Walleye Rehabilitation in Golden Lake – A Pilot Project

A proposal by Don Bishop and Dr. Peter Heinermann,

Co-Chairs of the Golden Lake Property Owners Association Fish Committee

Biographies of the Co-Chairs

Dr. Peter Heinermann

Peter's ties to Golden Lake go back 32 years, to when he first started attending Red Pine Camp, a tradition that continues to this day. He has also organized and run a catch-and-release children's fishing derby at Red Pine for over three decades. He retired in September of 2019, after a 28-year career as the Undergraduate Laboratory Coordinator in the Department of Biology at the University of Ottawa.

Peter has also worked as a research assistant at the University of Waterloo and Woods Hole Oceanographic Institution, studying the ecology and population dynamics of Atlantic Salmon and Brook Trout; a project biologist for Bio-Environmental Services Ltd, studying effects of mine tailings on the behaviour and survival of Atlantic Salmon and the introduction of invasive species via ballast water; as a secondary school teacher, a Cegep instructor, and a lecturer at the University of Montreal.

Peter holds a Bachelor of Science in Honours Fisheries from the University of Guelph, an Aquatic Biology Technologist Diploma from Sheridan College, a Bachelor of Education from Western University, followed by a Master of Science and a PhD from the University of Montreal. It is there that he studied the Ecology and Physiology of Fish Vision in the Creek Chub, White Sucker, Cutlips Minnow and Arctic Charr. He is also the author of more than twenty scientific publications and reports.

Don Bishop

Don has lived on Golden Lake since 1986, he previously lived in Eganville where he moved from Newfoundland with his family in the late 60's. He started his first business at the age of 20, when he ran Bishops' Sports a Yamaha dealership in Eganville with his brother. After that closed in 1993, Don got involved in the aquaculture industry, first through a partnership with a Japanese company that developed solutions for mollusk farming, and then through a partnership with an American manufacturer, where he helped design containment and waste management technologies for finfish applications globally with different species. He is well known for his ability to create solutions using disruptive technologies that create benefits for clients and the environment throughout the world in his 25 years of global travel.

He built four companies in the water sectors since the mid 90's, two in the aquaculture sector, one in wastewater technologies and one as an environmental cleanup contractor. The latter two became the largest of which he sold both in 2018. All the companies were based on taking research applications and creating turnkey solutions based on advancing science and engineering principles.

Don is still involved with both aquaculture ventures on a part-time advisory basis, he has also been involved in research and development of wastewater and nutrient recovery technologies, as well as shoreline erosion-prevention methods and contaminated soil remediation. Now semi-retired, he has volunteered with groups on community development, and coaches and mentor's individuals and companies in a variety of ways.

Walleye Rehabilitation in Golden Lake – A Pilot Project

The Fish Committee, co-chaired by Don Bishop and Dr. Peter Heinermann, has been studying the various approaches taken by the Ontario Ministry of Natural Resources and Forestry (OMNRF) regarding the management of Walleye in Golden Lake starting in 1922. Walleye were first stocked in Golden Lake in 1922 and another ten times until 1945 (Radford, 2000) but numbers, size and life cycle stages have not been reported. Since 1946, the Ministry has stocked Golden Lake with 2.58 million Walleye of various life cycle stages and sizes: eyed eggs (0.2 cm diameter), one- to two-month-old fry (2.5 – 3.2 cm in length), summer fingerlings (3.8 – 5.1 cm), fall fingerlings (12.7 – 17.8 cm), yearling fish (~22.9 cm) and adult brood stock (>51 cm) (OMNRF Geohub, 2022). These early introductions resulted in an established Walleye population, providing both a recreational and First Nations (Pikwakanagan) subsistence fishery. Up until the late 1970s, Golden Lake was considered one of the premier Walleye lakes in eastern Ontario (Radford, 2000, Gillies et al., 2003; Whillans et al., 2013). Walleye populations since that time have decreased significantly throughout the 1980s and 90s. A five-year Walleye fishing closure began on January 1, 2002, in Golden Lake, during which the Ministry of Natural Resources began a stocking program to rehabilitate the Walleye population. Since 2003, however, only 130,966 summer fingerlings (3.8 – 5.1 cm) and 260 adults (>51 cm) have been stocked, with no visible improvement in resident Walleye numbers. As well, no stocking of Walleye fingerlings has occurred since 2014. It is quite clear that the number of Walleye stocked by the Ministry in Golden Lake has declined dramatically and precipitously since 2005.

Following the Walleye closure (2002-2007), regulatory changes were also put in place, such that a maximum of two Walleye could be kept and they had to be a minimum of 50 cm in length.

