LIGHT LINES

CREDIT RIVER ANGLERS ASSOCIATION

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The Value of Wild Fish

By Brian Morrison

I'm sure that many readers of our newsletter often wonder why so much emphasis is placed on the creation of a wild steelhead fishery in the Credit River. Not only are wild fish a good indication of the quality of our environment, they are better suited to survive to adulthood than are hatchery plantations. In the wild, only the fittest survive, which is quite evident on the end of a noodle rod. But when natural conditions are lacking, for example, during a drought year, people want to see more fish, and they look towards stocking. Stocking to increase a population of wild stocks can have detrimental effects by reducing the genetic diversity/viability of existing populations and encourage energy costly behavioral interactions. Pathogens are also capable of entering the ecosystem via the introduction of hatchery fish. If I were to hand raise an animal from birth until it was two years old then release it back into the wild, you would tell me that I was crazy, that animal will never survive. But we have no trouble doing this with fish.

Paula with a Pennsylvania "Cookie Cutter" steelhead, 1993. Photo: John Kendell.

Genetic concerns about hatchery-reared fish fall into three categories: (1) direct genetic effects caused by introgression or hybridization; (2) indirect genetic effects caused by competition, predation, disease, or any other factors that lead to reduced population size or altered selection regimes in the wild populations; and (3) genetic changes to hatchery stocks brought about by selection, drift, or stock transfers (Trotter, 33; 1994).

Direct genetic effects. When cultured fish manage to interbreed with wild fish, either from straying or from supplementation of hatchery-reared fish with wild populations, there are two important genetic consequences – loss of gene diversity between populations and outbreeding depression. Regarding the loss of between-population genetic diversity, the concern with salmonids is that a variety of locally adopted populations will be replaced with fewer homogenous ones (Trotter, 33;1994), a process that tends to limit the evolutionary potential of the species as a whole.

The amount of genetic differentiation between a wild salmonid river, like the Gold River on Vancouver Island, as opposed to a hatchery dependent stream such as Elk Creek in Pennsylvania can be substantial. The Gold River is managed as a wild salmonid river with several distinct populations of wild steelhead (Oncorhynchus mykiss) including one of the last completely wild summer run steelhead populations in the Pacific Northwest. Elk Creek on the other hand is 100% hatchery-reared steelhead, with minimal diversity amongst the fish, better known as 'cookie cutter' fish.

The diversity afforded through adaptations to local conditions, is what buffers the total productivity of the resource against natural patterns of disturbance and unpredictable changes. Loss of between-population diversity may lead to a reduction in overall productivity and greater vulnerability to both natural disturbances and environmental change. Hybridization can impact in more immediate ways as well,

... continued p.4

Credit River Anglers Association

LIGHT LINES

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CRAA General Meeting

A General Meeting was held at Streetsville Hall on October 9 featuring slide presentations and discussions. Our special guest speaker was **Jon George**, one of North America's leading steelhead and salmon biologists. He has worked for OMNR in both southern and northern Ontario for over 25 years, the last 15 in Thunder Bay. Jon presented information about the Portage Creek steelhead study he spearheaded which demonstrated the importance of lower limits and reduced spawner harvest for improved the steelhead population. This cutting-edge work by Jon has been the most important factor in the regulation changes for Lake Superior steelhead to ensure there will be a viable population in the future.

Mike Tost – Gold River, B.C. 2001 Trip

CRAA Vice President and hatchery manager Mike Tost presented slides from his trip in late February of this year to Gold River, B.C. CRAA member and director Mike Brady also attended the trip with other anglers from Thunder Bay. Pictures of big steelhead, gorgeous water, incredible scenery and the story of Mike's 25 lb steelhead that got away (sounds pretty fishy).

Chris Atkinson – Nottawasaga Steelheaders

Chris Atkinson, founder and President of the Nottawasaga Steelheaders (NS) handed out copies of the Nottawasaga River Steelhead Report and led the discussion on proposed steelhead regulation changes for that river. In addition, Chris brought our membership up to date on the work the Nottawasaga Steelheaders have completed on the Boyne River rehabilitation program.

