Squamish River Spawning Ground Recovery of 1973 Brood Coded - Wire - Tagged Coho Salmon

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Fisheries and Marine Service

Manuscript Report No. 1469

April, 1978

SQUAMISH RIVER SPAWNING GROUND RECOVERY OF 1973 BROOD CODED-WIRE-TAGGED COHO SALMON

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ABSTRACT

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Escapement returns of 1973 brood coho salmon (Oncorhynchus kisutch) were visually enumerated and sampled in the fall and winter of 1976/1977 throughout most of the Squamish River system. In 1977/1978 the study was limited to the Tenderfoot Creek - Mosley Lake region. The object of the study was to recover adipose-clipped and coded-wire-tagged (CWT) coho salmon from the 1975 tagging operation in Tenderfoot Creek, Meighn Creek and Little Stawamus River.

During the 1976/1977 spawning ground survey 77 adipose-clipped coho were recovered; 42 contained CWTs. The CWT coho were recovered in or near their creek of origin. These 42 fish returned as age 1.1 adults. Tagged coho returns in 1976/1977, adjusted for sampling intensity, represented at least 0.9% of the 17,835 tagged 1973 brood coho smolts.

Recoveries of adult coho with complete adipose fins comprised a high proportion of the adult sample from each study stream in 1976/1977. It is hypothesized that large numbers of 1973 brood juveniles left the study streams as imprinted fry or fingerlings prior to May, 1975, reared elsewhere in the Squamish River system, went to sea, and then returned to the study streams as unmarked adults.

Some 1973 brood coho that were tagged as smolts in Tenderfoot Creek - Mosley Lake returned during the winter of 1977/1978 at age 2.1. No tagged 1972 brood coho smolts were recovered as age 2.1 adults in 1976/1977.

Estimated incidence of coded-wire-tags in the 1976/1977 escapements was 1 in 4.2 for Tenderfoot Creek coho, 1 in 5.5 for Meighn Creek coho and 1 in 7.7 for Little Stawamus River coho. A rough estimate of the total Squamish River system incidence of tags was 1 in 52.

Key words: Mark-recovery, coded-wire-tags, adult salmonids, biological surveys, river systems, Fisheries biology.

RÉSUMÉ

Les saumons coho (Oncorhynchus kisutch) de remonte de la génération de 1973 ont été comptés visuellement et échantillonnés pendant l'automne et l'hiver 1976-77 dans la plupart des cours d'eau du bassin de la rivière Squamish. En 1977-78, nous nous sommes limités à la région du ruisseau Tenderfoot et du lac Mosley. Cette étude avait pour but de recapturer les saumons coho marqués, en 1975, par amputation de la nageoire adipeuse ou par pose d'un fil métallique codé, dans les ruisseaux Tenderfoot et Meighn et dans la petite rivière Stawamus.

Pendant l'inventaire des frayères de 1976-77, on a recapturé 77 spécimens sans adipeuse; 42 d'entre eux portaient un fil métallique. Ces derniers ont été capturés dans ou à proximité de leur ruisseau d'origine; ils étaient adultes et leur âge moyen était de 1.1 an. Les résultats des recaptures pour 1976-77, une fois apportées les corrections tenant compte de l'intensité d'échantillonnage, représentent au moins 0.9% des 17,835 coho marqués nés en 1973.

Les adultes recapturés et encore pourvus de leur adipeuse comptaient pour une grande part des spécimens recapturés dans chacun des ruisseaux étudiés en 1976-77. On a émis l'hypothèse qu'un grand nombre de juvéniles de 1973 auraient quitté leur ruisseau d'origine avant mai 1975, mais après en avoir subi l'empreinte à l'état d'alevins, se seraient développés ailleurs dans le bassin de la rivière Squamish pour descendre à la mer puis retourner dans les ruisseaux d'étude à l'état d'adultes non marqués.

Certains saumoneaux de la génération de 1973 ont été marqués dans le ruisseau Tenderfoot et le lac Mosley et y sont retournés pendant l'hiver 1977-78, à l'âge de 2.1 ans. Aucun spécimen marqué de la génération de 1972 et ayant atteint cet âge recapturé en 1976-77.

La fréquence estimative des coho de remonte de 1976-77, marqués d'un fil métallique, était de 1 pour 4.2 chez ceux du ruisseau Tenderfoot, de 1 pour 6.9 chez ceux du ruisseau Meighn et de 1 pour 7.7 chez ceux de la petite rivière Stawamus. La fréquence des poissons marqués puis recapturés dans l'ensemble du bassin de la rivière Squamish est en gros de 1 pour 52.

Mots clés: marquage et recapture, fils métalliques codés, saumons adultes, inventaires biologiques, bassins hydrographiques, biologie des pêches.

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INTRODUCTION

This report presents results from spawning ground surveys between October 1976 and March 1977, and between December 1977 and March 1978, to recover 1973 brood coded-wire-tagged coho salmon (Oncorhynchus kisutch) returning to the Squamish River system (Fig. 1). Wilson, Armstrong and Argue (1977 MS) summarized a similar Squamish survey for 1972 brood coho spawners during the fall and winter of 1975/1976.

In the spring of 1975, 1973 brood coho smolts from the Squamish River system were captured by minnow traps and fence traps and were marked by removal of the adipose fin and injection of binary coded-wire-tags (17,678 were tagged) (Argue and Armstrong, 1977 MS). The following study streams (Fig. 2) were trapped: Tenderfoot Creek - a tributary of the Cheakamus River, 9,027 tags were applied (1,370 code 15/2/5 and 7,657 code 4/2/5)[1]; Meighn Creek - a tributary of the Squamish River, 2,490 tags were applied (code 5/2/5); and Little Stawamus River - a tributary of the Stawamus River, 6,161 tags were applied (code 8/2/5).

In the fall and winter of 1976/1977, coho smolts marked in the spring of 1975 returned to the Squamish River system as age 1.1 adults to enter their streams of origin for spawning. Objectives of the 1976/1977 survey were to estimate the incidence of tagged 1973 brood coho in the total coho escapement to the Squamish River system, including the Cheakmus and Stawamus Rivers, and to estimate the total return of tagged coho to each study stream. A limited survey was conducted in 1977/1978 to recover age 2.1 brood coho from Tenderfoot Creek - Mosley Lake.

In addition, data on the abundance, timing and distribution of spawning coho were obtained to provide a second year of base data on the importance of these streams to the Squamish River system coho population.

FIELD METHODS

ESTUARY GILL NETTING

The 28 foot (9 m) Fisheries Service vessel MV RD 104 made 39 gillnet sets in the Squamish estuary and upper Howe Sound during the period October 18 to November 3, 1976. It was felt that returning coho must pass through the estuary during that period. The gillnet measured 200 fathoms (371 m) in length by 60 meshes deep; mesh size was 6 inches (15 cm) and twine colour was medium green (Redden R9). Sets were made at 13 locations between Defence Islands and the mouth of the Squamish River (Fig. 3) during different stages of the tide and under all light conditions.

The intent of the test fishing was to obtain sufficient samples to estimate the incidence of tagged coho salmon in the total Squamish system.

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[1] Code order: Data 1/Agency/Data 2

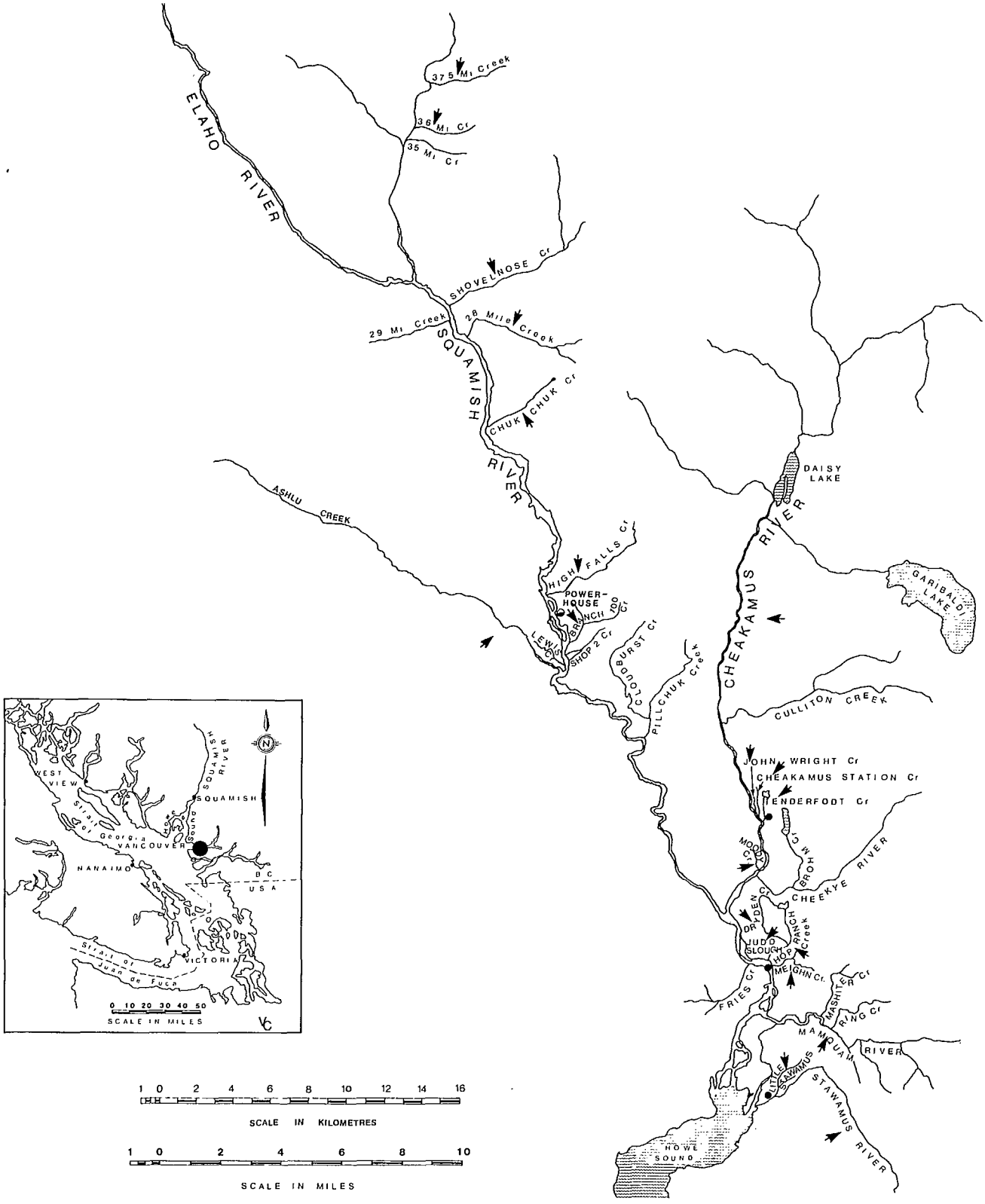

Figure 1. Squamish River system: surveyed streams are indicated by arrows; trap sites are indicated by circles.

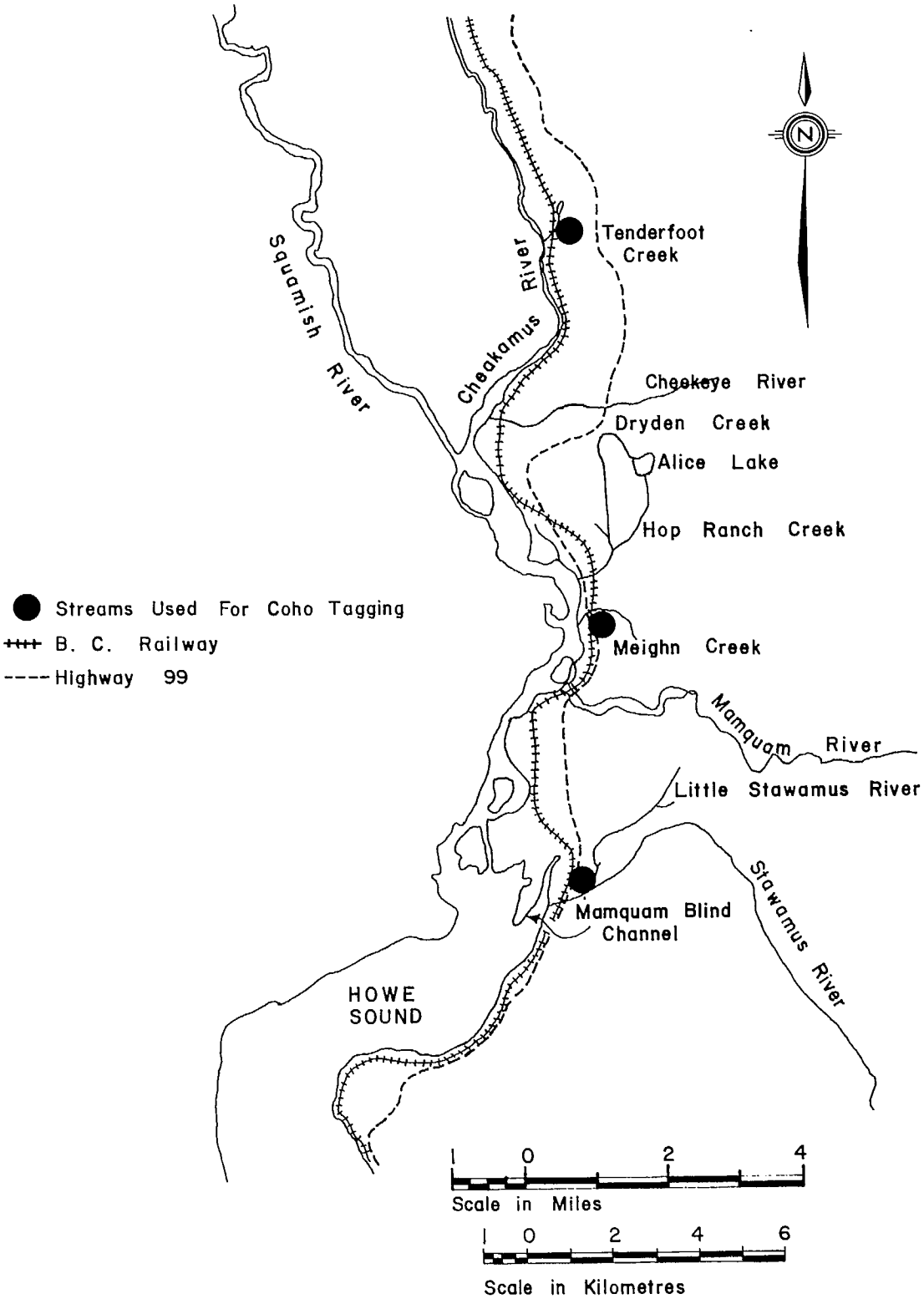

Fig. 2. Detail map showing location of the three tagging streams: Tenderfoot Creek, Meighn Creek and Little Stawamus River.

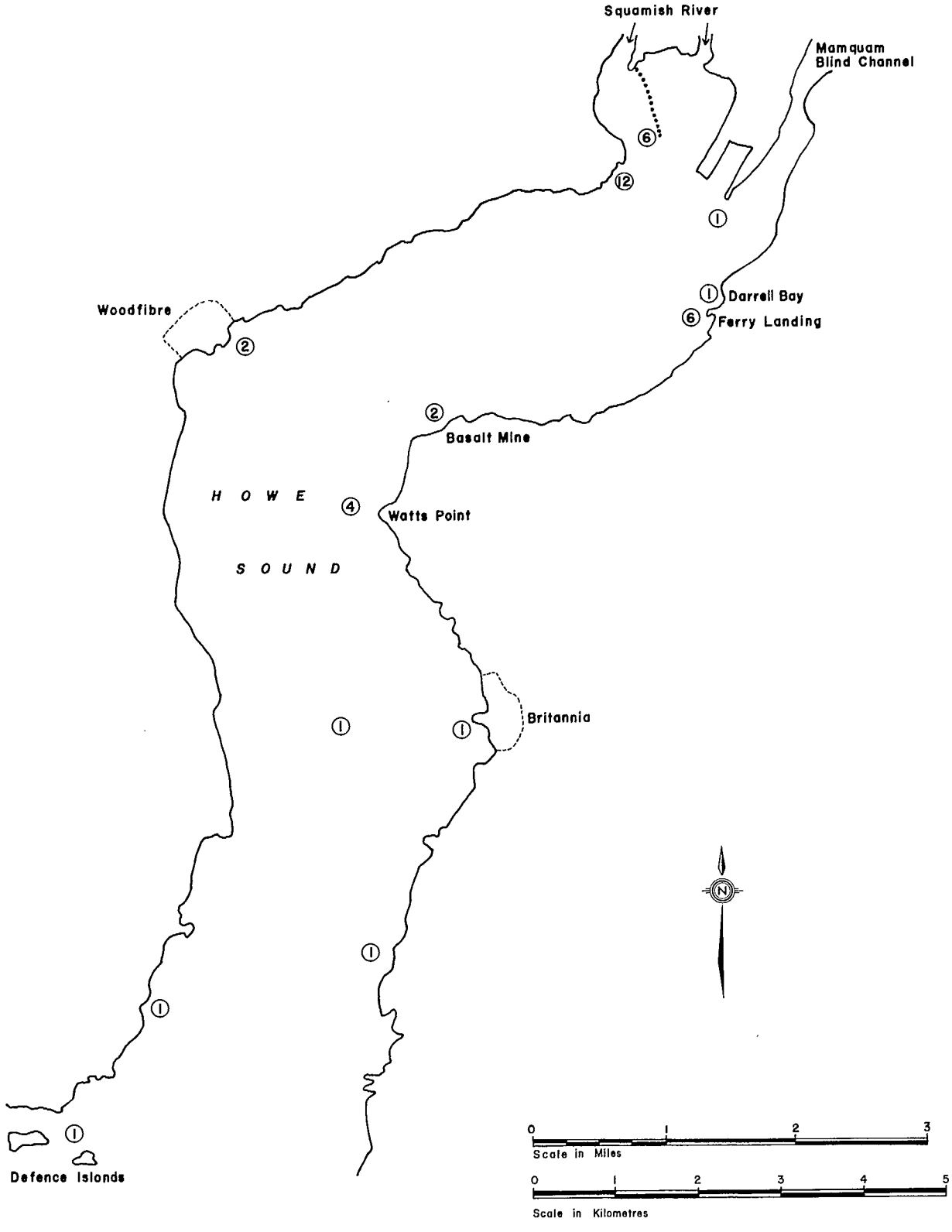

Figure 3. Howe Sound and Squamish River estuary. Circles show the gillnet test locations and the number of sets made at each location.

