WILD SALMON CENTER

Samarga River Watershed

RAPID ASSESSMENT REPORT

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Samarga River Watershed Rapid Assessment Short Report

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INTRODUCTION

The Samarga River is a unique and relatively untouched center of biodiversity in the Eastern Sikhote-Alin Mountains. It may be considered an index river basin for the Primorsky Territory region of the Russian Far East. This river is located in northeast Primorsky Territory. The northern and western boundaries of the Samarga watershed form the border between Primorsky Territory and Khabarovsk Territories.

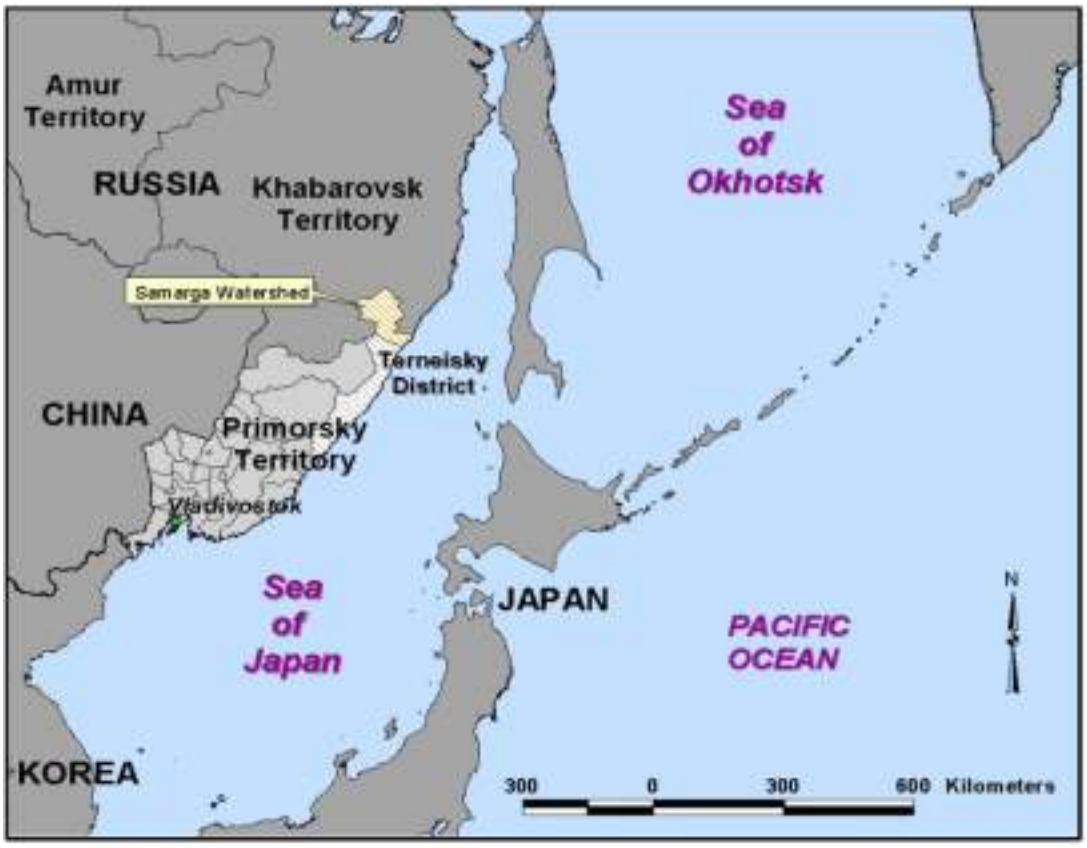

Figure 1. Samarga watershed location map.

This watershed is part of an ancient natural complex, which is still very pristine because it is remote and mountainous – there are no roads. The Samarga is the longest coastal river (220 km length) in the northern Sikhote-Alin Range. Healthy populations of pink, masu, and chum salmon, Dolly Varden, and white-spotted char still exist here. The Samarga basin is also home to the largest population of a rare salmonid species – Sakhalin taimen – still in healthy condition. The third largest population (122 people) of indigenous Udege people is located in the middle reaches of the river. The Samarga watershed is a unique ecosystem comprising many rare species: Japanese yew, ginseng, Amur tiger, Himalayan bear, Amur mountain goral, Gould's merganser, and Blakiston's fish owl. The diversity of habitats provides for a great diversity of resident and anadromous fish. The watershed is facing the onset of industrial development, particularly timber harvest and road construction, which would dramatically alter areas previously used primarily for Udege subsistence.

