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Section M

Job No. AFS 42-5-B
Development of Techniques for Enhancement of Anadromous Cutthroat Trout in Southeast Alaska

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RESEARCH PROJECT SEGMENT

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Project No.:	F-9-9		
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Job No.:	AFS-42-5-B	Job Title:	Development of Techniques for Enhancement of Anadromous Cutthroat Trout in Southeast Alaska

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ABSTRACT

This report covers the first year's study of the development of techniques for enhancement of anadromous cutthroat trout, Salmo clarki Richardson, in Southeast Alaska. During this first year, spawning areas of anadromous cutthroat were identified, techniques were developed for the capture of mature adult cutthroat, potential sources of cutthroat brood stocks were investigated, and cutthroat were tagged to determine intra- and interstream movements.

The identification of anadromous cutthroat spawning areas was made on three stream systems during 1976. Surveys of Petersburg Creek were conducted at night with "Coleman" lanterns. No cutthroat spawners were located in the areas where they were observed in 1975; however, spawners were observed in the West Fork of Petersburg Creek. Daylight surveys of Kadake Creek and Helm Creek did not turn up any actively spawning cutthroat. Surveys did locate active redds in habitat preferred by spawning cutthroat; and mature ripe cutthroat were captured by hook and line in the deep water areas, indicating that spawning most likely was occurring at night, as was noted at Petersburg Creek.

The development of capture techniques for adult anadromous cutthroat was tested in four stream systems during 1976. Hamilton River, Kadake Creek, and Castle River are all large nonlake systems that contain enough deep water areas to overwinter anadromous cutthroat. Helm Lake is a smaller lake system. Hamilton River and Kadake Creek do not contain good sites for a weir and are prone to high water, which would preclude a weir as a capture method. Castle River does contain a good weir site; however, the physical size of the stream would require an extensive outlay of money and manpower to construct a suitable weir.

The use of a beach seine as a capture method was investigated. Hamilton River contains many submerged logs and obstructions in the deep pools,

which would make seining difficult. Kadake Creek and Castle River contain pools with fewer underwater obstructions, and beach seining may be a practical capture method for these two streams.

Hook and line was tested in all three systems and was found to be quite effective as a capture method. Hook and line does have a few drawbacks in that some fish are lost due to handling, and the success of this technique varies according to changing weather and water conditions and the ability of the sampler. Hook and line does have the advantage of being highly mobile, which affords a wide coverage of the area. It is also relatively inexpensive.

Helm Creek was the fourth stream surveyed for the development of capture techniques. Helm Creek is a small lake-stream system with the cutthroat overwintering in Helm Lake and moving into Helm Creek to spawn. Helm Creek's small size makes it a good candidate for a weir to capture adult cutthroat. Helm Creek does not contain any large pools that would lend themselves to the use of a beach seine. Hook and line was again employed and found to be effective as a capture method.

Four stream systems were investigated as possible sources of brood stock of anadromous cutthroat. Hamilton River, Kadake Creek, Castle River, and Helm Creek were evaluated during 1976. All four streams were found to contain adequate numbers of adult cuttroat. Hamilton River and Kadake Creek cutthroat were of a larger size than those obtained in Castle River and Helm Creek. It was determined that two or more of these systems should be tapped to supply the 150 or so adult female cutthroat necessary to meet the brood stock needs. Removal of adults from more than one system will give a varied gene pool to the brood stock and will lessen the impact on the donor streams.

Intra- and interstream movement of cutthroat was studied in six nonlake streams during 1976. These tagging studies were aimed at determining the contribution on nonlake streams to the overwintering population of cutthroat in the Petersburg Creek system. Returns of tags to date do not indicate any movement of tagged cutthroat from one stream to another. However, only limited tagging has been done so far, and these findings may be premature.

BACKGROUND

A life history study on the sea-run cutthroat trout, Salmo clarki Richardson, in Southeast Alaska was conducted for a period of 5 years at Petersburg Creek. Results of this study have done much to help with the formation of sound management programs for sea-run cutthroat in Southeast Alaska (Jones, 1972, 1973, 1974, 1975).

Studies at Petersburg Creek and at Lake Eva (Armstrong, 1971) have shown that wild natural populations of sea-run cutthroat are not large for any given stream system. In addition it was determined that these cutthroat are mostly older fish in age classes four through six.

Studies at Petersburg Creek showed that the preferred rearing habitat for anadromous cutthroat is quite limited in any specific stream or tributary and may account in part for the low total population of cutthroat (Jones, 1973).

Angler harvest of sea-run cutthroat has shown a steady increase throughout Southeast Alaska. This harvest is concentrated around population centers and on the better known streams within easy access of these population centers.

With the low natural production of anadromous cutthroat a known fact, it becomes apparent that overharvest of these populations in the more popular fishing areas will soon be a reality. To prevent this from occurring, this study for the development of enhancement techniques was undertaken. The use of hatchery-produced anadromous cutthroat may be necessary to maintain natural runs or it may be used to create new fisheries.

RECOMMENDATIONS

Management

1. Provide for a reduction in the cutthroat bag limit to six fish daily with a possession limit of two daily bag limits.

Studies of sea-run cutthroat at Lake Eva, Petersburg Creek, and Helm Creek have shown that cuthroat populations are not large, usually numbering between 800 and 1,500 annually. The sport fishing mortalitiy of approximately 300 cutthroat annually at Petersburg Creek is considered to be excessive and responsible for the declining adult run size. The bag limit prior to 1974 was 15 fish daily with 30 fish in possession. The bag limit was reduced to ten daily and 20 in possession starting with the 1975 season. Creel census work at Petersburg Creek in 1975 found that the reduction to ten fish daily had virtually no influence on angling mortality, as 309 cutthroat were caught and retained during the census period. When the bag limit was 15 fish, very few anglers caught and retained 15 fish daily. Most anglers killed between five and six cutthroat and either quit taking fish or released any additional fish caught. Consequently, the reduction to ten fish daily did not influence the total harvest at Petersburg Creek in 1975. A bag reduction to six fish daily will not greatly affect angling patterns but will help maintain the existing sea-run cutthroat populations in Southeast Alaska.

2. Develop a comprehensive management and enhancement plan for cutthroat in Southeast Alaska.

To adequately manage and enhance cutthroat populations in Southeast Alaska, there must be a plan setting out goals and a time frame in which these goals are to be achieved. At present there is insufficient data on the many cutthroat systems in Southeast Alaska to adequately manage each for the highest return to the angler and yet maintain the integrity of the population. The development of a cutthroat management and

enhancement plan will bring together all the bits of known data on cutthroat in Southeast Alaska. Once this data is collected in a working manual, areas that require additional work will become evident.

3. Establish selected cutthroat systems in Southeast Alaska as roadless, dispersed recreation, or natural areas.

Research on cutthroat in Southeast Alaska has shown that cutthroat populations in any given stream system are not large and are easily harvested by sport anglers. Where easy access is afforded to cutthroat systems, numbers of cutthroat begin to decline. It is recommended that selected cutthroat systems be placed in a land classification that will limit the ease of access.

4. Develop and maintain a brood stock of sea-run cutthroat for enhancement work.

The use of hatchery-reared cutthroat to enhance or create new fisheries for sea-run cutthroat has occurred throughout Oregon and Washington. These programs have had varying degrees of success. Oregon has successfully augmented its wild cutthroat fishery by releasing hatchery-reared smolts. These releases have contributed to both the stream and estuary fisheries. Washington State programs have been successful in producing a spring stream fishery with hatchery-reared cutthroat but have not been too successful in producing a saltwater fishery. The Washington program relied on cutthroat brood stock that has been captive in fresh water for many generations. Offspring from these brood fish have apparently lost the ability to survive adequately in the marine environment. To correct this problem, Washington has embarked on the experimental culture of wild stocks in both freshwater hatcheries and saltwater rearing facilities. Results to date are favorable on augmenting the saltwater fishery. It is recommended that Alaska select and develop brood stocks of anadromous cutthroat to augment existing fisheries.

