salmon's approach to the coast), and among Japanese fishing companies, as per the Intergovernmental Agreement signed by Russia and Japan on 12 May 1985. The fisherman use drift and floating nets, a few kilometers in length, set across salmon migration routes.

Quota types (1) and (9) are the main commercial quotas. The coastal quota is filled largely by means of fishing with fixed nets on the open sea and in waters close to the river mouths. When fixed gear is used, a guiding wing of the net is placed in the way of fish migrating along the coast.

² It is worth noting, that dead salmon consumed by predators in the post-breeding period are an important source of organic substance in the river basins' ecosystems. The importance of this input to the maintenance of a healthy ecosystem has never been considered in the theory of salmon fisheries management or practical fishing. As such, current salmon fisheries management is still far from the principles of "ecosystem-based management."

Figure 2. Life cycle of the Pacific salmon (with the pink salmon as an example) and the factors affecting the survival and return of the individuals of the various age groups (after TINRO-Centre, 2004).

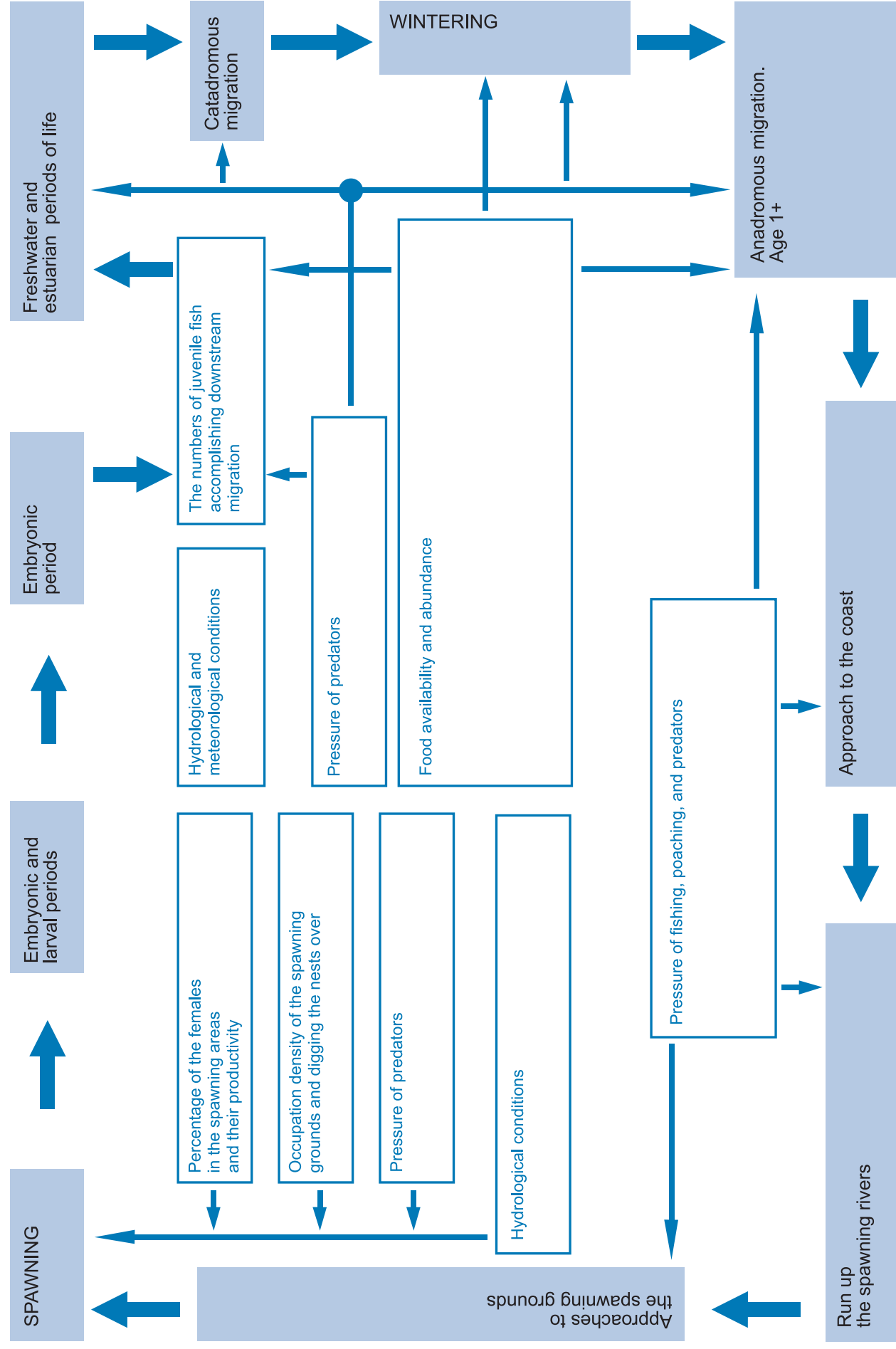
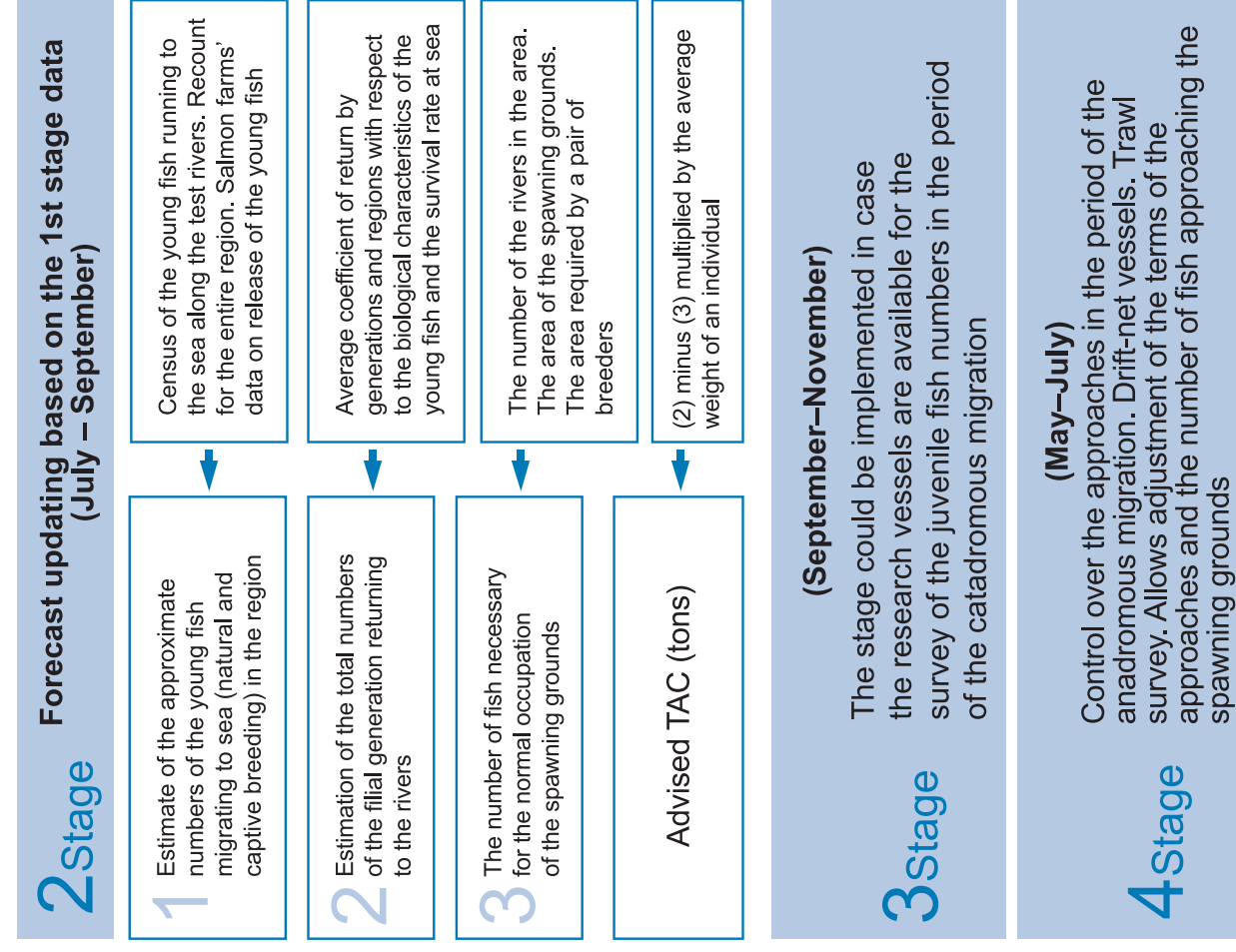
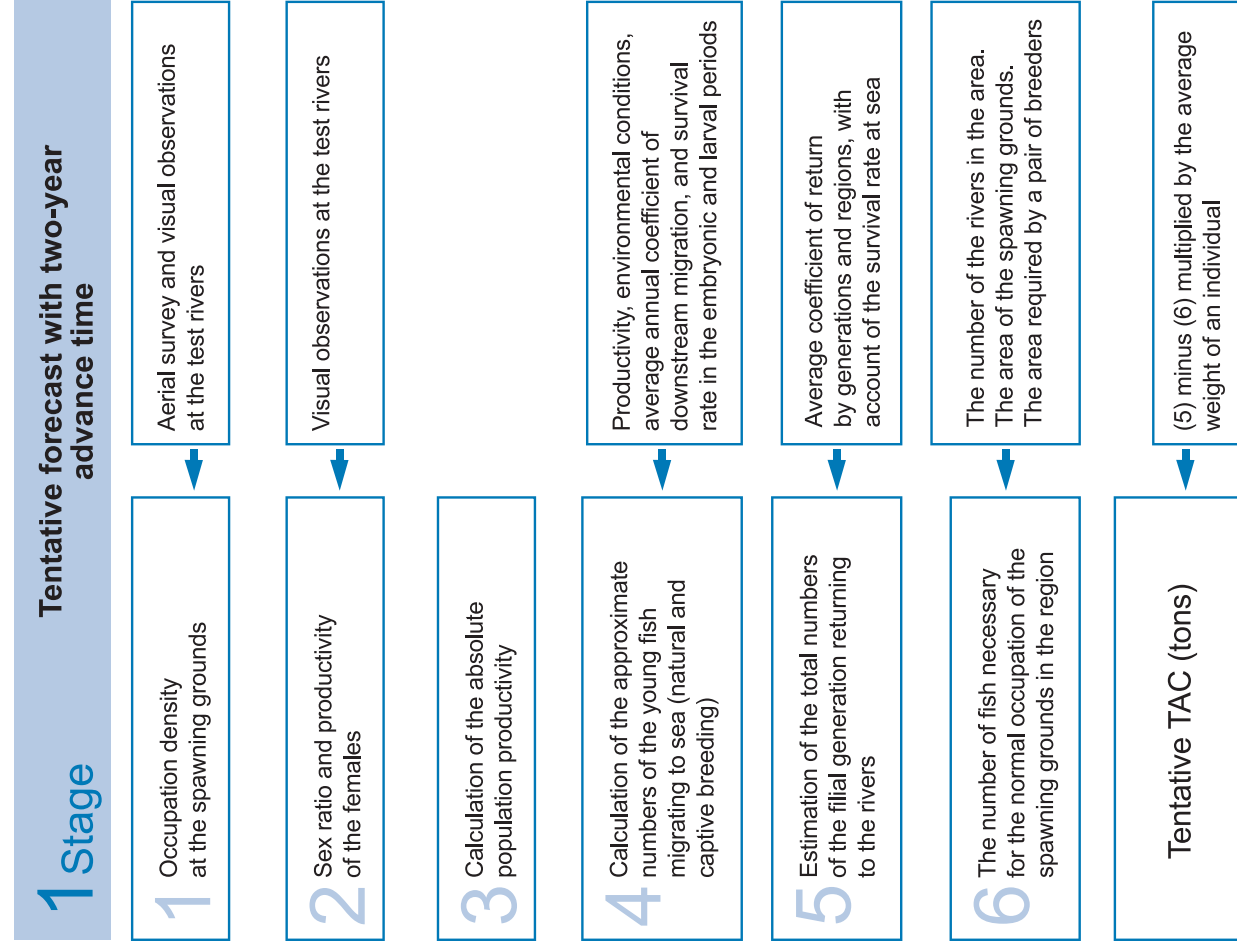


Figure 3. Flow chart of the basis stages of the development of the forecast of the salmon resources and TAC substantiating (after TINRO-Centre, 2004).



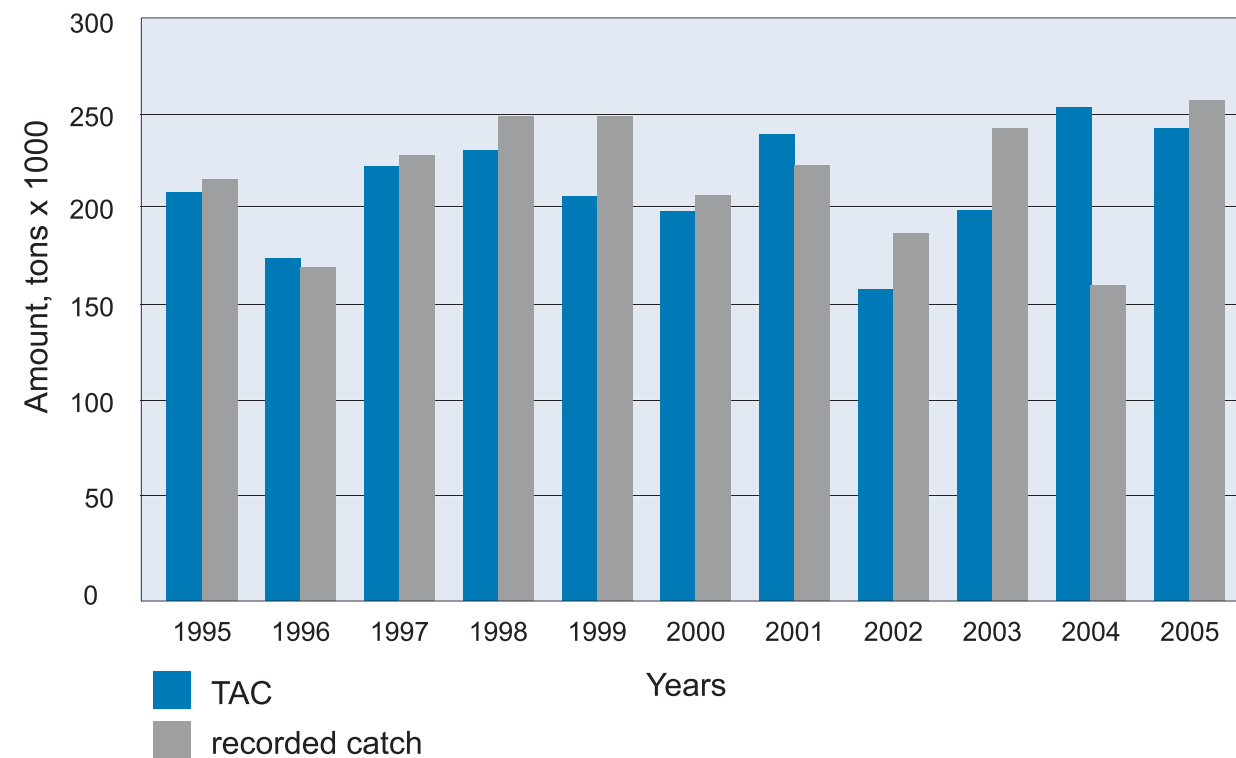


Figure 4. TAC and the recorded catch of Pacific salmon (all species and regions) in 1995- 2005 (from TINRO-Centre, 2004, 2005, 2006).

The salmon are guided along the wing into the trap and gather there, and are subsequently removed and delivered to the coast. About 70 % of all harvested salmon are trapped in this way. In larger rivers where fishing is permitted, fisherman use fixed, floating, and sweep nets. It is worth noting, that as it stands today research fishing is "research" in name only. Insofar as it only targets valuable commercial salmon species and the sockeye salmon in particular, it does not principally differ from commercial fishing. The fish are caught for control purposes, but the catch amounts to several thousand tons annually (Anon., 2007).