John Kendell – CRAA's Recent Projects

CRAA President John Kendell presented slides of our past conservation work and updates on how the work has been progressing. John also elaborated on threats to the future health of our beloved Credit River watershed with many frightening pictures of flooding, erosion and environmental degradation.

Your Help is Needed!

Please review the list below to see if there is something you can do to help out. CRAA continues to be one of the most active conservation organizations in Canada. To ensure we continue our important work we need your help. Members are needed to assist in our projects for planning, organization and more.

Fish Hatchery

We need some more members to help out. The help we need at the hatchery has to be a commitment over several months, but only for half an hour, once each week. The work is easy, feed the fish and make sure everything is operating properly. Members living close to Georgetown would be the best for this to minimize driving time, however, if you're willing to drive from Mississauga or another area we would love your help.

Tree Propagation

CRAA has operated a small nursery for 3 years to grow some of our trees to a larger size. We need a few members to help in watering once a week and spread fertilizer a few times a year. With two people it may only take 5-10 hours a summer – spread out over 3 months. The nursery is near Georgetown with direct access by car.

Fund Raising

We always need money for projects, whether buying trees, stocking fish or completing river rehabilitation. It would be great to have a few members actively searching for funds from government agencies, private companies and other projects to raise money, such as the Port Credit boat launch.

Event/Project Planning

We have many projects to complete, but it takes one person to plan them to make sure everything is prepared for volunteers to show up and help. Again, not a lot of work, but a few evenings out of the year to make sure trees are ordered, food and drinks are brought to a work site, volunteers are called or e-mailed and more.

Marketing and Publicity

With our large membership there must be a few who have marketing experience. We need at least one member to help with press releases, calls the media for events and highlights and marketing to make sure the public is aware of our work. As we spread the word about our conservation work we will draw more volunteers and more people to take on larger projects.

Sign up new members

All members should be actively bringing new membership to CRAA. Get your fishing buddies to join first, then encourage others to join while you are fishing. If you are fishing the Credit and speaking to another angler ask if they're a CRAA member, if not, why? We have done so much great work and have made Erindale a great fishing spot. Why haven't they joined?

The Value of Wild Fish *continued from p.1*

through the fitness of the resulting mixture of gene pools (Trotter, 33; 1994). Sometimes, especially if the hybridizing gene pools are inbred and are not too different from one another genetically, the fitness of the offspring may actually increase over the parent stocks, a phenomenon known as heterosis or hybrid vigor (Trotter, 34; 1994). As genetic distance between parental stocks increases and genetic incompatibilities become more likely, the fitness of the offspring declines. This decline is called outbreeding depression (Trotter, 33; 1994).

Unfortunately, outbreeding depression has been studied more in other organisms, plant species for example, than it has been in salmonids (Trotter, 34; 1994). In order to examine some of the genetic consequences of hybridization of salmonid populations adapted to different local environments, one can ask themselves several questions: (1) What are the genetic consequences of hatchery fish straying into the wild? (2) How does the periodic infusion of wild brood stock into a hatchery affect fitness? And (3) How much time would it take for natural selection to restore fitness in populations that have experienced outbreeding depression? (Trotter; 34; 1994). Non-trivial reductions in fitness may indeed occur from periodic mixing of hatchery with wild fish, even when the mixing proportion is as low as 5-10% (Trotter; 34;1994). Furthermore, recovery of fitness following a single hybridization event may require many generations.

Mike Brady with a 36" Gold River, B.C. wild steelhead. Nice genes. Photo: Mike Tost.

Indirect genetic effects. Any factor that reduces population size or alters selection regimes can alter the genetic structure of wild populations. The effects of competition, predation, and disease brought about by artificial production may lead to reductions in the size of wild fish populations. Add to these biological factors the social, economic, and political pressures to fully utilize the new resource that usually accompany a hatchery facility – pressures that too often are associated by setting generous harvest levels, long fishing seasons, increased numbers of commercial licenses, and the like. These actions place a burden on the wild stock in mixed stock fisheries, thus reducing their numbers still further. The consequence is, in the short term, that wild fish may be left more vulnerable to catastrophes or shifts in environmental conditions than they were before, and may even be placed at risk of extinction in the face of such events.