Research

1. Conduct research on the intra- and interstream movement of sea-run and/or resident cutthroat in Southeast Alaska.

Tagging studies conducted at Petersburg Creek from 1971 through 1975 as part of the life history study determined that sea-run cutthroat do not exhibit a strong homing pattern and are somewhat random in their selection of wintering areas.

Studies at Petersburg Creek also revealed that there were large numbers of cutthroat entering the system in the fall in-migration that did not originate at Petersburg Creek. Efforts to define the origins of these cutthroat have not been successful to date, and this aspect of sea-run cutthroat behavior needs further study. Results of this research will greatly aid the geographical management of sea-run cutthroat populations in Southeast Alaska.

2. Research of the ecological relationship between cutthroat; steelhead, Salmo gairdneri Richardson; Dolly Varden, Salvelinus malma (Walbaum); and coho salmon, Oncorhynchus kisutch (Walbaum), should be undertaken.

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 one species can begin. The enhancement of one or more species may have undesirable impacts on other species.

OBJECTIVES

1. Determine the spawning areas and requirements of anadromous cutthroat within selected stream systems.

2. Determine suitable capture methods for obtaining anadromous cutthroat trout for egg takes in selected stream systems.

3. Develop a brood stock of anadromous cutthroat.

4. Investigate selected stream systems to determine their contribution to the sport fishery.

TECHNIQUES USED

Background information from prior studies conducted by the Alaska Department of Fish and Game and other agencies was reviewed.

The distribution, spawning areas, and spawning requirements were determined by daylight foot surveys of Kadake Creek, Helm Creek, and Hamilton River. Surveys of Petersburg Creek were made at night using "Coleman" lanterns for illumination.

The most suitable method of capturing anadromous cutthroat was determined from surveys made on four known cutthroat spawning streams. During each stream survey, maps were made noting potential weir sites, beach seining areas, and holding areas. Each stream was sampled by hook and line, and the size of the cutthroat was noted.

To determine possible locations for obtaining a source of anadromous cutthroat brood stock, samples were obtained from four selected streams by hook and line and gill net. Cutthroat obtained by various sampling gear were anesthetized with Tricaine Methanesulfonate (MS-222), measured, and tested for ripeness. A random sample of these fish was killed, and various biological data were collected including sex, maturity, and otoliths for age determinations. All cutthroat not sampled were allowed to recover before release at the point of capture.

To determine the contribution of various area streams to the cutthroat sport fishery, anadromous cutthroat were captured using hook and line, baited minnow traps, and backpack electro shocker. These cutthroat were anesthetized with MS-222, measured, and tagged with color-coded, numbered

"Floy" internal anchor tags. These cutthroat were placed in a quiet water area of the stream to recover before release at the point of capture. Return of tags by area anglers was recorded by location of capture and other biological data were noted.

FINDINGS

Cutthroat Spawning Areas and Requirements

Two lake-stream systems (Petersburg Creek and Helm Creek) and one non-lake system (Kadake Creek) were investigated during May 1976 for spawning grounds and spawning requirements of anadromous cutthroat.

Petersburg Creek

Petersburg Creek has been surveyed on an annual basis since 1972; however, it wasn't until 1975 that the first actual spawning activity was observed (Jones, 1976). Cutthroat were observed spawning during the hours of darkness in two small inlets to Petersburg Lake in late May 1975. No cutthroat were observed actively spawning in these areas during daylight hours.

Between May 24 and 26, 1976, attempts were made to confirm the 1975 observations of spawning cutthroat and to further define and map the areas used (Figure 1). Surveys of the two inlets to Petersburg Lake were not rewarded with observations of adult spawners even though adults were observed spawning in one tributary in 1975. The only cutthroat observed were immature fish moving up each night to feed.

Two nights were spent surveying the West Fork of Petersburg Creek for a distance of 1.5 km above its confluence with Petersburg Creek. This section of the West Fork is comprised of several large, deep pools with connecting riffle areas. Excellent spawning areas, as described by Jones, 1976, exist in this stream section; and newly constructed redds were noted throughout the riffle areas. Adult steelhead also spawn in this area; however, their redds could be distinguished from cutthroat redds in that the former were of a larger size and tended to be in deeper water in the middle of the stream. Cutthroat redds were usually in water less than 10 cm deep and were located near overhanging cover or other escape cover.

During the two nights of observation a total of four pairs of spawning cutthroat were observed for varying periods of time. As was noted in 1975, the artificial light caused the cutthroat to stop spawning activity and to seek cover. Two pairs of cutthroat became used to the light on the second night of observation and resumed spawning activity. The males from both pairs were kept busy running off immature cutthroat that were attracted by the spawning activity and the artificial light. As noted previously, the light seemed to attract immature cutthroat that were actively feeding on salmon fry and other drifting organisms.

