

Hydroacoustic Surveys of Pelagic Fishes in the Glen Canyon Dam Forebay

Conducting research to help manage endangered species

Bottom Line

To help understand the potential for entrainment of warm-water, non-native fish into the Colorado River below Glen Canyon Dam, this field study was conducted (2007 - 2009) to help establish base-line data for monthly density and distribution of pelagic fishes within the dam forebay.

Better, Faster, Cheaper

This research allows Reclamation to proactively evaluate potential impacts to endangered species for better decisionmaking.

Principal Investigator

Juddson Sechrist
jsechrist@usbr.gov
303-445-2198

R&D Office Contact

Miguel Rocha
Science and Technology Program
Coordinator
mrocha@usbr.gov
303-445-2841

Collaborators

Reclamation:

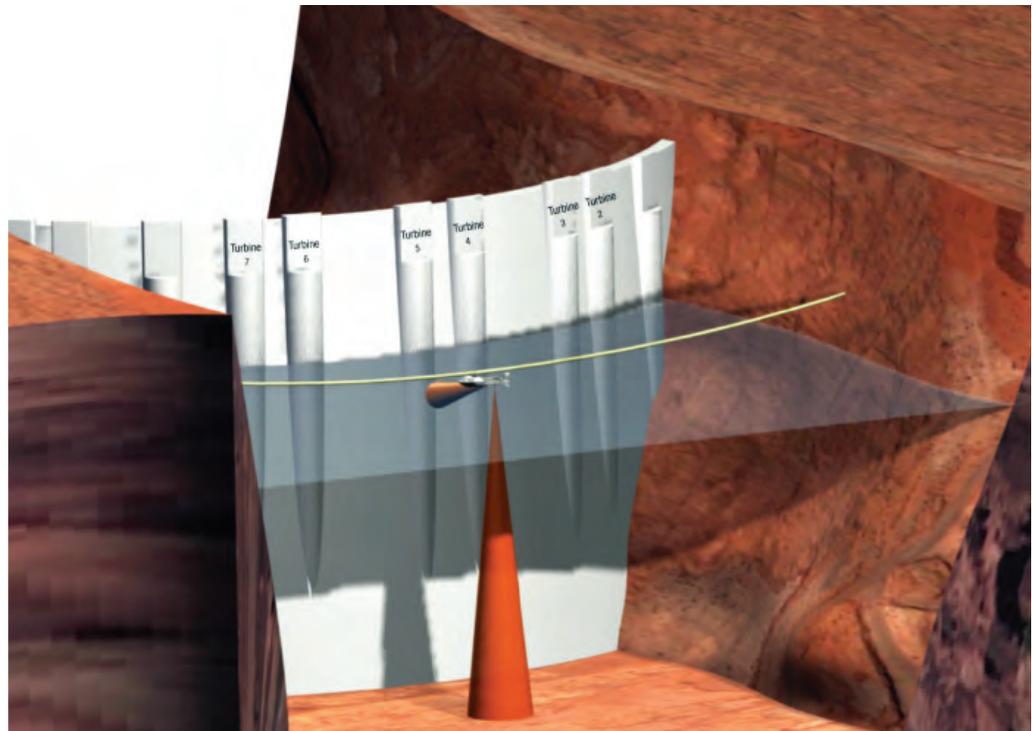
- Science and Technology Program
- Upper Colorado Area Offices

Problem

As an element of the reasonable and prudent alternative set forth in the 1995 Biological Opinion on the operation of Glen Canyon Dam, Reclamation was directed to implement a selective withdrawal program for Lake Powell to determine the feasibility of releasing warm, epilimnetic water below Glen Canyon Dam.

As part of this program, Reclamation conducted a 2-year field investigation from June 2007 through June 2009 to establish baseline data for monthly density and distribution of pelagic fishes within the Glen Canyon Dam forebay. The study improved Reclamation's understanding of the potential for entrainment of warm-water, non-native piscivorous fish into the Colorado River below the dam. These fish (if entrained into the river) could potentially complicate recovery of the humpback chub through predation or competition and negatively impact other native fish.

Other study objectives included monitoring water quality parameters and far-field velocity profiles within the forebay, documenting species composition within the forebay, and determining the Glen Canyon forebay water surface elevation where entrainment of pelagic fish could become problematic if epilimnion withdrawal occurs.



Schematic of the sample vessel attached to the Kevlar line (yellow) within the Glen Canyon Dam forebay. This figure shows the ensounded volumes of water as cones for both down- and side-looking transducers.

— continued



Analysis/Methods

This Science and Technology Program research project partnered with Reclamation's Upper Colorado Area Offices for researchers to conduct research, including monthly surveys from July 2007 to June 2009. Volumetric hydroacoustic surveys were conducted at predetermined stations in the forebay on the Kevlar line (see figure). The stations were located so that the transducers were oriented downstream (toward the dam) and inline with the turbine being sampled. Turbines 2 through 7 were selected for volumetric density estimation. Turbines 1 and 8 could not be sampled effectively from the survey line because of the curvature of the dam and the interference caused by the forebay canyon walls. Volumetric data were collected to document fish density and distribution by depth.

Water quality parameters were recorded monthly. An acoustic Doppler velocimeter was used to measure point velocities at the centerline elevation of the penstock intakes (elevation 3,470 feet) and an occasional vertical temperature profile. An acoustic Doppler current profiler was used to measure velocity profiles in front of penstock intakes (turbines) 2 through 7.

Attempts to identify species composition in the forebay included midwater ichthyotrawls, vertical gill-netting, electrofishing, and direct observation.

Results and Conclusions

1. The density and distribution of fish within the forebay varies with light versus dark periods, month of the year, and depth, with more fish present during dark periods from June through September.
2. Regardless of reservoir elevation, fish in the Glen Canyon Dam forebay were most abundant in the top 14 meters of water during the study period, which overlapped largely with the epilimnion during periods of thermal stratification. Fish were especially abundant in the top 4 meters of the water column.
3. Fish entrainment through Glen Canyon Dam penstocks during the course of the study was likely low, based on densities of fish at water elevations where they would be entrained.
4. Entrainment would likely be via a selective withdrawal system operating at 40' below the surface or during periods of extremely low reservoir elevations (about $\leq 3,516$ feet mean sea level) even without a selective withdrawal.

Management Implications

This study used hydroacoustic methodologies to provide critical information about temporal and spatial patterns of pelagic fishes proximate to Glen Canyon Dam. This information will be important to Reclamation managers who have a responsibility to deliver water and power while minimizing environmental impacts to recovery activities associated with the endangered humpback chub.

“This study is an important component of the knowledge base that Reclamation will use for future determination of the feasibility of releasing warm, epilimnetic water below Glen Canyon Dam through a selective withdrawal, particularly with regard to impacts on native and non-native fish species.”

**Dennis Kubly,
Program Manager,
Environmental Resources Division,
Upper Colorado Region**

Future Development Plans

These data and methods will be used in future evaluations of a selective withdrawal system in the Glen Canyon Dam Forebay.

More Information

Reclamation 2012: Hydroacoustic Surveys of Pelagic Fishes in the Glen Canyon Dam Forebay, 2007-2009.