According to Accounting Bureau estimates, the results of the Pacific salmon fishing season in 2004-2006 suggest that the salmon TAC (from their own scientific studies) did not correspond to the actual catch. The poor quality of the forecasts and, hence, underestimated TAC resulted in material and financial losses for fisheries organizations preparing for the fishing

season. Attempts at strategic regulation of fishing and adjustment of the TAC during the short fishing season proved to be inefficient, as TAC adjustment require an environmental impact assessment and thorough analysis of relevant regulatory documents from Rosrybolovstvo and the Ministry of Agriculture of the Russian Federation (Anon., 2007).

On average, the officially recorded catch in the Russian Pacific exceeded the TAC by approximately 10 % in the years 1995-2005, though this figure varied depending on the particular region (fig. 4).

Many fishermen distrust scientists, as the salmon approach cannot be accurately forecasted in advance and thus, TAC's cannot always be effectively regulated in a timely fashion. They are often convinced that the catch could exceed allocated quotas. In the Soviet period, as well as in the 1990s, under-estimated TAC resulted in material and financial losses for fisheries organizations preparing for the fishing

the salmon approached the coast in low numbers, or expand the TAC if numbers appeared to be high. On July 18th, 2002, the State Fisheries Committee of the Russian Federation (the agency responsible for state fisheries management prior to the 2004 administrative reform) issued Order N 241. According to this document, Fishing Season Centers were only authorized to regulate fishing within the limits of adopted TAC's. By 2003, the Fishing Season Centers were no longer operational, and virtually no means for timely and efficient regulation of fishing remained.

As fishing cannot reasonably be regulated on a day-to-day basis and the present system encourages unrecorded fishing, some experts advise foregoing management of Pacific salmon fishing by means of a TAC, and instead regulating the amount of fishing equipment (Kotenev et al., 2006). This proposal is being actively discussed by experts and fishing industry representatives.

A new article was added to the Federal Law "on Fisheries and Preservation of Aquatic Biological Resources" (FL No.333) on 6 December 2007. This article, Article 29.1, is entitled "The harvest (catch) of anadromous fish species," and reads:

1. Anadromous fish species are to be harvested by legal entities and independent businesses, as stipulated by Article 16, Part 3 of the current Federal Law, on the basis of the agreement defined by Article 33.3 of the current Federal Law.

2. Bodies of water designated for harvesting anadromous fish species may only be used for other purposes with the consent of the persons listed in Part 1 of the this article (including uses not connected with fishing).

3. For harvesting of anadromous fish species, the fish and their habitats are to be assigned to the persons stipulated in Part 1 of this article, on the basis of the resolution of the commission regulating the anadromous fish harvest. This resolution is adopted by local authorities, authorized by the federal executive branch.

4. Commissions regulating the anadromous fish harvest are to be established in the subjects (republics, okrugs, oblasts, etc.) of the Russian Federation. The commission is to be headed by top official of the subject of the Russian Federation (the head of the top executive authority of the subject of the Russian Federation). The commission must be comprised of representatives from the federal executive authorities, including defense, security, and environment protection authorities, as well as public authorities of the subjects of the Russian Federation, community organizations, legal associations, and scientific institutions.

5. The commission regulating the anadromous fish harvest determines the volume, timeframe, and locations for the catch, and other conditions for the harvesting of anadromous species. This resolution is adopted by local authorities, authorized by the federal executive branch.

6. The list of members of the commission regulating the harvest of

anadromous fish species and the operating procedures is to be approved by the authorized federal executive authority.

7. In order to establish favorable conditions for fishing and preserve aquatic biological resources in waters allocated for the harvest of anadromous fish species, a special agreement may be negotiated between two parties, one of which heads the regulating commission, and is obligated to issue fishing permits for anadromous fish in a given body of water for a period of 10-20 years. The second party, in turn, is responsible for the implementation of measures aimed at sustainable use and conservation of the aquatic biological resources, including water body amelioration and the responsible management of aquatic biological resources.

8. The agreement denoted in Part 7 of this article must be officially registered with local authorities, authorized by the federal executive branch. The agreement is considered effective immediately following registration.

9. The procedures for preparation, completion, and official registration of the agreement mentioned in Part 7 of this article, as well as the sample agreement form, are specified by the government of the Russian Federation.

In effect, this document establishes the legal grounds for the allocation of fishing areas in accordance with the "one body of water - one user" principle. The practicability of assigning local salmon stocks for the long-term use has been discussed for a long time. Such an approach could establish conditions that would compel the users (actual stock "owners") to be engaged in salmon conservation issues. It would also lay the groundwork for a smooth transition from the existing system of assigned TAC's. At present, TAC's are a necessary mechanism for distributing quotas among fishing enterprises, i.e. among fixed nets. Salmon fishing would effectively become a process of removing excess fish heading towards their spawning rivers. The user would have no reason to persuade (or deceive) himself every year that the original fishing forecast

must be repeatedly increased over the course of the fishing season, because the spawning grounds of the fished salmon will be located within his own fishing area, rather than in far-off and unknown rivers (Makoedov et al., 2006). To this end, the State Fisheries Committee is currently developing the necessary bylaws. This measure has its opponents as well as its supporters and thus, requires thorough and careful consideration for each region and body of water.

It is safe to say, that the long-term assignment of fishing areas will have both positive and negative consequences. Competition for fishing areas sometimes escalates into veritable wars, best summarized in the words of British philosopher Bertrand Russell: "War does not determine who is right - only who is left". Regional topical publications, particularly those distributed via the Internet, illustrate fairly ugly aspects of these wars, in which administrative resources are widely used in constant attempts to change the terms of access to aquatic biological resources. It is worth noting, that no relevant documents detailing the new procedures for allocation of fishing areas were available by the beginning of the 2008 fishing season. Some experts expressed fears that those documents would be drafted in haste, and that the distribution of fishing areas would serve the interests of the larger fishing enterprises, who have greater administrative resources and are well equipped to capitalize on the redistribution, at the expense of small-scale users. In addition, conflicts between the new long-term users and the local population are unavoidable, as locals will inevitably consider some new users illegitimate. Conflict resolution will depend upon the ability of the users to win the favor of residents in settlements situated along the rivers and seacoast, ensure their employment, and help them find their place in the new economy. If the fishing industry fails to strike this balance, conflicts with the local population will provoke increased poaching.



3 The Recorded Catch

In the period between 2000 and 2004, Pacific salmon constituted 6.17 % of the overall Russian catch, 8.65 % of the Russian EEZ catch, and 10.18 % of the Far East catch (Sinyakov, 2006). In that period, pink salmon

accounted for the greatest portion of the Far East catch (144.3 thousand tons, or 73.3 % of the total catch, on average). They were followed by chum (30.8 thousand tons, 15.6 %), sockeye (18.4 thousand tons, 9.4 %),

coho (1.64 thousand tons, 0.8 %), chinook (0.4 thousand tons, 0.2 %), and cherry salmon (6 tons, 0.003 %) (Sinyakov, 2006). The catch data for 1999 through 2006 are presented in Table 1.

Table 1. Salmon yield in the Russian Far East, 1999-2006, in tons (TINRO-Centre 2000-2007).

	1999	2000	2001	2002	2003	2004	2005	2006
Pink salmon	188207	148542	170906	108273,5	180583	113260,5	205791,30	199308,2
Chum salmon	25127	32619	31230	31086,2	28877	30157,54	33110	46931,3
Sockeye salmon	12276	15127	18102	24796,8	17692	16342,16	19817,60	24925
Coho salmon	1348	1796	1776	1728,64	1364	1515,67	872,4	1453,9
Chinook salmon	765	457	433	555,3	225	320,67	572	752,1
Cherry salmon				3,057	10	10,98	28,1	25,4
TOTAL	227723	198541	222447	166443,5	228751	161607,5	260191,40	273395,9

Kamchatka is the main salmon fishing region of the Far East, with an average annual yield of 93.12 thousand tons between 2000 and 2004 (47.3 % of the overall catch in the Far East). Kamchatka produces 41.4 % of the pink salmon catch, 40.1 % of the chum catch, almost 100 % of the sockeye and chinook catch, and 82.2 % of the coho catch (Sinyakov, 2006).

Salmon yields are fairly stable, particularly in Kamchatka (Fig. 5), and show a steady increase. The relatively large catches of recent years result from particularly favorable conditions for salmon in their saltwater period (Sinyakov, 2006).

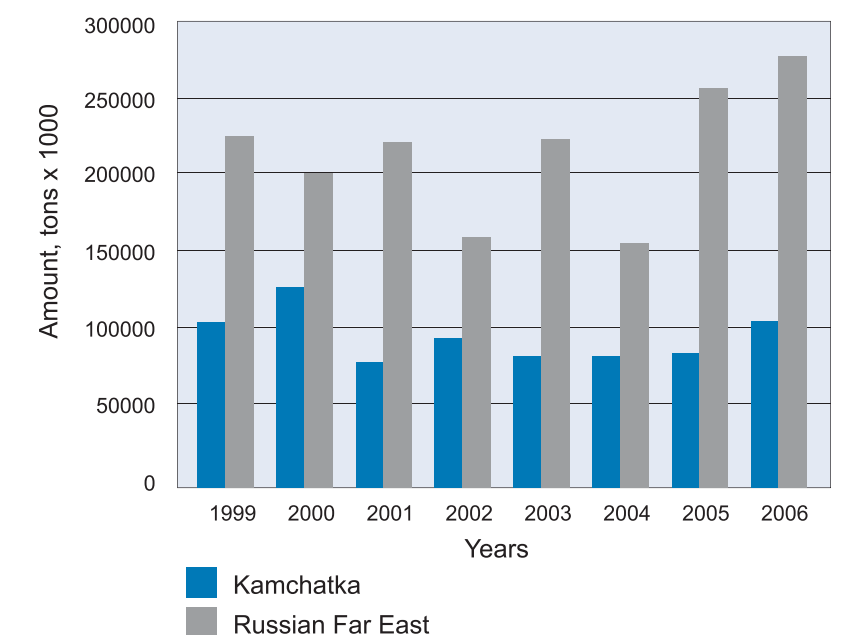


Figure 5. Salmon yields in the Russian Far East and in Kamchatka, 1999-2006 (TINRO-Centre 2000-2007).

4 The Volume of Salmon Export from Russia

4.1. Export of Salmon Products

Russian export statistics indicate that the bulk of all salmon products is exported to Japan, China, and the Republic of Korea. In addition, small amounts are exported to Ukraine, Kazakhstan, and Kyrgyzstan (Figs. 6, 7, and 8).

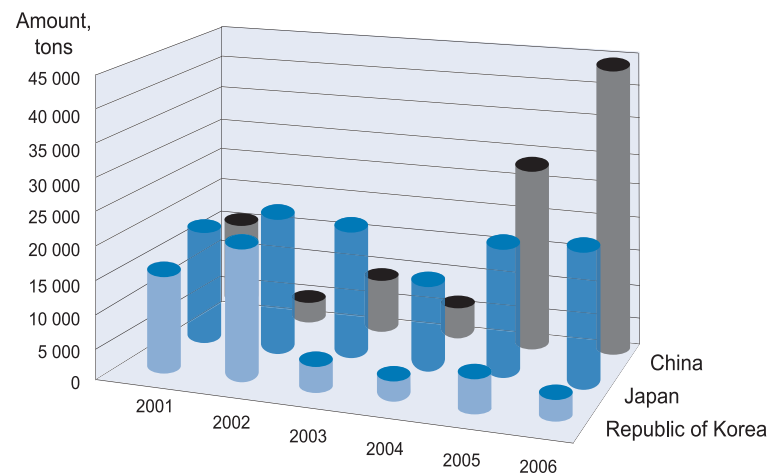


Figure 6. Russian export of salmon products to the major importing countries, by year (M_INFO database).

The following Pacific salmon products are recorded in Russian customs statistics: (see Appendix 2):

- live salmon,
- fresh or refrigerated salmon,
- frozen sockeye salmon,
- other frozen salmon,
- fresh or refrigerated salmon fillets,
- frozen salmon fillets,
- salted salmon fillets,
- smoked salmon,
- salted salmon,
- processed and canned salmon,
- salmon roe.

In Japan, the market value of sockeye salmon is higher than that of the chinook salmon; the situation is reversed in Russia and America. The economic value of sockeye to Russian fishing companies has increased considerably over the last 10 years, due to growing export volumes (Bugaeu, 2004).

Figure 7 illustrates that frozen sockeye are exported mainly to Japan; and export volumes are increasing. On the contrary, the amounts of sockeye exported to the Republic of Korea are small, and decreasing over time. Sockeye exports to China are negligible (see fig 7).

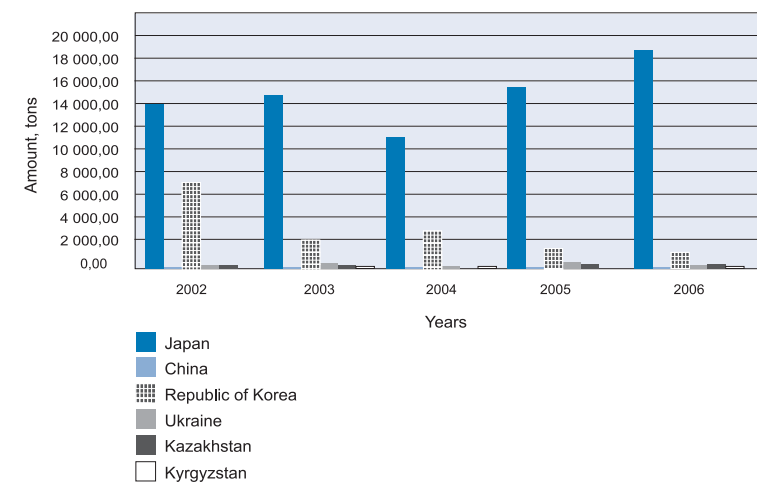


Figure 7 illustrates that frozen sockeye are exported mainly to Japan; and export volumes are increasing. On the contrary, the amounts of sockeye exported to the Republic of Korea are small, and decreasing over time. Sockeye exports to China are negligible (see fig 7).

In 2002, frozen sockeye salmon was given its own code (0303110000), whereas previously it was included under the 033100000 code, designating frozen salmon. Now, sockeye can be used to trace export dynamics by year and country, and to compare these data with the official catch (see sections 4.2).

The opposite trend can be observed for imports of other, less expensive salmon products (fig. 8). China tops that list; Chinese imports of Russian salmon increase nearly every year.

Figure 9 clearly demonstrates the dominance of sockeye salmon among exported salmon products (by cost). The only exception is 2006, when the export of other frozen salmon to China noticeably increased. It is worth noting, that given an essentially equal monetary value of exports in 2006, the volume of other salmon species exported to China was 2.3 times greater (see figures 7 and 8).

Salted salmon, and both frozen and salted salmon fillets, comprise a negligible share of total exports, which has not exceeded a thousand ton in the past few years (see fig. 10).

According to data provided by the Accounting Bureau of the Russian Federation, salmon exports from Russia are stable and amount to 22-30 thousand tons annually. Salmon represent 14-16% of overall seafood exports by volume, and 9-11 % by value. Frozen sockeye is the single largest Russian salmon export; in 2005, 24 759 tons were exported, and the overall sockeye harvest totaled 26 634.8 tons (Anon., 2007).

However, data from our own analysis of the export statistics indicate much larger volumes of exported salmon (see fig. 11), in some years more than double the official statistics.

In the period from 2001 to 2006, the overall export amounted to 287 394 tons. Figures 6, 7, 8, 10, and 11 show that, in 2004, overall export volumes, as well as exports to individual countries, hit a minimum. This year saw the smallest number of salmon harvested in the Far East (Fig. 5, Table 1).

In 2004, the recorded catch in western Kamchatka was considerably smaller than the TAC. Experts attributed this phenomenon to weather conditions. A cyclone hit this area on August 4-6, and 90 % of the nets (out of a total 106) were damaged and removed. Only 30 to 40 %

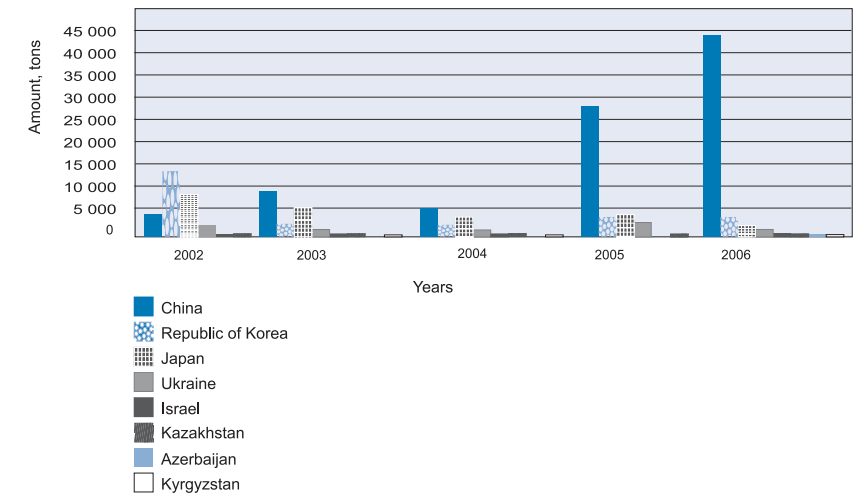


Figure 8. Russian exports of frozen salmon (excluding sockeye) in 2002-2006, in tons (M_INFO database).

