By Daniel Nelson

Salmon Island

The road from Yuzhno-Sakhalinsk to the Kura River in the southern part of Sakhalin Island takes longer than it should. The pavement ends just past of the village of Taranay, and those who wish to proceed along Aniva Bay toward the southern tip of Sakhalin must do so on the gravelly beach, so soft and unpredictable that even the most agile all-wheel-drive vehicles slip and slide. Those who dare to make such a cumbersome journey along the southern coast typically come for one reason: salmon.

Our mode of transportation is the legendary Gaz-66, a two-ton Soviet-era bus originally used to ferry soldiers across even the roughest terrain. Revered for its simplicity and durability, the bus derives its nickname, *shishiga*, from a mythological female creature that dwells in the forests and swamps, occasionally rising to the bank to lure unsuspecting travelers into impenetrable places.

With three river crossings between us and the Kura – the Uryum, Tambovka, and Ulyanovka rivers – the *shishiga* is our best hope for reaching our destination. River mouths, at least those untouched by concrete walls and rock jetties, constantly morph with changing tides, fluctuating

flows from upstream, and unpredictable weather conditions.

At the Ulyanovka, the final and most treacherous river crossing before reaching the Kura, we encounter a dark green Federal Fisheries Agency truck stranded in the water. While the driver smokes a cigarette behind the wheel and one man stands helplessly in the bed of the truck, a third man in hip waders inspects the situation from the water.

Our driver, Alexander, a wrinkly, Russian-born Korean dressed from head-to-toe in camouflage, signals for us to hop out of the bus. He uncoils a large rope hanging on the *shishiga's* rear door and passes one end to the man in waders. Initial attempts to pull out the truck churn up the beach but fail to lift the truck to dry land. We call in reinforcements: two oversized trucks from the fishing camp less than a mile to the north. Fighting time and the rising tide, the three vehicles eventually extract the government truck from the Ulyanovka.

Watching the freed truck escape north along the beach, we begin our own attempt at crossing the dicey Ulyanovka. A direct fording of the river is out of the question. After much contemplation and examination, Alexander decides to navigate the *shishiga* deep into the surf, in a wide arc that avoids

PHOTO BY SIGMUND DUNKER

ANATOLY SOSENKO/SAKHALIN SALMON INSTITUTE

The team's *shishiga* and two other trucks pull the stranded Federal Fisheries Agency truck out of the Ulyanovka.

the river mouth altogether. This time of day, under these conditions, the Ulyanovka is best left alone.

A short while later we reach our destination. As the *shishiga* crosses the mouth of the Kura, the sights and sounds around us suddenly change. The silence is broken only by the sounds of the saltwater waves rapping the beach. We've entered a "land before time," a place where everything is brighter, from the green of the trees to the blinding white of the seagulls feasting on baby salmon.

THE KURA RIVER is perfect salmon habitat: a cool, clear flowing river that winds through a thick forest. Fallen trees and other debris create pools and other places of slow-moving water, hideouts for juvenile fish to grow and prepare for their journey to sea.

Most of the time, the only traffic on these roads is brown bears in search of a tasty salmon meal.

Although appearing pristine at first glance, the landscape is visibly shaped by pre-war Japanese settlement. Housing plots, roads, bridges, electric lines – once meticulously constructed – are buried under thick swaths of bamboo. Passage is given to humans during the short period between snow melt and early summer, before the bamboo towers over even the tallest individual. Most of the time, the only traffic on these roads consists of brown bears hustling between the forested hills and the riverbank in search of a tasty meal of spawning salmon.

Our camp sits on a small hill overlooking the bay, where the fields of a former Japanese village meet the sea. The mixture of buildings contains everything fishermen need: a pair of bunk houses, a kitchen and dining area, and, most importantly, a carefully crafted wooden *banya*. The sign outside the dining area reads "Delta," for the commercial fishing company that owns the fishing rights in this area, with the fishing parcel number and manager's name listed below. A well-fed guard dog sleeps attached to a flagpole, the blue flag of the Sakhalin oblast flying at full staff.