SPAWNING GROUND DEAD RECOVERY

Spawning ground recovery of dead adult coho was conducted between November 15, 1976 and March 3, 1977 to obtain adipose-clipped coho. The three study streams were checked visually on a weekly basis during this period. Nearby and upriver streams were also checked to ensure that wandering marked coho would not be missed. These streams were: Dryden Creek, Hop Ranch Creek, Shovelnose Creek, High Falls Creek, 28 Mile Creek, Judd Slough, 36 Mile Creek, 37½ Mile Creek, Moody Creek, Chuk Chuk Creek, Branch 100 Creek, Cheakamus River (including Cheakamus Station Creek and John Wright Creek), Mamquam River, Ashlu Creek and Stawamus River (Fig. 1). It was hoped to maintain consistent weekly recovery effort on these streams but limited manpower made this impossible. Instead, each creek was thoroughly checked at least three times during the 1976/1977 survey period.

Between December 17, 1977 and March 11,1978, Tenderfoot Creek and Mosley Lake were surveyed for marked 1973 brood coho adults. Argue and Armstrong (1977 MS) had speculated that some 1973 brood smolts remained in fresh water for an additional year. Funds and manpower in 1977/1978 were only sufficient to cover Tenderfoot Creek - Mosley Lake for returning age 2.1 adults.

Marked coho, identified by the missing adipose fin, were obtained as spawned-out dead. Occasionally a live spawned-out coho was discreetly gaffed from the water. All unmarked dead coho were counted then cut in two to eliminate the possibility of recounting. When a marked coho with a completely or partially missing adipose fin was found, post-orbital-hypural-plate lengths were recorded and scale samples taken. When possible, nose-fork length measurements were taken. The heads were then removed behind the eyeball and placed in individual cloth bags marked with: date, location, length, sex, scale number, condition of adipose and carcass (completely or partially missing; decomposed) and sample number. Bags were placed in a 10% formalin solution for storage and were transported to the Head Dissection Laboratory where the heads were examined for coded-wire-tags (CWTs) and the recovered tags were decoded. For creeks where marked coho were recovered, the mark recovery locations and spawning concentration locations were noted.

Spawning ground counts and recovery data on each adipose-clipped coho are appended (Appendices B and C).

OBSERVATIONS AND DISCUSSION

ESTUARY GILL NETTING

Attempts to estimate the incidence of marks for the total Squamish River system by test-fishing in the Squamish estuary were unproductive. Fishing was carried out at times when it was known that coho were entering the Squamish River system based on upstream observations of spawners, plus sport fishing and Indian food fishery catches in the river. No "finners" or "jumpers" were seen in the estuary.

Thirty-nine gillnet sets resulted in the capture of 92 dogfish, 35 chum salmon and only 4 coho salmon, none were missing the adipose fin (set records in Appendix A). High dogfish catches during after-dark sets necessitated shorter sets and reduced hight time effort; these sets indicated that night fishing was no more productive than day fishing for coho or chum salmon.

It appears that adult coho did not hold in or move through the estuary in fishable concentrations or at fishable depths. Similar results were obtained in 1975. Squamish River flows were more than adequate for upstream migration at all times during the fall. As the Squamish River is glacial fed and the estuary is quite milky in colour, it is unlikely that coho were able to see and avoid the gill net. It is notable that the estuary is seldom productive for coho sport fishing.

DESCRIPTION OF STUDY STREAMS AND LOCATION OF SPAWNERS

General descriptions of the Squamish River system, of the streams where tagging took place, and of some nearby streams where marks were expected to stray were reported by Argue and Armstrong (1977 MS) and Wilson, Armstrong and Argue (1977 MS). Mark recoveries and spawning locations for 1976/1977 are noted on sketch maps for Tenderfoot Creek (Fig. 4), Meighn Creek (Fig. 5), Little Stawamus River (Fig. 6) and Cheakamus River near Tenderfoot Creek (Fig. 7).

Spawning locations in 1976/1977 were almost identical to those observed during the 1975/1976 survey. Note that coho spawners again avoided the channelized section of the Little Stawamus River (Fig. 6). This was an important spawning location prior to urban development (John Wright, Fishery Patrolman, personal communication). For Tenderfoot Creek, surveys showed that for all three years coho spawners favored Mosley Lake (Fig. 4), likely due to its stable groundwater supply.

Access to Tenderfoot Creek via culverts under the B.C. Railway roadbed was improved in the fall of 1977 (Fig. 8). During the 1977/1978 spawning period only a few coho spawners were observed in John Wright Creek, in Cheakamus Station Creek, and in sections of the Cheakamus River near the Tenderfoot Creek culverts. In comparison, during 1975/1976 and 1976/1977 between 200 and 500 coho spawned in the Cheakamus River, John Wright Creek and Cheakamus Station Creek. These spawning locations were within 2,000 feet (610 m) of the Tenderfoot Creek culverts. The above observations, plus recoveries of adipose-clipped coho from Cheakamus spawners in 1975/1976 and 1976/1977 (see page 12) suggest that many of the coho spawners observed at these locations in 1975/1976 and 1976/1977 were probably destined for Tenderfoot Creek.

SPAWNING TIMING

Coho adults were present in the Squamish River system from late August 1976 to late February 1977 with spawning in the upper reaches (e.g. Shovelnose Creek) beginning in early November.

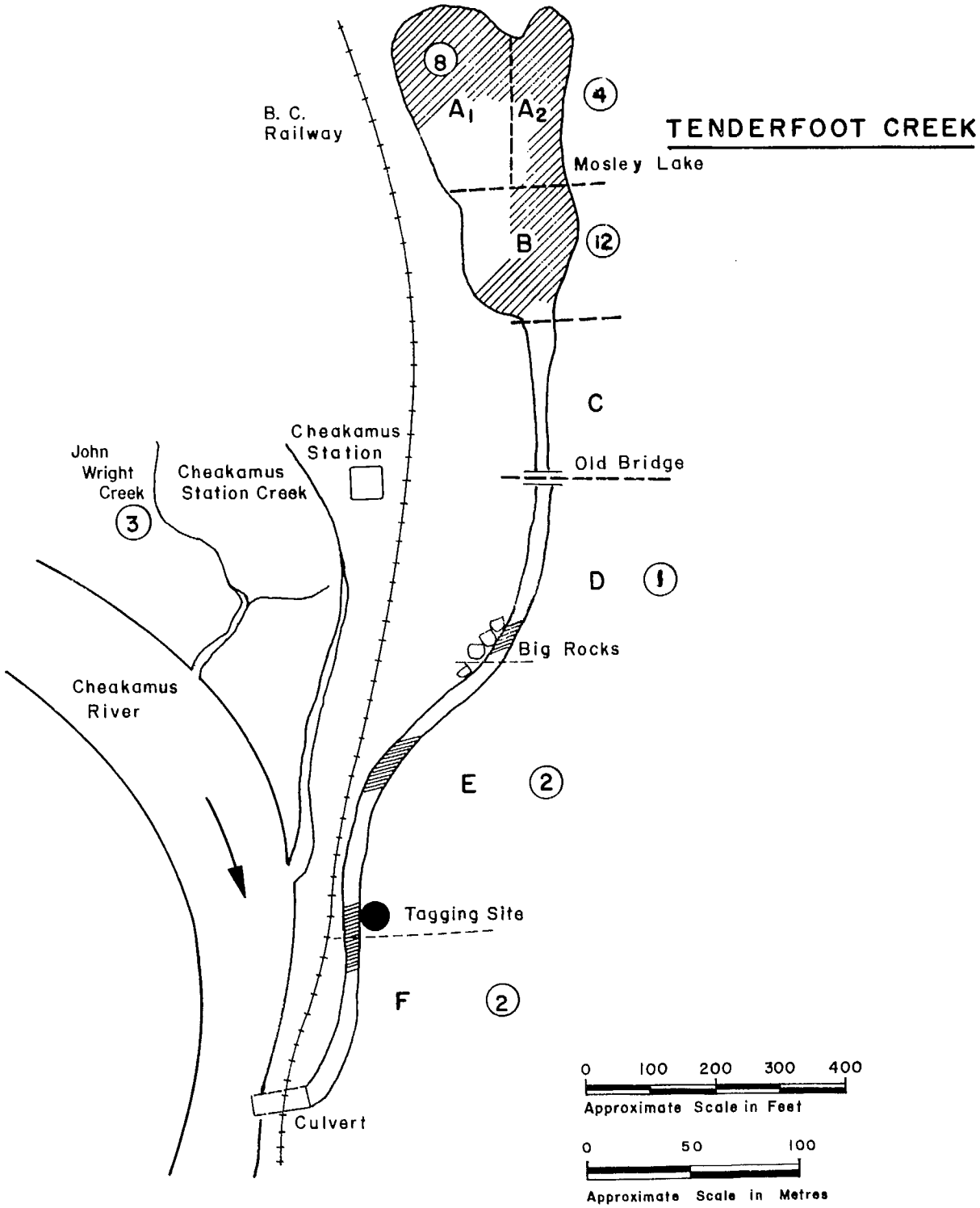

Figure 4. Tenderfoot Creek sketch map, not to scale, showing recovery locations A to F for marked coho. Major 1976/1977 coho spawning areas are cross-hatched. Numbers of adipose-clip recoveries at each location are circled.

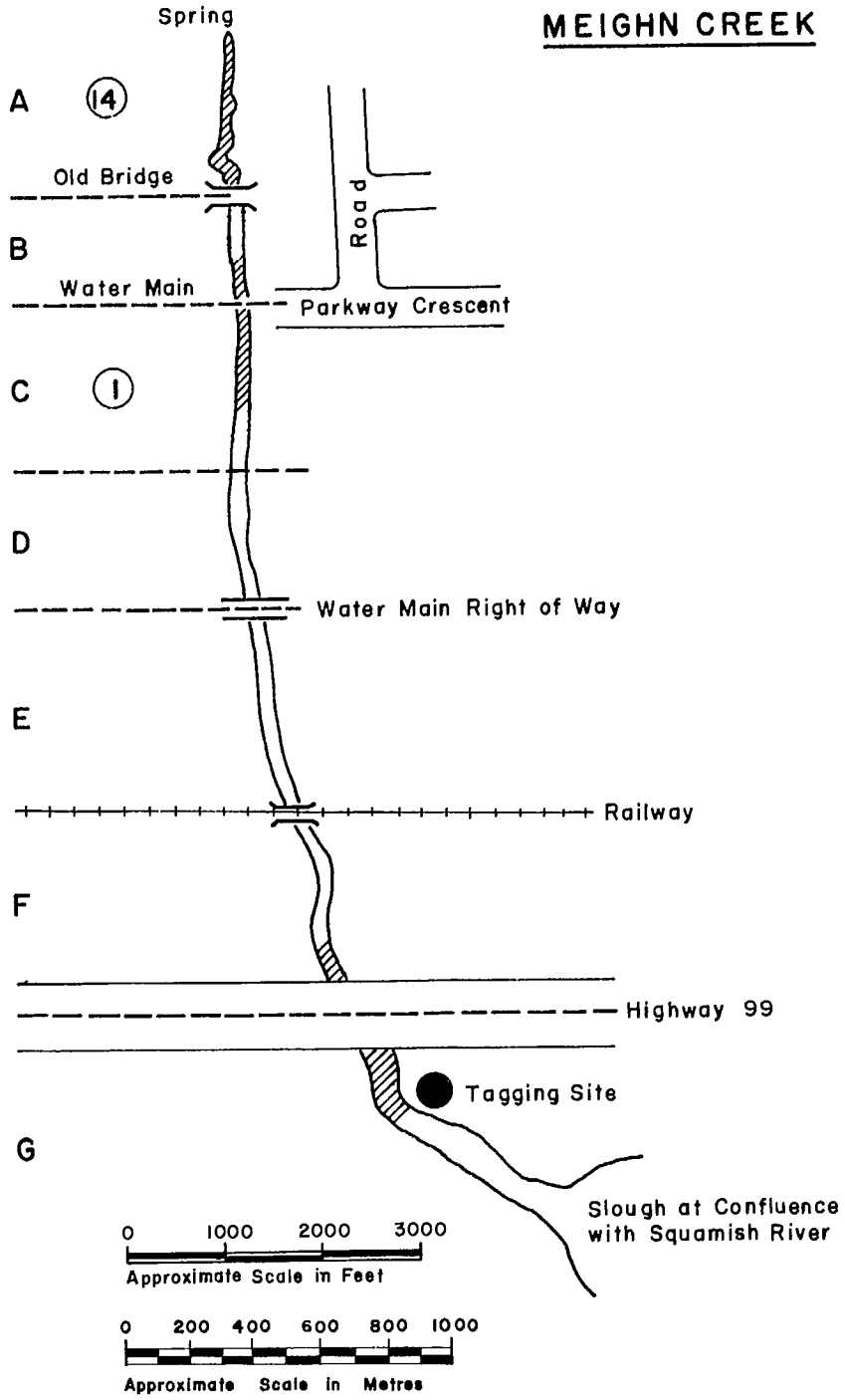

Figure 5. Meighn Creek sketch map, not to scale, showing recovery locations A to G for marked coho. Major 1976/1977 coho spawning locations are cross-hatched. Numbers of adipose-clip recoveries at each location are circled.

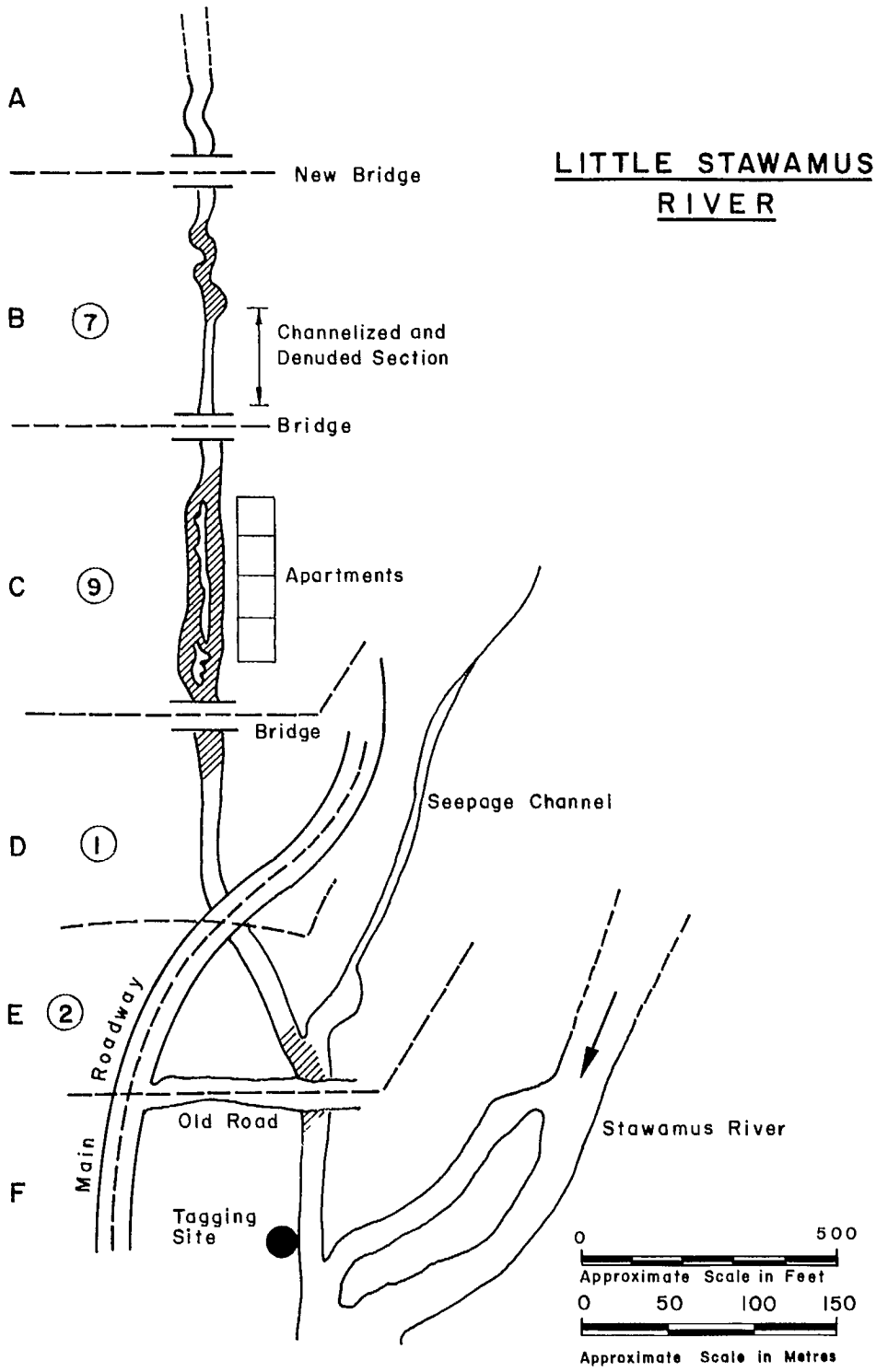

Figure 6. Little Stawamus River sketch map, not to scale, showing recovery locations A to F for marked coho. Major 1976/1977 coho spawning locations are cross hatched. Numbers of adipose-clip recoveries at each location are circled.

