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Japanese Research Plan in 2002-2005

by

Fisheries Agency of Japan

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Japan Research Plan 2002-2005

Introduction

Japanese salmon research conducted in 1993-2000 under the Science Plan decided by the North Pacific Anadromous Fish Commission (NPAFC) were reviewed by Ishida et al. (2000) and Urawa et al. (2000). Recent developments of stock identification techniques and high-seas salmon population surveys provided new information for the ocean distribution of chum salmon: Japanese chum salmon inhabit the Okhotsk Sea in the early ocean life, pass the first winter in the western North Pacific Ocean, and then migrate to the Bering Sea by the next summer. Coastal surveys suggested that major salmon mortalities occur in the early ocean life, but the causes of juvenile mortalities have not been well understood. Scale pattern analysis suggested that Japanese chum salmon may suffer from growth reduction in the Bering Sea, resulting in increase of age at maturity. A long term biological monitoring in the subarctic North Pacific Ocean found a negative relationship between macrozooplankton and pink salmon biomass. A similar biological monitoring should be necessary in the Bering Sea. The extremely low lipid contents in the muscle of overwintering salmon indicated a great difficulty for them to survive in winter.

The major purpose of Japanese salmon research is to accomplish sustainable fisheries, balancing the conservation and use of salmon stocks in the North Pacific ecosystem. We will concentrate future salmon studies to population dynamics and ocean ecosystems in specific waters. These are (1) juvenile salmon studies in the coastal sea and the Okhotsk Sea, (2) winter salmon studies in the North Pacific Ocean, (3) summer salmon studies in the Bering Sea, and (4) monitoring of major salmon stocks in Japanese coastal waters and rivers. The former three issues have been already adopted into the new NPAFC Science Plan (North Pacific Anadromous Fish Commission 2001a), and may be carried out in cooperation with scientists in other member countries. For the Bering-Aleutian Salmon International Survey (BASIS) plan adopted at the 9th annual meeting, Japanese salmon research focuses on salmon abundance and ecosystem structure in the Bering Sea (North Pacific Anadromous Fish Commission 2001b, Azumaya et al. 2002).

1. Juvenile Salmon Studies

1-1. Coastal Sea Juvenile Salmon Studies

Major mortality of chum and pink salmon may occur during the initial coastal life. Thus, coastal life history studies are important to understand the survival mechanisms of salmon. To clarify mechanisms controlling population dynamics of juvenile salmon, we focus on the following research items:

- # Feeding, growth, and survival of juvenile salmon
- # Migration route of thermally-marked salmon by stocks
- # Monitoring of coastal environment such as surface water temperature, salinity, and zooplankton biomass along the coasts of northern Japan

1-2. Okhotsk Sea Juvenile Salmon Studies

The previous studies indicated that Asian salmon stocks are abundantly distributed in the Okhotsk Sea during summer and fall in the first year of ocean life. In order to develop the population dynamics of juvenile salmon, we should concentrate the following research items:

- # Seasonal distribution and migration of juvenile salmon stocks
- # Population size and survival estimates of juvenile salmon stocks
- # Feeding competition and growth change of juvenile salmon

Primary production and food animals

2. Winter Salmon Studies in the North Pacific Ocean

Recent winter salmon studies indicate that Japanese chum salmon are distributed in the western North Pacific Ocean during the first winter, while in the Gulf of Alaska during the following winters. Biochemical analysis suggests that winter is one of the critical periods for salmon population. To elucidate impacts of winter ocean environments on salmon survivals, future research issues are:

- # Winter salmon distribution and habitat environments
- # Population size and survival estimates of overwintering salmon
- # Survival strategies of salmon in winter

3. Summer Salmon Studies in the Bering Sea and Other Waters

3-1. Bering Sea Salmon Ecology Studies

Recently, the depression of ocean growth was observed in salmon stocks originating both the Asian and American coasts. Current studies suggest that salmon growth reduction may occur in the Bering Sea, when many salmon migrate in the waters for their feeding and growth in summer. To clarify relations between the growth and mortality of salmon and the carrying capacity in the Bering Sea, we focus the following research items:

- # Climate change and primary production
- # Production of food animals
- # Population size and distribution of major salmon stocks
- # Feeding competition and growth change of salmon
- # Homing migration and maturing mechanism using archival tags and physiological analysis

3-2. Monitoring of Salmon and Environment in the North Pacific Ocean

To assess the status of salmon population, Japanese salmon research vessels are continuing monitoring of salmon and their environment in the western and central North Pacific, the Bering Sea, and the Gulf of Alaska in summer. Monitoring items are:

- # Salmon abundance estimated using research gillnets
- # Body sizes and ages of salmon
- # Physical and chemical environmental conditions
- # Chlorophyll a concentration and zooplankton biomass
- # Offshore migration and distribution of salmon
- # Stock identification using genetic analyses, otolith marking, and tagging experiments

4. Monitoring of Major Salmon Stocks

A monitoring program is continued to assess the status of major salmon stocks in Japan for their proper management.

- # Annual changes in the number of adult returns
- # Annual changes in body size and age at maturity, and fecundity
- # Genetic monitoring for stock conservation
- # Development of otolith-marking and other stock identification techniques
- # Salmon stock assessment and forecast

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