In the long term, erosion of the genetic variability of the population through random loss of alleles becomes an important factor. A population of individuals may have many forms of a given gene, even though each individual in that population may possess no more than two, one donated by each parent (Trotter, 34; 1994). The total array of alleles of each gene present in the population is another component of genetic variability. Random loss of alleles is much more likely to occur in small populations where the probability is greater that an individual that dies off without passing genes on to the next generation may be the only one possessing a certain allele (Trotter, 34; 1994). The outcome of reduction in overall levels of genetic variability, as has already been seen, is to limit the evolutionary potential of the population and compromise its long term ability to survive (Trotter, 34; 1999). This sort of erosion of genetic variation also leads to an increase in the number of individuals that may inherit a single form of some gene that is deleterious (Trotter, 34; 1994), thus reducing fitness through what is called inbreeding depression.

Factors that influence the abundance of wild populations can alter selective pressures and thus bring about directional genetic changes. Directional change is anything that favours only a specific portion of the gene pool being passed on to the next generation (Trotter, 34; 1994). An example might be allocation of water flow at a dam that is timed to the outmigration of hatchery steelhead smolts. If the hatchery fish pass in a slug, rather than over the longer time period characteristic of many wild populations, then only those wild smolts that happen to pass at the same time as the hatchery smolts will be favoured for survival (Trotter, 34; 1994). A fishery that selectively harvests only certain sizes or age groups, leaving only those outside that range to reproduce, would be another example.

Genetic changes in hatchery stocks. Genetic changes can occur in hatcheries through selection, through mixing or transfers of stocks, and through random processes. These changes are important because they help to determine the nature and significance of genetic interactions with wild fish after the hatchery stocks are released.

Random processes can operate in hatcheries because, in the first place, many hatchery populations were founded from only a small number of individuals (Lichatowich, 124; 1999). But even in those taking spawn from large numbers of adults, the number of individuals actually passing genes to the next generation can be surprisingly small. Geneticists call this number the effective population size per generation and give it the symbol Ne (Trotter, 36; 1994).

In populations that are permanently cultured, in aquaculture operations for example, genetic changes mediated by selection may be desirable. There you would want stocks to be well adapted to the hatchery environment, and you might deliberately select for fish that exhibit increased fitness and higher productivity under those conditions. But for fish intended for release into the wild, the hatchery represents only a portion of the life cycle. Selective regimes are quite different in the wild, especially for anadromous species. Hatchery managers have become highly aware of this, and many now strive to avoid selecting for hatchery-adapted traits.

Two wild steelhead providing eggs and milt at the Streetsville fish ladder. Photo: Pete Petlos.

The advantage to artificial propagation of a species such as steelhead is that a large percentage of fertilized eggs can be raised to fry or smolts, therefore avoiding the heavy early mortality experienced by wild populations. The difference is dramatic – 50% or higher egg-to-smolt survival in hatcheries compared to generally less than 10% for wild populations (Trotter, 36; 1994). This means that much of the culling that occurs before the fish return as adults must take place outside of the hatchery environment. Post-release mortality of hatchery salmonids is very high, often exceeding 99% (Trotter; 1994). In an Ontario study, a hatchery fingerling rainbow trout is 141% less likely to survive to maturity compared to a wild fish, and a hatchery smolt is 79% less likely to survive to adulthood (Atkinson; 1996). This shows us that hatchery fish certainly exceed the mortality rate of most wild populations.

There are opportunities for inadvertent selection to occur in the hatchery environment. Simply choosing which fish to breed is one. This differs in many basic ways from what happens in the wild. One common occurrence in hatcheries is advancement of spawning time, something that is sometimes deliberately done to prevent hatchery steelhead that escape harvest from interbreeding with wild, later-spawning steelhead, for example. Another related problem in hatcheries is how to mimic selection for reproductive success. In a study by I.A. Fleming and M. R. Gross showed in 1989 that phenotypic traits associated with female mating success in coho salmon were reduced in hatchery stocks, presumably due to relaxation of breeding competition in the hatcheries. Another study showed that hatchery rainbow trout are 71% less fecund than wild fish (Atkinson; 1996).