As we gear up for the first day of our expedition, Anatoly, a veteran fish scientist from Vladivostok, drapes a red smoke signal around my neck and offers some advice.

"Always wear this when you step outside the cabin," he says, "There are bears out here. You want to return home from Sakhalin alive, don't you?"

Anatoly stashes a handgun inside his jacket, and we start hiking away from camp, across the grassy plateau and toward the forested wilderness. The weather is cloudy, threatening to rain, but the temperature is pleasantly warm. Regardless, our seasoned guide has dressed in several woolly layers, topping it off with a camouflage hunting suit. His weathered skin and burly hands tell of decades in the harshest field conditions. It is rumored that Anatoly once fought off a bear in hand-to-paw combat, but he never speaks of it unless asked. His inner strength is soothed by an outer humility, perhaps even a slight insecurity, reflecting his unusually intimate understanding of a human's relationship with nature.

Anatoly is leading our Russian-American research expedition on the Kura River in the Aniva Region of southern Sakhalin. He and I are joined by specialists working for the Sakhalin Salmon Initiative, a large-scale salmon conservation program established in 2006 by Sakhalin Energy Investment Company and the Wild Salmon Center, a Portland, Oregon-based environmental nonprofit.

The Sakhalin Salmon Initiative, or SSI, aims to bring recognition to the island's vital Pacific salmon resource and support efforts to conserve it before the species becomes threatened. It is a different and more proactive approach than that most often used to conserve species on the brink of extinction, such as the western gray whale, which also migrates along the Sakhalin coast.

SSI conservation activities focus on "priority basins" – rivers where strong populations of wild salmon still exist, especially in the southern and northeastern regions of Sakhalin. Just as important, SSI supports conservation programs led by active local officials and community members,

WILD SALMON CENTER

Anatoly Semenchenko dozes off in the *shishiga* after the expedition to the Kura.

WILD SALMON CENTER

Aniva Bay reflects in the windows of the *shishiga* as it cruises down the coastline in Southern Sakhalin.

WILD SALMON CENTER

Artyom Vlasov and Daniel Nelson hike up the Kura River in search of juvenile Pacific salmon.

Most of the salmon consumed the world over (about five-sixths of the total) is farm-grown and highly vulnerable to viral infections, like the ISA virus which has ravaged Chile's industry in recent years. Russia and Alaska remain two of the world's largest sources of wild salmon. For a comprehensive survey of the world salmon market, see **bit.ly/cyrGcq**

committed to making changes to salmon management to protect the salmon.

Nearing the end of its four-year, $8.8 million first phase, the initiative tackles the problems facing salmon through a variety of channels: educating youth, sponsoring the fight against poaching, empowering local citizens to collaborate on watershed management issues, creating incentives for commercial fishermen to sustainably harvest the resource, and ensuring that fish scientists on Sakhalin have access to the latest information and technology in order to monitor changes in salmon populations and habitat. Technology, particularly GIS mapping tools to monitor salmon ecosystems, is what brought us to the Kura.

OUR TEAM SIPS tea and snacks on sweets around the fishing camp's center table. To my left is Christina Friedle, a Geographic Information Systems specialist from the Wild Salmon Center, who just led a seminar on using GIS software to map watersheds. Next to her is Sergei Makeyev, a seasoned fish scientist and founder of the Sakhalin Salmon Initiative; his passion for nature and knowledge the rivers of the Aniva Region are unmatched. Artyom Vlasov, a fish scientist from the Federal Fisheries Agency and perhaps the deftest fisherman I have ever seen, and Sasha Tsoy, a satellite imagery specialist from the Sakhalin Fisheries and Oceanography Research Institute, add a younger element to the expedition team.