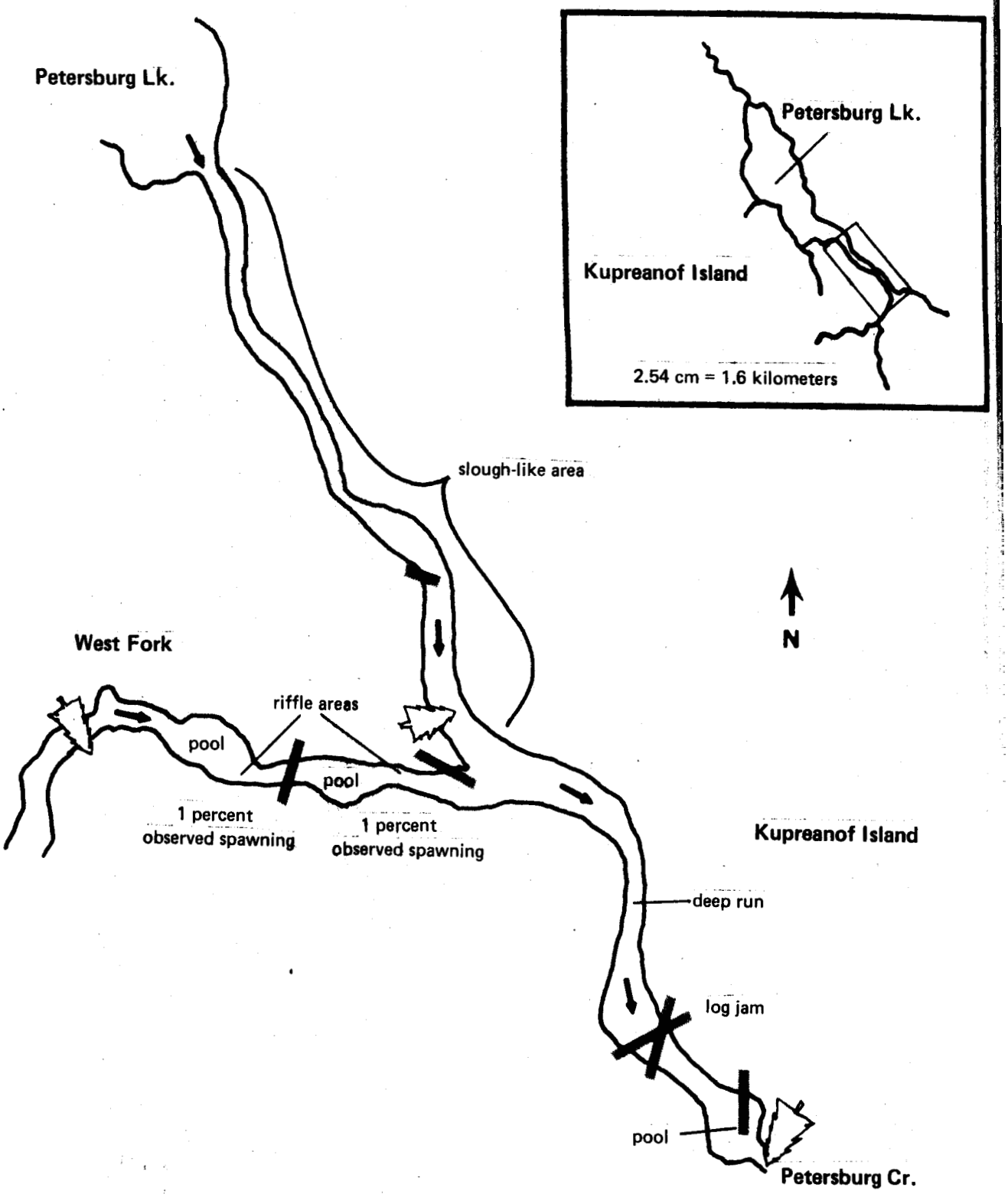

Fig. 1 Cutthroat Spawning Areas, Petersburg Creek

Daytime surveys for cutthroat redds revealed the largest number were within the first 2 km of the West Fork and the first kilometer of Petersburg Creek below the confluence of the West Fork. Cutthroat redds were found to be within the first 200 m of the two tributaries to Petersburg Lake.

Kadake Creek

Kadake Creek, located on northeast Kuiu Island, was given an intensive survey in the spring of 1975 and again in 1976. Kadake Creek is a large nonlake stream system with two large tributaries and many lesser ones (Figure 2). The assessments of the spawning grounds in Kadake Creek were conducted during daylight hours with the aid of a helicopter for transportation from site to site.

Surveys of the right fork of Kadake Creek from an area 4 km above the confluence downstream to the main stem were made in May 1976. This stream section is composed of bedrock rapids with very few pools and only limited spawning areas that could be classified as good cutthroat spawning. The only fish species noted in this stream section were rearing Dolly Varden, coho, and adult steelhead. From these findings it was assumed that the right fork of Kadake Creek was not a major spawning area for cutthroat.

Surveys of the first 4.5 km of the left fork of Kadake Creek were carried out on the same date as were the surveys of the right fork. The left fork of Kadake Creek was of a lower gradient than that found in the right fork with many large pools interconnected by excellent spawning riffles. Mature cutthroat were located in several of the large holes throughout the area surveyed (Figure 3). These fish ranged from ripe to nearly spent, which indicated that spawning was taking place in the area. No cutthroat were observed spawning in the section surveyed. Newly constructed redds were noted throughout the area, and most were presumed to be cutthroat redds.

The main stem of Kadake Creek from the confluence of the forks to tidewater, a distance of 8 km, was foot surveyed in both 1975 and 1976. This stream section is comprised of large, deep pools and extensive shallow riffle areas (Figure 4).

Mature cutthroat were most abundant in the large pools within the first kilometer below the confluence of the left fork. These cutthroat were less ripe than those found in the left fork and appeared to be holding prior to moving upstream to spawn.

Cutthroat captured in the middle section and near tidewater were either green adults, immatures, or spawned-out adults. Active spawning redds were noted throughout the main stem of Kadake Creek; however, they appeared to be steelhead redds due to their location and general size. Some cutthroat spawning probably occurs in this stream section but on a limited basis.

