Interview with Dr. Scott Hinch by Elizabeth Edgerton and Kai Geddes

Scott Hinch: My name is Dr. Scott Hinch. I am a professor in the Faculty of Forestry and the Department of Forestry and Conservation Sciences at UBC. I study Pacific salmon and one of the species I study the most is Sockeye salmon.

It's funny, because I didn't grow up here. I grew up in Ontario where Pacific salmon had been introduced, but are not native; and so I rarely spent any time with Pacific salmon until I moved to British Columbia in 1992. I just knew I wanted to study them because they were so cool; but, I rarely encountered them except maybe on a dinner plate or [at] a barbecue. [However], once I moved out here, [to Vancouver], I started to study their migrations and [I] was instantly enthralled with them and their superior abilities and just their innate drive to get home.

I spent most of my time studying the adult phase of migration although I've studied all of them [during their lifetime]. What amazes me about the adult phase, is their ability to cope with hardships and stressors while they are becoming diseased and what we [would] say [is] immunosuppressed. So, they are on a one way journey to death. They are maturing rapidly [within] the last three to four weeks of their life as they're migrating up the river. Their bodies are shutting down. They've stopped feeding, [and] they are starting to pick up unexpressed pathogens and diseases because they can't fight them off. Their stress hormones are skyrocketing, and their reproductive hormones are skyrocketing in their blood; so, they are rapidly changing their body physiology and morphology so they go from a sleek silver fish to a bold colored, robust bodied individual with the males having a long kype, which is sticking up the front of their nose, and a large hump on their backs. Females are developing huge masses of eggs in their abdomen, up to 20% of their body mass, and this is all happening just [within] a few weeks. Then within the next few weeks of getting to the spawning grounds, they mate and die all within a week of getting there. So, it's an entire lifecycle almost compressed into just a few weeks.

[02:16] If I was a juvenile Sockeye, about one to two years old, I'd be living my life in a small to large lake usually in the center of the province [of] British Columbia. These lakes are unique in that Sockeye require them for part of their life history; so I'd be spending my time in large groups of fish in schools growing and feeding, spending time in the middle of the lake in what's called the pelagic zone. I [also] would be spending time during the day when it's daylight in deeper portions of the lake avoiding predators who are trying to eat me. Then, I would move up to shallow waters at dawn and dusk to feed

and I'd eat as much as I could, and then I'd go back down into the depths to digest my food and continue to grow. I would do that and repeat that cycle for an entire year before I would change my body into the salt marine form and head out to the ocean.

The ocean day would be somewhat similar, although even more risky. I'd be off trying to avoid predators at all costs. This is where most of my brothers and sisters die. Only a small percentage of us return from the ocean back to spawning areas; although that percentage has been getting less and less the last couple of decades, because the oceans are getting warmer, there's more predators there, and the food abundance in many cases is less. I would spend my time doing similar sorts of migrations up and down in the water column between dawn and dusk but at the same time, I'm also moving longitudinally and latitudinally around the Pacific Gyre, and the Alaskan Gyre moving from the coast of British Columbia, and heading westward towards the Aleutian Islands and then circling back and making one to two full circles of the Alaskan Gyre before reaching a certain size [so] that I can return as an adult back to my home stream.

[4:17] The Fraser River, aside from being one of the largest rivers in Canada and the largest producer of wild salmon in Canada, also has some of the longest distance migrating populations of salmon. So, they migrate, you know, over 1000 kilometers up river to get to their spawning grounds; while there's a few other populations of Sockeye salmon and around the world that go that far or [further], there's none in Canada. This is some of the most arduous migrations for populations of Sockeye anywhere. They have to, not just travel over 1000 kilometers upriver, [but] they're doing this all on reserve energy; they've stopped eating in the ocean, but in some populations, they're climbing over a kilometer in elevation as well. They're very arduous. Their natural conditions can take its toll on these fish and it's a limiting factor for getting to spawning grounds. [W]hen you layer on top of it, the climate change effects that we've seen in the Fraser and we've studied that quite a bit. You [know Sockeye] are in a situation where these--some of these populations of Sockeye--are under extreme threat. [T]hen the final layer happened this past year with the Big Bar landslide, which occurred in the middle of the migratory route from all of these upriver migrating populations. It just created another hardship now for them to have to confront; and, this past year, those early migrating long distance Sockeye were not able to get to their spawning grounds and very few made it.

[05:47] They've seen significant reductions [of] Sockeye up the Skeena. There's some very large populations that come out of Babine Lake that we [have] enhanced. [Sockeye] have [been] spawning [in] channels, and all the- some of those populations [of Sockeye] are doing okay - the enhanced [Sockeyes], [however], there are several numerous populations that are small and wild. The concern is a lot of these small wild stocks [of Sockeye which] are dropping away or they're not doing very well. I wouldn't have been able to convince me of this 20 years ago that we'd be saying that- those things about the Fraser, we are seeing, [these] small populations are getting smaller in the wild- the wild ones are becoming [more] at risk. It's what we saw in the Columbia River 20 years before that. We're just seeing this transition as we move from south to north of things not going as well as they once did. There's still some strongholds going up in the north, even further north of the Skeena, into Alaska where things are alright; but, even in Alaska, had [a] record high [of] water temperatures this past summer. [T]hey saw high mortality in those runs. So, times are changing everywhere, and I think the variability uncertainty is what we have to come to live with.