We had come to the Kura to ground truth maps, validating data we had in our computer systems. During the preceding seminar, participants learned how to make maps of watersheds by importing satellite images and creating stream layers using GIS mapping software. Detailed, high quality maps enable scientists to better understand the dynamics of a watershed. Given time, Sergei feels optimistic about using the software: "If I ever become good at GIS, not only will I be able to show the data I've collected, perhaps I'll even learn something new about the rivers."

The purpose of the Kura expedition was to validate maps of riparian vegetation – the trees and plants that line the banks of the river and provide necessary habitat for salmon and other animal species. Riparian vegetation cools the water and gives shelter to the insects that salmon feed on. Changes in vegetation due to human activity such as logging – or potentially due to climate change – greatly impact the health of salmon.

Sakhalin has plenty of salmon. In 2009 – a record year, nearly 300,000 metric tons of Pacific salmon were harvested, not far behind the catch for the entire state of Alaska.

In the field, map validation is a slow, methodical process. After examining the map produced from satellite images, we select an appropriate route based on accessibility and apparent variability in vegetation. Former Japanese roads made for great corridors through the bush, as did the main channel of the Kura itself. The expedition team walks from point to point, taking down coordinates, and marking the vegetation type in our vicinity.

As the expedition's official note taker, I jot down descriptions of the trees and plants we see around us: band of alder to the north, a grove of fir to the east, an expanse of bamboo to the south. Vegetation species translate into different shades of green and brown on the map we produced using GIS software. After three days of walking through the brush, we had collected a few dozen validated points to add to our maps, enabling us to more confidently analyze vegetation types in other areas of the Kura watershed.

SALMON THRIVE in places that humans typically find impassable, and the Kura River is one of many such places on Sakhalin. The limited access minimizes threats from poaching, agriculture, and industrial development, leaving the rivers clean and open for salmon and the 137 species that depend on them.

The island's location – the intersection of the warm Sea of Japan and the frigid Sea of Okhotsk – enables the production of a seemingly unlimited supply of marine and freshwater resources. Sakhalin's roughly thirteen hundred rivers act as corridors for salmon returning from the ocean to spawn, ending their own lives in the process, in order to give birth to the next generation.

Sakhalin has plenty of salmon. In 2009 – a record year, nearly 300,000 metric tons of Pacific salmon were harvested, not far behind the catch for the entire state of Alaska. As such, roughly 17 percent of the entire North Pacific salmon catch comes from an island smaller than the state of West Virginia. One in four Sakhalin residents works directly or indirectly for the fishing industry, which contributes around 30 percent of the region's total commercial output.

The six species of Pacific salmon that swim in Sakhalin's waters can be divided into two simple groups: the "big money" fish and "other." In the former category, the two species that dominate the salmon economy on Sakhalin – pink and chum salmon (*keta*) – have always been the primary focus of government fishery managers and scientists. As

ANATOLY LEMEKS/CNWD SAKHALIN SALMON INITIATIVE

Sergei Makeyev and Sasha Tsoy use a rangefinder to mark the location of vegetation in the Kura River basin.

long as the numbers of pink and chum remain high and meet market demands, all is good.

On a more recent trip to Yuzhno-Sakhalinsk, Sakhalin's capital, I found store shelves packed with all manner of *keta*: fresh *keta*, frozen *keta*, *keta* fillet, canned *keta*, and smoked *keta* sticks. The fish served at restaurants is no different. The list of choices at Veranda, my favorite café in town, featured grilled *keta*, *keta* with mushrooms, fried *keta*, and *keta* topped with mayonnaise. I could have a different recipe of *keta* each day of the week.

Pink salmon, the more valuable of the two species because it is available in larger quantities, plays a major role in Sakhalin's salmon exports, especially to seafood-loving Japan and other East Asian countries. In fact, salmon caught off the coast of Sakhalin often take a

Sergei Makeyev notes the age and species of juvenile salmon in the Kura River.