WATERSHED DESCRIPTION

The Samarga River (7,280 km^2) abuts the Second Samarga, Zheltaya, Nelma, Botchi, Koppi, Anyui, Khor, and Edinka river basins. The length of the watershed boundary is 515 km. The Samarga's left-hand tributaries (facing downstream) are: Perepadnaya (30 km length), Dagdy (70 km), Moi (45 km), Isimi (45 km), and Agzu (30 km). The major right-hand tributaries are: Pukhi (60 km), Kuksi (30 km), and Bolshaya Sokhatka (36 km; Panichev 1998).

Calculated on the basis of 19 years of monitoring data, the Samarga River's discharge is between 74 and 242 m^3/sec. Peak daily discharge occurs during typhoon-induced floods and reaches 1,479 m^3/sec, a measurement which we observed during July 24-28, 1999. The single biggest measured discharge was 1,540 m^3/sec. The biggest estimated discharge was 2,400 m^3/sec during a period of severe flooding in 1981. The flood season usually extends from the end of June until the middle of October. The average annual modal discharge is 12.2 liters/sec/km^2 (range 7.49-18.7 liters/sec/km^2). The longest flood was recorded in 1981 near the Sabu River mouth (June 15-October 10, 1981).

Figure 2. Upper reaches of the Samarga River.

The stream network of the Samarga watershed is very complex. Tributary length ranges from 2-3 km to 70 km (Dagdy River). The upper reaches of the river have very narrow floodplains, high velocities, and few gravel bars. There are many side channels that accumulate woody debris and form plenty of quiet pools. Those pools are used for rearing by taimen, grayling, masu salmon, and lenok.

The vegetation of the basin is classified as coastal-riparian. Meadows, bushes, and short trees grow by the coast. Wild rose (*Rosa rugosa Thunb.*) and willows are the predominant species there. Willows, alder (*Alnus hirsuta Turcz.*), and tall grasses grow around numerous bogs and small lakes of the watershed. Chosenia (*Chosenia arbutifolia (Pall.) A. Skvorts.*), several willows (*Salix rorida Laksch., S. cardiophylla Trautv. et Mey, S. schwerinii E. Wolf*), and Maximovich

poplar (*Populus maximoviczii A. Henry*) grow in the lowland flood plains of the Samarga River. The terraces are occupied by poplar, alder, ash, and mixed deciduous forests (Vasiliev 1977; Osipov in print). Fir groves occupy most of the river valleys in Northern Primorsky Territory. The principal species are Khingan fir (*Abies nephrolepis (Trautv.) Maxim.*) and Ayan spruce (*Picea ajanensis (Lindl. et Gord.) Fisch. ex Carr.*). Fir stands have been decreasing in area in recent years. For the most part the decline is attributed to fires and logging. Larch forests (*Larix dahurica Turcz. s.l.*) in the Samarga basin are mostly in the mountains but also occur in river terraces and valleys.

Subalpine meadows form at the upper border of the forests in the mountains. Japanese stone pine (*Pinus pumila Rgl.*) occupy the upper belt of the mountains in the upper reaches of the Samarga. Stone pine generally grows at altitudes of 900-1000 meters above sea level. Unwooded areas at elevation are vegetated with epilithic lichens. Alpine tundra occupies the peaks of the mountains in the Samarga watershed. The elevation of the tundra belt varies with aspect, relief and distance from the ocean -- from approximately 1,100 m (near the coast) to 1,400 m above sea level.

