

Program
For Expeditionary Research of the Fisheries Waters
of the Sakhalin Oblast

Goals and Purposes of the Research

1. Determination of the numbers, quality, distribution and condition of the spawning areas in the rivers of the study area.
2. Evaluation of the conditions of the stocks of the salmon species in each river and tributary, qualitative indicators for the fish, identification of spawners for each spawning area and the degree to which the spawning areas are filled.
3. Obtain information on the local ichthyofauna, the sizes of their stocks, river and spawning area hydrobiology.
4. Identify the extent to which human commercial activity has impacted the condition of the spawning areas, the ability of the fish to pass through to its spawning areas, and the chemical composition of the river water.
5. Offer suggestions for restoring or increasing salmon stocks and other important species of commercially significant fish.
 - a) offer proposals aimed at diminishing the impact of industrial and commercial outflow;
 - b) determine the targets and volumes of melioration;
 - c) determine the efficacy and possibility for artificial fish aquaculture.

The scale of operations shall include the following:

1. Collection and simple processing of cartographic, climactic, physical geographic and statistical materials for the region under study.
2. Study existing materials from commercial fish science, fish conservation and commercial fisheries enterprises that relate to commercial fisheries and to the sanitary condition of the bodies of water in the region under study. The relationship between these materials and materials collected during the expeditionary field work.
3. Conduct field studies of the bodies of water and pursue research in fish aquaculture and biology.

Collection of Materials

A) Physical geographical and hydrological information

The main cartographic materials to be used to indicate the locations of spawning areas that have been identified and researched and to present other data, shall be copies of 1:100,000-scale maps of the river basins.

Using existing data obtained from the literature, special research and cartographic materials, the following types of information shall be collected on the areas under study: areas and boundaries, topography, soils, geological formation, rivers and lakes, vegetation and the animal world.

This information will be corrected upon completion of the expeditionary field work to reflect study results.

Information shall be collected from the Hydrometeorological Department or developed independently concerning the following:

1. Areas of the river basin watersheds.
2. Presence and location of hydrometeorological stations and water measurement posts for the

bodies of water under study.

3. Water level data spanning a number of years (monthly average, highest and lowest monthly levels, average annual levels).
4. Information on water flow per second of the rivers: maximum (flood stage), average, minimum (during low-water periods).
5. Data on water flow in the rivers, maximum, average and minimum annual flows.
6. Depths and durations of flooding by year (beginning, peak, end) in spring and summer-autumn periods.
7. Times of appearance of slush ice, river ice freezing and breakup.
8. Temperatures in the rivers throughout the year (over a number of years).
9. Ice thicknesses in the rivers and thicknesses of lake ice.
10. Climatology of the river watersheds. Data on average maximum and minimum temperatures over decades, average annual temperatures.
Average monthly precipitation and evaporation. Onset and end of snowfall periods.
11. Excerpts from the hydrographic descriptions of the bodies of water.
12. Hydrochemical analysis (if available).
13. Percentages of the river watersheds covered by forests and bogs.

B) Information on human commercial utilization of the river watersheds

Information on the following shall be collected in the Mayoral offices in villages and regions:

1. The numbers and names of settlements, commercial enterprises and new construction in the river watersheds.
2. The potential for development of the various industries in the region.
3. Amount of land utilized for agriculture in the river watersheds (pasture land, hayfields) and their locations relative to the spawning areas.

C) Information on industrial enterprises that dirty and pollute the bodies of water.

Data on the following shall be collected in the logging enterprises and commercial forestry companies:

1. Names and locations of the logging organizations, number and locations of logging camps and maintenance shops for the sections.
2. Year that logging and log rafting began in the river watersheds.
3. Area of lands logged by river watershed, total and by year. Remaining forest resources in the river watershed areas. Numbers of trees harvested (annually) over the previous years and planned for upcoming years.