During our analysis of the Ministry's Walleye stocking approaches, we noticed that in 1946 200,000 yearlings (~22.9 cm in length) were introduced. These initial and significant plantings of larger fish tipped the scales and apparently made a major contribution to the development of an established fishery. However, since 1947, of the nearly 2.18 million Walleye put into Golden Lake, only 260 fish have been Walleye greater than 5.1 cm in length. We are suggesting that we need to return to the original successful approach of stocking larger fish. The increased costs to the ministry of raising these fish can be avoided by engaging the fishing community during the grow out phase.

Radford (2000) concluded in the Walleye Improvement Strategy for Golden Lake, that "recruitment in Golden Lake is very low and that perhaps intense predation on emerging Walleye fry is contributing to failed year classes". He also strongly recommended that stocking of fall fingerlings occur at least once during the closure of the fishery. Unfortunately, only summer fingerlings have been stocked since the recommendation.

In 2009, a hydroacoustic study on Golden Lake conducted by the Harkness Fisheries Laboratory has estimated the Rainbow Smelt population to be approximately **4.1 million fish** (Middel, 2009), by far the largest number of any fish species in this water body. Since adult Rainbow Smelt (~15.2 cm long in Golden Lake) are voracious predators that feed upon the eggs and young of the year of many fishes, we believe that the major reason why all of the ministry's rehabilitation stockings of walleye have not shown any measurable effects, is because they were

effectively feeding the Rainbow Smelt in Golden Lake. Rainbow Smelt have been shown to contribute to recruitment failure in Walleye, through direct predation on young of the year fish (Mercado-Silva et al. 2007). They are also known to cause deleterious effects by competing for zooplankton with young of the year and older Walleye (Beisner et al. 2003). Female adult Walleye that eat mainly Rainbow Smelt may also produce eggs with a thiamine deficiency, resulting in early mortality syndrome in age-0 Walleye (Honeyfield et al. 2005, Rosburg et al. 2022).

The Fish Committee of the Golden Lake Property Owners Association believes we have a solution to this problem. In a nutshell, conduct Walleye rehabilitation stocking of fall fingerlings (12.7 – 17.8 cm) into Golden Lake with the help of the stakeholders.

Our initial goal for this project is to try to establish an approach to rehabilitate the Walleye population in Golden Lake. It is based on evidence that the survival rate of stocked fish will be much better if we can go from the summer fingerling stage (~3.8 cm) to the fall fingerling stage (~ 15.2 cm). In this way, instead of the stocked Walleye potentially being food for the abundant Golden Lake Rainbow Smelt and the other species, the larger stocked Walleye will be a serious competitor with the Smelt, and hopefully have a higher survival rate. There is a large body of scientific evidence in support of this (Santucci and Wahl, 1993; Seip, 1995; Harder and Summerfelt, 1996; Kerr, 1999; Kampa and Hatzebeler, 2009; Grausgruber and Weber, 2020; Weber and Weber, 2020). In addition, using a model proposed by Lawson and Carpenter (2014), we will be able to calculate the actual length of fall Walleye fingerlings we need to achieve before release, in order to avoid predation by the resident Rainbow Smelt.

Something that we have known because of our backgrounds is that when one species wins another loses. This is the balance of nature and applies to all living things. The scales were tipped against Walleye 30 years ago and we will be working to tip them back.

It should be noted that the province operates nine hatcheries that have up to a 4-year planning cycle for production. The methodology is generally to hatch the species and move them out to the required location at the earliest stages, as space and operational logistics are limited to hatching and not to nursery grow out. Our focus will be to create a nursery application that is manageable and that can be used with different species in different bodies of water so that the target species of rehabilitation will be far more efficient than traditional stocking methods.

In order to succeed with our pilot project, we have sought information from many different types of Walleye experts. We started with and have had many communications with the Pembroke District Management Biologist (Tania Baker). Don and I have visited the White Lake Culture Station for a tour and extensive discussions with its Fish Hatchery Manager (Tim Drew). To ensure support and active involvement of the Algonquins of Pikwakanagan First Nation, we have had numerous discussions with their Department of Natural Resources Manager (James Kushny). We have solicited input from a specialist (Gary Chapman) regarding methodology and lessons learned from a commercial Walleye rearing project conducted with a First Nation community close to Lake of the Woods. A commercial finfish aquaculture owner of an operation on Manitoulin Island (Mike Meeker) has shared his Walleye cage culture expertise and provided

guidance on design and operational experience. Through extensive discussions with a regional tournament sport fisher (Thomas Plebon), we have also obtained historical input from someone who has used his specialized sonar systems to identify the areas on Golden Lake that have the highest numbers of Smelt and mature Walleye. All of these people bring hands on experience of dealing with Walleye culture both at and beyond the hatchery stage. In addition, we have received resources, contacts, and guidance from leaders in Walleye intensive culture practice from the states of Iowa (Drs. Alan Johnson and Greg Fischer), Vermont (Dr. Kevin Kelsey) and Wisconsin (Dr. Chris Hartleb).