WILD SALMON CENTER

Sakhalin's salmon fishery is the second largest in Russia.

whirlwind tour of Asia – distributed through South Korea, processed and packed in China – before being shipped to the rest of the world. After sharp declines in the mid-twentieth century, pink salmon numbers have rebounded dramatically, aided by fish hatcheries, which release hundreds of millions of pink salmon smolts into the Pacific Ocean each year. Although hatcheries help fishery managers meet the human demand for salmon, scientists from around the Pacific Rim question the effectiveness of hatcheries in helping to reverse declines in wild salmon populations.

Efforts by conservation organizations, including the Wild Salmon Center and the Sakhalin Salmon Initiative, have shown that, in addition to pink and chum, the "other" salmon species matter, too. Species diversity – for example, the presence of different types of salmon, and the genetic diversity within a particular species – signifies the health of a river system. Although Sakhalin still has rivers mostly untouched by humans, Makeyev pointed out that these places are not unthreatened: "Although you cannot see the impact of humans, it doesn't mean you can ignore the problem. Will nature survive these threats, especially the most vulnerable species?"

One of the "other" salmon species is critically endangered. The enigmatic Sakhalin *taimen* – the largest and oldest of all Pacific salmon species; they can live up to 20 years – lurks in Sakhalin's rivers. It spends years in the estuary and returns upriver to spawn in late April, just as the ice is melting. The treacherous, snowy conditions and murky swollen rivers make it almost impossible to witness Sakhalin *taimen* spawning, and locating their spawning nests in the rivers is even more difficult. "It took one generation for us to completely destroy the population of Sakhalin *taimen* in southern Sakhalin," Makeyev said, "and southern Sakhalin is the exact center of its range. Not even listing the species as endangered could save Sakhalin *taimen* in the South of the island." Anatoly, our guide from the Sakhalin Salmon Initiative, who has spent his entire adult life in the Russian Far East, has yet to find a Sakhalin *taimen* nest during his expeditions to the north of the island, where Sakhalin *taimen* still exist in small numbers.

A wild horse gallops in the surf next to the *shishiga*.

ANATOLY SEMYENCHENKO, SAKHALIN SALMON INITIATIVE

DESPITE THE FACT that Sakhalin bursts at the seams with salmon, profit from the resource eludes many island residents. Large fishing companies control the harvests on many rivers. Along these same rivers, local villagers are often unable to obtain fishing licenses that would enable them to catch enough fish to meet their daily dietary needs. "Villagers without jobs and barely enough to eat stand at the side of the road and watch truckloads of salmon go by," said Vladimir Smirnov, director of Plavnik, a commercial fishing company with operations in the Smirnykh region of northeastern Sakhalin, "Then they go to their local river to catch dinner, only to be cited for poaching."

The poaching epidemic on Sakhalin – widespread and, at times, militant – hinders the growth of the legitimate fishing industry and poses the gravest threat to salmon stocks.

Smirnov, who also chairs the Smirnykh Fisherman's Association, has battled poachers in his region for nearly a decade. His anti-poaching brigade on the Langeri River – one of the most productive pink salmon rivers on Sakhalin – began as a six-person militia representing the Union of Veterans of the Afghanistan War. "At that time we were only able to patrol the middle reaches of the river," Smirnov explained, "There was so much poaching that it was physically impossible to do anything more."

Today, Smirnov joins forces with the Smirnykh Watershed Council, an advisory group that includes the regional administration and law enforcement agencies. Funding for the anti-poaching work comes, in part, from the Sakhalin Salmon Initiative. This collaboration between private fishing companies, government agencies, and conservation organizations has virtually eliminated poaching on the Langeri River.

The latest campaign by fisheries agencies and environmental groups targets another species of Pacific

salmon endemic to Sakhalin known as Masu salmon, or by its Russian name, *sima*. As Masu salmon matures, it develops crimson-colored splotches along its side, giving the fish yet another name, Cherry salmon.

