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**The 1994 Joint U.S.-Russian
Kamchatka Steelhead Expedition**

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Final Report

to

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Executive Summary

This report summarizes research results from the 1994 joint U.S.-Russian expedition to collect biological information on native steelhead populations in northwestern Kamchatka, Russia. Scientists from the University of Washington, School of Fisheries, Fisheries Research Institute (FRI), High Seas Project, received funding from the U.S. National Marine Fisheries Service to participate in the 1994 expedition. FRI's primary objectives in 1994 were to (1) foster international cooperation in exchange of scientific information, (2) tag fish and collect scale samples for high-seas stock identification studies, and (3) disseminate information on FRI's high-seas tagging program.

Seventy adult steelhead were collected by gillnet (35 fish) and by hook-and-line (35 fish) from the Kavachina and Snotolvayam rivers from 24 September to 9 October 1994. All fish caught by hook-and-line were released alive. There were no statistically significant differences in fork lengths of steelhead between the two rivers, gear types, and sexes. There were also no significant differences in the sex ratios between the two rivers or between the two gear types. The lack of biological differences between fish caught by the two gear types indicates that catch-and-release fishing by hook-and-line is an excellent alternative to gillnet sampling, particularly because of the endangered status of steelhead populations in Kamchatka.

Age composition and spawning history of adult steelhead were determined from scale samples. The predominant age groups in the 1994 samples were 3.3 (33% of the total), 2.3 (22%), and 3.4 (16%). The majority of fish were repeat spawners on their second (48%), third (22%), fourth (3%), sixth (1%), and seventh (1%) spawning runs. The percentage of repeat spawners in the Snotolvayam and Kavachina samples is much higher than that found in wild populations in most North American streams, but sampling was conducted prior to the peak of the run in mid October, and repeat and first-time spawners may have different run timing.

Thirty one of the 35 steelhead caught by hook-and-line were tagged with numbered red anchor tags and released. One of these, a female steelhead tagged in the Snotolvayam River on 3 October 1994, was recovered in the Utkholok River on 12 October 1995. The mouths of the two rivers are approximately 47 km apart.

The 1994 Kamchatka Steelhead Project expedition did much to foster international cooperation. U.S. and Russian scientists freely exchanged data and samples collected during the expedition. The scale samples collected in 1994 were used by FRI researchers to validate scale pattern models for identification of hatchery and wild steelhead in mixed fishery samples, and will also be useful in the future development of models to identify Russian and North American steelhead in mixed high-seas samples.

The results of the 1994 expedition indicate that significant research can be conducted on an annual basis under this joint U.S.-Russian program. We recommend (1) continued field sampling to develop a useful time series of data, (2) tagging and marking studies to validate age and life history information, determine migration patterns, and estimate population abundance, (3) instream studies of juvenile steelhead, associated species, and overwintering and spawning adult steelhead, and (4) continued analysis of scale samples for age, growth, life history, and stock identification studies.

The 1994 Joint U.S.-Russian Kamchatka Steelhead Expedition

Introduction

In 1965 the Ichthyology department at Moscow State University (MGU) initiated field and laboratory investigations of steelhead and rainbow trout (*Oncorhynchus mykiss*) populations on Russia's Kamchatka Peninsula. Topics of investigation have included ecology, life history, morphology, genetics, and systematics (Maksimov 1972; Savvaitova et al. 1973; Savvaitova 1975; Maksimov 1976; Savvaitova et al. 1989). Periodic investigations of various steelhead populations on the Kamchatka Peninsula have continued through 1993. In the early 1980s Russian scientists determined that steelhead populations in the southern regions of Kamchatka had inexplicably been suffering sharp declines in abundance (V. Maksimov, MGU, pers. comm.). Therefore, in 1983, at the recommendation of MGU scientists, the Russian government listed the anadromous form of *O. mykiss* (currently classified by MGU as *Salmo mykiss*) in the Red Book of the Russian Federation as a rare and endangered species.

In 1994 a joint steelhead research expedition to western Kamchatka was organized by the Steelhead Committee of the Federation of Fly Fishers (FFF), Moscow State University (MGU), the University of Washington (UW), and the United States-based Wild Salmon Center. In April 1994 meetings were held at the UW School of Fisheries and the National Marine Fisheries Service (NMFS), Northwest Fisheries Science Center, Seattle between scientists from MGU, UW, NMFS, and organizers from FFF. During these meetings it was decided that the 1994 scientific expedition to Kamchatka would involve scientists from MGU and UW. It was also agreed that participating anglers would fund a large portion of the research and participate as official members of the scientific expedition by systematically collecting various data from all steelhead they would catch. The long-term objectives of this joint program of research are to (1) foster U.S.-Russian scientific exchange in problems primarily involving management of anadromous salmonid populations, (2) gain a better understanding of the distribution, run size, life-history, ecology, behavior, and genetic characteristics of Kamchatka steelhead, particularly to compare population characteristics of healthy northern populations with disappearing southern populations, and (3) develop management regimes with Russian authorities to achieve long-term health of steelhead resources while promoting economic development through properly regulated recreational angling.

An important underlying objective for the 1994 expedition was to determine whether or not significant scientific research could be conducted on an annual basis under the arrangements described above. In addition, the following specific scientific objectives were established for the 1994 expedition (23 September to 13 October 1994): (1) collect and analyze data on the age structure, sex ratio, morphology and meristic characteristics of at least two northern (i.e., healthy) populations of steelhead, (2) collect genetic material and conduct DNA analysis that will allow for comparisons among Kamchatka populations, and between Kamchatka and North American steelhead populations, and (3) compare data on population characteristics, listed in (1) above, with data from previous studies (e.g., Maksimov 1972) to assess changes over time.