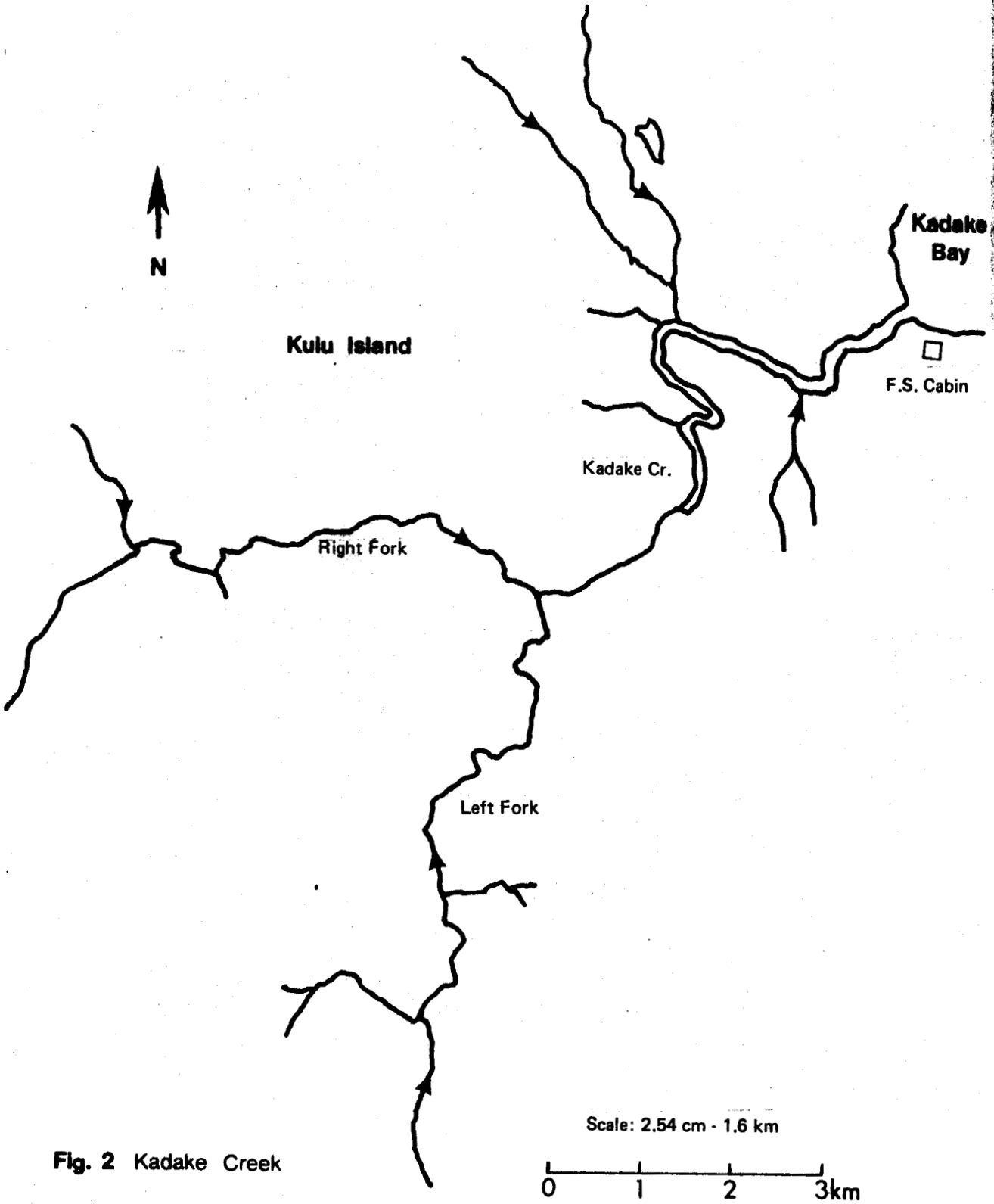

Fig. 2 Kadake Creek

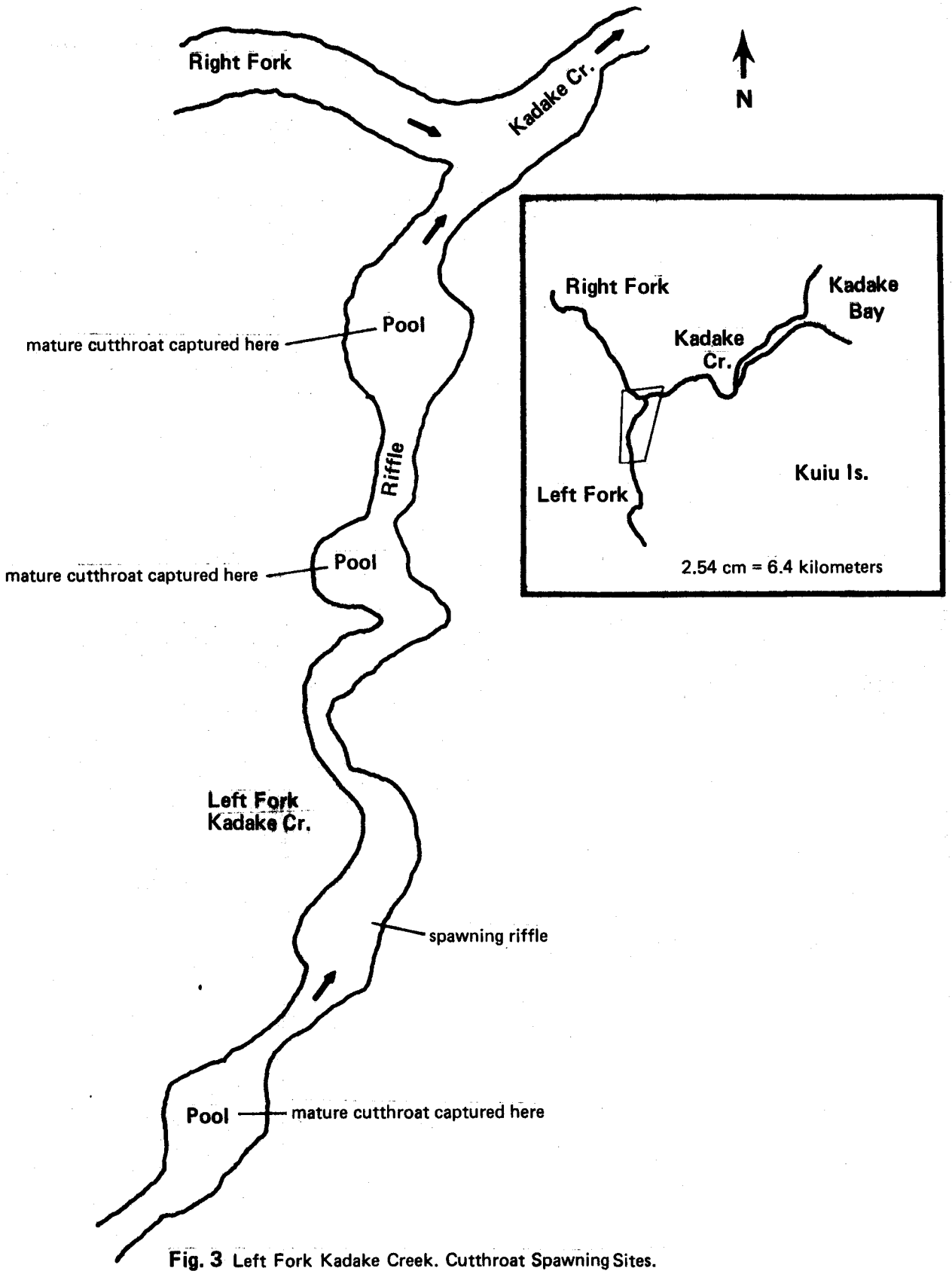

Fig. 3 Left Fork Kadake Creek. Cutthroat Spawning Sites.

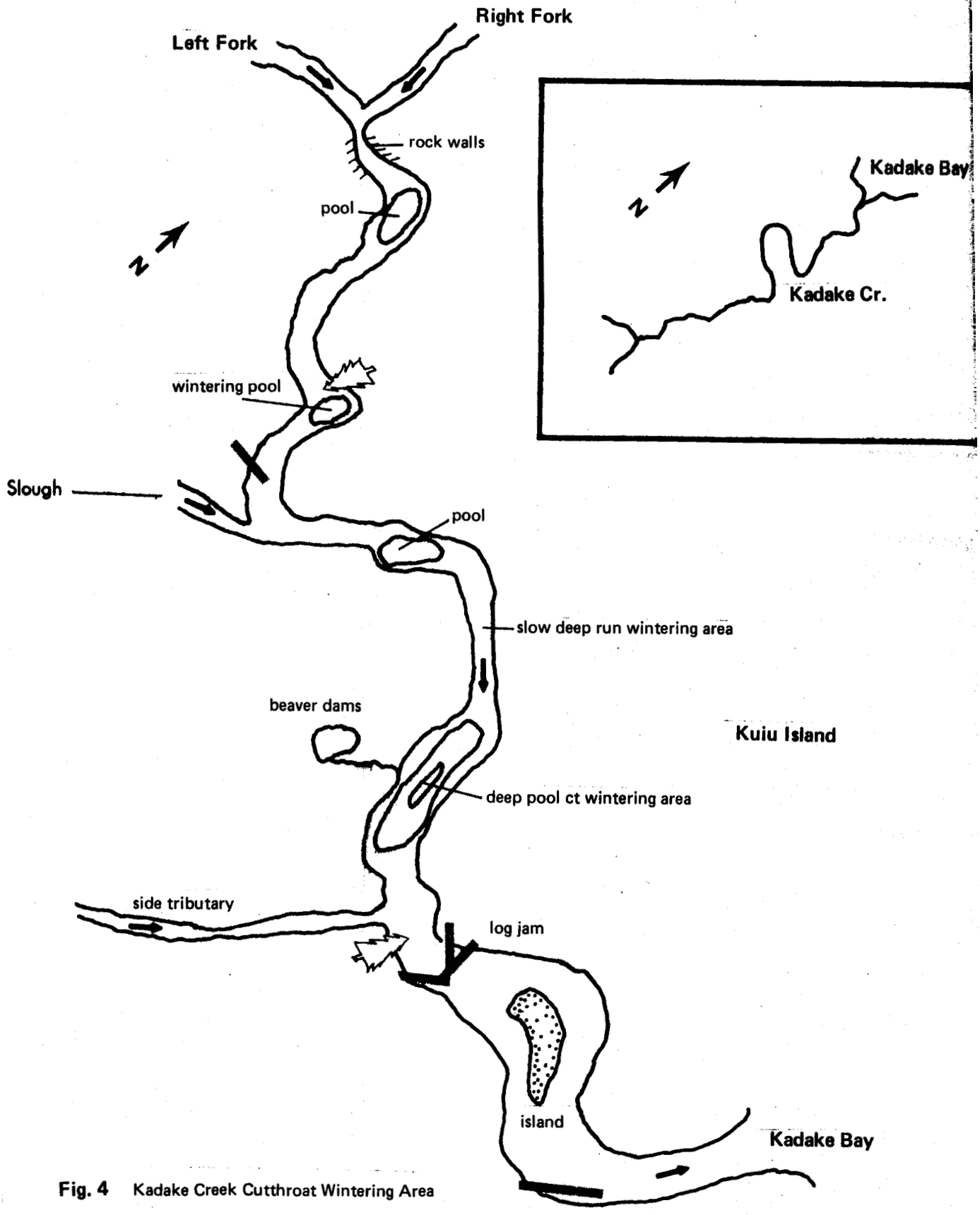

Fig. 4 Kadake Creek Cutthroat Wintering Area

Helm Creek

Helm Creek, located in Helm Bay, Cleveland Peninsula, was foot surveyed for its entire length in early May 1976. Helm Creek is small, originates in Helm Lake, and flows 4.5 km to Helm Bay (Figure 5). The section of the creek for the first kilometer below Helm Lake is comprised of slow moving current with many undercut banks, overhanging vegetation, and down timber. Only a limited amount of spawning gravel was available in this section; however, it showed evidence of recent spawning activity. Ripe adult cutthroat were captured in almost every section of holding water. The large numbers of cutthroat present in this stream section would indicate that this area was the preferred spawning grounds in Helm Creek. Helm Creek does not contain a large run of steelhead; therefore, the spawning activity noted was most likely that of cutthroat.