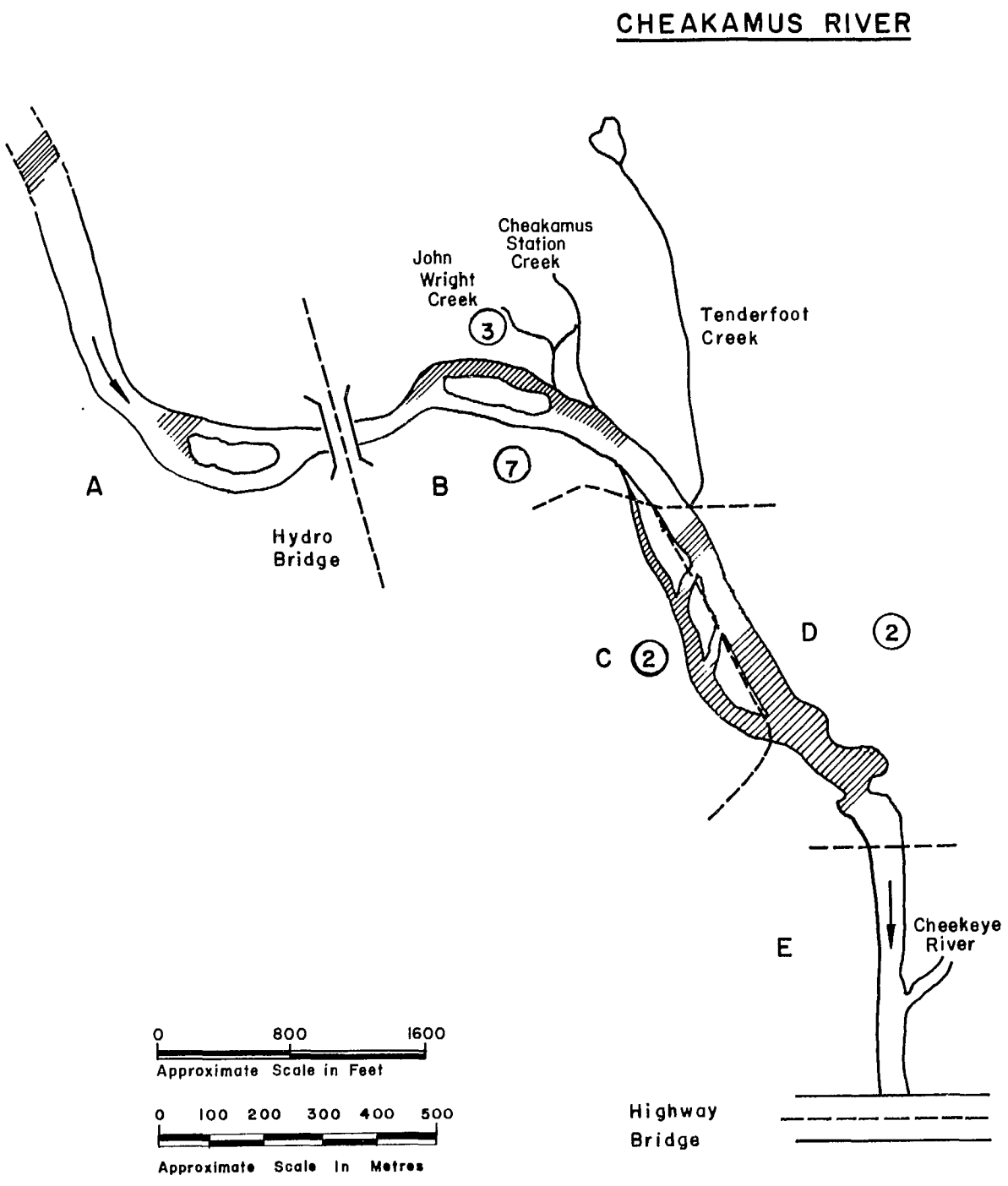

Figure 7. Cheakamus River (in vicinity of Tenderfoot, Cheakamus Station and John Wright Creeks) sketch map, not to scale, showing recovery locations A to E for marked coho. Major 1976/1977 coho spawning locations are cross hatched. Numbers of adipose-clip recoveries at each location are circled.

Fig. 8. Culverts at confluence of Tenderfoot Creek and the Cheakamus River under winter flow conditions. Cheakamus flowing from top to bottom of photograph. In the fall of 1977 a single large culvert (diameter 5 ft , 1.5 m) was placed slightly upstream and approximately four feet (1.2 m) below the position illustrated in the above photograph.

Coho did not enter Tenderfoot Creek until late December in 1976/1977 due to low water conditions which restricted access via the culverts. A large school of coho was observed in mid-December waiting in the Cheakamus River below the Tenderfoot Creek culverts; these fish entered several weeks later during high flows in the Cheakamus River. By the end of January most of the spawning in Tenderfoot Creek and Mosley Lake was completed.

Coho spawning in Meighn Creek lasted from the beginning of December to the end of January with a peak in late December. Coho spawning in Little Stawamus River started in mid-November, peaked in mid-December and finished by the first week in January. Peak spawning in the three study creeks occurred approximately one week earlier in 1976/1977 than in 1975/1976.

COHO MARK RECOVERY

Number of Marks Recovered

From a sample of 962 spent coho, 77 adult coho were identified as having missing adipose fins. From these 77 marked fish, 42 CWTs (55%) were recovered (Table 1). In 1975/1976, 27 CWTs (39%) were recovered from 69 marked coho in a sample of 463 spent coho.

It was felt that due to the problems Tenderfoot Creek coho had in entering the culverts in 1976/1977 and due to the close proximity of Tenderfoot Creek to excellent spawning locations in the Cheakamus River, Cheakamus Station Creek and John Wright Creek, that marked coho found in these areas would likely contain Tenderfoot Creek tags (4/2/5 or 15/2/5). This was the case as two CWTs (4/2/5) were recovered from the Cheakamus River and one CWT (4/2/5) was recovered from John Wright Creek (Table 2).

A large percentage (67%) of the total coho dead recoveries in 1976/1977 were recovered from locations other than the three study streams. Except for the anticipated adipose-clip recoveries from the Cheakamus River and John Wright Creek, adipose-clipped coho were recovered only from the three study streams (Table 1).

One Meighn Creek coho CWT (5/2/5) was recovered from Tenderfoot Creek (Table 2). This fish may have migrated from Tenderfoot Creek as an imprinted fry and over-wintered in Meighn Creek approximately 8 miles (12.9 km) downstream (see below). With the exception of this Meighn Creek tag, and the three Tenderfoot Creek tags which were recovered from the Cheakamus River and John Wright Creek, all readable CWT recoveries were from coho which had spawned and died in the creek they had been tagged in as smolts. Thus there was little evidence of adult coho straying.

There were no recoveries of age 2.1 coho CWTs (1972 brood) in 1976/1977.

Table 1. Spawning ground dead pitch and mark recoveries

Location	Total Dead Recoveries	Unmarked	Marked[a]	CWT Recoveries
Tenderfoot Creek	97	68	29 (2) 4	17 2
Meighn Creek	90	75	15 (1) 2	10
Little Stawamus River	126	107	19	12
Cheakamus River	265	251	14 (2) 3	3
Dryden Creek	70	70	-	-
Hop Ranch Creek	16	16	-	-
Shovelnose Creek	57	57	-	
Branch 100 Creek	9	9	-	-
Mamquam River	19	19	-	-
Chuk Chuk Creek	14	14	-	-
28 Mile Creek	59	59	-	-
Judd Slough	3	3	-	-
36 Mile Creek	27	27	-	-
37½ Mile Creek	73	73	-	-
Moody Creek	5	5	-	-
High Falls Creek	31	31	-	-
Ashlu Creek	1	1	-	-
Totals	962	885	77 (5) 9	42 2

[a] Numbers in brackets refer to marked or marked and tagged coho having badly decomposed carcasses. Numbers to right of brackets refer to those marked coho that were judged to have partially missing or stubby adipose fins. These fish are included with the numbers of marked and marked and tagged coho (numbers on left). For example, in the sample of 29 marked coho from Tenderfoot Creek two marks were obtained from coho with badly decomposed carcasses and four marks were judged to have partially missing or stubby adipose fins. Two of 17 CWTs were recovered from carcasses with partially missing or stubby adipose fins.

Table 2. CWT recoveries in 1976/1977 for each tag code.

Recovery Location	Pin Lost	4/2/5	15/2/5	5/2/5	8/2/5	Total CWTs	Total Dead Pitch
Tenderfoot Creek	2	11	3	1	-	17	97
Meighn Creek	-	-	-	10	-	10	90
Little Stawamus River	-	-	-	-	12	12	126
Cheakamus River	-	2	-	-	-	2	223
John Wright Creek	-	1	-	-	-	1	20
Total	2	14	3	11	12	42	556

For the three study streams the proportion of spawning coho with complete adipose fins was surprisingly high (79.9%, see Table 3) (1975/1976 figure was 78.7%). It had been assumed that nearly all downstream migrating smolts had been adipose-clipped and tagged. Since no significant straying of CWT coho could be demonstrated, we assumed that large scale straying of unmarked coho did not occur either. These 1976/1977 observations reinforce the hypothesis, presented in the 1975/1976 report, that many coho juveniles leave the three study streams as imprinted fry or fingerlings to complete fresh water rearing in lower sections of the Cheakamus, Squamish and Stawamus Rivers or in the Squamish estuary, and after one and one-half years of ocean rearing they return to the three study streams to spawn. This hypothesis would explain the recovery of the tagged Meighn Creek coho in Tenderfoot Creek. The above observations also suggest that streams such as Tenderfoot Creek, Meighn Creek and Little Stawamus River are valuable not only as habitat for smolt rearing, but also as stable spawning areas and as distribution points for fry and fingerlings that complete fresh water rearing elsewhere in the Squamish River system.

A large percentage (36.5%) of the coho with completely missing adipose fins were missing CWTs (Table 3). Possible reasons for this are high incidence of missing eyeballs due to scavengers (eagles and seagulls) or carcass decomposition, and poor tag placement. Many coho carcasses lacking adipose fins were in fresh condition except for missing eyeballs. In a sample of 11 such carcasses, nine (81.8%) were missing CWTs. In a sample of five badly decomposed coho carcasses that were considered to have missing adipose fins, no tags were recovered.

Two of the nine coho with partially missing adipose fins contained CWTs. Apparently adipose fin excision at the time of tagging was not complete in all cases.

Size of Marked Coho

All marked coho were measured for post-orbital-hypural-plate length (Table 4). Mean lengths of coho with and without CWTs were similar, about 46 cm, but were significantly smaller in length ($p<0.05$) than 1972 brood coho that returned in 1975/1976 (1975/1976 average length was 51 cm). It is noteworthy that the 1973 brood coho smolts from the three study creeks were smaller (81/lb) than the 1972 brood coho smolts (59/lb) (Argue and Armstrong, 1977 MS).

Tenderfoot Creek marked coho averaged 46.8 cm in 1976/1977 and were slightly larger than marked coho from Meighn Creek (45.4 cm). Tenderfoot Creek and Meighn Creek adult coho were significantly larger ($p<0.05$) than Little Stawamus River adult coho (41.0 cm). At the time of tagging coho smolts were also slightly larger in Tenderfoot Creek (71/lb; average fork length 85 mm) than in Meighn Creek (82/lb; 81 mm) and Little Stawamus River (88/lb; 79 mm).

Sex Ratio of Dead Recovery Coho

In Tenderfoot Creek and Little Stawamus River just over 50% of the dead recovery sample were females (Table 5). Meighn Creek recoveries had

Table 3. Distribution of adipose mark recoveries into different recovery categories.

	CWT Creeks									
	Tenderfoot Creek	Meighn Creek	L. Stawamus River	Total	Cheakamus River	John Wright Creek	Cheakamus/Wright & Tenderfoot	Total including Cheakamus & Wright	Other Creeks	Grand Total
Unmarked	68	75	107	250	212	17	297	479	406	885
Complete marks	23	12	19	54	7	2	32	63	-	63
CWTs recovered	15[a] (65.2%)	10 (83.3%)	12 (63.2%)	37 (68.5%)	2 (28.6%)	1 (50%)	18 (56.3%)	40 (63.5%)	-	40 (63.5%)
Decomposed carcasses with marks	2	1	-	3	1	1	4	5	-	5
CWTs recovered	0 (0%)	0 (0%)	-	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	-	0 (0%)
Partial marks	4	2	-	6	3	-	7	9	-	9
CWTs recovered	2 (50.0%)	0 (0%)	-	2 (33.3%)	0 (0%)	-	2 (28.6%)	2 (22.2%)	-	2 (22.2%)
Total marks	29	15	19	63	11	3	43	77	-	77
CWTs recovered	17[a] (58.6%)	10 (66.7%)	12 (63.2%)	39 (61.9%)	2 (18.2%)	1 (33.3%)	20 (46.5%)	42 (54.5%)	-	42 (54.5%)
Total dead pitch	97	90	126	313	223	20	340	556	406	962
% Complete marks	23.7%	13.3%	15.1%	17.3%	3.1%	10.0%	9.4%	11.3%	-	6.5%
% Decomposed carcasses	2.1%	1.1%	-	0.9%	0.4%	5.0%	1.2%	8.9%	-	0.5%
% Partial marks	4.1%	2.2%	-	1.9%	1.3%	-	2.1%	1.6%	-	0.9%
% Unmarked	70.1%	83.3%	84.9%	79.9%	95.1%	85.0%	87.4%	86.2%	-	92.0%
% Marked	29.9%	16.7%	15.1%	20.1%	4.9%	15.0%	12.6%	13.8%	-	8.0%
% Total dead pitch with CWTs	17.5%	11.1%	9.5%	12.5%	0.9%	5.0%	5.9%	7.6%	-	4.4%

[a] Includes 1 Meighn Creek tag.

Table 4. Average post-orbital-hypural-plate length of CWT and NO PIN adipose-clipped coho.

Recovery Site	Sample Size	Avg. Length	S.D.
CWT			
Tenderfoot Cr.	17	46.7	4.50
Meighn Cr.	10	46.6	5.69
L. Stawamus R.	12	39.3	5.75
Cheakamus R.	3	47.6	5.05
Avg. of Means		45.5	
NO PIN			
Tenderfoot Cr.	11	47.0	5.94
Meighn Cr.	5	43.2	7.11
L. Stawamus R.	7	44.0	4.41
Cheakamus R.	10	51.9	6.49
Avg. of Means		46.5	
COMBINED			
Tenderfoot Cr.	28	46.8	5.01
Meighn Cr.	15	45.5	6.17
L. Stawamus R.	19	41.0	5.66
Cheakamus R.	13	50.9	6.28
Avg. of Means		46.1	

Table 5. Sex ratio of spawning ground coho recoveries (marked and unmarked)

	Unmarked		Marked		Total		% F
	M	F	M	F	M	F	
Tenderfoot Cr.	31	37	15	14	46	51	52.6
Meighn Cr.	52	23	8	7	60	30	33.3
Little Stawamus R.	47	60	12	7	59	67	53.2
Cheakamus R.	108	104	2	9	110	113	50.7
John Wright Cr.	10	7	1	2	11	9	45.0
Dryden Cr.	25	45					64.3
Hop Ranch Cr.	6	10					62.5
Cheakamus Station Cr.	11	11					50.0
Shovelnose Cr.	27	30					52.6
Branch 100 Cr.	4	5					55.5
Mamquam R.	2	17					89.5
Chuk Chuk Cr.	5	9					64.3
28 mile Cr.	33	26					44.0
Judd Slough	3	0					0.0
36 mile Cr.	11	16					59.3
37½ mile Cr.	40	33					45.2
Moody Cr.	2	3					60.0
Ashlu Cr.	0	1					100.0
High Falls Cr.	12	19					46.4
Totals	429	456	38	39	467	495	51.5%

only 33.3% females. Females comprised 47.3% of all 1976/1977 dead recoveries from the three study streams combined (54.2% in 1975/1976). Female coho comprised 51.5% of all the 1976/1977 dead recoveries from the Squamish River system (56.9% in 1975/1976).

1975/1976 Survey Recovery of "Jack" Coho

A small proportion of the tagged 1973 brood coho were expected to return in 1975/1976 to spawn as "jacks" - small males sexually mature after less than one year of ocean residence. Six jacks were recovered with missing adipose fins in 1975/1976: 3 were found in Tenderfoot Creek, 1 in Meighn Creek, 1 in the Little Stawamus River, and 1 in the Cheakamus River. Since none of these jacks contained CWTs, no tag recovery conclusions could be drawn from jack recoveries.

Estimated Number of Tags in 1976/1977 Escapement to Study Streams

Coho escapements in Table 6 for Tenderfoot Creek, Meighn Creek and Little Stawamus River were estimated by Fisheries field staff plus the field crew associated with the tag recovery effort on the Squamish River system. These estimates were based on regular visual observations of spawners in each study stream, and were used to expand dead recoveries of marks and CWTs returning to each tributary (Table 6).

For these estimates it was assumed that untagged and unmarked coho escaping to each tributary originated in that tributary. Note that numbers tagged were not adjusted for tagging mortality or for delayed tag loss from juveniles in fresh water.

The estimates of CWTs in the escapement should be adjusted upwards for apparent tag loss due to carcass decomposition and, in particular, loss of eyeballs and eye musculature. If we assume that the 85.8% CWT recovery rate for adipose-clipped adult coho recovered alive in the Cowichan River estuary[2] represents the true percentage of escaping adipose clips containing tags in the three Squamish study streams, then corrected estimates of CWTs in tributary escapements are 103 for Tenderfoot Creek, 26 for Meighn Creek and 31 for Little Stawamus River (Table 6).