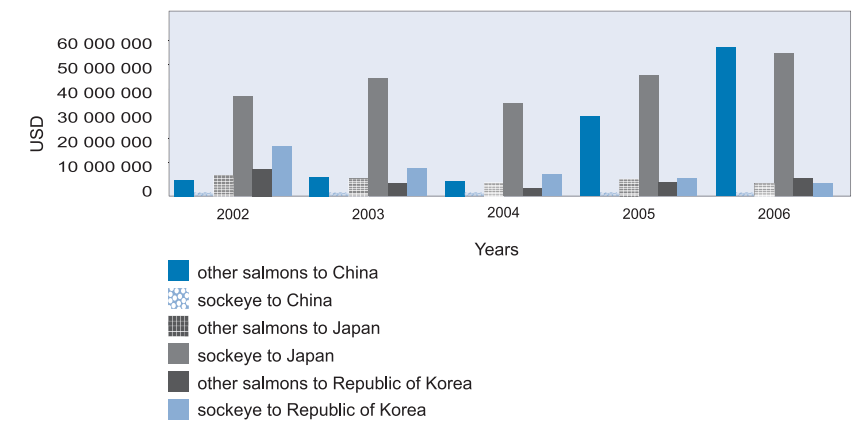


Figure 9. Russian exports of frozen salmon to Japan, China, and the Republic of Korea (USD) (M_INFO database).

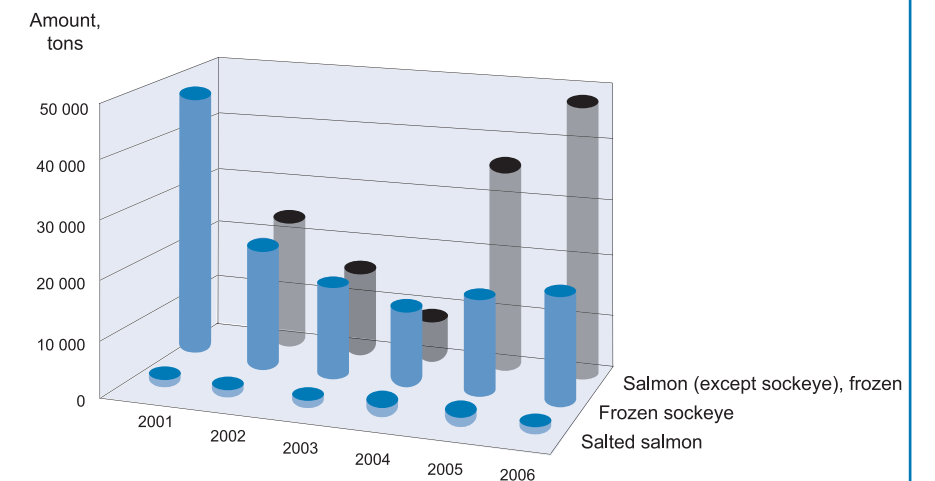


Figure 10. The overall volume of Russian salmon product exports (M_INFO database).

of the nets were restored by August 10-15. This indicates that underfishing was caused primarily by the storms. They also prevented the removal of fishing equipment, including traps with already caught fish, and more than 15 thousand tons of pink salmon drowned. On top of that, nets were destroyed and, thus, could be no longer used for fishing. One more reason for underfishing was the late issuing of permits to set fishing nets, though this would not have improved the situation regardless (V. Tsygir, TINRO-Centre, pers. comm., 2007).

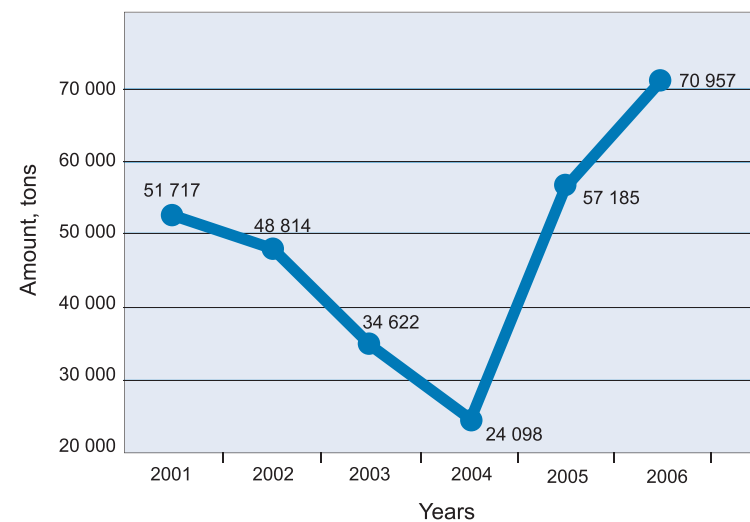


Figure 11. Overall volume of Russian salmon product exports (M_INFO database).

4.2. Foreign Imports of Salmon from Russia

According to import statistics, Japan, China, and the Republic of Korea import most of Russia's salmon products. The amount of salmon imported by other countries is negligible, as it does not exceed a few tons.

4.2.1. List of Russian salmon products exported to Japan

Japan is the lead importer of Russian salmon products. In Japanese import statistics, Pacific salmon products are recorded by species, 1) fresh/frozen sockeye salmon, 2) fresh/frozen coho salmon, and 3) fresh/frozen "other species of Pacific salmon" (excluding sockeye and coho); They also record frozen imports alone, including frozen: 4) sockeye, 5) coho, and 6) "other species of Pacific salmon". The following import statis-

tics are also available: 7) salted refrigerated salmon (all species), 8) hard salted salmon roe (fully ripe egg masses), and 9) salted granular salmon roe. In addition, Japan imports frozen hard salmon roe (10). Frozen salmon roe is not recorded in customs statistics as a separate product. However, media publications say that customs records frozen salmon roe as "frozen roe of other fish", equating it to imports of "frozen salmon roe."³

In addition to Pacific salmon products, records show that the following species were imported from Russia in certain years: 11) frozen trout, 12) Atlantic salmon, 13) trout (fresh and refrigerated), 14) other frozen salmon, 15) Pacific salmon / Atlantic salmon / taimen (fresh/refrigerated), 16) smoked Pacific salmon / Atlantic salmon, including fillets, and 17) salmon: whole/chunks (not canned).

³ Special import statistics exist for pollock and herring roe. Aside from the roe of these species, only salmon roe is imported from Russia as a frozen product. As no special records of imported frozen salmon roe are kept, the category "frozen roe of other fish" includes salmon roe, and especially pink salmon roe, with regard to imports from Russia.

4.2.2. The volume and cost of Japanese salmon imports from Russia. Dynamics of import volumes and prices

Although the list of salmon products bought from Russia is extensive, frozen products, in particular frozen sockeye, make up the bulk of all imports. Most of the sockeye breed in the waters of Kamchatka. Import dynamics of frozen sockeye are depicted in figure 12. The long-term trends suggest an increase in volume, a decrease in average prices, and an increasing total import value.

In the 2000s, import volumes of frozen sockeye ranged between 16.3 and 24.8 thousand tons per year. The import dates show certain "lagging" behind the fishing seasons; in other words, the import dates do not entirely correspond to the years/months of fishing. For example, fish harvested in 2005 were imported through May 2006. The first catches from Russian drift-net fishing vessels are delivered in May and June. Overlap between previous-year products and the current-year harvests may occur during these months. Additionally, customs statistics draw no distinction between the products of coastal fishing and those of drift-net fishing. Most products imported from Russia belong to the former.

In recent years, the average annual price for sockeye imported from Russia has ranged between JPY 585 per kg (USD 4.9) per kg (2001) and JPY461 (USD3.9) per kg (2006). The lowest prices were recorded in 2005 and 2006, when import volumes were largest. In March 2006, the prices for Russian sockeye caught with drift nets in 2005 ranged between JPY680 (USD5.7) and JPY700 (USD5.9) per kg on the Tokyo wholesale market (data from Japanese customs statistics, Clarke, 2007). Sockeye salmon fished both in the eastern and western coastal areas of Kamchatka cost JPY510 (USD4.3) to JPY530 (USD4.5) per kg (Tsygir, 2007).

Imports of other frozen Pacific salmon ranged between 5 277 and 8 394 tons; prices averaged JPY142 (USD1.2) to JPY 355 (USD2.98) per kg.

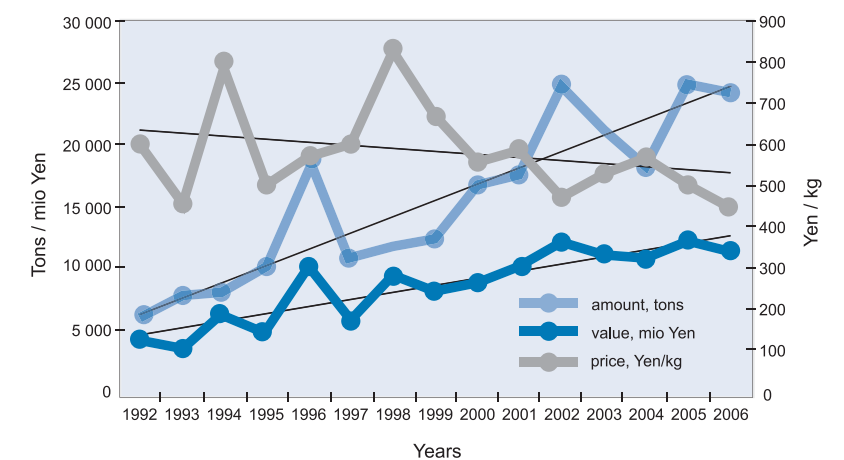


Figure 12. Dynamics of Japanese frozen sockeye imports from Russia (according to Japanese customs statistics).

It is impossible to deduce the volumes and prices of imported chum, pink, and chinook salmon from these figures. Import dynamics of other Pacific salmon species (besides sockeye and coho salmon) are shown in figure 13. The long-term trend suggests a decrease in import volume, increasing average prices, and stable total import value.

Fresh/refrigerated Pacific salmon exported from Russia to Japan are

products of drift-net fishing. According to import statistics, they were imported only four months a year (June through September) between 1992 and 2006. The amount of imported fresh/refrigerated salmon is fairly small; such products are not delivered every year (e.g., no import was recorded in 2005, 2004, or 2002). All told, only 2 120 tons of Russian fresh/refrigerated Pacific salmon have been imported by Japan since 1992.

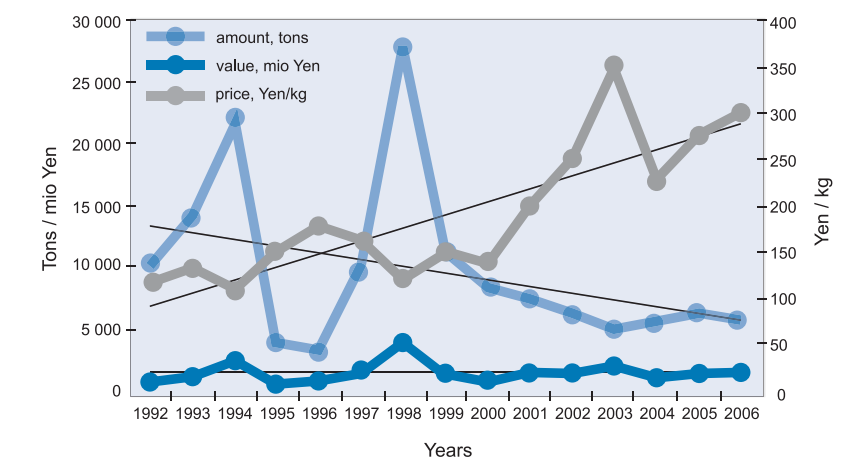


Figure 13. Dynamics of Japanese frozen salmon imports from Russia, excluding sockeye and coho salmon (According to Japanese customs statistics).

4.2.3. The supply of Russian salmon to Japan: Shipments direct from Russia and via the Republic of Korea

Russian fishermen harvest salmon in the coastal areas, at the river mouths and in the rivers, using both fixed gear and floating nets. Sockeye is virtually the only product of Russian coastal fishing in demand on the Japanese market. Since 1993, drift-net fishing of Pacific salmon has been conducted in Russia with the twin aims of monitoring and strategic forecasting of the salmon's approach to the coasts. Teams of Russian drift-net vessels are implementing the scientific programs of fisheries research institutions. Salmon caught during these marine investigations are of very high quality; most of them are subsequently exported to Japan. Products of Russian coastal fishing supplied to Japan, as well as these yields of Russian drift-net studies, are recorded in Japanese customs statistics as imports from Russia.

In addition to salmon harvested by Russians, salmon of Russian origin caught by Japanese fishermen are also delivered to Japan. The latter are harvested either in the 200-mile zone of Japanese territorial waters, or in Russia's EEZ. In Japanese waters, Japanese fishermen catch salmon of Russian origin with drift nets, in compliance with the Intergovernmental Agreement on Cooperation in Fisheries signed in 1985⁴. Japan pays compensation to Russia for such activities. A certain amount of Russian salmon is also fished in Japanese coastal areas. After the Convention for the Conservation of Anadromous Stocks in the North Pacific Ocean was signed in 1992, Japanese fishermen ceased to fish for salmon on the open sea. They do, however, catch salmon in the Russian EEZ on a commercial scale, in accordance with the 1985 agreement mentioned above.

According to the Customs Law of Japan (Custom Law, 1954), "import"

denotes transfer of the goods to Japan from abroad (including seafood harvested by any foreign vessel on the open sea) and goods approved for export from Japan, having undergone the relevant customs procedures. The fundamental criterion for "imports," with regard to seafood, is that they be harvested by a foreign vessel. If seafood is harvested by a Japanese vessel, even in the open sea, it is considered "local goods" and its transfer to Japan is not considered an "import". Thus, salmon harvested by Japanese vessels outside of Japanese waters and subsequently shipped to Japan are not considered imported products. In NPAFC and FAO statistics, salmon harvested by Japanese drift-net vessels in the Russian EEZ are recorded as part of the Japanese catch.

At present, Russian fishermen harvest Russia's salmon both in the territorial and inner waters of the Russian Federation (within the customs territory), and in the EEZ, which is outside the customs territory. In compliance with Russian legislation, salmon may be harvested in Russian waters only with permits, and within allocated quotas. Fishing products are shipped outside the customs territory by means of customs declarations, drawn up at customs offices. Products may be shipped from Russian ports to Japanese ones by vessels flying the Russian flag or the flag of any other country. As it is impossible to verify the legality of all salmon products at customs offices, a certain amount of illegally harvested salmon is inevitably certified. This may be either salmon harvested over the permitted limits, or poached salmon (harvested without any permit).

With regard to coastal salmon fishing, there should be no problems certifying products and receiving

shipping documents in Russian ports. However, drift-net studies of Pacific salmon for the purposes of monitoring and strategic forecasting of the salmon approach nonetheless have been conducted in the Russian EEZ since 1993.

Salmon harvested during Russian drift-net monitoring studies are sold in Japan. According to Russian legislation, these vessels are not required to call at any Russian port prior to delivery of their products to Japan or any other foreign country. It is enough to simply fill in the Ship Cargo Declaration. However, this document is not recognized by Japanese authorities. According to Japanese legislation (the Law on Regulation of Fishing by the Foreign Persons, No.60, 14 July 1967), the import of seafood from foreign fishing vessels directly from the fishing areas is prohibited. A document confirming shipping from a foreign port is required for customs registration of imported seafood in Japan. Hence, Russian vessels delivering seafood to Japan need to attain such a document, either in a Russian port, or in the port of another country (e.g. The Republic of Korea). Call at a port requires additional money for fuel, paperwork (filling out immigration, customs, and other relevant documents), and time. Because of this, salmon fished by Russian drift nets have been delivered and are still delivered to Japan directly from fishing areas, either by the drift-net fishing vessels, or by cargo ships.

