Volume 18 Study AFS-42

RESEARCH PROJECT SEGMENT

State: Alaska Name: Sport Fish Investigations of Alaska

Project No.: F-9-9

Study No.: AFS-42 Study Title: A STUDY OF CUTTHROAT-STEELHEAD IN ALASKA

Job No.: AFS-42-5-A Job Title: Development of Techniques for Enhancement of Steelhead Trout in Southeast Alaska

Period Covered: July 1, 1976 to June 30, 1977

ABSTRACT

This report covers the first year of study on the development of techniques for the enhancement of steelhead trout, Salmo gairdneri Richardson, in Southeast Alaska.

Work included stream surveys to determine the distribution and general abundance of steelhead, surveys to determine steelhead systems suitable for obtaining brood stock, surveys of stream systems for potential experimental stocking of steelhead smolts, experimental stocking of two selected systems with steelhead smolts, and an attempt to obtain fish for establishing a brood stock of fall-run steelhead.

The distribution and abundance of spring-spawning steelhead was determined for three streams in 1976 to determine potential sources of brood stock. Kadake Creek is a large nonlake system with two large tributaries and many lesser ones. Spawning steelhead were observed in the lower portions of the right fork and throughout the left fork. Good numbers of steelhead were observed spawning throughout the main stem of Kadake Creek with an estimated 300 spawners during the 1976 run. Hamilton River is also a large nonlake system containing good runs of spring steelhead with spawning occurring throughout the main stem and into all of the major tributaries. Sitkoh Creek is a smaller lake-stream system in northern Southeast Alaska. Surveys conducted during May of 1976 located steelhead spawning concentrations below the lake and again just upstream from tidewater. Actual counts placed the 1976 steelhead run at 250 adults.

The distribution and abundance of summer-run steelhead was determined for river systems during 1976. Surveys were conducted during July 1976 at Plotnikof River, as it contains the only known run of summer steelhead in Southeast Alaska. The abundance of summer-run steelhead in Plotnikof River is difficult to determine due to the large size of this system. From observations made in past years and in 1976 it is estimated

that no more than 200 summer steelhead enter Plotnikof annually. Rearing summer-run steelhead are confined in Plotnikof Lake outlet and to Plotnikof River.

Four streams were surveyed for their suitability for stocking steelhead smolts. Cowee Creek near Juneau is accessible via the Glacier Highway and has a good foot trail adjacent to the stream. Cowee Creek contains eight to ten excellent steelhead holding areas in the 4.5 km area surveyed. Montana Creek near Juneau is accessible from the Mendenhall Loop Road and the Montana Creek road. This stream flows 19 km before joining the Mendenhall River. Excellent steelhead rearing and holding water is found throughout Montana Creek. Fisherman access is excellent throughout. Indian River is located on the edge of the city of Sitka and is easily accessible by road and foot trail. Indian River contains ten excellent steelhead holding pools in the 5 km of stream surveyed. Fisherman access is excellent in the lower reaches of the stream, and access to the upper stream is via U.S. Forest Service trail. Salmon Creek, located at the head of Silver Bay, is accessible via skiff or floatplane. Salmon Creek is short, 2 km, and has limited amounts of steelhead holding water. A U.S. Forest Service trail parallels the stream and provides easy access.

Three streams were planted with spring-run steelhead smolts in 1976 in an attempt to (1) evaluate the feasibility of increasing natural runs, (2) create new runs of spring steelhead in a system with no past history of steelhead production, and (3) establish a brood stock of spring-run steelhead at the Crystal Lake Hatchery. Montana Creek, near Juneau, was planted with 6,500 steelhead smolts averaging 170 mm in length. This marks the first plant in an attempt to create a run of spring steelhead. Petersburg Creek was planted with 6,500 spring steelhead smolts in early June 1976. This is a continuation of a program started in 1975 to assess numbers of smolts needed to enhance existing fisheries. Crystal Creek received a total of 11,000 spring steelhead smolts in 1976. Plants at Crystal Creek are designed to produce hatchery brood stock.

An attempt was made in the fall of 1976 to capture adult fall-run steelhead for brood stock. Two streams on the northeast coast of Prince of Wales Island were sampled in October and early November. Fall-run steelhead numbers in these two streams was determined to be too low to support egg taking operations. The capturing crew was moved to the Naha River system in early November. Hook and line were employed to capture adult fall-run steelhead for shipment via helicopter to the Crystal Lake Hatchery. Various problems with weather, handling losses, and vandalism restricted the take to only five adults.

## BACKGROUND

Research into the basic life history of the spring-run steelhead, Salmo gairdneri Richardson, conducted at Petersburg Creek from 1971 to 1975 provided information about the steelhead in Southeast Alaska. This research determined that the annual wild steelhead smolt production for Petersburg Creek is about 1,200. It was also found that 50% of these

steelhead will return as adults after 2 years at sea while the remainder spend 3 years at sea. The low number of smolts and the old age at maturity tend to limit the annual run of spawners. Research findings showed a steady decline in adult steelhead numbers for 1971 through 1975. It may be possible that steelhead are cyclic in abundance, as are other salmonid species that rear for one or more years in fresh water. If indeed this is the case, it may be necessary to enhance adult runs during the years of low natural abundance.

Comprehensive data on other steelhead systems in Southeast Alaska is lacking; however, angler interest in steelhead has shown a steady increase. This interest in steelhead is concentrated on the better known streams within easy access of population centers. Most of these steelhead streams do not have large runs of steelhead (usually between 200-400 annually). With improved access due to logging road expansion and the development of mining and oil exploration the pressure on the wild runs will increase and make them hard to maintain. Present bag limits are quite restrictive (two per day) and do not have much room for further reductions.

With completion of the Crystal Lake Hatchery in 1972 Southeast Alaska acquired a facility capable of producing steelhead smolts in 12 months. A limited program of spring-run steelhead production was initiated in 1974, and the first spring steelhead smolts were liberated in Petersburg Creek and Crystal Creek in the spring of 1975. The plant at Petersburg Creek was an experiment to compare returns of hatchery steelhead compared with natural production. The plants at Crystal Creek were for the development of a brood stock at Crystal Lake Hatchery. Additional liberations were made in Petersburg Creek, Crystal Creek, and Montana Creek in June 1976. Adults produced from the 1975 releases should be available to the angling public and for egg takes during the spring of 1977.

Southeast Alaska contains numerous stream systems that support fall-run steelhead and one system that contains a summer run of steelhead. The run timing of these two races of steelhead make them quite attractive to the angling public. Investigations into the development of these races for brood stock and subsequent enhancement work were made during 1976.

## RECOMMENDATIONS

### Management

1. Develop a brood stock of spring-run steelhead at the Crystal Lake Hatchery. A total of 11,000 spring-run steelhead smolts have been released at Crystal Creek since 1975. The first ocean adults are expected to return to the hatchery in the spring of 1977. If survival has been normal, the expected return of adults will provide between 100,000 and 200,000 eggs. However, if the survival is poor and very few fish return, I recommend the trapping of wild adults from Falls Creek or other suitable sources to assure a supply of eggs for incubation.

2. Develop a brood stock of fall-run steelhead at the Crystal Lake Hatchery. Work was carried out during the fall of 1976 in an attempt to obtain adults for brood stock. This program was not overly successful in numbers of fish captured, but it did answer many questions on run timing to various streams and the logistics involved in obtaining brood stock from wild fish. The run timing of fall-run steelhead make them a desirable race for enhancement work in selected streams. Development of a brood stock of this race of steelhead should proceed in a timely manner.

3. Provide for a reduction in the steelhead bag limit in areas being affected by human population growth.

The development of oil fields offshore near Yakutat and the development of a molybdenum mine east of Ketchikan will result in an influx of people into the two areas. This influx of people will directly affect the steelhead populations of the areas, and in order to preserve these populations a reduction of the bag to one steelhead a day and two in possession is recommended.

Research

1. Continue experimental stocking of spring-run steelhead smolts to determine optimum numbers needed to create new fisheries in selected waters of Southeast Alaska.

   The experimental stocking of spring-run steelhead smolts was begun at Petersburg Creek and Crystal Creek in 1975. This program was expanded in 1976 with the addition of Montana Creek. Results of the 1975 releases will be known in early 1977 when the first two ocean steelhead adults return to Petersburg Creek and Blind Slough. Evaluation of the experimental plants will be complete in 1978 when the three ocean steelhead return to Petersburg Creek and Blind Slough and the first two ocean adults return to Montana Creek. Results of these returns will provide guidelines for future work with spring-run steelhead.

2. Conduct experimental rearing of steelhead in saltwater pens.

   Available space in existing freshwater rearing facilities will reach capacity within a short time. Alternate rearing facilities should be investigated to assess their potential for steelhead smolt production.

3. Investigate possible sources of summer-run steelhead for future brood stock development.

   Summer-run steelhead have been recorded in only one location on the islands of Southeast Alaska. Development of this population for brood stock will be both time and money consuming. Runs of summer steelhead ascend the larger mainland rivers of Southeast Alaska; however, their spawning grounds are located in Canada. Development of these populations will require negotiations with Canadian officials.

Summer runs of steelhead occur on Kodiak Island, and even though geographically far removed, they may be desirable for brood stock use in Southeast Alaska.

4. Research the ecological relationships between steelhead, cutthroat, Salmo clarki Richardson, Dolly Varden, Salvelinus malma (Walbaum), and coho salmon, Oncorhynchus kisutch (Walbaum).

   The competition among the various salmonids for rearing habitat and food will need to be better understood for Southeast Alaska before large-scale enhancement of any species can begin. The enhancement of one or more species may have undesirable effects on other rearing species.

## OBJECTIVES

1. Determine the distribution and general population levels of steelhead in selected streams throughout Southeast Alaska.