For the remaining 3.5 km of stream the numbers of cutthroat captured became less, and they were mostly immature fish or spawned-out adults. This section of stream contained a higher gradient with a substrate of bedrock and large boulders interconnected with some spawning riffles. The large pools contained cutthroat, but most were immature or spent. No recent spawning redds were noted in the lower middle and lower sections of Helm Creek.

Adult Cutthroat Capture Techniques

Surveys of Hamilton River, Kadake Creek, Castle River, and Helm Creek were conducted during the spring of 1976 to determine the best capture methods and areas for securing a source of sea-run cutthroat eggs for brood stock.

Hamilton River

Hamilton River, located on northwest Kupreanof Island, is one of the largest river systems in Southeast Alaska with respect to number of river kilometers open to anadromous fish (Figure 6). Hamilton River drains a vast area comprised mostly of muskeg, which stains its waters a dark brown. This stain makes for difficult observations in any area exceeding 1 m in depth.

Hamilton River does not contain any sizable lakes in its drainage. Fish utilize the larger pools of the main river as wintering areas. These pools are located just below the confluence of the three main river forks and are approximately 19 km above tidewater. Information supplied by local anglers indicated that these large pools on Hamilton River contained large numbers of cutthroat throughout the winter.

A helicopter survey of the area in May 1976 was conducted to determine the most suitable capture method for obtaining mature cutthroat. Hamilton River, in the area surveyed, averages 70 m in width with an average depth of 0.5 m. High water marks indicate that this system is prone to extreme high water flows, which would make weiring this system impractical. The presence of sunken logs, branches, and large rocks in the large pools would rule out the use of a seine as a suitable method for capturing any number of adult cutthroat.

