

## Juvenile salmon health

### Problem statement

Toxic chemicals in estuaries and nearshore environments may impair growth, suppress immune response, and alter behavior in juvenile salmon.

### Critical factors

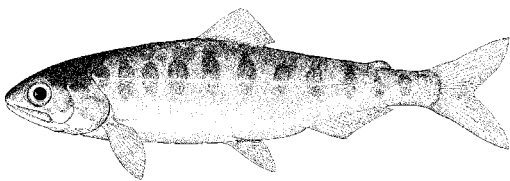
- Estuaries provide crucial habitat for several species of juvenile salmon during their migrations from rivers to the ocean.
- In the estuaries, juvenile salmon may encounter habitats that have been physically altered by human economic development, chemical contamination, unfamiliar predators, infections and pathogenic organisms, and unfavorable ocean or climate conditions.
- These natural and human-caused environmental stresses can impair the immune functioning of juvenile salmon, make them more susceptible to disease, alter their behavior and neurological functioning, and impair their growth.
- Poor growth and increased susceptibility to disease can reduce the early ocean survival rates of young fish.
- Exposure to commonly-used organophosphate pesticides may impair the olfactory function of salmon, which could reduce their ability to avoid predators or find their way back to spawning streams.

### Status of research

State-of-the-art analytical and bioanalytical techniques are being used by Northwest Fisheries Science Center (NWFSC) scientists to examine the ways in which natural environmental variations and exposure to contaminants affect juvenile salmon during their passage through estuaries in Washington and Oregon. Studies focus on determining how natural and human-induced stresses alter growth, affect neurological function and behavior, and influence disease-caused mortality. Impacts on health which result from exposure to toxic substances are also being examined and levels of exposure to highly toxic compounds in juvenile salmon found in urban and non-urban rivers and estuaries are being measured. Biological markers are used to detect links between human-caused stresses and significant effects on fish health. NWFSC scientists are also assessing the prevalence of key diseases in both natural salmon populations and hatchery stocks and are studying the interaction between altered immune function and disease susceptibility in juvenile salmon.

### Future considerations

Humans will continue to physically alter and chemically contaminate estuarine and nearshore environments. In order to effectively manage those environments, through habitat restoration and/or by reducing the flow of contaminants, cause-and-effect relationships between threshold levels of toxic chemicals and immune suppression, changes in neurological function and behavior, and impaired growth in juvenile fish must be established.



Juvenile chum salmon

### Key Players

**Environmental Conservation (EC) Division,  
NWFSC**  
U.S. Environmental Protection Agency  
U.S. Army Corps of Engineers  
Southwest Fisheries Science Center, NMFS  
Natural resource agencies in Washington, Oregon,  
and California

Puget Sound Ambient Monitoring Program  
Native American Tribal agencies  
University of Washington  
Oregon State University  
Muckleshoot Indian Tribe  
City and county environmental departments  
Suquamish Indian Tribe

**Contact: Dr. John Stein, Director, EC Division (206/860-3330).**