2. Investigate selected stream systems for future hatchery reared steelhead plants.

3. Investigate selected streams for potential egg take sites for summer and/or fall-run steelhead.

4. Assist with the procurement of steelhead eggs for hatchery rearing.

## TECHNIQUES USED

Foot surveys, hook and line, boat, and aircraft were used to determine the location and general abundance of adult steelhead in selected stream systems in Southeast Alaska. Adult steelhead captured were measured, sexed, and a scale sample was removed before they were released at point of capture.

Minnow traps baited with cured salmon eggs were used to determine the presence and distribution of rearing steelhead in selected streams in Southeast Alaska. Rearing steelhead captured were anesthetized with Tricaine Methanesulfonate (MS-222) and their fork length was measured. These steelhead were then allowed to recover before release at the capture site.

Baited minnow traps and foot surveys were used to evaluate streams selected for enhancement with hatchery-reared steelhead. Rearing fish captured in the minnow traps were enumerated by species before release at the point of capture. Maps of the streams were drawn noting various physical features.

Hook and line were employed to capture adult fall-run steelhead in three lake-stream systems in central and southern Southeast Alaska.

These adults were placed in nylon holding pens and subsequently moved via helicopter to the Crystal Lake Hatchery.

A tripod and picket weir was constructed across lower Falls Creek and at Crystal Creek to capture adult spring-run steelhead for egg take purposes. Eggs obtained from these fish were placed in incubators at Crystal Lake Hatchery for incubation.

## FINDINGS

### Adult Spring-Run Steelhead Surveys

Surveys were conducted on three stream systems during the spring of 1976 to determine the distribution and general abundance of spring-run steelhead.

Kadake Creek:

Kadake Creek, located on the northeast end of Kuiu Island, was surveyed in 1970 (McHugh et al., 1971), 1975, and 1976.

Transportation throughout the system was via helicopter, which enabled a greater coverage of the many kilometers of Kadake Creek accessible to anadromous fish.

Kadake Creek is a large nonlake system approximately 40 km long, including both large tributaries and many lesser tributaries (Figure 1). The lower main stem of Kadake Creek averages 10 m wide by 1 m deep. The larger tributaries average 4 to 5 m wide by 0.5 m deep. Surveys to determine the spawning grounds and distribution of steelhead were made in May of 1975 and 1976. Surveys of the right fork of Kadake Creek started at what appeared to be a partial barrier to migrating fish and proceeded downstream for 5 km to the junction with the left fork. The right fork of Kadake Creek is composed of many bedrock rapids with very few pools and only limited spawning areas, and only four adult steelhead were noted spawning in two locations. Six additional steelhead redds were noted throughout the area, indicating that a moderate amount of spawning takes place in the right fork.

Foot surveys were made of the first 4.5 km of the left fork of Kadake Creek. An additional 6 or 8 km of the left fork is open to anadromous migration; however, time did not allow surveys of this upper area. The left fork in the area surveyed was of a lower gradient than that found in the right fork. The pool-riffle ratio was good with most riffle areas containing good to excellent spawning gravel (Figure 2). Twelve to fourteen adult steelhead were noted on several riffles, and additional redds were noted throughout the length of the area. From these findings it appears that the left fork is one of the preferred spawning areas for Kadake Creek steelhead.

The main stem of Kadake Creek from the confluence of the forks to tidewater, a distance of 8 km, was foot surveyed in 1976. This stream section is comprised of large, deep pools with extensive riffle areas

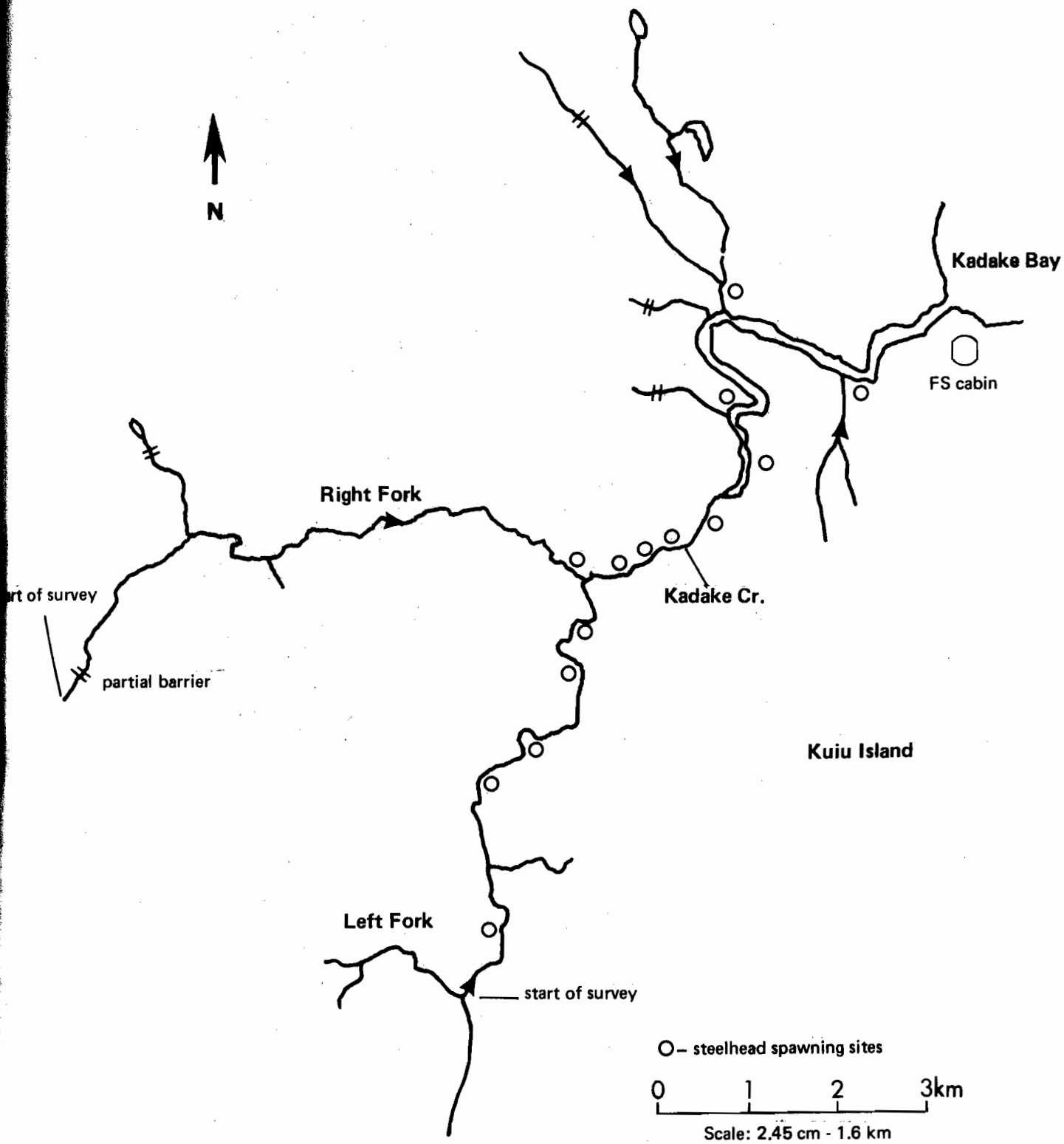



**Fig. 1** Kadake Creek

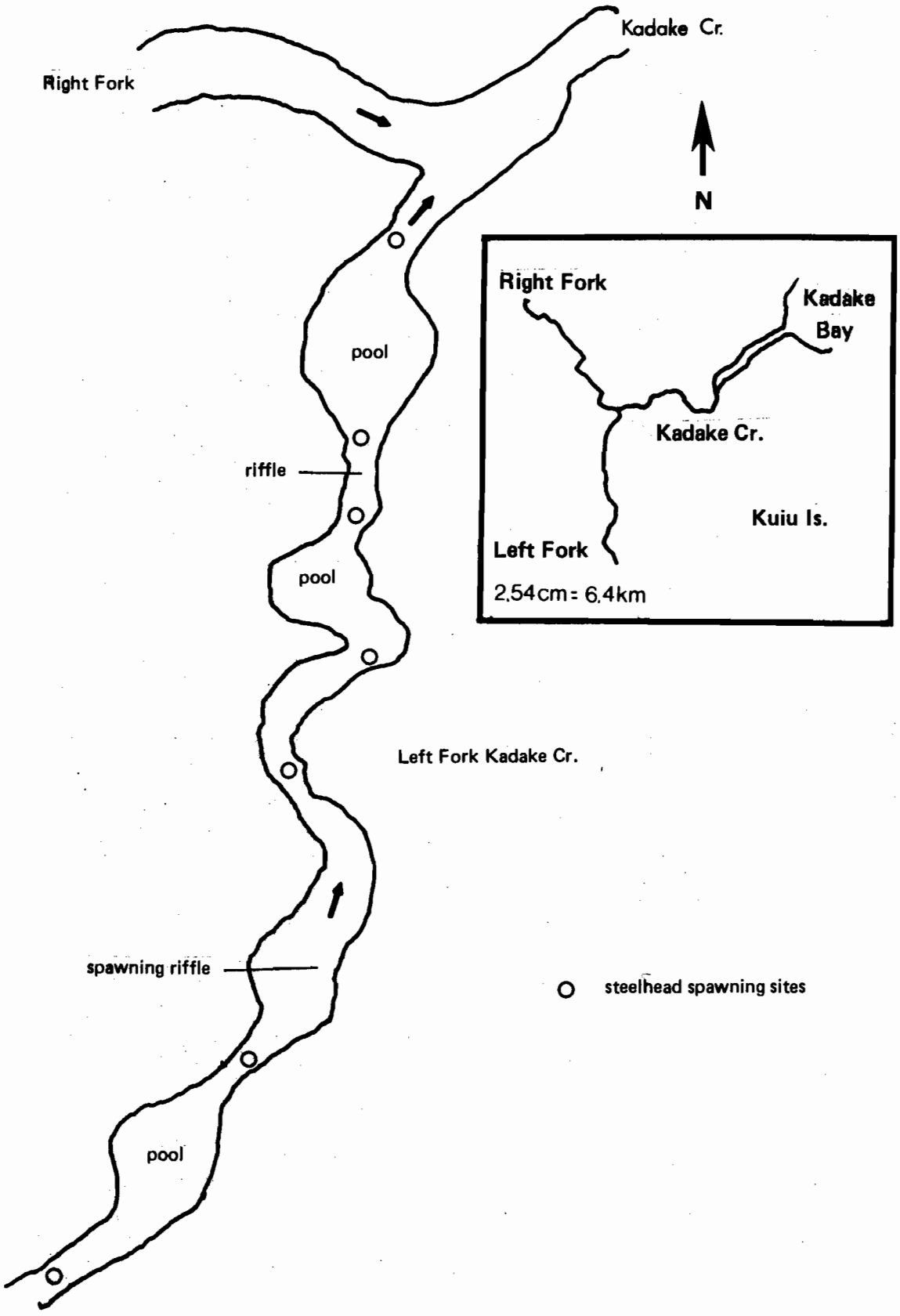



**Fig. 2** Left Fork Kadake Creek Steelhead Spawning Sites

(Figure 3). Excellent steelhead spawning sites, as described by Jones, 1976, were scattered thoughout the entire length of this section of Kadake Creek. Nine redds and eight to ten spawning steelhead were noted throughout the upper 4 km but appeared less abundant in the lower stream area.