Up until 1 April 2002, Russian fishing vessels produced false port clearances (PC) confirming shipment through a foreign⁵ port, as required by Japanese customs. False documents were manufactured either on board the vessels themselves, or in Japanese ports.

Protracted Russian-Japanese consultations have been held on various levels, on the importance of the joint struggle against poaching and seafood smuggling. As a result of these consultations, along with certain political events that occurred in Japan in 2001-2002, Japanese authorities began rejecting so-called "port clearances" from fishing vessels flying the Russian flag, beginning on 1 April 2002. Russian owners of these fishing vessels were unaware of the forthcoming changes in early 2002. The problem was solved promptly: false port clearances were replaced with false cargo declarations. Moreover, in the Japanese interpretation, the agreement does not affect transport vessels that have no fishing equipment on board. Such vessels have been used in recent years to ship seafood, including salmon products from Russian drift-net fishing, from Russian to Japanese ports.

The term "smuggling" was used in the Russian-Japanese consultations mentioned above, because illegal shipment of seafood to foreign ports is often referred to as such. However, the term "smuggling"⁶ implies the crossing of state or customs borders. With regard to marine areas, this corresponds to the 12-mile zone of Russian territorial waters. That is

why any fish harvested (even illegally) outside the Russian territorial waters cannot be formally considered "smuggled" goods, just as the shipment of seafood to foreign ports without crossing the Russian border is not smuggling.

Japanese authorities do not verify the authenticity of documents produced by vessels delivering seafood, so the forgeries are very commonly used. Until 2002, Japanese ports harbored many vessels conducting illegal fishing in Russian waters. The overwhelming majority of Russian crab-fishing vessels were supplied, repaired, and refitted in Japanese ports, and avoid calling at Russian ports for years on end. Many vessels were even unable to call at Russian ports, because they no longer met the standards for registration. The ship owners were reluctant to incur additional expenses by calling at Russian ports.

In the late 1990s and in 2000, Hokkaido also harbored several drift-net vessels, which harvested salmon in the Russian EEZ, as well as in the open waters of the Pacific Ocean (the NPAFC Convention area). Harvested salmon were delivered to Japan. Those vessels carried documents that allowed them to fly the flags of third-party countries. To conceal their illegal activities, such

vessels also carried false documents identifying them as other, Russian-flagged drift-net vessels. Russian documents were used in Russian waters; while calling at the Japanese ports, the ships produced either Russian documents, or documents that permitted them to fly other countries' flags. In some cases, such vessels were detained, both in open waters by the US coastguard and in the Russian EEZ by the Russian Federal Frontier Guards (e.g., the Albatros 101 case⁷).

The 1982 UN Convention on Maritime Law (Article 92, p. 2) reads: "A ship which sails under the flags of two or more States, using them according to convenience, may not claim any of the nationalities in question with respect to any State, and may be equated to a ship without nationality".

This provision is no longer practiced. This is in part, because Japanese authorities no longer support such vessels, since Japanese support for those conducting illegal drift-net fishing was made public. Additionally, these waters are patrolled by NPAFC parties (on the open seas) and the Russian Federal Frontier Guards (in Russian territorial waters).

⁶ Smuggling - 1) concealed transportation of prohibited or declarable goods across state borders; 2) smuggled goods - commodities and goods transported in this way (Efremova, 2001). According to the Criminal Code of the Russian Federation (Article 188, Part 1), smuggling is the transportation of commodities and other articles across the Russian Federation's state border, avoiding customs control or concealing goods from it.

⁷ Sem' Dney [Seven Days], 24 February 2001 (http://www.segodnya.ru/w3s.nsf/Archive/2001_43_news_text_lenc1.html); newsru.com, 22 February 2001 (<http://www.newsru.com/arch/russia/22feb2001/albatros2.html>).

⁴ Before, fisherman engaged in long-line fishing as well.

⁵ With regard to Japan.

4.2.4. Imports of Russian Pacific salmon by the Republic of Korea

The Republic of Korea imports small amounts of frozen Pacific salmon from Russia. Statistics have used the categories "frozen Pacific salmon" (through 2001, with no species indicated), "frozen sockeye salmon" (recorded separately since 2002), and "other frozen Pacific salmon" (since 2002). The greatest volumes of Pacific salmon were imported in 2000 and 2001 (1.8 to 3.2 thousands tons); prices averaged USD 0.96-1.38 per kg. In subsequent years, sockeye and other Pacific salmon were imported in small amounts, for prices averaging USD 3.16-3.69 per kg. No Pacific salmon were imported from Russia in 2005.

The absence of a given seafood item in South Korean import statistics

does not mean that the item has not passed through South Korean ports. For example, if seafood is shipped in containers from Russian ports to Japan, it is transferred through Korea. If seafood from the Russian EEZ is delivered to Korea by cargo ships or fishing vessels en route to Japan, they are transferred in South Korean ports (usually in Pusan) without any customs certification. In such cases, transit freight is omitted from Korean customs statistics (Tsygir, 2007). Russian products shipped to Japan via the Republic of Korea, and not certified by Korean customs, are recorded in Japan as imports from Russia. If Russian products were to be certified by Korean customs, and subsequently exported to Japan, they

are recorded in Japanese customs statistics as imports from the Republic of Korea.

According to Japanese import statistics, negligible volumes of salmon products are imported from Korea. There is no need to ship products from the Russian EEZ, and destined for the Japanese market, through South Korea. As mentioned above, these products are delivered from the EEZ of Russia directly to Japanese ports by "transport" ships.

All salmon products of coastal fishing, as well as those harvested in the EEZ and shipped to Japan, are recorded there as "imports from Russia".

4.2.5. Imports of Russian Pacific salmon by the People's Republic of China

The volume of Russian Pacific salmon imported by the People's Republic of China has increased considerably in recent years. Most of the imported products are inexpensive, such as frozen pink and chum salmon (proportions by species are unknown, as they are recorded together); 40.4 thousand tons of frozen salmon were imported in 2005, and around 49 thousand tons were imported in 2006. Average prices increased to USD1.92

per kg in 2006 (compared to USD1.66 per kg in 2005), which can be attributed to a greater proportion of chum and coho salmon. Sockeye imports are recorded separately; China imported 600 tons of frozen sockeye products in 2005, and 860 tons in 2006. China imports lower-quality sockeye products than Japan. Prices for sockeye averaged USD1.87 per kg in 2006, and USD1.49 per kg in 2005. It should be noted, that sockeye

prices are lower than those of other Pacific salmon species. This may indicate that salmon of other species (e.g. coho salmon) were imported under the name "sockeye," or that the products were of low quality. In terms of raw weight (with a coefficient of 1.33, see Methods), China imported around 54.5 thousand tons of Pacific salmon from Russia in 2005, and 66.0 thousand tons in 2006 (Tsygir, 2007).

4.2.6. Exports of Russian sockeye salmon, compared to the total yield of the species in Russia

The raw weight of Pacific salmon of all species, processed into frozen products for Japan, China, and South Korea, totaled around 107 thousand tons in 2006, and 97 thou-

sand tons in 2005.

Foreign import statistics suggest volumes of sockeye significantly larger than the recorded Russian sockeye catch. Foreign imports of

sockeye and coho salmon are compared with the recorded coastal and drift-net catch in Table 2.

Table 2. Comparison of sockeye and coho salmon imports from Russia in 1998 through 2006 with catch data, in tons

Year	Product	Import from Russia		Catch in Russia			Overall import of raw fish	Import, raw fish minus the recorded catch
		Japan	PRC	Republic of Korea	Coastal (after TINRO-Centre)	Russian marine drift studies		
1998	Sockeye salmon (fresh/refrigerated)	25					33	
1998	Sockeye salmon (frozen)	11 412					15 177	
1998	Sockeye salmon (TOTAL)	11 437			10 135	2 480	12 615	2 596
1998	Coho salmon (frozen)	1 261			1 697	492	2 189	1 677
1999	Sockeye salmon (frozen)	12 186			12 276	2 787	15 063	16 207
1999	Coho salmon (frozen)	1 460			1 348	223	1 571	1 942
2000	Sockeye salmon (frozen)	16 354			15 127	3 227	18 354	21 751
2000	Coho salmon (frozen)	1 195			1 796	303	2 099	1 589
2001	Sockeye salmon (fresh/refrigerated)	3					4	
2001	Sockeye salmon (frozen)	17 489					23 260	
2001	Sockeye salmon (TOTAL)	17 492			18 102	4 062	22 164	23 264
2001	Coho salmon (frozen)	1 137			1 776	249	2 025	1 512
2002	Sockeye salmon (frozen)	24 562		62	24 797	3 335	28 132	32 750
2002	Coho salmon (frozen)	614			1 729	221	1 950	817
2003	Sockeye salmon (frozen)	20 892		13	17 692	3 676	21 368	27 804
2003	Coho salmon (frozen)	1 074			1 364	385	1 749	1 428
2004	Sockeye salmon (frozen)	18 827		52	16 342	2 877	19 219	25 109
2004	Coho salmon (frozen)	871			1 516	717	2 233	1 158
2005	Sockeye salmon (frozen)	24 759	601		19 818	4 167	23 985	33 729
2005	Coho salmon (frozen)	1 080	860		872	381	1 253	1 436
2006	Sockeye salmon (frozen)	24 649			24 925	4 293	29 218	33 927
2006	Coho salmon (frozen)	632			1 454	251	1 705	841

5 Evaluation of the Domestic Market

Foreign Imports of Salmon from Russia

In terms of total raw fish (assuming that 75% of this total are frozen - see methods), the sockeye catch supplied to Japan totaled 22-33 thousand tons per calendar year in the 2000s⁸ (table 2). The volume of Japanese raw fish imports alone (not including fish supplied to the Russian market) exceeded the total recorded coastal and drift-net catch of Russia. In 2005, a record volume of Russian sockeye (24.8 thousand tons) was imported by Japan. This amounts to at least 33 thousand tons of raw fish. This exceeded the 2002 total only slightly; nearly the same amount of fish was delivered to Japan in that year. However, the recorded sockeye catch in 2002 was 28.1 thousand tons, whereas only 24 thousand tons (4.1 thousand tons less) were harvested in 2005. Thus, the amount by which Japanese sockeye imports exceeded the official catch was greatest in 2005, totaling 9.7 thousand excess tons. The actual sockeye catch was even larger, as some sockeye products entered the Russian domestic market (see part 5).

Figure 14 clearly illustrates that sockeye imports by Japan, China, and South Korea (according to data provided by these countries) significantly exceed both the total Russian export of frozen sockeye (by 27 % on average)

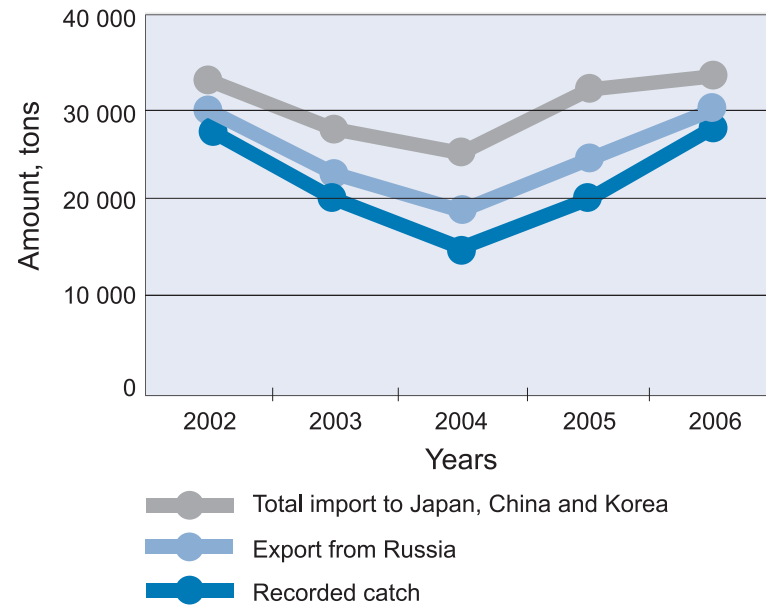


Figure 14. Comparison of the volumes of Russian raw fish exports, raw fish imports by East Asian countries, and the recorded catch of sockeye salmon in the years for which the full data set is available.

and the recorded sockeye catch (by 20 % on average).

From 1995 to 2006⁹, overall Japanese and Korean imports of sockeye salmon from Russia, calculated in terms of raw fish weight, exceed the recorded catch of the species by more than 40 thousand tons (Table 2).

The volume of Japanese frozen coho imports from Russia ranged between 600 and 1200 tons in the 2000s, and prices averaged JPY207-276 (USD1.7-2.3) per kg. In terms of raw fish, the amount of coho imported by Japan exceeded the recorded catch in 2005 and 1999.

⁸ In recent years, there has been an increase in the output of gutted and headless frozen sockeye salmon, which constituted less than 75% of the total. However, the relative share of these products is unknown, so we made no changes to the conversion factor. Therefore, the actual weight of raw fish used for processing exceeds data presented in Table 2.

⁹ Including 11 months of 2006.

The fish market is likely the least "transparent" of all Russian markets. Although a great variety of fish products are available for purchase, no comprehensive investigations into trade volumes, stakeholders, supply and demand, or proportions of imported vs. domestic products have ever been conducted.

Russian fish companies are reluctant to disclose both production and trade volumes. No reliable data on the number of fish companies operating on the Russian fish market are available. The number of such companies may reach hundreds or even thousands. Since companies do not dis-

close actual production and trade volumes, it is equally difficult to identify industry leaders.

Considering all of the above, assessment of the domestic market is an extremely difficult task. While collected data are often contradictory, they still characterize the general situation and reflect the state and tendencies of the salmon market.

During our sociological survey, fishing industry representatives and fishermen of Kamchatka (150 respondents in all) were asked about the countries that import salmon, and the percentage of salmon products that remain in Russia. Answers from both

respondent groups appear to be consistent. Most sockeye salmon are exported to Japan (70% and 75%, estimated by industry representatives and fishermen, respectively). South Korea accounts for 20% of sockeye imports and negligible amounts of pink, coho, and chum salmon. The same volumes of those species are supplied to China. Fishing industry representatives state that 10% of pink salmon and 35% of chinook salmon are exported to Japan. The fishermen, on the other hand, are convinced that all chinook salmon and 99% of pink salmon enter the domestic market (see table 3).

Table 3. Results of the survey on the domestic and international distribution of Russian salmon products

To which countries do your companies distribute their products (by percent)?	Russian domestic market	Japan	China	South Korea
Industry representatives (58 respondents)				
Sockeye salmon	10 %	70 %	2 %	20 %
Pink salmon	85 %	10 %	1 %	3 %
Chum salmon	97 %	2 %		
Coho salmon	99 %			1 %
Chinook salmon	55 %	35 %		10 %
Fishermen (43 respondents)				
Sockeye salmon	5 %	75 %		20 %
Pink salmon	99 %		0,5 %	0,5 %
Chum salmon	98 %		1,5 %	0,5 %
Coho salmon	100 %			
Chinook salmon	100 %			

Analyzing the answers of our respondents (see table 3) and official catch statistics (see table 1), we can deduce the following figures: According to results of the questionnaire and recorded catch figures, 219 to 246 thousand tons of Pacific salmon must have entered the Russian domestic market in 2006. At this point, it is worth mentioning that in 2006, the recorded catch was 273 thousand tons

(table 1, part 3) and the overall export of raw fish totaled around 90 thousand tons (part 4). In other words, no more than 183 thousand tons of the Pacific salmon entered the domestic market.

In order to assess the salmon and roe trade in the Moscow market, the RBTL Communication Group conducted an audit of sales outlets (see methods), under the auspices of this project.

The results of the audit showed that the monthly trade of salmon products in Moscow grocery chains amounted to 1 647 tons (USD 22.3 million) (see table 4), 52% of which were frozen fish (854 tons). Pacific salmon (pink, chum, sockeye, and coho) comprised 28% (470 tons) of this total.

Table 4. Retail sales of salmon in Moscow grocery chain in September 2007, based on market surveys. In tons (net weight)

Species	Canned fish	Frozen fish	Refrigerated fish	Salted fish	Smoked fish	TOTAL
Pink salmon	158	72	–	6	11	247
Chum salmon	5	169	–	7	4	185
Sockeye salmon	27	8	–	2	1	37
Coho salmon	1	–	–	1	–	2
Subtotal: Pacific salmon	191	249	-	16	15	470
Pacific salmon, as a percent of the whole	87%	29%	0%	11%	32%	28%
Farmed Atlantic salmon	–	349	209	61	16	633
Trout	29	256	180	62	16	543
Total	220	854	389	139	46	1 647

Based on the estimate of RBTL (see assumptions and limitations of this estimate below), the volume of the entire Moscow salmon market was [103.5 thousand tons \(USD 1412 million\)](#) in 2007.