At present, there is no reliable information on the ocean distribution and migration patterns of Kamchatka steelhead (Burgner et al. 1992). The UW School of Fisheries, Fisheries Research Institute (FRI), High Seas Project, received funding from NMFS for a graduate student to participate in the 1994 expedition. FRI's primary objectives in 1994 were to (1) foster international cooperation in exchange of scientific information, (2) tag fish and collect scale samples for high-seas stock identification studies, and (3) disseminate information on FRI's high-seas tagging program. This report summarizes the results of FRI's participation in the 1994 expedition.

Methods

Study Area

Adult steelhead were collected from the Kavachina and Snotolvayam rivers, which enter the northwest coast of the Kamchatka peninsula at 58° 10' N latitude, 157° 6' E longitude through a common estuary (Fig. 1). The sources of both rivers are freshwater springs that percolate through peat bogs and tundra. The rivers are consequently brown in color, even during late summer and early fall low flow periods. The Kavachina river has roughly the same main channel length as the Snotolvayam (approximately 75-80 km), but has a greater flow (8.5 m³/s) than the Snotolvayam (7.0 m³/s) from September through October. Both rivers originate at elevations of less than 300 m, meander through tundra for most of their length, and consequently are of very low gradient (< 0.4%). Riparian vegetation consists mainly of grasses and willows not exceeding 2 m in height. Instream substrate is predominantly small (2-5 cm) angular gravel, and a much lesser percentage of fine silt near cut river banks and backwater areas. The Kavachina River was sampled from approximately river kilometer (rkm) 11 upstream to the junction of the Puhkla River, which contributes about 40 percent of the flow to the mainstem of the Kavachina at rkm 23. The Snotolvayam River was sampled from approximately rkm 9 upstream to rkm 16.

Data Collection

Russian scientists obtained an exemption from the Red Book of the Russian Federation to lethally collect 50 steelhead. Adult steelhead were captured by MGU scientists in two stationary gillnets (16.5 cm stretch measure) set at the downstream-most positions of the study reaches described above. Both nets were set and checked twice daily on the Kavachina River from September 9 to October 2, and again from October 6 to October 9. The nets were fished in the Snotolvayam River from October 3 to October 5. A suite of morphometric and meristic measurements (e.g., Savvaitova et al. 1989) were taken from each fish collected from the gillnets. Tissue samples were also taken and frozen for protein-gel electrophoresis.

Fly anglers took part in sampling adult steelhead by catching steelhead, collecting data, then releasing the fish in the best condition possible. Instructions for sampling and data collection are listed in Appendix A. Ten field sampling kits that included alcohol filled vials for genetic samples, coin envelopes for scale samples, forceps, hemostats, scissors, measuring tapes, tagging guns, tags, pencils, and waterproof notebooks were provided by FRI to FFF. Upon landing a steelhead, anglers held the steelhead firmly by the caudal peduncle, leaving the head, including the gills, totally immersed in water. Anglers recorded the sex and measured fork length and girth (immediately anterior of the dorsal fin). They also collected approximately 10 scales from the preferred body area, 2-3 rows above the lateral line on a diagonal from the posterior insertion of the dorsal fin to the anterior insertion of the anal fin. A distal portion of one of the pelvic fins was removed and placed in a 5 ml vial containing 100% non-denatured alcohol to preserve it for future DNA analysis. Numbered red T-bar tags were injected into the dorsal musculature below the dorsal fin, so that the bar at the distal end of the tag intersected the vertebral spines.

Scale Analysis

After the expedition returned to Seattle, scale samples were analyzed in the laboratory by FRI scientists. The total number of scales collected and the number of regenerated scales in each sample was determined for each fish. Up to three non-regenerated scales per fish were selected, cleaned, and mounted on gummed cards. Acetate impressions of the scales were made with a heated hydraulic press (100°C at 5,000 psi for 3 minutes). Ages were determined by visual examination of the acetate impressions under a microform reader (100x). Age was designated by the European method, whereby the first number, followed by a period, indicates the number of

winters in freshwater prior to ocean migration, and the second number indicates the number of winters in the ocean and spawning checks. For example, an age 2.3 fish spent two winters in freshwater before migration to the ocean and three winters in the ocean or on the spawning grounds. The ocean and spawning history was described by designating the number of winters spent in the ocean with a numeral and each winter on the spawning grounds with the letter "S". For example, a "2SSS" spent its first two winters in the ocean and then returned to freshwater to spawn for the next three consecutive winters. Ages and spawning histories were determined independently by two experienced scale readers. In the few cases where there was a disagreement between readers, the scales were re-examined, and a final age was assigned.

Results

Logistics

The outfitters provided a safe, well supplied camp and reliable transportation and communication. Transportation to and from the nearest airport in Tigil was by an Aeroflot M-8 helicopter. Ground transportation was by a large military all-terrain vehicle capable of transporting up to 12 people and heavy gear. Rivers were navigated in a 9 ft, 3-person inflatable raft powered by a 25 hp outboard, jet-propelled motor. Radio communications to Tigil were made daily. No members of the expedition party developed illness as a result of consuming the camp food and river water. The most difficult travel complications arose from the apparently typical unreliability of Aeroflot flight schedules in the city of Magadan. This should be avoidable in future years by either chartering a flight from Magadan to Tigil (or other final destination) or by flying directly from Anchorage, Alaska to Petropavlovsk, Kamchatka.