Results of these surveys indicate that spring-run steelhead utilize most of the available spawning areas in the main stem of Kadake Creek with some spawning also occurring in both large tributaries.

Time did not allow surveys of the numerous small tributaries. Steelhead abundance was considered excellent in both 1975 and 1976, placing Kadake Creek in the top category of spring-run steelhead streams in Southeast Alaska.

Hamilton River:

Hamilton River, located on northwest Kupreanof Island, is one of the largest river systems in Southeast Alaska with over 128 river kilometers open to anadromous fish migrations (Figure 4). Hamilton River drains a vast area of 182 square kilometers comprised mostly of muskeg, which stain its waters a dark brown. This dark stain makes visual observations difficult in water exceeding 1 m in depth.

Hamilton River does not contain any sizable lakes in its drainage. The main river below the confluence with the three main tributaries does contain several large, deep pools that have been reported to contain overwintering fall-run steelhead (Figure 5).

Hamilton River was surveyed in May of 1976 in the area depicted in Figure 5. Access to this area was via helicopter. One adult steelhead was noted during this survey and appeared to be a bright spring-run fish. The spawning areas for steelhead in Hamilton River probably are upstream from the area surveyed, and additional work will be necessary to locate and describe these areas.

Sitkoh Creek:

Sitkoh Creek, located on the southeast tip of Chichagof Island, originates in Sitkoh Lake and flows eastward for 4 km before entering Sitkoh Bay.

Sitkoh Creek supports one of the best spring-run steelhead populations on Chichagof Island and receives moderate to heavy fishing pressure. Stream surveys together with a creel census program was carried out during the month of May 1976.

Sitkoh Creek for the first 0.8 km below Sitkoh Lake is slow moving with several deep pools and several areas of good spawning gravel (Figure 6). Spawning steelhead were observed in six locations in this section. Sitkoh Creek then enters a semi-canyon-like area with narrow streambed and rapid current. No steelhead were observed in this 0.4 km area.