This estimate is based on the following assumptions:

Monthly trade volumes remain almost consistent throughout the year, except for the peak season in December and January, when the trade volume is twice as large.

30% of salmon on the Moscow market was sold in chain groceries (*this figure comes from computer simulations, based on the data of the EIU, RSM, and "Norge-Fish" consulting companies, as well as expert evaluation of the salmon roe market based on data provided by "Russkoe More"*).

Around 25% of all salmon sold is sold at stands in the marketplace and in small stores, not affiliated with any chain (*this figure comes from mathematical modeling, based on expert evaluation by the "Russkoe More" Company*¹⁰).

If Pacific salmon constitute 28% of all salmon sold (see above), approximate annual sales of Pacific salmon on the Moscow market amount to [29 thousand tons](#).

This is likely an underestimate, as data provided by the statistics department indicate that 12 thousand tons of sockeye salmon products entered Moscow's city and regional markets in 2005 (Anon., 2007), and sockeye salmon account for a much smaller share of the domestic market than pink or chum salmon (see Table 4).

Using this figure of 29 thousand tons as the annual input to the Moscow market, let us evaluate the Russian Pacific salmon market. We failed to find any coefficient that could be used for such an extrapolation from published sources, so these figures are based on a survey of the Russian processed fish market, conducted by Agriconsult Joint-Stock Company, in cooperation with the Regional Economic Development Agency¹¹. Dividing the volume of the Russian market (1509 thousand tons) by the volume of the

Moscow market (135 thousand tons) yields a coefficient of 11. Making no pretence for accurate calculations, we multiplied 29 by 11 and estimated the approximate [annual volume of the Russian Pacific salmon market at 319 thousand tons](#).

The volume of the Moscow salmon roe market sold in chain stores amounted to [32 tons \(USD 2.5 million\)](#), with an average price of [RUR 1923 \(USD 76.9\) per kg](#).

The monthly volume of salted and smoked salmon products sold in grocery chains in the Moscow market totals 186 tons; prices average RUR 616 (USD 24.6) per kg (see table 5). Trout and farmed Atlantic salmon account for 84% (154.4 tons) of this total, or 43 % and 41 %, respectively. Weighted mean prices were RUR 697 (USD 27.9) per kg of trout and RUR 673 (USD 26.9) per kg of farmed Atlantic salmon. Other salmon species (pink salmon, chum, sockeye, coho, and chinook salmon) comprise no more than 16% of the market (31.4 tons).

Table 5. Retail sales of salted and smoked salmon products in Moscow grocery chains in September 2007, and average prices per kg.

Species	Amount, tons	Price, RUR/kg
Trout	77,5	697
Farmed Atlantic salmon	76,9	673
Pink salmon	17,0	226
Chum salmon	10,6	341
Sockeye salmon	2,5	356
Coho salmon	0,8	277
Unidentified species of Far-Eastern salmon	0,4	205
Chinook salmon	0,1	555
Total	185,9	616

The monthly volume of frozen salmon products sold in Moscow's grocery chains totaled 853 tons; prices averaged RUR 294 (USD 11.8) per kg (see table 6). Trout and farmed Atlantic salmon comprised 70% (604.7 tons) of this total, or 41 % and 30 %, respectively. Weighted mean prices were RUR 335 (USD 13.4) per kg for trout and 330 RUR (USD 13.2) per kg for farmed Atlantic salmon. Other salmon species (pink salmon, chum, sockeye, coho, and chinook salmon) comprise no more than 29% of the market (249 tons).



Shipping to Japan and the South Korea by sea is almost three times cheaper than shipping by train to central Russia. According to a Rosrybolovstvo representative¹², transportation of fish products from the Far East to European Russia is "too expensive for fishing companies;

transportation costs exceed 50% of the final values of the products". In addition, Japanese and Korean companies pay Russian fishermen in advance for fish that have yet to be harvested.

As a result, Russia's central and even far eastern regions import Norwegian salmon, bred in captivity.

Table 6. Retail sales of frozen salmon products in Moscow grocery chains in September 2007, and average prices per kg.

Species	Amount, tons	Price, RUR/kg
Farmed Atlantic salmon	348,5	330
Trout	256,2	335
Chum salmon	169,4	206
Pink salmon	71,7	182
Sockeye salmon	7,8	226
Total	185,9	616

The monthly volume of canned salmon sold in Moscow's grocery chains totaled 220 tons; prices averaged RUR 175 (USD 7) per kg (see table 7). Pink salmon accounted for 73% of the total (158 tons), and the weighted mean price was RUR 129 (USD 5.2) per kg. The most valuable salmon species, such as sockeye and coho salmon, only constituted around 13% of the canned fish market.

Table 7. Retail sales of canned fish in Moscow grocery chains in September 2007, and average prices per kg.

Species	Amount, tons	Price, RUR/kg
Pink salmon	158	129
Trout	29	337
Sockeye salmon	27	258
Chum salmon	5	250
Coho salmon	1	165
Total	220	175

According to RBTL data, Norwegian salmon comprise more than 70% of the Moscow fish market (see evidence in tables 5 and 6).

The Russian Federation imported a total of 74 527 tons of frozen and refrigerated farmed Atlantic salmon and trout in 2006 (M_INFO data). This was 4% less than in 2005 (77 818 tons).

¹⁰ SmartMoney ; 09.07.2007 ; 25 (66) , Small and big fish, grow [rasti rybka, bol'shaya i malenkaya]
¹¹ A processed fish market (<http://www.agricons.spb.ru/services/33-agroinform/fish-market.htm>)

¹² Gudok; 21.09.2006, No more legal sturgeon caviar (<http://www.gudok.ru/index.php/print/40073>)

6 Violations of Fishing Legislation and Poaching in the Far East

Evaluation of the Domestic Market

According to calculations by ACNielsen Company and RBTL data, the volume of the Russian market for salted and mildly-cured salmon specialties was approximately 20 thousand tons (USD 409 million) in 2006. Russkoe More, ASTO, ROK-1, and Severnaya Kompaniya are the leading companies in the Russian specialty salmon market.

Based on various data, annual volumes of roe production, including illegal production, in the territory of the Russian Federation reach 11-26 thousand tons. According to NP Consulting¹³, the volume of roe production is 11 to 18 thousand tons; 8 to 12 thousand tons of which are produced legally (6-8 tons are prepackaged and 2-3 tons are sold by weight)

and about 3-6 thousand tons are produced illegally, and processed with non-industrial methods.

Rosrybolovstvo data indicate that fish processing plants in Sakhalin, Kamchatka, Primorskiy and Khabarovskiy krais, and Magadan oblast processed more than 26 thousand tons of salmon roe in 2006¹⁴. These data also suggest that more than 50% of this roe was exported, mainly to Japan and South Korea. However, import statistics of these countries, as well as Russian export statistics (M_INFO data), provide no evidence for this. Only one import to Japan (1.3 thousand tons) was recorded in 2006.

According to Rosstat (Federal Statistics Service), the volume of

legally produced salmon roe was approximately 5.5 thousand tons in 2005. However, as shown below, these figures are likely underestimates.

Based on calculations from ACNielsen Company, the volume of Russian salmon roe retail ranged between 3.9 and 7.2 thousand tons (USD 187 and 345 million, respectively) in 2006.

Roe production, if calculated from the estimated volume of the Russian market and available export data, should not exceed 10.3 thousand tons (see table 8), which contradicts Rosrybolovstvo data. However, this figure matches other evaluations of the roe market.

The Far East region is characterized by large-scale illegal fishing. Poaching has become commercial there, a kind of "economy inside the economy", governed by its own rules. Tens of thousands of people are involved in this business; enforcement agencies record thousands of violations, but only hundreds are taken to trial, and of those only dozens receive actual sentences. Even if the violators are caught in the act, and investigations are conducted successfully, the poachers are usually fined negligible sums, and the sentence suspended (see text box 1 and 2).

Official sources name two main reasons for the inefficiency of efforts against poaching. The first is poor logistics and insufficient funding of bodies engaged in fish protection; the second is overly permissive legislation.

The annual illegal catch of salmon in Kamchatka averaged 55 thousand tons from 2002-2006 (Zaporozhets et al., 2007, 2008). According to alternative data, up to 100 thousand tons¹⁵ of salmon are poached annually on Kamchatka, mostly with the aim of roe extraction (the rest of the fish is often discarded) (Zaporozhets et al., 2007). Environmentalists estimate illegal roe production in Kamchatka in 2005 at 2.5 thousand tons¹⁶.

According to Sergey Osipov, Vice-Governor of Sakhalin Oblast, the situation on Sakhalin is the same: an estimated 80 thousand tons¹⁷ of salmon are illegally fished there each year.

Between January 1st and November 1st, 2006, the Department of Protection, Use, and Restoration of Aquatic Biological Resources and their Habitats revealed 4 711 violations and arrested 4 633 violators.

Fines totaling 3 185.2 thousand rubles were imposed and 2 102.2 thousand rubles were collected, (66 % of all imposed fines).

Damages were assessed at 64 535.5 thousand rubles, and 487.9 thousand rubles were collected (0.7 % of the assessed damages).

The Department, in response to administrative malfeasance, confiscated 690.2 tons of aquatic biological resources in 2006, including 668.4 tons of fish products and 21.8 tons of salmon roe. (Anon., 2007).

Table 8. Calculated production volumes of salmon roe in the Russian Federation (data from ROSSTAT, Rosrybolovstvo and RBTL)

	Net weight, tons	
	min	max
Volume of the Russian salmon roe market in 2006	3 900	7 200
Roe exports from the Russian Federation to Japan in 2005	3 100	
Roe production in the Russian Federation (calculated)	7 000	10 300



A kilogram of salmon roe, bought wholesale from the Far East, costs trading companies RUR 600-700. Illegally produced roe costs RUR 500 per kg on the market. That said, demand for roe in Russia is not only stable, but constantly increasing (Zaporozhets, Zaporozhets, 2007). For the most part, trading companies and processing firms in Siberia and central Russia purchase the roe. It is usually sold in shipments of 1-20

tons. During the fishing season, buyers prefer to purchase salted roe, because if the roe is frozen in the ovaries, a large part of the product is wasted in processing.

Those who partake in the roe market regard it as anarchic and unregulated. It is characterized by a great number of middlemen. Resale of so-called "red gold" (salmon roe) is a very profitable business. Unlike fish, relatively small shipments of roe do

not require large refrigerating units, and are transported from Sakhalin and Kamchatka by air in thermos bags. Such cargo can be "made legal" much easier. The main task is to transport the roe from the Far East. The price for a kilogram of roe shipped to Moscow is not RUR 700 (USD 28), but RUR 1 200 to 1 500 (USD 48-60). Moscow businessmen use the difficulty of shipment to justify the twofold price increase.



The press service of the Far Eastern Division of the Russian Ministry of Internal Affairs reported, that 58.4 tons of salmon roe, valued at 24 million rubles, and 445.3 tons of salmon, valued at 15.1 million rubles, were confiscated from illegal dealers on the territory of the Federal Okrug between May and October¹⁸ 2005. This was a result of the "Putina-2005" campaign.

Since the beginning of "Putina-2006" campaign¹⁹, enforcement agency officers have confiscated more than 1092 tons of salmon and 105 tons of salmon roe. In addition to this sum, agents confiscated a large shipment (18 tons²⁰) of salmon roe on November 2nd, 2006.

¹⁵ Reuters, Category: Criminal. 28 June 2007

¹⁶ Chestnyi Detectiv. "Golden" Fish Eggs. 1 December 2005

¹⁷ ITAR-TASS, 20.09.2005

¹⁸ Source: Russian Hunters' Newspaper; 26.10.2005; 44 (588)

¹⁹ Source: Regions.Ru / Russia. Regions; 11.10.2006

²⁰ Source: WebDigest.RU; 02.11.2006

¹³ Trade News and Technology (TorgRus.com); 05.03.2007, Prices for salmon caviar increased by 40%

¹⁴ Gudok; 21.09.2006, No more legal sturgeon caviar (<http://www.gudok.ru/index.php/print/40073>)

ILLEGAL COMMERCIAL FISHING

At present, Russia is the only country where drift-net fishing is conducted by vessels of a foreign state (Japan). The reasons for this are as follows: On December 20th, 1991, the UN General Assembly adopted resolution No.46/225, which banned drift-net fishing in open waters. On February 11th, 1992, Russia, the USA, Canada, and Japan signed the Convention for the Conservation of Anadromous Stocks in the North Pacific Ocean. After that, Japanese fishermen ceased to fish on the open sea, and began commercially harvesting salmon of Russian origin only in the Russian EEZ, and in the 200-mile zone of Japanese territorial waters on a compensatory basis, within quotas and other restrictions (the number of the vessels, areas, and fishing seasons). Such restrictions were established by a Russian delegation, during the annual sessions of the Russian-Japanese Joint Fishery Commission. Japan signed the Convention, which granted them a guarantee from Russia that commercial fishing in the Russian EEZ could continue. Japan took responsibility for cooperation in restoring the salmon stock in the territory of the Russian Federation.

It is noteworthy, that only the right to fish in the Russian EEZ is sold, not the fish itself. This is much more profitable than harvesting and producing a final product, as fishing, processing, and transportation costs are avoided. Japanese vessels primarily select the most valuable species of fish, such as sockeye, chinook, and coho.

It should be mentioned, that the Japanese quota for fishing in Russian waters has been considerably reduced since 1999. However, the problem was not solved, due to a simultaneous increase in activity by

the Russian drift fleet, using drift nets for scientific purposes. At first, less than one thousand tons of salmon were caught for these purposes per season²¹. In 2000, the scientific quota had increased to 6.4 thousand tons. Russian drift-net fishing for "monitoring" purposes has recently become a large-scale business; its yields considerably exceed those required for scientific purposes (Spiridonov, Nikolaeva, 2004).

As mentioned above, sockeye, chinook, and coho salmon are the most valuable targets of drift-net fishing. This is why both foreign and Russian fishing vessels often exceed quotas for those particular species and record them as less expensive pink and chum salmon. Although inspectors are always present on drift vessels, companies clearly have the means to involve them in these activities, or divert their attention elsewhere.

It is no wonder, that the amount of frozen sockeye imported by Japan clearly exceeds the recorded catch of the species.

Naturally, not only sockeye salmon, but also other salmon species are harvested in excess of allocated quotas. According to questionnaire data (with 43 fishermen participating), fishermen caught 1.5-2.5 times their quotas in 2005. A certain amount of illegally harvested fish is salted, smoked, and used for production of canned fish, and in turn shipped by air, ground and sea. Extraction of roe from illegally harvested fish is the most profitable business, as roe is ten times more valuable than fish.

In our sociological survey, 68% of fishermen and 76% of inspectors noted that the fish is harvested in excess of quotas. Inspectors identified "corruption in controlling bodies", "increased demand from fish processing companies", and "inadequate punishment" as the main reasons. The fishermen also consider corruption the major cause. According to representatives from the

During control operations undertaken by the Kamchatka State Sea Inspection in the Petropavlovsk-Komandorskaya subzone on 9 July 2006, the cargo ship "Zolotistyi," belonging to the "Unichekl" company, was intercepted. It had around 79.3 tons of salmon products on board. According to daily ship logs and data from control devices, the products were transferred in the Petropavlovsk-Komandorskaya and Karaginskaya subzones from the ship "Algazeya," leased by the "National Fish Resources" Federal Unitary Enterprise, and owned by the "Tunaicha" Company Ltd. Ministerial inquiries into the case were carried out in accordance with the Code of Administrative Infringements of the Russian Federation, Article 8.17, Part 2. The damage inflicted on the aquatic biological system was estimated at 32 million rubles. However, Rosrybolovstvo took no measures to exclude "National Fish Resources" Federal Unitary Enterprise from planned research programs.

fish industry, one of the main reasons is the "low legal incomes".

In the current circumstances in Kamchatka, the different respondents understood the concept of poaching in different ways. According to the fish industry representatives and fishermen, poaching is, first and foremost, fishing in excess of quotas and in prohibited areas. More so than the fisherman, industry representatives consider substitution of fish, concealment of the catch, and misrepresentation of yields in documents serious issues.