Catch and Biological Data

Thirty-five adult steelhead were captured in gillnets and 35 adult steelhead were caught by hook-and-line from 24 September through 9 October 1994 (Table 1). Thirty adult steelhead were captured by gillnets and 17 by hook-and-line in the Kavachina River. Five adult steelhead were captured by gillnets and 18 by hook-and-line in the Snotolvayam River. No pre-smolt juvenile steelhead were observed in the mainstems of either river in 1994.

There were no significant differences in fork lengths of adult steelhead between the two rivers ($F=0.08$, 1 df, $p=0.78$), gear types ($F=0.35$, 1 df, $p=.55$), and sexes ($F=1.81$, 1 df, $p=0.18$), and there were no significant higher order interactions. There were also no significant differences in the sex ratios between the two rivers ($X^2=.064$, 1 df, $p=0.61$) or between the two gear types ($X^2=0.60$, 1 df $p=0.63$). Adult steelhead had a pooled average fork length of 832 mm ($SE=6.68$, $N=66$), an average girth of 450 mm ($SE=5.25$, $N=42$), and an average weight of 6.12 kg ($SE=230.3$, $N=31$). Length-weight and length-girth relationships for males and females are presented in Figs. 2 and 3.

Scale Analysis

Scale samples were not received from MGU scientists for four fish caught by gillnets in the Kavachina River (I.D. no. 1-4, Table 1), and scales from one fish caught by hook-and-line fishing were missing (I.D. no. 1627, Table 1). An average of ten scales were collected per fish ($n = 63$ fish; Table 1). Scale regeneration rates (no. of regenerated scales/total no. of scales collected) for individual fish ranged from 20% to 100% and averaged 68%.

Freshwater ages could not be determined for seven fish, because all of the scales collected

from these fish were regenerated in the freshwater zone (designated by the letter "R" in Table 1). For fish with non-regenerated scales (n=58 fish), the predominant age groups in the 1994 samples were 3.3 (33% of the total), 2.3 (22%), and 3.4 (16%) (Table 2). The older ocean age groups were all female fish (ages .5, .7, and .8; Tables 1 and 3). For ocean age groups that included both sexes (.2, .3, .4), the mean sizes (fork length, girth, and weight) of males were larger than those of females (Table 3).

Spawning history was determined from scale patterns for 65 fish (Table 1). Twenty-five percent of the fish were on their first spawning run (indicated by an asterisk in Table 1). The majority of the fish were repeat spawners on their second (48%), third (22%), fourth (3%), sixth (1%), and seventh (1%) spawning runs.

Tag Release and Recovery

Thirty-one of the 35 steelhead caught by hook-and-line were tagged with numbered red anchor tags (Table 1). One of these, a female steelhead tagged in the Snotolvayam River on 3 October 1994 (no. 1657, Table 1), was recovered in the Utkholok River (156° 50'E, 57° 46'N) on 12 October 1995. The mouths of the two rivers are approximately 47 km apart. The recovery scales from this fish showed extensive resorption in the year of tagging (1994), and the first two spawning checks were no longer visible on the scales. Along the longest axis of the scale, seven new circuli, which represent summer growth in 1995, had formed at the edge of the scale.

Discussion

The catch-and-release method employed by anglers was very successful in that the full complement of data (except body weight) were collected from all steelhead that were captured, and all steelhead appeared to be in excellent condition when released. The lack of statistically significant differences between size and sex ratios of fish caught by the two gear types indicates that catch-and-release fishing by hook-and-line is an excellent alternative to gillnet sampling. Although rates of survival and spawning success of steelhead caught by hook-and-line during the 1994 expedition were not determined, one steelhead that was tagged and released in 1994 was recovered in 1995, and the fish was reported to be in excellent condition (P. Soverel, pers. comm.). Catch-and-release fly fishing is a particularly attractive alternative to gillnet sampling because of the endangered status of steelhead populations in Kamchatka.

The percentage of repeat spawners in the Snotolvayam and Kavachina samples is much higher than that found in wild populations in most North American streams (Table 4). Ocean distributions and run timing may be different for first-time and repeat spawners. Discussions with the MGU scientists and local Koryak people indicated that the main portion of the steelhead run had yet to occur by the time we departed on 10 October 1994. According to information from the local people and Maksimov (1972), the majority of the adult steelhead enter the rivers during a very short period (a few days) in mid to late October. The peak of the run generally coincides with the onset of ice formation in the rivers. This may explain the unexpectedly low numbers of steelhead caught in the gillnets, which were fished almost continuously for 18 days.

All of the age and spawning history data presented in this report are preliminary, because they have not been validated by marking or tagging studies. The October 1995 recovery in the Utkholok River of a fish tagged one year earlier in the Snotolvayam River (tag no. 1657, Table 1) shows that Kamchatka steelhead can enter more than one river, but the location of this fish's

spawning ground is not known. Adult Kamchatka steelhead may overwinter in freshwater and then return to the ocean in the spring without spawning. If overwintering and spawning checks cannot be distinguished on the scales, then the spawning histories shown in Table 1 may be erroneous. The recovery scales from steelhead no. 1657 were very resorbed in the year of tagging (1994), and the first two spawning checks visible on the release scales were no longer visible on the recovery scales. If extensive resorption of scales occurs naturally in adult steelhead not subject to the stress of our catch-and-release, scale sampling, and tagging procedures, then our age composition estimates may be negatively biased.