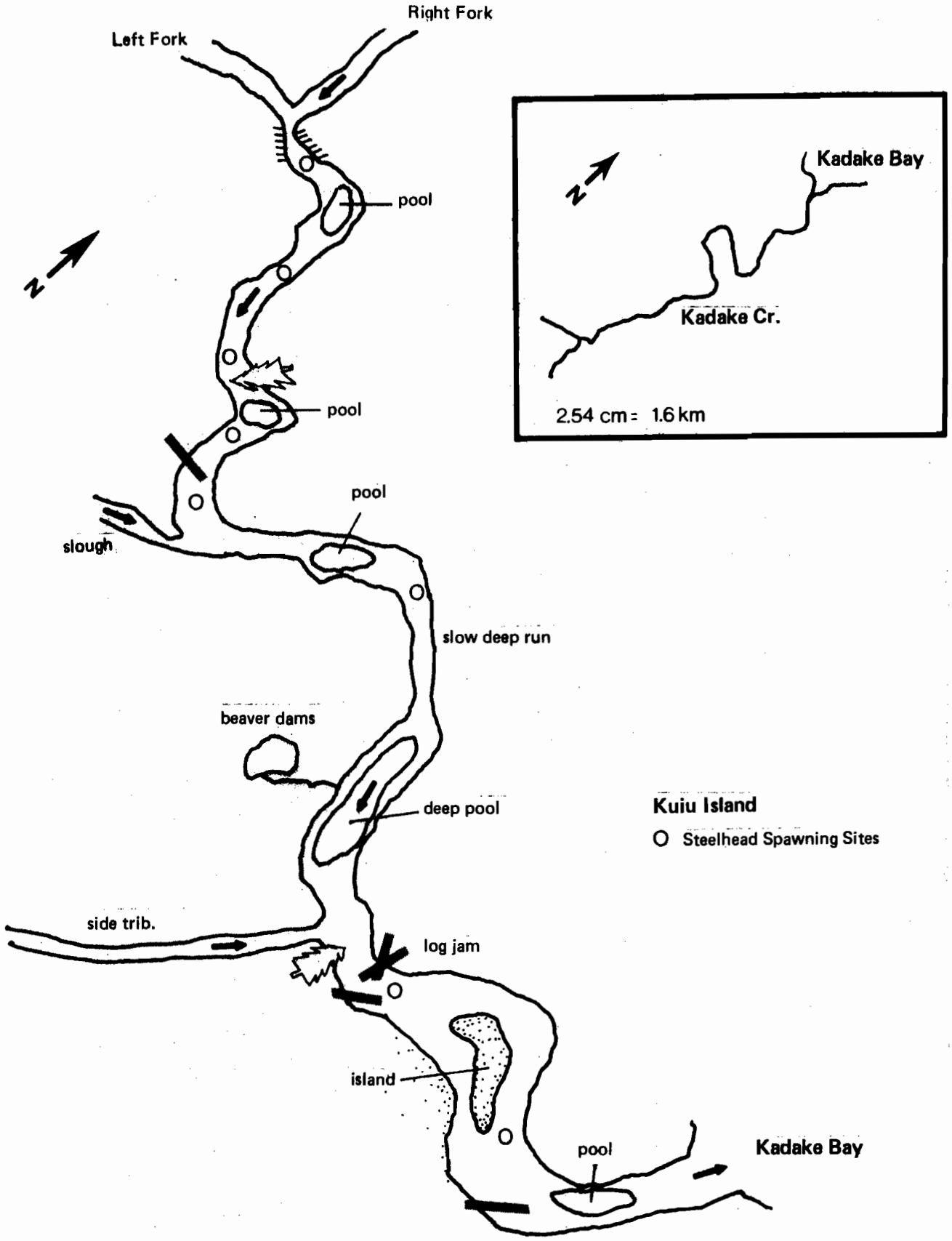



**Fig. 3** Main Stem Kadake Creek Steelhead Spawning Areas

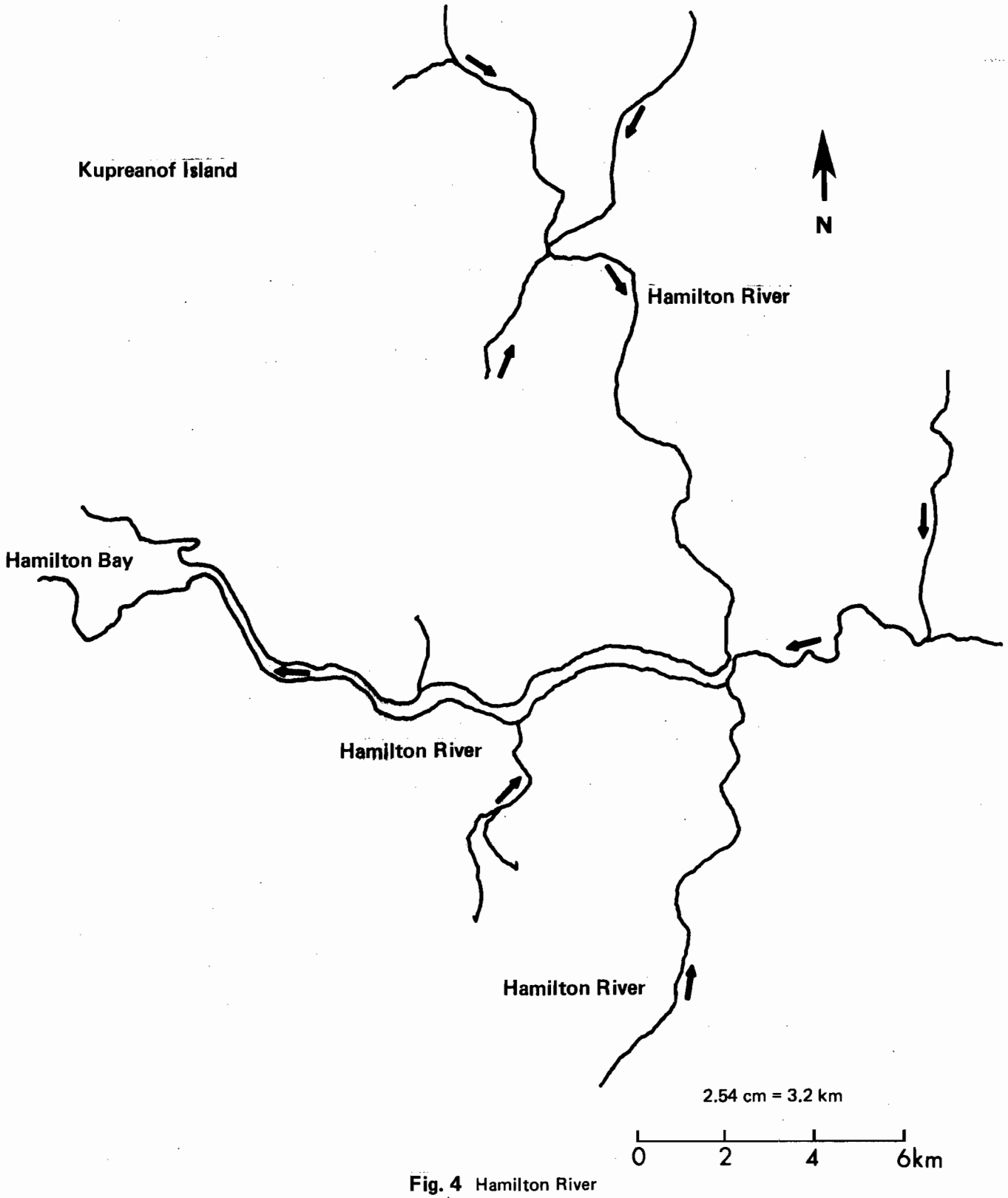



**Fig. 4** Hamilton River

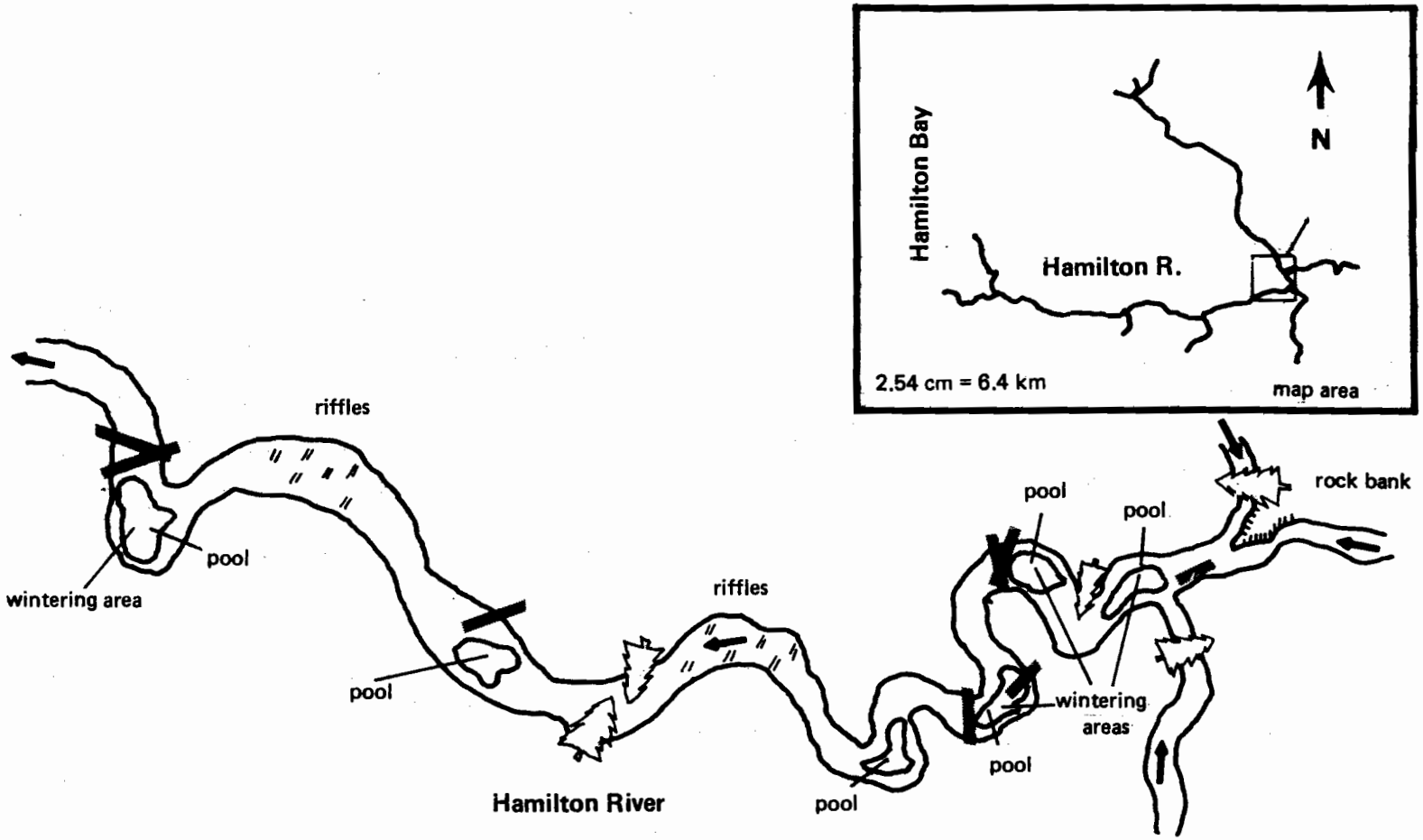



**Fig. 5** Hamilton River Survey, 1976

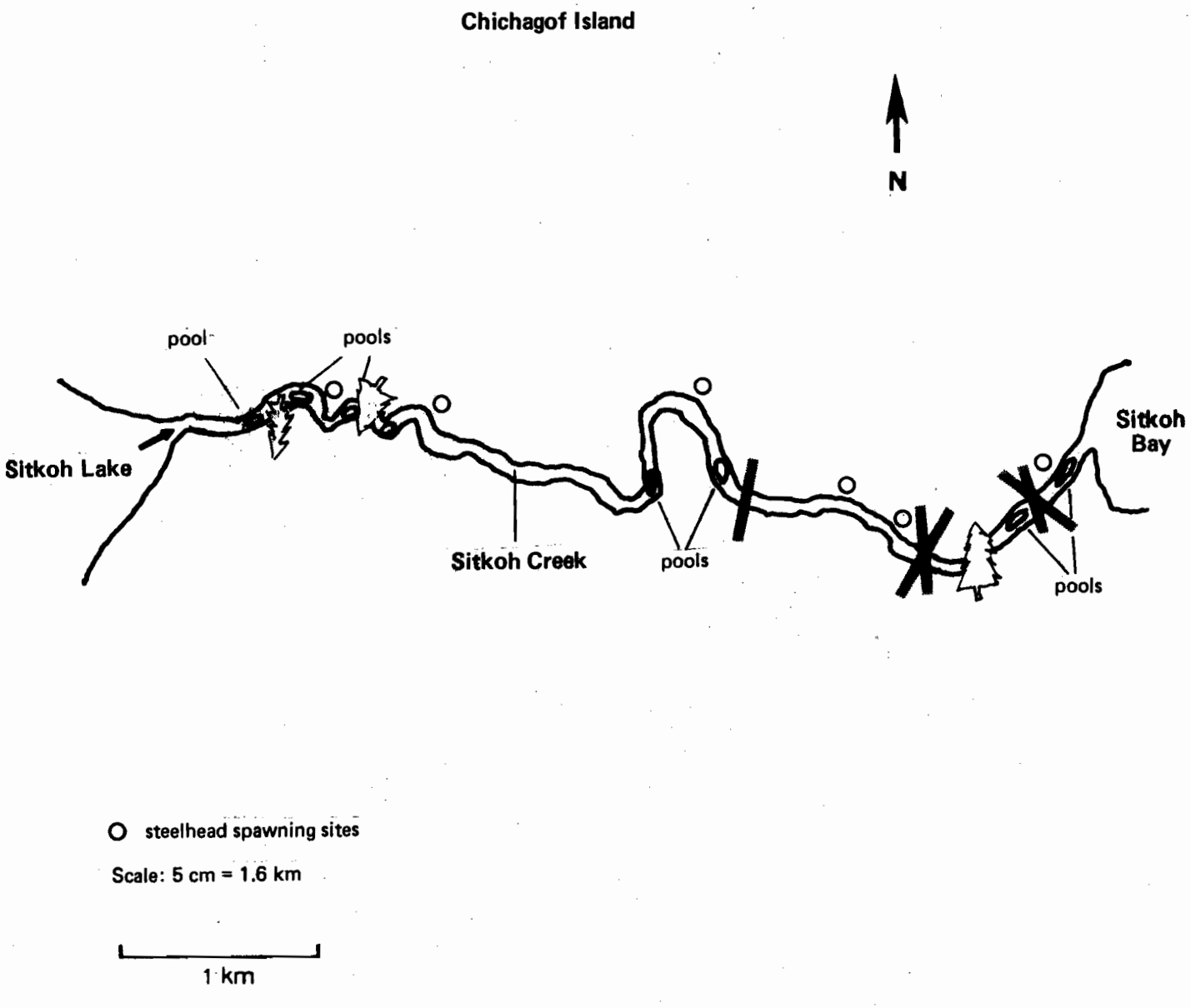



**Fig. 6** Sitkoh Creek Steelhead Spawning Areas

The midsection of Sitkoh Creek is a 2 km area that is fairly uniform in width and depth with a moderately fast current with many pools and riffle areas. This stretch contained 20 spawning steelhead even though much of the substrate was bedrock or basketball-size rocks. Very few windfalls were present in this area.

The lower 0.8 km of Sitkoh Creek is of a slower gradient with many windfalls and log jams. The pool-riffle ratio is nearly equal with sporadic steelhead spawning activity throughout.

The first steelhead normally enter Sitkoh Creek sometime in early April, and approximately 250 adults were enumerated during 1976. For the size of the stream, this can be considered an excellent run.

Adult Summer-Run Steelhead Survey

The Plotnikof Lake and River system, located at Port Banks on the west coast of Baranof Island, supports the only known run of summer steelhead in Southeast Alaska.

Physical surveys of the two inlets to Plotnikof Lake and Plotnikof River from the lake to Port Banks were conducted in July 1976. Impassable falls occur a short distance above Plotnikof Lake on both inlets. The inlets are of a fairly steep gradient with only limited pools and a few riffles that could be considered as good spawning areas.