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[2] A similar wild coho marking program was conducted on the Cowichan River in 1975 and 1976 (Armstrong and Argue, 1977). Marked adults from this smolt tagging program were recovered alive while purse seining in the Cowichan River estuary during October of 1976 and 1977. These fish were in "silver-bright" condition, thus the proportions with CWTs should represent the cumulative effect of all tag loss prior to spawning. Note that the same personnel tagged Squamish River and Cowichan River coho smolts in 1975. In 1976, 81.8% of the estuary recoveries had CWTs (18/22); in 1977, 89.7% had CWTs (183/204). The average of 1976 and 1977 percentages with CWTs was 85.8%.

Table 6. Coho escapement and estimated CWT returns to study streams.

Tagging Location	Total Dead Recoveries	Total Mark Recoveries	CWT Recoveries	Estimated Escapement
Tenderfoot Creek	97	29	17	400
Meighn Creek	90	15	10	180
Little Stawamus River	126	19	12	240
Total	313	63	39	820

	Estimated Marks in Escapement[a]	Estimated CWTs in Escapement (uncorrected)[a]	Estimated CWTs in Escapement (corrected)[b]
Tenderfoot Creek	120	62	103
Meighn Creek	30	20	26
Little Stawamus River	36	23	31
Total	186	105	160

	Estimated CWTs in Escapement (corrected) for each Tag Code[c]				
	4/2/5	15/2/5	5/2/5	8/2/5	Total
Tenderfoot Creek	75	21	7	-	103
Meighn Creek	-	-	26	-	26
Little Stawamus River	-	-	-	31	31
Total	75	21	33	31	160

[a] The estimated escapement is assumed to contain the same proportions of adipose marked and CWT coho as did the dead recovery sample.

[b] Corrected for tag loss due to carcass decomposition (e.g. 120 (.858) = 103) see text.

[c] "Estimated CWTs in Escapement (corrected)" apportioned into estimates for each CWT code using proportions of each known tag code from tag recovery data in Table 2.

Based on the corrected tag estimates and the estimated escapements in Table 6, the incidence of tags in 1976/1977 was 1 in 5.5 for Meighn Creek[3] and 1 in 7.7 for Little Stawamus River. To estimate the incidence of tags for Tenderfoot Creek we subtracted the estimate of 7 adults that were tagged in Meighn Creek and returned to spawn in Tenderfoot Creek, from the estimated Tenderfoot Creek CWT escapement. Thus Tenderfoot Creek incidence of tags in 1976/1977 was 400/(103-7) or 1 in 4.2. Comparable values for 1975/1976 were 1 in 5.4, 1 in 4.8 and 1 in 5.8 for Meighn Creek, Little Stawamus River and Tenderfoot Creek respectively.

Based on corrected tag recoveries it was estimated that a minimum of 1.1% (2.4% in 1975/1976) of the tagged Tenderfoot Creek coho smolts returned as age 1.1 spawning adults in 1976/1977; comparable return for Meighn Creek tags[3] was 1.3% (0.5% in 1975/1976) and for Little Stawamus River, 0.5% (0.8% in 1975/1976). For the three study streams combined, a minimum of 0.9% of all tagged smolts were estimated to have escaped in 1976/1977 (1.1% in 1975/1976). No allowance was made for Tenderfoot coho that may have spawned in nearby sections of the Cheakamus River, for possible jack returns of marked age 1.1 coho from the 1973 brood in 1975/1976, and for age 2.1 adult returns of marked coho in 1977/1978 (see below).

The above CWT estimates should be viewed with some caution as they were calculated on the basis of visual spawning ground population estimates. However, spawning ground surveys on the study creeks were certainly made on a more regular and systematic basis in 1976/1977 than in years when tag recovery was not the major objective, and in our opinion are an accurate reflection of coho escapements. Also it should be remembered that the CWT estimates assume negligible straying by marked and unmarked fish.

1977/1978 Escapement Recovery of 1973 Brood Coho from Tenderfoot Creek

Argue and Armstrong (1977 MS) speculated that a significant fraction of the 1,370 coho pre-smolts tagged on March 22, 1975 remained in fresh water for an additional year. Tenderfoot Creek and Mosley Lake were surveyed between December 17,1977 and March 11, 1978 to check for marked adult spawners from the 1973 brood.

In a total spawning ground dead pitch of 571 carcasses, 5 coho had completely missing adipose fins and 3 coho had partial adipose clips. One of the coho with a completely missing adipose fin contained a CWT (code 15/2/5) from the March 22, 1975 tagging (Table 7). It was assumed that all adipose clips were from coho marked in 1975, and not from coho that were naturally missing their adipose fins. This seems to be a reasonable assumption since the incidence of naturally missing adipose fins was 1 in 1,312 for the 1975 smolt migration (Argue and Armstrong, 1977 MS) compared to an incidence of one adipose clip in 70 for the 1977/1978 adult escapement.

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[3] Includes the estimate of 7 Meighn tag recoveries in Tenderfoot Creek.

Table 7. Distribution of Tenderfoot Creek adipose mark recoveries into different recovery categories.

	1977/78	1976/77
Unmarked	563	68
Complete Marks	4[a]	23
CWTs Recovered	1 (25.0%)	15 (65.2%)
Decomposed Carcasses with Marks	1	2
CWTs Recovered	0 (0%)	0 (0%)
Partial Marks	3	4
CWTs Recovered	0 (0%)	2 (50%)
Total Marks	8	29
CWTs Recovered	1 (12.5%)	17 (58.6%)
Total Dead Pitch	571	97
% Complete Marks	0.7%	23.7%
% Decomposed Carcasses	0.2%	2.1%
% Partial Marks	0.5%	4.1%
% Unmarked	98.6%	70.1%
% Marked	1.4%	29.9%
% Total Dead Pitch with CWTs	0.2%	17.5%

[a] Three coho with completely missing adipose fins also had missing eyeballs.

Based on procedures used in the previous section we estimated that 9 CWTs returned in 1977/1978 (Table 8). As mentioned previously, the observed CWT recovery was code 15/2/5. Thus it was assumed that the nine estimated CWTs were all code 15/2/5. As noted by Argue and Armstrong (1977 MS), code 15/2/5 was placed on coho smolts that were clearly smaller than average and had the outward appearance (colour and parr marks) of juveniles that would likely remain resident in fresh water for an additional year. For both Tenderfoot Creek tag codes (4/2/5 and 15/2/5), nine of 105 returns or 9% returned in 1977/1978, and 96 or 91% returned in 1976/1977.

The total percentage of Tenderfoot Creek tags that returned from a release of 9,027 tagged smolts was 1.16%, made up of 1.06% in 1976/1977 and 0.1% in 1977/1978.

Scales were taken from all marked coho in 1977/1978. Of interest, all marked coho, including the tagged coho, were aged 1.1, not 2.1 as expected based on the 1975 tagging data. Scale photographs from three of the 1977/1978 adipose-clipped coho (Figs. 9 to 11) are compared with two unmarked coho sampled in 1977/1978 (Figs. 12 and 13) and two tagged adult coho (15/2/5; 4/2/5) sampled during the 1976/1977 survey (Figs. 14 and 15).

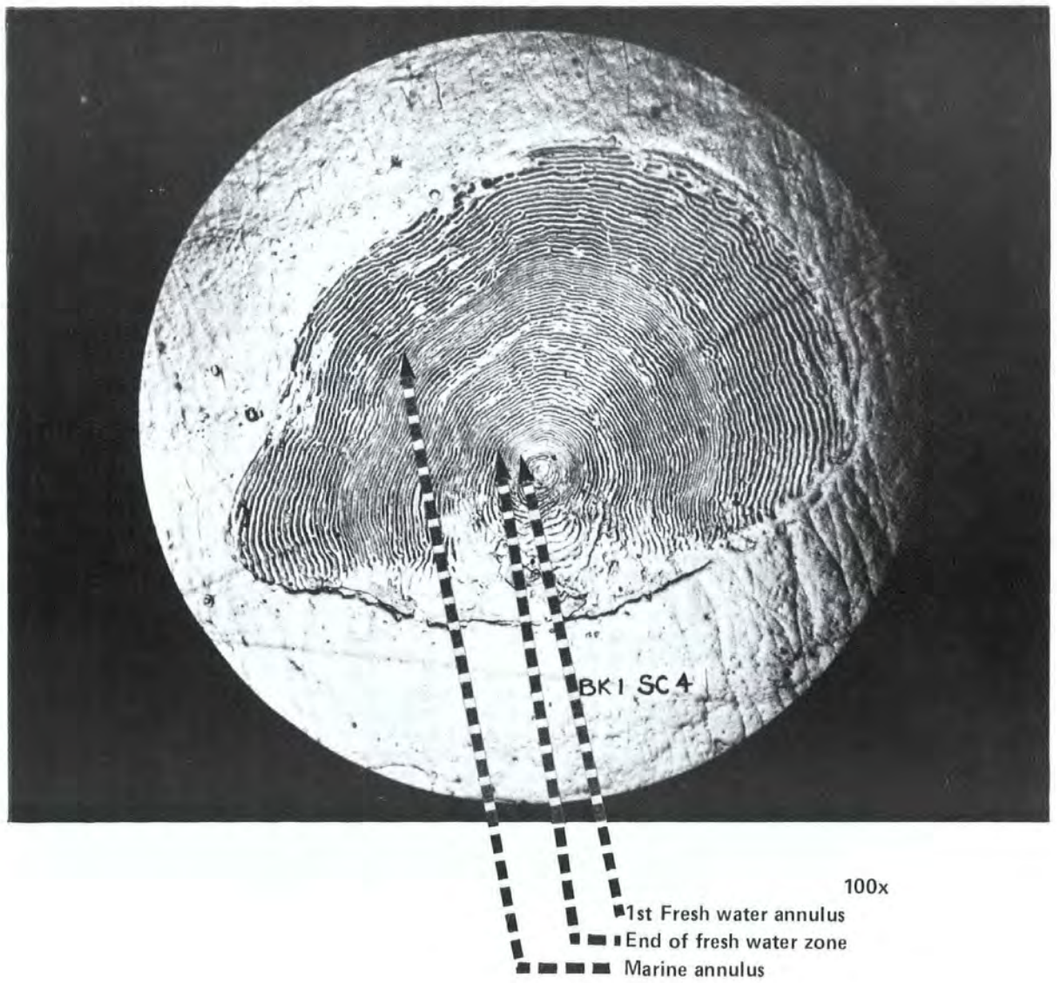
Fresh water growth patterns on scales from age 2.1 coho (based on the presence of an adipose clip) show no clear indication of a second annulus (e.g. Figs. 9 to 11). The circuli patterns did, however, suggest that first year growth was poor, since the visible annuli generally occurred between 6 and 11 circuli from the scale focus. The circuli patterns past the fresh water annulus on some of the known age 2.1 coho (e.g. Figs. 9 and 11) were similar to a large "estuary" type pattern (i.e. wider spaced circuli) with no visible check or annulus before entry to salt water. This particular pattern was also observed on adult coho scales from the Vedder/Chilliwack River system in 1977/1978 (Y. Yole, personal communication). Of interest, Clutter and Whitesel (1956) noted that a few Fraser River sockeye smolt scale samples did not show a characteristic first fresh water annulus, and there was a transitional intergradation of fresh and salt water circuli on a few adult scales.

The tagged age 2.1 coho (Fig. 10) demonstrated a different circulus pattern in fresh water. For this fish the circuli to the fresh water annulus (7 circuli) were fine and equally spaced, but contained many broken circuli (stressed) as were the circuli from the fresh water annulus to the end of the fresh water growth (9 circuli). The scale reader was not aware that this fish was age 2.1 based on the tag and clip; however, due to the large number of fine, stressed fresh water circuli, the scale reader noted the possibility that this pattern might represent an age 2.1 coho. Some scales from unmarked coho recovered in January, 1978 showed fresh water patterns similar to adipose-clipped coho (Fig. 12) while others had fresh water patterns typical of age 1.1 coho (Fig. 13). Scales from tag code 15/2/5 (Fig. 14) and tag code 4/2/5 (Fig. 15) coho recovered in January of 1977, and therefore undoubtedly age 1.1, are presented for comparison.

In summary, from the scales presented it is apparent that age 2.1 nuclear scale patterns are not distinct from nuclear patterns of age 1.1 coho in Tenderfoot Creek. Clearly more documented scale samples are required, based on coho of known age, in order to clarify this potential ageing problem with coho salmon.

Table 8. Comparison of coho escapement and estimated CWT returns to Tenderfoot Creek for 1976/1977 and 1977/1978.

	1977/78	1976/77	Total
Total Dead Recoveries	571	97	668
Total Mark Recoveries	8	29	37
CWT Recoveries	1	17	18
Escapement	800	400	1200
Estimated Marks in Escapement	11	120	131
Estimated CWTs in Escapement (uncorrected)	1	70	71
Estimated Total CWTs in Escapement (corrected)	9	103	112
Estimated CWTs by Tag Code			
5/2/5 (Meighn)	-	7	7
4/2/5 (Tenderfoot, smolts)	-	75	75
15/2/5 (Tenderfoot-Mosley Lake, pre-smolts)	9	21	30
Total	9	103	112



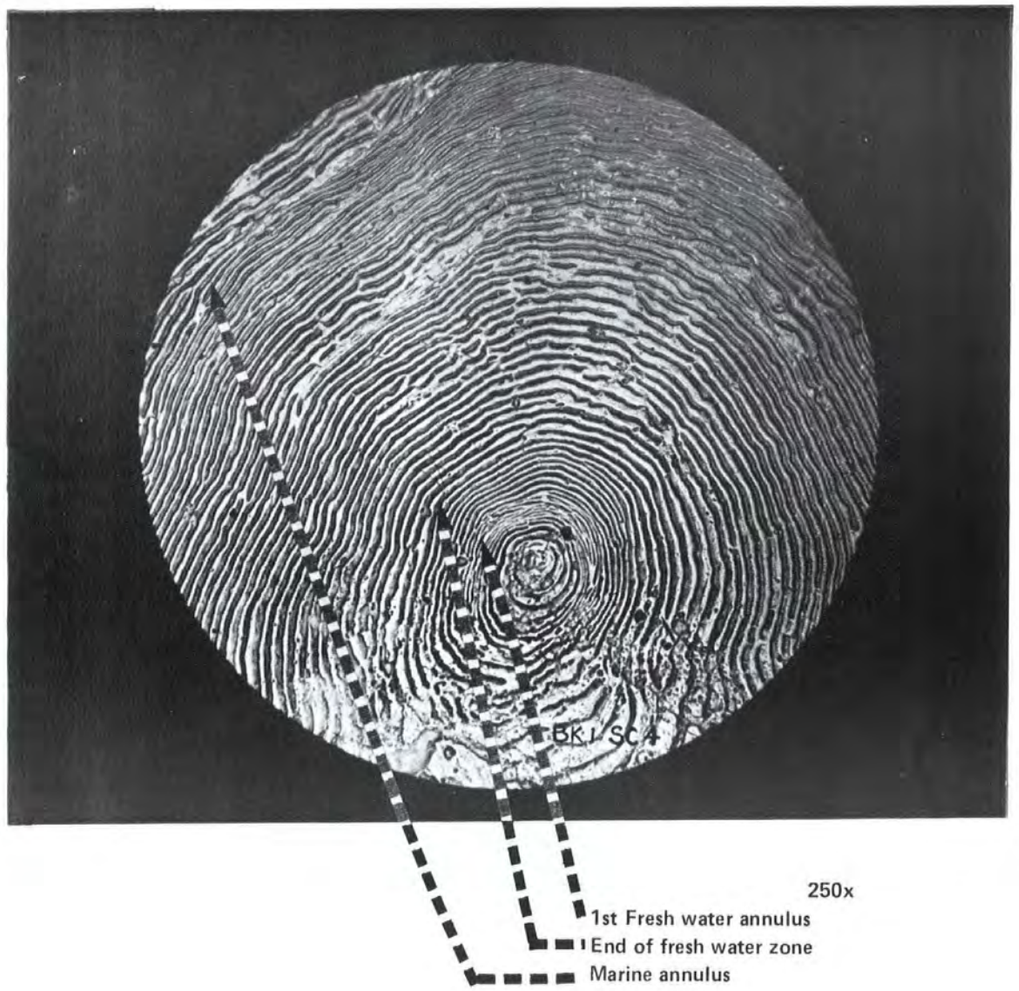
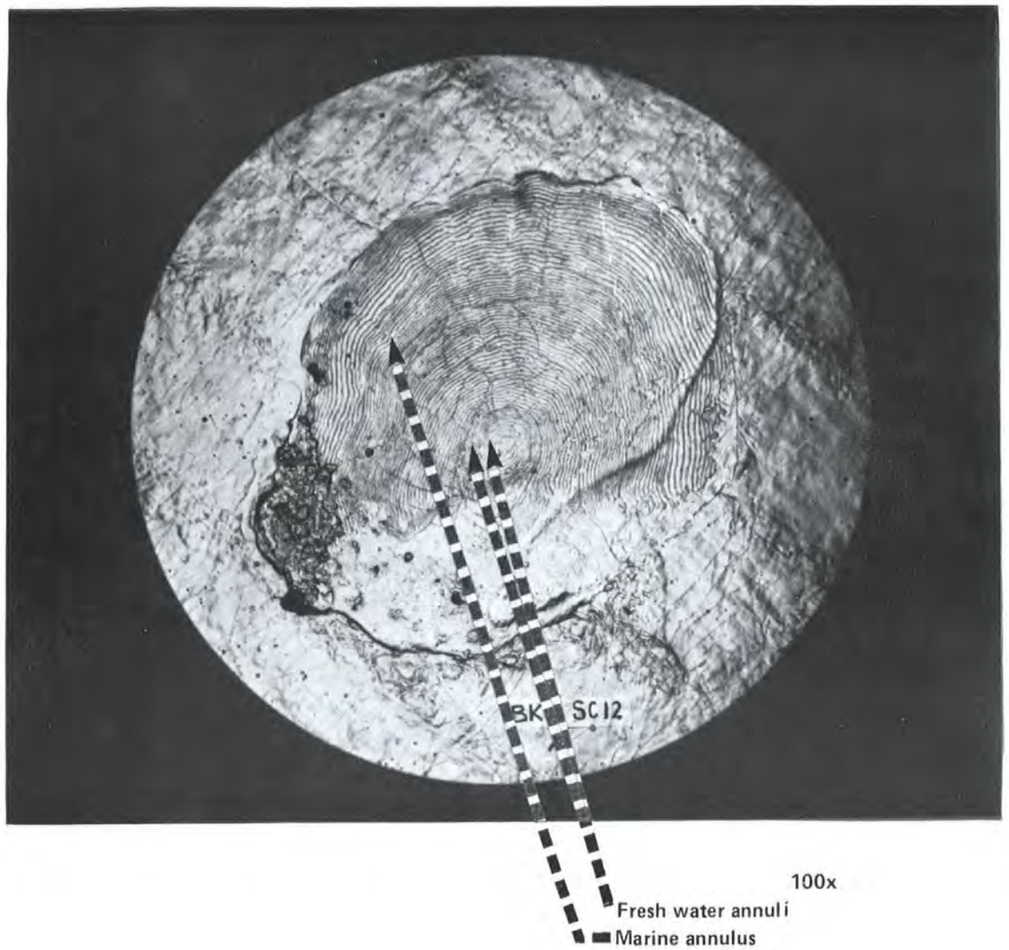


Fig. 9. Scale from age 2.1 adipose-clipped coho (length 44.5 cm) recovered on December 20, 1977 in Tenderfoot Creek: magnification 100, 250x; eleven closely packed circuli to the fresh water annulus and ten wider spaced circuli to the end of the fresh water or estuary zone. Fresh water zones and salt water annulus are indicated by arrows.



