

Impacts of Cage Aquaculture

2003 - 2007?

As the human population has rapidly increased during the past few decades, the demand for fish as food protein has also increased dramatically. Many populations of wild fish have been reduced to minimal levels, or entirely wiped out. As a result, humans increasingly have turned to aquaculture, or fish farming, as a source of fish protein.

While aquaculture is now a large business in many marine areas, freshwater aquaculture, particularly in Canada, is a relatively small industry. The majority of Canadian fish farming operations are in Ontario, particularly in Lake Huron. However, as demand continues to rise, freshwater aquaculture is expected to grow in the Great Lakes, and possibly in smaller inland lakes. While we know that growing caged fish in lakes can result in various environmental impacts (e.g. over fertilization, disease, competition with native fish), little is known about the optimum size of these operations to ensure that these problems are minimized or avoided in various bodies of water.

With this in mind, an experimental, cage aquaculture operation has been established in Lake 375 at the Experimental Lakes Area. A cooperative effort between ELA researchers and the Ontario Aquaculture Association, along with Meeker Aquaculture, its purpose is to test current fish concentrations and operating procedures used by the Ontario aquaculture industry, and to determine what, if any, impacts such an operation will have on the natural lake and on its biota.

Following two years of intensive background studies on the lake, a 760 m³ nylon mesh cage was suspended in Lake 375 in May of 2003. On June 5 of that year, 10,000 rainbow trout fingerlings were placed in the cage. These fish were fed pelletized marine protein twice daily during the next 5¹/₂ months, while they grew to more than 10 times their starting weights. On November 19, 2003, the fish were removed from the cage and shipped to market. During this time, ELA researchers were carefully documenting conditions in the lake and the behaviour of native fish and other species.



Technicians feed pelletized marine organisms to the caged rainbow trout in Lake 375.



Rainbow trout swimming in the Lake 375 cage, late June of 2003.



ELA staff remove rainbow trout from the cage, November 2004.

A second cohort of fish was raised in the same cage during 2004, between May 31 and November 1. Researchers continued their detailed monitoring of Lake 375.

On May 30, 2005, a third annual cohort of rainbow trout was placed in the cage and the grown fish were harvested on 30 October 2005. On 29 May 2006, the fourth cohort was introduced to the cage. They were harvested on 30 October 2006. The fifth, and possibly final, cohort went into the cage on 7 May 2007. Detailed monitoring of the Lake 375 ecosystem, and of nearby reference lakes, has been conducted throughout this period, and will continue for at least two years after the farm ceases operation.



Transferring live rainbow trout from the tanker truck for transport to Lake 375, May 2006.

One special aspect of this study is the real-time tracking of movements by native lake trout, white suckers, and "escaped" rainbow trout in Lake 375. Beginning in the spring of 2002, selected native lake trout and white suckers in the lake were captured and sonic transmitters were surgically implanted under the skin in their bellies. These fish were then released to the lake. Each transmitter sends out a signal every few minutes, and these signals are detected by receivers placed in a triangular formation within the lake. The signals are then relayed to a computerized system located on shore, where the horizontal and vertical position of the fish is recorded. Over time, the ELA researchers have accumulated a huge amount of detailed information about fish movements in the lake, both before and after the caged fish were introduced. Since November of 2003, some implanted rainbow trout have been released in the lake and their movements are also being tracked with this system.



Lori Tate (left), assisted by Paul Blanchfield, completes a radio-tag implantation on a live rainbow trout.