No pre-smolt juvenile salmonids were observed in the mainstems of either river in 1994, indicating that juveniles probably rear in the relatively small tributaries, which are generally less than 2 m wide, or upstream reaches of the rivers. The Kavachina and Snotolvayam rivers are inhabited by at least eight other species of anadromous salmonids, indicating the possibility of intense interspecific competitive interactions among species that have extended freshwater residence (e.g., char *Salvelinus* sp., coho salmon *O. kisutch*, and cherry salmon *O. masou*).

There is a wealth of literature on the species interactions among juvenile salmonids in North American freshwater streams; the most studied interactions involve steelhead, coho salmon, and chinook salmon (e.g., Bisson et al. 1988; Taylor 1988; Bugert and Bjornn 1991; Fausch 1993; Roper et al. 1994). Study of interspecific relationships among anadromous salmonids has produced valuable insight into their ecological requirements. Fish assemblages in Kamchatka steelhead rivers obviously differ from those in North America. White spotted char (*S. leucomaenis*) and cherry salmon are non-existent in North American rivers, but are present in Kamchatka rivers. The opportunity to study relationships between these species and steelhead would likely improve understanding of the ecological niche of steelhead in Kamchatka.

The 1994 Kamchatka steelhead expedition did much to foster international cooperation among U.S. and Russian steelhead anglers and scientists. During the expedition, U.S. participants engaged in lengthy discussions with MGU scientists regarding comparisons between Kamchatka and North American anadromous salmonid population structure, abundance, distribution, and management. We freely exchanged data and samples collected during the expedition. A conservation biologist from the Tigil region of the Koryak District (roughly two-thirds of the Kamchatka Peninsula) enthusiastically acquired information from us regarding FRI's High-Seas tagging program, and agreed to undertake an effort to distribute information on the tagging program to the appropriate personnel in his organization. He has also begun an organized effort to collect any existing high-seas tags from the local Koryak peoples, commercial fisherman, and sport anglers, and return them with any available data to FRI (Vladimir D. Plotnikov, pers. comm.). The scale samples collected in 1994 were used by FRI researchers to validate a model developed from the scales of Columbia River steelhead to identify hatchery and wild steelhead in mixed high seas samples (Bernard and Myers 1996), and will also be useful in the future development of scale pattern models to identify Russian and North American steelhead in mixed high seas samples.

In conclusion, the results of the 1994 expedition indicate that significant scientific research can be conducted on an annual basis under this joint U.S.-Russian program. The study of Kamchatkan steelhead should provide North American researchers and managers with insight into the structure of native steelhead populations. We recommend (1) continued field sampling in Kamchatka on an annual basis to develop a useful time series of biological data, (2) tagging and marking studies to validate age and life history information, determine migration patterns, and estimate population abundance, (3) instream studies of juvenile steelhead, associated species, and overwintering and spawning adult steelhead, and (4) continued laboratory analysis of scale samples for age, growth, life history, and stock identification studies.

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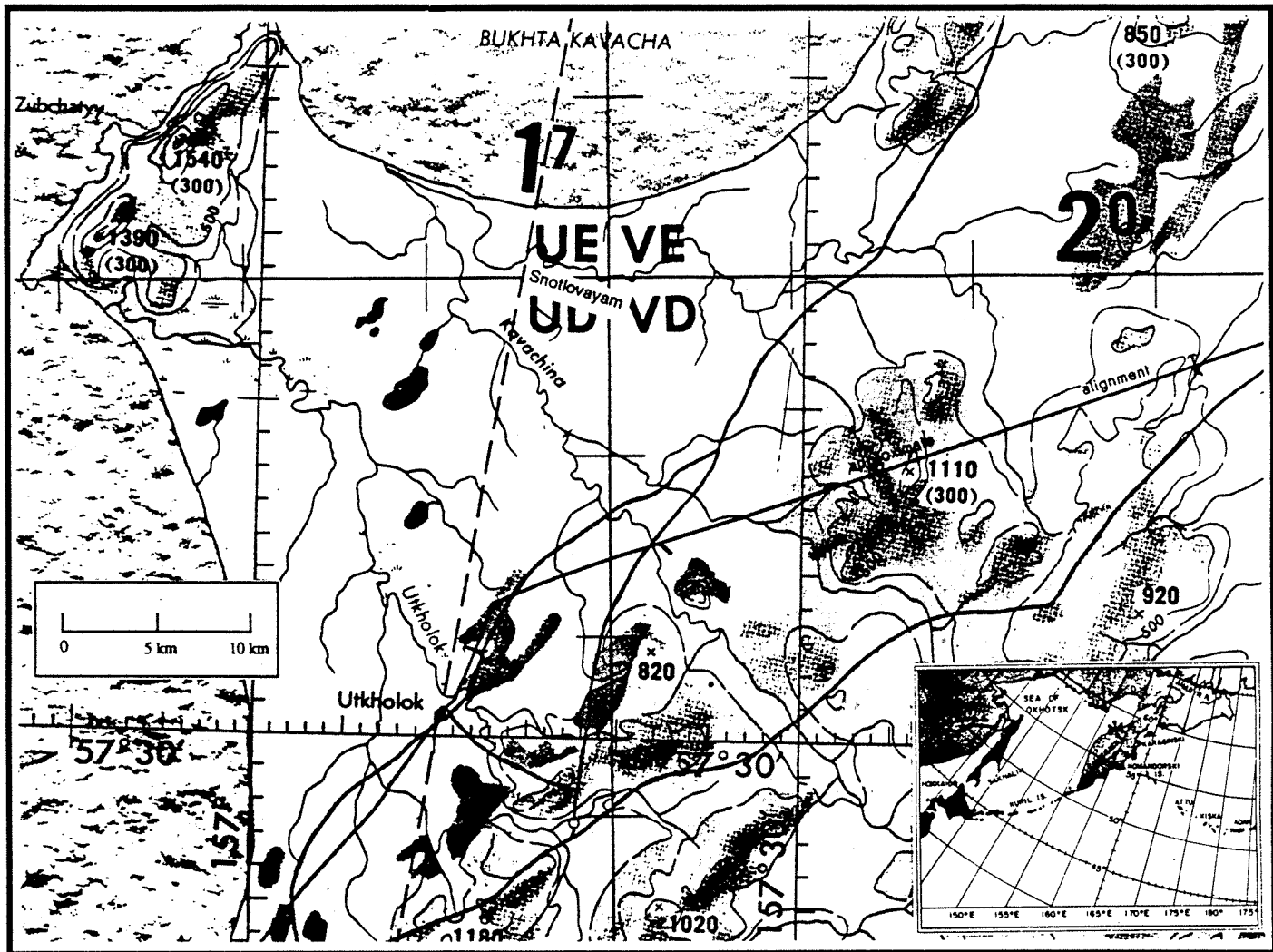