Rare plant species listed in the regional Red Book (Endangered Species List) found in the Samarga watershed include: Japanese yew (*Taxus cuspidata Siebold et Zucc. ex Endl.*), woodland peony (*Peonia obovata Maxim.*), ladyslippers (*Cypripedium macranthon Sw., C. calceolus L., C. guttatum Sw.*), two-rowed and candlestick lilies (*Lilium distichum Nakai, L. pensylvanicum Ker-Gawl.*), Palibin's edelweiss (*Leontopodium palibinianum Beauv.*), false juniper (*Microbiota decussata Kom.*), and others (Kharkevich and Kachura 1981; Osipov in print).

To date, Dr. V. A. Nedoluzhko (1997) has found 595 species of vascular plants in the Samarga and Edinka watersheds. He believes that about 100-150 more species could be identified in those watersheds in the near future.

FISH FAUNA OF THE SAMARGA WATERSHED

The Samarga River watershed is classified as part of the Amur transitional region according to L.S. Berg's zoogeographic classification. Within this region, the watershed is part of the Primorsky Territory. According to I. A. Chereshnev (1998), the Samarga River is in the Northern Primorye zoogeographic subzone. This zone is characterized by small number of resident freshwater fishes and abundance of anadromous species. The taxonomic structure of the Samarga fish fauna is very diverse, attributable in large part to its location on the border of these different zoogeographic regions.

The production topography of the Samarga River is very interesting. The lowest part of the river (from Unty Creek to the river mouth) is a zone of pink salmon, chum, rainbow smelt, and grayling. The middle part of the river (from Zova Creek to Unty Creek) is an area of pink salmon, adult masu, taimen, lenok, and grayling. The upper reaches of the Samarga (upstream from Zova Creek) are home to juvenile masu, taimen, and grayling. The main channel is used for passage by anadromous and semi-anadromous freshwater fish. Side channels and tributaries are used by chars for reproduction, and by juvenile salmon for feeding.

As shown in Table 1, twenty species of fish dwell in the Samarga River and its tributaries. Anadromous salmon (pink, masu, chum, and less abundant coho) comprise a substantial part of the river biomass. The pink salmon stock is the largest, comprising 10% of the total population of pink salmon of the Russian mainland Japan Sea coast. Masu salmon stocks rank second after pinks, and char are fairly abundant.

Table 1. Fish species of the Samarga Watershed (based on documentation by Berg 1933; Taranets 1938; Parpura 1989; Parpura and Semenchenko 1989; and Chereshnev 1998).

Common Name	Taxon
	Fam. Petromyzontidae
Pacific lamprey[1]	*Lentheron japonicum (Martens)*
Far East creek lamprey	*Lentheron reissneri (Dybowski)*
	Fam. Salmonidae
Lenok	*Brachymystax lenok (Pallas)*
Sakhalin taimen	*Parahucho perryi (Brevoort)*
Pink salmon	*Oncorhynchus gorbuscha (Walbaum)*
Chum salmon	*Oncorhynchus keta (Walbaum)*
Cherry (masu) salmon	*Oncorhynchus masou (Brevoort)*
Coho salmon	*Oncorhynchus kisutch (Walbaum)*
White-spotted char	*Salvelinus leucomaenis (Pallas)*
Dolly Varden char	*Salvelinus malma (Walbaum)*
	Fam. Thymallidae
Amur grayling	*Thymallus arcticus grubei (Pallas)*
	Fam. Osmeridae
Pond smelt	*Hypomesus olidus (Pallas)*
Rainbow (Asiatic) smelt	*Osmerus mordax dentex Steindachner*
	Fam. Cyprinidae
Amur minnow	*Phoxinus lagowskii Dybowski*
Far East redfin	*Tribolodon brandti (Dybowski)*
Big-scaled redfin	*Tribolodon hakonensis Gunther*
	Fam. Cobitidae
Siberian stone loach	*Nemacheilus barbatulus toni (Dybowski.)*
	Fam. Gasterosteidae
Three-spine stickleback	*Gasterosteus aculeatus Linnaeus*
Amur stickleback	*Pungitius sinensis (Guichenot)*
	Fam. Cottidae
Spotted sculpin	*Cottus poecilopus Heckel*

Sakhalin taimen (*Parahucho perryi Brevoort)* spawn in the spring soon after ice breaks in the middle of May. After spawning, the fish go downstream and stay in coastal waters. According to Arkady Kaza of the Udege village Agzu, the main spawning grounds for taimen are in the middle part of the Samarga River. A typical taimen spawning site is by a steep bank in a spot with fast currents, around 1.5 m/sec. According to our estimates the taimen population in the

[1] Western and Japanese literature currently list *L. japonicum* and *L. reissneri* as a single species, with two forms.

watershed is no bigger than 1,500-2,000 fish. Local residents usually do not fish for taimen, but in years when pink salmon are less abundant, taimen become one of the main fishing targets.