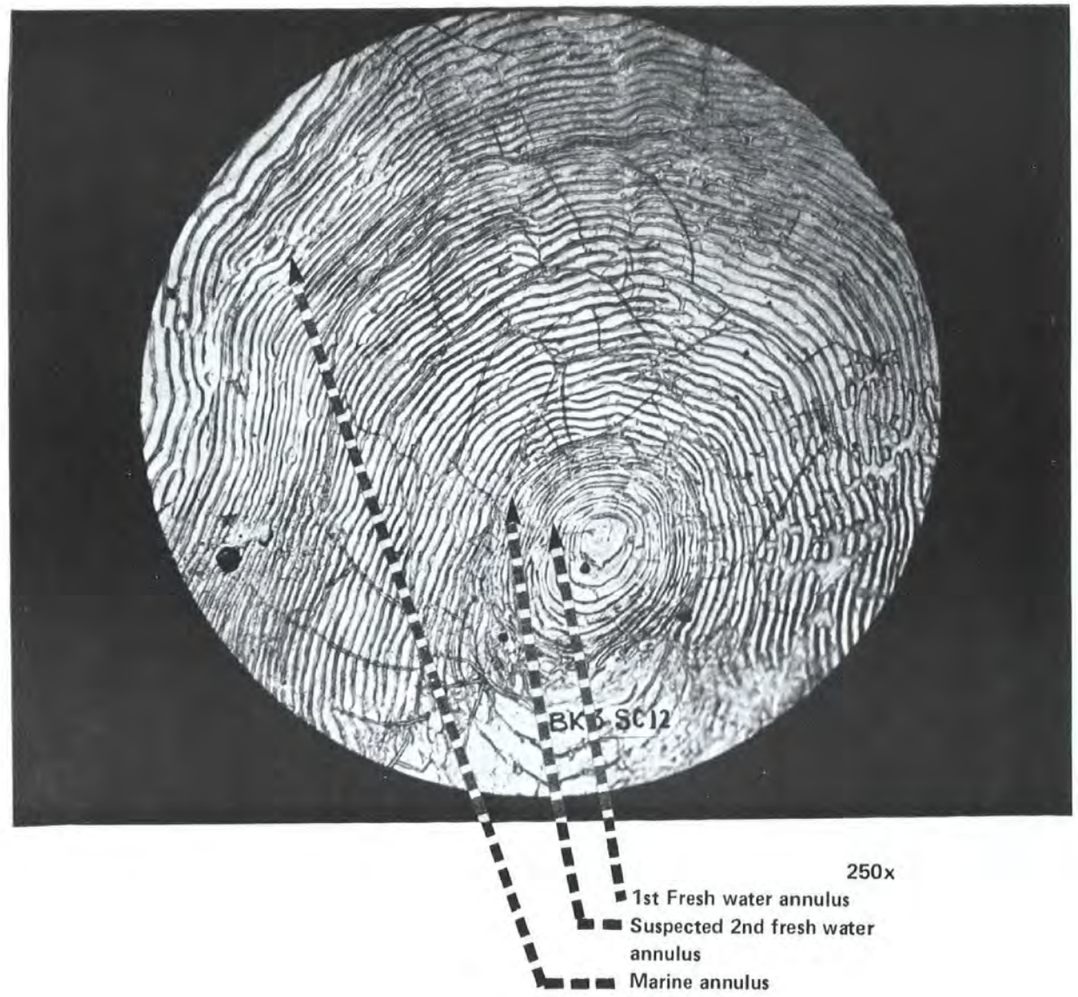
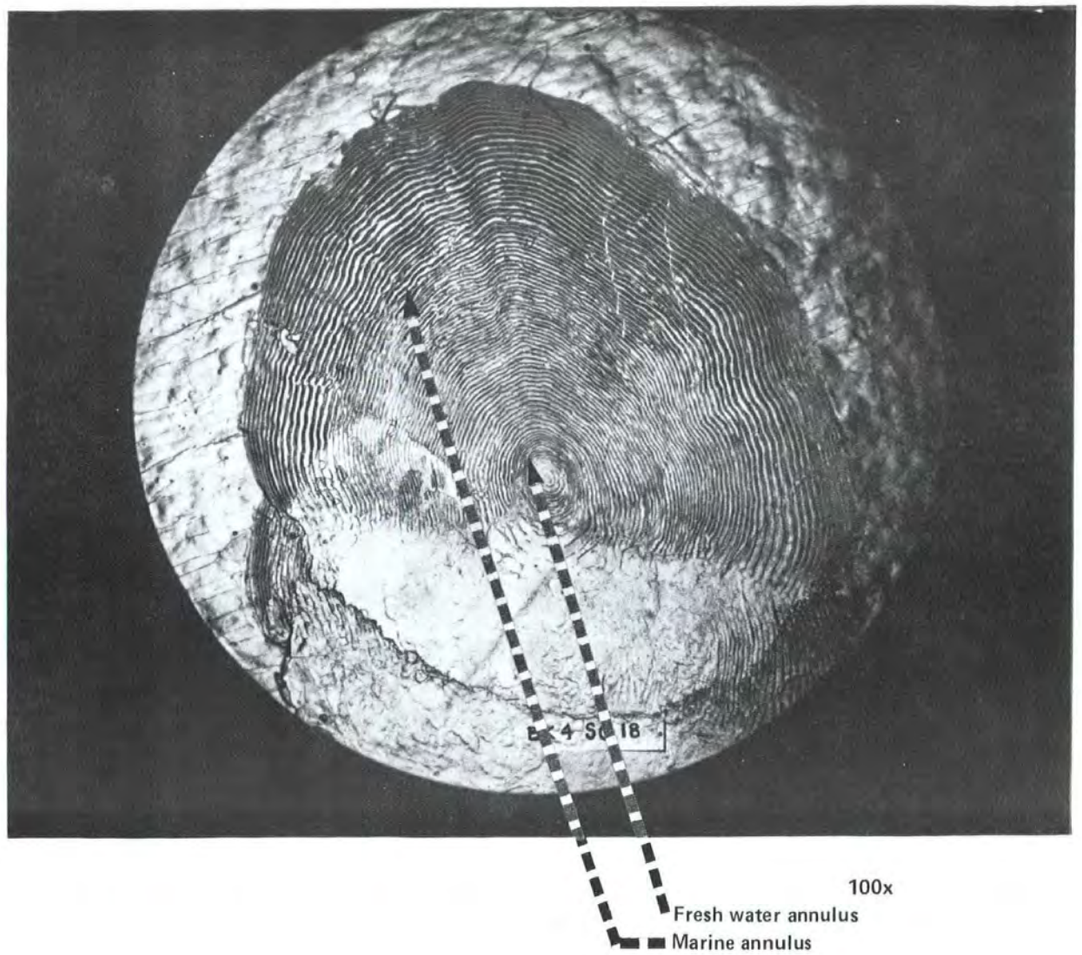


Fig. 10. Scale from age 2.1 adipose-clipped and tagged (15/2/5) coho (length 48.8 cm) recovered on January 23, 1978 in Mosley Lake: magnification 100, 250x; scale slightly regenerate; seven circuli to an obscure first fresh water annulus, and nine circuli to the end of the suspected second fresh water annulus. Fresh and salt water annuli are indicated by arrows.



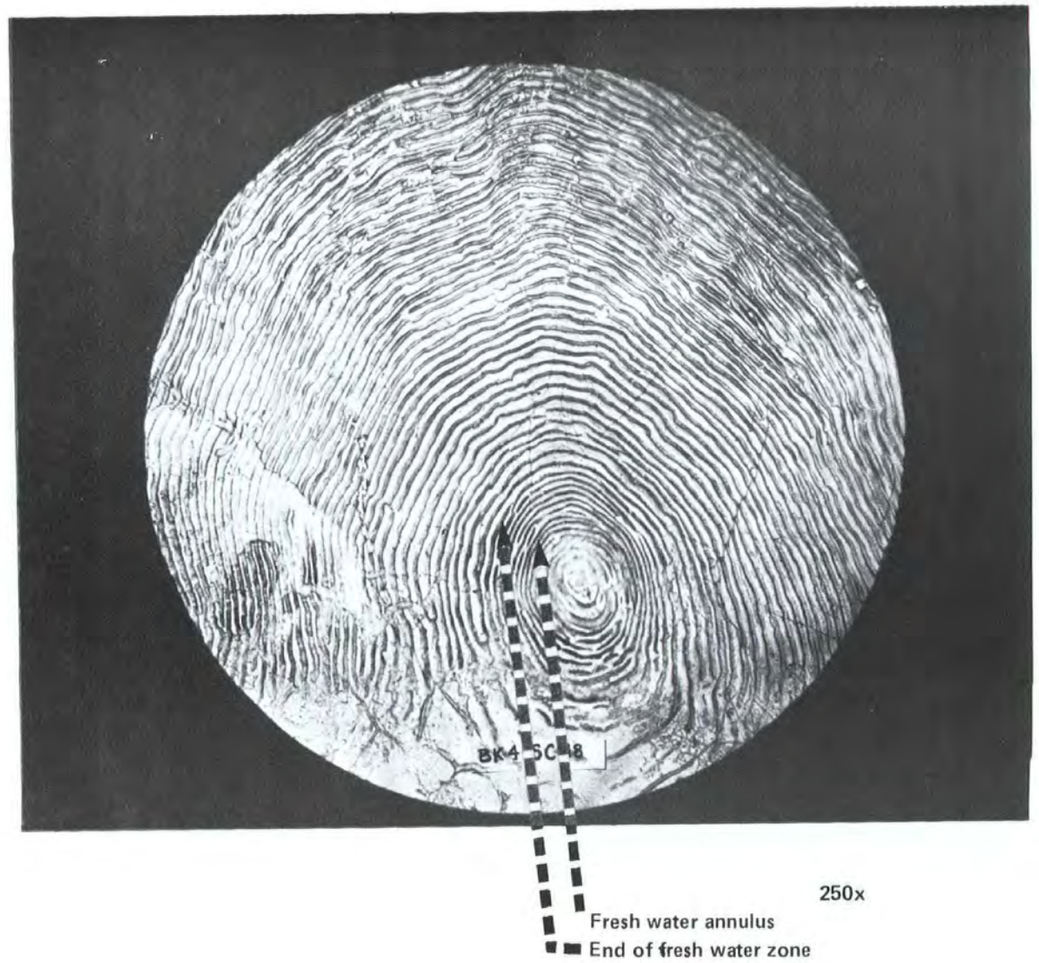
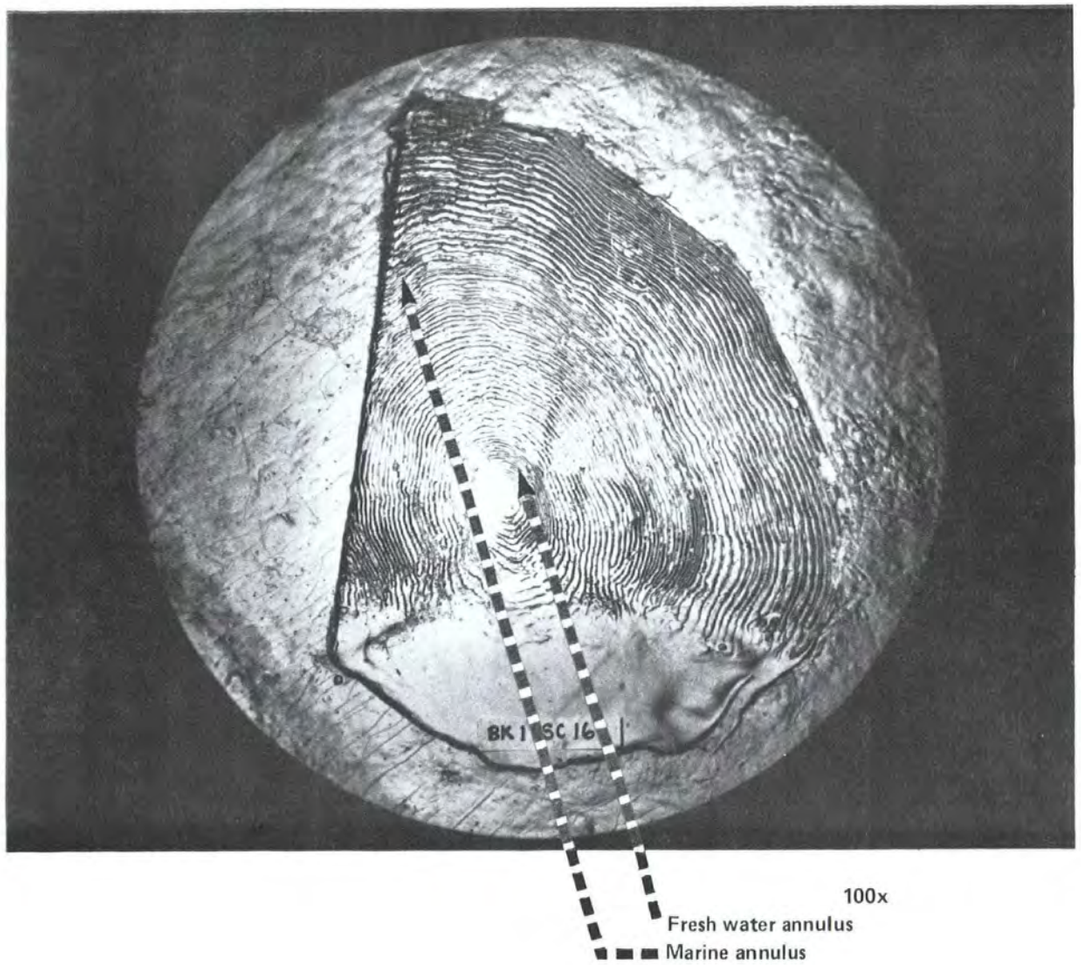


Fig. 11. Scale from age 2.1 adipose-clipped coho (length 49.5 cm) recovered on February 1, 1978 in Mosley Lake: magnification 100, 250x; six closely spaced circuli to the fresh water annulus and nine wider spaced circuli from the fresh water annulus to the end of the fresh water zone. Second fresh water annulus obscured by transition or estuary growth. Fresh water zones and salt water annuli are indicated by arrows.