Plotnikof River from Plotnikof Lake to Port Banks has one of the steepest gradients known to be passable to anadromous fish (Figure 7). The area below the lake is a series of low falls 1 to 2 m high connected by rough rapids. The middle section of Plotnikof River is a 2 km section of lower gradient with many deep pools and many excellent spawning riffles. The last 0.75 km of Plotnikof River again is comprised of several low falls and rapids and terminates in a 5 m falls at tidewater in Port Banks.

The numbers of summer-run steelhead entering the Plotnikof system each year is difficult to determine. The physical size of the stream with its many deep pools make visual observations difficult, and once the steelhead reach Plotnikof Lake they disappear into deep water. From observations of various biologists for the past several years, it appears that the summer-run steelhead population is not large and usually numbers less than 200 fish annually.

Rearing Steelhead Surveys

During the summer of 1976 surveys were undertaken on two systems in Southeast Alaska to confirm the suspected presence of steelhead in one system and to define the rearing areas of the steelhead in the other system.

The Sarkar Lake system, located on the west coast of Prince of Wales Island, is a complex of six lakes with interconnecting streams that flow into Sarkar Lake (Figure 8). Baited minnow traps were fished in the outlet streams of all lakes, and rearing steelhead were captured in

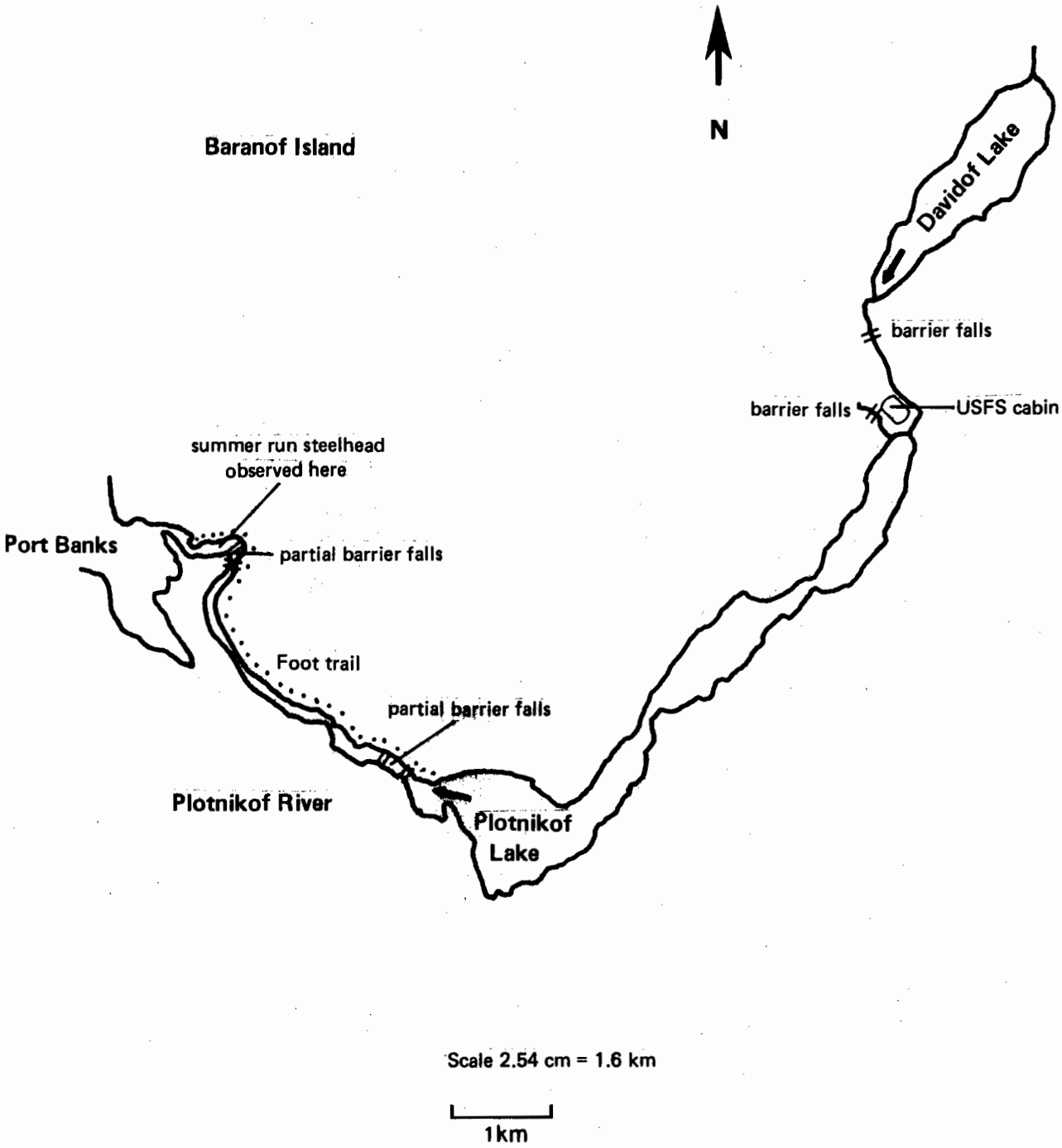



**Fig. 7** Plotnikof Lake & River

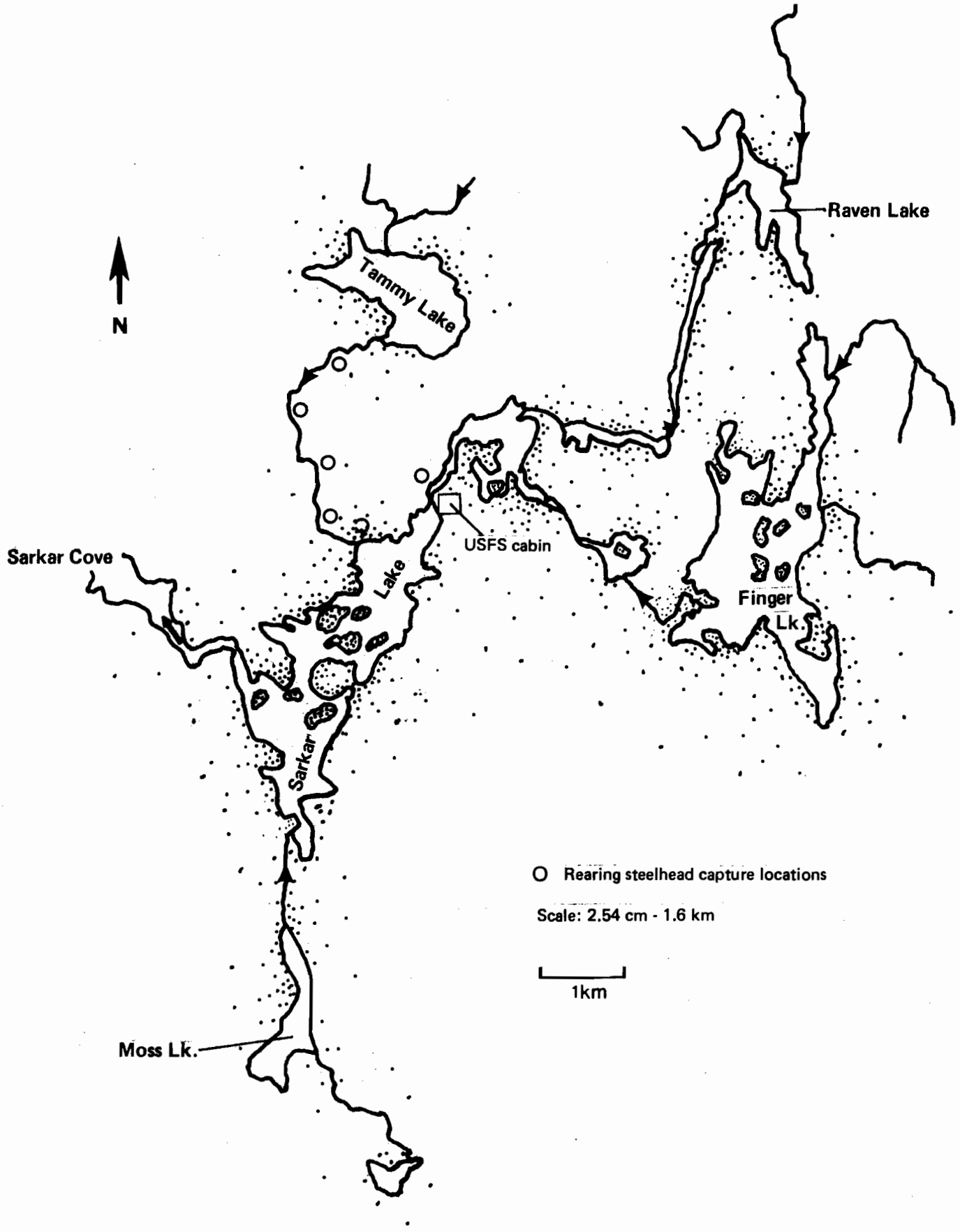



**Fig. 8** Sarkar Lake System

Tammy Lake outlet stream and below Finger Lake. Results of these surveys indicate that steelhead runs are present in the Sarkar complex. The timing of these runs is unknown and will await future investigations.

The distribution of rearing steelhead in the Plotnikof River system was conducted during July 1976. A physical description of the Plotnikof River system was presented in an earlier section.

Baited minnow traps were fished in the two main inlets to Plotnikof Lake, in Plotnikof Lake proper, and in Plotnikof River (Figure 7). No rearing steelhead were captured in either of the inlets or in upper Plotnikof Lake. Minnow traps set at the outlet of Plotnikof Lake and throughout Plotnikof River captured numerous rearing steelhead with the largest catches made in the midsection between the lake and the bay. Resident rainbow are also found throughout the Plotnikof system, and the rearing fish captured could not be identified as rearing steelhead or resident rainbow. The rearing fish captured in the midsection of Plotnikof River are most likely rearing steelhead, as there are several barriers impassable to rearing fish just below Plotnikof Lake. No large resident rainbow were observed in this area, which supports the theory that these rearing fish are steelhead rather than resident rainbow.