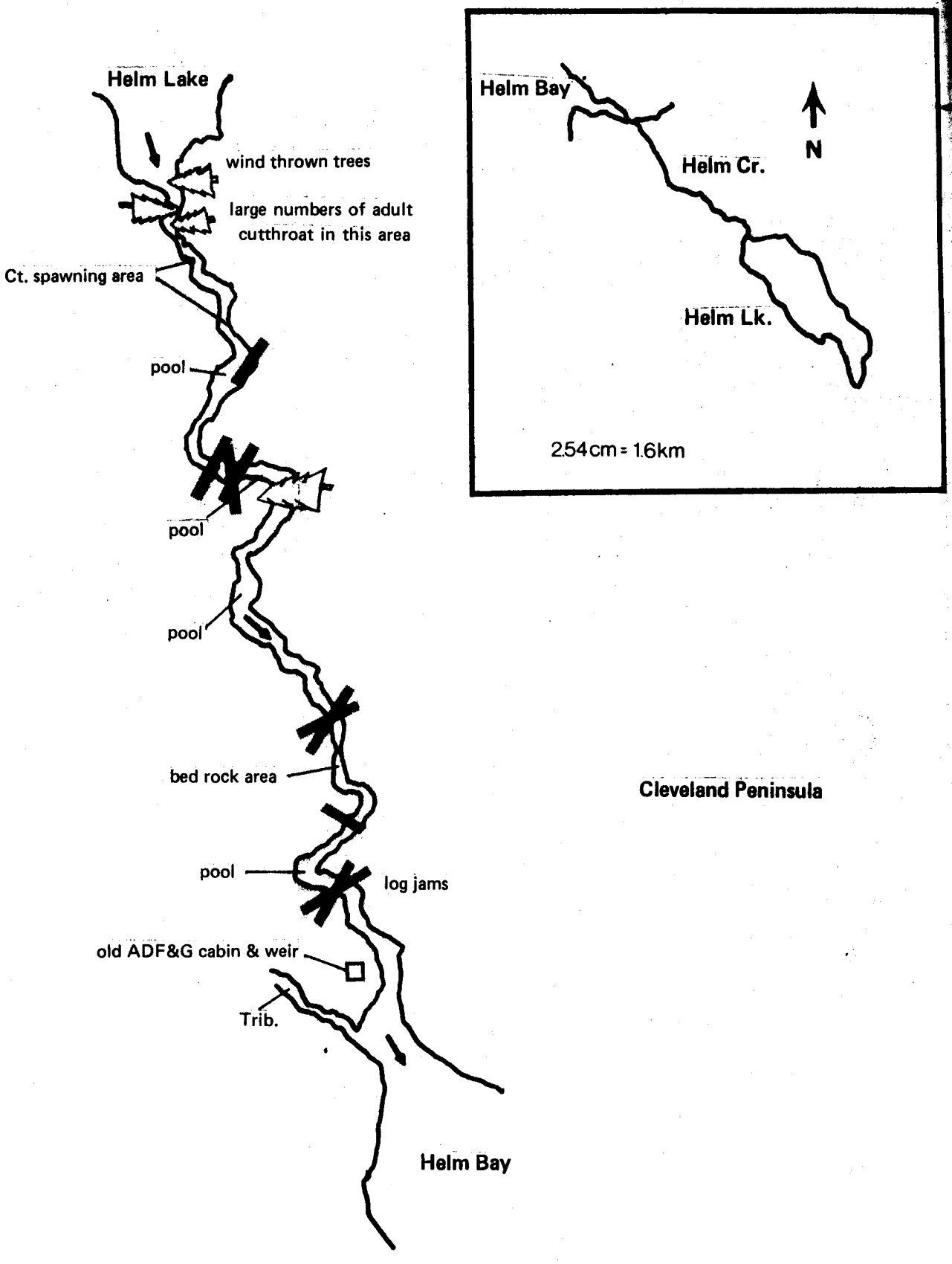

Fig. 5 Helm Creek Cutthroat Spawning Areas

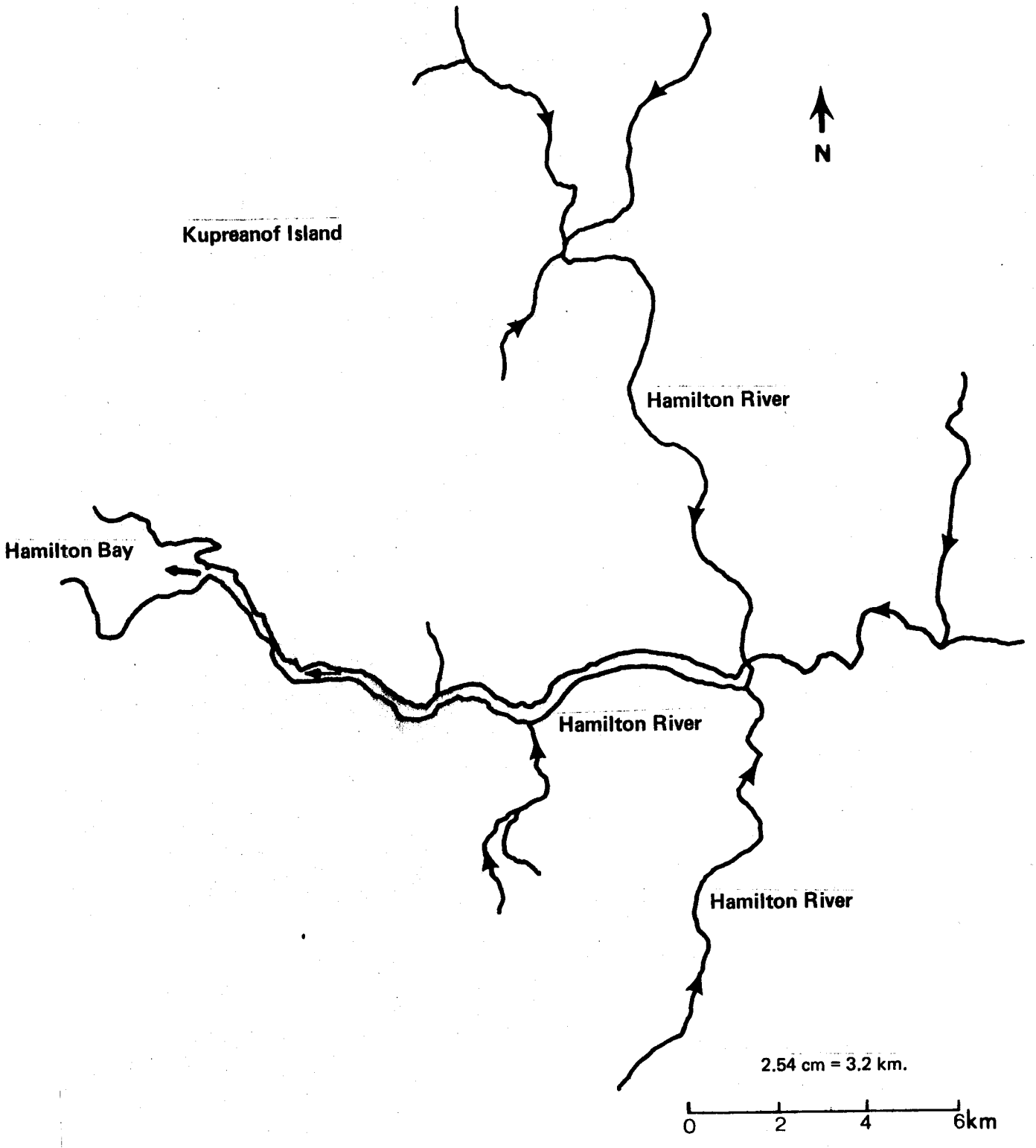

Fig. 6. Hamilton River

Hook and line was found to be the most effective capture method employed at Hamilton River. This type of capture method does have its drawbacks, as there is no selection in the fish captured and some fish will be lost to handling. This capture method does have the advantage of being highly mobile, inexpensive, and adaptable to changing river conditions.

Kadake Creek

Kadake Creek, located on northeast Kuiu Island (see Figure 2), was surveyed to determine its potential as a source for cutthroat brood stock. Kadake Creek is another nonlake system large enough to overwinter cutthroat in large pools in the main creek. Kadake Creek was surveyed in 1970 (Jones, 1971) as a study stream but was found unsuitable due to its large size, which would make a weir hard to hold in high water periods. Surveys in 1975 and 1976 reaffirmed this finding that a weir to capture cutthroat would prove impractical.

The areas in Kadake Creek that overwinter sea-run cutthroat do offer some potential for beach seining. Underwater obstructions do not appear to be as numerous as in Hamilton River, and this capture method may prove useful.

Hook and line capture of adult cutthroat was tested in Kadake Creek and found to be quite effective with the same advantages and disadvantages described for Hamilton River.

Castle River

Castle River, located on southcentral Kupreanof Island, drains a large section of mid-Kupreanof Island before emptying into Duncan Canal. Castle River is second only to Hamilton River in number of kilometers open to anadromous fish in central Southeast Alaska (Figure 7). It is also a large nonlake system capable of overwintering cutthroat in its lower deep water areas.

Castle River was surveyed in the spring of 1976 to determine what capture method would be best to use to capture adult anadromous cutthroat. The area found to contain the large schools of cutthroat is comprised of several deep pools 1 to 3 m in depth with relatively clean substrate. These pools ranged in length from 30 to 75 m with cutthroat scattered throughout.

A site suitable for a weir is located 1 km above tidewater. This site is approximately 70 m wide with an average depth of less than 1 m. The construction of a weir capable of withstanding peak flows in Castle River would be a major undertaking and would be quite expensive; however, it appears to be more practical than construction of weirs on Hamilton River or Kadake Creek.

Beach seining may be practical as a capture method in certain areas of Castle River. The pools are large and are mostly free of submerged obstructions. However, before seining it would be wise to check out the area with scuba gear, as the water in Castle River is very dark due to muskeg stain.

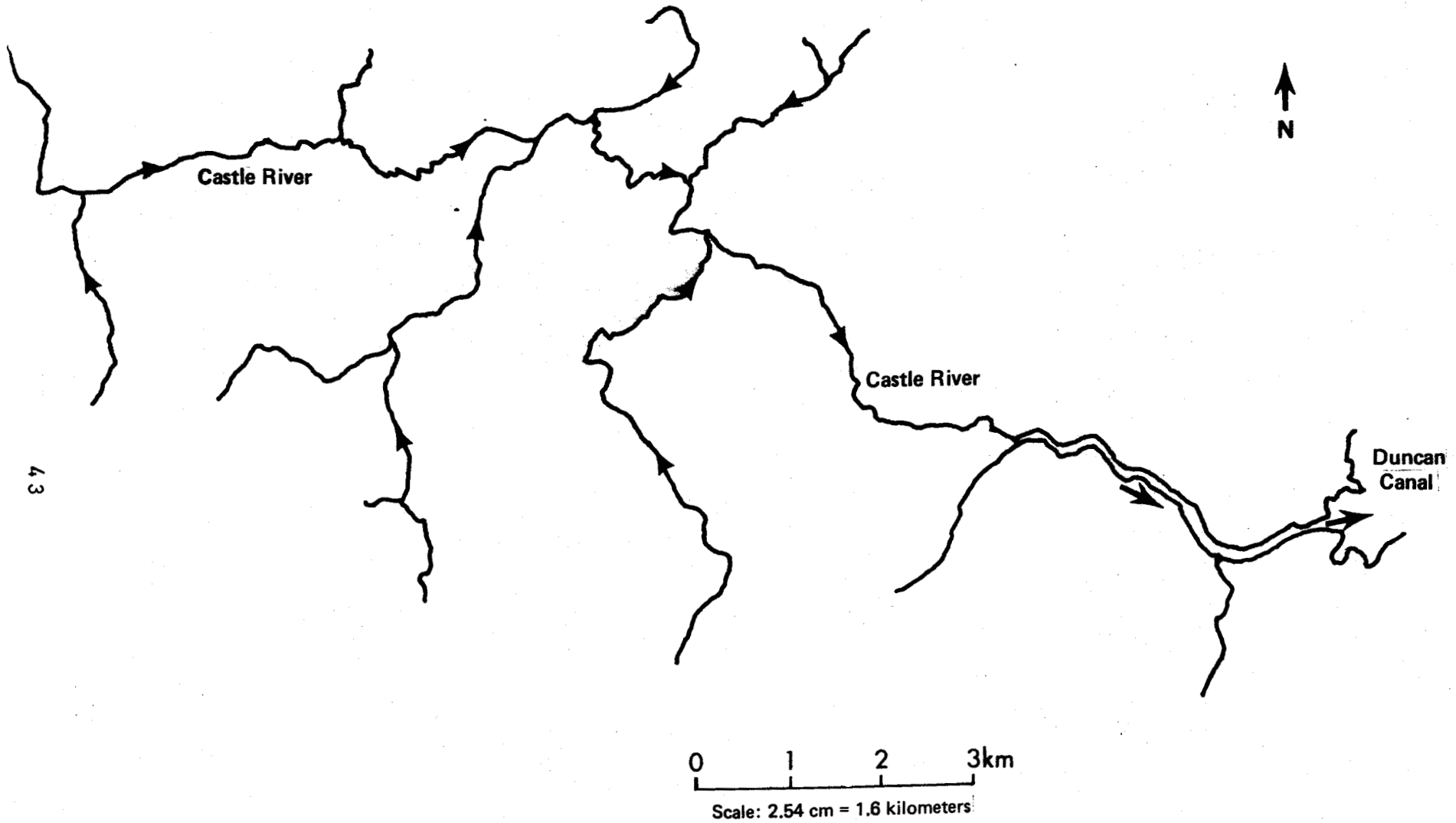

Fig. 7 Castle River

Hook and line capture of adult cutthroat again seems to hold the most promise as a capture method for Castle River. Past experience has shown this method to be highly effective when a large school of cutthroat is located.