70% of fish industry representatives disapprove of fishing in excess of quotas and in prohibited areas, compared with 51% of fishermen. Fishermen demonstrated better understanding of these problems (24%), than industry representatives

(5%). In the opinion of fishermen, fishing in excess of the quotas is the most serious threat to the salmon population (73%). It is followed by fishing in prohibited areas (59%) and fishing without permits (39%). Inspectors shared these opinions.

It is worth noting, that 66% of fishermen consider poaching a threat to the salmon population, 34% had difficulty answering, and nobody answered "no".

In the opinion of inspectors, the percentages by which species were overfished were large in 2005 and 2006. This figure was largest for chum (183% and 193% in 2005 and 2006, respectively), coho (170% and 185%), pink salmon (153% and 133%), and chinook salmon (126% and 133%). In 2006, the percentage of cherry salmon in excess of the quota noticeably increased from 2% to 10% (see table 9).

The recent practice of keeping several sets of documents aboard Russian fishing vessels (different names, ports of registration, ship owners, etc.) has become widespread. Such vessels are fishing in the Russian EEZ under various names and in various fishing areas.

Registration of ships with forged documents in Russian ports is another widespread violation. Such vessels acquire all the same rights and quotas for fishing of aquatic biological resources as Russian vessels and their owners. The ships, however, are managed by Japanese companies and retain their legal obligation to be returned to their actual owners.

The use of twin ships by one and the same company is also practiced.

Table 9. Fishing of Pacific salmon in excess of the limits (% over the quota) (Expert estimates from 49 officers of the Fish Protection Inspection of Kamchatka)

Species	2005 r.	2006 r.
Sockeye salmon	101 %	99 %
Pink salmon	153 %	133 %
Cherry salmon	2 %	10 %
Chum salmon	183 %	193 %
Coho salmon	170 %	185 %
Chinook salmon	126 %	133 %

According to information provided by the Kamchatka State Fish Inspection of the North-East division of the coast guard, the following violations of fishing regulations by fishery companies were discovered in the fishing periods of 2005 and 2006. In 2005, the catch of the "Okean Produkt" Co., Ltd exceeded the fishing quota for Pacific salmon by 10 tons; "Rybolovetskaya Artel" Co., Ltd procured raw fish without weighing; and "Vostochnyi Bereg" Co., Ltd violated the conditions of their allocated permit for fishing sockeye, exceeding the limits by 4.9 tons. In 2006, the catch of the "Alukinskoe" Co., Ltd exceeded the commercial quota for fishing of chum and chinook salmon with fixed nets by 1.3 tons. Fines totaling 397 thousand rubles were imposed, and 233 thousand rubles were collected. Thus, in 2005 and 2006, the Department did not fully exercise its ability to rescind permits for Pacific salmon fishing in cases of overfishing.

Fishing is carried out by two vessels with the same names, board numbers, etc.

The introduced system of ABR monitoring, and observation and control over the activities of fishing vessels with GPS, could be considered effective with regard to most foreign fishing vessels. However, this system failed to produce positive results with regard to actual Russian and Japanese poachers.

Despite widely held opinion, poaching inflicts the greatest damage on

the interests of fisheries industry (i.e. fishermen), rather than on the state. Fisherman can be divided into honest and dishonest camps. The former, usually larger fishing companies, operate in compliance with the law. They purchase the limits and pay taxes. The latter do nothing of the sort. Poachers not only undermine the resource base, but also suppress the market by low-balling prices, such that honest companies are forced to patrol fishing areas, in addition to the enforcement agencies.

²¹ The impact of fishing on the Pacific salmon population (<http://www.greenpeace.org/russia/ru/campaigns/660660/660700>)

POACHING ON THE RIVERS

Poachers inflict the greatest damage to salmon stocks during the approach to the spawning grounds. Salmon roe is virtually the only product of this type of illegal fishing. The fundamental reasons behind this type of poaching is deep economic depression in most of the regions where it is practiced, a lack of jobs, and the marginalization of local populations.

The degree of poaching in spawning areas has considerably increased compared to the 1950-1970s, due to enhanced economic incentives, greater access to the spawning grounds, fewer restrictions on the trade of salmon products, and frequent restructuring of fish protection agencies, which decreases their effectiveness. Even if the officially recorded number of breeders is equal to that recorded in the 1950-1970s, the actual number of spawning fish is lower (Sinyakov, 2004). The scope of the illegal harvest of Kamchatka salmon (excluding pink salmon) has increased particularly sharply over the last five years, after strategic regulation of fishing was abandoned. This increase in poaching is mainly due to fishing over the limits by authorized users (Zaporozhets et al., 2007, 2008).

The scale of poaching increased after Rosselkhozadzor (The Federal Veterinary and Phytosanitary Surveillance Service) became responsible for the protection of rivers in 2005 (see the chart in Appendix 3). Effectively, nobody is presently dealing with the issue of river protection. As it turns out, 270 thousand tons of fish were harvested legally, while no less than 150 thousand tons were poached (as noted in a Federal Fisheries Agency intercom conference devoted to Pacific

salmon fisheries, August 27th, 2006).

No precise evaluation of poaching on the rivers is available. The lack of such estimates, as well as a lack of information on the socio-economic role of poaching, are major reasons that the fight against poaching is ineffective.

During the fishing season, virtually every Kamchatka settlement turns into a poachers' camp. Both specially organized groups and locals are involved. The roe is procured on site by visiting dealers. For example, a Greenpeace helicopter survey in 2005 counted 21 teams of poachers along the Vorovskaya River (data of Greenpeace). Such illegal fishing is oriented first and foremost towards the extraction of roe, as it is the most expensive product. The fish carcasses are usually discarded. Poaching inflicts the greatest damage on the salmon populations of the Kamchatka, Bolshaya, and Avacha river basins. These areas are the closest to human settlements, and easily accessible to roe poachers.

According to some experts, up to 95% of breeders may be poached in those basins of Kamchatka's rivers and lakes, located near the roads. Survey data indicate that the catch of salmon by legal users in the lower reaches of the rivers, and in coastal areas, may exceed allocated quotas by a factor of 10 (Zaporozhets, 2007).

The actual scale of poaching can be assessed using volumes of shipped roe. According to official data, 2980 tons of salmon roe were shipped by plane from Kamchatka alone in 2001. Since the mass of the roe constitutes about 4% of the fish's total weight, it can be assumed that at least 74.5 thousand tons of fish were harvested to extract this roe²².

Monitoring at the Elizovo Airport, conducted under the auspices of this project, showed that at least eight thousand tons of roe were

shipped in hand luggage and, in part, via the cargo terminal, between June 2006 and July 2007. This means that about 200 thousand tons of fish were harvested. Taking into consideration the volume of exports and of the recorded catch, these figures considerably exceed the TAC.

Unfortunately, confronting poaching on the rivers is a difficult task. On one hand, effective control over the spawning grounds requires a well-equipped and corruption-resistant inspection apparatus; on the other hand, illegal salmon roe is effectively the main source of income for the local population. As such, the problem of poaching should be solved not only through prohibitive measures, but also by changing social and economic policy in the villages.



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7 Assessment of the Scope of IUU Fishing

Knowing export and import volumes of Russian salmon products, and having assessed the domestic market as best as possible, as well as the character and scope of illegal salmon fishing, let us attempt to evaluate the actual catch.

As mentioned above, overall imports from Russia of all species of Pacific salmon by Japan, PRC, and the Republic of Korea amounted to 107 thousand tons in 2006 (see part 4.2.6). Our rough estimate of the volume of the domestic market is 219 to 319 thousand tons (part 5).

Accordingly, the actual catch could range between 326 and 426 thousand tons. These are our most conservative estimates, not taking into account fish discarded on site after roe extraction (about 55 thousand additional tons, see part 6 (Zaporozhets et al., 2007, 2008)).

The recorded catch amounted to 273 thousand tons in 2006 (part 3), which suggests excess fishing of at least 53 to 153 thousand tons, or 1.2-1.6 times official numbers.

According to other expert estimates by the autonomous non-profit

organization of the scientific and technical center "Dalrybtehnika" ("Dalrybtehnika", 2007), the volume of the illegal catch is at least comparable to the recorded catch. However, survey participants, officials, and salmon experts on more than one occasion estimated the total yield at 3 times the recorded one.

Thus, various estimates indicate the actual catch as being between 1.5 and 3 times larger than officially recorded.



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²² Poaching is the main threat to the Pacific salmon population (<http://www.greenpeace.org/russia/ru/campaigns/660660/660736>)

8 Methods of Resolving the IUU Fishing Problem

Authorities have proposed a system of rights-based use for fishing areas, with the aim of mitigating the effects of poaching. When we began the preparation of this report, such a system was being discussed, and at present the administrative reform of fishing rights is already underway. Fishing areas could be allocated for long-term use in accordance with the "one body of water - one user" principle. In this approach, the users themselves are supposed to use their own means to protect the spawning areas from poaching. This concept has both its advocates and opponents. On one hand, such reform may incite conflicts, both among potential users and between the users and the local populations, which may in turn provoke additional poaching pressure at the spawning grounds as a form of social protest. On the other hand, regional authorities could solve this problem by selecting only those users who can prove their ability to cooperate with local people, and ensure their employment and financial security.

Criminal codes should also be updated to enhance the efficiency of poaching control. Not only the captains of the fishing vessels, but also the chief managers (owners) of the fishing companies need to be held responsible for illegal salmon fishing.

Poachers' means of transport and fishing equipment need to be confiscated. However, the true owners of fishing vessels are often difficult to identify. Vessels are rented by outside companies and carry out fishing under those companies' names, while their true owners remain on the sidelines, not technically involved in criminal activities.

Unfortunately, amending and strengthening existing legislation alone would be insufficient. For many reasons, the entire system of control is inefficient in confronting poaching. Reasons for this include poor logistics, corruption, and other factors. Even a two or three-fold increase in funding for fisheries enforcement would hardly yield positive results, at least in the Far East. Interception of poachers at sea requires both great effort and great expenses. The only effective strategy would be to ship all harvested aquatic resources to Russian ports, and introduce obligatory declaration.

This convention is widely practiced through the world: everything harvested at sea is unloaded in ports, counted, checked, declared, and only then loaded onto cargo ships and transported elsewhere. In Russia, most biological resources harvested in the exclusive economic zone are immediately shipped abroad.

Not all fishermen are pleased with the introduction of mandatory declaration, and for good reason: Russian ports, at present, are not equipped for this. The filing and checking procedures are cumbersome, and many ports have their own administrative apparatuses that levy taxes (in addition to state taxes), so the entire process requires both time and money. Given these circumstances, foreign ports that can service ship in a few hours are very attractive to Russian fishermen. It is much easier for them to ship raw fish directly to a foreign port or transfer it on the open sea, receive payment in cash, and avoid taxes.

It is undeniable, that declaring products in Russian ports will inevitably increase expenses for the fishing companies. However, the state could minimize those expenses by means of simplifying administrative procedures. For example, special customs zones could immediately be established in Russian port, in which ships would technically remain outside of the country.

The paradox is, that when the supply of illegally harvested raw fish to foreign ports decreases, market prices will rise, and fishermen will not only compensate for their expenses, but also turn profits. This, in turn, will

promote the development of Russian ports and the construction of fish processing enterprises.

It is important to realize that without proper declaration procedures, Russia will neither have the legal grounds to confront countries that accept illegal products, nor be able to reduce illegal fishing in the exclusive economic zone or control the shipment of raw fish from it.

According to amendments to the Law "On Fishing", beginning on the 1st of January 2009, all fish harvested in the exclusive economic zone of the Russian Federation must be delivered to Russian customs, i.e. transferred through Russian ports. Beginning that same year, all fish products delivered to the ports can be sold only via the Russian Fish Exchange. Divisions of the Fish Exchange will open in Moscow, Saint-Petersburg, Kaliningrad, Murmansk, Vladivostok, and Petropavlovsk-Kamchatskiy. Trial auctions were held in December 2007, and the exchange is due to begin trading at full capacity in the second half of 2008²³.

In our sociological survey, we asked respondents of three groups (inspectors, fishermen, and fishing industry representatives) to identify methods for settling the poaching problem. Generally speaking, respondents from all groups were unanimous in their choice. Most checked the following measures: "control over air transportation of roe"; "the use of aircraft to protect spawning areas"; and "regular verification of vessels accepting salmon by Kamchatka

inspectors". The smallest number of respondents chose the following answers: "allocation of fishing areas according to the 'one body of water - one user' principle" and "management by means of regulating the fishing haul". No fundamental differences between the groups of respondents were revealed, though certain tendencies were noted. For instance, fishermen chose the answer "regular verification of vessels accepting salmon by the Kamchatka inspectors" more often than industry representatives. Inspectors mentioned "the use of aircraft to protect spawning areas", "management by means of regulating the fishing haul", and "allocation of fishing areas" more often than the other respondents.

It should be noted, that attitudes towards the major issues of salmon protection appeared to be similar among all three groups. The differences are connected with the social and professional status of the respondents, which in turn make for differences in interests, the degree openness, and, sometimes, general awareness. Thus, inspectors are more dogmatic in their evaluation of poaching and more technocratic in their choice of poaching control methods. They mentioned administrative measures less frequently than fishing industry representatives, and often chose methods connected with their own activities, for example, "the use of aircraft to protect spawning areas". As administrative problems are concerned, inspectors first and foremost blamed problems of regulation strate-

gy, whereas the other respondents put corruption on top of the list. However, respondents from the other two groups preferred to combat poaching through state inspections, rather than by regulating the fishing haul or allocating fishing areas.

At the same time, many industry representatives assume that fisheries management is inefficient and must be improved. In their opinion, the major problems are corruption among decision-makers, inaccurate forecasts of the salmon's approach to the coast, and complications in assigning fishing areas. An overwhelming majority of respondents from this group consider that administrative problems could be solved if a fishing council were to be established. The council's main tasks would be the strategic regulation of fishing, the creation of regional fisheries policy, and the distribution of fishing areas.

It should be mentioned, that virtually all of the fishing industry representatives are aware of the fishermen's unions (and may even be involved in their activities), and consider them an influential force in regional fisheries politics.

According to survey data, voluntary ecological certification of fishing (e.g., in compliance with the system used by the Marine Stewardship Council - see Spiridonov, Zgurovskiy, 2007) remains the business of managers, who consider it a means of access to the international market. The fishermen employed by the companies know little or nothing about the certification process.



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²³ Koltunova O., 2008. *Under the Sign of the Fish* (<http://www.ko.ru/document.php?id=18198>)

9 Socio-Economic Importance of Salmon Fishing

About two thirds of Russia's total aquatic biological resources come from the Far East. Hence, the fishing industry is one of the Far East's largest employers. Over the past 16 years, the productivity of the average fishing industry employee has declined by 60 % in monetary terms, and by 25-30% in the terms their catch ("Norge-Fish" Co., Ltd., 2006). On one hand, this stems from a physical deterioration of production facilities; on the other, it shows a desire within individual enterprises to maintain high levels of employment in the fishing industry. It is well known that the industry, in some regions the backbone of the urban population, is of great social and geopolitical importance to the country. This is particularly true for coastal regions, where up to 70% of the industry's production is concentrated ("Norge-Fish" Co., Ltd., 2006).

Fishing in Kamchatka Kray is of great social importance, as it ensures employment for the local population, particularly in the coastal areas (Ust-Kamchatskiy, Ust-Bolsheretskiy, Sobolevskiy, Aleutskiy, Milkovskiy, and Elizovskiy districts). In these districts listed above, fishing is the major source of income for the locals and, in part, funds local budgets for the development of social infrastructure. It is also significant that many small

and mid-size companies, registered in local municipalities and paying taxes to local budgets, are engaged in coastal fishing. Incidentally, this is one of the latent shortcomings of the long-term "one body of water - one user" principle of fishing area allocation. As the administrative resources of large-scale businesses are immeasurably greater than those of small business, the new changes may result in the expulsion of local enterprises, which currently pay taxes to municipal budgets for fishing rights. In 2006, the fishing industry in Kamchatka Kray employed around 16 thousand workers, or more than a half of all employees of industrial enterprises. ("Dalrybtehnika", 2007).

Salmon fishing on Kamchatka is an extremely important source of economic stability and external income (4-5 billion rubles), exceeding incomes from the nonferrous metals industry by a factor of 1.7. With regard to the overall Japanese catch in Russian waters (as per the Intergovernmental Agreement of May 12th, 1985²⁴), Kamchatka salmon make up 60% of the total monetary value.