Steelhead Enhancement

The enhancement of spring-run steelhead with hatchery-produced smolts is in the early stages of development in Southeast Alaska. The Crystal Lake Hatchery, located at Petersburg, has the capability of producing smolt-size steelhead in a little less than 1 year. In an effort to utilize this production, investigations were carried out in 1975 and 1976 to determine what streams would be most suitable for these plants.

During 1975 and 1976 four stream systems were surveyed to determine suitability for plants of hatchery-reared steelhead smolts. Two streams were adjacent to the Juneau road system and two were close to Sitka. The two Juneau area streams, Cowee Creek and Montana Creek, were surveyed in 1975 and 1976 to assess their potential for plants of hatchery-reared steelhead. Fisherman accessibility, steelhead holding water, and rearing species were the primary criteria.

Cowee Creek:

Cowee Creek heads in a small glacier and flows about 13 km to the south end of Berners Bay (Figure 9). The area from approximately 1.5 km above to 3 km below the Glacier Highway was walked during the survey. This area is accessible from the road by a fairly good foot trail on the north side of the river. This trail starts at the junction of Davis Creek above the highway bridge and runs out on the tideflats below the highway. The section of Cowee Creek that was surveyed is used by anglers fishing for Dolly Varden and coho salmon. There are eight to ten good holding areas for steelhead in the area surveyed. Cowee Creek was fairly glacial in color during the survey. However, during steelhead time (April through June) this creek should show less glacial color, which would ease angling.

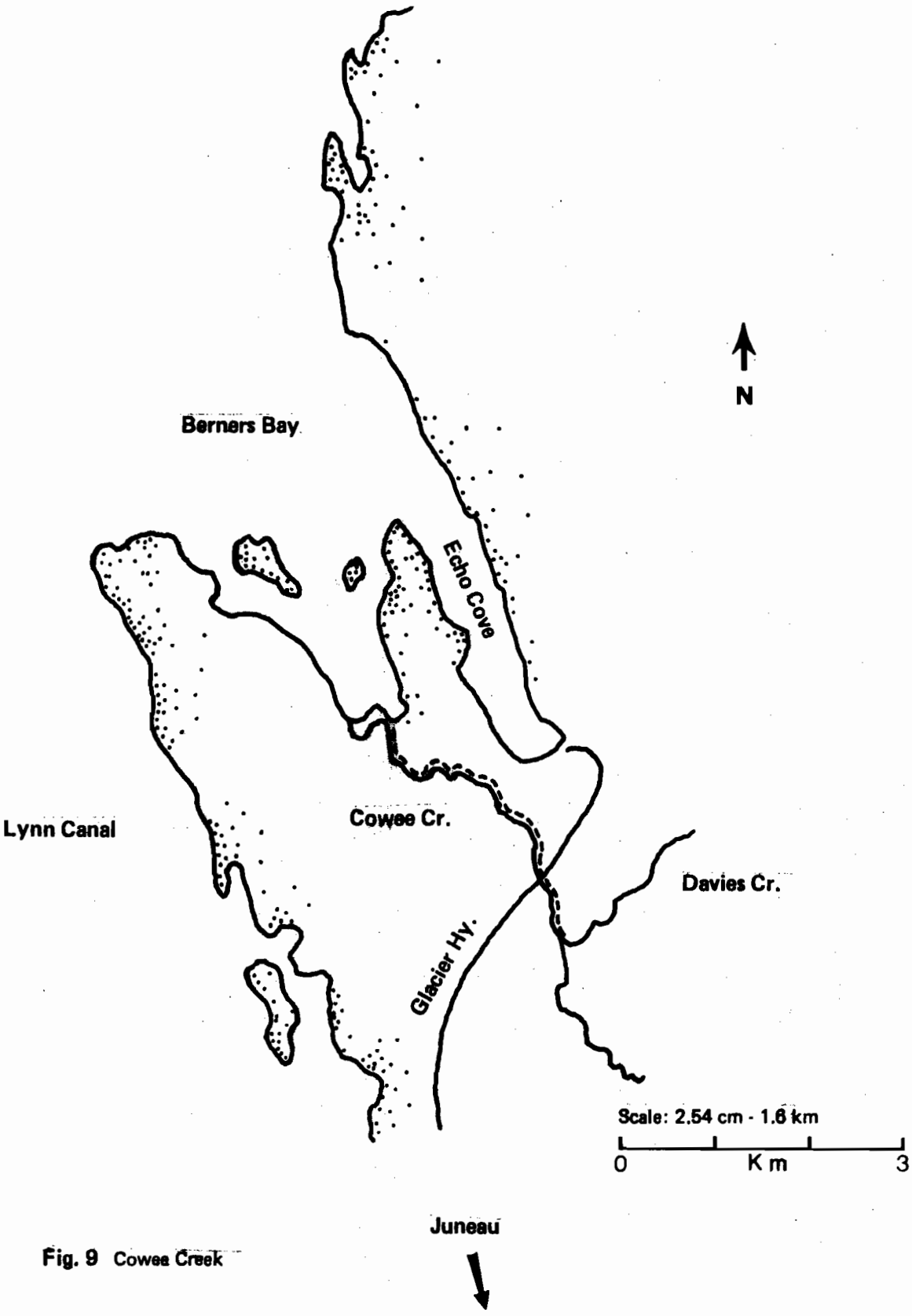



Fig. 9 Cowee Creek

Montana Creek:

Montana Creek heads in a high mountain valley and flows approximately 19 km to join the Mendenhall River. Montana Creek was foot surveyed in the area adjacent to Mendenhall Loop Road and the Montana Creek road (Figure 10). Montana Creek road parallels the stream for over 3 km and affords excellent fisherman access. The stream adjacent to the Montana Creek road is comprised of rapids and numerous deep holes. The upper area of Montana Creek appears to contain many excellent holding areas for steelhead. The section of Montana Creek near Mendenhall Loop Road is slow moving with overgrown banks and many deep areas. This portion appears to contain excellent steelhead holding water even though it may be difficult to fish due to the heavy streambank cover. Baited minnow traps fished throughout the area captured rearing coho salmon and Dolly Varden, with Dollies being more abundant. The mouth of Montana Creek is accessible via a foot trail running adjacent to the Mendenhall River with access at the Brotherhood Bridge. The mouth of Montana Creek is reputed to be an excellent fishing area and would be the first area in which migrating steelhead would rest.

Cowee Creek and Montana Creek both have potential as sites for hatchery-supported populations. Of the two, Montana Creek appears to be the best choice, as it has the best access, contains more holding water, and runs clear throughout the year.

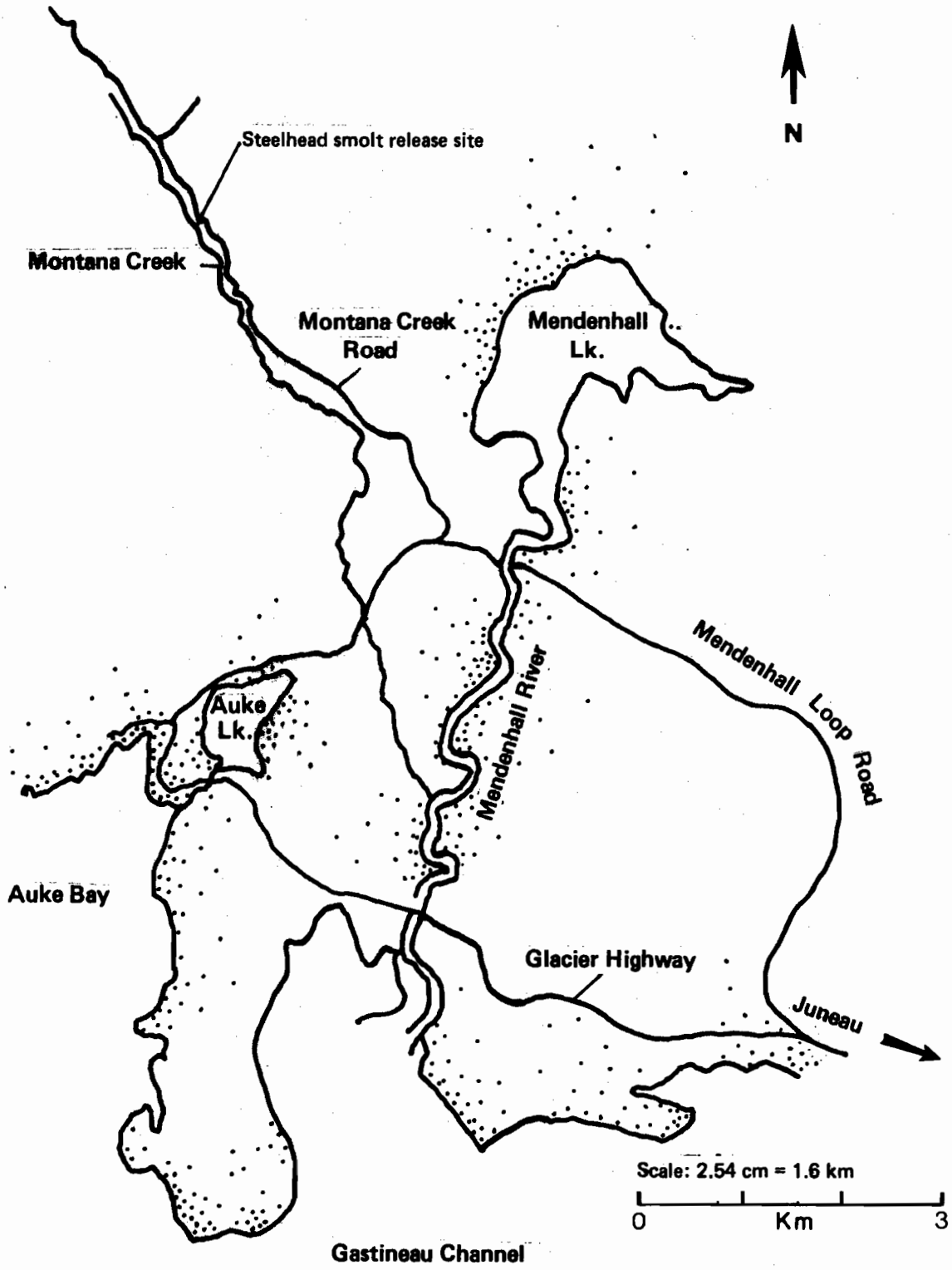
Based on the above findings, Montana Creek was selected as the first stream to receive hatchery steelhead as an experimental enhancement. No native steelhead are found in this system, and any adults produced would be the result of enhancement.