Stock transfers, i.e., the transfer of fish and eggs among often distant hatcheries, was a common practice for decades (Lichatowich, 125; 1999). Although fisheries managers are mush less prone to make such transfers today, pressures to do so still exist. When hatchery stocks genetically homogenized by stock transfers are outplanted, concerns arise about loss of between population genetic variation and outbreeding depression, the two genetic consequences of stock transfer.

Despite from genetic concerns, there is a growing body of evidence showing that hatchery reared fish are poorly educated for life in the wild. What's incredible about this is not so much the revelations about behavior themselves, but how long fisheries scientists and managers have know that there were problems. Some of the references go back nearly 100 years (Lichatowich, 141;1994).

Wild salmonids, which includes both resident trout and the juveniles of anadromous species such as steelhead that rear in streams, establish dominance hierarchies. They do this through a set of subtle almost ritualistic signals and low-intensity tussles that seem to be understood by all of the species (Trotter, 37; 1994). Subordinate fish know their status; they give way to more dominant fish and avoid trespass. The population is spread out, each individual utilizing the most energy profitable space it can defend through a series of displays and bluffs. This conserves the energy not only of individual fish, but the population as a whole.

Feeding is also done in an efficient, casual way in which the fish use the currents, mostly letting the food come to them. At the same time, wild salmonids adopt a wary, fail-safe outlook on life. They are never far from cover, and often rest in or on the bottom substrate when not feeding. When threatened, they dart for cover and remain there, often for 10 minutes or more (Close; 1999).

Hatchery fish, when stocked in a stream, behave altogether differently. Reflective of their crowded, frantic lives in the hatchery raceway, they flock up and aggregate rather than seeking cover or dispersing to energy profitable sites like wild fish. They hold high in the water column and swim actively, attacking both the current and one another in a most energy wasteful way (Trotter, 37; 1994). Probably because they were fed regularly with pellet food delivered on the surface, they seem not to recognize natural food. Starvation has been found to be common for hatchery fish released into streams, as has failure to avoid predators (Trotter, 37; 1994). Fish in hatcheries learn to scramble for food delivered from overhead, thus they respond to overhead stimuli rather than fleeing, as wild fish do. Unfortunately for them, in the wild most overhead stimuli are predators.

But these are all behaviors that would lead to the culling of hatchery fish from the system. It's their interactions with the wild fish that is the primary concern. Hatchery fish are aggressive fish. They fail to recognize or obey the hierarchical signals that keep the wild fish community in balance (Weland, 11; 1996). They constantly trespass on feeding territories, drawing the wild fish into energy consuming defensive forays. Serious fights are much more frequent. In one study of a resident trout population, the aggressive and aberrant behavior of hatchery outplants so disrupted the community that both wild and hatchery fish lost energy and died at a rate greater that the mortality rate before stocking, thus reducing the total population to less than pre-stocking levels (Trotter, 37;1994).

As long as fishery managers continue to overlook the underlying causes of why the fish populations are declining and continue to use hatcheries to the detriment of wild populations, they will not be able to protect and increase the populations. This is like taking an aspirin to treat a brain tumor – at the beginning the pain may go away, but the underlying problem is not addressed, which is usually habitat destruction and over-harvesting. This should prove to us that there needs to be more emphasis placed on habitat rehabilitation, opposed to hatcheries to make up for sagging fisheries. A good example of this is on the Columbia River, where 3 billion dollars has been spent on hatcheries (Lichatowich; 1999), but the population of wild salmonids is at the lowest point ever. As a wise friend once told me – stock a fish today, maybe have a fish tomorrow, plant a tree today, have dividends of fish forever.

President's Note

This is a fine article written by CRAA member Brian Morrison highlighting the incredible value of wild fish and illustrating another example of humans damaging something natural with the use of hatchery-reared fish.

