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By Bill Bakke, Director



Stocking or restoration

By Kaare Manniche Ebert

M.Sc. in Fisheries biology. Consultant in Danish Angling Association.

Which way should anglers go to improve the angling for salmonid species: Keep on stocking trout in the rivers or try to restore the natural habitats? Danish experiences have shown that there is a change in attitude towards improvement of the ruined streams.

In Denmark only a few percent of the 40.000 kilometres of watercourses are unspoiled. About 38.000 kilometres of the rivers and streams have been straightened out. They lost their meanderings in order to get more agricultural soil. What just three decades ago seemed to be a very good idea from the society's point of view has now resulted in very serious problems with oxygen depletion in probably all the Danish lakes and fiords.

A good way to address the basis for this catastrophe would be to restore meanderings in the watercourses and let the micro-organisms transform the nutrients into harmless gasses. In order to enhance the river's ability of self-purification and increase the denitrification, several big restoration projects have taken place over the last few years. But the canalisation of almost all the watercourses has certainly also been a disaster for the inhabitants of the running waters. A lot of insects have disappeared, but the most visible sign of the impoverishment is the decline of the fish populations. Trout (*Salmo trutta*) is the most common species, and it has declined to under 7 % of its original population.

Therefore Danish Angling Association (DAA) has started to make many tiny restoration projects in the streams. The results are very good. We put out gravel where the trout can spawn and some bigger stones where they can hide, and the success is evident: We have

experienced rises from five trout each 100 m² to 650 per 100 m², and almost every single project has had very positive implications on the fauna. But it has been quite a struggle to convince the anglers. In Denmark it is generally very difficult to engage people in voluntary work. Their spare time is almost sacred, but in spite of that, DAA has managed to get the members involved. We use weighty arguments, which are based on the latest research.

In order to help the declining trout population in our rivers, we have a very extensive stocking programme. The stockings are based on the carrying capacities of the watercourses, which means that we never stock more trout than the river can support. The stockings have made fishing in Denmark quite interesting, but they have also meant that the anglers for a long time have been relatively passive. Since there are fish to catch why be discontent with the state of the watercourses? The latest research, however, has demonstrated, that a wild trout is much better than a trout that is born in fish farms and used for stocking. In theory the wild trout is between 1554 and 7770 times more likely to survive to adulthood than a farm bred trout (fig 1).

	Trout from a fish farm	Wild trout
Fry – the first year	1	21
The second year	1	1-2
Migrating smolt	1	2-5
Survival in the sea	1	37
Difference	1	1554 – 7770

Figure 1: The theoretical difference in survival between a wild trout and a trout from a fish farm, which is stocked in the nature. A wild trout is theoretically between 1554 and 7770 times better to survive in the nature. The data comes from several scientific investigations/articles.

These facts have opened the eyes of the anglers. Why use time and money on stocking, if the rivers can produce fish, which will make angling many times more profitable?

But it is very difficult to keep the spirit high without getting good results to profit from. Therefore it is important to answer, if restoration really is a solution, which anglers can benefit from within a few years? To answer that we need to know some facts about the stocking programme and the production of the Danish watercourses. Today we stock 1.200.000 smolts in the river mouths. Let us presume that one wild smolt correspond to five smolts from a fish farm (in fact the difference is much higher – see fig. 1). The 1.200.000 stocked smolts then correspond to about 300.000 smolts of wild origin. In other words that is the amount, which needs to be produced in the nature to replace the stockings. How much area is needed to produce that amount of smolts? In general a Danish stream produces 10 smolts per 100 m², which means that we need to restore 3.000 kilometres of streams of one meter’s width in average.

One of my colleagues – Jørn Chemnitz – has a municipal nature school. He restores every year two kilometres of watercourse. He uses schools and anglers as manpower, and the municipality pays for the materials. In the last ten years he has restored 20 kilometres and it has cost an average of 1.200 Euro per kilometre. We have 275 municipalities in

Denmark. Now we have the preconditions to be able to answer how long a time it actually will take to restore the 3.000 kilometres of watercourses. If all the municipalities restore two kilometres each year as they have done in Kolding, it will take six years to finish the 3.000 kilometres. And the price? 3.6 million Euro which exactly equals the amount of money that the anglers pay for seven years of stocking of the 1.200.000 smolts! These arguments have convinced a lot of anglers. They have stopped stocking and are now using their resources and time on restoration.

The authorities are very pleased with the angler's engagement. They sponsor the projects willingly, and since the anglers often know the landowners better than the officials, many more projects are carried through.

I have no doubt in my mind: Restoration of the streams is the only reasonable solution if we wish to improve recreational fishing for brown trout and grayling. And so do most of the Danish anglers.