Masu salmon populations are declining and, unlike pink and chum species, Masu salmon cannot be sold at the market. Sport anglers are still permitted to catch the fish with a rod and reel as long as they purchase a fishing license, paying 100 rubles ($3) per fish.

Lately, however, Masu salmon has started to turn up on the counters of local shops, often scarred with marks from mesh fish nets, a sure sign of poaching. The Aniva Watershed Council, led by Makeyev, has joined Sakhalin Environment Watch, a local environmental NGO, to initiate an educational campaign to inform the public about the threats to Masu. With support from the Sakhalin Salmon Initiative, they organize sting operations at markets in the region, in cooperation with law enforcement. "We need to do something to protect Masu salmon," Makeyev said, "or else it will face the same fate as Sakhalin *taimen*."

DURING THE KURA mapping expedition, Sergei Makeyev focuses more on Masu salmon than on vegetation. He wants to see how far upstream the Masu travel and to what extent drops in the stream become barriers for salmon traveling toward the spawning grounds. He races upstream ahead of the rest of the group. At one point I thought we had lost Sergei, only to find him perched in the bushes a couple of kilometers further up the river, waiting for us to arrive.

Makeyev embodies the salmon conservation movement. When Wild Salmon Center staff first appeared on Sakhalin a decade ago, armed with stories of declining wild salmon populations in North America and a desire to make things right, Sergei was there to receive the torch. In recent years, he has played an advisory role for the Sakhalin Salmon Initiative.

Sergei shows me how to sample juvenile fish. While I hold the net downstream, he shuffles his feet in the water, stirring up the river bottom. Underneath logs and rocky ledges are the best places to find fish. As the muddy water drains out of the net, shiny, silvery baby salmon, no more than two inches long, squirm in the mesh. Sergei identifies them, and I mark the names and ages down in my notebook: 2-year-old Masu salmon, 1-year-old pink salmon, 1-year-old white spotted char.

Salmon at a port in the Russian Far East, ready to be shipped to "Mainland" Russia.

Even though Sakhalin bursts at the seams with salmon, profit from the resource eludes many island residents.

The juvenile salmon data we collect on the Kura will be added to what Makeyev has collected over the decades. Based on what he's learned in seminars sponsored by the Sakhalin Salmon Initiative, Makeyev has adjusted his data collection methods in order to import the data into GIS software more easily. A better understanding of exactly where salmon live, and the ability to effectively show that to policy makers will, hopefully, create more informed salmon management decisions in the future.

RETURNING FROM the Kura along Aniva Bay at sunset, we see an orange glow miles away across the water. It is the flare of the Prigorodnoye liquefied natural gas plant, a 125-meter high birthday candle that pierces the surrounding darkness. It burns continuously and will burn for decades to come.

Salmon conservation, too, has the potential to be a permanent fixture on the Sakhalin landscape, but it won't be easy. Scientists say that the results of conservation measures can only be analyzed after two to three salmon life cycles, depending on the species. Given the fact that life cycles range from two to six years, the true effectiveness of the Sakhalin Salmon Initiative won't be known for the next six to eighteen years. With the tight deadlines set by politicians and funding organizations, with the expectation of concrete, on-the-ground results in the matter of a year or two, true progress in conservation appears all but impossible.

On the other hand, the flame burning across Aniva Bay reminds us that watersheds untouched by humans are a thing of the past in much of the salmon's range. The relationship between people and salmon will only become more and more strained as the intense competition for freshwater resources continues to grow. Therefore, when conservation activities focus on changing *human* behavior, then salmon and other creatures that live in our rivers stand a better chance of surviving.

On Sakhalin there is still hope to strike a balance between fish and oil, conservation and development. As a start, the Sakhalin Salmon Initiative has an opportunity to help change the way the island's residents interact with their watershed.

As long as someone is there to carry the torch. RL

For a review of the situation of salmon in the Pacific, visit the excellent website: **stateofthesalmon.org**