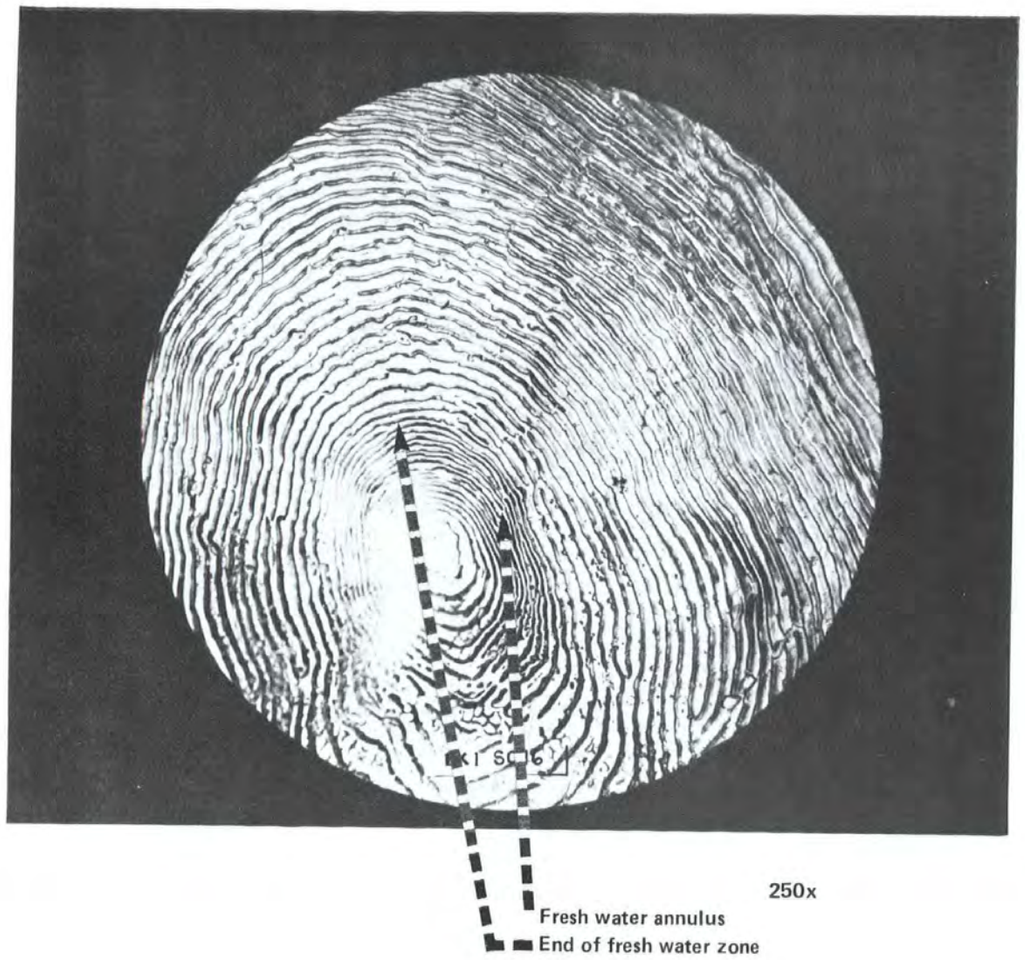
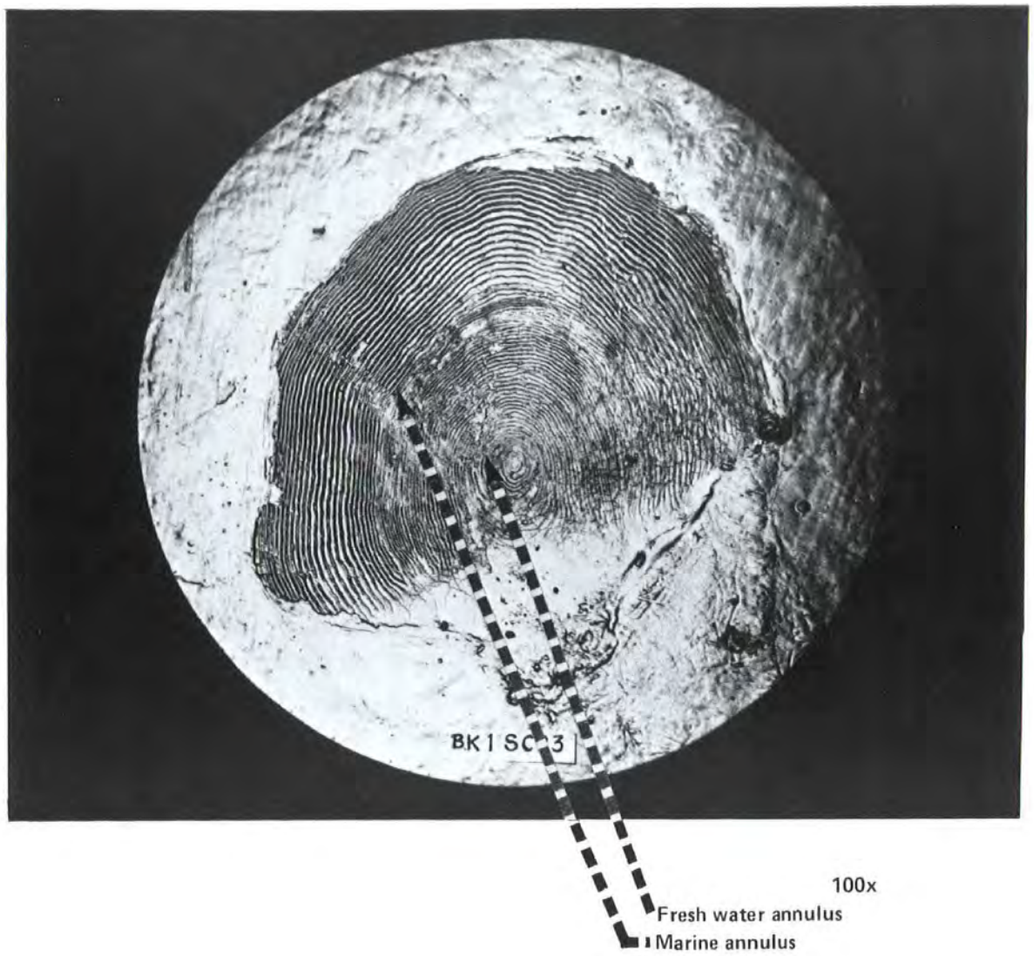


Fig. 12. Scale from age 1.1 unmarked coho (length 36.5 cm) recovered on December 29, 1977 in Mosley Lake: magnification 100, 250x; scale slightly regenerate; ten circuli to the fresh water annulus and eight circuli plus growth to the end of the fresh water zone. Fresh and salt water annuli indicated by arrows.



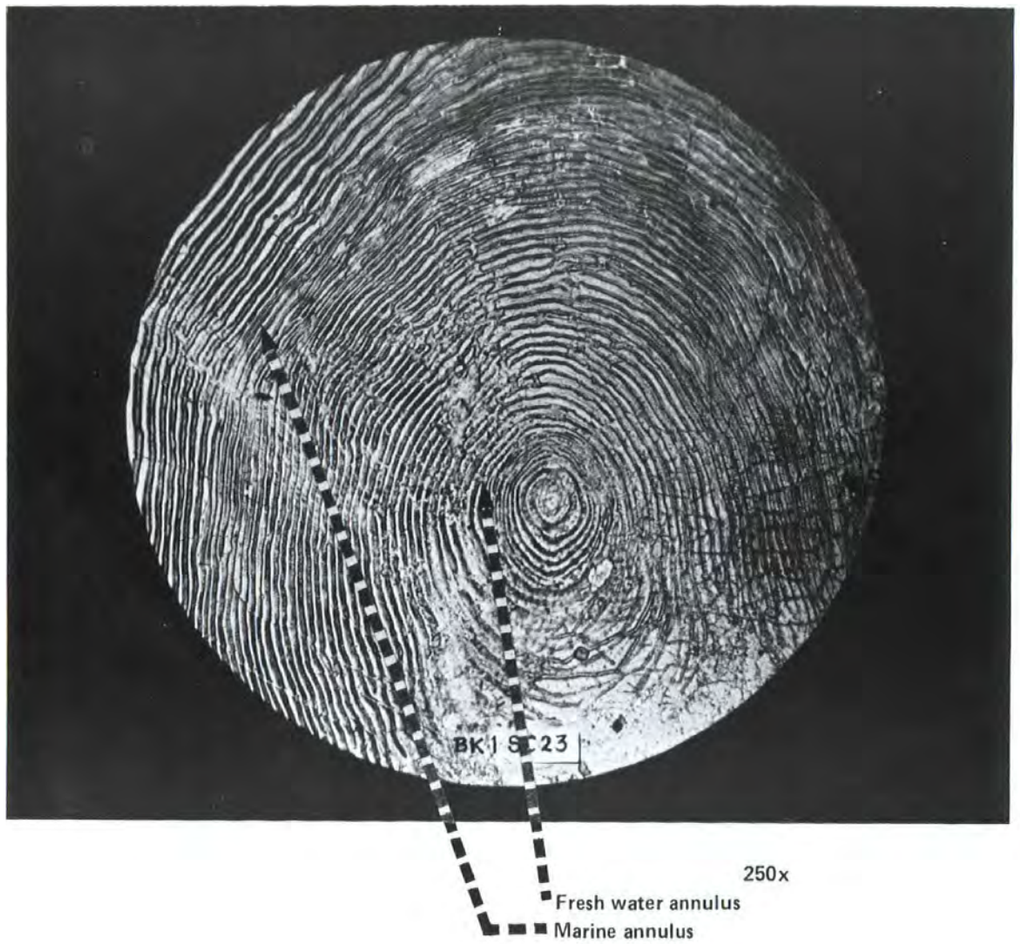


Fig. 13. Scale from age 1.1 unmarked coho (length 48.8 cm) recovered on December 29, 1977 in Mosley Lake: magnification 100, 250x; nine circuli to the fresh water annulus with no plus growth. Fresh and salt water annuli are indicated by arrows.

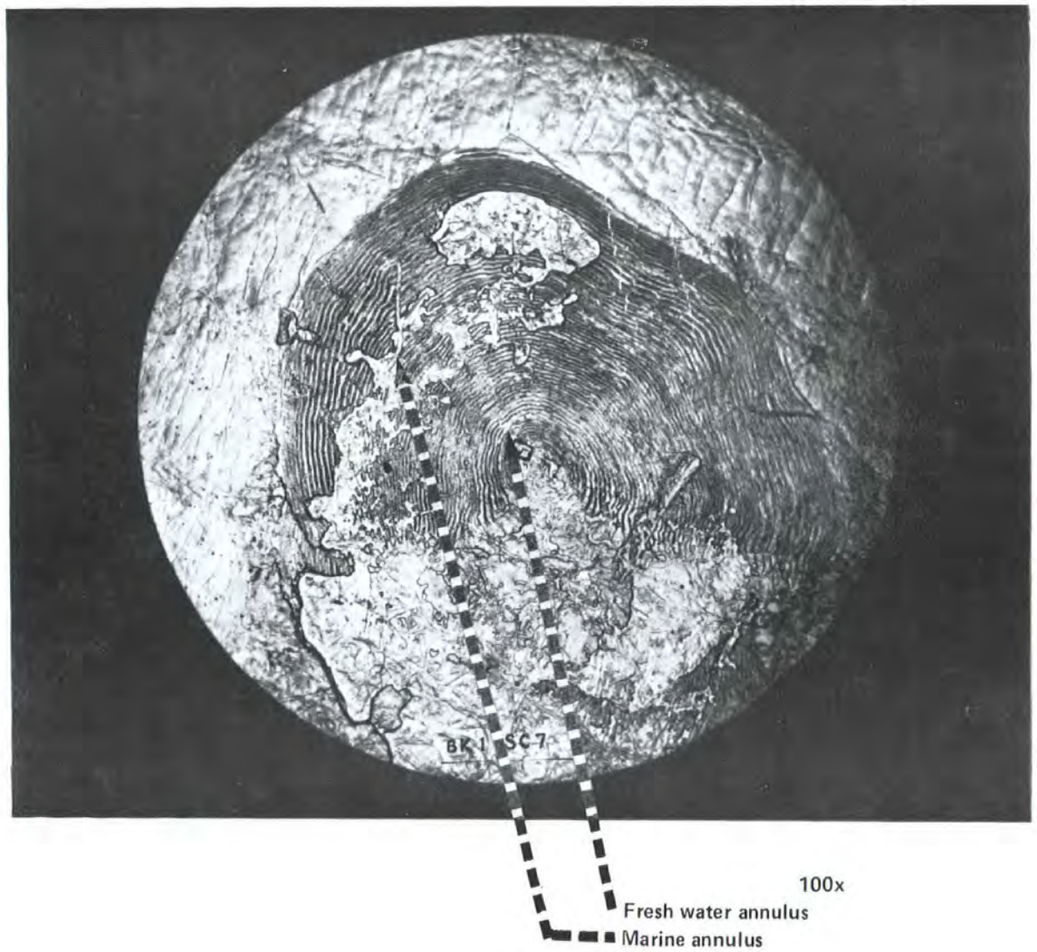
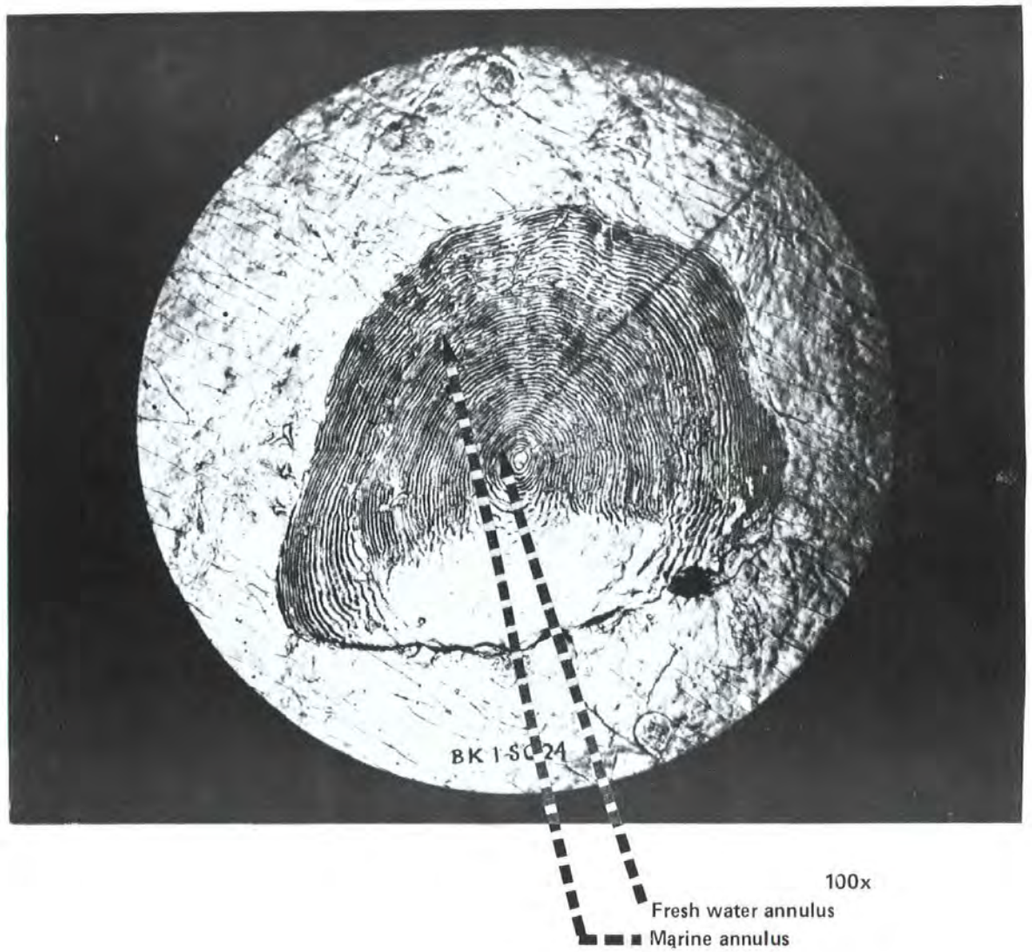


Fig. 14. Scale from age 1.1 adipose-clipped and tagged (15/2/5) coho (length 56.4 cm) recovered from Mosley Lake on February 12, 1977: magnification 100, 250x; condition of the scale very poor; ten circuli to the fresh water annulus and five circuli plus growth to the end of the fresh water zone. Fresh and salt water annuli are indicated by arrows.



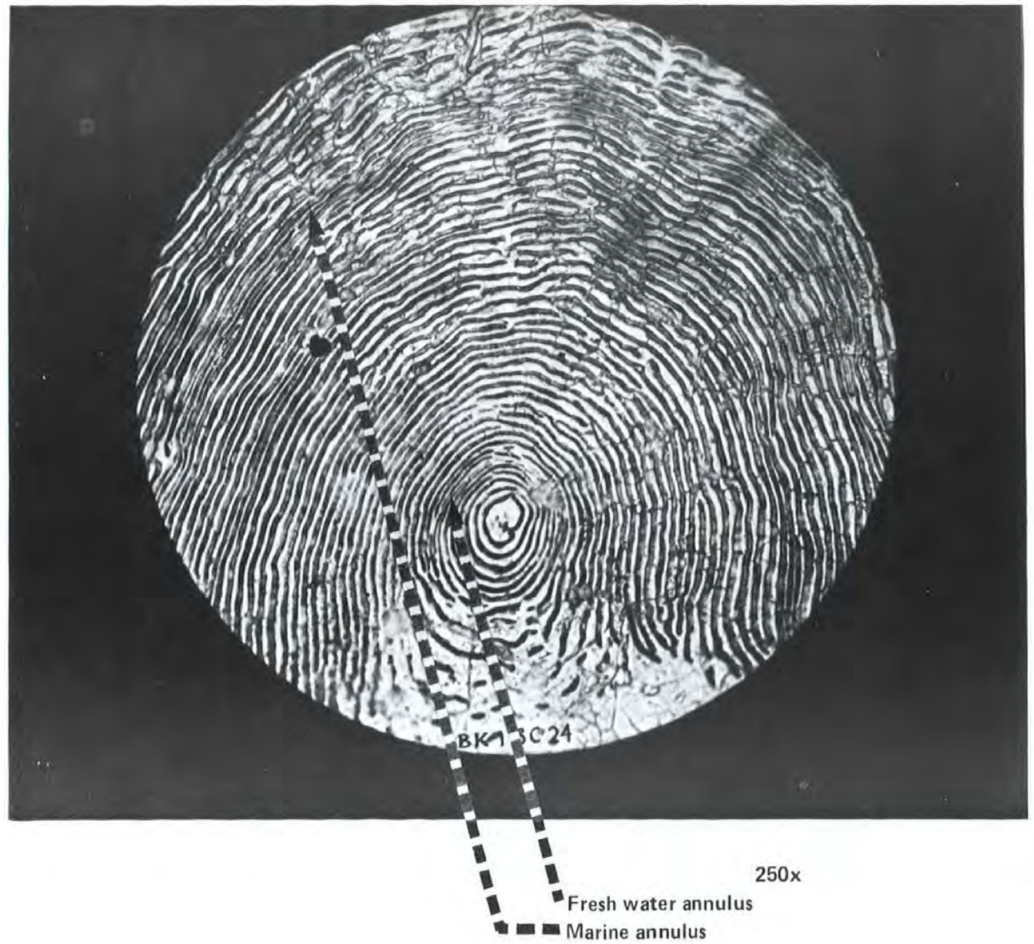


Fig. 15. Scale from age 1.1 adipose-clipped and tagged (4/2/5) coho (length 43.4 cm) recovered on February 12, 1977 in Mosley Lake: magnification 100, 250x; scale slightly regenerate; nine circuli to the fresh water annulus with no plus growth. Fresh and salt water annuli are indicated by arrows.