On July 6, 1976, a total of 6,500 steelhead smolts averaging 170 mm were released at a point 2 km above the upper bridge (Figure 10). Studies of hatchery steelhead smolt releases in Oregon (Buchanan, 1976), Washington (Royal, 1972), and Alaska (Jones, 1976) have shown that the highest returns of hatchery steelhead were achieved by releasing the smolts when they have reached an average of 175 mm. Smolts released at Montana Creek approached this average, and minnow trapping in late August 1976 captured only one residual steelhead.

Indian River:

The two Sitka area streams, Indian River and Salmon Creek, were foot surveyed in August 1975 and 1976 to determine their potential for introduction of hatchery-reared steelhead smolts. Indian River heads in an old glacial valley and flows approximately 16 km to Sitka Sound (Figure 11). Indian River is the source of Sitka's domestic water supply, and a diversion dam is located approximately 3 km above tidewater. This dam is not a total block to migrating fish on normal water levels because a side channel bypasses the dam structure. Fisherman access to Indian River is excellent; a road parallels the lower 2 km, and an excellent U.S. Forest Service maintained foot trail runs adjacent to the river above the water diversion dam. There are several excellent steelhead holding holes in the lower 2 km of Indian River with additional holding areas above the water diversion structure.

**Fig. 10** Montana Creek



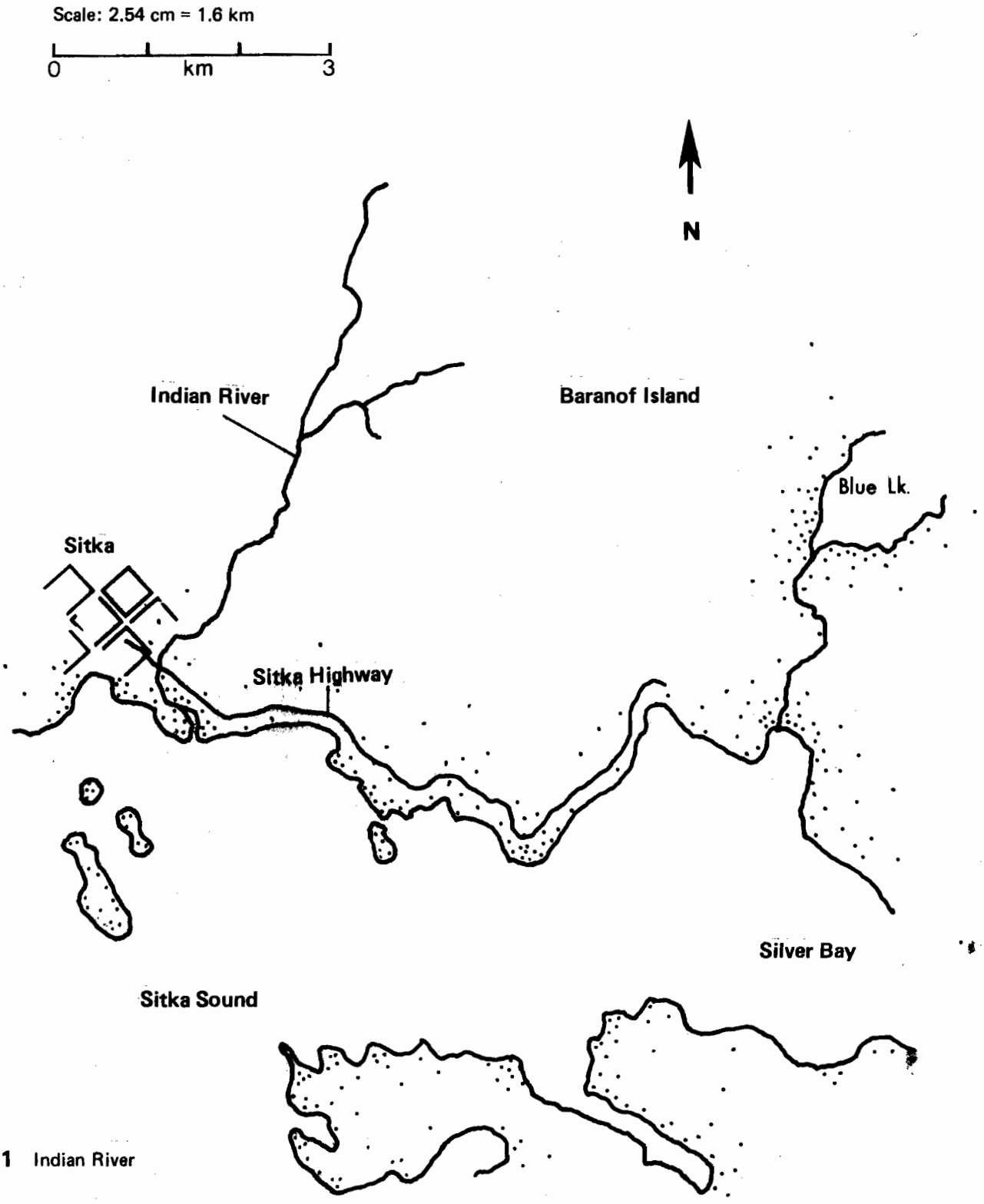



**Fig. 11** Indian River

Baited minnow traps fished throughout the lower area of Indian River captured rearing coho salmon and Dolly Varden. Trap catches in the area of the water diversion structures were predominantly Dolly Varden with as high as 75 Dollies per trap.

Salmon Creek:

Salmon Creek, located at the head of Silver Bay, is approximately 16 km southeast of Sitka. Salmon Creek heads in Salmon Lake and flows a little over 2 km to Silver Bay (Figure 12). Salmon Creek was surveyed from the outlet of Salmon Lake to tidewater in August 1975 and 1976. Salmon Creek was the smallest (4.5 to 6.0 m wide) of all streams surveyed and contained only three or four good holding areas for adult steelhead. Access to Salmon Creek is by boat to the head of Silver Bay or by float-plane to either Salmon Lake or Silver Bay. An excellent U.S. Forest Service foot trail parallels Salmon Creek from tidewater to Salmon Lake.

Indian River and Salmon Creek both have potential as future areas for hatchery-supported steelhead runs. Indian River appears to have the greatest potential from both the fisherman access and holding water standpoint. Salmon Creek has been reported to contain a small run of spring steelhead. Extensive minnow trapping in August of 1976 failed to capture any rearing steelhead in the area from the lake outlet to tide-water. The inlet to Salmon Lake was not surveyed, and it is possible that the wild steelhead may be rearing there.

Petersburg Creek:

In conjunction with ongoing life history studies of spring-run steelhead at Petersburg Creek, experimental enhancement studies were begun with the first plant of 8,000 hatchery-raised steelhead smolts in June of 1975. The smolts released in 1975 averaged only 142 mm in length, which resulted in a high residualism in Petersburg Creek. In early June of 1976 the second plant of 6,500 spring-run steelhead smolts were liberated in Petersburg Creek. These smolts averaged 170 mm, and very little residualism was noted. Evaluation of these enhancement efforts is planned for the spring of 1977 and will form the basis for expanded enhancement work throughout Southeast Alaska with spring-run steelhead.

Steelhead Brood Stock Development

The Department policy of not allowing the importation of trout or salmon eggs into the State of Alaska has made it necessary to develop brood stocks from native Alaskan steelhead.

Southeast Alaska is home to three distinct races of steelhead. Spring-run fish are the most abundant and widely distributed race occurring in Southeast. They arrive in fresh water in late March to early April and are gone by mid-June. Fall-run steelhead are second in abundance and are only found in systems that contain large deep pools or lakes in which to spend the winter. Fall-run steelhead normally begin to enter fresh water in September with a peak occurring in October and November. These steelhead overwinter and spawn together with spring-run fish in