While other provinces flourish off of Russia's resources, the population of Kamchatka is declining; numbers have fallen by more than 100 000 people over the past 15 years. 16 Far

Eastern fishing ports are currently in very poor condition ("Dalrybtehnika", 2007).

Fish plays an important role in the diet of Kamchatka's indigenous peoples. On one hand, this stems from the unavailability other foods (often, it is impossible to cultivate anything else in the region, or people lack farming experience). On the other hand, they cannot afford to purchase other food, because of unemployment, chronic non-payment of salaries, and very low incomes. Additionally, the consumption of fish is a long-running tradition. As such, the needs of the indigenous peoples of Kamchatka, as well as those of other residents of the coastal areas, need to be considered when quotas are allocated.

It is important to remember that Russian salmon are ecologically pure, as they are caught in the wild instead of bred in captivity. The global demand for wild salmon is very large, and it is priced well above farmed varieties. In Russia, wild salmon are not a limited resource, so they can and must be priced more competitively. The promotion of Russian wild salmon harvested in accordance with legal regulations, in both domestic and international markets, is a guarantee of stability and wellbeing for the residents of Kamchatka.

Recommendations

RECOMMENDATIONS FOR GOVERNMENTAL AGENCIES

CONCERNING COMMERCIAL FISHING IN EXCESS OF QUOTAS, WE RECOMMEND THAT THE GOVERNMENT

- improve the system of state monitoring, using satellites to track vessels involved in open-sea salmon fishing (<http://www.fishcom.ru/page.php?r=40>). Satellite tracking data should be used to compile a "black list" of those vessels harvesting and transferring illegal products, and to inform the authorities of Japan, Korea, and China about the assumed illegal origin of delivered products;

- establish an efficient system of control, based on the permanent presence of qualified and financially independent inspectors on open sea salmon fishing vessels;

- make changes to legislation that allow for more severe punishment for illegal salmon fishing, including imprisonment for up to five years and confiscation of vessels and fishing gear. Not only the captains of the fishing vessels, but also the chief managers (owners) of the fishing companies need to be held responsible for illegal salmon fishing;

- involve fishing industry associations, regional fishing councils, municipalities, and environmental agencies in the process of adjusting Pacific salmon fishing regulations and improving their efficiency;

- make amendments to Article 56 of the Federal Law "On the Animal World" No. 52-F3 (April 24th, 1995) that correct overlap in the control and surveillance functions of different governmental institutions;

- accelerate the introduction of the governmental resolution "On the export of harvested and processed aquatic biological resources from the Russian exclusive economic zone and the Russian continental shelf outside of the exclusive economic zone and the continental shelf" to the government of the Russian Federation;

- evaluate the efficiency of the new salmon fisheries management system, and hold public forums on the topic every four years (two cycles for pink salmon and approximately one cycle for other salmon species) following implementation of the standards set forth in Article 29.1 of Federal Law No. 333, "On fishing and conservation of aquatic biological resources" (in the version passed December 6th, 2007).

CONCERNING THE ELIMINATION OF INCENTIVES FOR POACHING ON THE RIVERS, WE RECOMMEND THAT THE GOVERNMENT

- expand development plans for the regions and municipalities (e.g. development of legal fish processing and tourism) that offer Kamchatka's inhabitants alternatives to the illegal harvest of biological resources. The plans should define the procedures of their implementation, and contain provisions for education and training of the public.

CONCERNING THE STRENGTHENING OF CONTROL OVER THE SPAWNING GROUNDS, WE RECOMMEND THAT ENFORCEMENT BODIES

- create, finance and supply mobile, interdepartmental anti-poaching teams, engaging both fishing industry representatives and the public;

- use aircraft (helicopters) to locate and apprehend large teams of poachers;

- increase the efficiency of operating surveillance bodies, by conducting regular training courses and providing them with necessary information and equipment;

- amend legislation, in order to simplify the procedures for apprehending persons suspected of illegal fishing and stiffen punishments for poaching;

- raise wages and improve social security for lower- and mid-level employees of the surveillance bodies,

while simultaneously increasing accountability for activities inconsistent with the role of a state inspector. The state must provide a means for regional and municipal administrations, as well as concerned parties in the fishing industry, to pay bonuses to these inspectors for successful interception of poachers;

- establish an internal affairs department in every surveillance body that will conduct internal investigations and fight corruption;

- encourage the development of teams of inspectors from local communities (including from the indigenous population), and environmental protection teams (including students);

- when reforming fishing area use along the principles of "one body of water - one user," ensure that the following conditions are met: New long-term users must pay a portion of their revenues in taxes towards the local budget, guarantee employment of the local populations, and observe the rights of the indigenous people;

- in order to control the export of poached products by means of aircraft, mandate the printing of state registration numbers on the undersides of helicopters. Control over aircraft and their routes is essential in salmon fishing regions.

CONCERNING CONTROL OVER THE DEVELOPMENT OF INFRASTRUCTURE, WE RECOMMEND THAT THE GOVERNMENT

- develop efficient mechanisms to monitor the impact of infrastructure components (e.g., road construction) on poaching. The results of the monitoring should be used in the environment impact assessment and in public hearings on industrial projects;

- develop a system to ensure that compensation from operators of commercial projects for damage inflicted on aquatic biological resources goes towards improvement of equipment and informational support for state environmental agencies.

²⁴ RESOLUTION of the Conference of Kamchatka fishermen and their unions, "The Role of Fisheries in the Economy of the Kamchatka Oblast", Petropavlovsk-Kamchatskiy, December 21st 2006 (<http://www.fish-seafood.ru/news/detail.php?ID=1509>)

CONCERNING MARKET MECHANISMS FOR REDUCING THE ILLEGAL TURNOVER OF SALMON PRODUCTS, WE RECOMMEND THAT THE GOVERNMENT

introduce mandatory labeling and branding for salmon products. Public education should form a lasting association between legal fishing methods and high quality roe or other salmon products. Consumers should also associate Russian brands with high quality and legal fishing methods;

develop a public Russian Fish Exchange that will make available "guilt-free" salmon products to the public; additionally, it should help to create new economic incentives, attract investors, and introduce Russian fisheries to the market of domestic and foreign borrowings.

CONCERNING CONTROL OVER THE TRADE OF SALMON PRODUCTS, WE RECOMMEND THAT THE GOVERNMENT

adopt appropriate legislation that provides for control over the trade of salmon products on both the regional (Kamchatka Oblast) and the federal levels;

develop regulatory and economic mechanisms that would grant preference to those who supply salmon products directly to the domestic market through Russian ports.

Recommendations for fish processing and trade companies in the Russian Federation, as well as in the major importing countries

that they encourage legislative and administrative measures aimed at improving the salmon products market;

that they develop branding and labeling for salmon products. Russian brands should be built on a reputation for high quality products and legal fishing methods;

that they include ecological certification of fishing products, in accordance with the MSC system, in any plans to expand their companies.

Recommendations for environmental NGOs and other concerned organizations in the Russian Federation, as well as in the major importing countries

that they work with relevant state agencies to enhance incentives and motivation to carry out the measures proposed in this document;

that they continue monitoring the domestic market and IUU fishing of Pacific salmon, and distribute collected information among relevant state bodies and other interested parties

for the purpose of stock protection and economically efficient exploitation of Pacific salmon;

that they cooperate with the state agencies in activities aimed at protecting spawning areas;

that they monitor the salmon market and develop educational programs, which inform consumers on sustainability issues and the environmental impact of certain kinds of fishing and aquaculture;

that they encourage dialogue among representatives from state agencies, municipalities, and the scientific and business communities, towards the development of economic mechanisms for sustainable use of Pacific salmon.

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Methodology of Assessment of Illegal, Unreported, and Unregulated Salmon Fishing

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Definitions and Terms

Illegal, unreported, and unregulated fishing is often considered synonymous to poaching. However, these two terms should be addressed separately, in order to better understand the actual situation with regard to aquatic biological resources.

Illegal fishing denotes the harvest of aquatic biological resources in violation of national or international (outside the country's jurisdiction) legislation. From a legal standpoint, there is no fundamental difference between fishing over quotas by authorized commercial fisheries and individuals, and fishing by those who have no right to commercially fish in a particular place, or at all. However, the root causes of these kinds of illegal fishing are different. Thus, we will first speak to commercial fishing over the limits, and then address poaching.

From a legal standpoint, fishing in excess of quotas by local people (including indigenous people) for personal consumption should also be considered illegal fishing. At the same time, the illegal nature of such overfishing is questionable, because in this case fishing limits are set voluntarily in documents not registered with the Ministry of Justice and, unlike the TAC's, are not grounded in science.

However, given the current conditions in Russia, this kind of fishing (we will call it subsistence fishing in excess of quotas) contributes to the unreported catch, along with above-limit commercial fishing and poaching.

Even if a part of the above-limit and poaching catch could be more or less accurately estimated, it would be difficult to assess the share of that catch due to above-limit (commercial and subsistence) fishing and poaching, versus the share from unreported fishing.

In general, above-limit fishing and poaching can also be called unregu-

lated. However, one can imagine a situation in which certain administrative measures could affect change in the illegal and above-limit subsistence catches. In this case, though retaining its illegality, such kinds of fishing appear to be regulated to a certain degree.

Let us mention once again, that in the current state of the Russian fisheries, both illegal (above-limit commercial and poaching) fishing and above-limit subsistence fishing are unreported and unregulated. Different methods should be used for assessment of each of these in order to record, correct, or at least learn to regulate them.

Evaluation of commercial fishing of sockeye, chinook, and coho salmon in excess of quotas

Sockeye, chinook, and coho salmon are the most valuable target species of drift-net fishing in the EEZ. That is why teams of both Japanese and Russian fishing vessels often exceed quotas for these species, and record them in logbooks as pink and chum salmon. When caught, pink salmon are often discarded. These illegal fish products (mostly sockeye) do not enter the Russian market; they are delivered to Japan and sold there at prices approaching tens of dollars per kilogram. Observers from the marine inspection agencies of the Russian Border Guard and/or fisheries research institutions are usually present on board drift-net fishing vessels. We do not claim that all of them are corrupt; at the same time, representatives from fish companies are obviously able to divert their attention, if not outright bribe them.

The most valuable salmon species are also overfished using fixed nets at sea. In this case, the fresh fish is delivered to refrigerator trawlers and shipped to Japan and, to a lesser extent, the USA.

As a result, the amount of the frozen sockeye imported by Japan in the period 2002-2005 considerably exceeded the official catch of the species. At the same time, frozen sockeye were supplied in great quantity to the Russian domestic market. Since 2002, Japanese authorities have required export declarations for imported fish products. This means that either some sockeye, fished above the quotas, is registered without arousing suspicion, or some frozen sockeye and other valuable salmon are exported to Japan using fake documents.

Above-limit commercial fishing of sockeye, chinook, and coho could be assessed by comparing the official fishing data, export data, the amount of fish supplied to the domestic market, and import data from Japan and the USA.

Catch data

Data on fishing in Russia, by statistical regions specified by the Food and Agriculture Organization of the United Nations (FAO), are summarized by the Department of International Commercial Fisheries Statistics of the All-Russian Institute of Marine Fisheries and Oceanography (VNIRO). The data are then delivered to the FAO database of fisheries statistics

(<http://www.fao.org/fi/statist/FISOFT/FISHPLUS.asp>). Data on the Russian catch of the sockeye, chinook, and coho salmon in the northwest Pacific (FAO statistical region 61) encompass the yields of drift-net fishing (so-called control fishing), fishing with fixed nets, and fishing on the rivers.

In addition, data on the commercial salmon catch, organized by species and months, enumerated both in tons and the number of fish, as well as data on the average weight of the fish of a particular species, can be found in the annual reports of the North Pacific

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Anadromous Fish Commission (NPAFC) (http://www.npafc.org/new/pub_statistics.html). A separate table contains data on the salmon catch by indigenous communities. Data on salmon fishing by foreign (Japanese) vessels in the Russian EEZ are also available. Unlike the FAO statistics, NPAFC materials are regularly updated, but often released with great delay. In June 2006, the annual report from 2001 was available on the NPAFC website.

The NPAFC is supplied with data by the Pacific Research Centre of Fisheries and Oceanography (TINRO-Centre), which annually publishes forecasts for the fishing season. These forecasts also contain data on the salmon catch in particular regions and some river basins, as well as data on the catches of the Russian and Japanese drift-net fleets.

Data on the yields of various species of salmon, with more detailed indication of regions and fishing gear, are available at the regional departments of the Federal Fisheries Agency. These data are not accessible to the public, but can be obtained by request to state organizations.

Materials from regional statistics departments, based on the reports of enterprises, can serve as an additional source of data.

All available sources of data on the official catch should be used to assess the above-limit catch. If such data are contradictory, priority should be given to the NPAFC data for general estimates, and the data of the TINRO-Centre and regional departments of the Federal Fisheries to estimate the catch by regions. As such, the recorded annual catch of a particular salmon species in a particular region, including the yield of the drift-net fishing in the EEZ ($C_{reg i}$) and the overall catch in Russia ($C_{tot.}$) could be estimated.

$$C_{tot} = \sum C_{reg i} \quad (1)$$

Supply to the domestic market

Products of the most valuable Pacific salmon species enter the domestic market as frozen, refrigerated, salted, smoked, and canned fish. Data from regional statistics departments may list production indices for various types of products; however, different salmon species are not always itemized separately. Nonetheless, the possibility of using

such data to assess the domestic market should be investigated. However, even if production indices for different species were available, they would no doubt be underestimated.

Data collected by the Economic and Fisheries Departments of regional administrations appear to be more precise.

Information from fishing industry associations on the volume of production by their individual members is yet another source of data. However, the associations do not encompass all production enterprises, so it is necessary to compile a list of the fishing and fish processing enterprises of the region (e.g., the Kamchatka Oblast and Koryakia), and collect production data by species from those enterprises not affiliated with any associations. Naturally, they will provide only the official data presented to state control bodies.

Therefore, all evaluations based on fish production statistics are likely to be underestimates. If any discrepancies are revealed between data obtained from the regional statistics departments, Economic and Fisheries Departments of regional governments, and the fishing and fish processing enterprises, one should orient themselves towards the highest values.

One could assume that all fish products, except for fast-frozen ones, are supplied for the most part to the domestic market or to the CIS and Baltic countries (though this is irrelevant to this analysis, because such products are exported from the region via intermediaries in Russia). This assumption should be verified using customs export statistics. On Kamchatka, such data can be obtained on request from the regional customs department and checked against data obtained on request from Far-Eastern Customs. It is safe to assume, that even if salted, smoked, and canned sockeye, chinook, and coho are exported to the countries of the Asian Pacific Region and the USA, the volume of the export is not very large, and export data recorded by customs more or less reflect the actual volume.

With regard to the distribution of products frozen on shore between the domestic and international markets, the situation is more complicated. These products cannot be exported without customs certification (or in any case, the amount of smuggled

goods can be approximated by customs experts). However, customs certification can be complicated by "regrading," when a shipment of sockeye salmon is declared as a shipment of pink salmon. Customs experts are able to analyze such cases, and propose a correction factor in order to assess the true amounts of frozen sockeye, chinook, and coho exported to the Asian Pacific Region and the USA via the regional customs.

There is another, even more serious problem in estimating the share of the catch that enters the domestic market. Products accounted for annually by certain statistical systems may be products of the previous-year catch, while the most reliable fisheries statistics correspond to calendar years. To overcome this issue, one can refer to monthly statistics and analyze long-term production dynamics in the region. It may help to define when the extraction of raw products of the past year ends, and when the start of processing begins during the new season. Products that enter the market in the "production" year should be compared with the catch of the calendar year.

When discussing the amounts of the sockeye, chinook, and coho salmon supplied to the domestic market as a yield of both legal and above-limit commercial fishing, we assumed that the fish carcasses, being more valuable than the carcasses of chum and pink salmon, are always processed, rather than discarded after extraction of the roe. This may not always be the case, but it is very difficult to evaluate this particular factor. Expert estimates of the frequency of such cases could be obtained from interviews with the staff of fish protection agencies, police, prosecution agencies, and the media. If even a certain number of their estimates confirm such a practice, an additional factor (W) that accounts for such products should be considered.