Comparison of Pre-smolt and Smolt Tag Groups Recovered from Tenderfoot Creek

Coho pre-smolts were tagged in Mosley Lake in 1975 primarily to check the efficiency of the downstream trap and secondarily to determine whether tagging prior to and after smoltification resulted in similar recovery rates. Observed stream recoveries were higher for the pre-smolt group - 4 recoveries from 1,370 tags or 0.29% versus 11 recoveries from 7,657 smolt tags or 0.14% - but these return rates were not significantly different ($p>0.10$).[4] A similar test of return rates based on estimated total tag returns for each group (Table 8) showed that the escapement return rate for pre-smolts (2.19%) was significantly higher ($p<0.05$) than the return rate for smolts (0.98%) that were tagged approximately one and one-half months later than pre-smolts. A more complete test will utilize ocean tag recoveries from these groups once ocean recovery data are available.

For a second comparison we tested both tag groups for differences in post-orbital-hypural-plate length at the time of spawning ground recovery. The four CWT recoveries from the pre-smolt group (3 in 1976/1977 and 1 in 1977/1978) averaged 51.3 cm (S.D. 4.1), 4.5 cm longer than the eleven 1976/1977 CWT recoveries from the smolt tag group (46.8 cm, S.D. 3.2). The pre-smolt adult recoveries were significantly larger ($p<0.05$) compared to adult recoveries from the smolt tag group.

These preliminary results, based on small sample sizes, suggest that tagging smolts rather than pre-smolts may increase mortality and reduce growth. Further tests are required to confirm this observation.

Incidence of CWT Coho for the Squamish System in 1976/1977

The Squamish CWT recovery crew estimated that 8,250 coho spawned in the Squamish River system in 1976/1977 (Table 9). This estimate was based on regular visual observations of spawners and spawned-out carcasses and was independent of any other Fisheries Service population estimate. Influencing factors were: visibility conditions on the spawning grounds; presence of redds or other gravel disturbances; concentration or presence of predators such as bears, gulls and eagles; statements volunteered by local residents and anglers; and estimated life span of spawners on the spawning grounds. This figure is approximate as only a portion of all possible spawning locations could be or were regularly observed, and this portion was used to extrapolate to the total system estimate. In 1975/1976, an estimated 16,300 coho escaped to the Squamish River system.

If we accept the 8,250 coho escapement in 1976/1977 and assume that the four groups of marks were representative of all coho in the Squamish River system, then the incidence of tagged coho for the total Squamish system was approximately 1 in 52 (1 in 80 for 1975/1976).

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[4] The hypothesis, H_0 - proportion pre-smolts returning = proportion smolts returning, was tested by placing 90% and 95% binomial confidence limits on the difference between the two estimates of the proportion of tags returning.

Table 9. Squamish system coho spawning population estimates for 1976/1977.

Ashlu Creek		Cheakamus River		Mamquam River		Pillchuk Creek	
Ashlu Creek	200	Tenderfoot Creek	400	Mamquam River	150	Pillchuk Cr.	100
		Brohm Creek	50	Mashiter Cr.	10	Cloudburst	150
		Moody Creek	75				
		John Wright Creek	50				
		Cheakamus Station Cr.	75				
		Cheakamus River	1,000				
Totals	200		1,650		160		250

Shovelnose Creek		Squamish River		Stawamus River	
Shovelnose Creek	300	Meighn Cr.	180	Stawamus River	20
		Judd Slough	50	Little Stawamus River	240
		Dryden/Hop Ranch Creeks	150		
		Branch 100 Creek	100		
		High Falls Creek	250		
		Chuk Chuk Creek	150		
		Powerhouse Creek	300		
		28 mile Creek	100		
		35 mile Creek	100		
		36 mile Creek	100		
		37½ mile Creek	175		
		38½ mile Creek	50		
		Lewis Creek	75		
		Shop Creek	50		
		Elaho River	100		
		Squamish River	3,500		
Totals	300		5,430		260

Total for Squamish System 8,250

SUMMARY

Adult returns of coded-wire-tagged 1973 brood coho to Tenderfoot Creek, Meighn Creek and Little Stawamus River were enumerated between November 15, 1976 and March 3, 1977. A limited spawning ground survey was conducted on Tenderfoot Creek between December 17, 1977 and March 11, 1978. Unsuccessful attempts were made in the fall of 1976 to gillnet adult coho in the estuary for mark samples. Significant observations are noted in point form below:

1. "Silver bright" coho were present in the Squamish system from September to January. Coho spawning in Meighn Creek peaked in late December and coho spawning in Little Stawamus River peaked in mid-December. Tenderfoot Creek spawning peaked in the last two weeks of January. A few spawners were present through February,

2. From a 1976/1977 sample of 962 spawned-out coho, 77 were identified as having missing adipose fins, but only 42 (55%) of these contained CWTs. The low tag recovery rate probably resulted from carcass decomposition and poor tag placement,

3. Except for recovery of one Meighn Creek tag in Tenderfoot Creek in 1976/1977, there was little evidence of straying of marks,

4. Approximately 80% of the adults sampled from the study streams had complete adipose fins. It is hypothesized that large numbers of the 1973 brood juveniles left the study streams as imprinted fry or fingerlings prior to May, 1975, reared elsewhere in the Squamish River system, went to sea, and then returned as unmarked adults to the study streams in 1976/1977,

5. Little Stawamus River adult coho were significantly smaller than Tenderfoot Creek and Meighn Creek adult coho. Little Stawamus River coho smolts were the smallest at the time of tagging and had the lowest survival to escapement,

6. Approximately 47% of the dead recoveries from the three study creeks were females,

7. A minimum of 1.1% of the tagged Tenderfoot Creek coho smolts were estimated to have escaped to spawn at age 1.1; comparable returns for Meighn Creek and Little Stawamus River were 1.3% and 0.5% respectively. Little Stawamus River smolts were smallest at the time of tagging,

8. For the three study streams combined, a minimum of 0.9% of all tagged smolts were estimated to have escaped to spawn,

9. A significant fraction of the coho tagged in Tenderfoot Creek-Mosley Lake apparently resided in fresh water for an additional year and then returned to Mosley Lake as age 2.1 adult spawners in 1977/1978. Scales from marked age 2.1 spawners were interpreted as age 1.1,

10. Based on preliminary results, coho tagged as pre-smolts in March, 1975 at Mosley Lake (headwaters of Tenderfoot Creek) had a higher survival to escapement and returned at a larger size compared to downstream migrant coho smolts tagged approximately 1.5 months later at the Tenderfoot Creek trap. Further pre-smolt: smolt comparisons are required to verify these observed differences,

11. The incidence of age 1.1 coho CWTs in the 1976/1977 coho escapement was 1 in 4.2 for Tenderfoot Creek, 1 in 5.5 for Meighn Creek and 1 in 7.7 for Little Stawamus River,

12. A rough estimate of the total Squamish River system incidence of tagged age 1.1 coho for 1976/1977 was 1 in 52. It is assumed that the CWT recovery crew's spawning escapement estimate was relatively accurate and that the four groups of marks were representative of all coho in the Squamish River system.

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APPENDIX A

ESTUARY GILLNET SET RECORDS

Date	Set #	Time P.S.T.	Duration (min.)	Tide	Coho	Chum	Dogfish	Set Location
Oct 18	1	16:45	20	ebb	1 F	2 M	3	bluffs near river mouth
	2	17:40	15	ebb	-	-	-	across river mouth
	3	18:30	15		-	-	-	near Woodfibre
	4	19:15	15		-	-	12	½ net only - bluffs
Oct 19	5	08:00	15	ebb	-	2	-	bluffs
	6	09:25	30	ebb/slack	-	-	-	Watts Point
	7	11:00	40	flood	1 F	2	-	Woodfibre
	8	16:00	20	flood	-	4	-	ferry slip
Oct 20	9	08:25	30	ebb	-	2	2	bluffs
	10	09:30	30	ebb	-	-	1	river training wall
	11	10:30	30	low slack	-	-	-	basalt mine
	12	12:00	20	flood	-	-	4	ferry slip
	13	13:13	30	flood	-	-	-	Watts Point
Oct 25	14	12:00	15	ebb	-	-	-	river mouth
	15	13:00	20	ebb	-	1	1	bluffs near river
	16	14:10	25	low slack	-	2	1	ferry slip
	17	15:00	20	flood	-	-	-	basalt mine
	18	23:00	10	ebb	-	1	5	bluffs
	19	23:59	10	ebb	-	3	10	river mouth
Oct 26	20	01:00	10	ebb	-	1	12	bluffs
	21	02:20	10	low slack	-	-	8	ferry slip
	22	08:30	15	high slack	-	-	1	barge moorage
	23	09:30	60	ebb	-	2	7	bluffs
	24	11:15	15	ebb	-	6	-	ferry slip
	25	12:30	15	ebb	-	1	-	Watts Point
	26	13:30	15	ebb	1 M	-	-	Britannia Beach
	27	14:30	15	ebb	-	-	1	mid Sound near Britannia
	28	15:45	15	flood	-	1	2	bluffs near river
Oct 27	29	08:00	15	flood	-	2	2	bluffs
	30	09:30	30	ebb	-	-	-	2 miles SW of Britannia
Nov 2	31	10:40	15	flood	-	1	-	bluffs
	32	11:25	20	flood	-	-	-	river mouth SW
	33	12:05	30	flood	-	-	-	ferry slip
	34	12:55	30	flood	1	-	5	Watts Point
	35	14:00	20	high slack	-	-	-	Darrell Bay
	36	15:00	30	ebb	-	-	-	east side river mouth
	37	15:55	20	ebb	-	2	15	bluffs
Nov 3	38	09:00	25	low slack	-	-	-	1 mile N. of Defence Islands
	39	09:45	25	flood	-	-	-	Defense Islands
				TOTAL	4	35	92	

APPENDIX B

DAILY SPAWNING GROUND COUNTS

1976/1977

DATE	WEEK	LIVE COUNT		DEAD RECOVERY					RECOVERY LOCATIONS	WATER CONDITIONS			WEATHER
		ACTUAL	ESTIMATE	UNMARKED		MARKED		TOTAL		VISIBILITY	LEVEL	TEMP. °C	
				M	F	M	F						
TENDERFOOT CREEK													
Dec 26	6	-	-							poor	down	8.0	rain
27	7	6	-							medium	down	8.0	clear
28	7	50	100							good	down	8.0	clear
29	7	38	100+							good	down	5.0	cloudy
Jan 05	8	51	100		1			1	A_1	good	down	8.0	clear
06	8	31	100	1	4	1	1	7	A_1, E	good	down	8.0	clear
07	8	-	-						C, D	good	down	6.0	clear
09	8	12	-	4	4	1	2	11	A_1, A_2	good	down	7.0	cloudy
13	9	4	-	8	8	3	2	19	A_1, A_2	good	down	7.0	rain
14	9	2	-	1	1			2	E, F	good	rising	7.0	rain
18	10	2	-						F	good	rising	7.0	rain
19	10	7	-	1				1	F	good	down	7.5	clear
20	10	80	100	3		2		5	A, B	medium	stable	6.5	clear
28	11	80	100	1		1		2	A_2	medium	down	6.0	clear
29	11	40	100		1			1	A_1	medium	down	6.0	clear
Feb 01	12	1	-		1			1	F	good	stable	-	clear
06	12	40	50	3	6	1	3	13	A, B	good	down	5.5	clear
09	13	40	50	1			3	4	B	good	down	6.0	cloudy
10	13	2	-	1	1	2	2	6	D, E, F, G	-	rising	6.0	cloudy
11	13	2	-						D, E, F, G	medium	rising	5.5	cloudy
12	13	40	-		1	3		4	A, B	poor	rising	6.0	rain
16	14	-	-		1			1	E, F, G	poor	down	6.0	cloudy
18	14	20	25						A, B	good	down	6.5	clear
23	15	-	-		1			1	C, D, E, F, G	poor	down	8.0	clear
25	15	1	-		3			3	A, B	poor	down	5.5	cloudy
28	16	-	-	7	4	1	1	14	A, B	good	stable	5.5	rain
28	16	-	-		2			2	C, E, F, G	good	stable	6.0	rain
Mar 02	16	-	-						A, B, C, D, E, F, G	good	stable	6.5	clear
			TOTAL	68		29		97					
LITTLE STAWAMUS													
Nov 28	2	-	-				1	1	C	-	-	-	-
29	3	30	60	5	3	1		9	C	-	-	-	-
30	3	3	-			2		2	C, O	good	down	-	-
Dec 03	3	3	20	3	3	4		10	B	medium	down	-	-
07	4	1	-	4	12	2	3	21	C, E	poor	rising	-	rain
14	5	9	-	2				2	B	medium	stable	-	clear
17	5	5	25	10	12	1	1	24	B, C, D, E	poor	rising	-	rain
19	5	-	-	1				1	D	poor	down	6.0	clear
23	6	1	20	3	3			6	A, B, C	medium	down	6.0	cloudy
25	8	1	15		6	1		7	B, C	poor	stable	6.0	rain & snow
26	6	5	15	4	7		1	12	C	poor	rising	6.0	rain
28	7	1	-	4	4			8	A, B, C	medium	down	6.0	frosty
30	7	7	-		2			2	C	medium	down	6.0	frosty
Jan 02	7	-	-	3	1			4	C	good	stable	6.0	frosty
05	8	-	-		1			1	C	good	stable	6.0	frosty
10	9	-	-	5			1	6	B	good	stable	6.0	cloudy & snow
15	9	-	-	2	4	1		7	A, C, O	medium	down	6.0	rain
24	11	-	-						C, D	good	stable	7 0	frost
31	12	1	-	1				1	C	good	stable	6.0	rain
Feb 08	13	-	-		1			1	C	good	down	6.0	cloudy
17	14	-	-		1			1	C	good	down	6.5	cloudy
22	15	-	-						Full length	good	down	6.0	clear
			TOTAL	107		19		128					

1976/1977

DATE	WEEK	LIVE COUNT		CHUM	DEAD RECOVERY					RECOVERY LOCATIONS	WATER CONDITIONS			WEATHER
		ACTUAL	ESTIMATE		UNMARKED		MARKED		TOTAL		VISIBILITY	LEVEL	TEMP. °C	
					M	F	M	F						
CHEAKAMUS RIVER														
Nov 18	1	-	-							C	-	-	-	-
Dec 01	3	5	30		1	1			2	B	good	low (stable)	-	frost, foggy
07	4	3	?	4 dead	2	3			5	A, B	good	rising	-	rain
10	4	-	-		8				B (5J)	C	-	-	-	-
16	5	-	-		3				(3J)	C	-	-	-	-
21	6	28	160		13	14			27	B, D	medium	stable	-	cloudy
23	6	-	-							C	-	-	-	-
26	6	-	120		2		1		3	B	poor	rising	7.0	snow & rain
27	7	12	-		2	1			3	B	very poor	rising	4.5	heavy rain
28	7	28	-		3	2			5	B	poor	down	5.0	clear
29	7	50	200		7	6			13	A, B	medium	down	5.0	cloudy
29	7	13	20		2	3			5	C	good	down	-	cloudy
30	7	10	-		5	2			7	C	good	stable	-	-
Jan 04	8	30	100		1	4			5	B	good	down	4.0	clear, frosty
07	8	130	500		4	4			8	B, D	good	down	-	clear, frosty
13	9	50	300		5	13			18	B, D, E	medium	rising	4.0	rain
18	10	80	400							B, D, E	medium	rising	6.0	rain
19	10	-	-		2				2	C	good	dropping	4.0	rain
20	10	12	12		2	1	1	1	5	A, C	medium	down	6.5	clear
27	11	46	100		5	2		1	8	B	good	stable	4.5	clear
29	11	31	100		1	1			2	B	good	stable	4.0	clear
29	11	13	-		3	2			5	C	good	down	-	clear
Feb 01	12	100	200		1	9		1	11	C, C	good	stable	5.5	clear
02	12	10	-		1	1		2	4	C	good	stable	-	cloudy
07	13	1	-		5	1		1	7	C	good	stable	-	cloudy
09	13	4	?		7	5			12	B	good	stable	6.0	cloudy
10	13	2	-			1		1	2	B	good	stable	6.0	cloudy, rain
11	13	40	?							B, C	medium	rising	4.0	cloudy, rain
14	14	26	-		3	4			7	A, B	poor	rising	4.5	rain
16	14	10	50		1	2			3	B, C	medium	down	5.5	clear
18	14	25	50		1			2	3	B, C	medium	down	5.5	clear
21	15	21	50		1	4			5	B	poor	rising	5.0	rain
22	15	3	3		1				1	C	medium	down	5.0	cloudy
23	15	2	40							A, B	med-poor	down	5.5	clear
25	15	7	30		4	5			9	B	modium	down	5.5	cloudy
28	16	2	?		4	8			12	A, B, C, D, E	medium	down	6.0	cloudy
Mar 01	16	6	10		3	1			4	C to Mouth	medium	down	6.0	clear
03	16	8	10		5	4			9	A to Mouth	medium	down	6.0	clear
				TOTAL	212		11		223					
MEIGHN CREEK														
Dec 08	4	7	15				2		2	A, B	poor	rising	7.0	rain
14	5	11	-		3	3			6	A^2, B^1, C^1	poor	down	-	clear, werm
16	5	16	25		5	2	1	1	9	A, C	poor	stable	7.0	drizzle
18	5	15	30								poor	rising	7.0	clearing
19	5	9	30		3			1	4	A, C	medium	down	7.0	sunny, frost
22	6	12	20		3	3			6	A	good	down	6.0	cloudy
25	6	7	-		1	2	1	3	7	A, B	poor	down	6.0	rain
26	6	12	20		6	2	1	1	10	A	poor	rising	6.0	rain
26	6	1	-			1			1	G	poor	rising	6.0	rain
27	7	15	30		1	1			2	A	poor	rising	6.0	rain
27	7	21	30		2	2			4	A	medium	down	7.0	clear
28	7	8	30		3				3	A, C	medium	down	7.0	frosty
29	7	8	25		1		1		2	A	poor	stable	6.0	rnin
30	7	8	15		2	2		1	5	A, B, C, D	good	stnble	7.0	clenr
Jan 01	7	8	15		3	1	1		5	A, D	medium	stable	7.0	clear
03	8	2	10								medium	stable	6.0	clear
05	8	3	10		4				4	A, C	medium	stable	5.0	clear
06	8	-	10		1				1	A	medium	stable	6.0	clear
10	9	2	10		2	1			3	B, C	good	down	6.0	clear
12	9	-	10		1				1	A	medium	down	7.0	snowing
14	9	2	?		1				1	B	medium	rising	7.0	rain
17	10	4	?		2				2	D	medium	rising	6.0	rnin
19	10	5	?			1	1		2	A	good	down	7.0	clear
21	10	2	?		1	1			2	slough	poor	stable	-	clear
24	11	5	?			1			1	E	good	stable	7.99	frost
31	12	3	5							A, B, C, D	medium	stable	5.0	rain
Feb 06	12	1	5							A, B, C	medium	stable	6.0	clear
08	13	-	-		2				2	B	medium	stable	6.5	cloud
10	13	-	-		3				3	A, B	medium	stable	6.0	clear
17	14	-	-		1				1	C	poor	stable	5.5	cloudy
24	15	-	-		1				1	Full leagth	medium	stable	6.0	cloudy
				TOTAL	75		15		90					