Helm Creek

Helm Creek, located on the Cleveland Peninsula (see Figure 5), was the only stream outside the Petersburg area surveyed for brood stock potential. Past work conducted on this system by Baade (1957) showed that it contained a good population of anadromous cutthroat.

Helm Creek is a lake-stream system with the cutthroat overwintering in Helm Lake and moving into Helm Creek to spawn. Helm Creek is quite small and contains many sites suitable for a weir. Of the four systems surveyed, Helm Creek would be most suitable for this type of capture method.

Helm Creek does not contain many large pools in the area where cutthroat were most abundant, which precludes the use of a seine as a capture method.

Hook and line was tested in the spring of 1976 and was found to be quite effective in the capture of adult cutthroat. Helm Creek's small size pools did not contain many cutthroat per pool; however, some cutthroat were found in almost every area with sufficient depth and cover.

Sea-Run Cutthroat Brood Stock Development

In order to enhance anadromous cutthroat in Southeast Alaska, it will be necessary to develop a brood stock of sea-run cutthroat at the Crystal Lake Hatchery.

The Crystal Lake Hatchery would be utilized to rear sea-run cutthroat to smolt size before releasing them to grow to maturity in the natural environment. These cutthroat would then be trapped in Crystal Lake on their spawning migration as a source of eggs.

In Oregon (Gigor, 1972) sea-run cutthroat brood stock are not allowed to go to sea but are kept captive at the Alsea and other hatcheries. Washington State (Johnston, and Mercer, 1976) uses both conventional hatcheries and saltwater pens to hold cutthroat for brood stock. At this time it doesn't appear practical to hold cutthroat to maturity at the Crystal Lake Hatchery, and therefore brood fish will be allowed to mature at sea as wild fish do.

Surveys of four streams were made in 1976 to determine their suitability and potential as sources of eggs for the establishment of a sea-run cutthroat brood stock.

A helicopter survey of Hamilton River (Figures 6 and 8) was made in late May 1976. Mature cutthroat were found holding in three large pool areas prior to ascending to upriver areas for spawning. Data on length and

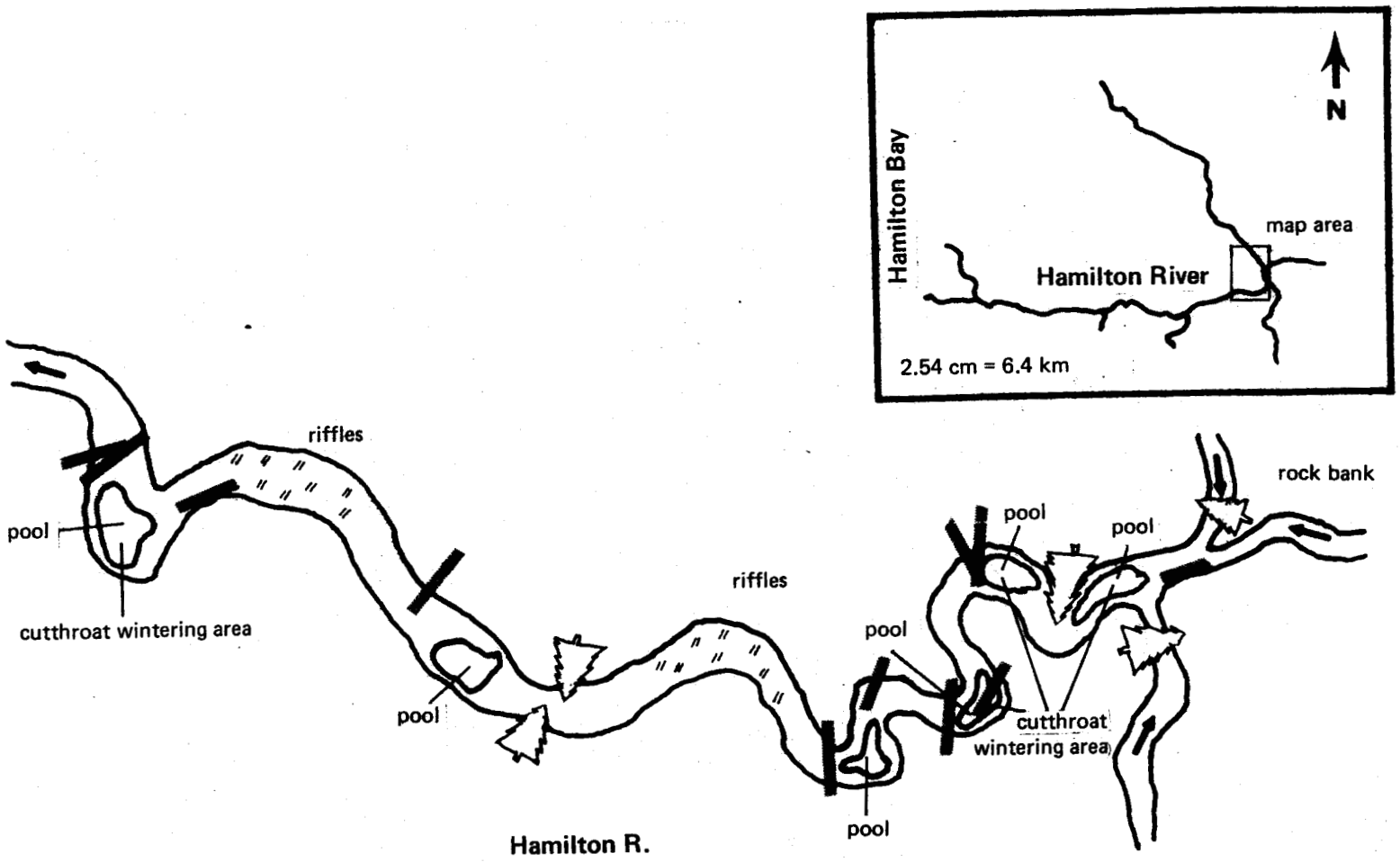

Fig. 8 Hamilton River Cutthroat Wintering Areas.

degree of maturity for sea-run cutthroat sampled at Hamilton River are presented in Table 1. .

Kadake Creek was sampled on two surveys in 1976. The first was conducted on April 28 and the other on May 17, 1976. On the first survey cutthroat were located in the large overwintering pool areas (Figure 4) and were mostly mature fish that had not yet spawned. On the second survey in mid-May the cutthroat were scattered throughout the area and were comprised of mostly spawned-out adults and immature fish. Presented in Table 1 are the cutthroat captured in Kadake Creek in 1976.

Castle River was sampled in early May 1976. Good numbers of overwintering mature cutthroat were located in three large pools (Figure 9). These cutthroat were from several age classes with immature fish found in the same area as mature fish. The lengths and sexual development of cutthroat captured in Castle River in 1976 are also presented in Table 1.

A survey of Helm Creek was made during the first week of May 1976. Helm Creek is smaller than the other streams surveyed, and the cutthroat were found scattered throughout with the largest concentrations near the outlet of Helm Lake. Even though Helm Creek was small it appeared to contain many cutthroat with a higher percent of immature fish in the sample. Cutthroat lengths and sexual development for Helm Creek are presented in Table 1.

Examination of the survey data indicates that all four streams contain adequate numbers of adult cutthroat. The development of one or more of these systems as a source for anadromous cutthroat eggs will depend upon the size of the cutthroat, fecundity, ease of capture, and expense involved.