[6:55] So, if you look back over the last six decades, we've seen a two to two-and-a-half-degree average warming in the lower Fraser River; so as an average, [for] some years, it's much higher than that. What this does is it changes the game in terms of how the body physiology works, we say that temperature is the master factor for fish; and, it is particularly important for migrating fish in the summer because temperatures are already warm. In some cases, they're near the maximum that they can tolerate. Now [if] you push that by another two to three degrees, you're pushing them over their capacity to cope. So, you're seeing energetics suffering, you're seeing diseases and pathogens having a much larger role, you're actually seeing their hearts not able to respond to the decreased oxygen [which] they need to move around their bodies because higher temperature water contains less oxygen, and they're working even harder. So, we know we've identified fish perishing, trying to swim really hard through warm water, and you know, the best explanation is they're having heart attacks because they're just not able to get oxygenated blood to the organs that they need to. [Then they] build-up, what we call oxygen debts, in their body, and they don't pay those debts back by finding cool water or--and this in many cases--lakes being able to get into [which] they'll just swim until they die.

In the Fraser River watershed, there really aren't many, if any, hatcheries for Sockeye. There [are a] couple [of] small populations that get enhanced by hatcheries. [O]ne that does it [is] for a conservation reason because one of the stocks, the Cultus Lake stock, [which is] an endangered population, so they

use the hatchery to help enhance it. [However] for the most part, most of the Sockeye that migrate in[to] the Fraser are [of] wild origin. That's not to say we don't have lots of hatcheries in the Fraser, they're just not raising sockeye. They're raising the other species. In Alaska, they do raise sockeye in hatcheries. They do that as a means of producing more for the fisher[ies]. My view on hatcheries is that it's not a simple thing to confront, because they have many purposes, that when they were all created in the 1960s, and 70s--they were created to enhance populations for fisheries. That was before we knew about climate change. That was before we understood this notion of what we call a carrying capacity in the ocean, that an ocean can only hold so many salmon.

[09:30] We started pumping lots of fish out of all the hatcheries from Washington, Oregon, BC, [and] Alaska into a common environment. Many cases, we've reached carrying capacity depending on the region of the ocean you're in and putting more fish into an ocean that's already at that carrying capacity has negative effects on the wild fish that are going there. We have a better understanding of that now in terms of the ocean [being] limited; and I know a lot of agencies are trying to make sure that they're not overseeding the ocean with hatchery fish; but that is a concern for all populations, including Sockeye that go out into the ocean and feed in a common environment with other species. A lot of concerns around hatcheries, for other species though, have to do with the the interbreeding between wild fish and hatchery fish that can happen when they come back to an area and there's also the concern that hatchery fish do not share the same behaviors as wild fish so they don't surv-- it's quite well known they don't survive as well in the wild when they're released. [T]he possibility of them passing on either a phenotype or genotype, that is not as favorable to wild fish if they were to come back to spawn with wild fish, is [a] legitimate concern. So, if they do have a purpose, though, for enhancement, one from a conservation sense, we're going to probably see a lot of enhancement associated with the Big Bar landslide coming up. Certainly the early Stewart Sockeye were brought back to a hatchery to try to save some of them. I suspect we're going to see more of that in the near future if things don't resolve themselves [after] that landslide, and I just think moving forward, hatcheries are going to be part of the equation. It's going to be a tool in the toolbox of a fisheries' manager, but it's not, and it shouldn't be, the only tool. Habitat protection, habitat management, fisheries management is all still important.

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I work with a lot of Indigenous groups and First Nations with their salmon and help them with research and partnering with them and it's difficult times for all of them. All [of] these First Nation groups, that

rely on Pacific salmon, are not going well. Particularly for those groups [of] the upper watershed because, though they're at the end of the receiving line, salmon as they migrate up river, and so because of climate change, fisheries and other issues, they are getting less and less access to salmon. The Musqueam in some respects are fortunate because they're first in the line, but they see the returns lower than they used to be. And they're trying to be respectful also of other Indigenous groups that need access to salmon further upstream,. [A]ll groups are getting less and less salmon from the Fraser made available to them, even though you know, priority of access, if there's any, will be to First Nations and Indigenous groups first before non-Indigenous groups. [However], we've seen in many years that even their access has been cut down [to] almost zero in some years depending on the returns. [As] you know, this has happened since I've started studying them. When I started studying them in the early 90s, we had some of the largest runs of sockeye ever in the Fraser, and it's just been a gradual, in some cases slow decline--some cases [a] fast decline since that time period and the returns.

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Well, I hope we have Sockeye around in the future in abundance enough [so] that you can take your kids out to a local stream or Sockeye spawn or any salmon spawn and be able to see it happening. You know, we still have that in some local areas. You can still go out to the Weaver Creek Spawning Channel near Harrison Hot Springs, and still see several thousand Sockeye spawning. It used to be several hundred thousand in some years but you can still go and see it and witness it and it is spectacular. You can still go to the Adams River in the Shuswap area where we still have large runs, you know, sometimes up to a million sockeye returning in that every four years, it's a spectacular thing to see. The late run sockeye, the Shuswap Sockeye, are still doing okay. I hope that they will continue to do okay into the future and that people will still be able to both appreciate them for what they are and also be able to, to harvest them as they have in the past. [Unfortunately], all indications are that things are still going to get worse for these groups as temperatures continue to warm in the ocean and in the lower Fraser River. Numbers will get lower and lower. If there's any good news to any of this, it's more of-- what's the other side of the coin-- is that salmon runs far in the north in some cases are doing fine, and we actually are now seeing new salmon runs experience in the Arctic. So, the Mackenzie River now has Chum and Chinook runs once they never did 20 years ago. So, we're seeing distributional shifts. So, the species will be around [for] a long time. It will not necessarily be around, in its current abundance, in some of the regions that it now is in.

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