Clarify the following for enterprises engaged in discharging effluents into the bodies of water:

1. Name, administrative subordination and address.
2. Year water pollution first noted for the watershed.
3. Watersheds subjected to pollution, amount of time such pollution continued.
4. Type of pollution or dirtying. Amounts of effluent and other waste materials discharged in cubic meters per day. Periods of maximum effluent discharge.
5. Chemical analysis of waste water.
6. Water purification facilities and effectiveness of their operation.
7. Planned measures to be undertaken by the enterprise to halt the dirtying and pollution of the watersheds and the extent to which they are being met.
8. Estimated cost of construction. Availability of funds for the construction. Planned time frame for putting water purification facilities into operation. Use of funds for construction.

D) Fisheries

Clarify the following in enterprises and collectives engaged in fisheries:

1. Locations of commercial fishing enterprises and fisheries collectives. Capacities of the processing base (salting capacities, ice houses, cannery capacities, etc.).
2. Data on salmon catches at river mouths and in rivers by species spanning a number of years.
3. Timing of the beginning of fishing, the most intensive fishing and the end of fishing by year and by salmon species.
4. Types of fishing gear used for salmon fishing, quantities of fishing gear and their locations, marked schematically. Changes in the numbers of fishing gear by year. Average catches per unit of fishing gear by year.
5. Fishing of non-salmon species in pre-coastal waters. Species and amounts of fish harvested. Fishing periods and fishing gear.
6. Catch sizes of river fish by species, fishing area and fishing gear.

E) Artificial Fish Aquaculture

Collect data from the fish hatcheries on the following:

1. The number of fish hatcheries in the region of study, their names, locations, and years of construction.
2. Information on collection of roe and release of juveniles by fish species from the beginning of hatchery operation.
3. Information on tagging and return.
4. Number of fish hatchery weirs, their locations, periods of operation, information on the number of salmon caught at each weir over a number of years.
5. Number of spawning fields upstream of the weir, whether or not fish was allowed through the weir for natural spawning, numbers of producer fish that have passed through to natural spawning upstream of the weir by year.
6. Information of fish mortality below the weirs. Reasons for mortality, numbers of dead fish by year.
7. Proposals on rational ways to combine natural and artificial salmon reproduction in the river.

2) Route reconnaissance of spawning rivers.

A) Description of rivers and river basins.

1. River length (taken from 1:100,000 scale maps). Watershed area. Main tributaries, their lengths.
2. River basins: topography of the river basin by section, percentages of forests and bogs, vegetation.
3. River valley: topography, breadth by section, soils, vegetation. Presence of water conservation belts.
4. River floodplains: breadth of the floodplain by river section, type of ground, vegetation, height of the floodplain banks and the natural riverbanks. Periods and duration of floods. Presence of detached bodies of water. Number of bogs. Clutter in the floodplain as a result of tree falls and wood remaining from timber rafting.
5. River channel: amount of branching, windiness, ground types. Breadth of the channel for the various sections. Distance from the mouth to the first bars in the river. Slope of the river. Presence of steps and waterfalls.
6. River depths at various sections, deep water portions, bars and depressions. Speed of water flow. Width of the active cross-section at the time of study. Average width of the active cross-section during the spawning period. Width of the active cross-section during low-water periods. Average breadth of the portion of the channel subject to drying out. Water run-off for the

various sections (profile views of the cross-sections shall be appended to the report). Maximum flood water height based on indications on shore and trees.

7. Water color and transparency. Water temperature at the time of study in the spawning areas and spawning sections of the river. Variation in water temperature over a 24 hour period. Air temperature.

B) Study of the spawning areas.