Fig. 1. Map showing location of the study area in northwestern Kamchatka, Russia. An asterisk on the inset map indicates the general location of the Snotlovayam and Kavachina rivers in northwestern Kamchatka, Russia.

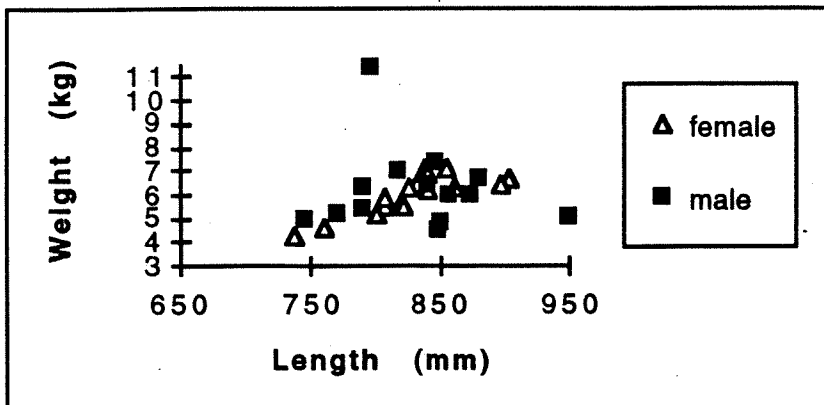


Fig. 2. Length-weight relationships for steelhead caught by gillnets in the Snotolvayam and Kavachina Rivers in 1994.

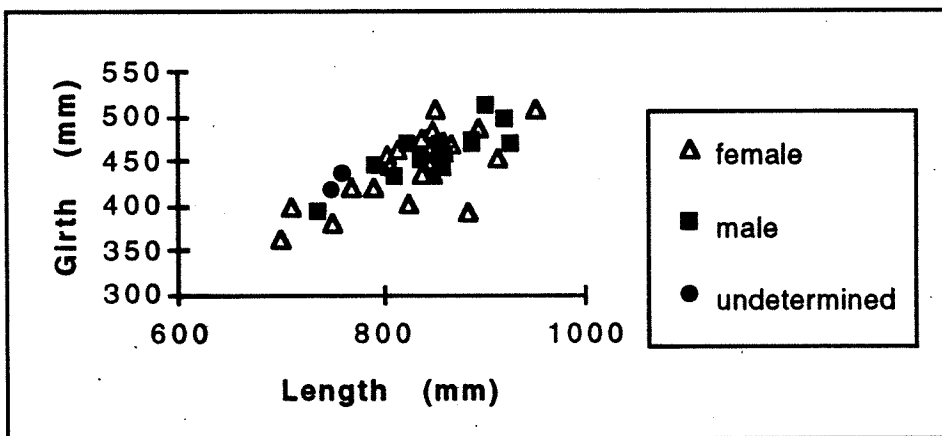


Fig. 3. Length-girth relationships for steelhead caught by fly fishing in the Snotolvayam and Kavachina Rivers in 1994.

Table 1. Data from adult steelhead captured from the Kavachina and Snotolvayam Rivers in western Kamchatka, Russia, 24 September through 9 October 1994. I.D.: four digit numbers indicate numbers on tags. FW = number of winters in freshwater before migrating to ocean. R = regenerated scale; Ocean = number of winters in ocean plus number of winters of adult overwintering in freshwater. Spawn = spawning history: the numeral is the number of winters in the ocean before the first spawning run and each letter "S" indicates one spawning run, * = fish is on first spawning run. No. Scales = the number of scales collected. No. Regen = the number of regenerated scales. Sex: m = male, f = female.