Let us introduce the following notations:

$D_{reg i}$ – amount of fish (in tons) supplied to the domestic market during the 'production' year

K_s – the subset of salted fish products from the total yield

K_{sm} – the subset of smoked fish products from the total yield

K_c – the subset of canned fish

products from the total yield

K_f – the subset of frozen fish products from the total yield (fish trunks and fillets are considered separately as K_{f1} and K_{f2})

D_s – total amount of salted fish products

D_{sm} – total amount of smoked fish products

D_c – total amount of canned fish products

F – total amount of frozen fish products (can be split into F_1 and F_2 , fish trunks and fillets, respectively)

E_f – total amount of frozen fish products produced by the coastal enterprises and having undergone customs certification

D_f – total amount of frozen fish products supplied to the domestic market; and

L – correction factor for recording fish under the wrong names in customs documents.

Therefore, the minimum amount of salmon of a certain species supplied to the domestic market by the enterprises of a particular region would be equal to

$$D_{reg i} = 1/K_s D_s + 1/K_{sm} D_{sm} + 1/K_c D_c + 1/K_f D_f \quad (2)$$

$$\text{where } D_f = L(F - E_f) \quad (3)$$

The overall volume of a salmon product of a certain species supplied to the domestic market would amount to

$$D = \sum D_{reg i} \text{ where } i(1;n), n - \text{the number of the regions.} \quad (4)$$

Supply to the international market

Assessment of the volume of supply to the international market is based on the assumption that most Russian fish products are imported by Japan. Japanese statistics are well presented in the reports of the Japanese Marine Products Importers' Association; these reports are regularly studied by the TINRO-Centre experts and fish market analysts. In addition, certain amounts of frozen sockeye, chinook, and coho are shipped to the United States. Information on these shipments can be found in official customs statistics. A certain amount of frozen salmon is also exported to South Korea, either for re-export to Japan or for local consumption. Although it is harder to obtain customs statistics from Korea than from

Japan, information on the unloading of particular kinds of fish products from ships can be found on the websites of Korean ports. As with products supplied to the domestic market, certain difficulties are caused by the delay of the annual import cycle in relation to the annual fishing cycle. That is why monthly analysis of imports statistics, as well as appraisal of the 'production' years of the international market (just as with the domestic market), are required.

Another problem stems from the impossibility of determining the particular region of origin for products in imports statistics. This complicates assessment of the above-limit catch of coho salmon, as it is harvested along virtually the entire eastern coast of Russia. Nevertheless, import data can yield fairly reliable results on the catch of sockeye and chinook salmon harvested commercially on Kamchatka and in Koryakia.

Let us introduce the following notations:

I_j – imports of frozen salmon (in tons) by Japan over the 'production' year

I_{us} – imports of frozen salmon of certain species (in tons) by the USA over the 'production' year; and

I_k – imports of frozen salmon of certain species (in tons) by South Korea over the 'production' year.

If fish trunks and fillets are imported, the estimate will be more accurate if imports of these products are considered separately, e.g., I_{j1} , I_{j2} .

I – the overall catch imported over the 'production' year

$$I = 1/K_f (I_j + I_{us} + I_k) \quad (5)$$

If frozen products are divided into fish trunks and fillets, calculations are performed separately with the use of factors K_{f1} (trunks) and K_{f2} (fillets).

Calculation of the above-limit catch

We propose the following method for calculating the above-limit catch of sockeye salmon. Assuming that most sockeye are harvested by commercial fisheries of the Kamchatka Oblast, Koryakia, and the Chukotka Autonomous Area, let us calculate the yearly catch of sockeye supplied to the domestic market (D_{kkch}) according to formula (4).

The overall actual catch, as estimated from the product yield amounts to

$$Y = I + D_{kkch} \quad (6)$$

The above-limit catch is then

$$I_{UU1} = Y - C_{tot} \quad (7)$$

Calculation of the actual catch of Chum and Pink Salmon, excluding poaching on the rivers

While the greatest part of the above-limit catch of sockeye and, possibly, chinook can be deduced from Japanese imports statistics, chum and pink salmon fished in Russian waters are shipped to the Japanese market only in small amounts. Most chum and pink salmon products are destined for the domestic market. Seeing as official data on the processing of these species are underestimated, the relative bias in the calculations of domestic market volumes with formula (2) will be higher than it is for more valuable salmon species. The calculation procedure may be geared towards selecting coefficients to account for concealment of products by enterprises.

A different approach may be applied to such regions as Kamchatka, from which fish products are shipped by processing trawlers and by air. The lowest estimate of the amount of fish caught with fixed nets and transferred to cargo ships is available through the Rybolovstvo information system. The amount of frozen fish (first and foremost chum and pink salmon) shipped by plane could be approximated with records of cargo flights to the mainland, if such records are available.

The actual catch also includes the subsistence catch by residents of the region, or fish harvested:

- in accordance with quotas of all types;
- in excess of quotas by commercial fishing teams;
- in excess of quotas by the communities of indigenous minorities;
- in licensed sport fishing;
- by local people for personal consumption, without permits, at the river mouths and at sea; and
- by teams of poachers at the river mouths and at sea.

Consumption of salmon products could be assessed by interviewing representative samples of various population groups. Such a survey should yield an assessment of the annual consumption of various species of fish by the entire population.

The estimate of the actual chum and pink salmon catch on Kamchatka, excluding the poaching catch on the rivers, will be the sum of the estimates of the amount of frozen fish shipped by processing trawlers, fish products shipped by air, and products consumed locally.

Assessment of poaching on the rivers

Assessing the scale of poaching on the rivers is one of the most difficult tasks in evaluating illegal, unreported, and unregulated salmon fishing. This kind of poaching is aimed exclusively towards roe extraction. However, roe is a product of all legal and illegal types of fishing. Thus, the major task is to assess the overall amount of roe produced in the region, shipped from it, and consumed on site. Let us call this amount R and introduce some more notation:

R_l – the amount of legally procured roe, extracted from salmon harvested in accordance with the quotas;

R_{oq} – the amount of roe procured through commercial fishing in excess of the quotas (according to estimates);

R_{lic} – the amount of roe procured by local people within the quotas allocated for indigenous minorities and licensed fishing (calculated based on the officially recorded catch); and

R_p – the amount of roe procured by poachers, mostly on the rivers.

We rely on the assumption that the overall amount of roe produced in such a region as Kamchatka could be estimated from

- the amount of officially produced canned roe (statistical data are available);

- the amount of roe shipped by passenger and cargo flights;

- the amount of fresh (not canned) roe shipped by sea; and

- the amount of roe consumed by residents of the region.

The amount of roe shipped by air is comprised, in turn, from the amount of roe taken by visitors for their own consumption and shipments of vari-

ous sizes exported from the region for sale.

One more assumption is that the residents of Kamchatka and visitors purchasing roe for their own consumption usually buy roe by weight, rather than canned products. We also assume that unreported shipments of roe exported for sale are usually transported in large packages rather than in cans. The assumptions mentioned above should be verified through anonymous questioning of air passengers, as well as consultations with experts from law enforcement agencies, journalists, and former airline employees.

The same methods could be used to assess roe consumption by local residents and by visitors to Kamchatka.

Consultations with experts are necessary to assess the sizes of large, packaged roe shipments exported by air and by sea for sale. In this case, former wholesale dealers should be also consulted.

0301 Live fish:

0301991100

Pacific salmon (*Oncorhynchus nerka*, *Oncorhynchus gorbuscha*, *Oncorhynchus keta*, *Oncorhynchus tshawytscha*, *Oncorhynchus kisutch*, *Oncorhynchus masou* and *Oncorhynchus rhodurus*), Atlantic salmon (*Salmo salar*) and Danube trout (*Hucho hucho*)

0302 Fresh and chilled fish, except for the fish fillet and other 0304 fish products:

0302120000

Pacific salmon (*Oncorhynchus nerka*, *Oncorhynchus gorbuscha*, *Oncorhynchus keta*, *Oncorhynchus tshawytscha*, *Oncorhynchus kisutch*, *Oncorhynchus masou* and *Oncorhynchus rhodurus*), Atlantic salmon (*Salmo salar*) and Danube trout (*Hucho hucho*)

0302700000

Fresh and refrigerated fish liver, roe, and soft roe

0303 Frozen fish, except for the fish fillet and other 0304 fish products:

0303110000

Red, or Sockeye Salmon (*Oncorhynchus nerka*)

0303190000

Other salmons

0304 Fresh, chilled, and frozen filleted and other fish, including mince:

0304101300

Pacific salmon (*Oncorhynchus nerka*, *Oncorhynchus gorbuscha*, *Oncorhynchus keta*, *Oncorhynchus tshawytscha*, *Oncorhynchus kisutch*, *Oncorhynchus masou* and *Oncorhynchus rhodurus*), Atlantic salmon (*Salmo salar*) and Danube trout (*Hucho hucho*)

0304 20 Frozen fillet

0304201300

Pacific salmon (*Oncorhynchus nerka*, *Oncorhynchus gorbuscha*, *Oncorhynchus keta*, *Oncorhynchus tshawytscha*, *Oncorhynchus kisutch*, *Oncorhynchus masou* and *Oncorhynchus rhodurus*), Atlantic salmon (*Salmo salar*) and Danube trout (*Hucho hucho*)

0305 Dried and salted fish; fish in brine; hot- and cold-smoked fish; fish meal, powder, and pellets for human consumption:

0305 30 Dried and salted fish fillet and fish fillet in brine, but not smoked:

0305303000

Pacific salmon (*Oncorhynchus nerka*, *Oncorhynchus gorbuscha*, *Oncorhynchus keta*, *Oncorhynchus tshawytscha*, *Oncorhynchus kisutch*, *Oncorhynchus masou* and *Oncorhynchus rhodurus*), Atlantic salmon (*Salmo salar*) and Danube trout (*Hucho hucho*)

Smoked fish including fillet:

0305410000 Pacific salmon (*Oncorhynchus nerka*, *Oncorhynchus gorbuscha*, *Oncorhynchus keta*, *Oncorhynchus tshawytscha*, *Oncorhynchus kisutch*, *Oncorhynchus masou* and *Oncorhynchus rhodurus*), Atlantic salmon (*Salmo salar*) and Danube trout (*Hucho hucho*)

Salted, but not dried and smoked, fish and fish in brine:

0305695000 Pacific salmon (*Oncorhynchus nerka*, *Oncorhynchus gorbuscha*, *Oncorhynchus keta*, *Oncorhynchus tshawytscha*, *Oncorhynchus kisutch*, *Oncorhynchus masou* and *Oncorhynchus rhodurus*), Atlantic salmon (*Salmo salar*) and Danube trout (*Hucho hucho*)

1604 Ready-to-eat and canned fish; sturgeon (black) caviar and roe substitutes produced from the other fish eggs:

1604110000 Ready-to-eat salmon products and canned salmon (whole or chopped, but not minced fish)

1604191000 Ready-to-eat and canned products of Salmonids, except for salmon (whole or chopped, but not minced fish)

160420 Other ready-to-eat and canned fish:

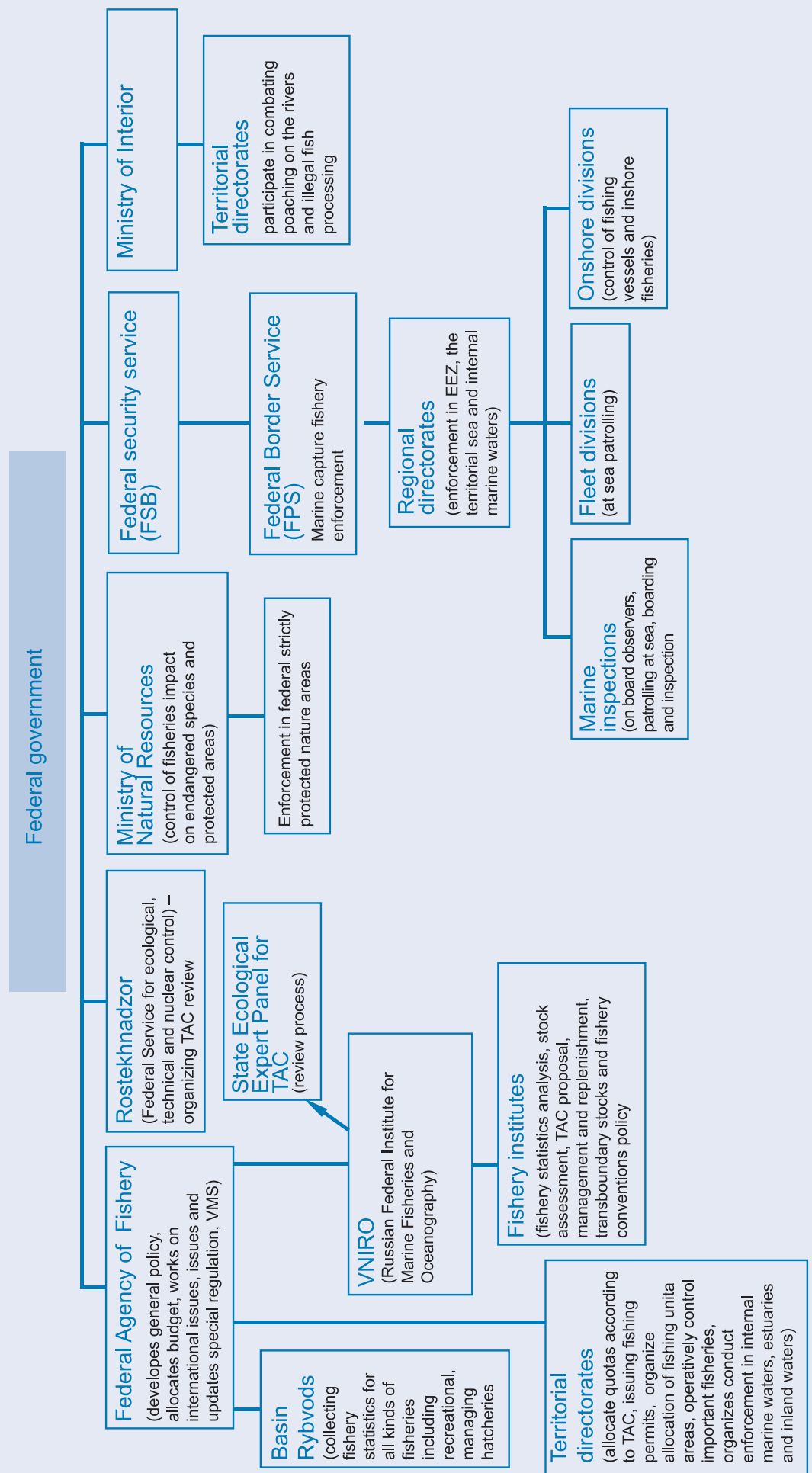
1604 201000 Ready-to-eat salmon products and canned salmon

1604203000 Ready-to-eat and canned products of Salmonids, except for salmon

1604309010 Ready-to-eat and canned salmon (red) roe

3

Structure of the federal institutions involved in marine fishery management and enforcement in Russia



SOSALMON ЛОСОСЬ

Natalia Dronova, Vassily Spiridonov. Illegal, Unreported, and Unregulated Pacific Salmon Fishing in Kamchatka. – WWF-Russia / TRAFFIC Europe, 2008. – 52 pages.

This brochure presents an analysis of different forms of poaching, figures on illegal, unreported and unregulated (IUU) salmon catch and proposed measures to decrease IUU catch. Useful information on Kamchatka salmon catch, its main producers and buyers, and fish products chain of custody is provided.

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Kamchatka is one of the few regions on the planet almost untouched by the destructive human activities. Volcanoes, geysers, bears and one fifth of the world's salmon population are all here. Kamchatka's spawning rivers is a global renewable resource of wild salmon. Eleven species of wild salmon live here. The Western Kamchatka shelf is comparatively small on the country's scale, but it provides about one third of all fish stock of Russia. While worldwide more and more salmon is raised artificially on farms, Kamchatka boasts a natural treasury of wild fish.



Oil extraction always goes hand in hand with oil spills

There are plans to make oil near the coast of Kamchatka. The estimated oil resources of Kamchatka comprise only 2.2% of Russia's oil resources and only 0.8% of Russia's natural gas. Their extraction will threaten the future of one third of nation's fish stock.

The works will be carried out in very severe ice and seismic conditions, deep under water. The noise of drilling machines will frighten off whales, and oil spills may kill crabs, salmon and sea birds.

Kamchatka is more precious than oil!

Let's stop dangerous projects!

Vote for Kamchatka on www.wwf.ru



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