THE BLM DECIDES TO NOT FOLLOW THE RULES. Stability in policy is needed to provide the ecological conditions salmonids require in order to rebuild in Northwest rivers. Policies based on our best scientific estimate for what is needed to protect habitat needs to have a long life – spanning decades if not centuries.

As our understanding of the salmon – habitat dynamic improves those policies can and should be amended so that as a society concerned about our impact on salmon our understanding can continually be perfected. This is the ideal and it is not too much to expect.

The problem is always one of political agenda and leverage. When an industry captures government it is because both agree. The resulting coalition is difficult to beat in the name of public policy and interests.

The salmon are now in the ER and to rebuild their declining populations they require a consistent long-term health policy. A wellness clinic for salmon is needed.

When the timber industry met the Bush administration the goal was set to put industrial priorities above a publicly approved ecological one. The recent plan by the Bush-BLM to throw away a science based policy to protect salmon and owl habitats in Northwest forests was set in place to give industry a leg up over a social contract to protect species.

Fortunately, there are also federal agencies that do not agree with the BLM and have called them out. It remains to be seen whether those agencies backing the owl and salmon policy will prevail. Because all federal agencies work for the Bush administration it is unlikely that the Northwest Forest Plan will survive unadulterated. A compromise will be reached that will have as its only legacy the ruin of what has been gained. The decisions we make today have consequences tomorrow.

KILLING SEA LIONS GIVES US SOMETHING TO DO. The recent decision to kill protected sea lions to save protected salmon contradicts logic and common sense.

Advocates for this policy change to rid the river of pesky salmon munching pennipeds are treating the symptoms rather than the problem.

From the sea lion's perspective, Bonneville Dam is like a waterfall; it is an impediment to salmon migration. The fish gang up there until they are lucky enough to find a way past the dam.

Being as opportunistic as humans, the sea lions have found a good place to profit. They have evolved to exploit an opportunity. After all, the sea lions have to make a living too.

The problem isn't the sea lions. It's the dam. Since humans want the dam for electricity and barge transportation, it will stay. The only solution then is to kill the sea lions because they are interfering with salmon recovery and the salmon fishing economy. This action will not rebuild the salmon runs, but it does give us something to do.

WDFW DETERMINES HATCHERY STEELHEAD CAN SPAWN NATURALLY. I'm sure it's a surprise to most of you reading this to find out hatchery fish do spawn naturally in rivers. At one time Oregon declared that they shouldn't do that, but it has now been confirmed that they do anyway.

The Skykomish River is a tributary to Puget Sound. In a recent genetics study of Skykomish summer steelhead by Todd W. Kassler and others said, "Hatchery salmonids can naturally reproduce."

Since 1962 from zero to over 200,000 hatchery steelhead smolts were released in the river per year. Because many of these were released above Sunset Falls, (an impassable barrier to steelhead on the NF Skykomish River), the fish are transported over the falls.

Since 1998, the authors note, "the number of non-ad clipped adult steelhead has been between 26-73% of the number of steelhead counted at the falls." Since there was no wild production above the falls, these fish are naturally produced by hatchery fish above the falls. They also found there are three distinct groups of summer steelhead in the river, but Sunset Falls steelhead are more similar to hatchery fish than to NF Skykomish river steelhead.

This research came to the startling conclusion "that there has been mixing between hatchery-origin and wild-origin steelhead in the Skykomish River basin."

Since the hatchery summer steelhead came from Skamania Hatchery on the Washougal River (a Columbia River tributary) the scientists have also proved that it is possible to transplant fish successfully from one ecosystem to another. It is a great success story that confirms the theory behind WDFW's long-standing "one size fits all" steelhead management policy. All one has to do is set up a structure where steelhead are reared at

a hatchery then transported around the state for release. Oregon has long followed this same policy. Borrowed from industry, it is an economically efficient model that is more concerned with supplying hatchery fish to the sport and commercial fisheries than protection of wild runs.

The Skykomish steelhead study has uncovered an additional benefit of this industrial hatchery approach: hatchery fish create their own naturalized run, adding to the benefits of stocking.

Over forty years ago, I asked Cliff Millenbach, Washington Game Department, about the wisdom of stocking non-native hatchery steelhead in Washington Rivers. With firm conviction he told me that all the steelhead raised in Washington hatcheries are native to Washington. That was not only the agency's version of sound science but a summary of their genetic policy. We know better now, and probably knew better back then, but both WDFW and ODFW continue to release non-native steelhead and salmon into far-flung rivers, even those with ESA-listed fish.