Date	I.D.	Captured	Location	Gear	Sex	Length (mm)	Weight (g)	Girth (mm)	Card No.	Fish No.	Scale			Info.		
											FW	Ocean	Spawn	No. Scales	No. Regen	No. Scales
1601	9/26/94		Kavachina	Hook-Line	m	813	-	432	2	5	R	3	*	5	5	
1651	9/26/94		Kavachina	Hook-Line	m	903	-	510	2	3	3	3	3	2S	4	2
mbp-1	9/26/94		Kavachina	Hook-Line	f	770	-	420	4	3	3	4	2SS	9	7	
1652	9/29/94		Kavachina	Hook-Line	f	815	-	464	2	7	R	3	*	6	6	
1653	9/29/94		Kavachina	Hook-Line	f	852	-	509	2	4	R	3	2S	6	6	
1726	9/29/94		Kavachina	Hook-Line	m	840	-	455	3	3	3	3	1SS	4	3	
1551	9/30/94		Snotolvayam	Hook-Line	f	952	-	508	2	1	2	8	2SSSSSS	8	5	
1552	9/30/94		Snotolvayam	Hook-Line	f	851	-	437	4	4	2	3	2S	10	6	
1626	9/30/94		Kavachina	Hook-Line	m	890	-	470	1	1	2	3	2S	8	4	
1550	10/1/94		Snotolvayam	Hook-Line	f	750	-	380	4	2	3	3	2S	10	6	
1556	10/1/94		Snotolvayam	Hook-Line	f	844	-	437	1	10	3	4	2SS	10	9	
1558	10/1/94		Snotolvayam	Hook-Line	m	921	-	495	2	6	3	4	2SS	9	6	
1654	10/1/94		Snotolvayam	Hook-Line	m	927	-	470	3	5	3	3	*	9	4	
1655	10/1/94		Snotolvayam	Hook-Line	f	698	-	362	3	4	2	2	1S	8	6	
1600	10/2/94		Snotolvayam	Hook-Line	f	844	-	476	1	2	3	3	*	10	5	
1656	10/2/94		Kavachina	Hook-Line	m	857	-	470	2	2	2	3	2S	8	4	
1727	10/2/94		Snotolvayam	Hook-Line	f	749	-	419	4	1	3	3	2S	10	2	
1729	10/2/94		Snotolvayam	Hook-Line	f	710	-	400	2	10	2	2	*	7	3	
1657	10/3/94		Snotolvayam	Hook-Line	f	914	-	454	3	6	4	4	2SS	12	7	
1658	10/3/94		Kavachina	Hook-Line	f	806	-	444	3	7	3	2	*	14	12	
1548	10/4/94		Snotolvayam	Hook-Line	m	863	-	457	3	8	3	3	*	10	9	
1599	10/4/94		Snotolvayam	Hook-Line	m	838	-	451	3	2	3	2	1S	10	8	
1659	10/4/94		Snotolvayam	Hook-Line	m	738	-	393	2	9	R	2	1S	11	11	
1661	10/4/94		Snotolvayam	Hook-Line	f	838	-	476	3	1	3	3	2S	23	9	
k-1	10/4/94		Snotolvayam	Hook-Line	f	850	-	450	3	9	3	3	2S	10	7	
k-2	10/4/94		Snotolvayam	Hook-Line	f	790	-	420	3	10	2	3	2S	10	4	
1730	10/5/94		Snotolvayam	Hook-Line	m	793	-	445	2	8	3	2	1S	7	5	
1598	10/7/94		Kavachina	Hook-Line	f	851	-	483	1	9	3	4	2SS	9	4	
1676	10/7/94		Kavachina	Hook-Line	f	884	-	394	1	6	3	3	2S	19	10	
1700	10/7/94		Kavachina	Hook-Line	m	825	-	470	1	8	3	3	2S	5	3	
1566	10/8/94		Kavachina	Hook-Line	f	868	-	470	1	5	3	3	2S	11	8	
1567	10/8/94		Kavachina	Hook-Line	f	844	-	451	1	4	2	3	*	8	4	
1662	10/8/94		Kavachina	Hook-Line	m	863	-	457	1	3	3	3	2S	6	5	
ps-1	10/8/94		Kavachina	Hook-Line	m	889	-	473	1	7	3	3	2S	14	13	
1627	10/9/94		Kavachina	Hook-Line	-	762	-	437	no scales	-	-	-	-	-	-	

Table 1. Continued.

I.D.	Date	Location	Gear type	Sex	(mm)		Weight (g)	Girth (mm)	Card No.	Fish No.	FW	Scale		Info.
					Length	Length						Ocean	Spawn No.	
1	9/24/94	Kavachina	Gillnet	Data not received from MGU scientist										
2	9/25/94	Kavachina	Gillnet	"	"	"								
3	9/26/94	Kavachina	Gillnet	"	"	"								
4	9/27/94	Kavachina	Gillnet	"	"	"								
5	9/25/94	Kavachina	Gillnet	m	745	4850		5	1	3	4	1SSS	12	7
6	9/26/94	Kavachina	Gillnet	f	831	6450		5	2	2	5	2SSS	10	4
7	9/26/94	Kavachina	Gillnet	m	771	4950		5	3	2	2	*	10	8
8	9/26/94	Kavachina	Gillnet	m	796	5200		5	4	2	3	1SS	9	7
9	9/27/94	Kavachina	Gillnet	m	880	11400		5	7	2	3	2S	10	9
10	9/27/94	Kavachina	Gillnet	f	854	7200		5	5	3	4	2SS	10	7
11	9/28/94	Kavachina	Gillnet	f	903	6750		5	6	3	7	2SSSSS	5	5
12	9/28/94	Kavachina	Gillnet	m	845	6700		5	8	R	3	ISS	10	10
13	9/28/94	Kavachina	Gillnet	m	848	7350		5	9	2	4	2SS	9	4
14	9/30/94	Kavachina	Gillnet	m	790	4550		5	10	3	2	*		
15	9/30/94	Kavachina	Gillnet	f	800	5200		6	1	3	3	2S	10	6
16	9/30/94	Kavachina	Gillnet	f	759	4650		6	2	3	3	2S	11	8
17	10/1/94	Kavachina	Gillnet	f	838	7100		6	3	2	3	*	10	7
18	10/2/94	Kavachina	Gillnet	f	840	6900		6	4	3	4	2SS	9	3
19	10/2/94	Kavachina	Gillnet	m	816	5400		6	5	2	3	2S	10	7
20	10/2/94	Kavachina	Gillnet	m	950	7000		6	6	R	4	3S	10	10
21	10/3/94	Kavachina	Gillnet	m	790	5100		6	7	3	2	1S	10	6
22	10/4/94	Kavachina	Gillnet	f	736	4300		6	8	2	2	*	10	8
23	10/5/94	Kavachina	Gillnet	f	821	5500		6	9	3	4	2SS	10	9
24	10/3/94	Snotolvayam	Gillnet	f	806	5500		6	10	2	4	2SS	10	8
25	10/4/94	Snotolvayam	Gillnet	f	819	5700		7	1	3	4	2SS		
26	10/5/94	Snotolvayam	Gillnet	m	840	5900		7	2	2	3	2S	8	4
27	10/6/94	Snotolvayam	Gillnet	m	873	6450		7	3	3	3	2S	10	10
28	10/7/94	Snotolvayam	Gillnet	m	850	6050		7	4	2	3	2S	10	7
29	10/8/94	Kavachina	Gillnet	f	860	6300	472	7	5	3	3	*	10	5
30	10/8/94	Kavachina	Gillnet	f	825	6350	402	7	6	2	4	3S	10	2
31	10/8/94	Kavachina	Gillnet	m	857	6400	462	7	7	2	3	*	10	6
32	10/9/94	Kavachina	Gillnet	f	840	6200	437	7	8	2	3	2S	10	5
33	10/9/94	Kavachina	Gillnet	f	896	6450	487	7	9	2	4	3S	10	10
34	10/9/94	Kavachina	Gillnet	m	860	6000	443	7	10	R	3	*	10	10
35	10/9/94	Kavachina	Gillnet	f	805	5900	457	8	1	3	3	*	10	8

