

III. Workshop Review

In 1998, the North Pacific Anadromous Fish Commission (NPAFC) organized the Workshop on Climate Changes and Salmon Production. The evidence presented at the workshop suggested strong connections between climate change and subsequent changes in marine productivity and salmon production. Salmon production takes place in freshwater and marine ecosystems, and the marine ecosystem is divided into coastal and offshore ecosystems or juvenile and immature/maturing stages. Therefore, it was scientifically logical to examine biological processes in the juvenile stage in much more detail. In 2000, the NPAFC and the North Pacific Marine Science Organization (PICES) organized a 1-day Workshop on Factors Affecting Production of Juvenile Salmon: Comparative Studies on Juvenile Salmon Ecology between the East and West North Pacific Ocean.

The review of past juvenile salmon studies was the first part of the workshop. It was recognized that Pacific salmon are primarily a marine species, and that there is still much to learn about the factors regulating their abundance. We also recognized that it is necessary to continue monitoring in standard areas and to organize a new investigation on biological interactions of enhanced and wild salmon stocks. It is also necessary to examine more fully the role of ocean physics and biology in determining salmon production. There were many scientific papers on juvenile salmon research on both sides of the North Pacific Ocean, but there were not comprehensive and complete review papers. Therefore, after the workshop the NPAFC decided to publish the salmon juvenile review papers in a consistent format for easy comparison. These review papers will be published in NPAFC Bulletin No. 3.

Several studies indicated that the mortality of juvenile salmon in coastal waters was much higher than the subsequent ocean mortality. Also it was reported that the most critical issues, such as abundance of preferred foods, environmental conditions, and abundance of competitors and predators determined survival of juvenile salmon. There were differences in some critical issues between the east and west North Pacific Ocean. For example, predation by seabirds had a greater effect on survival of juvenile salmon than predation by fish in coastal waters in Japan, but the predation by fish such as spiny dogfish and river lamprey was important for juvenile mortality in coastal waters in Canada. Further comparisons of critical issues between the east and west North Pacific Ocean will deepen our understanding of biological process of juvenile salmon production.

An extensive field survey showed that bottom-up processes affected the spring zooplankton bloom and thus influenced juvenile salmon growth rates and foraging behavior. But it also indicated that top-down processes were modified through size-selective predation on juvenile salmon and by altering the timing of a shift from planktivory toward piscivory among major predators on juvenile salmon. This was a good example of an ecosystem study for juvenile salmon. The development of mechanistic numerical bioenergetic-foraging models that incorporate interactions between juvenile salmon and their principal prey and predators are needed. Such models will provide an invaluable tool for formalizing our understanding of juvenile salmon ecology and can provide insights into system function that may not be directly observable. Several migration models were also presented at the workshop. The descriptive migration models will contribute to when, where, and how our research should be concentrated in the future. Also the numerical migration model will contribute to simulation of the effects of several factors such as climate change and enhancement. The model approach in conjunction with field surveys, and vice versa, should be promoted in the future.

General discussions focused on ocean distribution and migrations, factors affecting survival and growth, and the role of the NPAFC and PICES future research on juvenile salmon. Several research areas for understanding ocean distribution and migrations were pointed out such as estimation of plankton abundance as juvenile food resources, investigation of biological switches of salmon migration, and archival tags as a new technology in future studies. Also, factors affecting survival and growth, use of climate and oceanographic changes, and salmon response to these changes should be examined in the future. International collaboration is essential to solve these issues.

Yukimasa Ishida
Chairman of the NPAFC Committee
on Scientific Research,
Chairman of the Workshop Organizing Committee

