

Migrational behavior

Problem statement

Safe and efficient passage of fish through hydropower systems and other unnatural barriers is hampered by insufficient knowledge about their migration patterns and habits, both upstream and downstream.

Critical factors

- Scientists have traditionally used radiotelemetry to continuously monitor the movements of a few individual salmon over long periods of time.
- More recently, implanted electronic devices called Passive Integrated Transponders (PIT-tags) have allowed scientists to identify large numbers of individual fish as they pass by a transponder sensing device.
- Because PIT-tag sensors are installed only at hydropower facilities, this technology cannot be used to identify salmon in small streams or estuaries where much of the fish mortality occurs.
- Improvements in PIT-tag technology are needed.

Status of research

Advances in radiotelemetry, such as the miniaturization of transmitter components, have made it possible to radio tag Pacific salmon smolts. Development of PIT-tag technology has made it possible to identify large numbers of juvenile fish passing through hydropower systems. Northwest Fisheries Science Center (NWFSC) researchers are working to improve the PIT-tag system by developing a data gathering and system-control computer program for this technology, detection systems for adult salmon in fish ladders, and a flat-plate detection system. They have also conducted “dry” and “wet” tests to evaluate differences among PIT-tag interrogation system operating frequencies.



PIT-tag interrogation system

Future considerations

Scientists will find new uses for PIT-tag technology as the system becomes more refined and the need for more detailed information on which to base fisheries management decisions increases. NWFSC research goals include:

- increase PIT-tag detection range
- develop the ability to monitor individual returning adult fish in fish ladders
- develop the ability to monitor individual juvenile salmon in estuaries
- develop a flat-plate PIT-tag interrogation system for use in small streams and at dams
- further miniaturize transmitter components
- reduce power requirements
- improve software to reduce analysis time
- increase data storage capacity

These technological improvements will enable scientists to measure the effectiveness of fish collection and bypass facilities and to measure the effects of dam passage route fallbacks and delays on salmon survival and reproductive success.

Key Players

Fish Ecology (FE) Division, NWFSC
Bonneville Power Administration
Columbia Basin Fish & Wildlife Authority
Columbia River Inter-Tribal Commission
Washington Department of Fish & Wildlife
Oregon Department of Fish & Wildlife
Idaho Department of Fish & Game

Northwest Power Planning Council
Pacific States Marine Fisheries Commission
University of Washington
U.S. Army Corps of Engineers
U.S. Fish & Wildlife Service

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