After reading this you may ask, why is CRAA stocking steelhead and migratory brown trout, knowing this information. The fact is, this information is not new. Brian has done a nice job of stating the facts and issues for your information. CRAA is forced to operate a hatchery and stock steelhead and migratory browns to ensure there are some fish available to run the river and provide fishing opportunities, otherwise there would be few, if any, in the Credit River. This is the result of mismanagement by the MNR in the past, brought about by a combination of small special interest groups who campaigned against migratory fish, massive habitat degradation, lack of coordinated angler demand (for the migratory fish) and past misguided management (put-and-take fishery – quoted from the 1989 fisheries management plan). Fortunately, the MNR has listened to anglers and has begun changes to meet the desire and importance of wild salmonids. The new Credit River fisheries management plan will allow steelhead to spawning grounds (at some point in the near future, I hope) where they can support a wild, self sustaining population. Unfortunately, the fish cannot access these areas of superb juvenile habitat yet, therefore we must stock steelhead to ensure a population.

CRAA's egg collection uses a much greater number of parent fish than hatcheries often use and we attempt to collect eggs and sperm from wild fish only. In doing this we create the greatest genetic diversity possible from our hatchery offspring. The newly hatched fry are immediately stocked into the river, most prior to feeding. This eliminates the conditioning for surface cluster feeding and schooling that often occurs in older hatchery fish. Therefore, the newly-stocked fry must learn to eat, take cover and survive in the wild exactly like a wild steelhead born in the gravel. Finally, the steelhead and browns we stock are placed into sections of river where there are NO wild fish. There are no wild

...continued p.7

The Value of Wild Fish *continued from p.6*

fish because the MNR will NOT allow the adult steelhead and migratory browns access to these areas where they could reproduce successfully. We are permitted to stock in these locations only because the fry distribution can be controlled, whereas spawning locations for adult spawners cannot be controlled.

We are looking forward to a new barrier being constructed in Inglewood to stop migratory fish so they will once again be allowed access past Norval and create a wild, self sustaining population. Once this barrier is in place and steelhead and migratory browns have full, unobstructed access to it (that requires a new fish ladder at Norval Dam too) we can cease our stocking and concentrate on rehabilitation and fishing! I can't wait!

Salmon Fishing Tips

By John Kendell

Erindale Park has long been the most popular location for new anglers to learn the art of river fishing. The Credit is perfect for it, with large predictable salmon runs and easy access. The information provided here is for the Credit, but transferable to most southern Ontario rivers. The river is open all year for Pacific salmon fishing from Dundas Street to Highway 403, thanks to CRAA's hard work keeping it open.

The best salmon fishing will occur within 3 days of a moderate to heavy rain, between the end of August and the middle of October. Salmon will reach the Dundas end of the park within 12 hours of the rain and will hit Burnhamthorpe within 24 hours. The bulk of the run will pass the 403 by the third day, leaving groups of slower fish in the deeper pools. During the peak runs it is common to have 5,000 or more salmon swim through the park, with 3 or 4 large runs each fall.

When fish are on the move you should position yourself at the front of pools and deep runs where fish will congregate and pause before running rapids. The best baits are flies (such as egg patterns, wooly buggers, nymphs and bright attractor patterns), roe and single eggs. In murky water you should use brighter colours, such as red, pink and chartreuse. As the water clears change your presentation to cream, peach and white. As the water drops and clears fish will congregate in pools and stop running. Faced with these conditions you should use lighter leader line and head to deep pools like Falling Rocks, Wire Mesh and the Ice Breaker.

Present the bait by bottom bouncing or under a float or fly line. Cast into the fast water just upstream of your location. If bottom bouncing allow your bait to drift with the current until the line tightens and begins to drift in towards the bank below you. Repeat the drift over and over until you have one take. Under a float you should cast just upstream again, but allow your drift to pass downstream at the same speed as the current and let line off your real to extend the drift a little. Salmon will normally hit only as the bait is drifting to them (unless your using a lure) so at the end of the drift real in and cast upstream again. Make sure you have enough weight on to tap the bottom, but not too much to prevent snagging the bottom.

If there are many fish around you should lift your rod slowly at the end of the drift so you do not snag the salmon. If you do snag a salmon point your rod at the fish and put additional tension on the drag to open the hook or break the snagged fish off. It is a criminal offence and extremely unsporting to snag a fish and not release it immediately. Legally hooked salmon will 99 times out of 100 come up head shaking for a few seconds and then turn and go down river. If the fish immediately takes of without first head shaking it is almost defiantly snagged. It is better to break off the fish that you think is snagged right away and go hook another one legally. After all, on a good day it is easy to hook fifty or more salmon so why not do it properly.