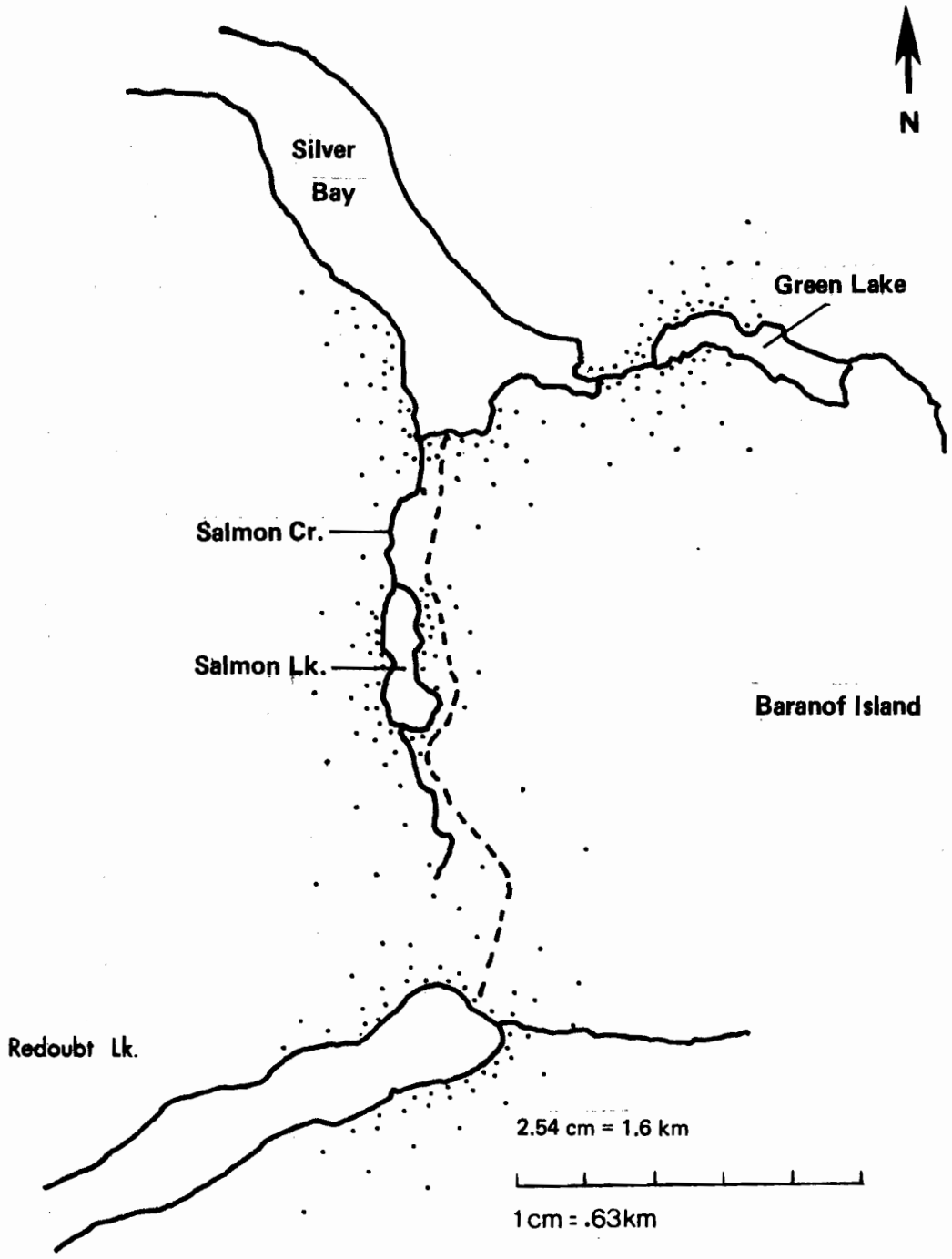



**Fig. 12** Salmon Creek

April and May. Summer-run steelhead occur only in one system on the islands and in the large mainland rivers that headwater in Canada. The island run enters fresh water in July and August and remains in fresh water until spawning is complete the following spring.

The first eggs for brood stock development were obtained from spring-run fish at Petersburg Creek in the spring of 1974. Subsequent eggs were obtained in 1975 and 1976 from Falls Creek, Petersburg Creek, and Crystal Creek. The development of a hatchery brood stock of spring-run steelhead started with the release of 9,500 smolts in Crystal Creek in 1975. To continue this program, a total of 1,500 smolts were released in June of 1976.

The first adult hatchery spring-run steelhead should return to Crystal Creek in the early spring of 1977, and the development of this brood stock should be assured.

Work was initiated in 1976 to determine the best available source of summer-run steelhead for brood stock development. Summer-run steelhead are a highly desirable sport species due to their run timing of July and the fact that they are available throughout the remainder of the fall and winter.

The only known population of summer-run steelhead in Southeast Alaska occurs at Plotnikof River (Figure 7). Surveys of this system in 1976 indicated that development of this run of fish for brood stock would be quite time and money consuming due to the size of Plotnikof River and its remote location. These factors determined that investigations should continue into a more easily accessible and less costly source of summer-run steelhead for egg takes and subsequent brood stock development.

Work was initiated in the fall of 1976 on the development of a brood stock of fall-run steelhead. Numerous lake-stream systems in southern Southeast Alaska and scattered systems in northern Southeast Alaska contain runs of fall steelhead. These fish enter the freshwater streams from August through December and provide excellent angling. The development of this race of steelhead for enhancement began with surveys of two lake-stream systems on the east side of Prince of Wales Island.

Eagle Creek and Salmon Bay Creek are both known to contain runs of fall steelhead. Sampling of Eagle Creek was begun in October, and Salmon Creek was surveyed in late October and early November. Extensive sampling of these two systems over a 6-week period did not produce significant numbers of fall-run steelhead. Operations were moved to the Naha system in early November (Figure 13).

Hook and line were used to capture adult steelhead in an area from just below Heckman Lake to just below Jordan Lake. Nylon web live cars were placed at three locations until transportation could be effected to Crystal Lake Hatchery. Only five adults, three females and two males, were successfully transported via helicopter to the hatchery in early December. Losses of adults to handling and vandalism were high, which

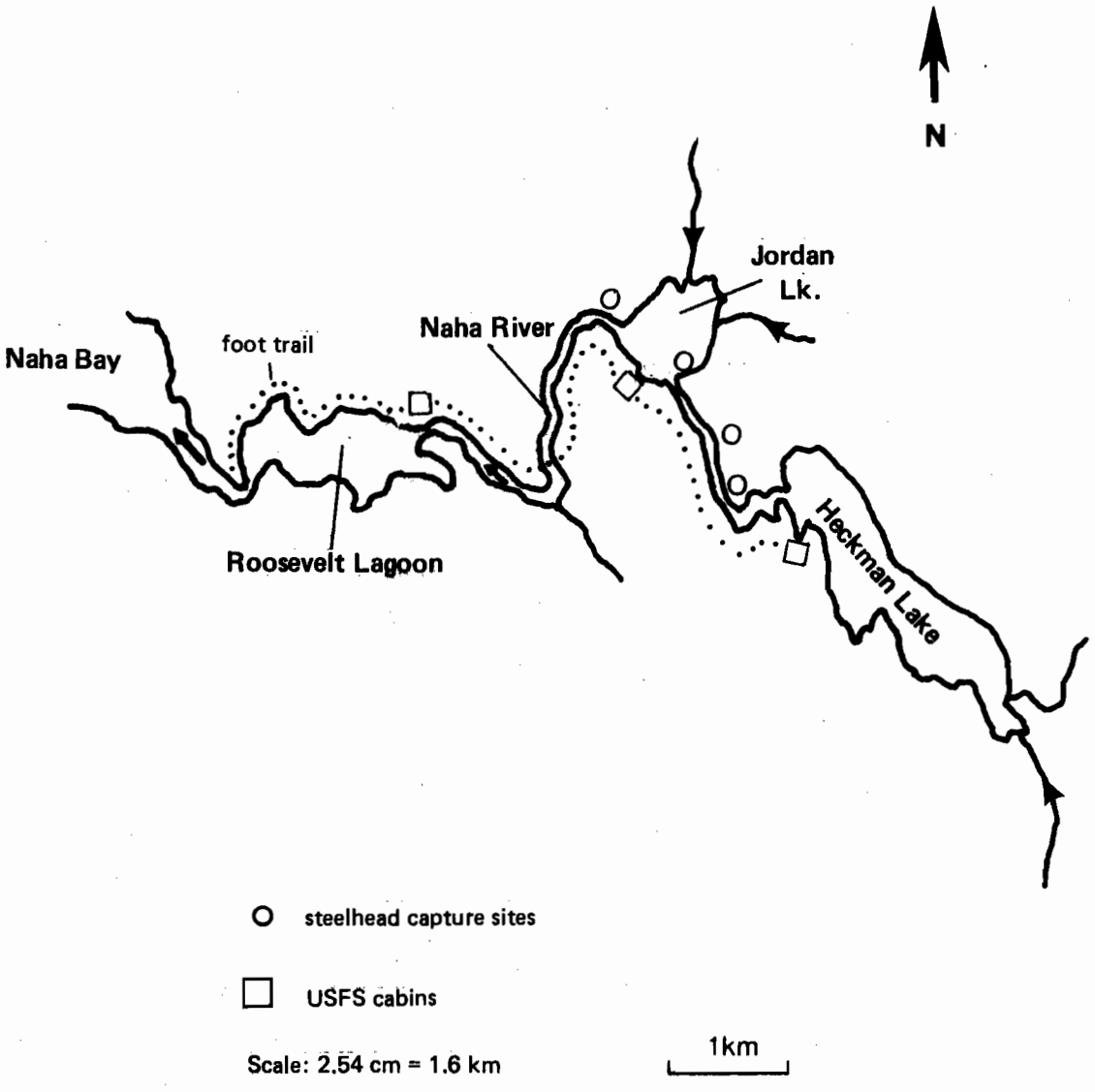



**Fig. 13** Naha River System

may render this type of capture for brood stock impractical, as eggs will be required for 3 years from wild stock before a run of brood fish is established at Crystal Lake.

## DISCUSSION

From background information gathered during the life history research on spring-run steelhead at Petersburg Creek it is apparent that there are several avenues open for the preservation of steelhead angling in Southeast Alaska. One method would be to restrict the angler harvest of wild steelhead. This reduction in harvest could be accomplished by reductions in bag limits, closures of sections of stream (spawning grounds), or by limiting ease of access. To preserve angling on some of the best systems, a concerted effort needs to be undertaken to place these watersheds in a land class that will give them the best protection from development. All too much of Southeast Alaska is slated for commercial timber harvest with attendant road construction.

Another method of preserving the steelhead fishery would be the creation of new fisheries and the careful enhancement of existing fisheries. The creation of new fisheries and enhancement of existing fisheries in close proximity to population centers will lessen the pressure on systems with only wild stock.

A brood stock of spring-run steelhead at the Crystal Lake Hatchery will become a reality in 1977 and 1978. With this brood stock the careful enhancement of spring-run steelhead near population centers will accelerate in the near future.

Brood stocks of fall- and summer-run steelhead will be developed as soon as acceptable donor stocks are located. Results of enhancement work with spring-run fish will aid in the enhancement work with fall- and summer-run steelhead.

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