Wild steelhead in Puget Sound rivers are now listed as a threatened species, so it was with relief that the researchers concluded that: "...hatchery steelhead have reproduced naturally for multiple generations, but does not provide any evidence that they would be sustaining if the hatchery program quit supplementing the run."

The WDFW leadership may take that statement to mean the hatchery program must continue so the sportsmen can have a kill fishery. It would be entirely progressive and welcome if they stopped the hatchery releases and invested their time and money in recovering the Skykomish River wild summer steelhead as required by the ESA.

STRUCTURING HARVEST TO IMPROVE COMPLIANCE WITH CONSERVATION OF WILD SALMONIDS.

Salmon are locally adapted. That means they return from the sea to their home river to reproduce and rear their young. We have known this since 1854 and it has been confirmed again and again since then. Therefore the scientific and practical basis for managing salmon and steelhead is to make sure that there are enough adult spawners to seed the habitat of their natal stream. But that is not all. The adults also import nutrients that enrich the streams and improve their productivity for rearing juvenile salmon and steelhead. There must also be enough adults spawning to maintain the genetic integrity of the population and its continuing capacity to adapt to fluctuating and changing environmental conditions. Wildlife also depends on salmon for part of their food supply.

Taken together salmonids help support productive rivers and provide ecological services to society.

The role and purpose of harvest is to not only provide the public market with salmon it is also responsible for delivering the adults to their home stream spawning grounds in

good condition. These two purposes are linked, but if that link is diminished or broken the salmon and the benefits they provide to society are reduced and can go away.

Harvest is not the only human activity that can cause salmon to decline, but more importantly, harvest can make a specific contribution to decline. The problem to be solved is this: Harvest must be managed so that it does not impede the recovery of ESA-listed salmon populations or the productivity of those populations that could become endangered.

Harvest is conducted in “mixed-stock” fisheries; this means that fish from many rivers are harvested together. This happens in ocean and in-river recreational and commercial fisheries. These fisheries are insensitive to the spawner abundance needs in our rivers. Transforming mixed stock to selective fisheries is the challenge. Improvements are being made, but until the fisheries are accountable to spawner abundance objectives by species and river, harvest will continue to contribute to salmon and steelhead decline.

Harvest of ESA-listed salmon is illegal, and fisheries cannot target fish protected by the Endangered Species Act. But fisheries are managed to target hatchery fish, allowing an incidental kill of ESA-listed fish. What is not known is whether this incidental take is too high to support recovery of the listed fish. The state and federal agencies with authority over harvest and its impact on listed fish cannot tell you whether their actions are impeding recovery or not. This is a problem that must be corrected.

Investments in habitat improvements provide important benefits to salmon streams. However, those investments by citizens, counties, cities and states are jeopardized if harvest does not deliver the natural spawners needed to optimize production in each of those streams. Harvest management cannot be in conflict with the good works of the public to recover salmon, nor be in conflict with federal law to recover ESA-listed salmon. Harvest must become part of the solution rather than contributing to the problem of salmon decline.

RECOMMENDATIONS:

1. Require the agencies to establish spawner abundance objectives for each species and river and to document their results annually to the public.
2. Mark all hatchery salmon so they can be identified in the harvest and in the streams where they stray.
3. Fund selective harvest experiments and technologies to control the incidental by-catch of naturally produced salmon so that specific spawner abundance objectives by species and river can be achieved.
4. Require harvest accounting to determine whether harvest is impeding recovery of ESA-listed salmon by species and river. This will also require funding support.
5. Enforce the law. It is illegal to kill ESA-listed salmonids and any incidental take must not impede recovery of salmonid Evolutionary Significant Units (ESUs) and their individual salmon and steelhead populations. The agencies with authority over harvest must be able to show that they are within the law.
6. Make sure that harvest is supporting public investments in salmon habitat.

7. Annual harvest accounting must be based on achieving measurable biological criteria for natural populations in each watershed. These include full seeding of the habitat, nutrient enrichment of streams with salmonid carcasses, and maintaining the adaptive capacity of the population. These are captured in requirements for diversity, abundance, and distribution under the Endangered Species Act.

SOME DAYS IT IS BETTER TO JUST STAY IN THE NEST!

Two days in a row, this mink had seagull for breakfast. Last Thursday we watched the mink run down the North bank, swim across the river to the South bank, and then nail a seagull that was sitting with his friends. The mink first grabbed the gull by the leg. They struggled together for about ten minutes out in the water. The mink gradually moved from the leg to the breast and finally to the neck. When the seagull finally expired, the mink dragged it to shore, turned it upside down, and had seagull breast for breakfast! The gull never once pecked at the mink and the carcass of the gull he killed on Wednesday was on the bank. The gull was about twice as big as the mink but he still came out the loser. Thanks to Harry Barber for this exceptional account.