1. Based on surveys of the local inhabitants, determine the following: which salmon enter the river to spawn, at which times do they enter the river, what are the times of beginning and end of spawning, which are the main spawning tributaries and spawning sites, at what distance from the river mouth is the first spawning area located? Are there spawning areas that undergo intense dessication? What is the time that the first downstream run of young fish occurs? Does die-off of the young fish take place? Does the young fish die off in detached bodies of water? What years have the best up-river runs and the worst? Have mass die-offs of spawning producer fish occurred in the past, and what were the characteristics of those years? Are there obstacles in the river to the passage of fish (downed trees, waterfalls, etc.)? What amount of fish was harvested in the river before fishing was prohibited?
2. Through direct observation determine the following: amount of spawning area in the main channel, the main spawning tributaries and springs, and for the river as a whole (visual estimation of the area of the body of water, for each section of river).
3. Conduct a detailed description of the largest spawning sites and spawning river sections and indicate them on the river schematic. (For the most valuable spawning sites, also compile a eye-ball schematic). The description shall encompass the following: the bottom composition in the spawning ground (ground type, particle sizes, distribution throughout the spawning area), depth and current speed distributions, presence of groundwater outflows, water temperatures in the various sections, height and steepness of the banks, distribution of producer fish throughout the width of the river, deep pools and bars. Distribution of salmon spawning mounds and their density. Minimum, average and maximum water depth above the spawning mounds. Depth of egg laying in the bottom soil. Calculation of egg numbers using spawning mounds or area (using 1-2 mounds in the main spawning ground as a basis).
4. Density of spawning producer fish at the spawning sites. Average density of spawners at the spawning sites by section of river. Total number of spawners. Are there too many spawning fish at the spawning sites? Level of sexual maturity of the main mass of spawners at the spawning sites as of the day of observation of the river section. Proportion of males to females. Number of spawned out individuals per unit of area in the spawning section. Amount of roe not laid (in 100 females). Presence of dead pre-spawning salmon, reasons for mortality. Any fish diseases or parasites noted.
5. Fish sampling in the main spawning sites to determine weight, size and age composition and fecundity (total of about 100 individuals).
6. Based on survey data and individual observations determine whether the spawning sites are used multiple times by spawners of a single or different species. Also establish whether there are any regularities in distribution of the spawners belonging to various runs for the various sections of the river (upper, middle and lower).
7. Condition of approaches and spawning sites. Presence of fallen trees and their impact upon the approach and spawning of the fish. Presence of overgrown approaches and spawning sites. Presence of silt accumulation at the spawning sites. Other obstacles to fish approach and spawning. What amount of the spawning sites is unavailable for use due to the presence of clutter or waterfalls. Targets and volumes of required melioration work and measures to bring

- them to completion. Reasons for clutter in the rivers and possibilities of eliminating them.
8. Presence of predator fish at the spawning sites – species, their numbers, stomach contents. Presence of other local fishes, their numbers, distribution. Information on the biology of local fishes. The possibility of their commercial utilization. Predatory birds and animals that cause damage to the fish, roe or spawn, their numbers and the extent of damage caused.

**Upon completion of the field work, each specialist shall submit
the following on his portion of the expedition to the expeditionary manager:**

1. Working daily journal with notes on daily routes taken, weather conditions, types of work completed, with full detailed descriptions of work completed based on the program, observational and research results, calculations of spawning areas, survey data from local inhabitants, information received from organizations, enterprises, etc., and other data of interest to the expedition.
2. Sketch book, containing schematic drawings of the spawning sites, referencing the 1:100,000-scale map and filled in with all of the elements of interest, cross-section profiles of the rivers and spawning sites using data from hydrometric measurements, schematics showing the locations of fishing gear in the river and at the river mouth, schematics of the water sources used to supply the fish hatcheries, as well as other graphical representations.
3. Tracing paper overlay schematics of the spawning rivers, with indication of the locations of spawning sites, cluttered sections, dams, booms, fish hatchery sections, identification numbers of unnamed tributaries and spawning sites that reference their description in the daily journal and sketchbook, and other elements required by the program or representing interest to the expedition.
4. Biological analysis log with attached scale sample book.
5. Hydrobiological research log.
6. Developed photographic film and diskettes.
7. Fixed hydrobiological samples, representatives of the ichthyofauna, stomachs, etc.