Figure 3. Fish from a stationary net catch in the Samarga River mouth. From the top: two young taimen (4-6 years old), one white-spotted char, and two Amur grayling.

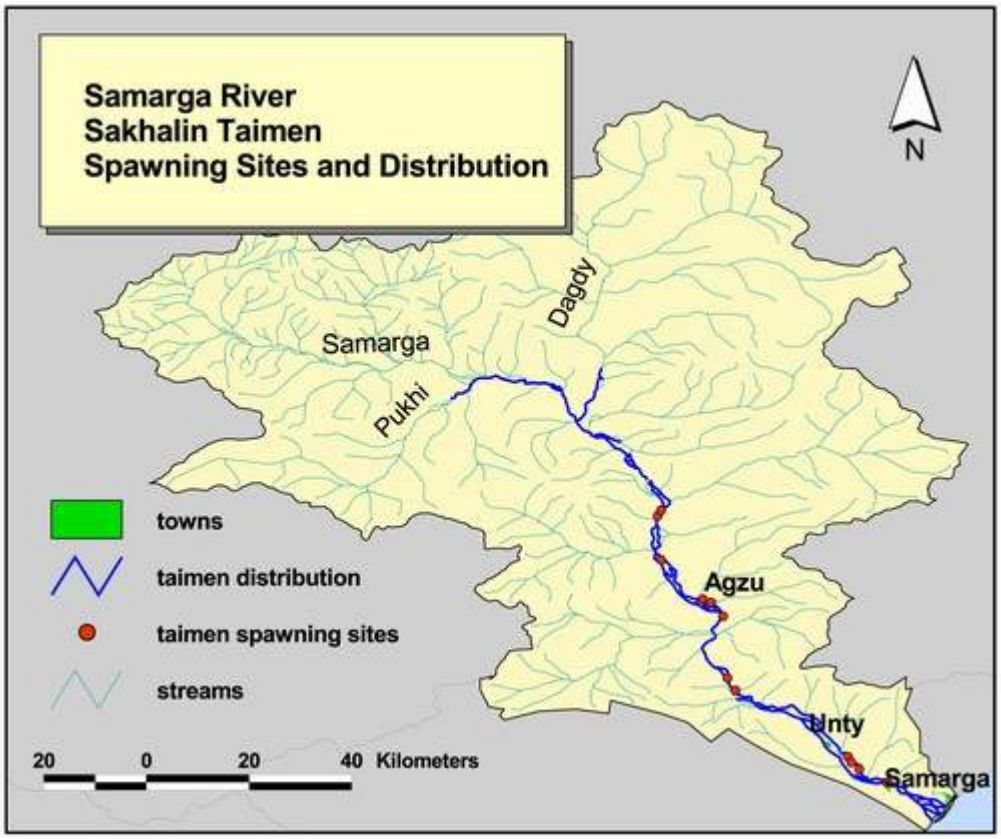

Figure 4. Distribution of taimen in Samarga watershed.

Pink salmon (*Oncorhynchus gorbuscha Walbaum*) start spawning in the Samarga watershed between June 16th and 24th, depending on temperature regime. Figure 4 shows pink salmon spawning sites for abundant generations, using summer 2000 as a reference point. Less abundant generations of pink salmon usually occupy only the lower parts of the watershed.

