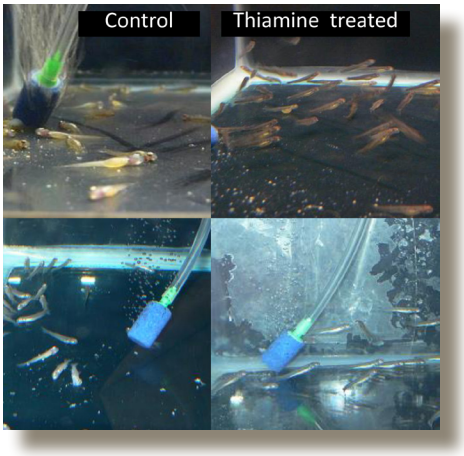
School of Environment and Natural Resources

Fisheries/ Aquaculture

This is an association between early mortality syndrome (EMS) of newly hatched lake trout and thiamine levels in unfertilized eggs. We propose a thiamine bath treatment at the late swim-up stage that is capable of ensuring almost complete survival of juveniles.



SITUATION

There are several cultural and ecological reasons that favor lake trout, the largest native salmonid undergoing rehabilitation efforts in the Great Lakes. This is a long-lived fish, attains a size of 44 lbs, inhabits various niches, and provides stability to lake fish communities. Management strategies include enhanced stocking of juveniles, establishment of sanctuaries around spawning habitats, and diversification of the genetic resources of lake trout. The salmonid sport fishery in Lake Erie is the fastest growing sector of charter boat operations, and in Erie County (PA) alone contributed $10.6 million to the local economy. However, lake trout in all the Great Lakes suffer from thiamine (vitamin B1) deficiency due to changes in their diet that now includes exotic/invasive prey species. This alteration in diet has resulted in juvenile lake trout mortalities of 40 to 90% at the time of yolksac absorption over the last 20 years.

RESPONSE

The objectives of this study were two-fold, first, to examine the effect of thiamine immersion treatment of fish from a population known for compromised survival due to EMS (Lake Michigan), and second, to investigate the cause-response relationship between thiamine concentrations and pathologies in tissues of swim-up stage lake trout. Control groups of alevins that had low thiamine levels at the unfertilized egg stage later exhibited EMS and had high mortality levels of 62.9 ± 21.5%. Also, pathological changes were frequently observed in the brain, olfactory nerve, eye, and liver, but not in the muscle of alevins. The major finding of this experiment was that thiamine immersion can be delayed until swim-up stage and recovery (measured as survival during the active feeding phase until day 16) can reach nearly 100%.

IMPACT

The present study showed that the low thiamine levels in unfertilized eggs led to pathological changes (necrotic cells) in the brain, olfactory nerve, liver, and retina in lake trout alevins at swim-up stage. We found that the fractional survival between hatching and swim-up stage was not related to EMS, and treatment postponed until swim-up stage was extremely effective in avoiding mortality. This collaborative research among four institutions, including a visiting scholar, will secure faster use of the developed technique in fish hatchery procedures, decreasing the cost of treatment, and decreasing the risk on handling newly hatched alevins of salmonid fishes.

SENR Contact

Konrad Dabrowski
Professor
210 Kottman Hall
2021 Coffey Rd.
Columbus, OH 43210
614.292.4555
dabrowski.1@osu.edu
http://senr.osu.edu

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