DATE	WEEK	LIVE COUNT		CHUM		DEAD RECOVERY					RECOVERY LOCATIONS	WATER CONDITIONS			WEATHER
		ACTUAL	ESTIMATE	ACT.	EST.	UNMARKED		MARKED		TOTAL		VISIBILITY	LEVEL	TEMP. °C	
						M	F	M	F						
JOHN WRIGHT ESQ. CREEK															
Jan 20	10	14	14			1	1			2		good	stable	-	frosty
24	11	13	13			3	1			4		good	stable	-	clear
27	11	3	3			4	4			8		good	stable	-	clear
28	11	1	1					1	1	2		good	stable	-	clear
Feb 11	13	-	-									good	stable	-	cloudy
13	13	7	7									good	stable	-	cloudy
16	14	3	3			2	1			3		good	stable	-	cloudy
18	14	-	-					1		1		good	stable	-	cloudy
22	15	1	1									good	stable	-	cloudy
28	16	-	-									good	stable	-	cloudy
				TOTAL		17		3		20					
SQUAMISH RIVER															
Dec 05	3	150	150								above mud creek	medium	rising	-	drizzle
08	4	-	-	4000 dead							side channel opposite Judd	medium	rising	-	rain
15	5	-	-	15 dead							side channel at 30 mile	medium	stable	-	rain
28 MILE CREEK															
Dec 21	6	24	50			11	4			15		good	stable	-	overcast
31	7	28	50			22	20			42		good	down	4.0	clear
Jan 25	11	-	-				2			2		medium	stable	-	frosty
				TOTAL		59		0		59					
CHUK CHUK CREEK															
Dec 01	3	11	150	15	250							good	stable	-	clear & frosty
21	6	14	30	Dec 1 + 21 each 300 dead		4	8			12		good	down	-	cloudy
Jan 26	11	-	-			1	1			2		medium	stable	3.25	frosty
				TOTAL		14		0		14					
BRANCH #100 CREEK															
Dec 21	6	2	6			4	5			9		medium	stable	-	drizzle
31	7	-	-									good	stable	-	clear
Feb 01	12	-	-									good	stable	-	clear
				TOTAL		9		0		9					
SHOVELNOSE CREEK															
Dec 01	3	43	60	100 300 dead		14	9			23		good	stable	5.0	clear, frosty
20	6	33	50			7	6			13	above bridge	good	stable	-	drizzle
20	6	9	15			5	8			13	below bridge	good	stable	-	drizzle
Jan 25	11	5	15	40 dead							above bridge	good	stable	4.5	clear
Feb 01	12	1	5			1	5			6	above & below bridge	good	stable	5.0	clear, cold
15	14	-	-				2			2	above & below bridge	good	down	6.5	-
27	15	-	-									-	-	-	-
				TOTAL		57		0		57					

DATE	WEEK	LIVE COUNT		DEAD RECOVERY					RECOVERY LOCATIONS	WATER CONDITIONS			WEATHER
		ACTUAL	ESTIMATE	UNMARKED		MARKED		TOTAL		VISIBILITY	LEVEL	TEMP. °C	
				M	F	M	F						
DRYDEN CREEK													
Dec 02	3	6	-		3			3	A, B, C	good	stable	-	frost & fog
08	4	12	20	1	1			2	A, B	poor	rising	-	rain
16	5	41	60		1			1	A, B, C	medium	rising	-	drizzle
22	6	14	30	5	12			17	A, B, C	medium	down	5.5	cloudy
30	7	11	25	1	9			10	A, B, C	medium	stable	4.0	clear & frosty
Jan 09	8	5	15	3	6			9	A, B, C	medium	stable	5.0	clear
14	9	0	10	2	1			3	A, C	poor	rising	6.0	rain
19	10	7	15	4	2			6		poor	rising	6.0	rain
20	10	0	-	1	5			6	D	poor	down	-	clear
27	11	11	1	4	3			7	A, B, C	good	stable	6.0	clear
Feb 04	12	-	-					0		good	stable	6.0	clear
08	13	-	-	2				2	C	good	stable	6.5	cloudy
17	14	-	-	2	2			4	C	poor	down	6.0	cloudy
24	15	-	-					0	A, B, C	medium	down	6.5	cloudy
			TOTAL	70		0		70					
CHEAKAMUS STATION CREEK													
Dec 28	7	20	50							good	down	5.0	frosty
29	7	21	50	1				1		good	down	5.0	cloudy
Jan 07	8	4	10	7	8			15		poor	rising	3.0	clear
19	10	3	10	1				1		good	down	6.0	clear
Feb 11	13	1								good	down	4.0	cloudy
13	13	13	13							good	down	5.0	cloudy
16	14	-	-	1				1		medium	down	5.5	cloudy
18	14	-	-	1	2			3		good	down	5.5	clear
22	15	-	-		1			1		medium	down	5.5	clear
28	16	-	-							good	stable	6.0	cloudy
			TOTAL	22		0		22					
HOP RANCH CREEK													
Dec 05	3	-	-							good	stable	-	drizzle
22	6	10	20		3			3	X	medium	down	6.0	cloudy
30	7	5	10	1	2			3	X	good	stable	5.5	clear
Jan 09	8	6	15	2	3			5	X, Y, Z	good	stable	6.0	clear
19	10	7	15	3	1			4	X, Y, Z	poor	rising	6.5	rain
24	11	-	-		1			1	X, Y, Z	good	stable	6.0	clear
Feb 17	14	-	-						X, Y, Z	medium	stable	6.0	cloudy
24	15	-	-						X, Y, Z	medium	stable	6.5	cloudy
			TOTAL	16		0		16					
MAMQUAM RIVER													
Dec 29	7	9	-	2	17			19	C	good	stable	5.0	clear
Jan 05	8	32	-						A, B	good	down	5.0	clear
Feb 24	15	-	-							good	stable	5.0	-
			TOTAL	19		0		19					

DATE	WEEK	LIVE COUNT		CHUM		DEAD RECOVERY				RECOVERY LOCATIONS	WATER CONDITIONS			WEATHER
		ACTUAL	ESTIMATE	ACT.	EST.	UNMARKED M	UNMARKED F	MARKED M	MARKED F	TOTAL		VISIBILITY	LEVEL	TEMP. °C	
JUDD SLOUGH															
Nov 15	1	-	-									-	-	-	-
18	1	-	-									-	-	-	-
25	2	-	-									-	-	-	-
Dec 02	3	-	-									-	-	-	-
09	4	-	-			1				1		-	-	-	-
16	5	-	-			1				1		-	-	-	-
22	6	-	-			1				1		-	-	-	-
				TOTAL		3		0		3					
36 MILE CREEK (DOG LEG CREEK)															
Dec 14	5	6	15	40 dead		3	4			7	above bridge	medium	stable	7.5	clear, warm
15	5	30	45	20 dead		6	11			17	below bridge	medium	stable	-	rain
26	6	-	-			2	1			3	above bridge	medium	stable	-	frosty
				TOTAL		27		0		27					
37½ MILE CREEK															
Dec 14	5	62	100			6	7			13		medium	stable	-	overcast
31	7	34	50			26	21			47[a]		good	down	4.0	clear
Jan 26	11	-	-			6	5			11		medium	stable	-	frosty
Feb 21	15	-	-			2				2		good	down	5.5	-
				TOTAL		73		0		73					
MOODY CREEK															
Feb 14	14	-	-			2	3			5		-	-	4.5	-
23	15	-	-									-	-	-	-
				TOTAL		5		0		5					
ASHLU CREEK															
Jan		No fish seen by Fisheries Engineering Crew													
Feb 08	13	2	-				1			1		-	-	-	-
24	15	-	-									-	-	-	-
26	15	-	-									-	-	-	-
				TOTAL		1		0		1					
MASHITER CREEK															
Dec 07	4	-	-									good	rising	6.0	rain
Feb 01	12	-	-			Unlikely spawning ground for coho - very steep and rocky									
HIGH FALLS CREEK															
Dec 01	3	18	30			3	3			6		good	stable	3.0	frosty
02	3	5	12			4	2			6	lower end	good	stable	-	frost & heavy fog
22	6	18	35			4	13			17		good	stable	-	overcast
31	7	-	-			1	1			2	east side of road	good	stable	-	clear
Feb 01	12	-	-									good	stable	3.0	clear
27	15	-	-									-	-	-	-
				TOTAL		31		0		31					

[a] 17 of 26 males were jacks

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Date	Live Count		Dead Recovery					Recovery Locations	Water Conditions			Weather
	Actual	Estimate	Unmarked		Marked		Total		Visibility	Level	Temp °C	
			M	F	M	F						
Tenderfoot Creek - Mosley Lake												
Dec 17	-	-	38	32	-	-	70	A,B	poor	-	-	rain
20	-	-	3	5	-	1	9	E,F,G,	medium	-	-	rain
Jan 3	-	-	10	14	1	-	25	-	medium	-	-	cloudy
11	-	-	108		1	-	109	A,B	good	-	-	clear
23	-	-	51	45	2	1	99	A,B	good	-	-	clear
26	-	-	26		1	-	27	A,B,C,D,E,F,G,	medium	-	-	-
Feb 1	-	-	22	25	-	1	48	A,B	medium	-	-	snow
8			57		-	-	57	A,B	good	-	-	clear
15	-	-	39		-	-	39	A,B	good	-	-	clear
21	-	-	28	22	-	-	50	A,B	good	-	-	clear
Mar 11	-	-	38		-	-	38	A,B	good	-	-	-
		TOTAL	563		8		571					

APPENDIX C

INDIVIDUAL MARK RECOVERY RECORDS

1976/1977

DATE	WEEK	SAMPLE #	LENGTH		SEX	SCALE AGE	CONDITION OF ADIPOSE		REMARKS	LOCATION	CWT CODE
			NOSE-FORK	ORB-HYP			COMPLETELY MISSING	PARTIAL OR DECOMPOSED			
TENDERFOOT CREEK											
Jan 06	8	TF I		44.5	M	3_2	completely			A_1	pin found then lost
06	8	2		42.5	F	poor	completely			A_1	no pin
09	8	3		47.2	F	R	completely			A_1	pin found then lost
09	8	4		37.4	M	3_2	completely			A_1	5/2/5
09	8	5		43.5	F	R	completely		eyes missing	A_2	4/2/5
13	9	6		52.6	M	3_2	completely			A_1	15/2/5
13	9	7		46.8	M	3_2	completely			A_1	4/2/5
13	9	8		50.2	F	3_2	completely			A_1	4/2/5
13	9	9		51.2	M	3_2	completely			B	4/2/5
13	9	10		52.0	F	-		decomposed	eyes gone	B	no pin
20	10	11		44.5	M	R		partial		B	4/2/5
20	10	12		41.5	M	3_2	completely			A_2	no pin
26	11	13		38.1	M	3_2		partial		A_2	no pin
Feb 06	12	14		47.0	F	R	completely			B	4/2/5
06	12	15		49.6	M	R	completely			B	4/2/5
06	12	16		41.3	F	R	completely			B	4/2/5
06	12	17		51.0	F	3_2	completely			B	no pin
09	13	18		47.3	F	3_2	completely			B	15/2/5
09	13	19		49.2	F	R	completely			B	no pin
09	13	20		44.0	F	3_2	completely			D	4/2/5
10	13	22		49.7	M	R	completely			F	no pin
10	13	23		37.8	M	3_2	completely		eyes gone	E	no pin
10	13	24		49.0	F	3_2	completely			F	no pin
10	13	25		52.0	F	3_2		partial	big fish	E	no pin
12	13	26		56.4	M	3_2	completely		big fish	B	15/2/5
12	13	27		43.4	M	3_2	completely			A_2	4/2/5
12	13	28		-	M	-	completely			B	no pin
28	16	29		47.0	F	3_2		partial		A_1	4/2/5
28	16	30		54.5	M	-		decomposed		B	no pin
MEIGHN CREEK											
Dec 08	4	M-1		34.8	M	R	completely			A	5/2/5
08	4	2		51.0	M	R		partial		A	no pin
16	5	3		44.6	M	R	completely			A	5/2/5
16	5	4		44.1	F	R	completely			C	no pin
19	5	5 (2-6)		32.8	F	3_2		deformed partial	deformed	A	no pin
25	6	7		48.0	F	-	completely			A	5/2/5
25	6	8		50.9	F	3_2	completely			A	5/2/5
25	6	9		49.0	F	-	completely			A	5/2/5
25	6	10		51.5	M	R	completely			A	5/2/5
26	6	11		48.0	M	3_2	completely		end of nose missing	A	no pin
26	6	12		48.6	F	-	completely			A	5/2/5
29	7	13		40.1	M	3_2	completely	decomposed	adipose area eaten away	A	nn pin
30	7	14		50.3	F	-	completely			A	5/2/5
Jan 01	7	15		38.3	M	3_2	completely			A	5/2/5
19	10	16		50.0	M	3_2	completely			A	5/2/5
LITTLE STAWAMUS											
Nov 28	2	LS 1		44.6	F	R	completely			C	8/2/5
29	3	2	42.8	33.9	M	3_2	completely			C	8/2/5
30	3	3		33.1	M	3_2	completely			C	8/2/5
30	3	4		38.9	M	3_2	completely			C	no pin
Dec 03	3	5		37.5	M	3_2	completely			B	8/2/5
03	3	6		44.4	M	3_2	completely			B	8/2/5
03	3	7		44.1	M	R	completely		no eyes	B	8/2/5
03	3	8		42.4	M	R	completely		no eyes	B	no pin
07	4	2-1		46.4	M	3_2	completely			C	8/2/5
07	4	2-2		41.9	F	3_2	completely			C	no pin
07	4	2-3		33.6	M	3_2	completely			C	8/2/5
07	4	2-4		51.0	F	R	completely			D	no pin
D7	4	9		46.3	F	3_2	completely			E	8/2/5
17	5	10		33.4	F	R	completely			C	8/2/5
17	5	11		32.8	M	-	completely			E	8/2/5
25	6	12		49.0	M	3_2	completely		one eye gone	B	no pin
26	6	13		40.9	F	3_2	completely			C	no pin
Jan 10	9	17		43.9	F	R	completely			B	no pin
15	10	18		41.8	M	R	completely			B	8/2/5
CHEAKAMUS RIVER											
Dec 26	6	CK 1		42.0	M	-	completely			B	4/2/5
Jan 20	10	2		49.3	F	3_2		partial	no eyes	B	no pin
20	10	3		50.0	M	3_2		partial	no eyes	C	no pin
26	11	4		53.2	F	R		decomposed	eyes gone	B	no pin
Feb 01	12	6		49.0	F	3_2	completely			C	4/2/5
02	12	7		45.0	F	3_2		partial		D	no pin
02	12	8		49.5	F	-	completely			D	no pin
07	13	11		50.0	F	3_2	completely			B	no pin
10	13	12		53.1	F	3_2	completely			B	no pin
1B	14	13		46.1	F	3_2	completely		eyes gone	B	no pin
18	14	14		55.0	F	R	completely		eyes gone	B	no pin
JOHN WRIGHT CREEK											
Jan 28	11	JW 1			M			decomposed	poor condition		no pin
28	11	2		51.8	F	3_2	completely				4/2/5
Feb 18	14	3	75.5	68.2	F	R	completely				no pin

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Date	Sample #	Length		Sex	Scale Age	Condition of Adipose		Remarks	Location	CWT Code
		Nose-Fork	Orb-Hyp			Completely Missing	Partial or Decomposed			
Tenderfoot Creek - Mosley Lake										
Dec 20	TF-1	-	44.5	F	3_2	completely	-		E	no pin
Jan 3	2	-	-	M	3_2	-	decomposed	no eyes	A_1	no pin
11	3	-	36.5	M	3_2	-	partial	-	A_2	no pin
23	4	-	43.5	M	3_2	-	partial	-	A_2	no pin
23	5	-	41.2	M	3_2	-	partial	no eyes	A_2	no pin
23	6	-	48.8	F	3_2	completely	-	no eyes	B	15/2/5
26	7	-	43.2	M	3_2	completely	-	no eyes	A_1	no pin
Feb 1	8	-	49.5	F	3_2	completely	-	-	A_1	no pin