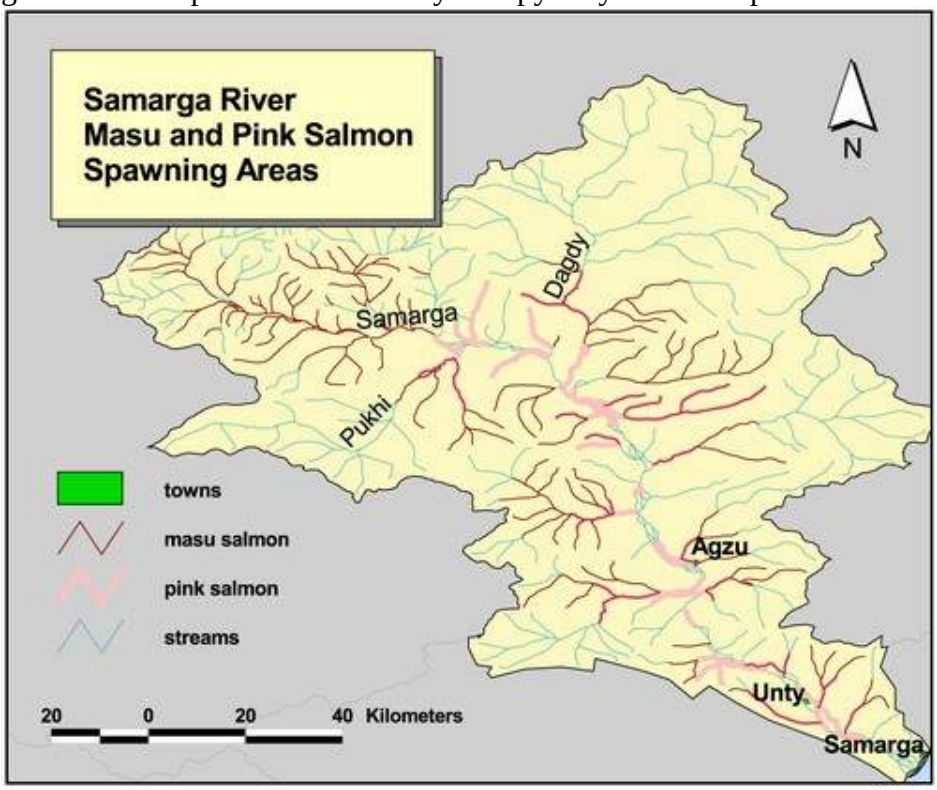

Figure 5. Distribution of pink and masu salmon in Samarga watershed in summer 2000.

Figure 6. View of the lower part of the river where most of the pink salmon spawning grounds are located.

Figure 7. Pink salmon of the Samarga River.

The proportions of males and females in the migrating stock are approximately equal, according to our data. Bigger fish arrive later during the migration. Specimens ranged in weight from 1.03 to 1.64 kg for males and 1.1 to 1.43 kg for females.

Pink salmon is the primary target of commercial fisheries in the Samarga basin. As shown in Figure 6, there could be great differences in the catches of pink salmon in different years – ranging from 1.7 metric tons in 2001 to 352 metric tons in 2000. An abundance of pink salmon decreases impacts of fishing on other salmonid species of the basin.