A noodle rod (9' to 13') is perfect with a fly, spinning or float real with 6 to 10 pound test. Hooks should be size 6 to 10, single (and barbless if you can pinch the barb). I recommend Eagle Claw Laser Sharp hooks, size 8 and 10 for salmon. They are sharp, strong and flexible enough if you do snag a fish they will open up when pulled hard on 6 lb. test. That way you get your hook and fly back and the salmon doesn't have a hook lodged into its back.

Good luck fishing and please release your fish. If you do take one home, make sure it goes home. People dumping fish and remains into garbage cans or along the banks is the greatest threat to future fishing opportunities.

News and Announcements

Beaver River–Thornbury Dam

After lobbying from CRAA, SSA, OS and other groups to remove the dam in Thornbury rather than replace it the MNR and other decision makers decided to re-build it and construct a new fishway. This is another prime example of just how backward things are in Canada sometimes. In the U.S. they are removing huge dams and here we are spending millions of dollars to rebuild them, and for what. The new dam will just be a dam and a barrier to fish as it has been for years. There are no plans to repair the power turbine so the proponents who want to keep the dam have no reason, other than their own pond out back. They obviously don't care that they are causing so much damage to the river and the fisheries to feed their private wants. The dam and fishway are to be rebuilt over the next five years, when the money is available.

Bronte Creek-Petro Park

Due to delays in receiving CFWIP funding, as well as a shortfall in the necessary funding the Petro Canada Park project will be delayed until 2002. We plan to construct a stump and boulder wall to stop the erosion and create a deep bend holding pool. The City of Oakville also did not respond to our requests for cost sharing and assistance with their own machinery.

The MNR has provided $2,000 in CFWIP funding for the project, but because of the need for machinery and delivery of rock the minimum cost will be at least $4,000. The benefits to the City of Oakville are clear so we expect they will contribute to the cost of the work. The tentative construction date is July, 2002.

Salmon Stopped at Streetsville

This is an announcement to the membership who are not aware the Ministry of Natural Resources mandates that all Pacific salmon are to be stopped at Streetsville Dam. This has been the case for over a decade and did not change with the recent fisheries management plan, although we did request that barrier be moved to Norval to increase fishing opportunities.

The MNR stops the salmon for egg collection purposes and concerns over trespassing up the river. Although these are valid reasons, several members have recently questioned why CRAA had not opened the ladder for the salmon. The reason is we are not allowed to pass the Pacific salmon. The ladder will be operated in late October for brown trout egg collection and will be opened after that time to allow fall run steelhead access past the dam.

MNR-CFWIP award to CRAA

The Aurora MNR put on an awards dinner to celebrate the Community Fisheries and Wildlife Involvement Program (CFWIP) earlier this year. Aurora MNR has the largest district budget for CFWIP funding and has been an important part in helping to fund fisheries projects on the Credit for years. CRAA received an achievement award for all are hard work in 2000, not to mention having the most CFWIP projects in the district and the most funding to one organization. CFWIP funding has been an important part of our projects for years, helping to finance materials and equipment to be used in tree plantings, the boulder placement, hatchery and fish ladder.

3 Bad Years

1999 was a hot, dry summer. In May of 2000 we had severe flooding in all southern Ontario streams killing most steelhead eggs buried in the gravel. 2001 has been a really hot and dry summer. Add it up, three bad years for trout and salmon production. What does this mean? Poor fishing for the future. Steelhead survival appears to have dropped in Lake Ontario (anecdotal info from LOMU) and three bad years for juvenile stream production means there will be fewer fish returning as adults. Tack onto that harvest rates exceeding 18% in Lake Ontario and stream harvest rates exceeding 30% (for Gany/Wilmot) (from LOMU 2001) and you've got even worse fishing. Perhaps this drop in population will finally result in lower harvest regulations, maybe even a one fish limit like that set on Lake Superior's north shore recently to protect wild populations of steelhead. Thanks to CRAA's stocking efforts at least the Credit should fare a little better. Our 2000 stocking was in late June so the cold, wet summer was perfect.