Table 2. Preliminary age composition estimates for steelhead caught in the Snotolvayam and Kavachina rivers in 1994. No. = number of fish in each age group.

River		Age										Total
		2.2	2.3	2.4	2.5	2.8	3.2	3.3	3.4	3.7	4.4	
Snotolvayam	No.	2	4	1	0	1	2	8	3	0	1	22
	%	9.1	18.2	4.5	0.0	4.5	9.1	36.4	13.6	0.0	4.5	100.0
Kavachina	No.	2	9	3	1	0	3	11	6	1	0	36
	%	5.6	25.0	8.3	2.8	0.0	8.3	30.6	16.7	2.8	0.0	100.0
Total	No.	4	13	4	1	1	5	19	9	1	1	58
	%	6.9	22.4	6.9	1.7	1.7	8.6	32.8	15.5	1.7	1.7	100.0

Table 3. Mean fork length, girth, and weight by ocean age and sex of adult steelhead caught in the Snotolvayam and Kavachina rivers in 1994. n = number of fish.

Ocean Age		Female			Male		
		(mm) Length	(mm) Girth	(g) Weight	(mm) Length	(mm) Girth	(g) Weight
2	Mean	738	402	4300	787	430	4867
	S.D.	48.3	41.0		32.6	31.9	284.3
	n	4	3	1	6	3	3
3	Mean	829	450	5892	857	464	6611
	S.D.	37.1	34.2	865.1	32.6	19.0	1859.6
	n	17	16	6	19	12	9
4	Mean	840	447	6229	866	495	6400
	S.D.	40.0	34.1	683.0	91.4		1353.7
	n	10	6	7	4	1	3
5	Mean	831					
	S.D.						
	n	1					
7	Mean	903					
	S.D.						
	n	1					
8	Mean	952	508				
	S.D.						
	n	1	1				

Table 4. Percentage of repeat spawning by number of spawning runs for selected wild populations of Washington, Oregon, California, and Kamchatka steelhead. References were compiled the U.S. National Marine Fisheries Service (Peggy Busby, pers. comm.).

Population	No. of fish	Spawning run							Reference	
		1	2	3	4	5	6	7		
Kalama R., Washington										
winter	3,114	89	9	2	<1	0	0	0	Leider et al. 1986	
summer	2,841	94	6	<1	0	0	0	0	Leider et al. 1986	
Sand Cr., Oregon										
winter	196	77	18	4	1				Bali 1959	
Alsea R., Oregon										
winter	1,223	89	9	2	0	0	0	0	Chapman 1958	
Siuslaw R., Oregon										
winter	125	86	11	2	0	1	0	0	Lindsay et al. 1991	
Coquille R., Oregon										
winter	79	61	32	5	2	0	0	0	Bali 1959	
Rogue R., Oregon										
summer	922	79	17	4	0	0	0	0	ODFW 1994	
Waddell Cr., California										
winter	3,888	83	15	2	<1	0	0	0	Shapovalov and Taft 1954	
Kavachina- Snotolvayam, Kamchatka										
summer (preliminary)	65	25	48	22	3	0	1	1	This report.	

Appendix A

i

KAMCHATKAN TROUT INSTRUCTIONS FOR SAMPLING AND DATA COLLECTION

For each fish that you catch, please write the following information in the yellow data books provided (see example sheet for how to format data in book):

date start new page each day

[Russian dates are usually day-month-year, separated by periods, e.g. 25.9.94]

location (river, and distance from ocean or other information which Barry will provide you with)

habitat information (water temperature, habitat type (pool, riffle, glide); migration barriers; description of riparian vegetation; description of substrate; stream order; other noteworthy information, such as turbidity, unusual geography, etc.)

tag number: the tag number is on the tag; e.g. A01552 [tag only steelhead]

If the fish is not tagged, give the fish a specimen number and enter that in the tag no. column.