Survival of deposited Walleye eggs in the wild has been documented as being highly variable. Serns (1982) found survival from potential egg deposition to the fall of the first year to be 0.0088% in 1979, 0.0026% in 1980, and 0.0714% in 1981. Forney (1976) also calculated rough estimates of potential egg deposition and found that Walleyes in Oneida Lake, New York, produced 12-18 billion eggs each year, of which only 0.05 to 0.07% lived to attain 8 mm in length. Survival of summer fingerlings has also been reported by Jennings et al. (2005), where over four years, using marked summer fingerlings (3.0-4.6 cm), stocked in 23 lakes in Wisconsin, they found that the mean survival of stocked fingerlings from June until October was only 3.4%. In another study on survival from Walleye fall fingerlings to adults (3 years old), Kempinger and Carline (1977) found that survival of fall fingerlings to age 3 averaged 12% annually.

Over the last 40 years, across many jurisdictions, it has been shown that Walleye fry stocking has produced highly variable results (Kerr, 2011). In fact, about 85% of fry stockings result in no measurable year class (WDNR, 1999). Partly, because of this, from 2013 to 2015, the Wisconsin Department of Natural Resources transitioned much of its Walleye stocking from June-stocked “small fingerlings” (about 3.8 cm fish) to September-October stocked “fall fingerling” Walleye (> 15.2 cm), through a program known as the Wisconsin Walleye Initiative (WDNR, 2022).

Our methodology for the pilot project proposed by the Fish Committee of the Golden Lake Property Owners Association will be to obtain summer fingerling Walleye (3.8 – 5.1 cm) that have been trained to eat granular feed and place them into transitional or nursery applications made up of small floating fish cages at strategic (considerations for water temperature control, weather avoidance and accessibility) locations on Golden Lake. We are also investigating the use of floating raceways to culture Walleye, as this has been a very successful approach used by Izumi Aquaculture with Rainbow Trout (Hill, 2022). There is also the potential to do remote secure nursery ponds (small lakes or secure bodies of water, such as purpose made rectangular nursery ground structures), which replicate the approach used in the late 40s, south of Pembroke by the MNRF.

All approaches will allow the summer fingerlings to grow protected with high value feed from June until November, when lower water temperatures will cause their metabolism to decrease as they prepare for over wintering. At this point these 15.3 to 20.3 cm Walleye will be fin clipped and released, having a much better chance of survival in Golden Lake. While this approach may seem unique, the Lake Ontario Net Pen Program has precisely done this with Chinook Salmon since 2003, having such great success, that in 2016 it represented 42% of the total Chinook

stocking load to the Canadian side of Lake Ontario, about 225,000 fish (Todd, 2017). Lake cage culture studies with feed-trained Walleye have also been conducted in Illinois, having an average survival of 86% over 79 days (Harder and Summerfelt, 1996), in Iowa (Bushman, 1996; Stevens, 1996; Blazek, 1996), in Kentucky (Coyle et al. 1997), as well as in Ontario (Meeker, pers. comm.). Since the cost of producing summer fingerling Walleye is relatively economical, compared to the much higher cost of producing fall fingerlings, growing the smaller fish in Golden Lake would be a significant saving for the ministry's fish culture program. If our pilot project is successful, it could serve as a model for use across the entire province.

Post study evaluation and monitoring

Following the first year of the study, adjustments and refinements to the methodology will have to be made. Creel surveys of fisher folk on Golden Lake will be conducted in the summers following the initial study. Publicity of the study will be used to engage people fishing on Golden Lake to photograph and report their catches, as well as promote our active **Walleye CPR** (**C**atch, **P**hoto and **R**elease) program.

Budgets are currently being put together for each different type of proposed nursery application, as well as associated soft costs. Once we have that, we can then work with all shareholders to combine funding sources. We want to make it very clear that this is a process, and we have a lot to do before we get a whole plan in place. Our initial focus will be proof of concept and to find ways to make the process work with the proper methodology and equipment. We will then move onto a five year measurable plan. We hope that we can count on your support.

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