A mink taking an adult gull

NATURALLY SPAWNING HATCHERY FISH ARE ANOTHER SOURCE OF MORTALITY FOR WILD SALMONIDS. At a recent meeting of the Lower Columbia River Recovery Plan Stakeholder Team for Oregon, the Oregon Department of Fish and

Wildlife presented information that has far reaching implications for wild salmon and steelhead management and conservation.

In the document, handed out at the meeting, *Recovery Strategies to Close the Conservation Gap, Methods and Assumptions*, it says,

“...relative population survival rates (recruits produced per spawner) were found to decrease at a rate equal to or greater than the proportion of hatchery fish in the natural spawning population. In other words, a spawning population with 20% hatchery strays had the net survival rate (recruits per spawner) that was 20% less than a population comprised entirely of wild fish (0% hatchery strays). Likewise, a population with 40% hatchery strays had a population survival rate that was 40% lower than a population comprised entirely of wild fish.”

This conclusion is based on research conducted by the Oregon Department of Fish and Wildlife staff and published in peer reviewed science journals in 2003 by Mark Chilcote and Tom Nickelson.

Mark Chilcote was at the meeting, so I was able to ask him if the effect of naturally spawning hatchery fish on a wild salmon or steelhead population can be considered a source of mortality just like harvest. He said it did. So if a wild salmonid population is harvested at a rate of 15% and the hatchery strays compose 20% of the natural spawning population, the mortality rate for that population is 35%.

Stray, naturally spawning hatchery fish are now considered a mortality factor for wild salmonids along with dam related mortality and harvest. Naturally spawning hatchery fish contribute to the decline of native wild salmonids in concert with logging, agriculture, pollution and ecological competition with hatchery fish where the productivity of the spawning and rearing habitats is reduced, affecting adult production from watersheds.

POLICY CHOICES HAVE CONSEQUENCES. The Native Fish Society spends time developing conservation policy and working to get it adopted and applied on the ground. We are a full service organization.

For many members and the public in general the value and importance of policy is overlooked as being the forte of wonks or just too damn boring. Even though policy drives the budget affecting what happens on the ground and in ones favorite stream, the connection is remote to those not paying attention.

When ODFW defines “fishing opportunity” as killing a limit, it leads to stocking hatchery trout in streams again even though hatchery trout were removed from streams to protect valuable or endangered native species. When ODFW proposes to release hatchery trout in Johnson Creek to increase fishing and, they hope, license sales, the City of Portland, the Johnson Creek Watershed Council, and individuals become disturbed. At stake is the investment in recovering Johnson Creek fish runs.

Even though water runs down hill, when the Oregon department of forestry makes a policy decision to give less protection to streams without fish during logging, downstream reaches with fish suffer higher sediment discharge, less large wood structure, and warmer temperatures. This policy favors logging corporations not wild salmonids and the economy they support. Anglers become connected to this decision over coffee in a café overlooking the muddy river they drove a hundred miles to fish that day.

Policy choices have consequences and they can last decades, causing havoc. One such policy choice that has shaped salmon management and the present decline of salmon is the decision to replace wild salmonids and their habitats with artificial production.

Another policy that has contributed to the decline of salmonids and a definite lack of effective recovery action, is the much applauded mandate to do all one can for salmon conservation as long as it is voluntary. Forget the state and federal laws and administrative rules to protect salmon and their habitats, because laws can be replaced with enthusiasm and a pathological optimism.

Taken together these policy choices are advancing the depth and breadth of the salmon crisis rather than working effectively to solve problems.

OREGON COASTAL COHO RELISTED AGAIN. The tortured history of wild coho salmon conservation has left the fish management agencies clumped together with property rights advocates arguing for less protection of wild salmon. It was instructive to see the attorneys representing ODFW and NMFS sitting on the side of the table with the PLF opposing the attorney from Earth Justice. We have come a long way down the slick road of cosy government – corporate cooperation.

Salmon are like the wolf and buffalo because they are in the way. As Tom McGuane said wild salmon are a problem. There is stronger protection and more accountability for wild coho now that a federal judge has ruled against the federal agency with responsibility for wild salmon recovery. This would not have happened without the vigilant work of a handful of environmental groups and their attorneys. These environmental groups, armed with the proceeds from their bake sales and auctions, are a meagre handbrake on the system.

Now that the coho are listed as a threatened species again there are more legal options available for their protection. But it will be up to the environmental groups to make sure the reluctant fish managers follow through.