Average fecundity of anadromous cutthroat at Petersburg Creek (Jones, 1977) was found to be 873 eggs per females. Fish from any system in Southeast Alaska would probably not exceed this average. It will be necessary to capture approximately 150 female cutthroat to meet the 125,000 egg target necessary for brood stock development.

Cutthroat Tagging Studies

The fall in-migration of sea-run cutthroat to Petersburg Creek contains large numbers of fish that were not tagged at the Petersburg Creek weir (Jones, 1977). The origin of these cutthroat is suspected to be area streams. To determine the validity of this assumption, tagging studies were initiated in 1975 and were continued in 1976. Six nonlake streams in the Petersburg area were selected (Table 2), which were all known to contain populations of anadromous cutthroat. A total of 168 cutthroat were tagged with color coded "Floy" tags in 1975, and an additional 69 cutthroat were tagged in 1976.

It was anticipated that some of these cutthroat would be captured at the Petersburg Creek weir during the 1975 fall in-migration. However, due to the loss of the weir for part of September and its poor fishing

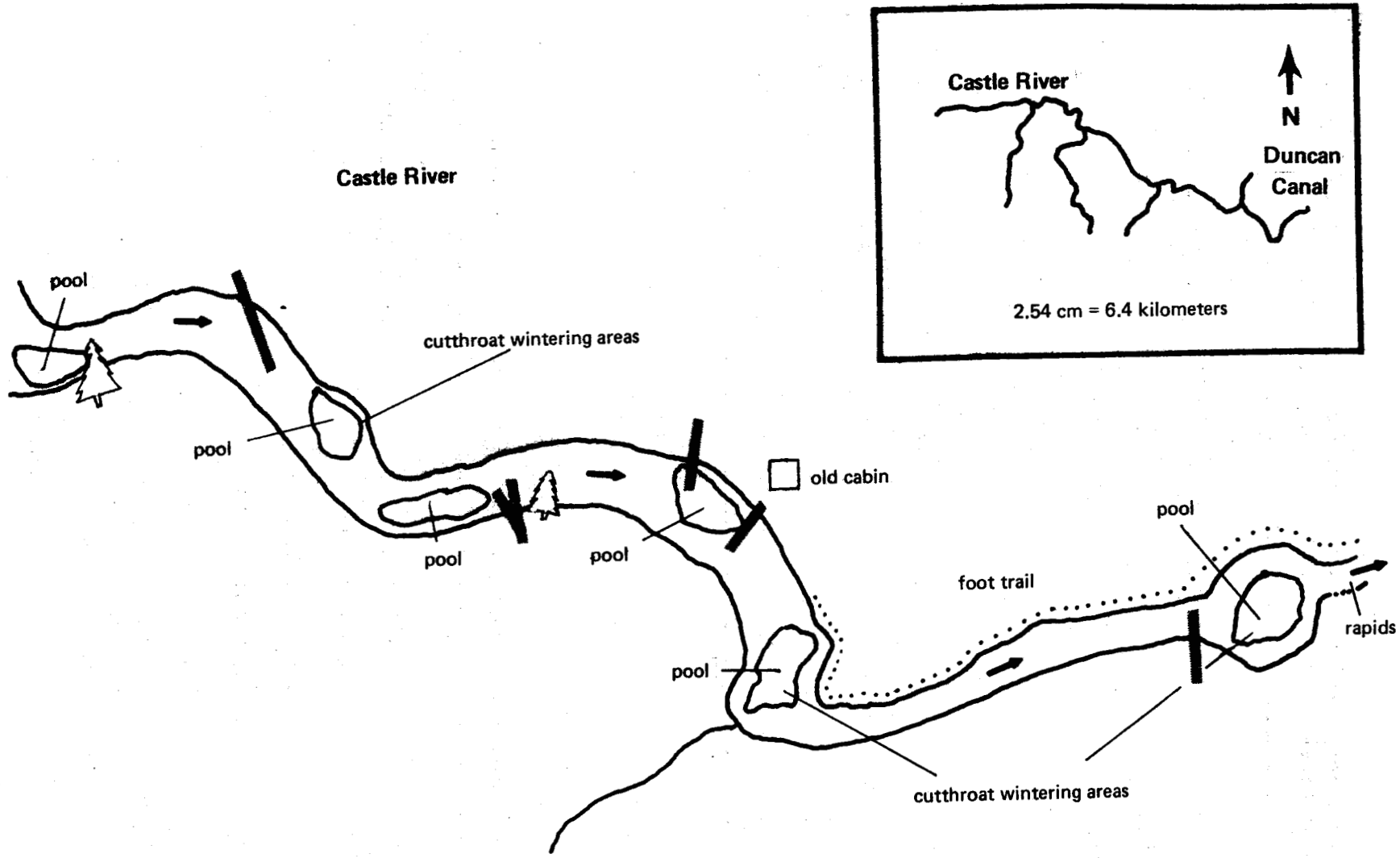

Fig. 9 Castle River Cutthroat Wintering Areas.

Table 1. Length, Sex, and Maturity of Anadromous Cutthroat From Hamilton River, Kadake Creek, Castle River, and Helm Creek. April-May, 1976.

	River Systems			
	Hamilton	Kadake	Castle	Helm
Number of Cutthroat	17	21	17	38
Number of Females	11	11	8	19
% Mature	90	68	75	63
% Ripe	0	12	33	9
% Green	90	75	33	27
% Spawned Out	10	13	34	64
Number of Males				
% Mature	100	90	64	64
% Ripe	100	66	100	66
% Green	0	0	0	0
% Spawned Out	0	34	0	34
Average Length in mm	352	352	290	281

Table 2. Sea-Run Cutthroat Tagging Sites, Petersburg Area 1975-1976.

Stream	Location	Number of Cutthroat Tagged 1975	1976
Duncan Salt Chuck	Kupreanof Island	86	24
Castle River	Kupreanof Island	17	7
"12 Mile" Creek	Kupreanof Island	4	4
"5 Mile" Creek	Kupreanof Island	8	17
Big Creek	Kupreanof Island	51	17
Blind Slough	Mitkof Island	2	--
	Totals	168	69

ability for the remainder of the season, no cutthroat tag recoveries were made in 1975.

Tag recoveries to date have been made only in the stream of origin. In other words, cutthroat tagged at Castle River have been recovered in Castle River but not in the Duncan Salt Chuck or any of the other streams. Based on the limited tag returns to date it would appear that there is not much movement of anadromous cutthroat between stream systems. Only continued tagging and tag recoveries will answer the question of movement of cutthroat.

DISCUSSION

From information gathered during the life history research at Petersburg Creek it is apparent that wild native sea-run cutthroat populations will be hard to maintain in any number or quality under heavy fishing pressure near population centers. In order to maintain these populations of cutthroat it may become necessary to enhance these runs. This enhancement may be achieved via more restrictive regulations on a stream-by-stream basis, more restrictive access in the limitation of various means of transportation and accommodations, or it may require the use of a hatchery-produced cutthroat fry or smolts.

Information gathered during the 1976 season indicates that the best capture techniques for wild anadromous cutthroat for brood stock depend a great deal on the particular stream. Hamilton River, Kadake Creek, and Castle River are too large to be considered for a weir structure. Helm Creek is more suited to this type of capture method. Beach seining may be possible in all streams studied and may prove to be a practical capture method. Hook and line capture was often successful, though the results of this method are affected by changing water and weather conditions and by the skill of the sampler.

From data gathered from the four streams it is apparent that more than one stream will need to be tapped to secure the necessary numbers of adult female cutthroat. This will also lessen the impact of spawner removal for each stream system.

Information derived from enhancement programs on sea-run cutthroat in Oregon and Washington will be helpful in planning enhancement procedures in Alaska once hatchery-raised cutthroat become available.

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