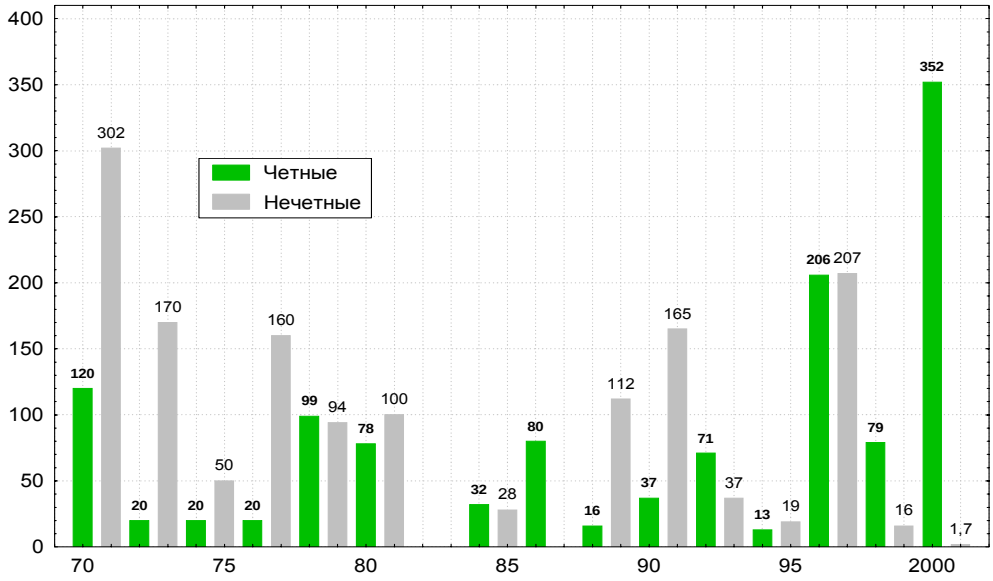

Figure 8. Dynamics of the pink salmon commercial catches, green – even year generations, grey – odd year generations. The *Y* axis is catch in metric tons, the *X* axis is the year.
Chum salmon (*Oncorhynchus keta Walbaum*) in the Samarga basin are represented only by the fall form that occurs in the lower tributaries downstream from Unty Creek.

Figure 9. Bright fall chum from the head of the run.

Masu (cherry) salmon (***Oncorhynchus masou Brevoort***) were observed as the dominant species of the river ecosystems at all of our monitoring stations. Masu parr are active predators that start feeding in the main river channel by the middle of June, after gaining initial weight in side streams. During the spawning season masu salmon spread across the whole basin. Their run starts in the middle of May, which is much earlier than the migrations of other salmonids. For spawning, masu use the main channel and also numerous creeks, which also differentiates this species from pink and chum in the Samarga.

Masu show great dependence on the quality of the riparian vegetation, because vegetation provides space for many insects on which masu feed – orthopterans, dipterans, caddis flies, may flies, and others. Any changes in riparian vegetation cause a response on behalf of masu salmon. Logging may significantly decrease the size of the masu population because of changes in light and temperature regimes, and less abundant food supplies. Masu salmon occupy the upper part of the basin and spawning creeks. It is noticeable that there are few spawning sites in the main channel of the Samarga (Figure 9).

Figure 10. Masu juveniles are long-bodied and have 9 wide distinctive parr-stripes.

The masu juveniles in the river are one and two year-olds (in a ratio of 53.2 : 46.8). The high percentage of masu two year-olds is typical for the rivers of Northern Primorsky Territory where the growth rates of fish are lower than in more southern areas. The high percentage of two year-olds seen in our observations in 2000 may also be explained by less abundant parent generations of the previous year (1999). N. I. Krupyanko calculated the abundance of the masu juveniles in the lower part of the Samarga as 169,500 fish. Taking into account multiple tributaries and upper reaches of the river, this figure can be multiplied by 2.5-3 times, reaching an estimated total stock of 424,000-510,000 masu juveniles in the watershed.

The fish entering the river at the end of May and beginning of June usually go to the uppermost reaches of the watershed, where no other salmon go. The migrants arriving at the end of the run at the end of July have ripe gonads and bright cherry colored sides.

Figure 11. Masu female in spawning colors.

White-spotted char (*Salvelinus leucomaenis Pallas*) was a very abundant and commercially important species in the Samarga watershed in the 1960s. Right now the population of this species in Samarga is small.

SOCIAL AND ECONOMIC SITUATION

The Central Sikhote-Alin is the ancient and present center of the ethnic culture of indigenous Udege people (Voronov and Sapaev 1997). There are currently four small towns in the area: Edinka, Peretychikha, Samarga and Agzu in the Edinka River and Samarga River watersheds. The total population is about 800 people, representing various ethnic groups. Data obtained in 2001 indicate that of the 340 year-round residents of the Samarga basin proper, 140 residents are Udege. This represents approximately a four-fold decline in the Udege population from the 1897 Russian census, which enumerated six Udege settlements (and missed at least three) on the Samarga River. Although 152 Manchurian Chinese were enumerated, there were no Slavic settlers in the basin until Old Believers began to settle in the area in the early 20th century.
The present-day Udege population of the basin lives primarily in one village – Agzu – while the residents of the remaining three towns are largely of Slavic origin. Soviet collectivization concentrated the Udege population in a few settlements and focused economic activity on fishing, leading to a dramatic decrease in fish abundance in the 1950s and a shift to a hunting-based economy. Economic and environmental problems have forced many people to move to other parts of Primorsky Territory over the past decade. It is estimated that per capita income in the Samarga basin, excluding black market income from poaching, is 3.6 lower than the average per capita income for Primorsky Territory.