For a specimen number, use your initials, followed by a number, starting with 1. e.g. JKL 1; next fish is JKL 2, etc.

[species (if other than rainbow trout/steelhead)]

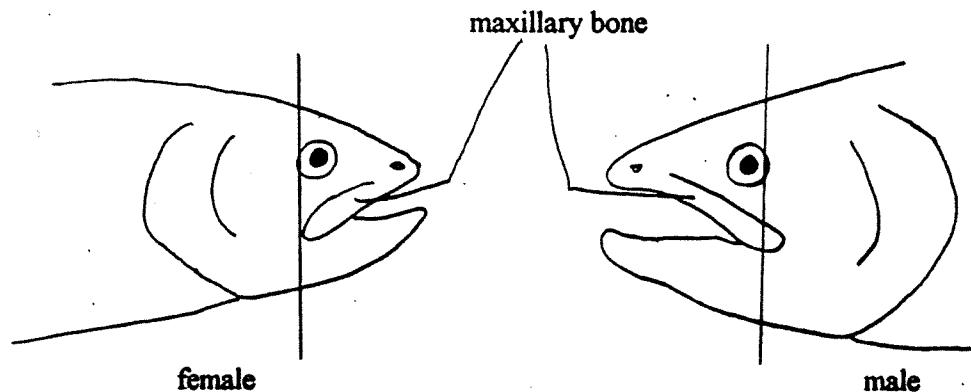
length of fish in millimeters, measured from tip of snout to fork of tail.

girth of fish [if taken] in millimeters, taken just in front of the dorsal fin

[if the weight of the fish is taken, record the weight, in grams]

sex: If the fish is dead, examine gonads and note maturity;

If the fish is to be released alive, the relative length of the maxillary bone may indicate gender, as illustrated;

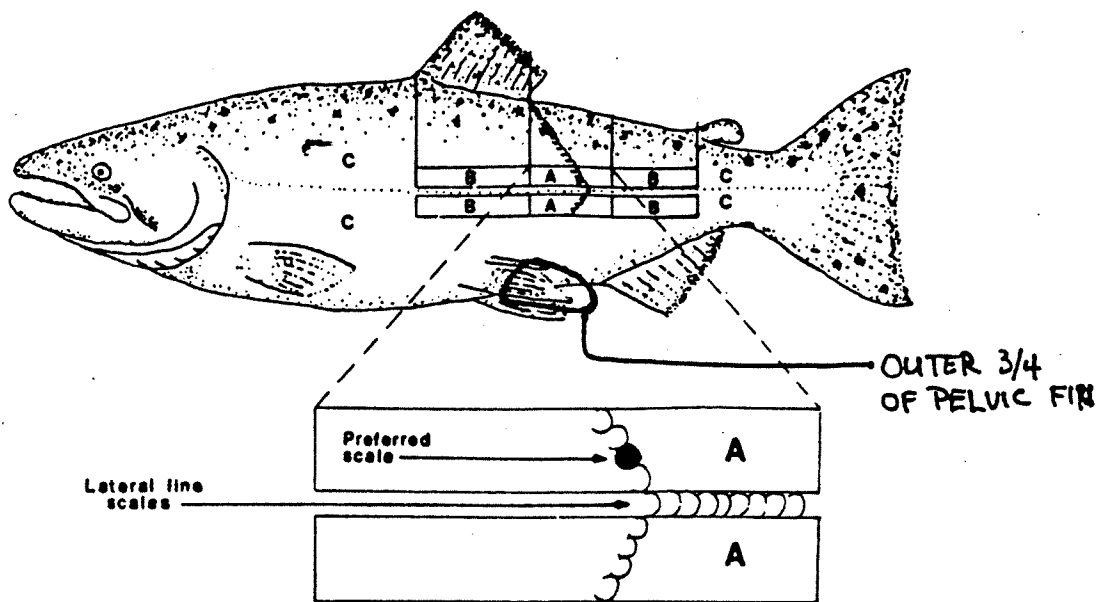


In females, the maxillary bone is shorter and reaches to about the back edge of the eye
In males, the maxillary is longer and extends back beyond the back edge of the eye.

appearance and comments: describe coloration; note development of secondary sex characters; describe condition of the fish (e.g., fresh from ocean, robust, has ectoparasites, diseased, etc.); anything interesting or unusual - scars, net marks, etc.

pelvic fin for genetic sampling: with scissors, clip off the outer 3/4 of one of the pelvic fins (see illustration below). Put the fin in a vial with alcohol and label the vial with the tag number or specimen number. The fin should occupy 1/3 or less of the volume of the vial.

scale sample: Collect scale sample from preferred area A as illustrated (just above or below lateral line, distance about half way between end of dorsal fin and beginning of anal fin). [If there are no scales in preferred area A, sample from area B (next) or area C (last choice) and note this in the data book and on the envelope.] Remove 5 scales from each side with forceps; take scales that are not next to each other. Label the envelope with the tag number.



tagging: insert tagging needle about 1-2" below the edge of the back, below the front part of the dorsal fin, coming in from behind and angled forward and down. You want the needle to pass between the neural spines of 2 vertebrae or the interneural spines of the dorsal fin [see illustration below and tagging gun instruction sheet]. pull the trigger, and twist the gun to make sure that the little T-bar at the end of the tag is cross-wise to the spines. Withdraw the needle and release the fish. Record the tag number used on that fish in your data book; this will act as the specimen number for that fish.

25 tags are included in your sampling kit, and Barry has more. You must account for all tags used and return unused tags, as they are used for other tagging studies.