The residents of the village of Samarga (Figure 12) continue to be actively involved in fishing. Every family prepares 250-300 fish (mainly pink salmon) each season. Excess fish are usually sold, given to relatives in other regions, or traded for vodka or gasoline for boat engines. In August many relatives of the locals and other people interested in fish come to the towns of Samarga and Edinka. In 2000 raw salmon caviar was sold for 40 rubles per kilogram ($0.80 US per pound). Salted caviar was sold for 60-80 rubles per kilogram ($1.20 - $1.60 US per pound). Local residents of the Samarga and Agzu villages are very willing to participate in such trade, since one or two days of good fishing may bring a fisherman about $100 US. This sum means a great deal in this area because most of the people do not have jobs or stable income. In such caviar harvesting, dozens of tons of fish are thrown away and many spawning sites are destroyed.

Figure 12. Village of Samarga.

Pink salmon and Dolly Varden are the only commercial fishing targets of the basin. Right now only even year generations of pink salmon are still abundant. Fishing of masu salmon has been prohibited since 1956, but local fishermen still actively catch it because of the high quality of the meat of this fish.

In the last few years there has been a lot of interest in recreational activities in the Samarga watershed. During each season up to twenty groups traveled the Samarga-Agzu route. As of 2002, there is no special tourist infrastructure and no local tourist companies. Since 2000 the non-governmental organization Friends of the Earth has conducted two eco-tours. Organized tourism has a good future as an alternative source of income in the basin. It is likely that in the near future, commercial logging will replace hunting, trapping and fishing as the major source of local income and district tax revenues. A major Primorsky Territory timber company, Terneiles, recently acquired 49-year lease rights for the commercial timber in the Samarga – one of the greatest expanses of unlogged forests remaining in Primorsky Territory.

CURRENT PROTECTION OF SALMON AND SALMON HABITAT

This area is very rich in timber, metals, and hunting and fishing resources. The absence of roads and industrial centers explains the high natural resource potential and good environmental situation. The forests of Samarga and Edinka watersheds are still in pristine condition, aside from forest fire regeneration stands dating to the 1970s. There are relatively large and healthy

populations of pink, masu, chum, and Dolly Varden. Samarga has one of the last stable populations of Sakhalin taimen in Primorsky Territory.

At present, stocks of salmonids are not well protected. Large scale poaching flourishes in the region and has a serious impact on rare species like Sakhalin taimen. Newspapers have printed articles recently discussing poaching of fish and large mammal species, sometimes with the collusion of underpaid and understaffed wildlife and parks officials. Active logging and mining in the region in the near future may seriously disrupt the present hydrologic regime and negatively affect the aquatic communities of the watershed.

A STRATEGY FOR NATURE PROTECTION

If commercial logging is to occur, then the currently mandated riparian buffer zone around the river should be assigned not only for the main channel, but also to the 3rd and 4th order tributaries (counting from the mainstem as first order). The forests of the area have so far preserved the productivity of the salmon ecosystem and the traditional way of life of the indigenous people.

Following the growing urbanization in Primorsky Territory there is a trend of salmon stocks to decrease in abundance and reproductive capacity. The Samarga River watershed is so far the only place in Primorsky Territory with very high fish biodiversity and high natural fish productivity.

Several steps must be taken to give the land a special status for use by indigenous people, organized as the Samarga Udege Obschina. Recognizing and legitimizing the rights of Udege people for fish and forest resources may also solve some problems of protection and sustainable use of natural resources. Initiation of environmental awareness programs for local residents alongside a well-managed ecotourism program would also be strategic investments in the future of this unique river basin.

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